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

WADANAHALLI (4D5B2L2a) 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 Wadanahalli Microwatershed, 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: 05-10-2019

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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Wadanahalli Microwatershed was conducted using village cadastral maps and IRS satellite imagery on 1:7920 scale. The false colour composites of IRS imagery were interpreted for physiography and 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 780 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 679 ha in the microwatershed is covered by soils, 86 ha is covered by rock outcrops 8 ha is covered by railway line and 7 ha by others (habitation and water body). The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 15 soil series and 23 soil phases (management units) and 7 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 679 ha area in the microwatershed is suitable for agriculture.*
- *About 13 per cent of area is very shallow (<25 cm), 24 per cent of area is shallow (25-50 cm), 6 per cent of area of the microwatershed has soils that are moderately shallow (50-75 cm), 9 per cent of area of the microwatershed has soils that are moderately deep (75-100 cm), 31 per cent of area is deep (100 - 150 cm) and 4 per cent of area is very deep (>150 cm).*
- *About 19 per cent area in the microwatershed has sandy soils, 58 per cent loamy soils and 10 per cent clayey soils at the surface.*
- *About 74 per cent area in the microwatershed is non gravelly (<15%) and 13 per cent is gravelly (15-35%).*

- *About 31 per cent area of the microwatershed is very high (>200 mm/m) in available water capacity, 19 per cent is low (51-100 mm/m) and 37 per cent area is very low (<50 mm/m).*
- *Entire area in the microwatershed is under very gently sloping (1-3% slope) lands.*
- *Maximum area of about 82 per cent is moderately (e2) eroded, <1 per cent area is slightly eroded (e1) and 4 per cent area is severely (e3) eroded.*
- *An area of 6 per cent is slightly acid (pH 6.0 -6.5), about 17 per cent is neutral (pH 6.5 -7.3), about 6 per cent is slightly alkaline (pH 7.3-7.8), about 19 per cent is moderately alkaline (pH 7.8-8.4), about 29 per cent is strongly alkaline (pH 8.4-9.0), and about 11 per cent is very strongly alkaline (pH >9.0) in the microwatershed.*
- *The Electrical Conductivity (EC) of entire soils of the microwatershed is <2 dsm^{-1} indicating that the soils are non-saline.*
- *About 66 per cent area is medium (0.5-0.75%), 4 per cent is low (<0.5%) and 17 per cent area is high (>0.75%) in organic carbon content of the soil.*
- *About 58 per cent of area is medium (23-57 kg/ha) in available phosphorus content of the soil, 28 per cent of area is low (<23 kg/ha) and 2 per cent of area is high (>57 kg/ha) in the microwatershed.*
- *Available potassium content is medium (145-337 kg/ha) in 85 per cent of area and high (>337 kg/ha) in 2 per cent of area in the microwatershed.*
- *Available sulphur is low (<10 ppm) in an area of about 69 per cent, medium (10 -20 ppm) in 18 per cent of area and high (>20 ppm) in <1 per cent of area in the microwatershed.*
- *Available boron is low (<0.5 ppm) in an area of 71 per cent and medium (0.5-0.1 ppm) in an area of 16 per cent in the microwatershed.*
- *Available iron is sufficient (>4.5 ppm) in 66 per cent of area and deficient (<4.5 ppm) in 21 per cent of area in 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 86 per cent and sufficient (>0.6 ppm) in an area of 1 per cent of 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	-	*281 (36)*		*Guava*	-	*73 (9)*
Maize	*73 (9)*	*208 (27)*		*Sapota*	-	*73 (9)*
Bajra	*73 (9)*	*208 (27)*		*Pomegranate*	-	*73 (9)*
Groundnut	*73 (9)*	-		*Musambi*	-	*73 (9)*
Sunflower	-	*73 (9)*		*Lime*	-	*73 (9)*
Redgram	*233 (30)*	-		*Amla*	*73 (9)*	*47 (6)*
Bengal gram	-	-		*Cashew*	-	-
Cotton	*47 (6)*	-		*Jackfruit*	-	*73 (9)*
Chilli	*73 (9)*	*48 (6)*		*Jamun*	-	-
Tomato	*73 (9)*	*48 (6)*		*Custard apple*	*73 (9)*	*47 (6)*
Brinjal	*73 (9)*	*48 (6)*		*Tamarind*	-	-
Onion	*73 (9)*	*48 (6)*		*Mulberry*	-	*73 (9)*
Bhendi	-	*73 (9)*		*Marigold*	*73 (9)*	*48 (6)*
Drumstick	-	*90 (20)*		*Chrysanthemum*	*73 (9)*	*48 (6)*
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 Wadanahalli 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 Wadanahalli microwatershed is located in the northern part of Karnataka in Yadgir Taluk & District, Karnataka State (Fig.2.1). It comprises parts of Vaddanahalli, Kanahalli, Arakera. B, Naganayakanhalli and Kolluru villages. It lies between 16^0 52' and 16^0 50' North latitudes and 77^0 1' and 77^0 3' East longitudes covering an area of about 780 ha. It is about 19 km southeast of Yadgir town and is surrounded by Vaddanahalli on the east and north, Kolluru on the northwest, Kanahalli on the south, Naganayakanhalli on the west and Arakera. B on the west and southwestern side.

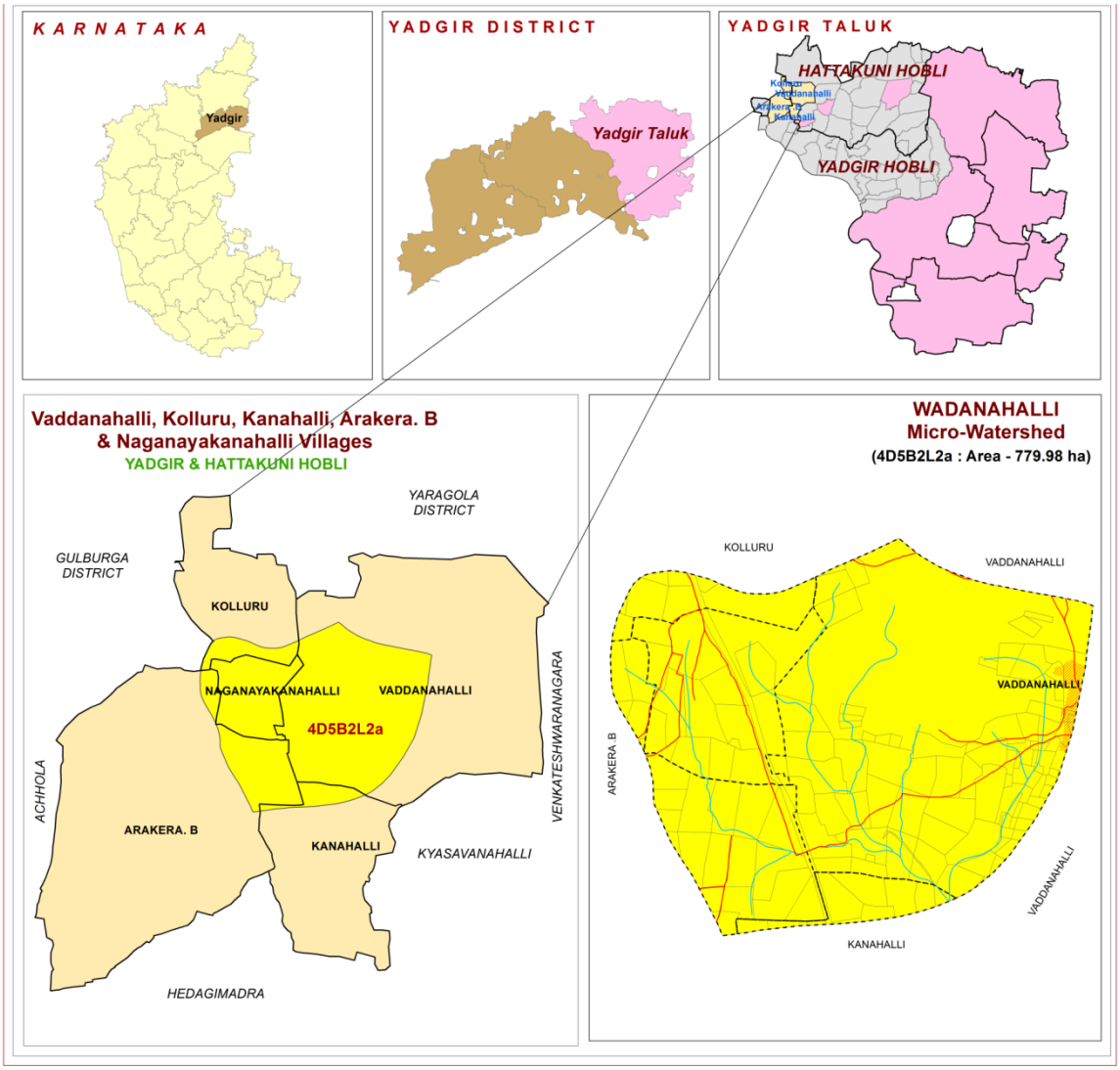


Fig.2.1 Location map of Wadanahalli Microwatershed

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 Wadanahalli 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 387-430 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**		

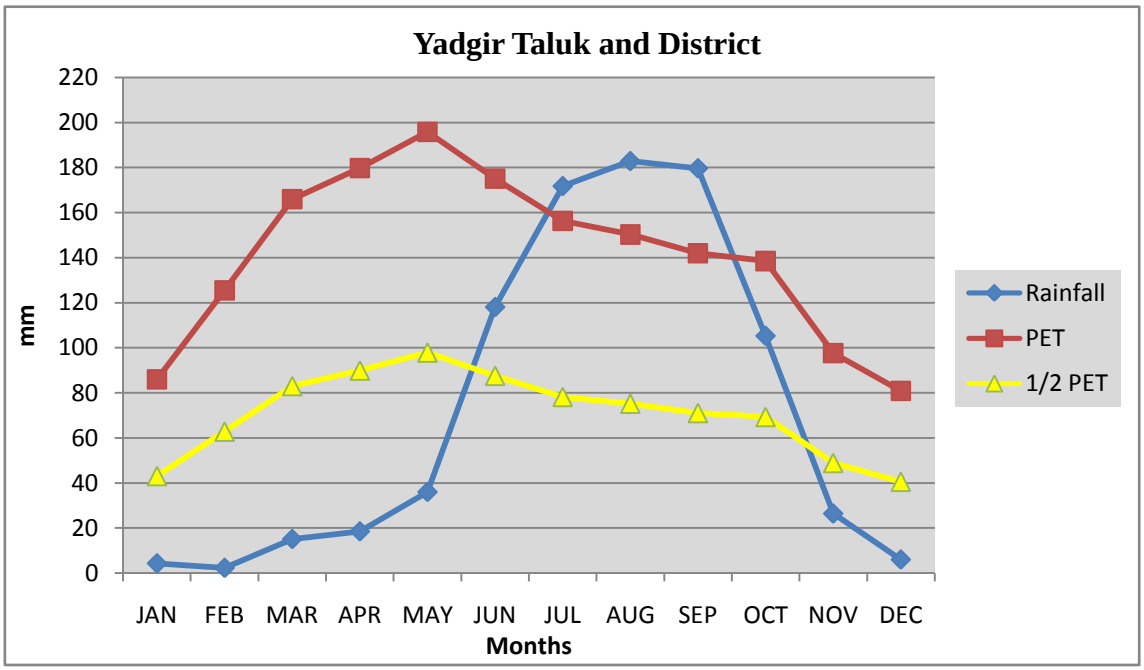


Fig 2.3 Rainfall distribution in Yadgir Taluk, Yadgir District

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 Wadanahalli 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 Wadanahalli 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 Wadanahalli 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

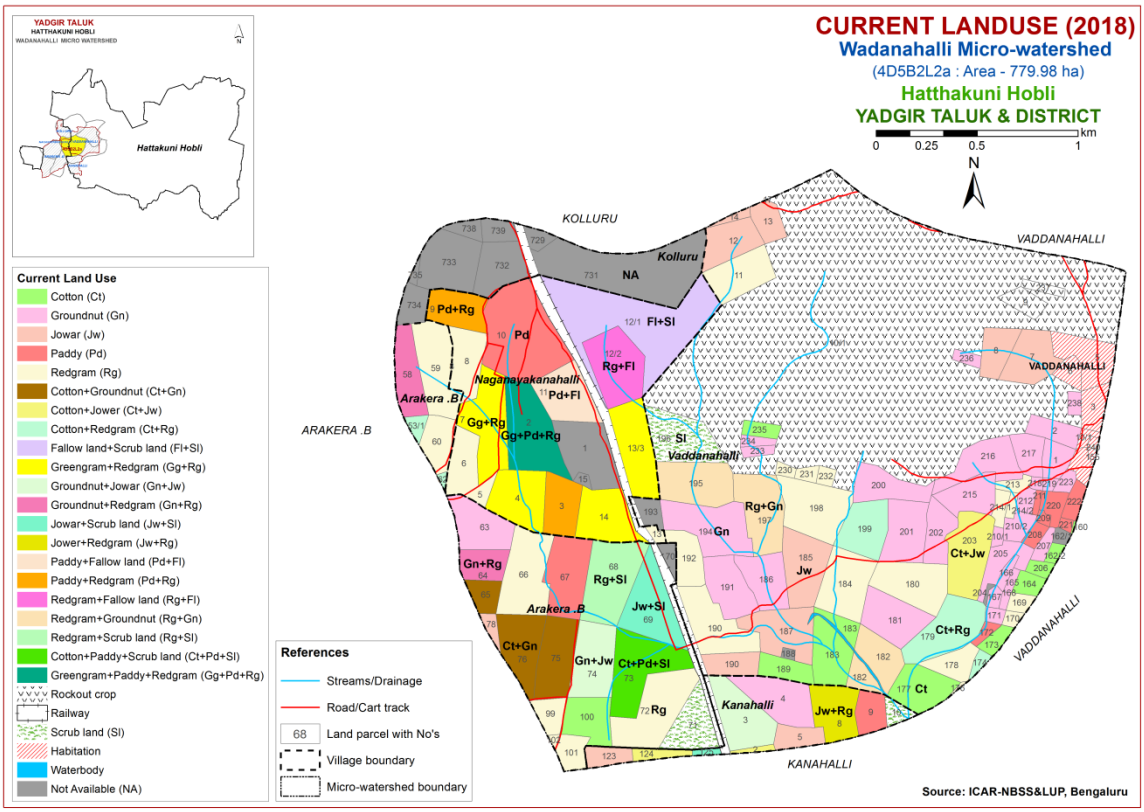


Fig.2.5 Current Land Use map of Wadanahalli Microwatershed

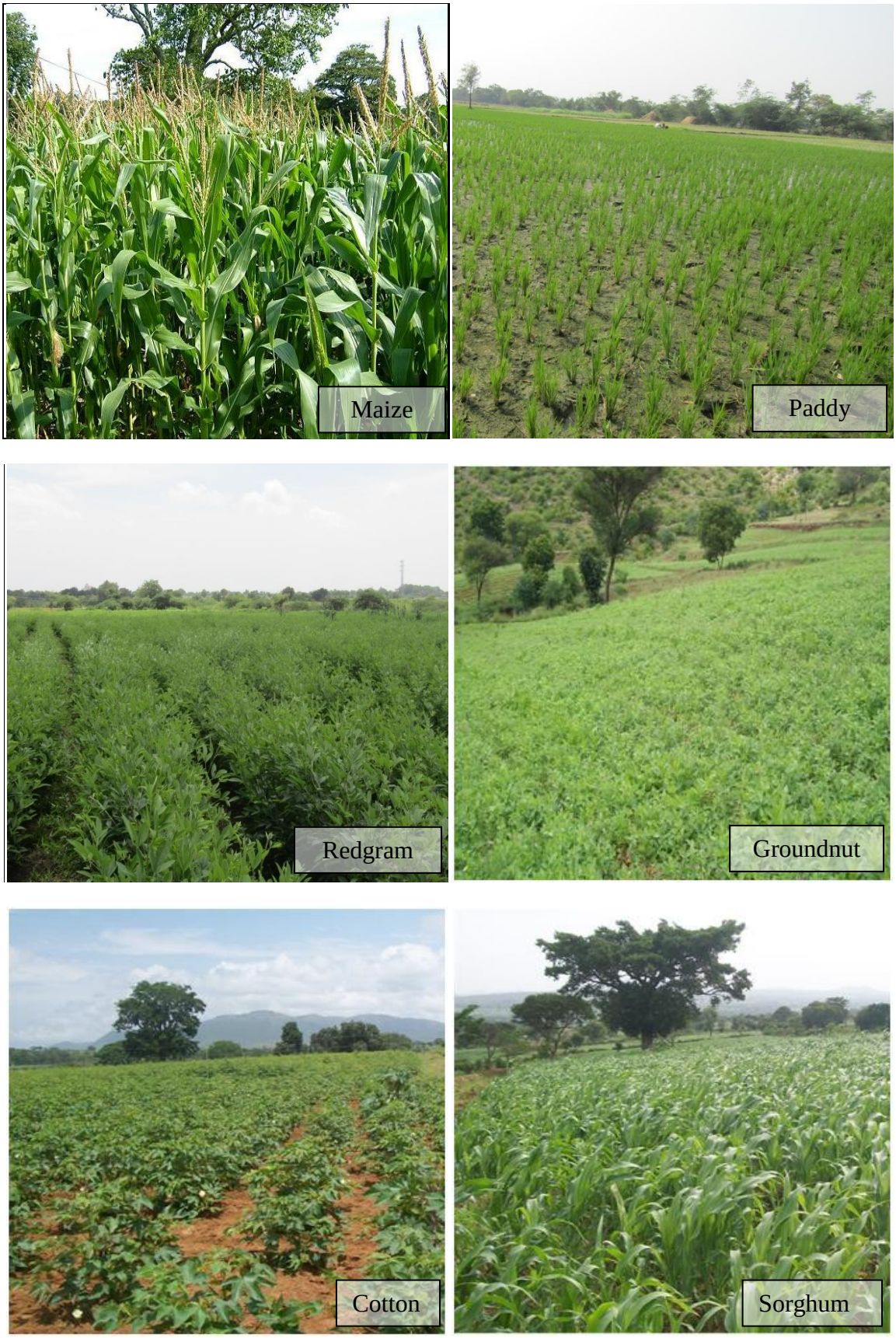


Fig 2.6 Different Crops and Cropping Systems in Wadanahalli Microwatershed

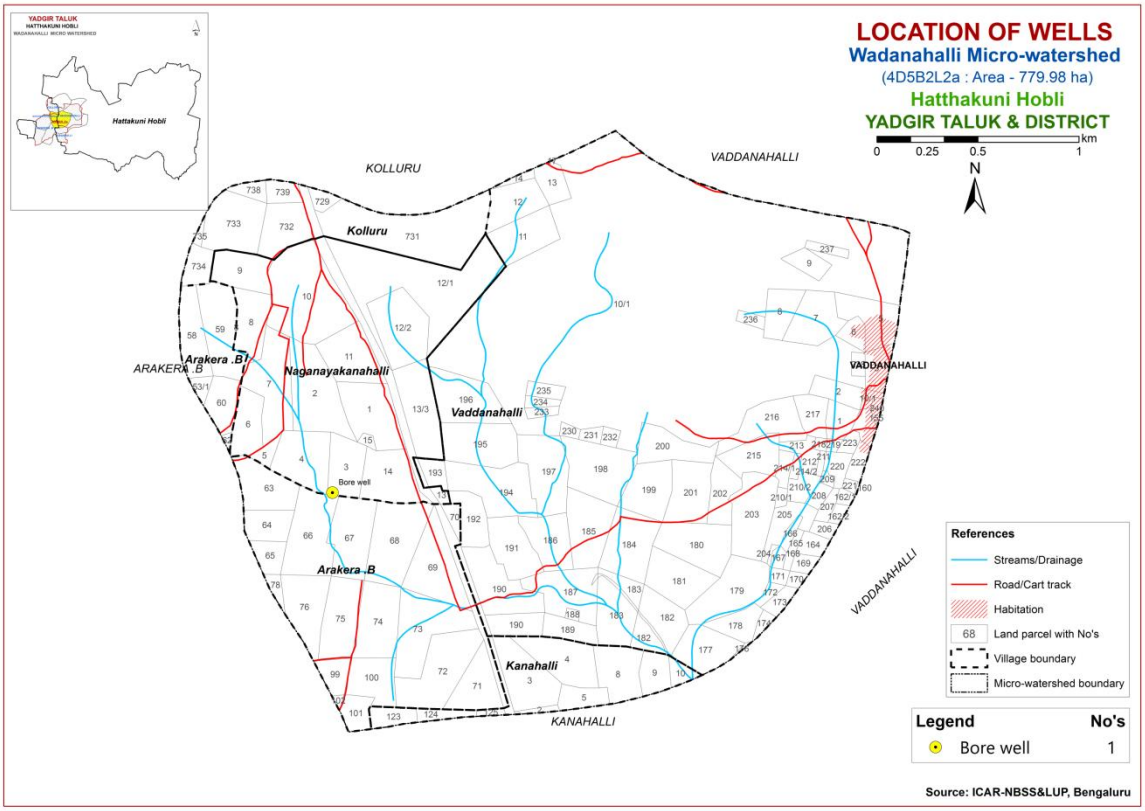


Fig 2.7 Location of wells in Wadanahalli Microwatershed

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 Wadanahalli 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 780 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

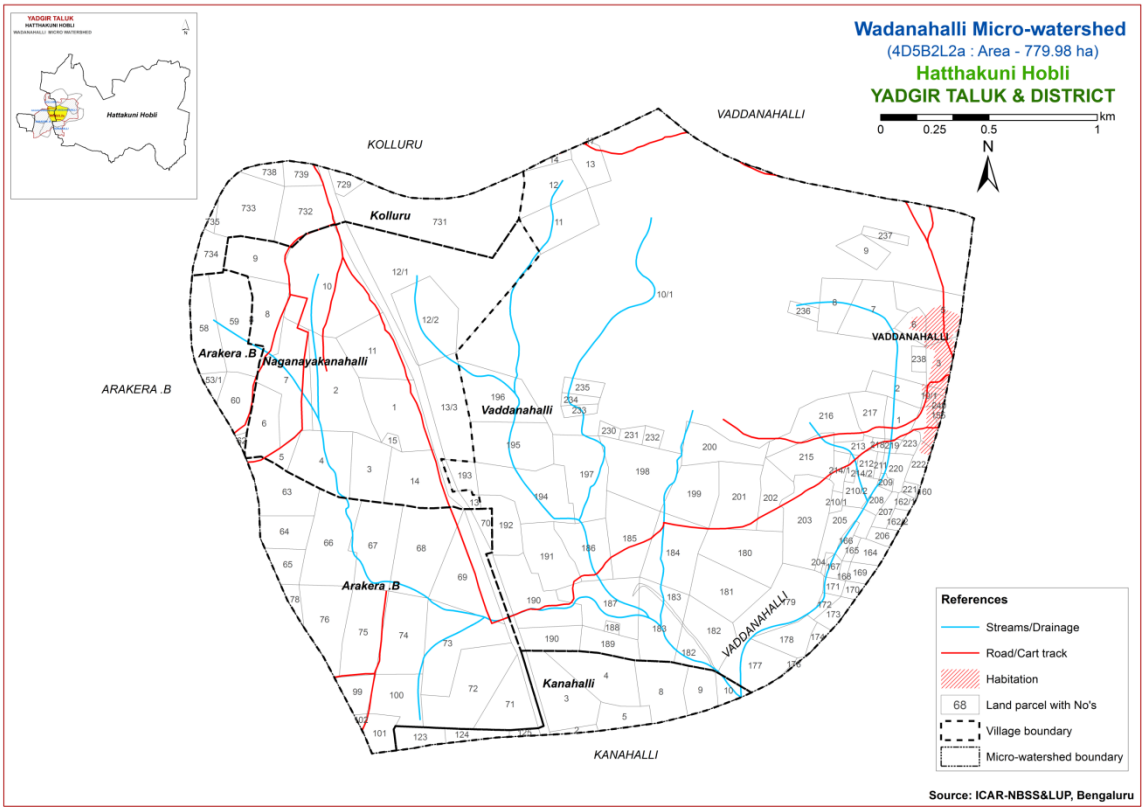


Fig 3.1 Scanned and Digitized Cadastral map of Wadanahalli Microwatershed

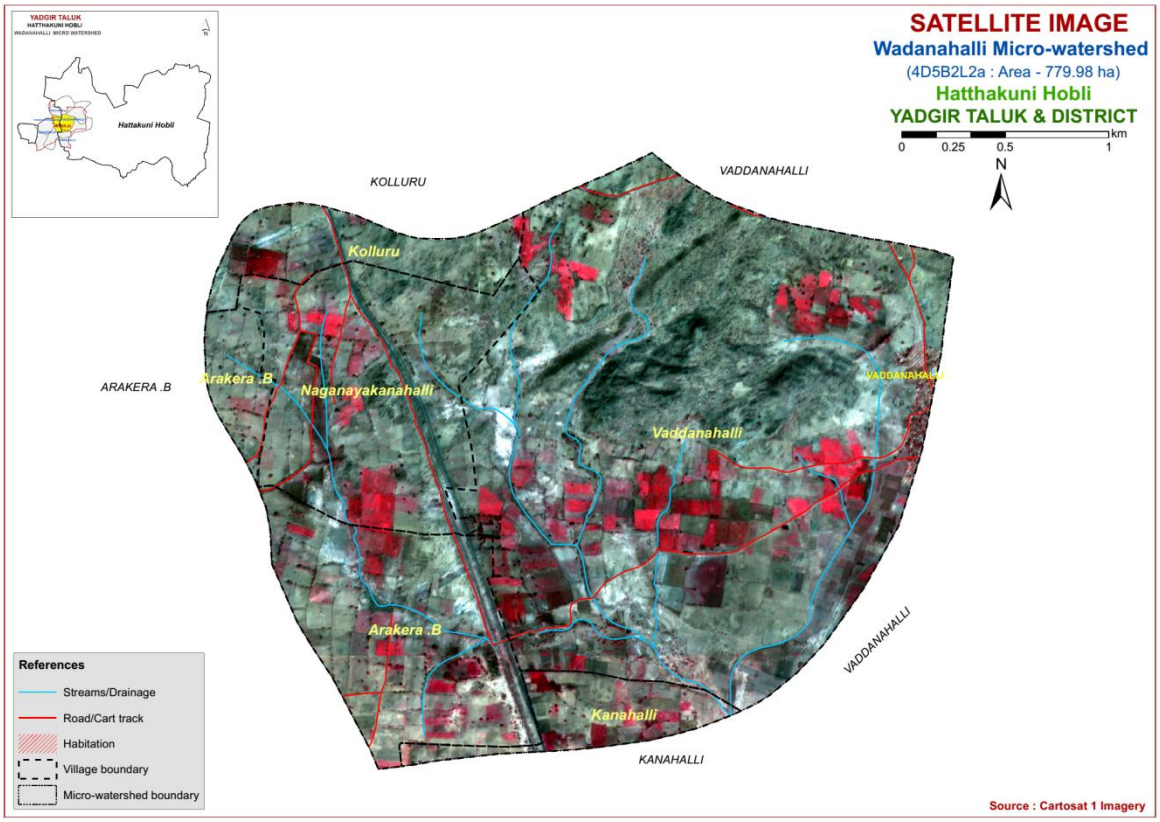


Fig.3.2 Satellite Image of Wadanahalli Microwatershed

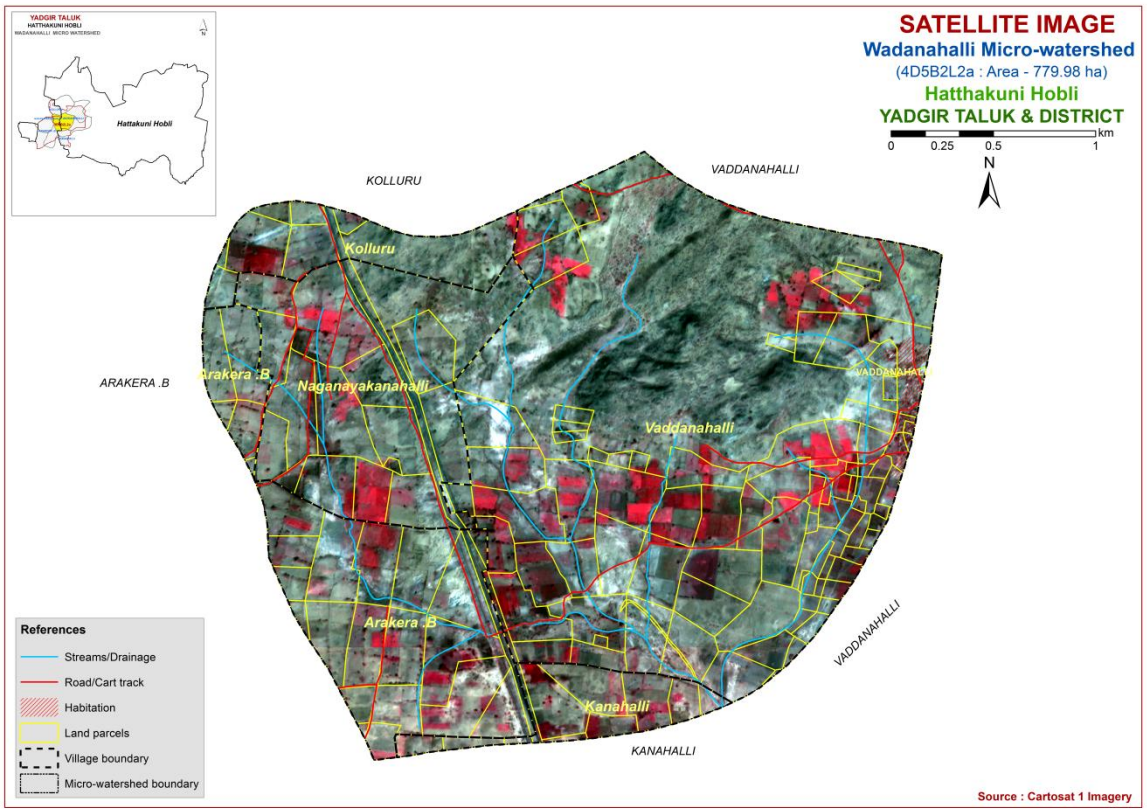


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Wadanahalli Microwatershed

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).

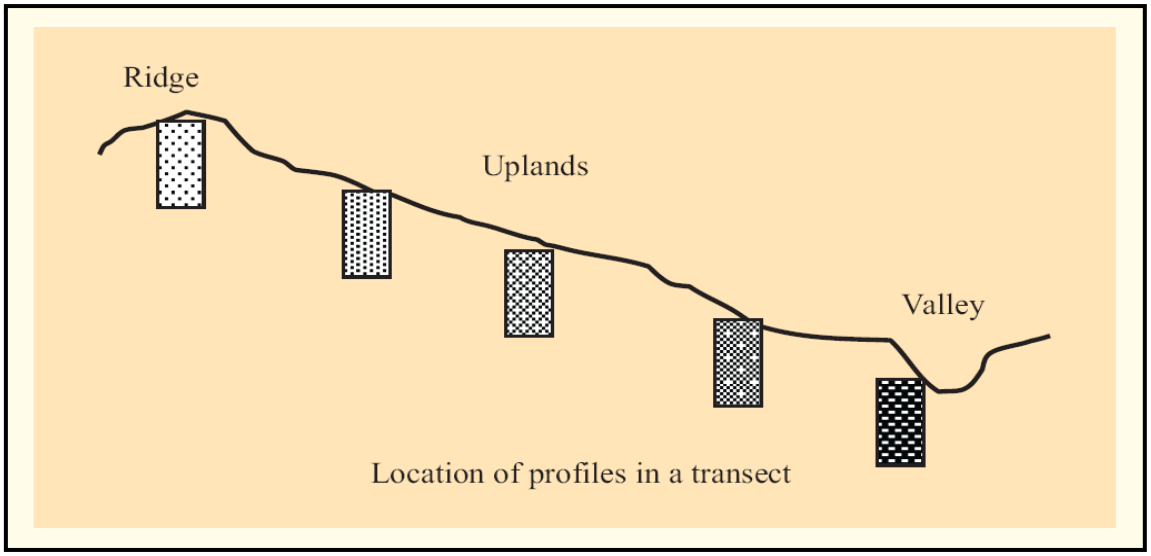


Fig: 3.4. Location of profiles in a transect

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, 15 soil series were identified in the Wadanahalli 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	BDL (Badiyala)	25-50	7.5YR 2.5/3,2.5/2,3/3 10YR 3/4,4/3	sl	-	Ap-Bw	e
3	DSB	25-50	7.5YR 3/3	g c	35-60	Ap-Bt-	-

	(Dastharabad)					Cr	
4	HTK (Hattikuni)	25-50	10YR4/6,4/4 7.5YR4/4,3/3	sl	10-25	Ap-AC	-
5	VNK (Vanakanahalli)	25-50	2.5YR 3/4	sc	-	Ap-Bt-Cr	-
6	JNK (Jinkera)	50-75	10YR3/1,3/2 7.5YR3/4	scl	-	Ap-Bw	e
7	SBR (Sambra)	50-75	10YR 7/1 7.5YR 7/4	ls	-	Ap-AC	-
8	YLR (Yalleri)	50-75	2.5YR 3/4,4/4 5YR3/4 7.5YR4/4	gc	15-35	Ap-Bt	-
9	SHT (Shettalli)	75-100	10YR 3/1	g sc	15-35	Ap-Bw	e
10	MDG (Mundargi)	100-150	10YR 4/4,3/3 7.5YR4/4	scl	-	Ap-Bw	-
11	YDR (Yadgir)	100-150	10YR4/3,4/4 2.5YR4/3,5/3	sl	-	Ap-A2-Bw	-
12	VKS (Vanakasambar)	100-150	10YR5/3,4/2,2/1,2/2,3/2,4/3	scl	-	Ap-Bw	es
13	ANR (Anur)	100-150	10YR 4/3,4/1	c	-	Ap-Bw	es
14	MDR (Madhwara)	>150	10YR 3/1,3/2,2/1,2/2	scl	-	Ap-Bw	e
15	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 23 mapping units representing 15 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 23 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 23 soil phases identified and mapped in the microwatershed were grouped into 7 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 Wadanahalli 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 Wadanahalli 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		**99(12.73)**
118		BDPcB2	Sandy loam surface, slope 1-3%, moderate erosion	11 (1.4)
120		BDPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	17 (2.21)
1		BDPiB2	Sandy clay surface, slope 1-3%, moderate erosion	64 (8.22)
119		BDPiB3	Sandy clay surface, slope 1-3%, severe erosion	7 (0.9)
	BDL	Badiyala soils are shallow (25-50 cm), well drained, have dark brown to very dark brown and dark yellowish brown, slightly calcareous sandy loam soils occurring on very gently to gently sloping uplands under cultivation		**93 (11.92)**
2		BDLbB2	Loamy sand surface, slope 1-3%, moderate erosion	93 (11.92)
	DSB	Dastharabad soils are shallow (25-50 cm), well drained, have dark brown to very dark brown, gravelly clay soils occurring		**3 (0.34)**

Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
		on very gently to gently sloping uplands under cultivation		
108		DSBiB2	Sandy clay surface, slope 1-3%, moderate erosion	3 (0.34)
	HTK	Hattikuni soils are shallow (25-50 cm), well drained, have dark yellowish brown sandy loam soils occurring on very gently sloping uplands under cultivation		**7 (0.9)**
165		HTKcB2	Sandy loam surface, slope 1-3%, moderate erosion	7 (0.9)
	VNK	Vanakanahalli soils are shallow (25-50 cm), well drained, have dark reddish brown, sandy clay red soils occurring on very gently to moderately sloping uplands under cultivation		**83(10.67)**
8		VNKbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	55 (7.09)
122		VNKcB3	Sandy loam surface, slope 1-3%, severe erosion	28 (3.58)
	SBR	Sambara soils are moderately shallow (50-75 cm), somewhat excessively drained, have light gray to pink, loamy sand soils occurring on very gently to gently sloping uplands under cultivation		**2 (0.2)**
	JNK	Jinkera soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark grayish brown, slightly calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation		**0.47 (0.06)**
20		JNKcB2	Sandy loam surface, slope 1-3%, moderate erosion	0.47 (0.06)
11		SBRcB2	Sandy loam surface, slope 1-3%, moderate erosion	2 (0.2)
	YLR	Yalleri soils are moderately shallow (50-75 cm), well drained, have brown to reddish brown and dark reddish brown, gravelly clay red soils occurring on very gently to gently sloping uplands under cultivation		**47(5.99)**
29		YLRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	44 (5.59)
31		YLRiB2	Sandy clay surface, slope 1-3%, moderate erosion	3 (0.4)
	SHT	Shettalli soils are moderately deep (75-100 cm), well drained, have very dark gray, slightly calcareous gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**73(9.33)**
128		SHTcB2	Sandy loam surface, slope 1-3%, moderate erosion	67 (8.55)
36		SHThB2	Sandy clay loam surface, slope 1-3%, moderate erosion	6 (0.78)
	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		**130(16.69)**

Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
57		MDGcB2	Sandy loam surface, slope 1-3%, moderate erosion	45 (5.76)
148		MDGhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	85 (10.93)
	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		**32 (4.1)**
42		YDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	32 (4.1)
	VKS	Vankasambar soils are deep (100-150 cm), well drained, very dark brown to brown, sodic calcareous sandy clay loam soils occurring on very gently to gently sloping lowlands under cultivation		**3 (0.33)**
100		VKSmB1	Clay surface, slope 1-3%, slight erosion	3 (0.33)
	ANR	Anur soils are deep (100-150 cm), moderately well drained, have dark gray to brown, calcareous, sodic, cracking clay soils occurring on very gently sloping uplands under cultivation		**77(9.92)**
168		ANRcB2	Sandy loam surface, slope 1-3%, moderate erosion	26 (3.33)
53		ANRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	51 (6.59)
	MDR	Madhwara soils are very deep (>150 cm), well drained, have very dark gray to very dark brown, slightly calcareous sandy clay loam soils occurring on nearly level to very gently sloping uplands under cultivation		**30 (3.8)**
132		MDRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	30 (3.8)
	BMN	Bhimanahalli soils are very deep (>150 cm), moderately well drained, have very dark gray, calcareous cracking clay black soils occurring on nearly level to very gently sloping uplands under cultivation		**0.18 (0.02)**
63		BMNmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	0.18 (0.02)
992		Railway	Railway line	**8 (1.07)**
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	**86 (11.04)**
1000		Others	Habitation	**7 (0.9)**

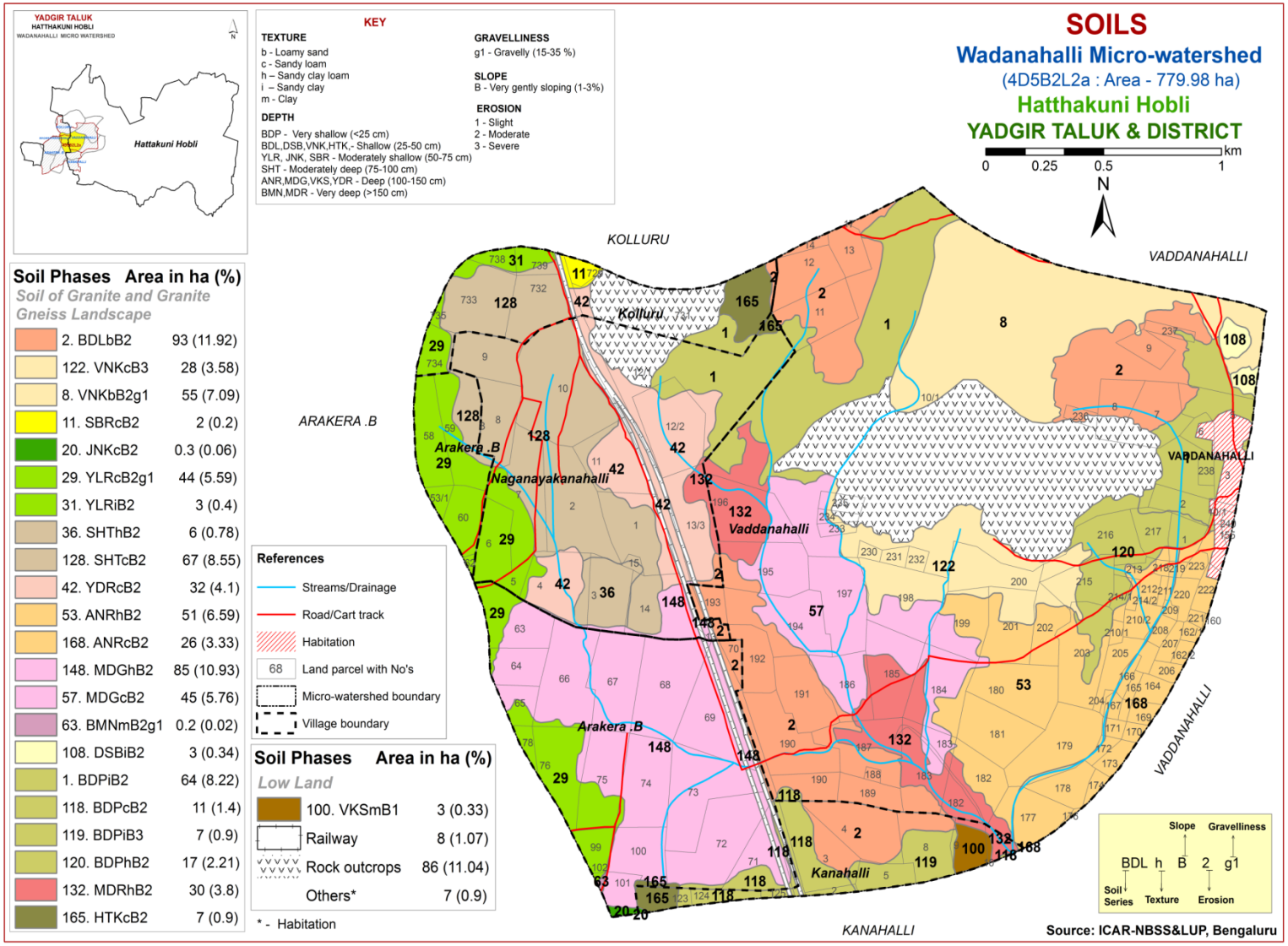


Fig 3.5 Soil Phase or Management Units - Wadanahalli Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and their distribution of different kinds of soils occurring in Wadanahalli microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss landscape based on geology. In all, 15 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 15 soil series identified followed by 23 soil phases (management units) mapped are furnished below. The physical and chemical characteristics of soil series identified in Wadanahalli 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, 15 soil series are identified and mapped. Of these, MDG series occupies a maximum area of 130 ha (17%) followed by BDP 99 ha (13%), BDL 93 ha (12%), VNK 83 ha (11%), ANR 77 ha (10%), SHT 73 ha (9%), YLR 47 ha (6%), YDR 32 ha (4%), MDR 30 (4%), HTK 7 ha (<1%), DSB 3 ha (<1%), VKS 3 ha (<1%), SBR 2 ha (<1), JNK 0.47 ha (<1%) and BMN 0.18 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). Four phases were identified and mapped.

Landscape and Soil Profile characteristics of Baddeppalli (BDP) Series

4.1.2 Badiyala (BDL) Series: Badiyala soils are shallow (25-50 cm), well drained, have very dark brown to dark yellow brown and dark brown, slightly calcareous sandy loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Badiyala series has been classified as a member of the coarse-loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum ranges from 28 to 50 cm. The thickness of A horizon ranges from 4 to 12 cm. Its colour is in 10YR hue with value 3 to 4 and chroma 3 to 4. The texture is loamy sand, sandy clay loam and sandy clay. The thickness of B horizon ranges from 27 to 45 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 4 and chroma 3 to 4. Its texture is sandy loam to sandy clay loam and is slightly calcareous. The available water capacity is very low (<50mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Badiyala (BDL) Series

4.1.3 Dastharabad (DSB) Series: Dastharabad soils are shallow (25-50 cm), well drained, have dark brown, gravelly clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Dastharabad series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of (Paralithic) Haplustalfs.

The thickness of the solum ranges from 28 to 50 cm. The thickness of A horizon ranges from 9 to 14 cm. Its colour is in 10 YR and 7.5 YR hue with value and chroma of 3 to 4. The texture varies from sandy loam to sandy clay. The thickness of B horizon ranges from 28 to 40 cm. Its colour is in 7.5 YR hue with value 3 and chroma 3 to 4. The texture is sandy clay to clay with 35-60 per cent gravel. The available water capacity is very low (<50 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Dastharabad (DSB) Series

4.1.4 Hattikuni (HTK) Series: Hattikuni soils are shallow (25-50 cm), well drained, have dark brown to dark yellowish brown sandy loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Hattikuni series has been classified as a member of the mixed, isohyperthermic family of Lithic Ustipsamments.

The thickness of the soil ranges from 36 to 50 cm. The thickness of A horizon ranges from 8 to 12 cm. Its colour is in 10YR and 7.5 YR hue with value 3 to 4 and chroma 4 to 6. The texture varies from loamy sand to sandy loam. The thickness of subsurface horizon ranges from 28 to 42 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 4 and chroma 4 to 6. Its texture varies from loamy sand to sand and sandy loam. The available water capacity is very low (<50 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Hattikuni (HTK) Series

4.1.5 Vanakanahalli (VNK) Series: Vanakanahalli soils are shallow (25-50 cm), well drained, have dark reddish brown, sandy clay red soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Vanakanahalli series has been classified as a member of the clayey, mixed isohyperthermic family of (Paralithic) Haplustalfs.

The thickness of the solum ranges from 25 to 49 cm. The thickness of A horizon ranges from 7 to 16 cm. Its colour is in 2.5 YR and 5 YR with value 3 and chroma 2 to 4. The texture is sandy loam to sandy clay loam and sandy clay. The thickness of B horizon ranges from 20 to 40 cm. Its colour is in 2.5 YR and 5 YR hue with value 3 to 4 and chroma 3 to 4. Its texture is sandy clay. The available water capacity is very low (<50 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Vanakanahalli (VNK) Series

4.1.6 Jinkera (JNK) Series: Jinkera soils are moderately shallow (50-75 cm), well drained, have very dark gray to very dark grayish brown and dark brown, slightly calcareous sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Jinkera series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 51-75 cm. Thickness of A horizon ranges from 6 to 11 cm. Its colour is in hue 10 YR and 7.5 YR with value and chroma of 3 to 4. The texture varies from sandy loam to sandy clay. The thickness of B horizon ranges from 53 to 66 cm. Its colour is in 10 YR and 7.5 YR hue with value and chroma of 2 to 4. The texture varies from sandy clay loam to sandy clay and is slightly calcareous. The available water capacity is low (51-100 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Jinkera (JNK) Series

4.1.7 Sambara (SBR) Series: Sambara soils are moderately shallow (50-75 cm), somewhat excessively drained, have light grey to reddish yellow, loamy sand soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Sambara series has been classified as a member of the mixed, isohyperthermic family of Typic Ustipsamments.

The thickness of the soil ranges from 52-75 cm. Thickness of A horizon ranges from 8 to 23 cm. Its colour is in hue 10 YR and 7.5 YR with value 3 and chroma 1 to 4. The texture varies from loamy sand to sandy loam. The thickness of subsurface horizons ranges from 41 to 66 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 5 and chroma 1 to 4. The texture is loamy sand. The available water capacity is very low (<50 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Sambara (SBR) Series

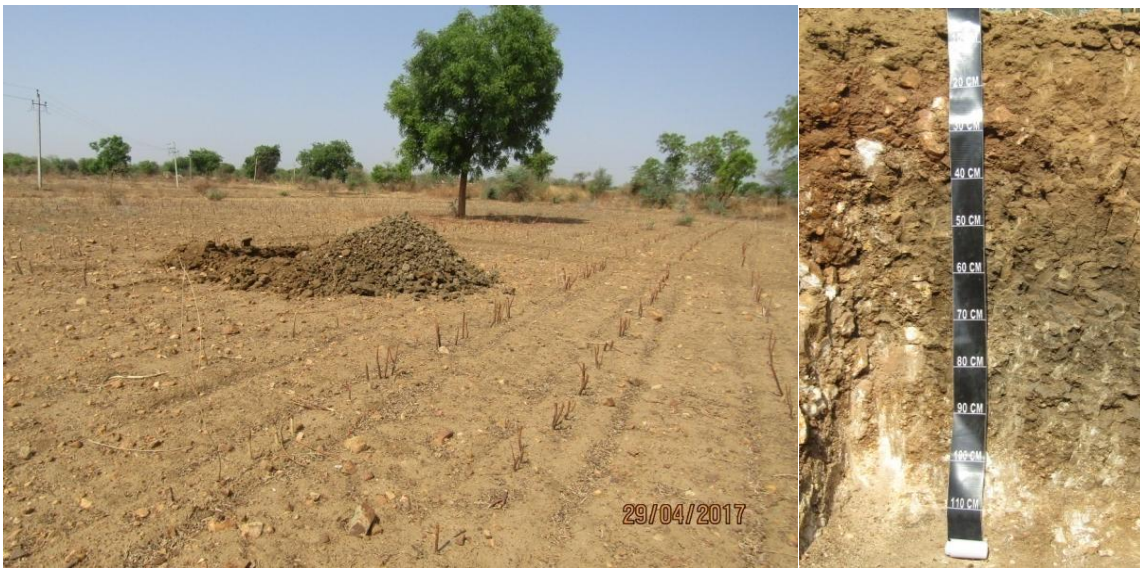
4.1.8 Yalleri (YLR) Series: Yalleri soils are moderately shallow (50-75 cm), well drained, have very dark reddish brown to dark brown, gravelly clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Yalleri series has been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

The thickness of the solum ranges from 50 to 74 cm. The thickness of A horizon ranges from 10 to 13 cm. Its colour is in 7.5 YR and 5 YR hue with value and chroma 2 to 4. The texture is sandy loam, loamy sand, and sandy clay loam. The thickness of B horizon ranges from 45 to 64 cm. Its colour is in 7.5 YR and 5 YR hue with value 2 to 4 and chroma 2 to 4. Its texture is clay with gravel content of 15-35 per cent. The available water capacity is low (51-100 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Yalleri (YLR) Series

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

The thickness of the solum ranges from 78 to 100 cm. The thickness of A horizon ranges from 7 to 12 cm. Its colour is in hue 7.5 YR with value and chroma of 3 to 4. Its texture varies from sandy loam to sandy clay with 20 per cent gravel. The thickness of B horizon ranges from 68 to 92 cm. Its colour is in hue 7.5 YR with value 2 to 4 and chroma 1 to 3. Its texture is sandy clay with 15-35 per cent gravel and is slightly calcareous. The available water capacity is low (51-100 mm/m). Two phases were identified and mapped.



Landscape and Soil Profile characteristics of Shettalli (SHT) Series

4.1.10 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). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Mundargi (MDG) Series

4.1.11 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 Fuluventic 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. Texture is 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.

Landscape and Soil Profile characteristics of Yadgir (YDR) Series

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

The thickness of the solum ranges from 120 to 150 cm. The thickness of A horizon ranges from 9 to 22 cm. Its colour is in 10 YR hue with value 4 to 5 and chroma 2 to 5. The texture varies from loamy sand, sandy clay loam and sandy clay. The thickness of B horizon ranges from 102 to 138 cm. Its colour is in 10 YR hue with value 2 to 5 and chroma 2 to 4. Texture is sandy clay loam to sandy clay and is calcareous sodic soils. The available water capacity is very high (>200 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Vankasambaar (VKS) Series

4.1.13 Anur (ANR) Series: Anur soils are deep (100-150 cm), moderately well drained, have dark gray to dark brown, calcareous, sodic, clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Anur series has been classified as a member of the fine, mixed (calcareous), isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 102 to 148 cm. The thickness of A-horizon ranges from 9 to 17 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture ranges from loamy sand to sandy clay loam and sandy clay and are calcareous. The thickness of B horizon ranges from 102 to 135 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 6. Texture is sandy clay loam to sandy clay and clay and is calcareous sodic soils. The available water capacity is very high (>200 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Anur (ANR) Series

4.1.14 Madhwara (MDR) Series: Madhwara soils are very deep (>150 cm), well drained, have black to very dark brown and very dark gray to very dark grayish brown, slightly calcareous sandy clay loam soils. They are developed from weathered granite gneiss and occur on nearly level to very gently sloping uplands under cultivation. The Madhwara series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum is more than150 cm. The thickness of A horizon ranges from 10 to 16 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 2 to 3. Texture varies from sandy clay and clay. The thickness of B horizon is >150 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. Texture varies from sandy clay loam to sandy clay and is slightly calcareous. The available water capacity is very high (>200 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Madhwara (MDR) Series

4.1.15 Bhimanahalli (BMN) Series: Bhimanahalli soils are very deep (>150 cm), moderately well drained, 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 Wadanahalli 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: Badiyala **(**BDL) **Pedon:** R-5

Location: $16^0$37'10.0"N $77^0$20'21.5", Gudalagunta 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
0-12	Ap	87.13	7.04	5.83	10.03	24.32	23.61	23.51	5.67	<15	ls	6.27	2.44
12-28	Bw1	64.63	13.30	22.07	6.74	13.07	22.30	17.01	5.50	<15	scl	16.34	7.83
28-50	BC	73.11	12.02	14.87	3.93	16.03	26.89	18.41	7.86	<15	sl	12.94	5.47

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-12	6.20	-	-	0.074	1.00	0.00	2.80	0.98	0.14	0.01	3.92	4.20	0.72	93	0.20
12-28	9.04	-	-	0.253	0.80	3.20	-	-	0.16	0.69	-	16.90	0.77	100	4.09
28-50	9.41	-	-	0.364	1.10	3.60	-	-	0.16	1.39	-	11.10	0.75	100	12.52

Contd...

Soil Series: Dastharabad **(**DSB) **Pedon:** R-17

Location: $16^0$31' 98.6"N $77^0$22'93.0"E, Duppalli village, Sydhapura hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-6	Ap	90.51	4.84	4.64	7.06	8.07	37.24	26.03	12.11	35	s	5.32	1.59
6-17	Bt1	49.11	8.08	42.81	10.67	15.44	10.00	8.44	4.56	20	sc	20.68	13.16
17-43	Bt2	39.54	2.84	57.63	12.89	9.14	7.71	6.83	2.97	50	c	26.69	18.50

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}							%	%
0-6	5.93	-	-	0.04	0.67	0.00	2.00	0.54	0.07	0.01	2.61	3.60	0.78	73	0.14
6-17	7.31	-	-	0.110	0.91	0.91	11.19	3.37	0.12	0.49	15.00	15.20	0.36	100	3.22
17-43	6.64	-	-	0.048	0.76	0.00	18.81	5.57	0.23	0.09	24.70	24.90	0.43	99	0.38

Contd...

Soil Series: Hattikuni (HTK), Pedon: R-7

Location: $16^0$50'46.5"N $77^0$10'16.4"E, Yaddalli village, Hattikuni hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Mixed, isohyperthermic Lithic Ustipsamments

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-12	Ap	90.89	5.62	3.49	8.50	13.46	29.86	29.55	9.51	20	s	7.73	3.16
12-22	A1	89.97	6.53	3.50	7.19	13.48	29.48	29.79	10.03	20	s	8.00	3.05
22-45	A2	87.20	6.43	6.38	11.09	14.42	31.55	7.16	22.98	40	ls	7.67	3.96

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-12	6.81	-	-	0.062	0.07	-	2.35	0.50	0.16	0.01	3.02	3.0	0.86	100	0.38
12.0-22	6.80	-	-	0.050	0.21	-	1.67	0.30	0.09	0.01	2.07	2.4	0.69	86.30	0.45
22-45	6.85	-	-	0.044	0.19	-	1.82	0.42	0.10	0.06	2.40	2.6	0.41	92.41	2.17

Contd...

Soil Series: Vanakanahalli (VNK) **Pedon:** R-15

Location: $16^0$43'49.5"N $77^0$17'17.9"E, Yaleri village, Balichakra hobli, Yadgiri taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey, mixed, isohyperthermic (Paralithic) Haplustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	82.61	8.09	9.30	6.77	8.59	21.13	34.58	11.53	-	ls	8.85	3.53
18-50	Bt	54.51	8.73	36.77	4.93	6.18	14.15	20.75	8.49	-	sc	18.88	11.63

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	5.37	-	-	0.11	0.60	0.00	2.96	1.45	0.13	0.14	4.68	6.27	0.67	75	2.22
18-50	4.71	-	-	0.05	0.81	0.00	5.56	2.24	0.10	0.05	7.95	13.31	0.36	60	0.38

Contd...

Soil Series: Jinkera **(**JNK) **Pedon:** R-1

Location: $16^0$45'13.5"N $77^0$10'59.8"E, Varkanahalli village, Yadgir hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, 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
0-15	Ap	66.84	13.62	19.54	12.15	21.22	11.23	12.56	9.68	10	sl	14.42	7.70
15-38	Bw1	59.08	12.11	28.81	12.53	12.42	17.85	8.77	7.52	20	scl	18.21	12.23
38-52	Bw2	68.21	11.68	20.11	17.90	21.81	10.60	10.80	7.10	10	scl	14.54	8.96

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-15	8.42	-	-	0.148	0.70	0.65	-	-	0.15	0.03	-	14.50	0.74	100	0.18
15-38	8.38	-	-	0.226	0.31	2.21	-	-	0.09	0.23	-	21.70	0.75	100	1.05
38-52	8.40	-	-	0.195	0.25	1.17	-	-	0.07	0.19	-	15.90	0.79	100	1.23

Contd...

Soil Series: Sambara (SBR) **Pedon:** R-10

Location: $16^0$42'04.5"N $77^0$14'35.3"E, Jinatera village, Balichakra hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Mixed, isohyperthermic Typic Ustipsamments

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	81.90	8.22	9.88	23.76	14.05	23.76	10.62	9.71	-	ls	9.45	2.69
9-17	C1	84.08	6.59	9.33	21.30	20.69	17.65	17.65	6.80	-	ls	7.84	2.65
17-60	C2	86.86	6.17	6.98	11.53	21.54	25.08	23.46	5.26	-	ls	5.48	2.62
60-78	C3	87.27	6.92	5.81	15.05	20.91	26.36	19.29	5.66	-	ls	5.19	2.81

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-9	8.24	-	-	0.145	0.61	0.91	-	-	0.12	0.09	-	7.50	0.76	100	1.15
9-17	8.21	-	-	0.068	0.57	0.39	-	-	0.06	0.12	-	6.70	0.72	100	1.82
17-60	8.47	-	-	0.080	0.38	0.48	-	-	0.03	0.17	-	2.70	0.39	100	6.34
60-78	8.50	-	-	0.081	0.30	0.52	-	-	0.03	0.17	-	2.70	0.46	100	6.43

Contd...

Soil Series: Shettalli (SHT) **Pedon:** R-14

Location: $16^0$47'21.1"N $77^0$04'91.1"E, Thumakura 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
0-14	Ap	74.39	10.89	14.73	5.64	8.30	21.00	28.89	10.55	50	sl	12.58	4.51
14-35	Bw1	54.37	14.73	30.90	3.58	5.90	15.38	21.71	7.80	25	scl	20.37	10.92
35-63	Bw2	41.16	20.63	38.21	1.71	1.71	10.61	13.61	13.50	30	cl	24.34	15.03
63-83	Bw3	36.96	21.52	41.51	4.31	5.28	8.94	12.39	6.03	35	c	24.76	16.17

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	7.26	-	-	0.199	0.91	0.13	-	-	0.28	0.09	-	10.60	0.72	100	0.86
14-35	7.05	-	-	0.051	0.80	1.17	-	-	0.12	0.09	-	18.20	0.59	100	0.48
35-63	7.67	-	-	0.238	0.70	2.86	-	-	0.14	0.16	-	24.40	0.64	100	0.64
63-83	8.67	-	-	0.142	0.20	12.48	-	-	0.13	0.23	-	27.40	0.66	100	0.84

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: 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 Fuluventic 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	73.39	11.31	15.30	6.76	20.27	24.87	15.66	5.83	-	sl	12.14	7.22
14-43	A2	86.59	8.77	4.64	23.19	26.92	14.11	15.22	7.16	-	ls	6.97	2.68
43-89	Bw1	80.41	3.75	15.84	8.06	13.47	36.73	15.71	6.43	-	sl	22.84	10.18
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: Vankasambar (VKS) **Pedon:** R-11

Location: $16^0$34'49.4"N $77^0$22'46.5"N, Baddepalli village, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, mixed, (calcareous), isohyperthermic Fulventic 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	61.32	10.31	28.37	7.14	12.07	16.04	19.03	7.05	-	scl	20.65	11.25
14-37	Bw1	62.63	8.72	28.65	9.88	14.50	16.19	15.57	6.49	-	scl	24.37	11.33
37-80	Bw2	61.43	9.14	29.43	4.84	15.45	18.01	16.73	6.40	-	scl	41.96	13.39
80-108	Bw3	55.39	11.75	32.86	4.06	5.99	23.87	15.39	6.08	-	scl	45.20	15.45

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	9.1	-	-	0.586	0.96	5.72	-	-	0.54	1.74	-	17.57	0.62	100	3.97
14-37	10.35	-	-	0.595	0.52	7.80	-	-	0.50	4.24	-	16.65	0.58	100	10.19
37-80	10.39	-	-	2.14	0.28	12.35	-	-	0.64	15.89	-	13.45	0.46	100	47.24
80-108	11.15	-	-	3	0.32	11.70	-	-	0.74	20.69	-	22.58	0.69	100	36.656

Contd...

Soil Series: Anur (ANR) **Pedon:** R-15

Location: $16^0$32'45.0"N $77^0$23'57.4"E, Duppalli village, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, 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	64.60	13.44	21.96	7.33	10.42	18.68	20.12	8.05	<15	scl	16.59	7.96
18-49	Bw1	56.66	12.19	31.15	4.73	9.80	18.66	17.02	6.45	-	scl	33.38	13.51
49-95	Bw2	39.94	17.81	42.25	3.09	3.30	15.44	10.65	7.45	<15	c	44.68	25.23
95-123	Bw3	30.65	17.58	51.77	1.50	5.57	10.18	9.65	3.75	<15	c	54.94	32.07

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	10.17	-	-	0.365	0.48	6.11	-	-	0.25	3.52	-	19.90	0.91	100	7.08
18-49	10.32	-	-	1.38	0.30	6.76	-	-	0.21	16.03	-	24.60	0.79	100	26.07
49-95	10.08	-	-	2.55	0.17	6.11	-	-	0.33	21.49	-	32.60	0.77	100	26.36
95-123	9.92	-	-	2.56	0.12	7.93	-	-	0.51	26.03	-	36.00	0.70	100	28.92

Contd...

Soil Series: Madhawara (MDR) **Pedon:** T_2 P_2

Location: $16^0$43'48.9"N $77^0$18'38.3"E, Yaleri village, Balichakra 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
0-11	Ap	58.94	20.74	20.32	5.41	7.28	13.31	20.89	12.06	-	scl	16.47	8.85
11-30	Bw1	55.52	19.32	25.16	5.00	7.19	13.12	19.69	10.52	-	scl	18.25	10.18
30-58	Bw2	53.95	19.15	26.90	4.68	7.48	12.58	19.65	9.56	-	scl	26.99	14.02
58-117	Bw3	52.68	19.51	27.81	2.84	5.47	14.72	20.82	8.83	-	scl	37.86	17.40
117-160	Bw4	49.95	17.27	32.79	2.11	5.07	14.15	20.49	8.13	-	scl	44.15	20.38

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}							%	%
0-11	8.31	-	-	0.33	0.46	2.76	-	-	0.45	0.47	-	20.57	1.01	100	0.90
11-30	9.25	-	-	0.20	0.31	4.20	-	-	0.19	1.40	-	23.98	0.95	100	2.34
30-58	9.78	-	-	0.40	0.19	5.76	-	-	0.16	1.53	-	24.53	0.91	100	2.49
58-117	9.94	-	-	0.88	0.23	4.80	-	-	0.18	9.09	-	24.31	0.87	100	14.96
117-160	9.98	-	-	0.93	0.15	3.00	-	-	0.24	11.09	-	28.27	0.86	100	15.69

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 23 soil map units identified in Wadanahalli microwatershed are grouped under 3 land capability classes and 4 land capability subclasses. An area of about 679 ha (87%) in the microwatershed is suitable for agriculture. About 7 ha (<1%) area is covered by others (water body & habitation), 8 ha (1%) is covered by railway track and 86 ha (11%) is under rock outcrops (Fig. 5.1).

Good lands (Class II) cover an area of about 36 per cent and are distributed in the southern, western, southwestern and central part of the microwatershed with minor problems of soil and erosion. Moderately good lands (Class III) cover an area of about 24 per cent and are distributed in the northern, northeastern, southern and central part of the microwatershed with moderate problems of soil and erosion. Fairly good (Class IV) lands occur in an area of about 27 per cent of the microwatershed and are distributed in the central, northwestern southern, western and eastern part of the microwatershed with very severe problems of soil and erosion.

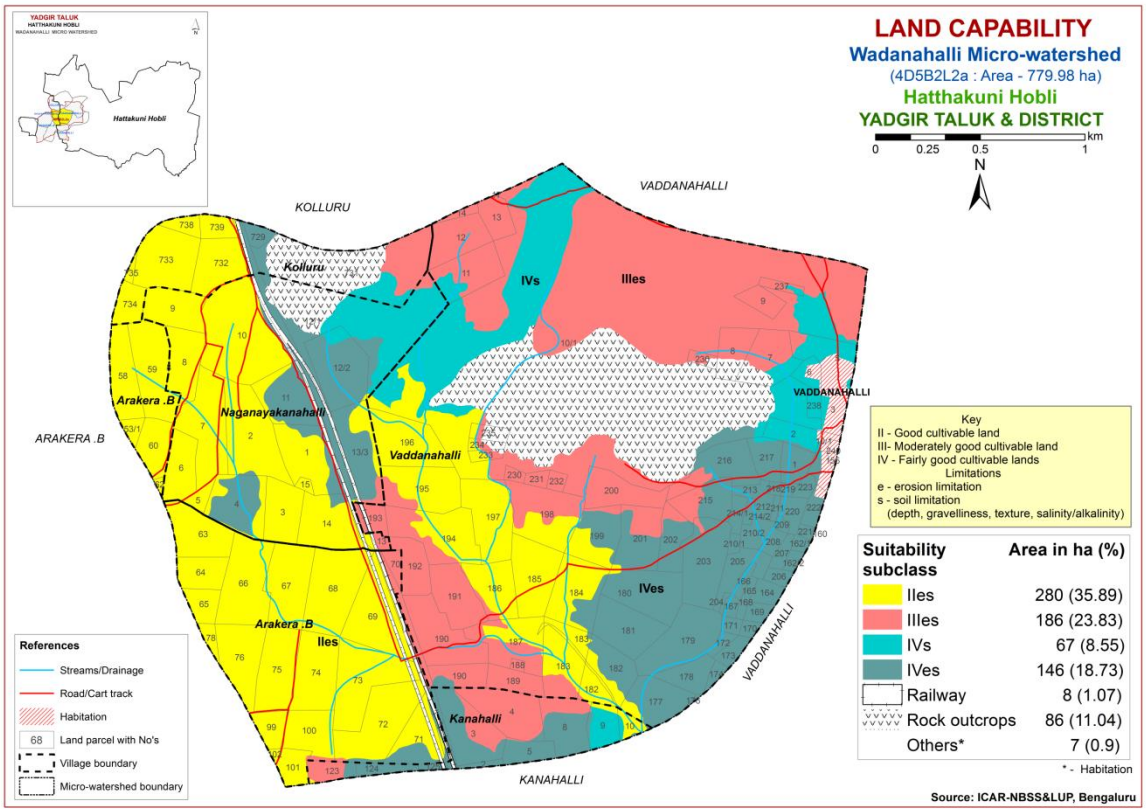


Fig. 5.1 Land Capability map of Wadanahalli Microwatershed

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 99 ha (13%) and are distributed in the northern, southern, northeastern and eastern part of the microwatershed Shallow (25-50 cm) soils occur in an area of 186 ha (24%) and are distributed in the central, northern, northeastern and southern part of the microwatershed. Moderately shallow (50-75 cm) soils occur in an area of 49 ha (6%) and are distributed in the western, northwestern and southwestern part of the microwatershed. Moderately deep (75-100 cm) soils occur in an area of 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. Deep (100-150 cm) soils cover an area of 242 ha (31%) and are distributed in the southern, southeastern, central, western, northern and eastern part of

the microwatershed. Very deep (>150 cm) soils cover an area of 30 ha (4%) and are distributed in the southern and central part of the microwatershed.

The most productive lands covering 272 ha (35%) 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 285 ha (37%) where only short duration crops can be grown occasionally and the probability of crop failure is very high.

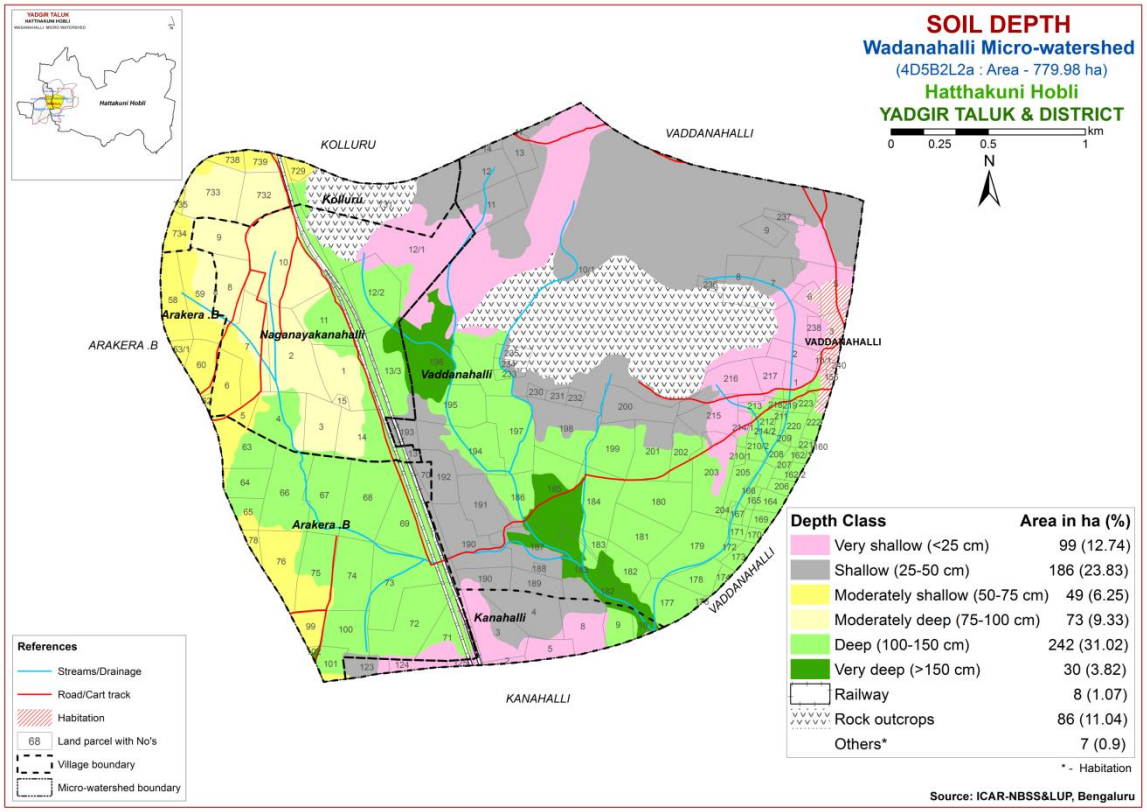


Fig. 5.2 Soil Depth map of Wadanahalli Microwatershed

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 148 ha (19%) of the microwatershed has sandy soils at the surface and are distributed in the northern, central, northeastern and southern part. An area of 451 ha (58%) of the microwatershed has loamy soils at the surface and are distributed in the

major part. An area of about 80 ha (10%) of the microwatershed has soils that are clayey and are distributed in the northeastern, northern, southern and northwestern 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. Problem soils have limitations of moisture and nutrient availability but are suited for root or tuber crops.

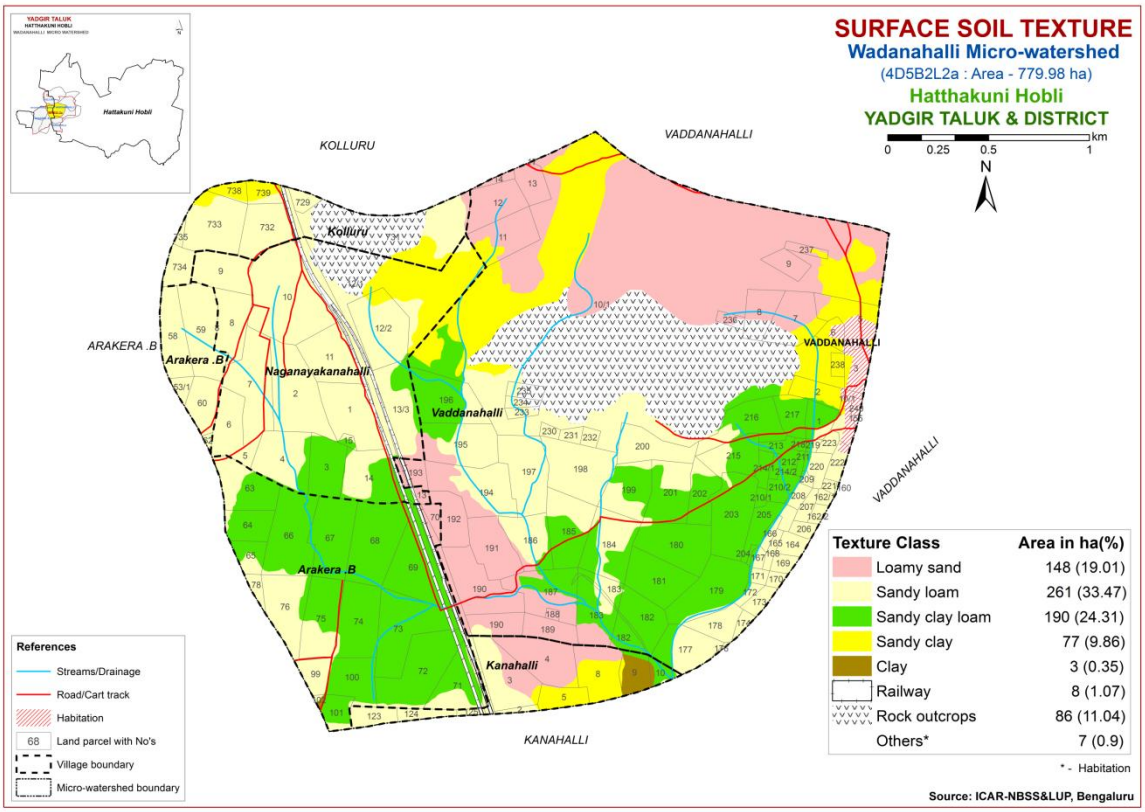


Fig. 5.3 Surface Soil Texture map of Wadanahalli Microwatershed

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 area of 579 ha (74%) and are distributed in the major part of the microwatershed. These are the most productive soils, where all climatically adapted short and long duration crops can be grown. Gravelly (15-35%) soils occur in an area of 99 ha (13%) and distributed in the southwestern, northwestern, western and northern part of the microwatershed. These lands are low in moisture holding

capacity and hence growing of short duration crops is ideal with best management practice.

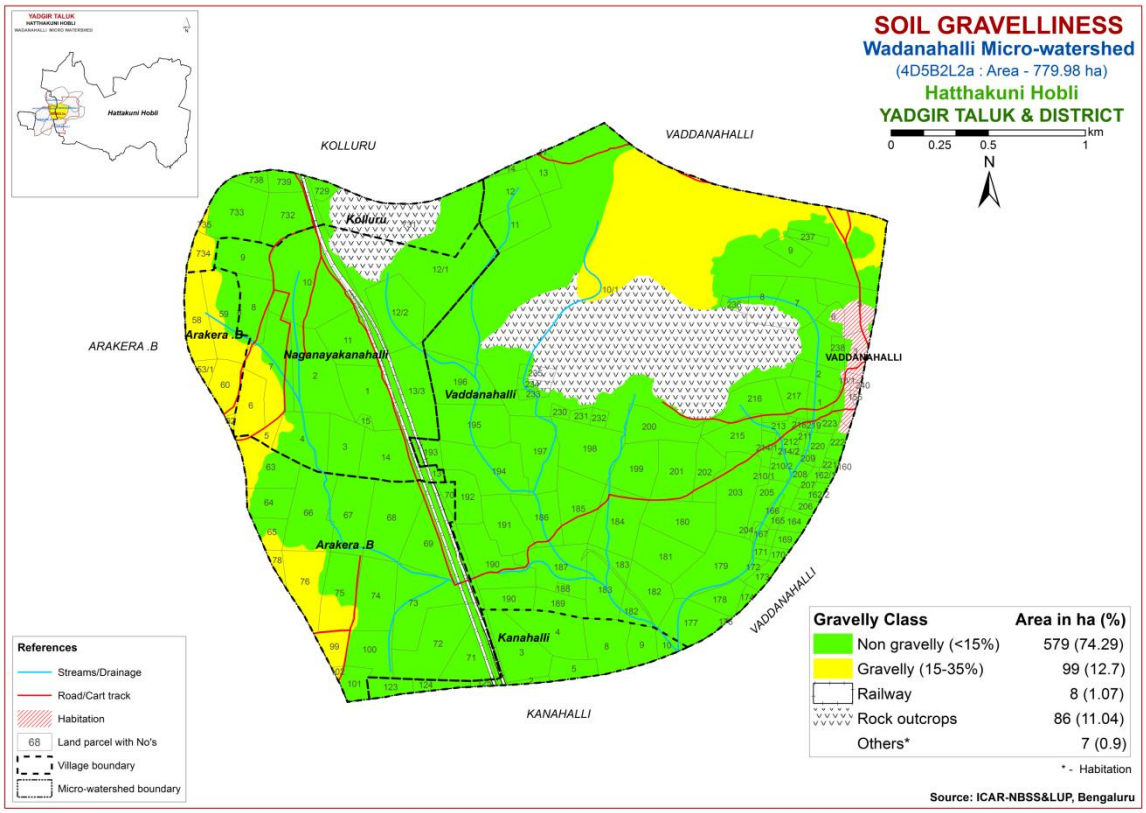


Fig. 5.4 Soil Gravelliness map of Wadanahalli Microwatershed

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 287 ha (37%) in the microwatershed has soils that are very low (<50 mm/m) in available water capacity and is distributed in the northern, central, northeastern, southern and eastern part of the microwatershed. An area of about 152 ha (19%) is low (51-100 mm/m) in available water capacity and are distributed in the western, northwestern and southwestern part of the microwatershed. Very high (>200 mm/m) in 240 ha (31%) and are distributed in the central, southeastern, western, southwestern and southern part of the microwatershed.

An area of about 439 ha (56%) 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 240 ha (31%) are potential areas with regard to AWC where all climatically adapted annual and perennial crops can be grown.

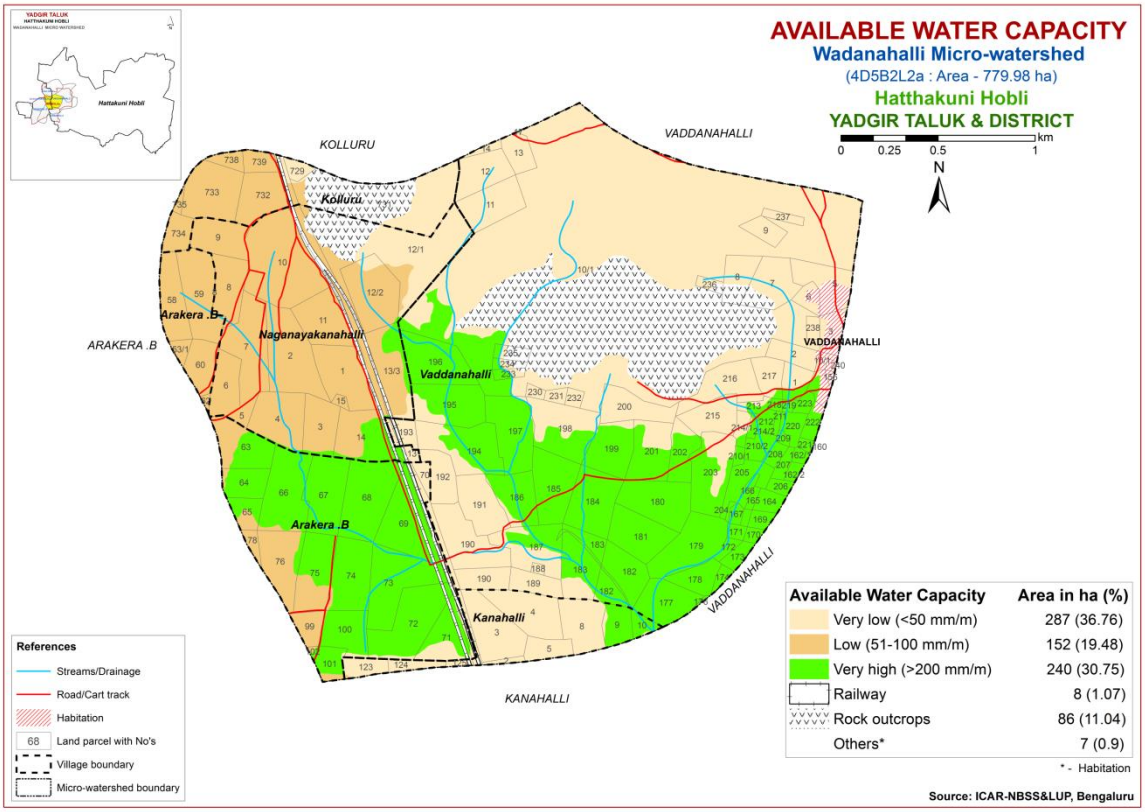


Fig. 5.5 Soil Available Water Capacity map of Wadanahalli Microwatershed

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

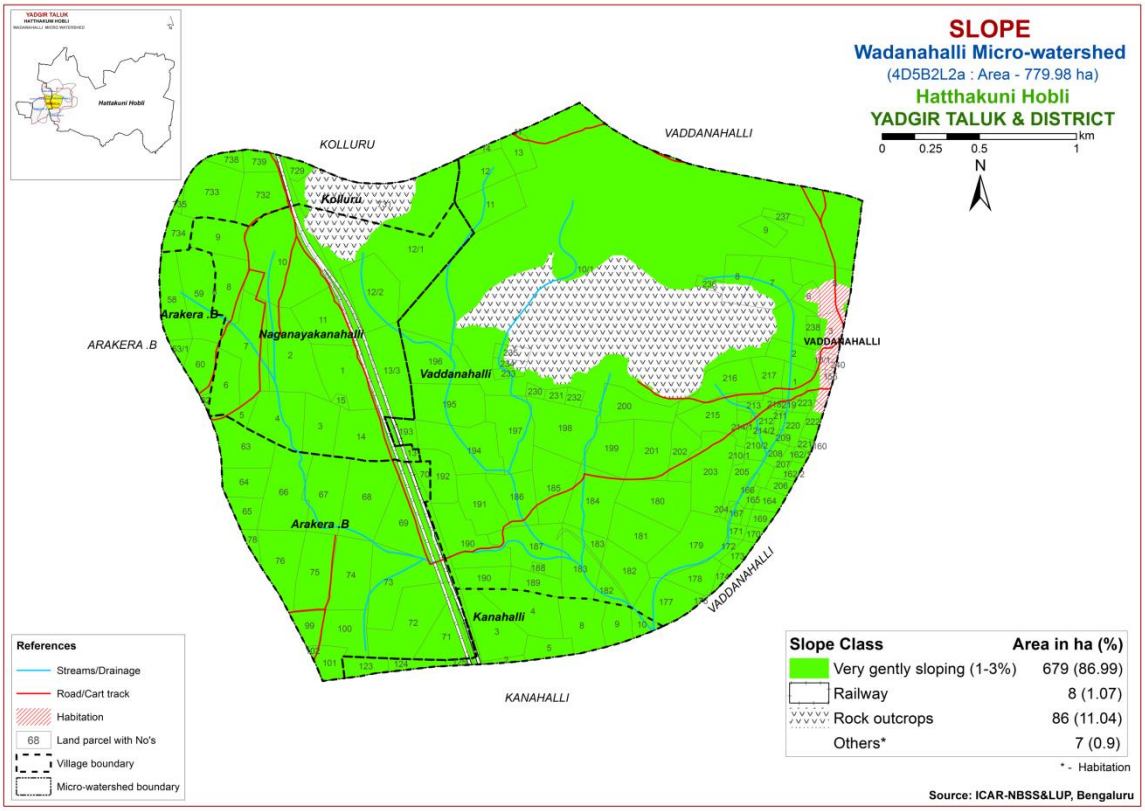


Fig. 5.6 Soil Slope map of Wadanahalli Microwatershed

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 641 ha (82%) and are distributed in the major part of the microwatershed. Severely eroded (e3) soils cover an area of 35 ha (4%) and are distributed in the central and southern part of the microwatershed and slightly eroded (e1) soils cover an area of 3 ha (<1%) and are distributed in the southern part of the microwatershed

An area of about 676 ha (87%) 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.

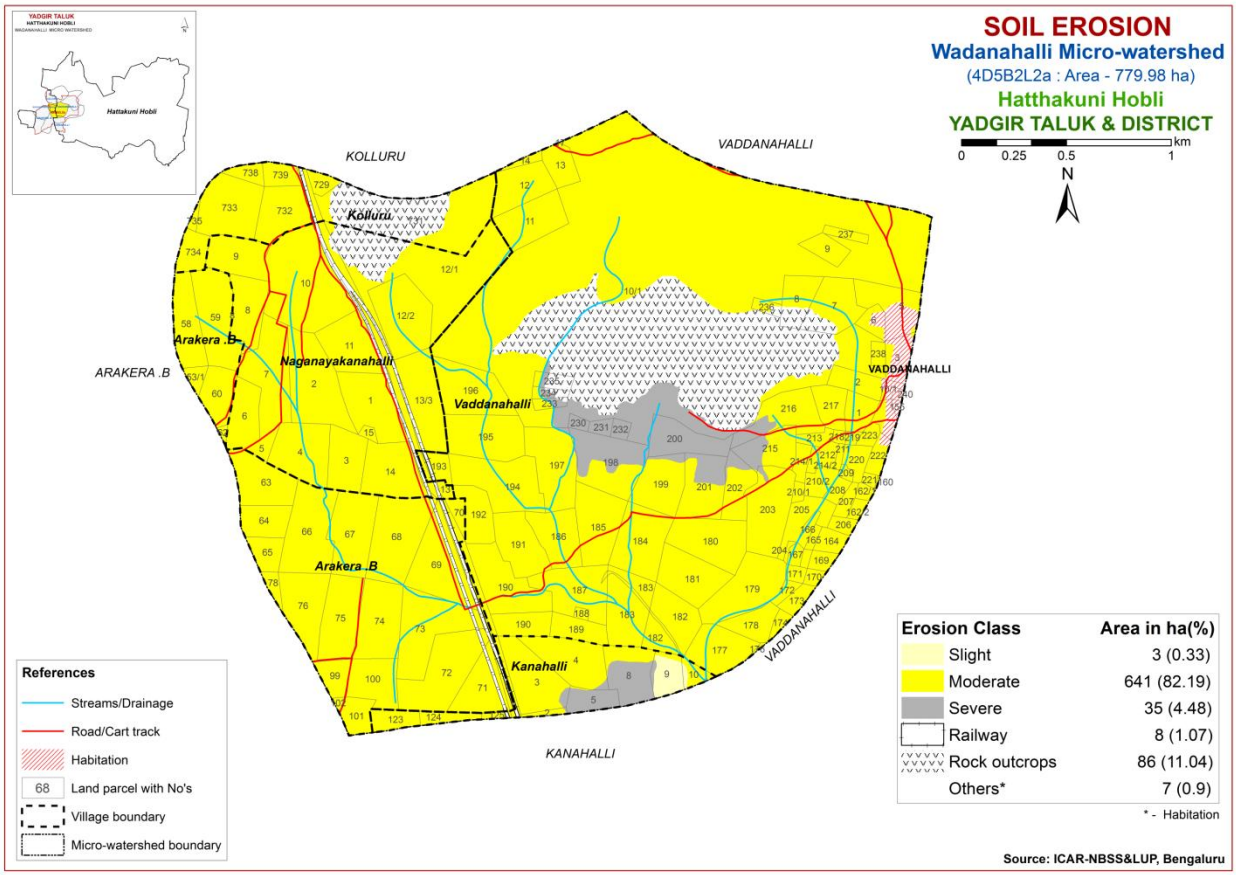


Fig. 5.7 Soil Erosion map of Wadanahalli Microwatershed

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 Wadanahalli microwatershed for soil reaction (pH) showed that an area of about 45 ha (6%) is slightly acid (pH 6.0-6.5) and are distributed in the western and northwestern part of the microwatershed, about 133 ha (17%) is neutral (pH 6.5-7.3) and are distributed in the western, northern and northwestern part of the microwatershed. An area of about 43 ha (6%) is slightly alkaline (pH 7.3-7.8) and are distributed in the western and northern part of the microwatershed, about 146 ha (19%) are moderately alkaline (pH 7.8-8.4) and are distributed in the central, northern, southern, northeastern and southwestern part of the microwatershed. About 228 ha (29%) area is strongly alkaline (pH 8.4-9.0) and is distributed in the major part of the microwatershed. About 83 ha (11%) area is very strongly alkaline (pH >9.0) and are distributed in the eastern and southern part of the microwatershed (Fig. 6.1). In all, major area of about 500 ha is alkaline, 133 ha is under neutral and 45 ha is under acid soils.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in an area of about 517 ha (66%) is medium (0.5-0.75%) and are distributed in the major part of the microwatershed. Low (<0.5%) in an area of 32 ha (4%) and is distributed in the southeastern part and high (>0.75%) in an area of 129 ha (17%) and are distributed in the

southern, northwestern, northeastern, northern and central part of the microwatershed (Fig. 6.3).

6.4 Available Phosphorus

Available phosphorus content is medium (23-57 kg/ha) in an area of 449 ha (58%) and distributed in the major part of the microwatershed. High (>57 kg/ha) in an area of 15 ha (2%) and are distributed in the northwestern part and low (<23 kg/ha) in an area of 215 ha (28%) and are distributed in the southeastern, southern, central eastern and northern part of the microwatershed (Fig. 6.4).

6.5 Available Potassium

Available potassium content is medium (145-337 kg/ha) in an area of 665 ha (85%) and are distributed in the major part of the microwatershed and high (>337 kg/ha) in an area of 14 ha (2%) and are distributed in the northwestern part of the microwatershed (Fig. 6.5)

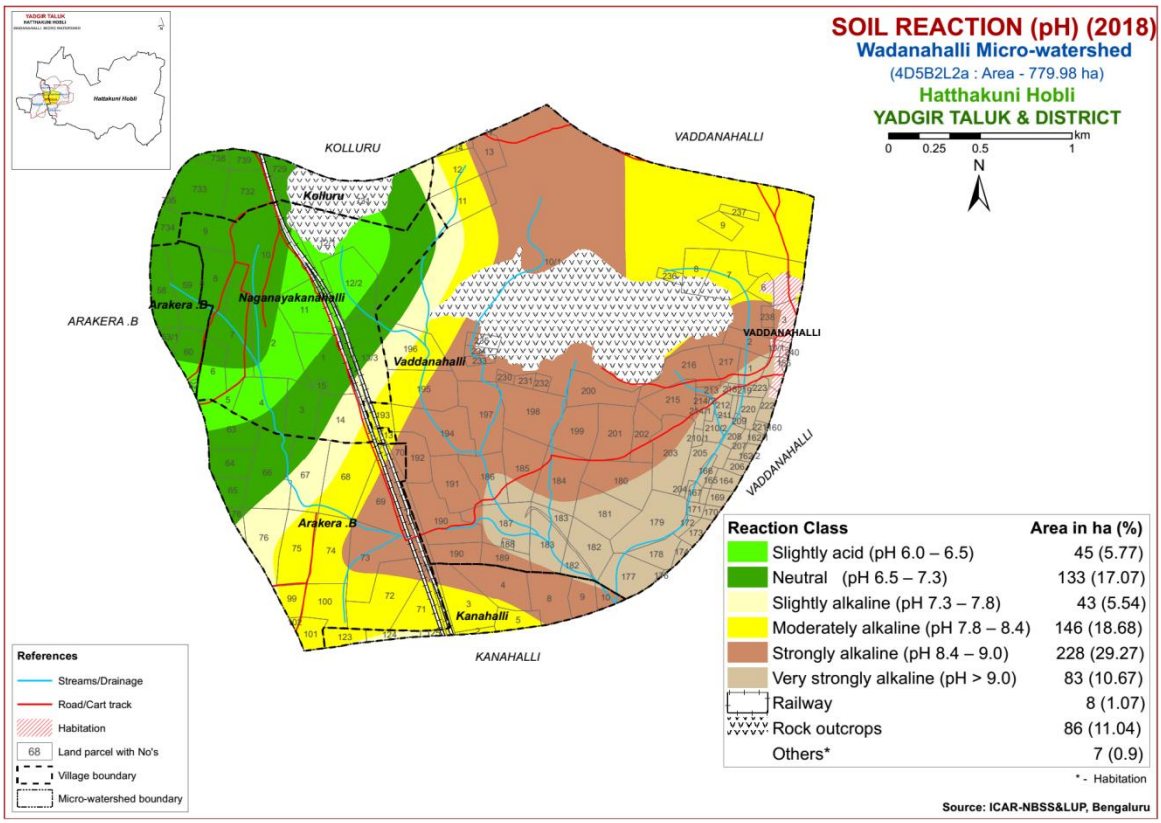


Fig.6.1 Soil Reaction (pH) map of Wadanahalli Microwatershed

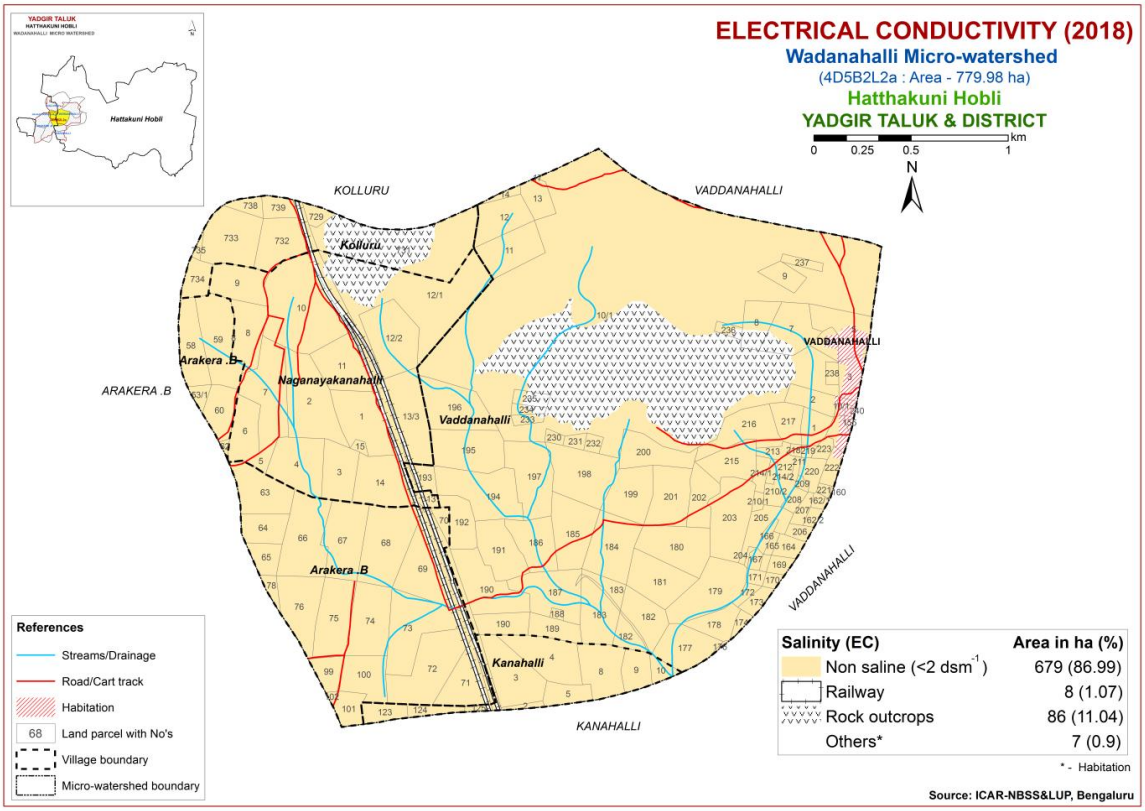


Fig.6.2 Electrical Conductivity (EC) map of Wadanahalli Microwatershed

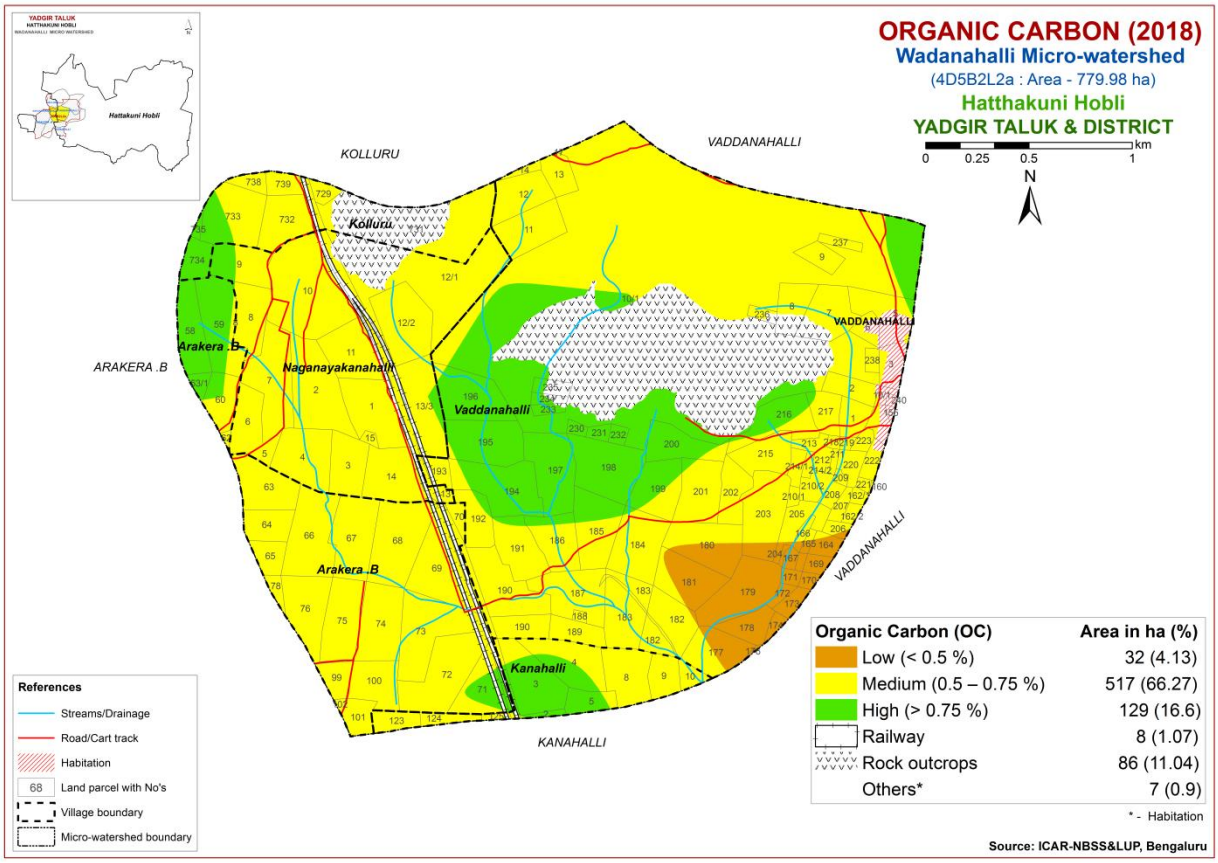


Fig.6.3 Soil Organic Carbon map of Wadanahalli Microwatershed

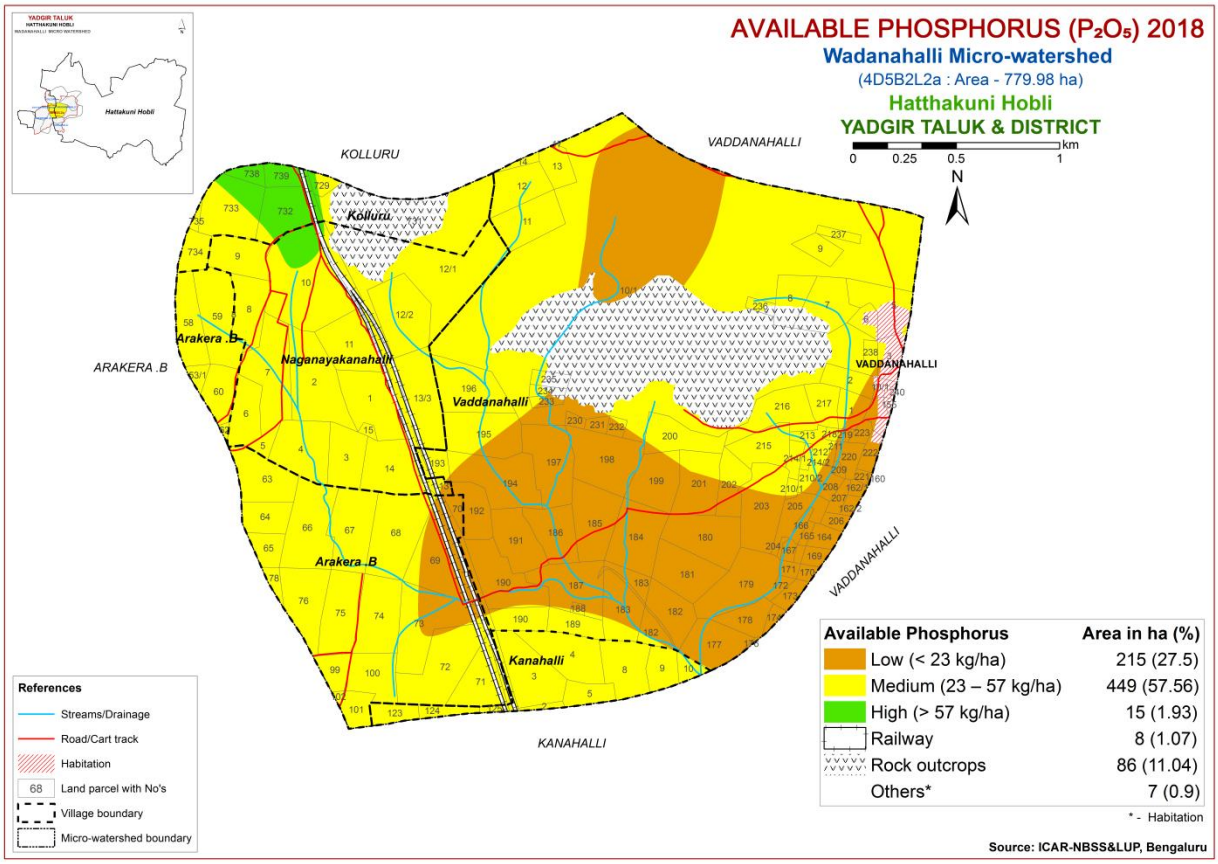


Fig.6.4 Soil Available Phosphorus map of Wadanahalli Microwatershed

6.6 Available Sulphur

An area of about 539 ha (69%) is low (<10 ppm) in available sulphur content and are distributed in the major part of the microwatershed. Medium (10-20 ppm) in an area of about 137 ha (18%) and is distributed in the northeastern, southern, northern and eastern part of the microwatershed and high (>20 ppm) in an area of 2 ha (<1%) and are distributed in the northwestern part of the microwatershed (Fig. 6.6).

6.7 Available Boron

Available boron content is low (<0.5 ppm) in an area of 550 ha (71%) and are distributed in the major part of the microwatershed and medium (0.5-1.0 ppm) in an area of 128 ha (16%) and are distributed in the northern, southern and western part of the microwatershed (Fig. 6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) in an area of 518 ha (66%) and deficient (<4.5 ppm) in an area of 161 ha (20%) in 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 a maximum area of 669 ha (86%) and are distributed in the major part and sufficient (>0.6 ppm) in an area of 9 ha (1%) and are distributed in the northwestern and northeastern part of the microwatershed (Fig 6.11).

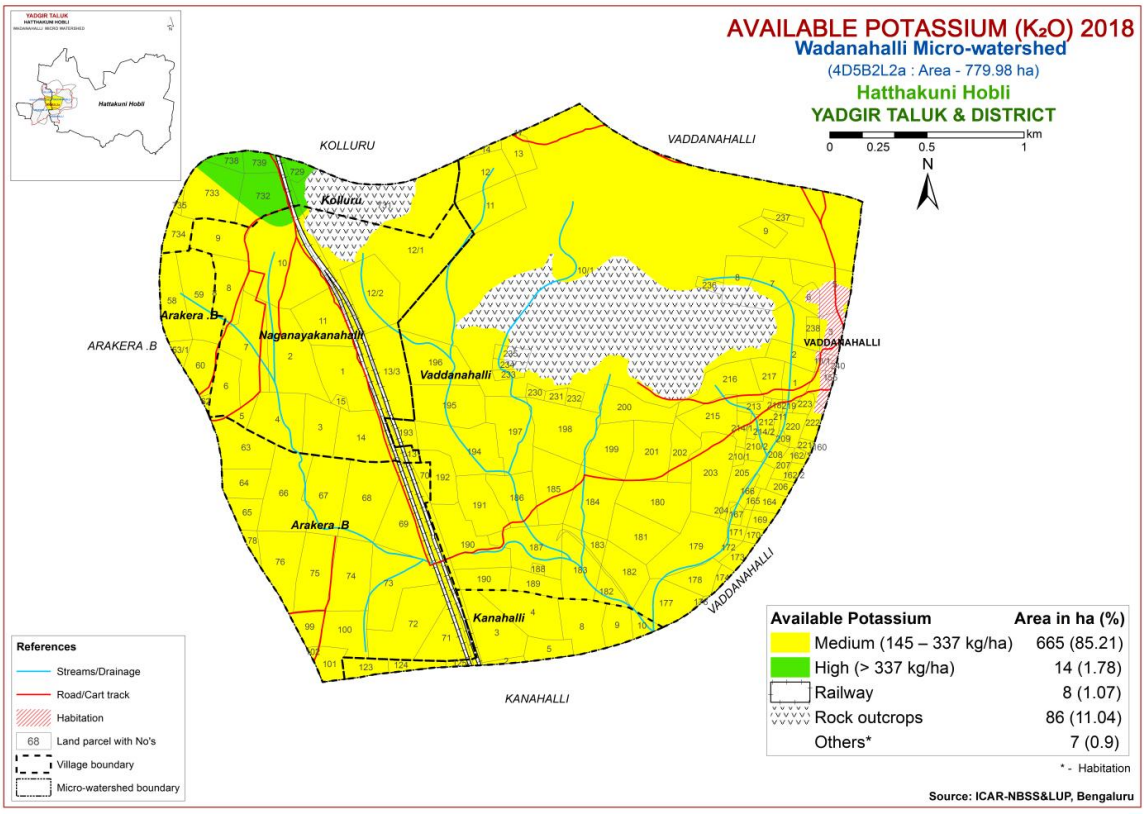


Fig.6.5 Soil Available Potassium map of Wadanahalli Microwatershed

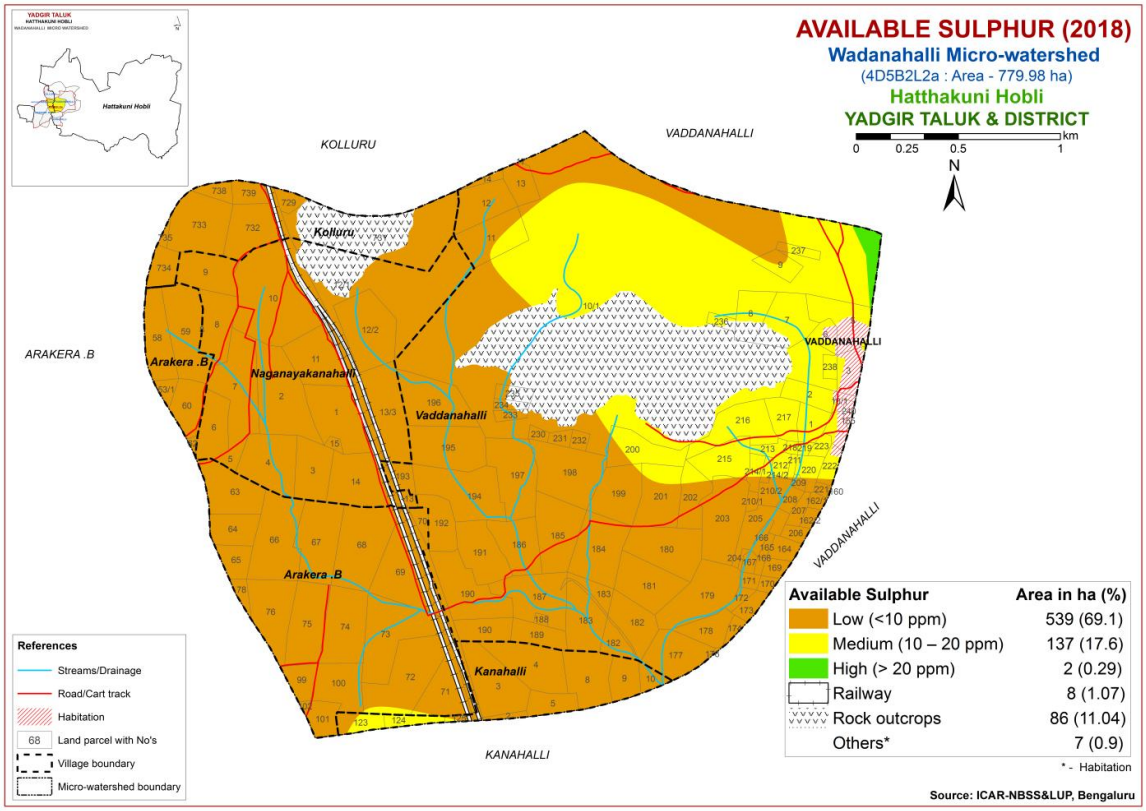


Fig.6.6 Soil Available Sulphur map of Wadanahalli Microwatershed

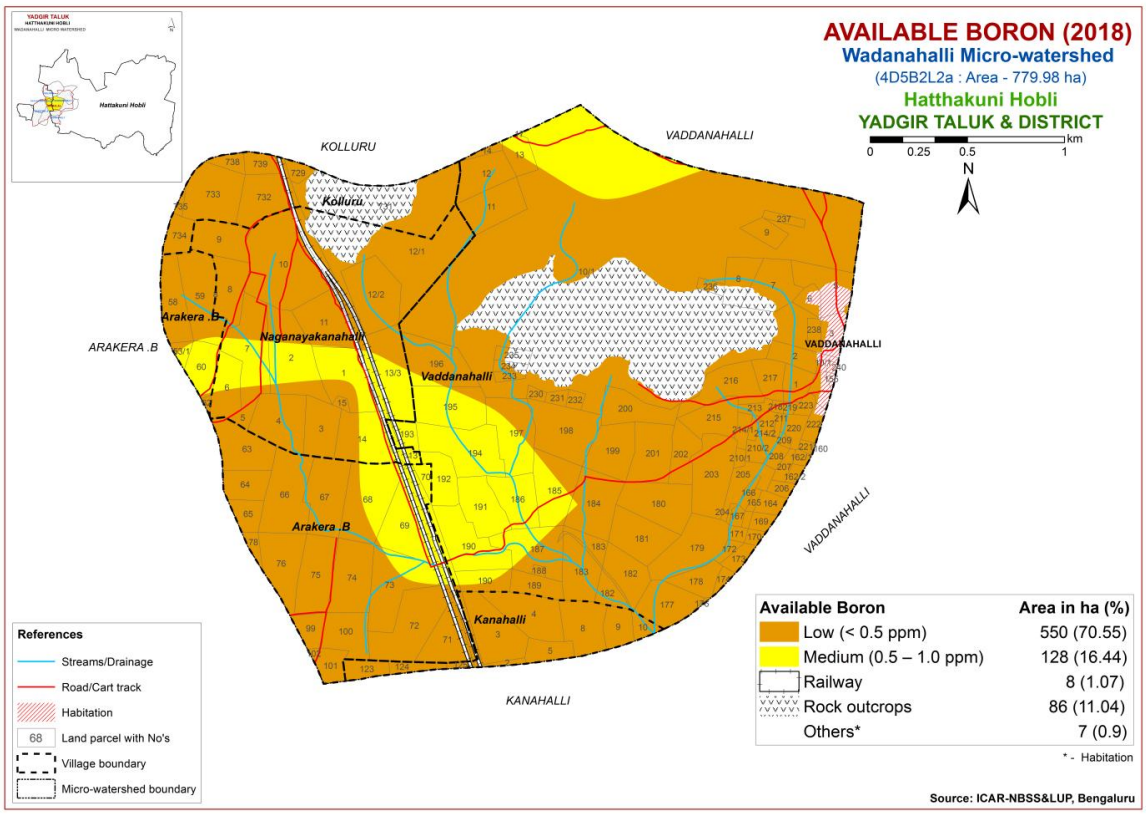


Fig.6.7 Soil Available Boron map of Wadanahalli Microwatershed

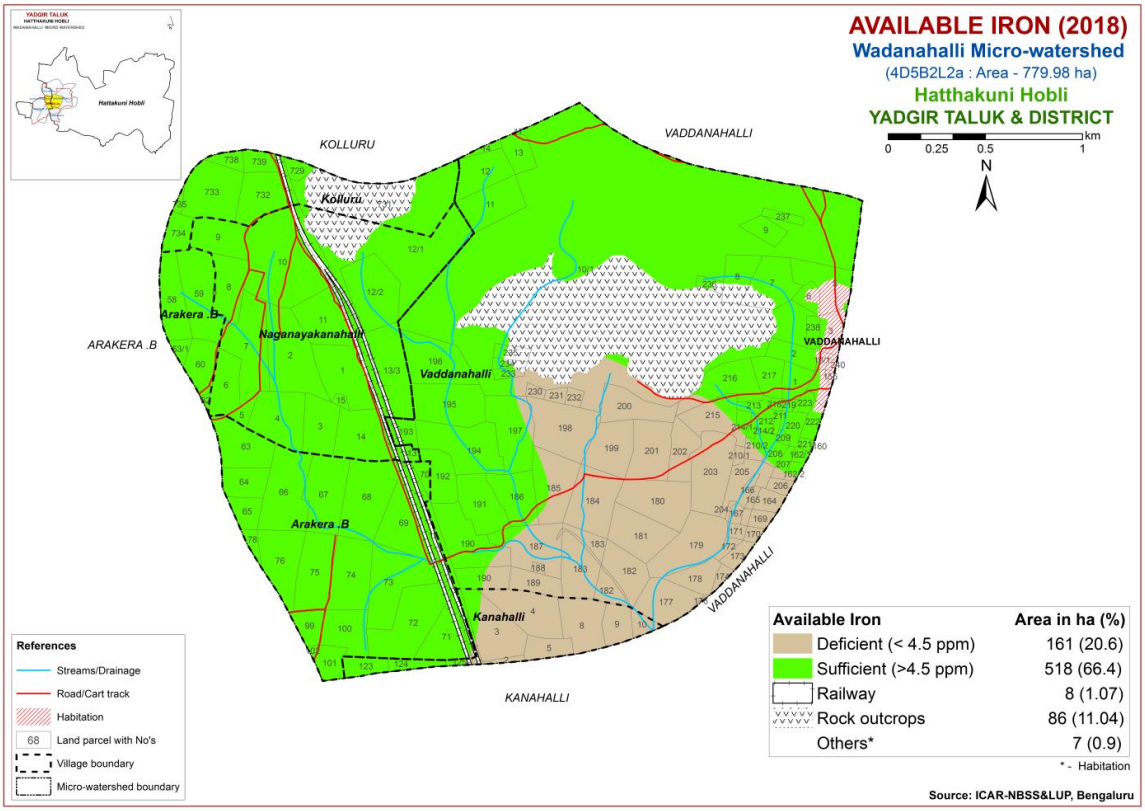


Fig.6.8 Soil Available Iron map of Wadanahalli Microwatershed

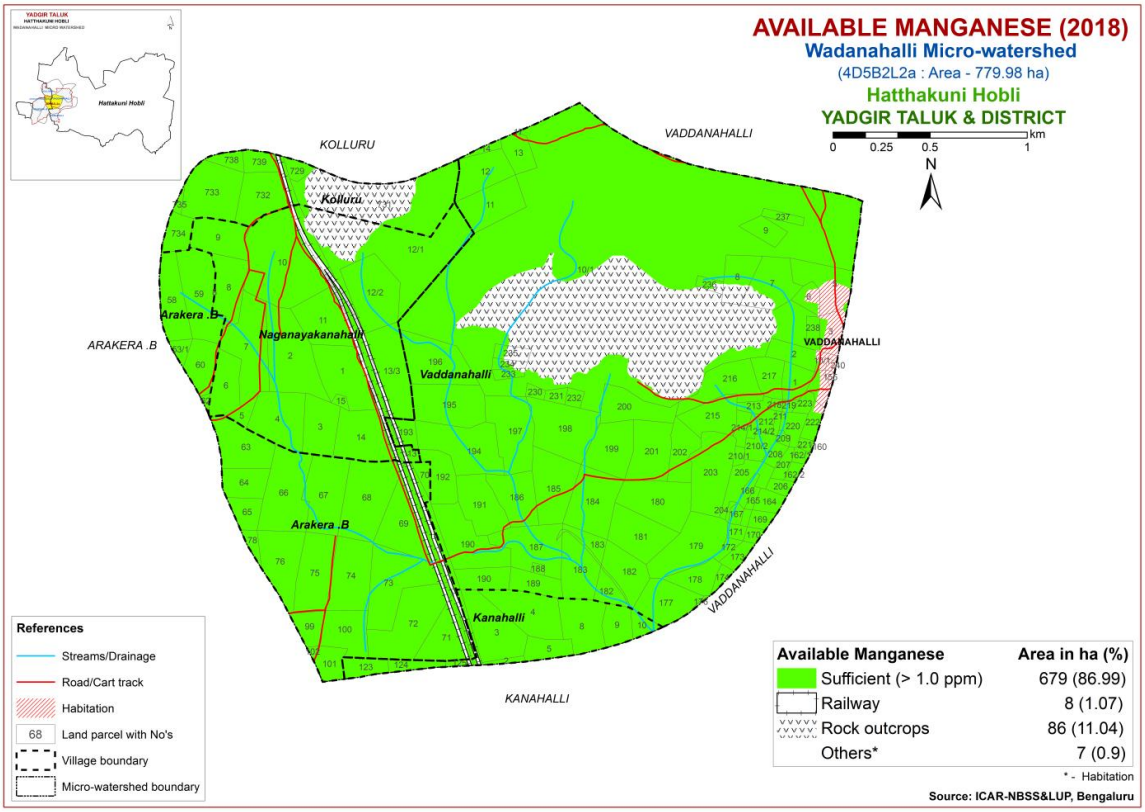


Fig.6.9 Soil Available Manganese map of Wadanahalli Microwatershed

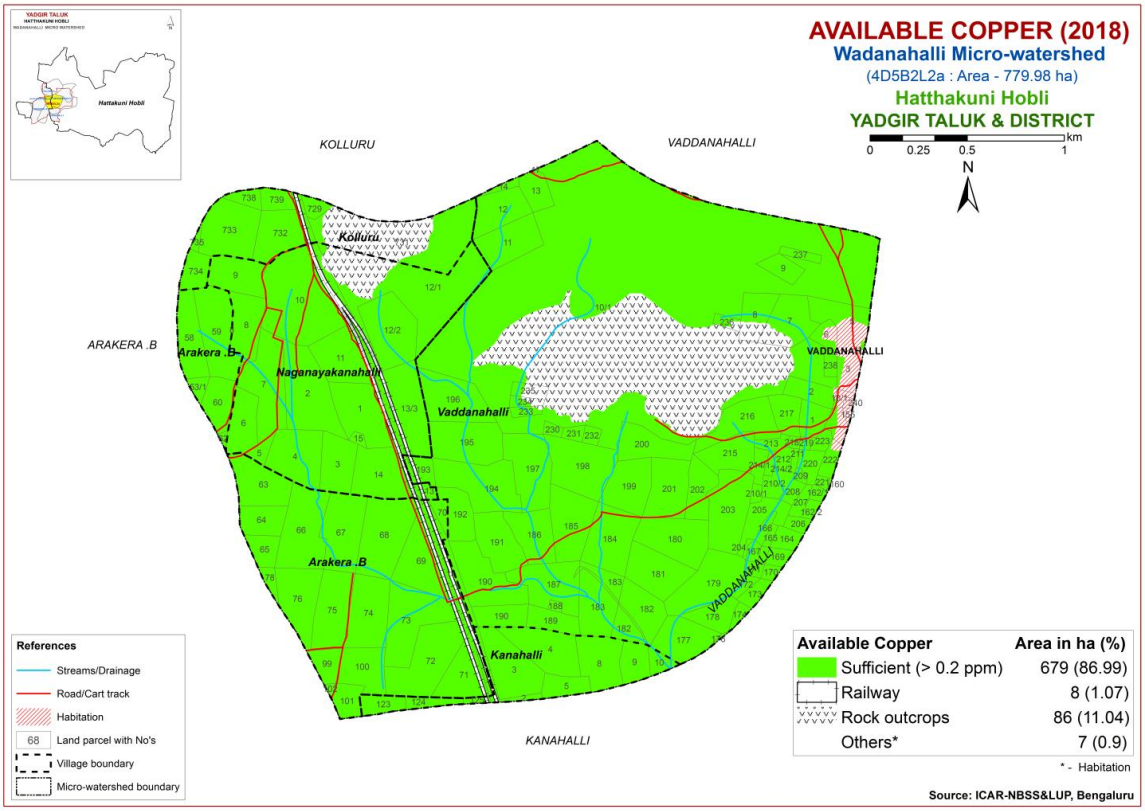


Fig.6.10 Soil Available Copper map of Wadanahalli Microwatershed

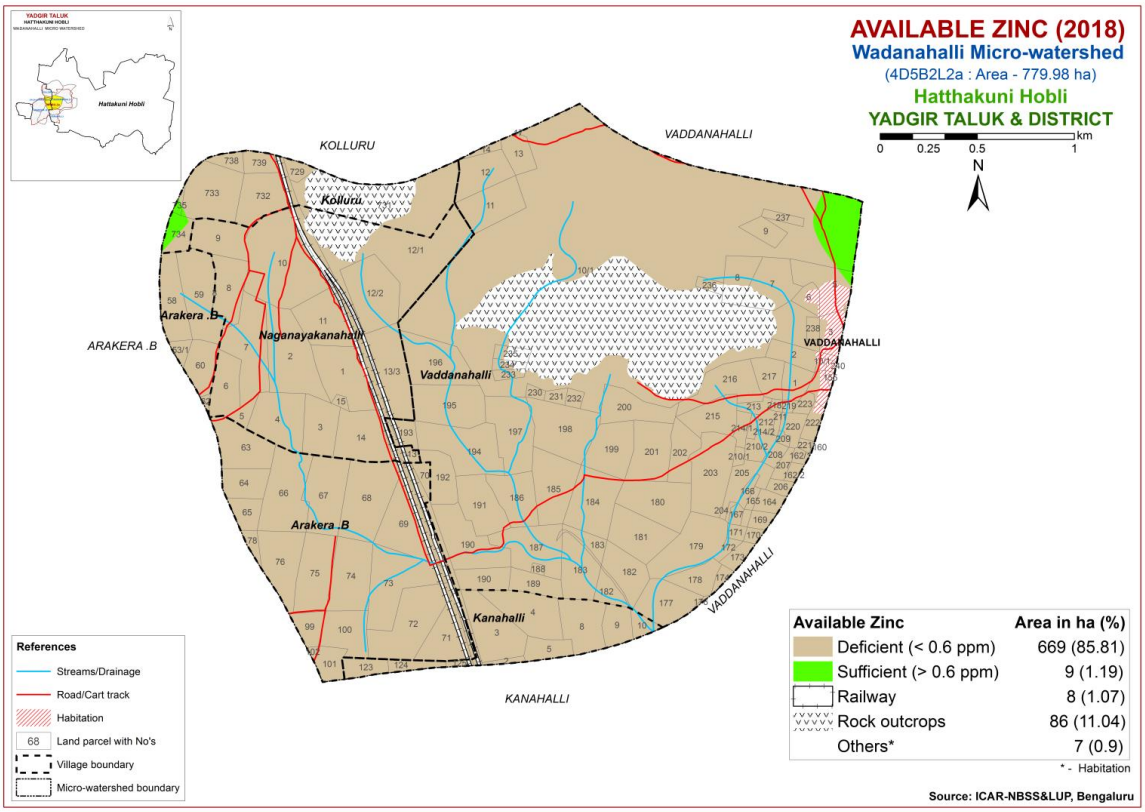


Fig.6.11 Soil Available Zinc map of Wadanahalli Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Wadanahalli 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.

An area of about 281 ha (36%) is moderately suitable (Class S2) for growing sorghum and is distributed in the central, southern, western, northwestern and

southwestern part of the microwatershed with minor limitations of rooting depth, nutrient availability, calcareousness and texture. An area of about 300 ha (38%) is marginally suitable (Class S3) for growing sorghum and is distributed in the central, eastern, northern, southeastern and southern part of the microwatershed with moderate limitations rooting depth, texture, gravelliness and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 99 ha (13%) and are distributed in the northern, eastern and southern part of the microwatershed with severe limitation of rooting depth.

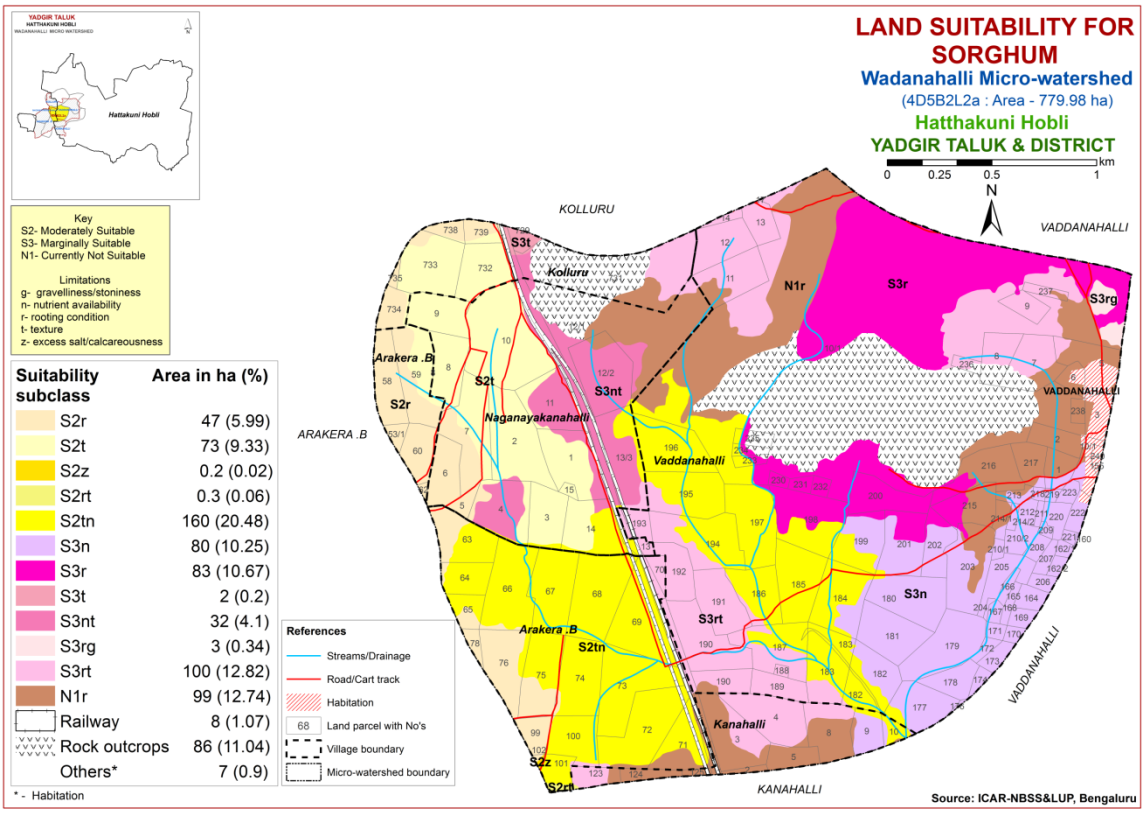


Fig. 7.1 Land Suitability map of Sorghum

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 73 ha (9%) and are distributed in the western and northwestern part of the microwatershed. An area of about 208 ha (27%) is moderately suitable (Class S2) for growing maize and is distributed in the central, southern, western, northwestern and southwestern part of the microwatershed with minor limitations of rooting depth, nutrient availability, calcareousness and texture. An area of about 300 ha (38%) is marginally suitable (Class

S3) for growing maize and is distributed in the central, eastern, northern, southeastern and southern part of the microwatershed with moderate limitations rooting depth, texture, gravelliness and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 99 ha (13%) and are distributed in the northern, eastern and southern part of the microwatershed with severe limitation of rooting depth.

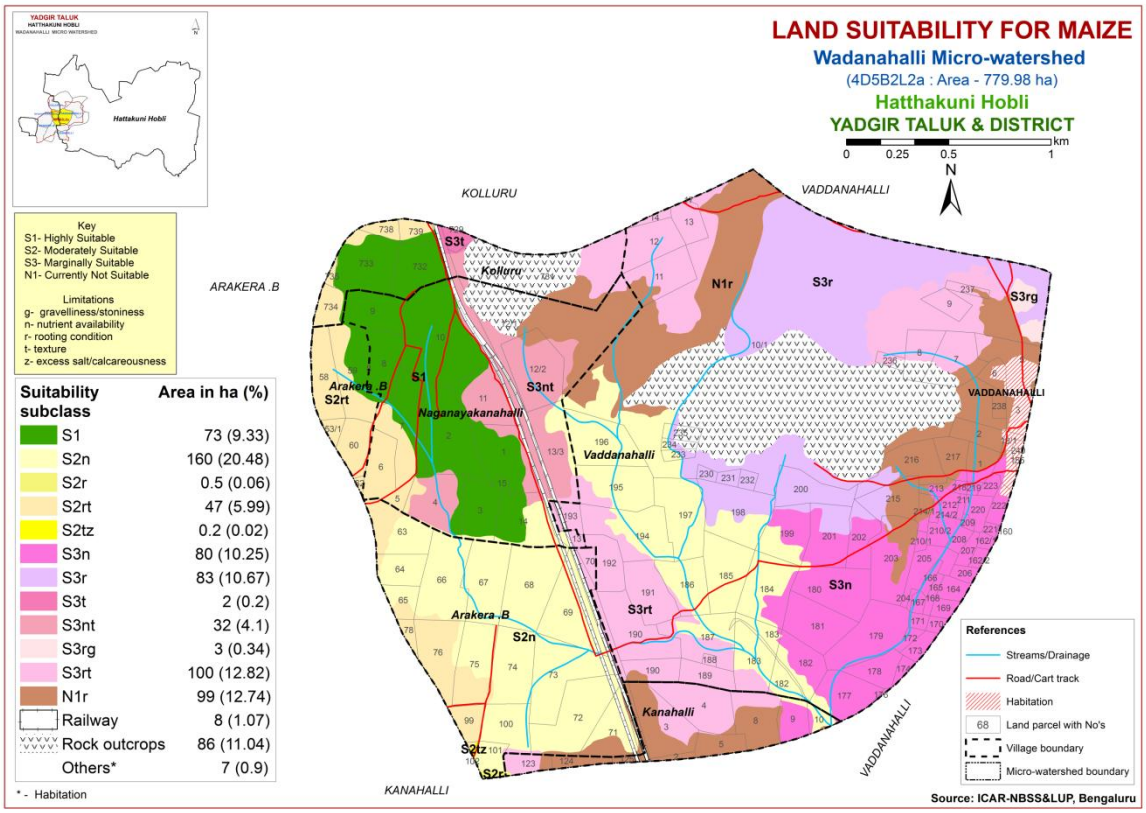


Fig. 7.2 Land Suitability map of Maize

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 73 ha (9%) and are distributed in the western and northwestern part of the microwatershed. An area of about 208 ha (27%) is moderately suitable (Class S2) for growing bajra and is distributed in the central, southern, western, northwestern and southwestern part of the microwatershed with minor limitations of rooting depth, nutrient availability, calcareousness and texture. An area of about 300 ha (38%) is marginally suitable (Class S3) for growing bajra and is distributed in the central, eastern, northern, southeastern and southern part of the microwatershed with moderate limitations rooting depth, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 99 ha

(13%) and are distributed in the northern, eastern and southern part of the microwatershed with severe limitation of rooting depth.

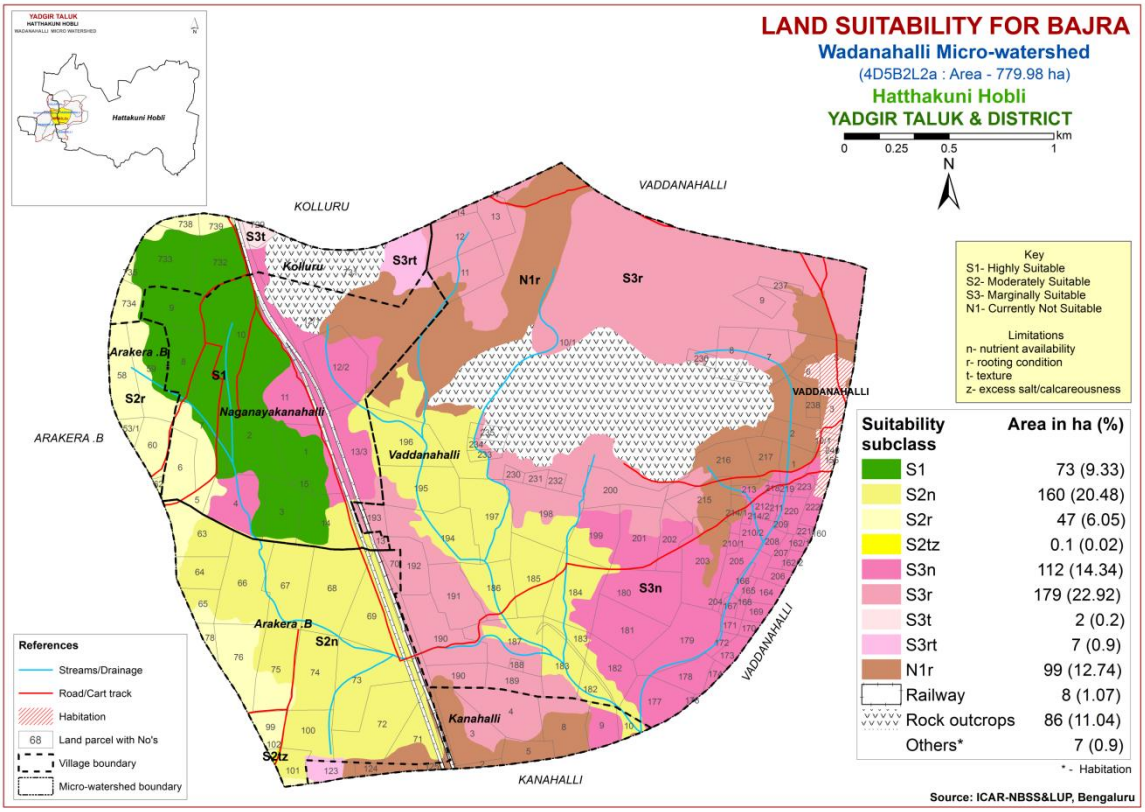


Fig. 7.3 Land Suitability map of Bajra

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 different suitability subclasses in the microwatershed are given in Figure 7.4.

Highly suitable (Class S1) lands for growing groundnut occur in an area of 73 ha (9%) and are distributed in the western and northwestern part of the microwatershed. An area of about 394 ha (51%) is marginally suitable (Class S3) for growing groundnut and is distributed in the major part of the microwatershed with moderate limitations rooting depth, calcareousness, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 211 ha (27%) and are distributed in the northern, eastern, southern and southeastern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

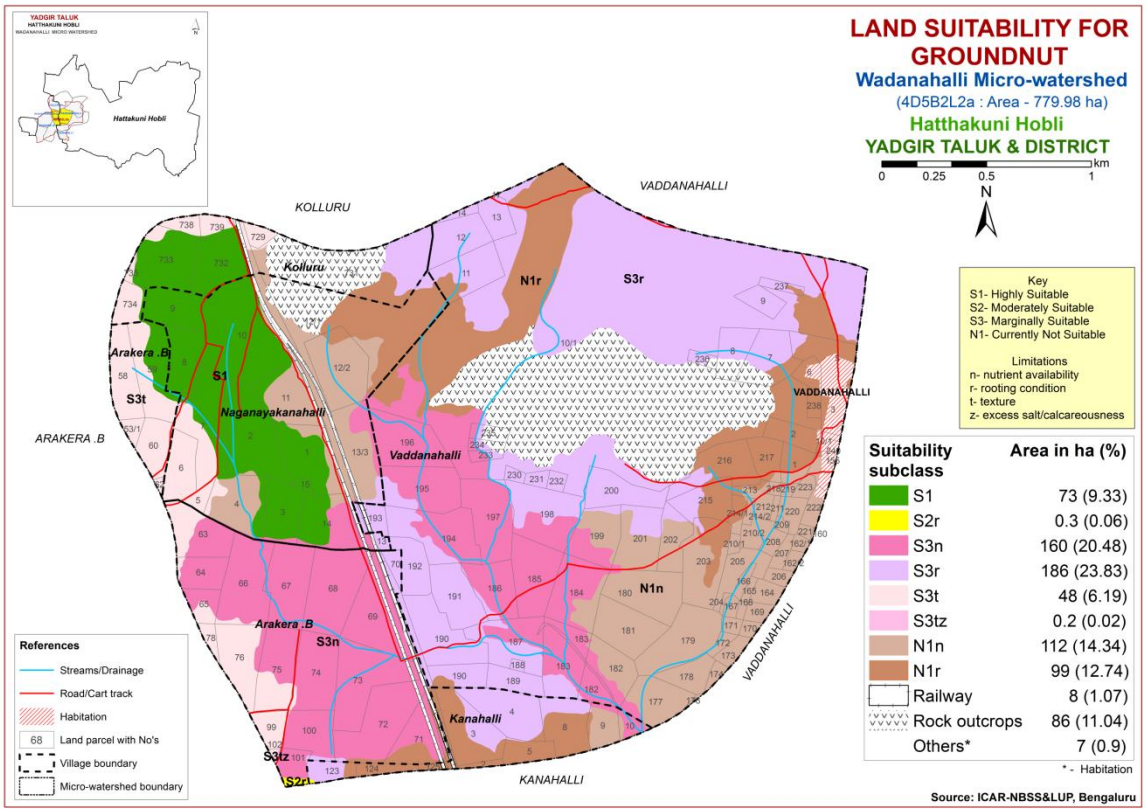


Fig. 7.4 Land Suitability map of Groundnut

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 73 ha (9%) is moderately suitable (Class S2) for growing sunflower and is distributed in the western and northwestern part of the microwatershed with minor limitations of rooting depth, calcareousness and texture. An area of about 209 ha (27%) is marginally suitable (Class S3) and is distributed in the central, southwestern, western, northwestern and southern part of the microwatershed with moderate limitations of rooting depth, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 397 ha (51%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

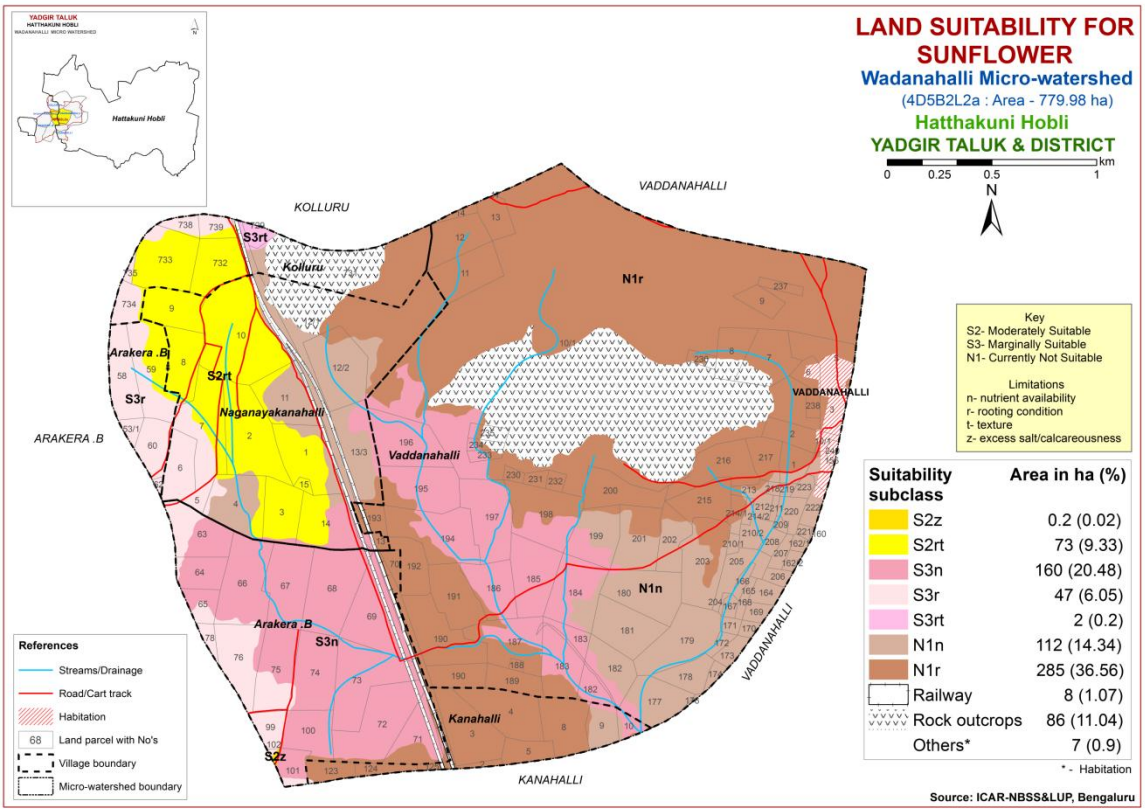


Fig. 7.5 Land Suitability map of Sunflower

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 233 ha (30%) is moderately suitable (Class S2) for redgram and are distributed in the southern, western, southwestern, northwestern and central part of the microwatershed. They have minor limitations of nutrient availability, rooting depth, calcareousness and texture. An area of about 161 ha (21%) is marginally suitable (Class S3) and is distributed in the southern and southeastern part of the microwatershed with moderate limitations of rooting depth, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 285 ha (37%) and are distributed in the northern, northeastern, eastern, southern and central part of the microwatershed with severe limitation of rooting depth.

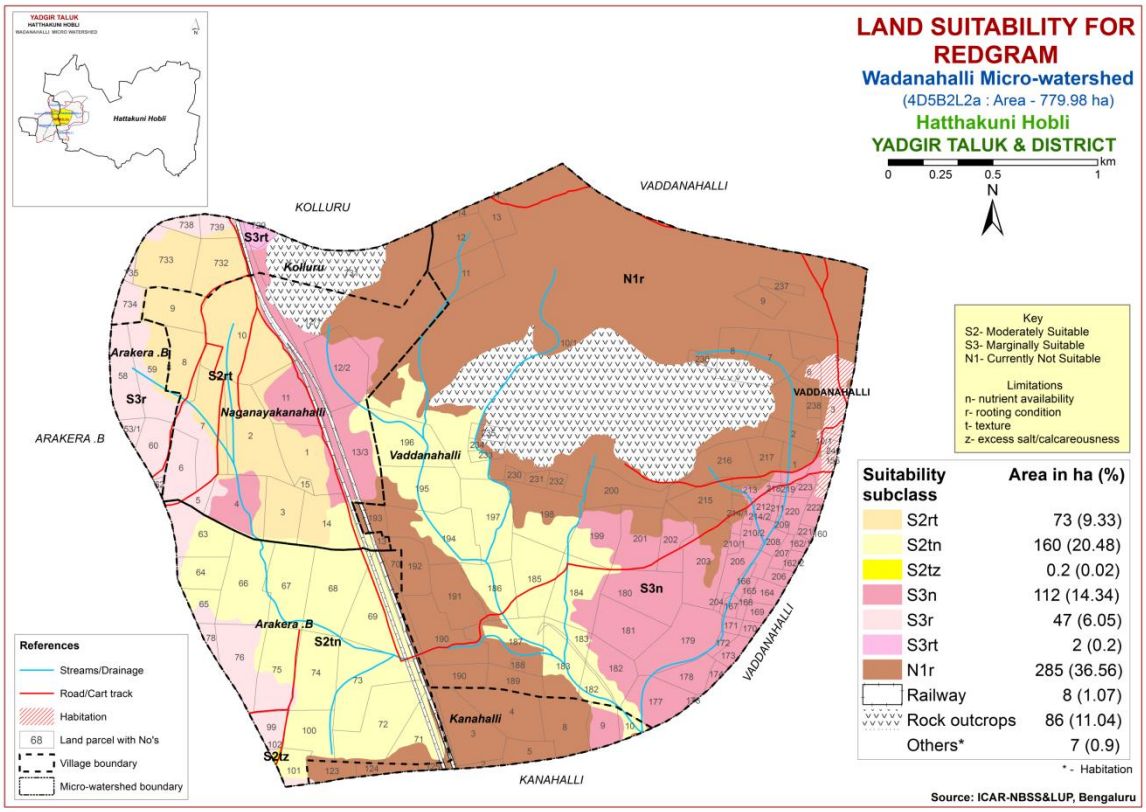


Fig. 7.6 Land Suitability map of Redgram

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 446 ha (57%) is marginally suitable (Class S3) and is distributed in the major part of the microwatershed with moderate limitations of rooting depth, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 233 ha (30%) and are distributed in the central, eastern, northern, southern and northeastern part of the microwatershed with severe limitations of texture of rooting depth.

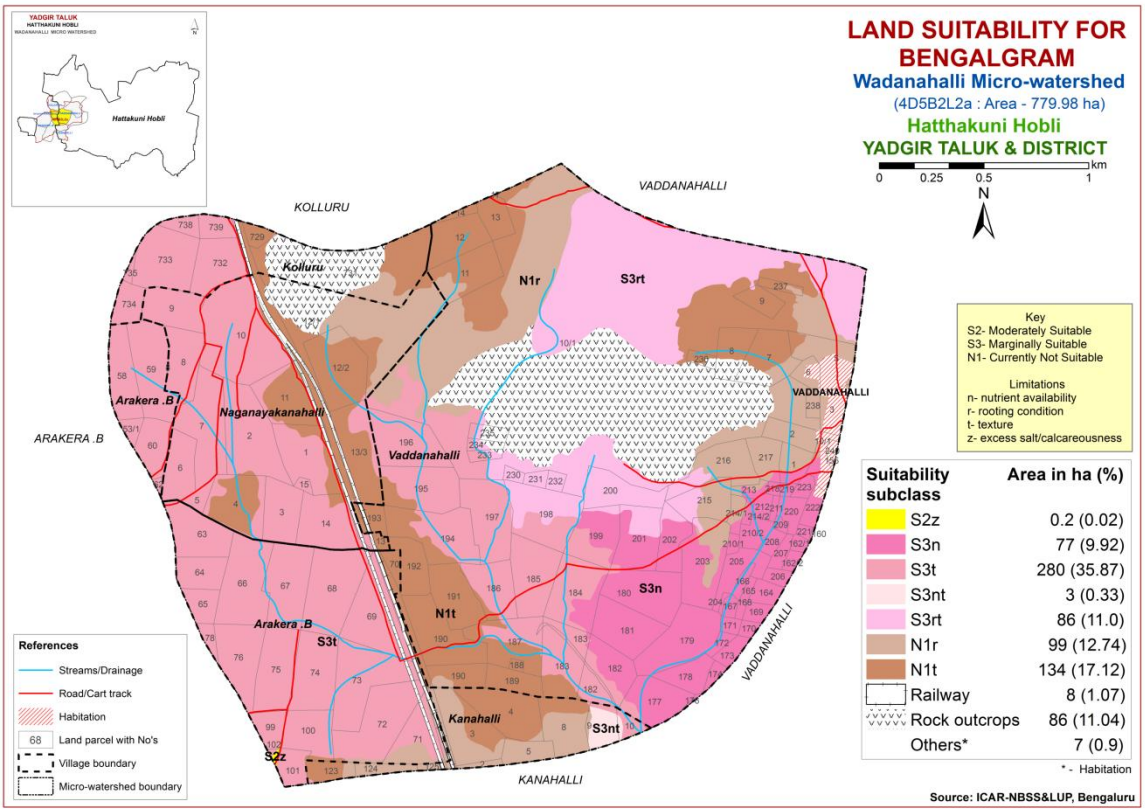


Fig. 7.7 Land Suitability map of Bengal gram

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 47 ha (6%) is moderately suitable (Class S2) for cotton and are distributed in the western, southwestern, and northwestern part of the microwatershed. They have minor limitation of rooting depth. An area of about 399 ha (51%) is marginally suitable (Class S3) and is distributed in the major part of the microwatershed with moderate limitations of rooting depth, gravelliness, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 233 ha (30%) and are distributed in the central, eastern, northern, southern and northeastern part of the microwatershed with severe limitations of texture of rooting depth.

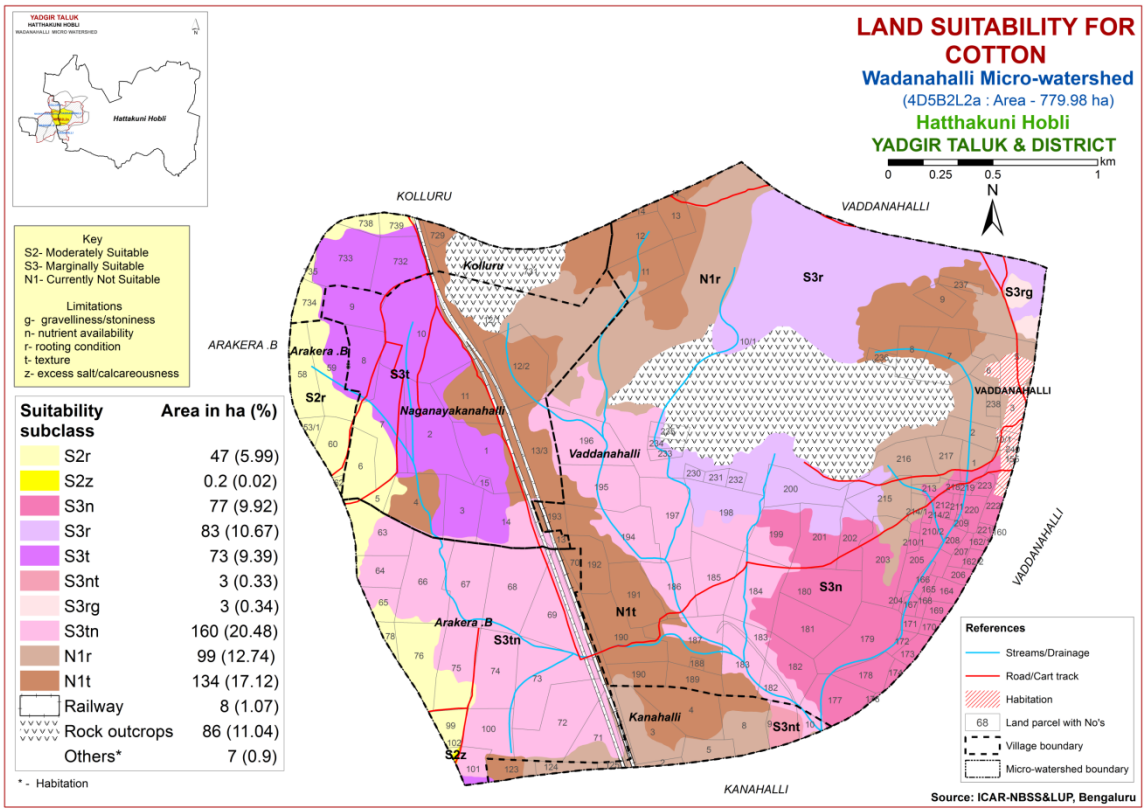


Fig. 7.8 Land Suitability map of Cotton

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 lands (Class S1) for growing chilli occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 48 ha (6%) is moderately suitable (Class S2) for growing chilli and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitations of rooting depth, texture, gravelliness and calcareousness. Marginally suitable lands (Class S3) for growing chilli occupy an area of about 348 ha (44%) and are distributed in the central, northern, southern, western, northeastern and southwestern part of the microwatershed with moderate limitations of gravelliness, nutrient availability, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 211 ha (27%) and are distributed in the northern, eastern, southern and southeastern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

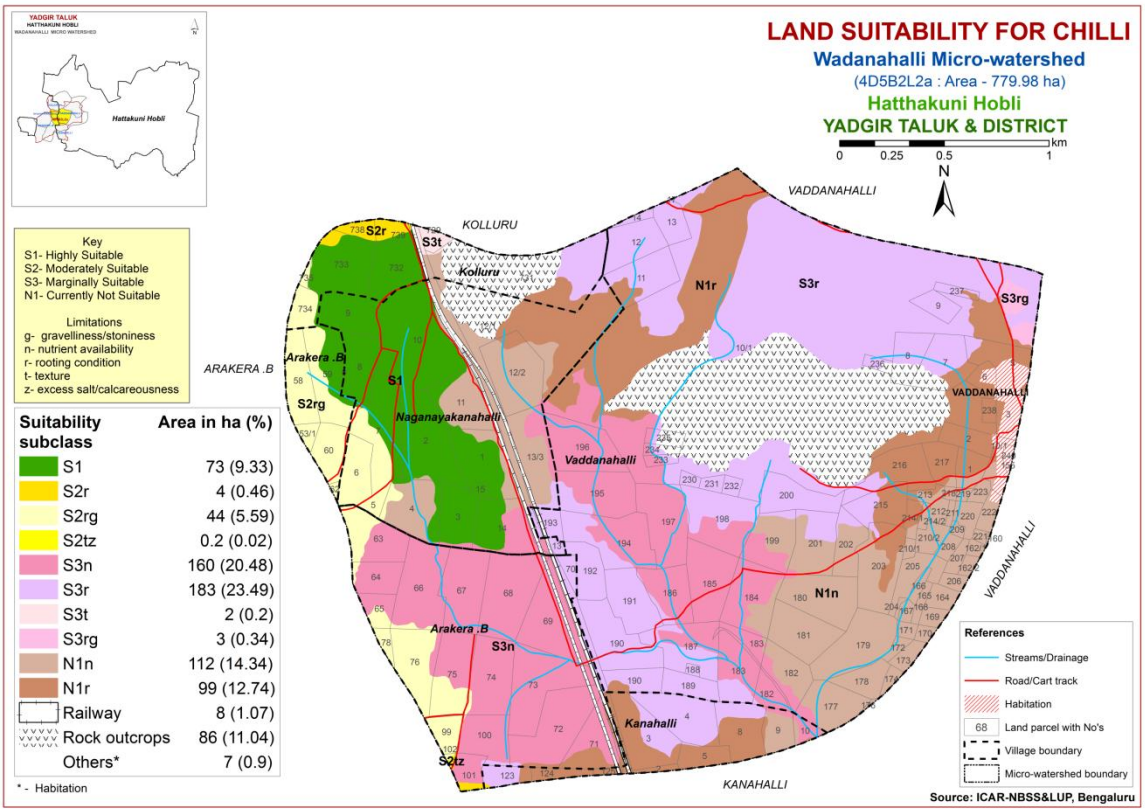


Fig 7.9 Land Suitability map of Chilli

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 lands (Class S1) for growing tomato occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 48 ha (6%) is moderately suitable (Class S2) for growing tomato and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitations of rooting depth and gravelliness. Marginally suitable lands (Class S3) for growing tomato occupy an area of about 348 ha (44%) and are distributed in the central, northern, southern, western, northeastern and southwestern part of the microwatershed with moderate limitations of gravelliness, nutrient availability, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 211 ha (27%) and are distributed in the northern, eastern, southern and southeastern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

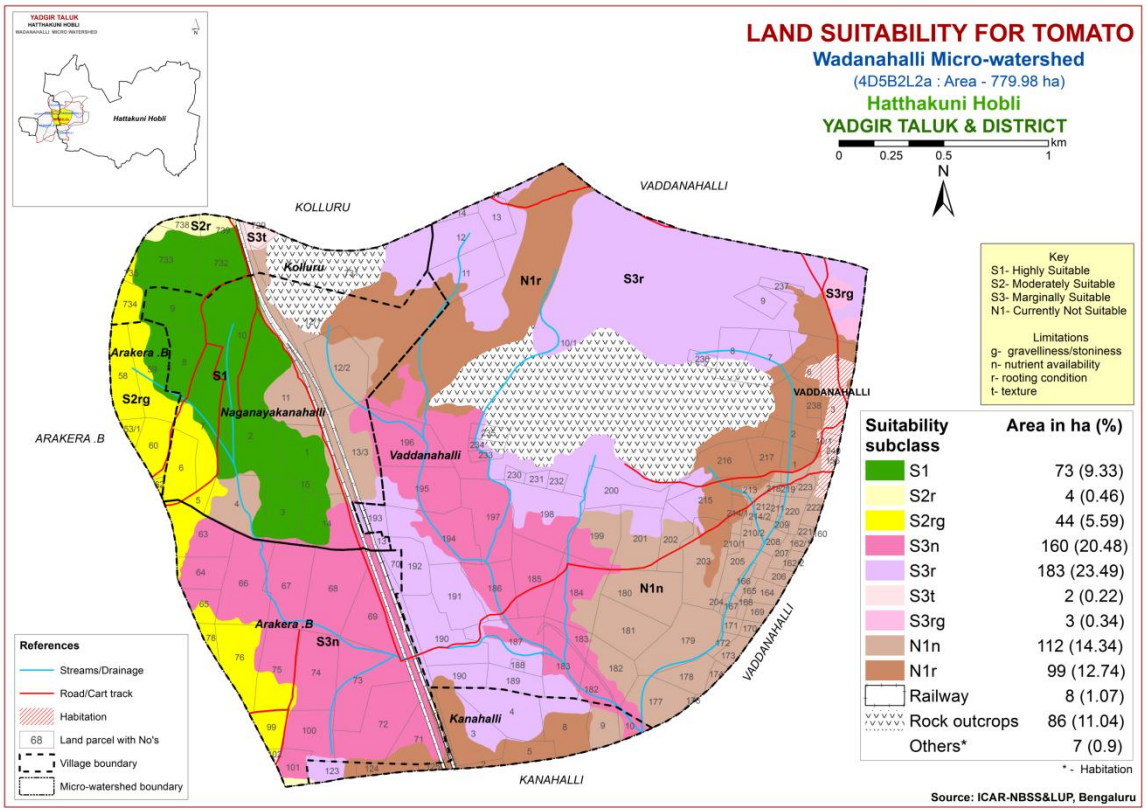


Fig 7.10 Land Suitability map of Tomato

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 lands (Class S1) for growing brinjal occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 48 ha (6%) is moderately suitable (Class S2) for growing brinjal and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitations of rooting depth and gravelliness. Marginally suitable lands (Class S3) for growing brinjal occupy an area of about 348 ha (44%) and are distributed in the central, northern, southern, western, northeastern and southwestern part of the microwatershed with moderate limitations of gravelliness, nutrient availability, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 211 ha (27%) and are distributed in the northern, eastern, southern and southeastern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

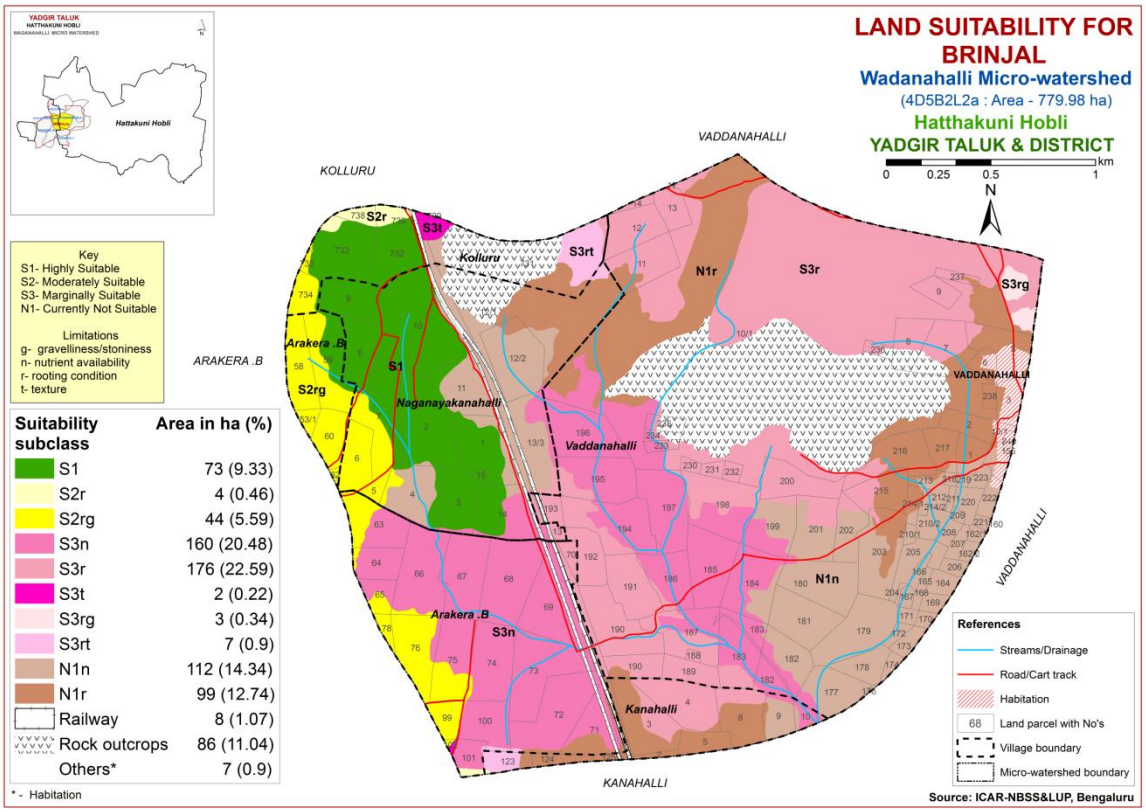


Fig 7.11 Land Suitability map of Brinjal

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 lands (Class S1) for growing onion occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 48 ha (6%) is moderately suitable (Class S2) for growing onion and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitations of rooting depth and gravelliness. Marginally suitable lands (Class S3) for growing onion occupy an area of about 188 ha (24%) and are distributed in the northern, northwestern, central, eastern, western, southwestern and southeastern part of the microwatershed with moderate limitations of gravelliness, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 371 ha (48%) and are distributed in the southern, central, northern, western, eastern, southwestern and southeastern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

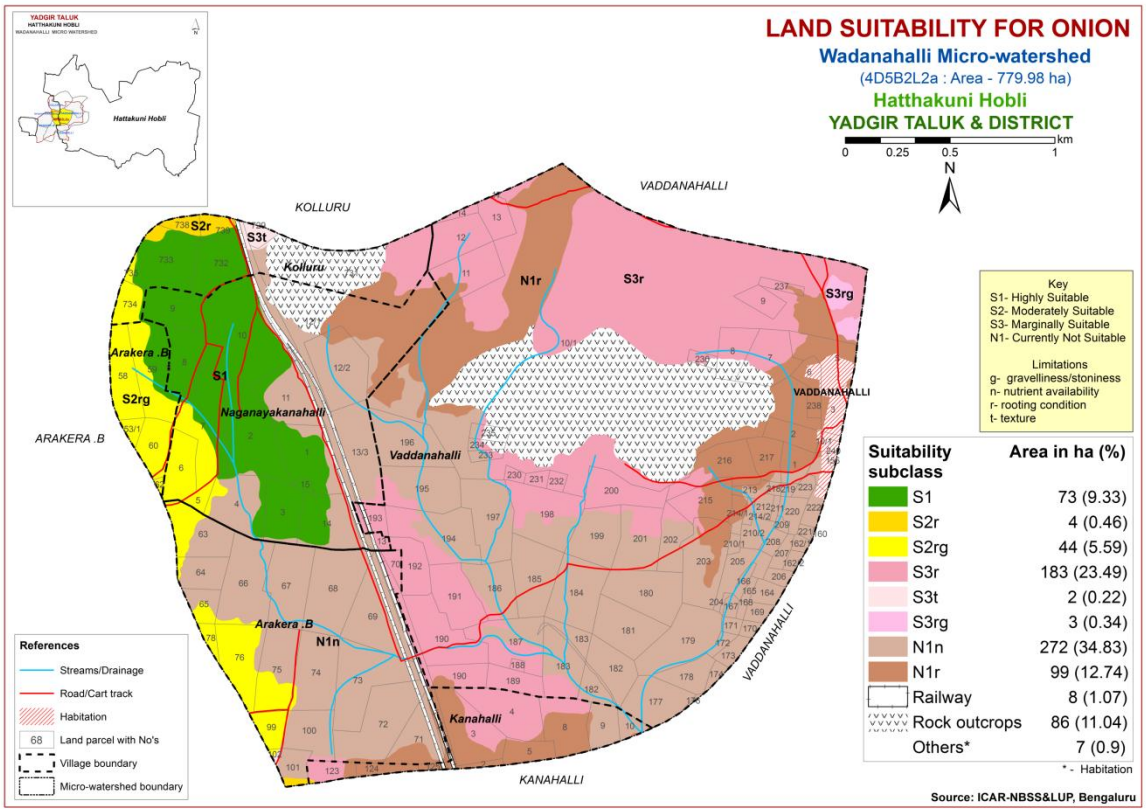


Fig 7.12 Land Suitability map of Onion

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 lands (Class S1) for growing bhendi occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 48 ha (6%) is moderately suitable (Class S2) for growing bhendi and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitations of rooting depth, texture, calcareousness and gravelliness. Marginally suitable lands (Class S3) for growing bhendi occupy an area of about 348 ha (44%) and are distributed in the central, northern, southern, western, northeastern and southwestern part of the microwatershed with moderate limitations of gravelliness, nutrient availability, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 211 ha (27%) and are distributed in the northern, eastern, southern and southeastern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

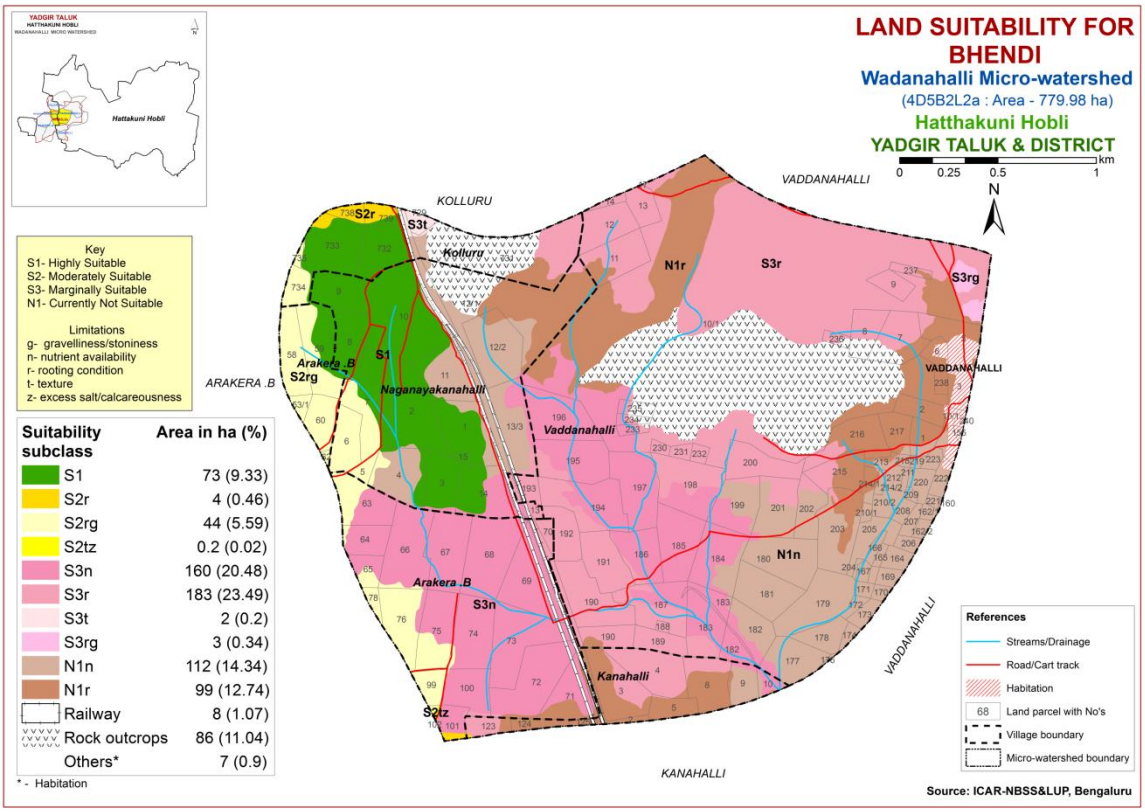


Fig 7.13 Land Suitability map of Bhendi

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 73 ha (9%) is moderately suitable (Class S2) for growing drumstick and is distributed in the western and northwestern part of the microwatershed with minor limitation of rooting depth. An area of about 49 ha (6%) is marginally suitable (Class S3) and is distributed in the central, southwestern, western, northwestern and southern part of the microwatershed with moderate limitations of rooting depth, texture and calcareousness. Currently not suitable (Class N1) lands occur in an area of 557 ha (71%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

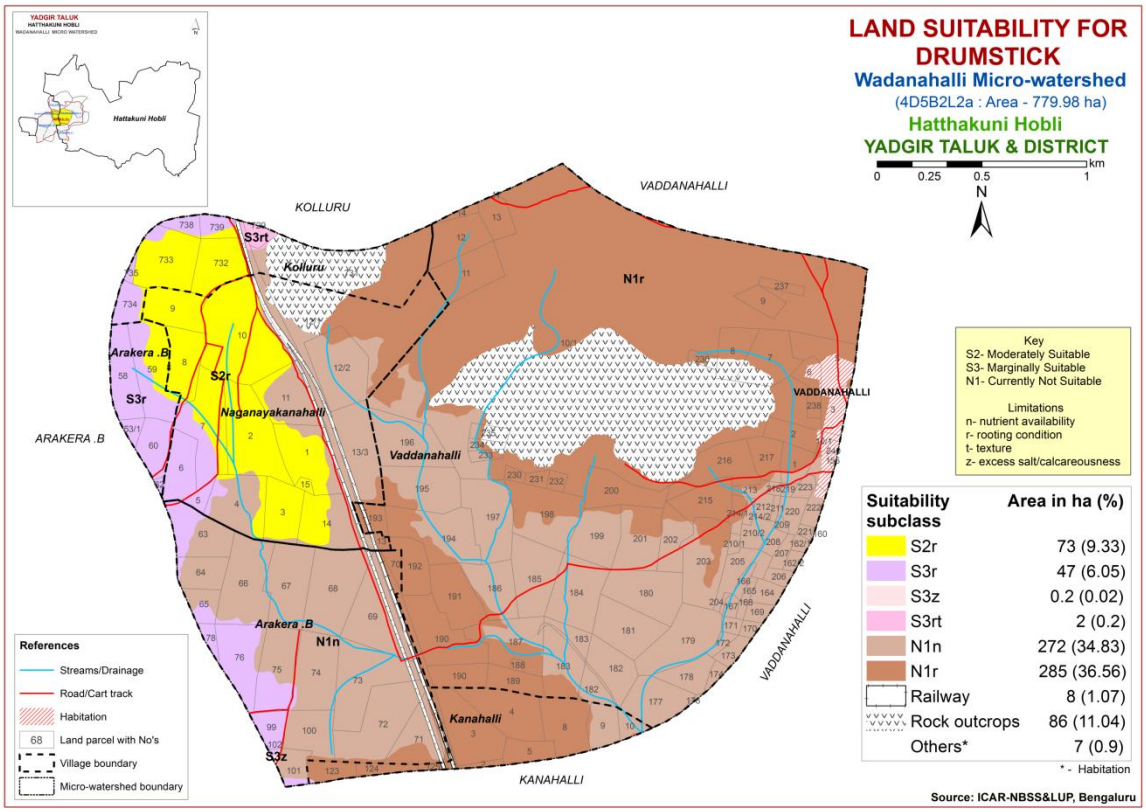


Fig 7.14 Land Suitability map of Drumstick

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 233 ha (30%) is marginally suitable (Class S3) and is distributed in the southern, southwestern, western and central part of the microwatershed with moderate limitations of nutrient availability, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 446 ha (57%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

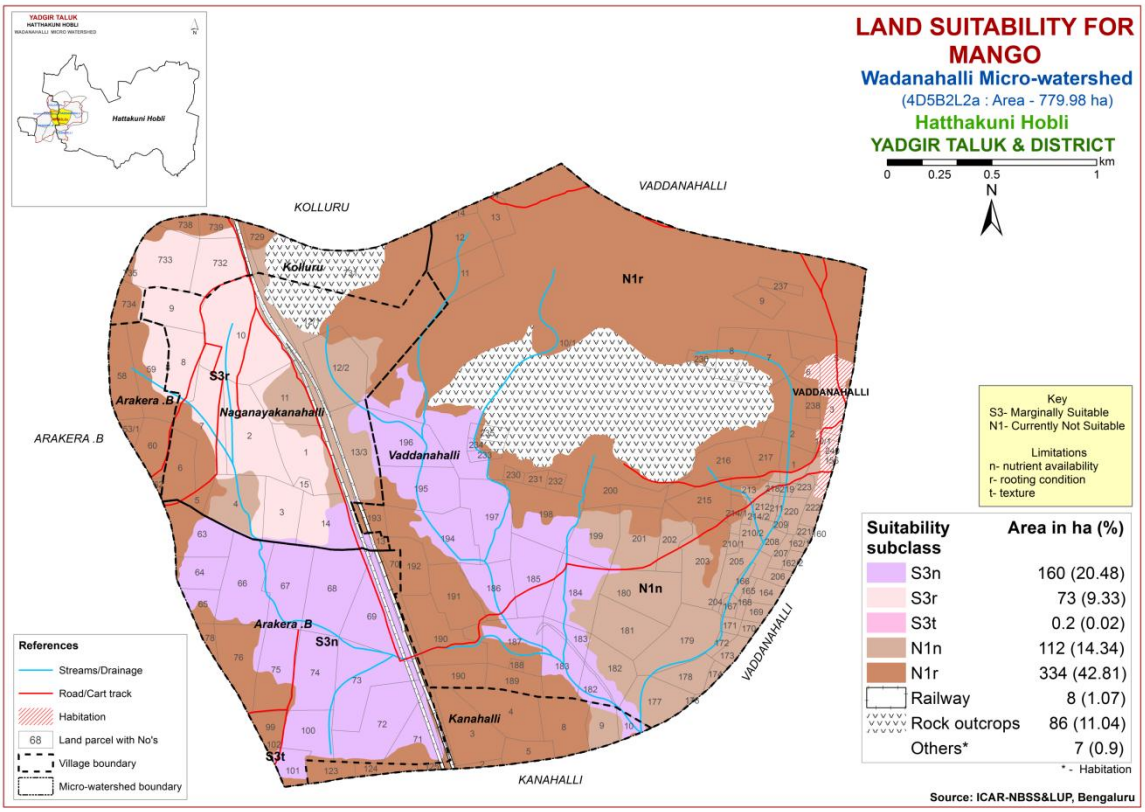


Fig. 7.15 Land Suitability map of Mango

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 73 ha (9%) is moderately suitable (Class S2) for growing guava and is distributed in the western and northwestern part of the microwatershed with minor limitation of rooting depth. An area of about 49 ha (6%) is marginally suitable (Class S3) and is distributed in the central, southwestern, western, northwestern and southern part of the microwatershed with moderate limitations of rooting depth, texture and calcareousness. Currently not suitable (Class N1) lands occur in an area of 557 ha (71%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

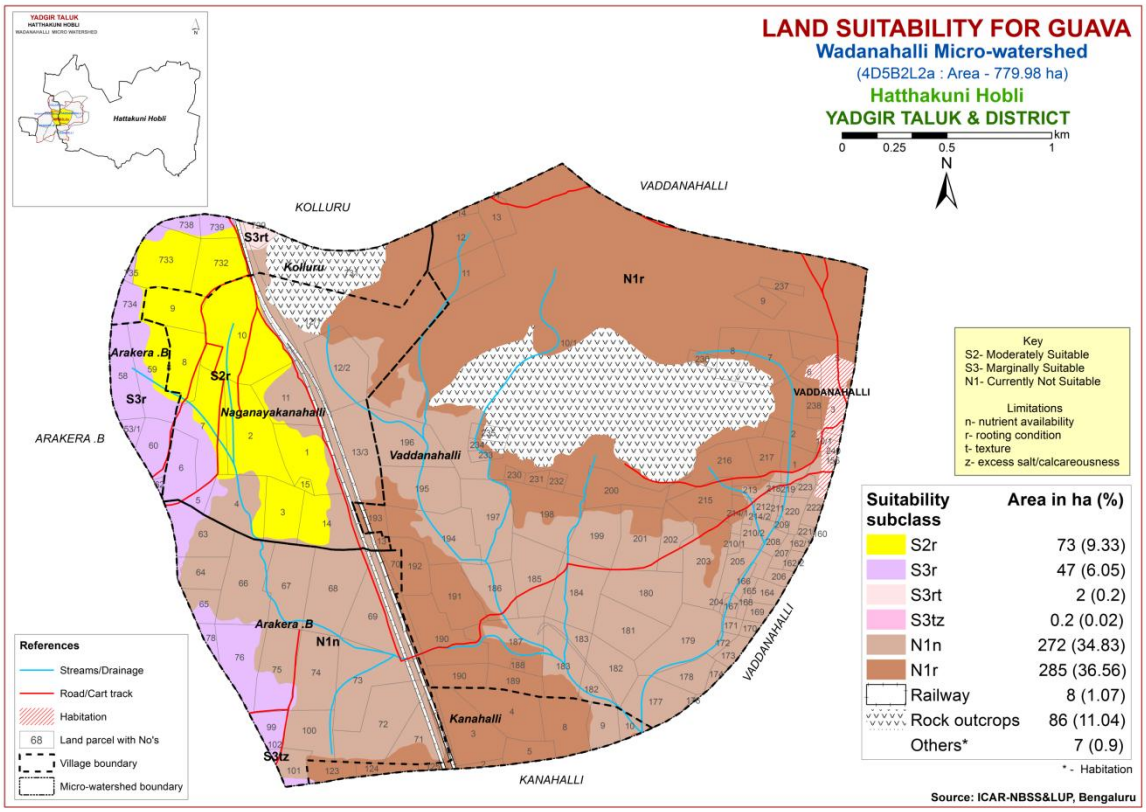


Fig. 7.16 Land Suitability map of Guava

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 73 ha (9%) is moderately suitable (Class S2) for growing sapota and is distributed in the western and northwestern part of the microwatershed with minor limitation of rooting depth. An area of about 49 ha (6%) is marginally suitable (Class S3) and is distributed in the central, southwestern, western, northwestern and southern part of the microwatershed with moderate limitations of rooting depth, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 557 ha (71%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

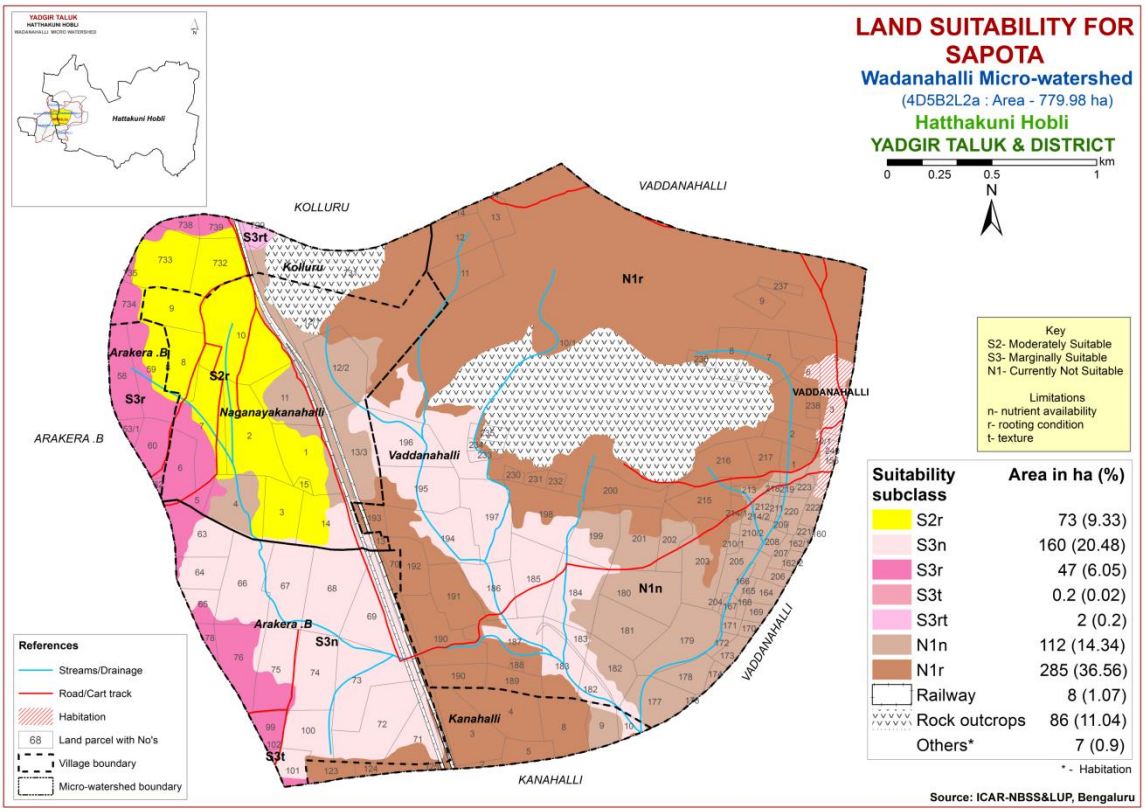


Fig. 7.17 Land Suitability map of Sapota

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 73 ha (9%) is moderately suitable (Class S2) for growing pomegranate and is distributed in the western and northwestern part of the microwatershed with minor limitations of rooting depth, texture and calcareousness. An area of about 209 ha (27%) is marginally suitable (Class S3) and is distributed in the central, western, southwestern and southern part of the microwatershed with moderate limitations of rooting depth, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 397 ha (51%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

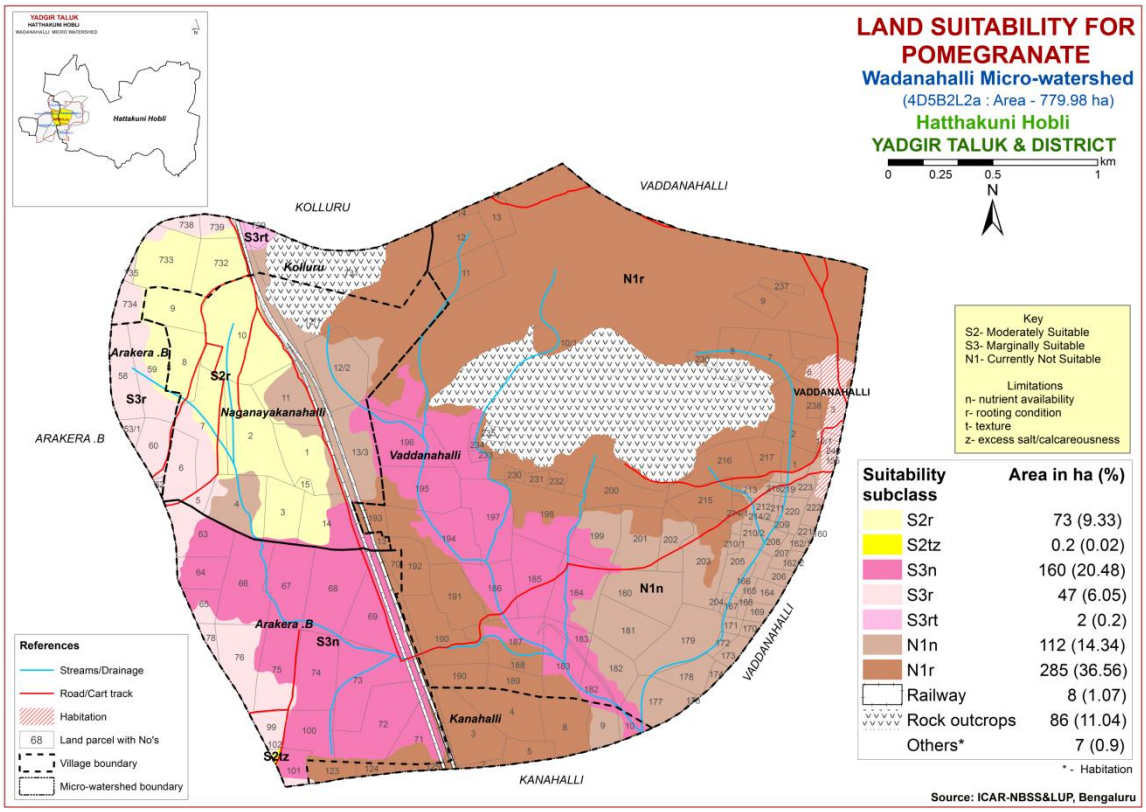


Fig 7.18 Land Suitability map of Pomegranate

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 73 ha (9%) is moderately suitable (Class S2) for growing musambi and is distributed in the western and northwestern part of the microwatershed with minor limitations of rooting depth and calcareousness. An area of about 209 ha (27%) is marginally suitable (Class S3) and is distributed in the central, western, southwestern and southern part of the microwatershed with moderate limitations of rooting depth, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 397 ha (51%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

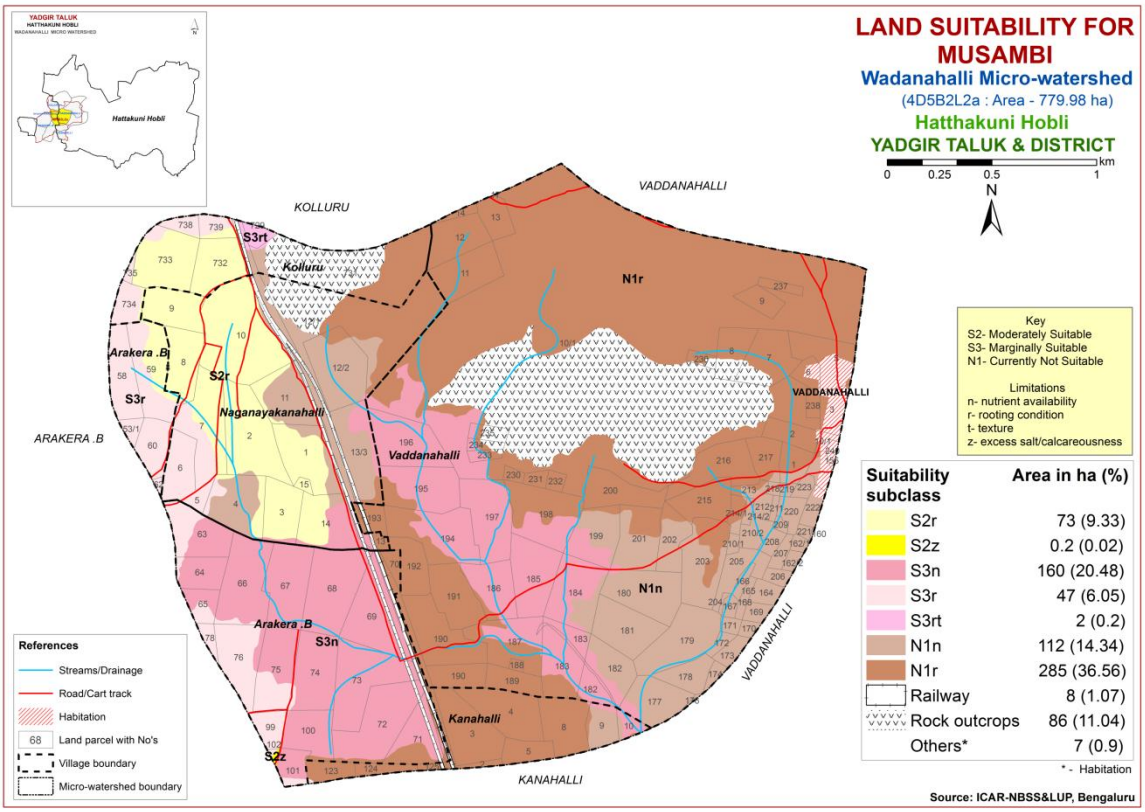


Fig. 7.19 Land Suitability map of Musambi

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 73 ha (9%) is moderately suitable (Class S2) for growing lime and is distributed in the western and northwestern part of the microwatershed with minor limitations of rooting depth and calcareousness. An area of about 209 ha (27%) is marginally suitable (Class S3) and is distributed in the central, western, southwestern and southern part of the microwatershed with moderate limitations of rooting depth, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 397 ha (51%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

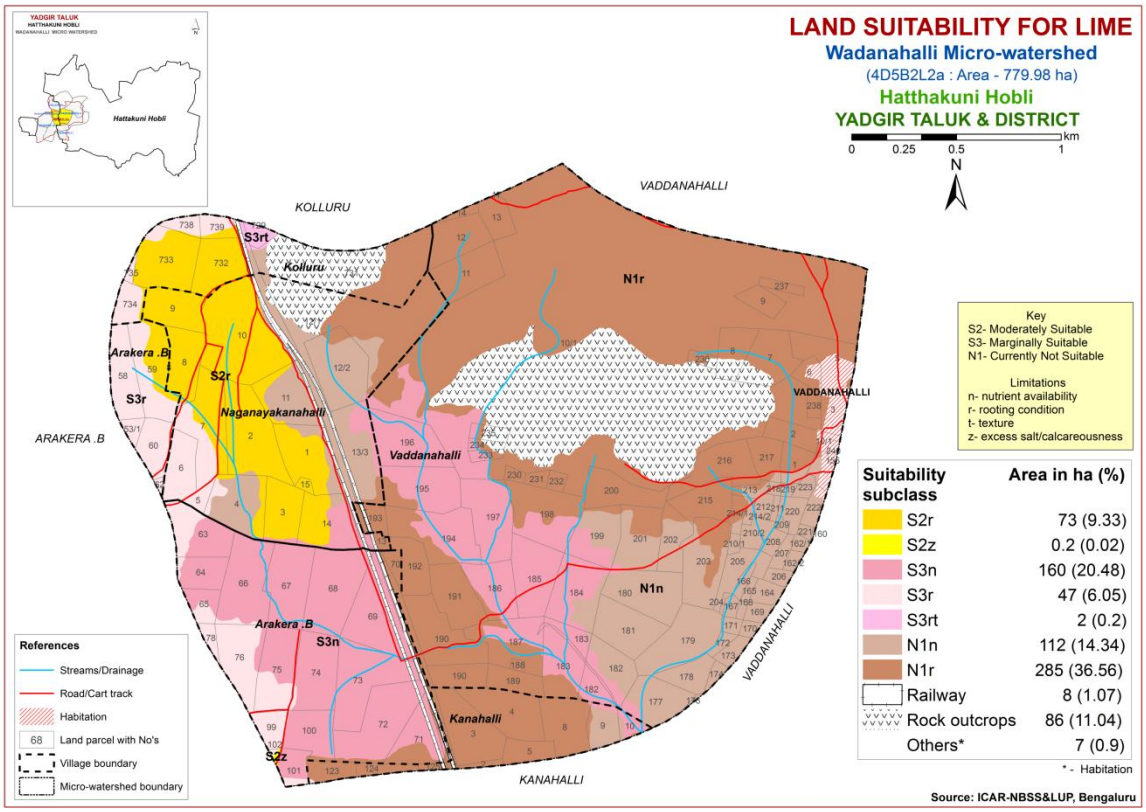


Fig. 7.20 Land Suitability map of Lime

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 lands (Class S1) for growing amla occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 47 ha (6%) is moderately suitable (Class S2) for growing amla and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitation of rooting depth. Marginally suitable lands (Class S3) for growing amla occupy an area of about 189 ha (24%) and are distributed in the northern, northwestern, central, eastern, western, southwestern and southeastern part of the microwatershed with moderate limitations of calcareousness, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 371 ha (48%) and are distributed in the southern, central, northern, western, eastern, southwestern and southeastern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

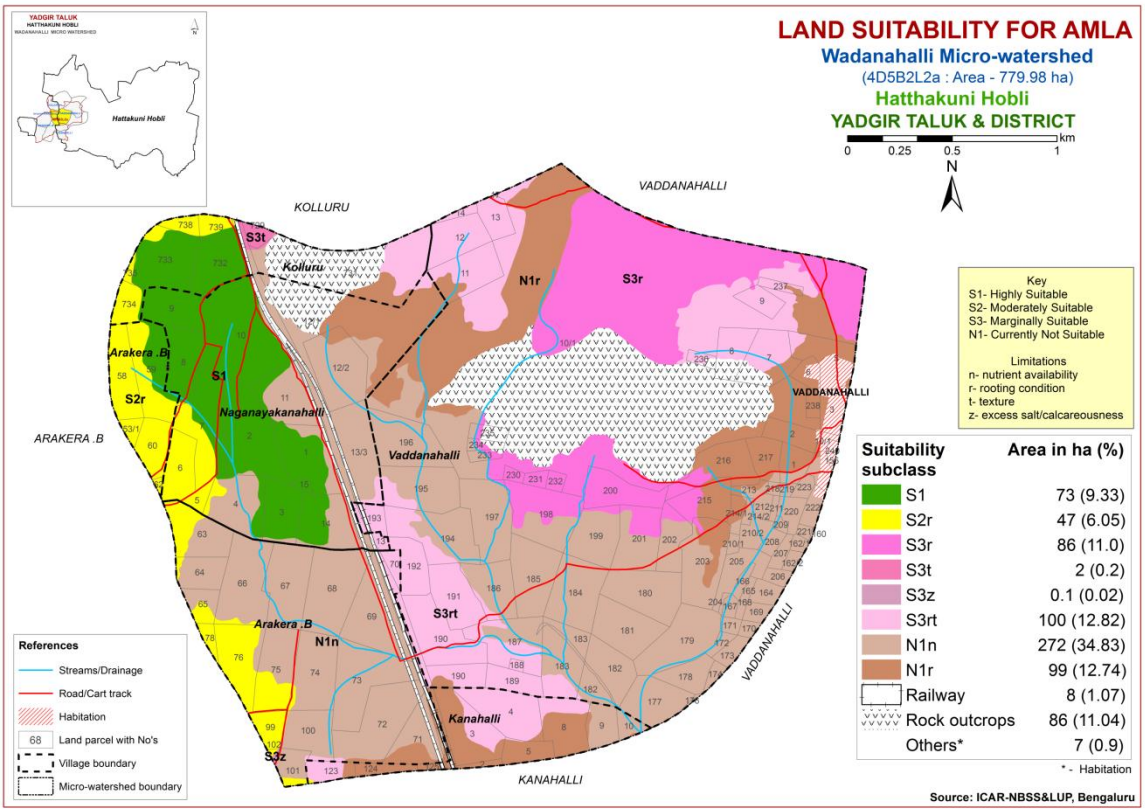


Fig. 7.21 Land Suitability map of Amla

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 120 ha (15%) is marginally suitable (Class S3) and is distributed in the northwestern, western and southwestern part of the microwatershed with moderate limitations of rooting depth and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 558 ha (72%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

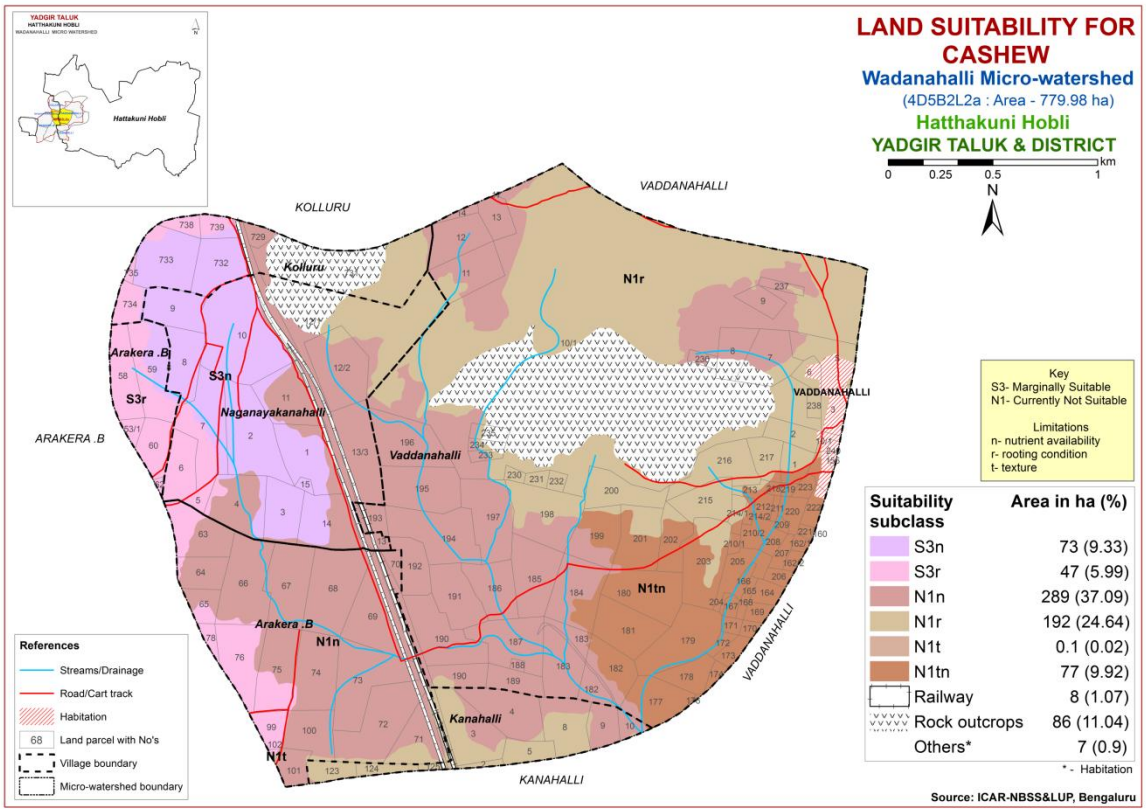


Fig. 7.22 Land Suitability map of Cashew

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 73 ha (9%) is moderately suitable (Class S2) for growing jackfruit and is distributed in the western and northwestern part of the microwatershed with minor limitation of rooting depth. An area of about 49 ha (6%) is marginally suitable (Class S3) and is distributed in the southwestern, western and northwestern part of the microwatershed with moderate limitations of rooting depth, texture and calcareousness. Currently not suitable (Class N1) lands occur in an area of 557 ha (71%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

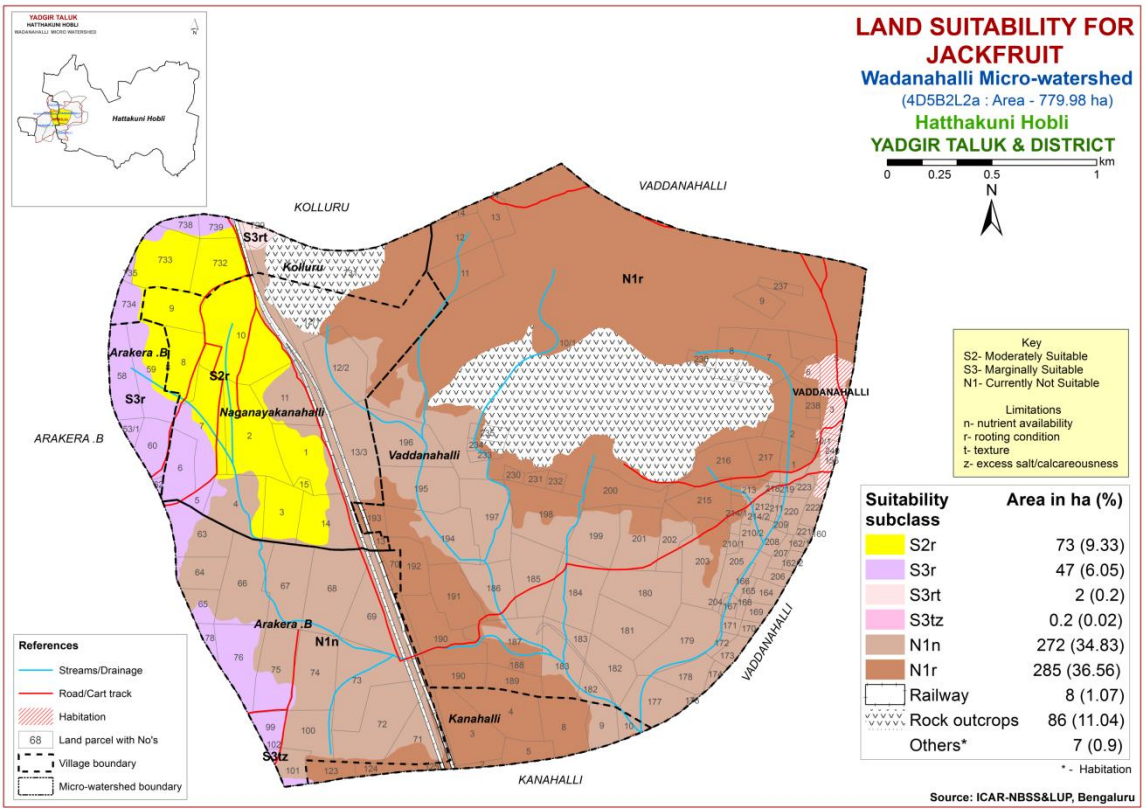


Fig. 7.23 Land Suitability map of Jackfruit

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 122 ha (16%) is marginally suitable (Class S3) and is distributed in the northwestern, western and southwestern part of the microwatershed with moderate limitations of rooting depth, calcareousness and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 557 ha (71%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

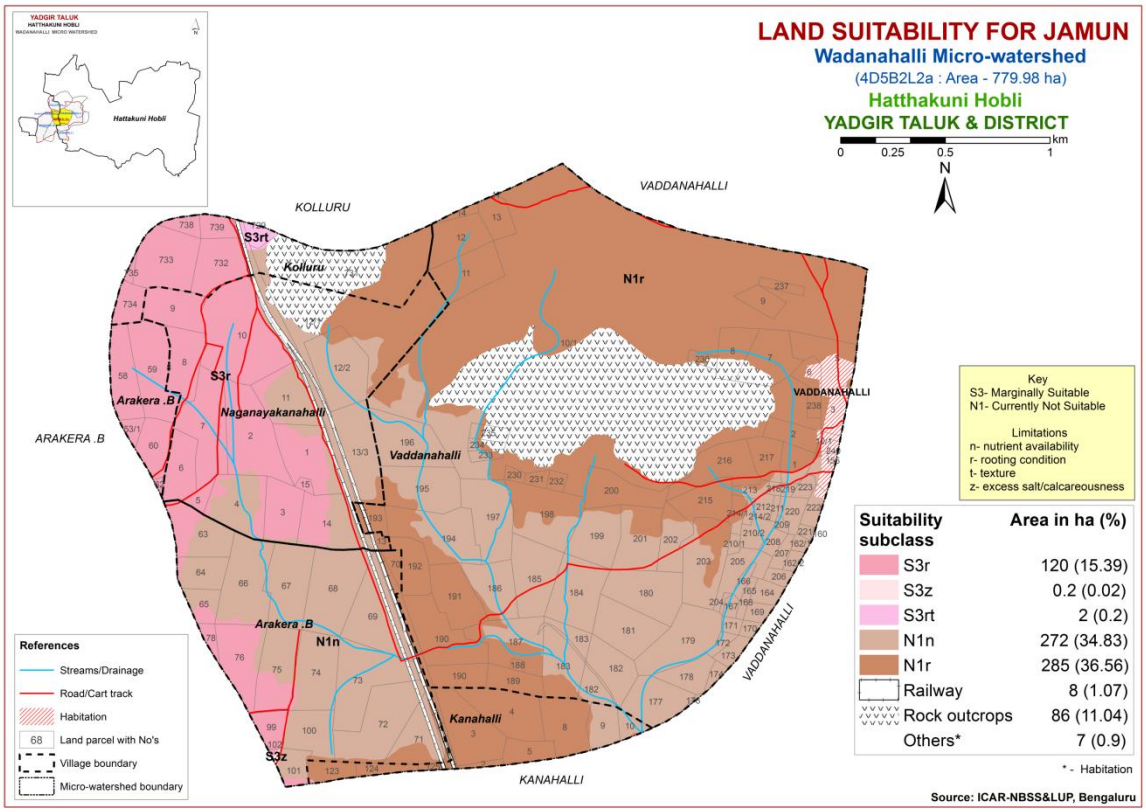


Fig. 7.24 Land Suitability map of Jamun

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.

Highly suitable lands (Class S1) for growing custard apple occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 47 ha (6%) is moderately suitable (Class S2) for growing custard apple and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitations of rooting depth and calcareousness. Marginally suitable lands (Class S3) for growing custard apple occupy an area of about 348 ha (44%) and are distributed in the central, northern, southern, western, northeastern and southwestern part of the microwatershed with moderate limitations of nutrient availability, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 211 ha (27%) and are distributed in the northern, eastern, southern and southeastern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

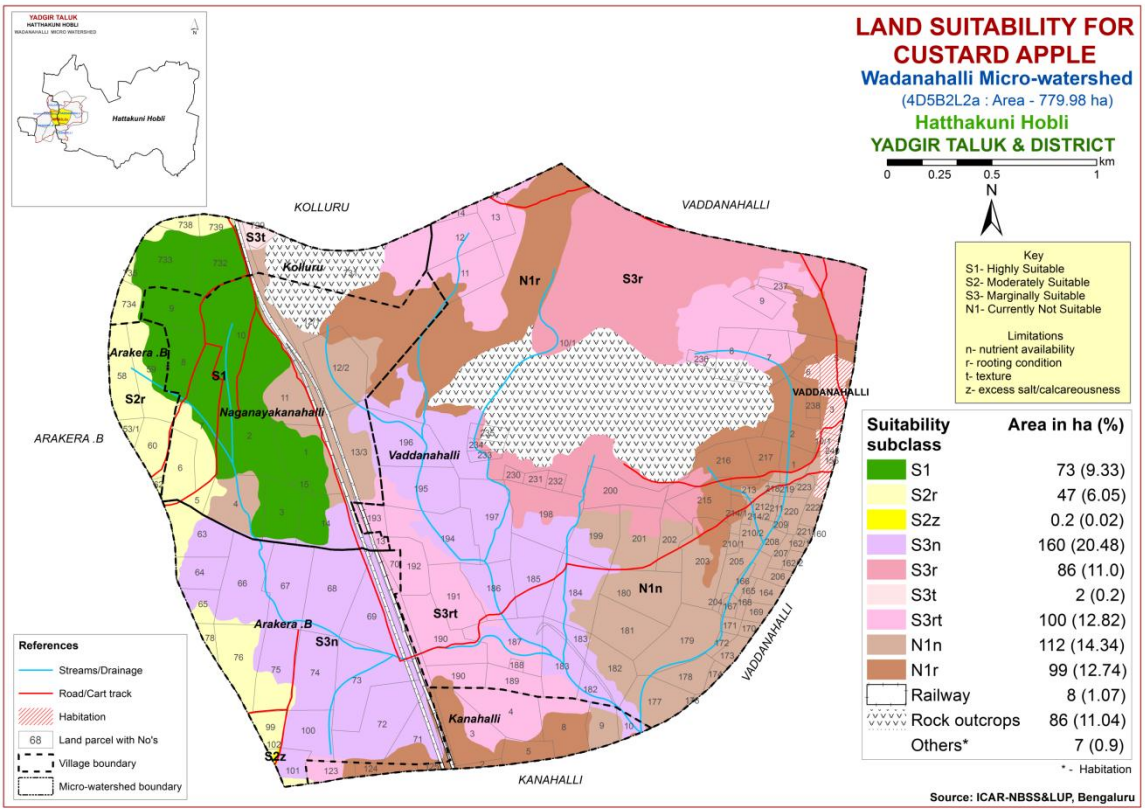


Fig. 7.25 Land Suitability map of Custard Apple

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 73 ha (9%) is marginally suitable (Class S3) and is distributed in the southwestern and western part of the microwatershed with moderate limitations of rooting depth and calcareousness. Currently not suitable (Class N1) lands occur in an area of 606 ha (78%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

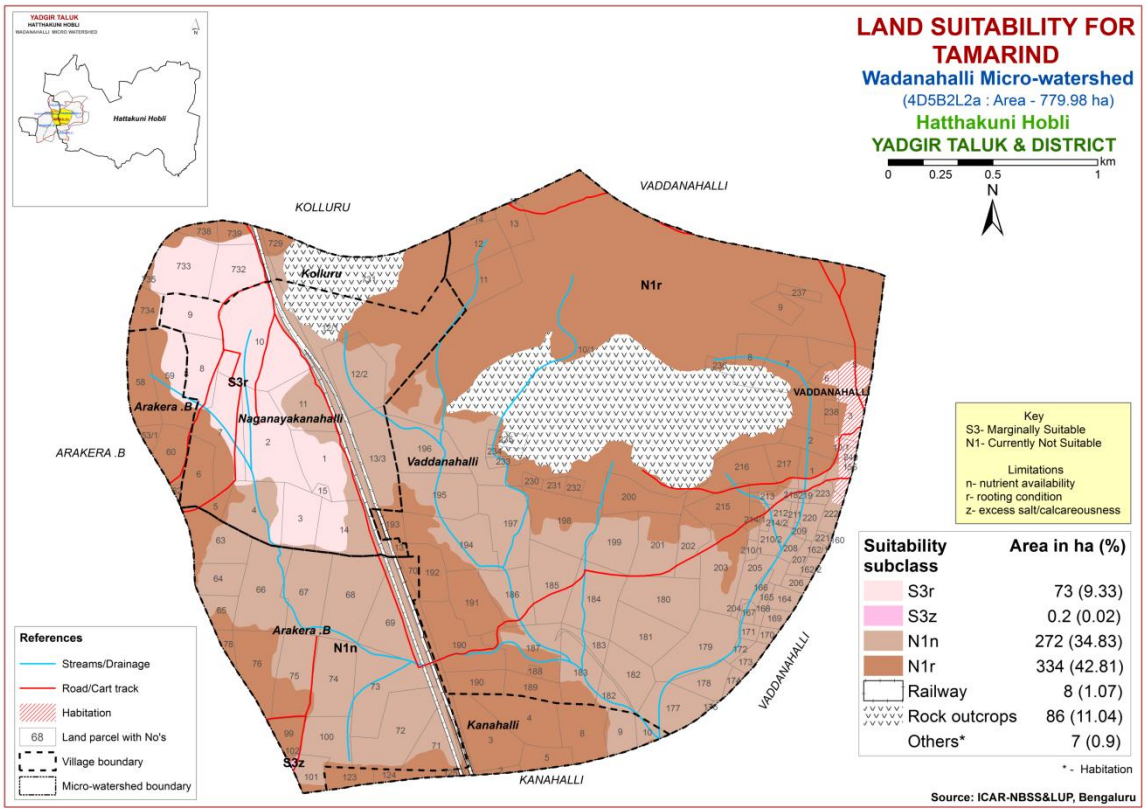


Fig. 7.26 Land Suitability map of Tamarind

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 73 ha (9%) is moderately suitable (Class S2) for growing mulberry and is distributed in the western and northwestern part of the microwatershed with minor limitation of rooting depth. An area of about 49 ha (6%) is marginally suitable (Class S3) and is distributed in the southwestern, western and northwestern part of the microwatershed with moderate limitations of rooting depth, texture and calcareousness. Currently not suitable (Class N1) lands occur in an area of 557 ha (71%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

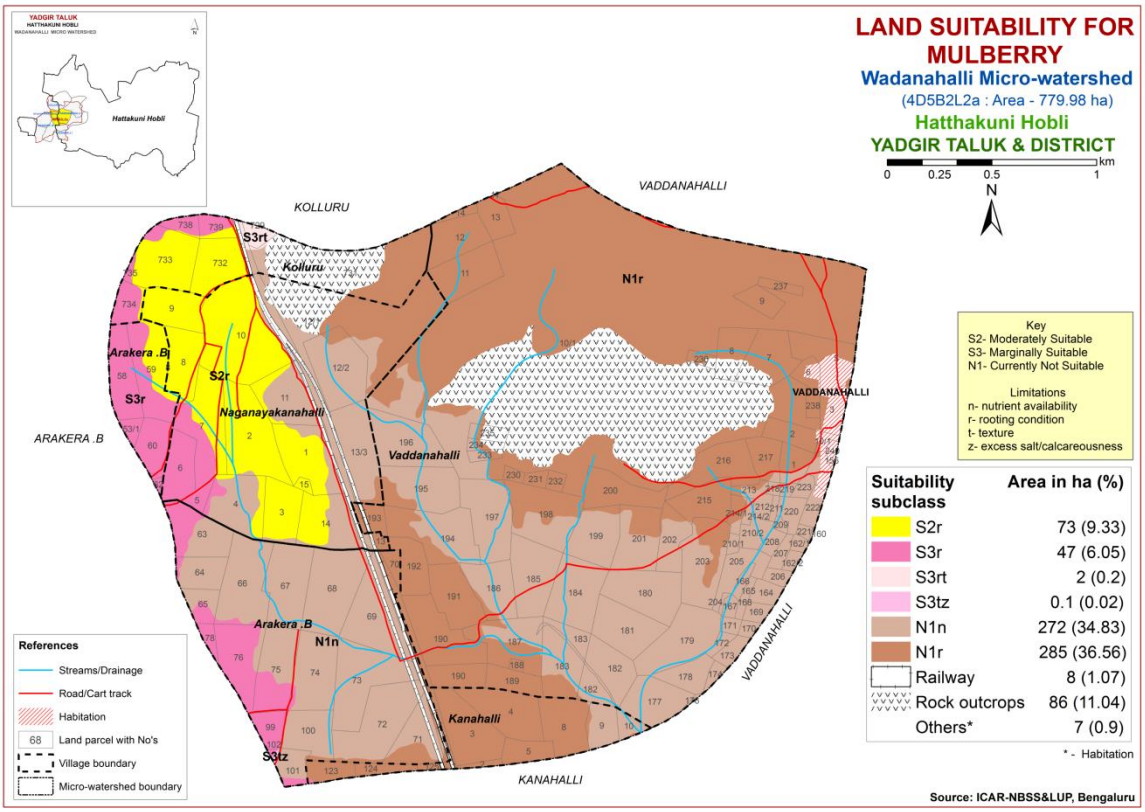


Fig 7.27 Land Suitability map of Mulberry

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 lands (Class S1) for growing marigold occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 48 ha (6%) is moderately suitable (Class S2) for growing marigold and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitations of rooting depth, texture, calcareousness and gravelliness. Marginally suitable lands (Class S3) for growing marigold occupy an area of about 348 ha (44%) and are distributed in the central, northern, southern, western, northeastern and southwestern part of the microwatershed with moderate limitations of gravelliness, nutrient availability, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 211 ha (27%) and are distributed in the northern, eastern, southern and southeastern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

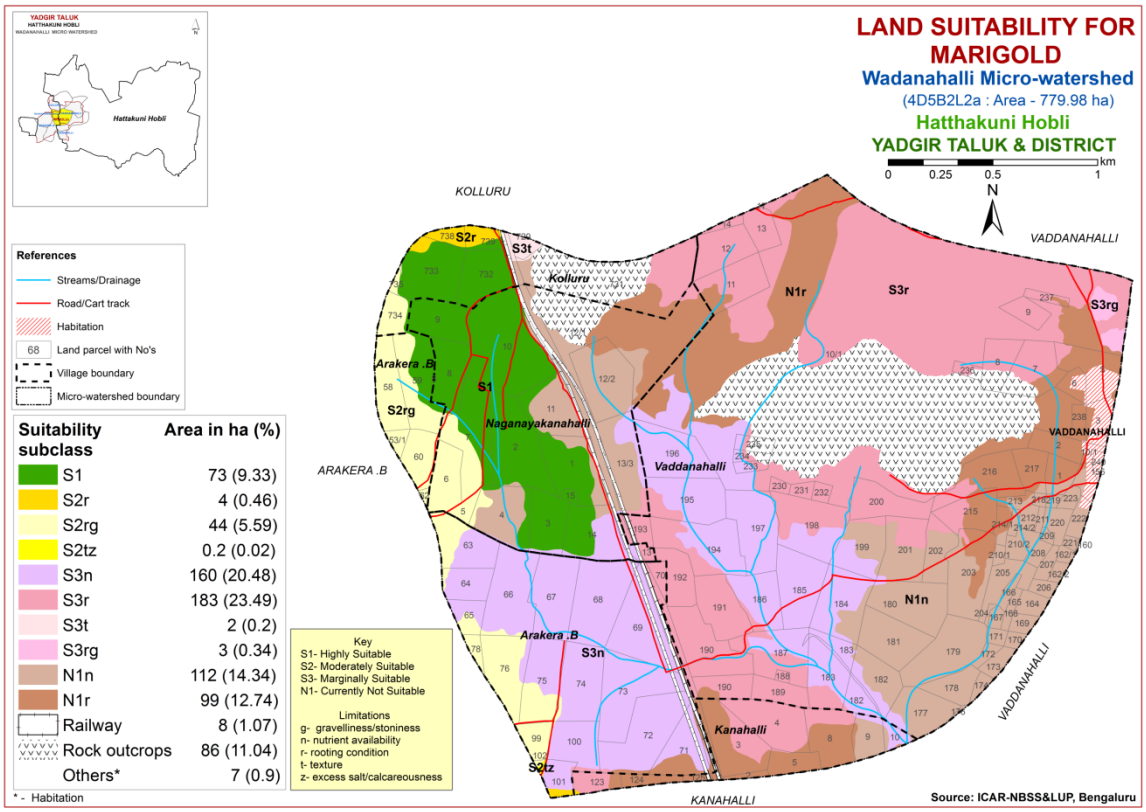


Fig. 7.28 Land Suitability map of Marigold

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 lands (Class S1) for growing chrysanthemum occupy an area of about 73 ha (9%) and are distributed in the northwestern and western part of the microwatershed. An area of about 48 ha (6%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in the northwestern, western and southwestern part of the microwatershed. They have minor limitations of rooting depth, texture, calcareousness and gravelliness. Marginally suitable lands (Class S3) for growing chrysanthemum occupy an area of about 348 ha (44%) and are distributed in the central, northern, southern, western, northeastern and southwestern part of the microwatershed with moderate limitations of gravelliness, nutrient availability, texture and rooting depth. Currently not suitable (Class N1) lands occur in an area of 211 ha (27%) and are distributed in the northern, eastern, southern and southeastern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

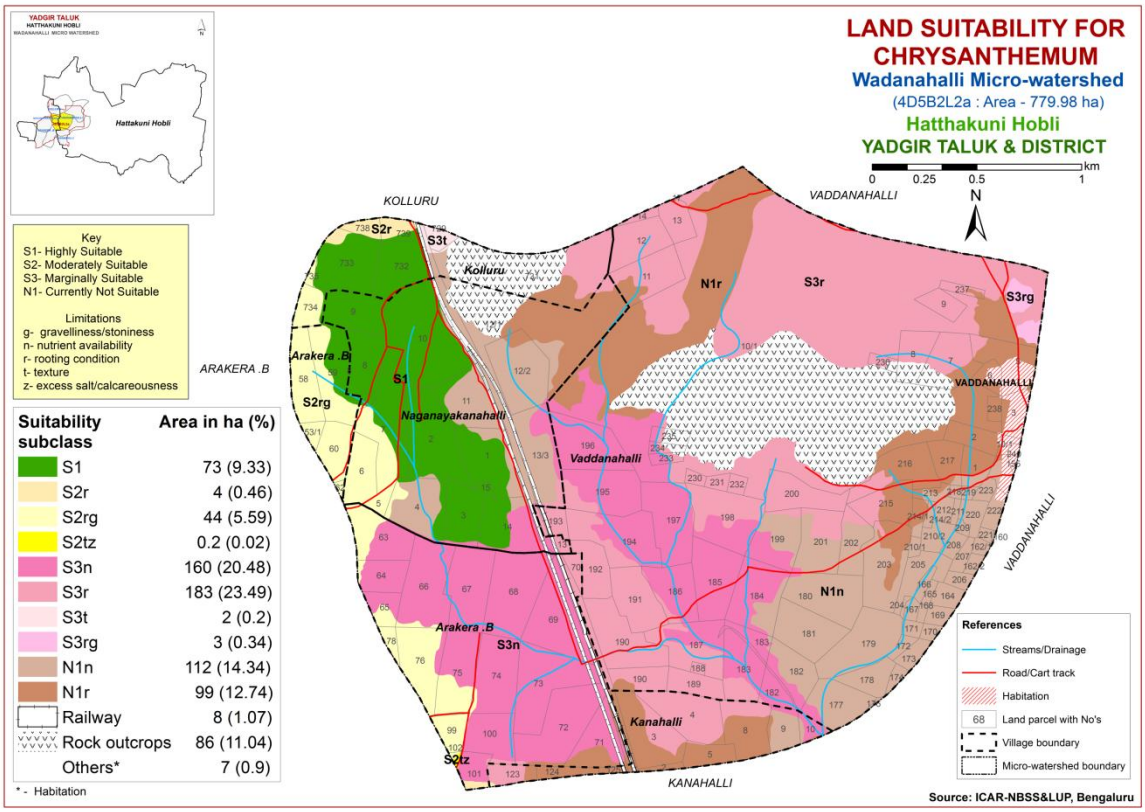


Fig. 7.29 Land Suitability map of Chrysanthemum

Table 7.1 Soil-Site Characteristics of Wadanahalli 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 (%)								
BDPcB2	866	150	WD	<25	sl	scl	<15	<15	<50	1-3	moderate	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
BDPiB2	866	150	WD	<25	sc	scl	<15	<15	<50	1-3	moderate	8.58	0.262	0.35	18.10	100
BDPiB3	866	150	WD	<25	sc	scl	<15	<15	<50	1-3	severe	8.58	0.262	0.35	18.10	100
BDLbB2	866	150	WD	25-50	ls	sl	<15	<15	<50	1-3	moderate	6.20	0.074	0.20	4.20	93
DSBiB2	866	150	WD	25-50	sc	g c	<15	35-60	<50	1-3	moderate	5.93	0.04	0.14	3.60	73
HTKcB2	866	150	WD	25-50	sl	sl	<15	10-25	<50	1-3	moderate	6.81	0.062	0.38	3	101
VNKbB2g1	866	150	WD	25-50	ls	sc	15-35	<15	<50	1-3	moderate	5.37	0.11	2.22	6.27	75
VNKcB3	866	150	WD	25-50	sl	sc	<15	<15	<50	1-3	severe	5.37	0.11	2.22	6.27	75
SBRcB2	866	150	Sed	50-75	sl	ls	<15	<15	<50	1-3	moderate	8.24	0.145	1.15	7.50	100
YLRcB2g1	866	150	W	50-75	sl	c	15-35	15-35	51-100	1-3	moderate	6.91	0.069	0.45	6.90	100
YLRiB2	866	150	W	50-75	sc	c	<15	15-35	51-100	1-3	moderate	6.91	0.069	0.45	6.90	100
SHTcB2	866	150	WD	75-100	sl	scl	15-35	<15	51-100	1-3	moderate	7.26	0.199	0.86	10.60	100
SHThB2	866	150	WD	75-100	scl	scl	15-35	<15	51-100	1-3	moderate	7.26	0.199	0.86	10.60	100
MDGcB2	866	150	WD	100-150	sl	scl	<15	<15	>200	1-3	moderate	8.2	0.399	3.08	4.90	100
MDGhB2	866	150	WD	100-150	scl	scl	<15	<15	>200	1-3	moderate	8.2	0.399	3.08	4.90	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
VKSmB1	866	150	WD	100-150	c	scl	<15	<15	>200	1-3	slight	9.1	0.586	3.97	17.57	100
ANRcB2	866	150	MW	100-150	sl	c	<15	<15	>200	1-3	moderate	10.17	0.365	7.08	19.90	100
ANRhB2	866	150	MW	100-150	scl	c	<15	<15	>200	1-3	moderate	10.17	0.365	7.08	19.90	100
MDRhB2	866	150	WD	>150	scl	scl	<15	<15	>200	1-3	moderate	8.31	0.33	0.90	20.57	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 23 soil map units identified in Wadanahalli microwatershed have been grouped into 7 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 23 map units that have been grouped into 7 Land Management Units along with brief description of soil and site characteristics are given below.

LMU	Soil map units	Soil and site characteristics
1	168.ANRcB2 53.ANRhB2 100.VKSmB1 42.YDRcB2	Deep (100 to 150), sodic soils, 1-3% slopes, non gravelly (<15%), slight to moderate erosion.
2	132.MDRhB2 57.MDGcB2 148.MDGhB2 128.SHTcB2 36.SHThB2	Moderately deep to deep (75 to 150), sandy clay loam soils, 1-3% slopes, non gravelly (<15%), moderate erosion.
3	63.BMNmB2g1	Very deep (>150), black calcareous clay soils, 1-3% slopes, gravelly (15-35%), moderate erosion.
4	29.YLRcB2g1 31.YLRiB2	Moderately shallow (50 to 75), red clay soils, 1-3% slopes, non gravelly to gravelly (<15-35%), moderate erosion.
5	11.SBRcB2	Moderately shallow (50 to 75 cm), loamy sand soils, 1-3% slopes, non gravelly (<15%), moderate erosion.
6	20.JNKcB2	Moderately shallow (50 to 75), sandy clay loam soils, 1-3% slopes, non gravelly (<15%), moderate erosion.
7	118.BDPcB2 120.BDPhB2 1.BDPiB2 119.BDPiB3 2.BDLbB2 108.DSBiB2 165.HTKcB2 8.VNKbB2g1 122.VNKcB3	Very shallow to shallow soils (<25-50), 1-3% slopes, non gravelly (<15-35%), moderate to severe erosion.

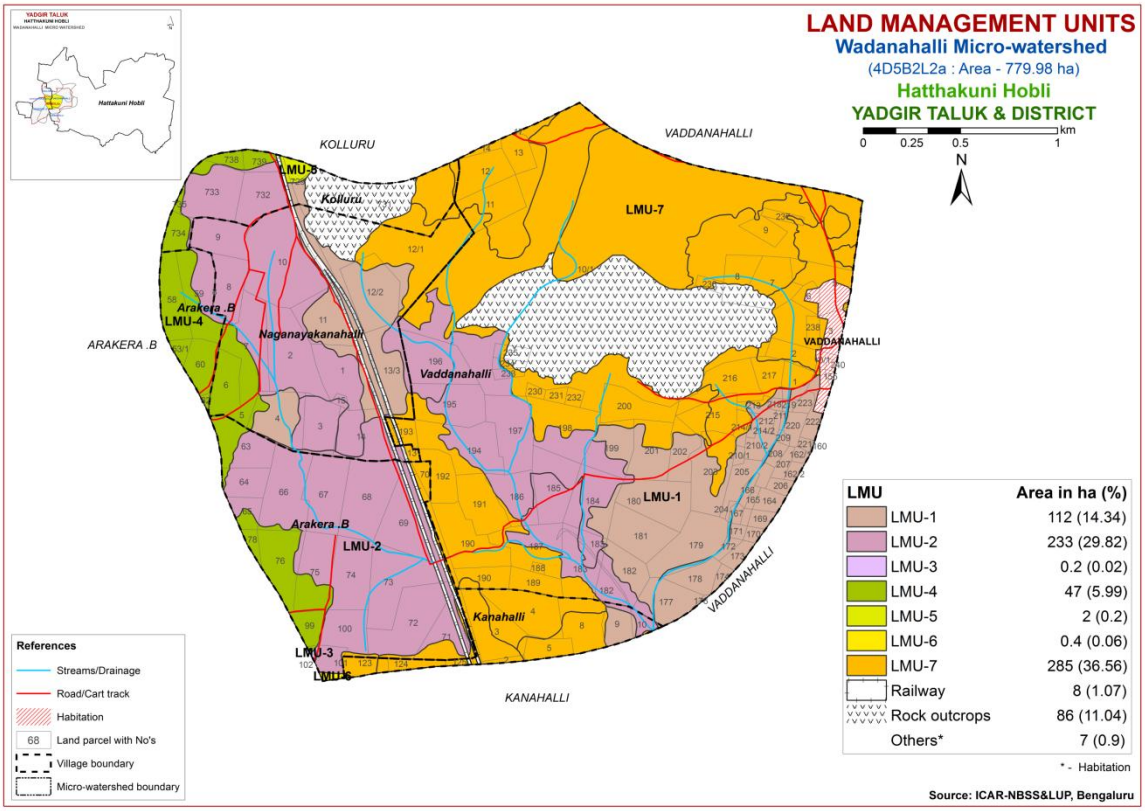


Fig. 7.30 Land Management Units Map- Wadanahalli Microwatershed

7.31 Proposed Crop Plan for Wadanahalli Microwatershed

After assessing the land suitability for the 29 crops, the Proposed Crop Plan has been prepared for the 7 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 Wadanahalli Microwatershed

LMU	Soil Map Units	Survey Number	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	168.ANRcB2 53.ANRhB2 100.VKSmB1 42.YDRcB2 (Deep, sodic soils)	**Kanahalli :** 9 **Naganayakanahalli :** 4,11,12/2,13/3 **Vaddanahalli:**160,162/1,162/2,164,165, 166,167,168,169,170,171,172,173,174, 176,177,178,179,180,181,182,199,201, 202,203,204,205,206,207,208,209,210/1, 210/2,211,212,213,214/2,218,219,220, 221,222,223	- `	**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
2	132.MDRhB2 57.MDGcB2 148.MDGhB2 128.SHTcB2 36.SHThB2 (Moderately deep to deep, sandy clay loam soils)	**Arakera .B :** 63,64,65,66,67,68,69,71, 72,73,74,75,100,101 **Kanahalli :** 10 **Kolluru :** 732,733 **Naganayakanahalli :** 1, 2,3,7,8,9 ,10, 14,15 **Vaddanahalli:**183,184,185,186,194,195, 196,197,233	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
3	63.BMNmB2g1 (Very deep, black calcareous clay soils)	**Arakera .B:** 102	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
4	29.YLRcB2g1 31.YLRiB2 (Moderately	**Arakera .B :** 53/1,58,59,60,62,76,78,99 **Kolluru :** 734,735,738,739 **Naganayakanahalli :** 5,6	Maize, Sorghum, Cotton, Bajra	**Fruit crops**: Amla, Custard apple **Vegetables**: Tomato,	Drip irrigation, mulching, suitable soil and water

LMU	Soil Map Units	Survey Number	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
	shallow, red clay soils)			Onion, Bhendi, Chilli, Brinjal **Flowers**: Marigold, Chrysanthemum	conservation practices (Crescent Bunding with Catch Pit etc)
5	11.SBRcB2 (Moderately shallow, loamy sand soils)	**Kolluru :** 729	-	**Agri-Silvi-Pasture**: Hybrid Napier, *Styloxanthes hamata, Styloxanthes scabra*	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
6	20.JNKcB2 (Moderately shallow, sandy clay loam soils)	**Arakera .B :** 101 **Kanahalli :** 123	Maize, Sorghum Groundnut, Bajra	**Fruit crops:** Amla, Custard apple **Vegetables:** Tomato, Chilli, Brinjal, Bhendi, Onion **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
7	118.BDPcB2 120.BDPhB2 1.BDPiB2 119.BDPiB3 2.BDLbB2 108.DSBiB2 165.HTKcB2 8.VNKbB2g1 122.VNKcB3 (Very shallow to shallow soils)	**Arakera .B :** 70 **Kanahalli :** 2,3,4,5,8,123,124,125 **Naganayakanahalli :** 12/1,13 **Vaddanahalli:**1,5,6,7,8,9,11,12,13,14,17, 187,188,189,190,191,192,193,198,2,200, 214/1,215,216,217,230,231,232,236,237, 238	-	**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 Wadanahalli Microwatershed

- The soil phases identified in the microwatershed belonged to the soil series of MDG series occupies a maximum area of 130 ha (17%) followed by BDP 99 ha (13%), BDL 93 ha (12%), VNK 83 ha (11%), ANR 77 ha (10%), SHT 73 ha (9%), YLR 47 ha (6%), YDR 32 ha (4%), MDR 30 (4%), HTK 7 ha (<1%), DSB 3 ha (<1%), VKS 3 ha (<1%), SBR 2 ha (<1), JNK 0.47 ha (<1%) and BMN 0.18 ha (<1).
- As per land capability classification entire area of the microwatershed falls under arable land category (Class II, III & IV). The major limitations identified in the arable lands were soil and erosion.

❖ On the basis of soil reaction, an area of about 45 ha (6%) is slightly acid (pH 6.0-6.5), an area of about 133 ha (17%) is neutral (pH 6.5-7.3), about 43 ha (6%) is slightly alkaline (pH 7.3-7.8), about 146 ha (19%) are moderately alkaline (pH 7.8-8.4), about 228 ha (29%) area is strongly alkaline (pH 8.4-9.0) and about 83 ha (11%) area is very strongly alkaline (pH >9.0) soil reaction in the microwatershed.

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 cover an area of 45 ha 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 an area of 500 ha 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, 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 occur in an area of 133 ha 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 780 ha area in the microwatershed, an area of about 35 ha (4%) is suffering from severe erosion, 3 ha (<1%) is slight erosion and about 641 ha (82%) 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 Wadanahalli microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is medium (0.5-0.75%) in an area of 517 ha (66%). High (>0.75%) in an area of 129 ha (17%) of the microwatershed and low (<0.5%) in an area of 32 ha (4%) in the microwatershed. The areas that are medium and low 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 and low (<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 449 ha (58%) in the microwatershed. Low (<23 kg/ha) in an area of 215 ha (28%) and high (>57 kg/ha) in an area of 15 ha (2%). In medium and low areas, for all the crops 25% additional P needs to be applied.
- **Available Potassium:** Available potassium is medium (145-337 kg/ha) in an area of 665 ha (85%) and high (>337 kg/ha) in an area of 14 ha (2%) in the microwatershed. All the plots, where available potassium is medium, for all the crops, additional 25% potassium may be applied.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. It is medium in an area of 137 ha (18%). Low in an area of 539 ha (69%) and high (>20 ppm) in an area of 2 ha (<1%) in 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 550 ha (71%) is low (<0.5 ppm) in available boron and medium (0.5-1.0 ppm) in an area of 128 ha (16%). Application of sodium tetra borate

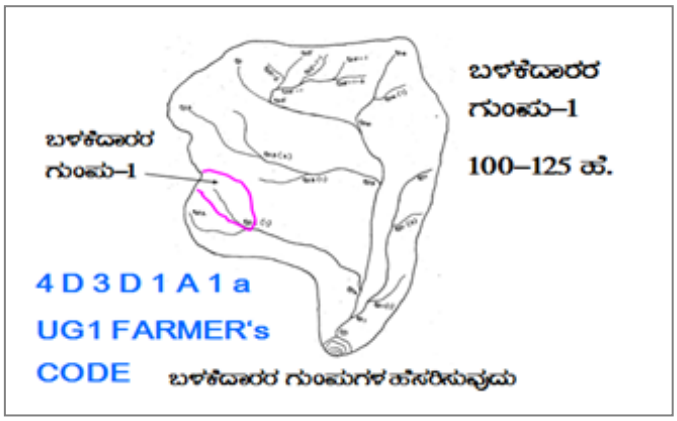
@ 10 kg/ha as soil application or 0.2 % borax as foliar spray is recommended for low and medium areas.

- **Available Iron:** Maximum area of about 518 ha (66%) is sufficient (>4.5 ppm) in available iron content in the microwatershed and deficient (<4.5 ppm) in an area of 161 ha (21%). 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 669 ha (86%) is deficient (<0.6 ppm) in available zinc content of the microwatershed and 9 ha (1%) area is sufficient (>0.6 ppm). Application of zinc sulphate @25 kg/ha is recommended for zinc deficient areas.
- **Soil Alkalinity**: Alkaline soils are not occuring in 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.

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Wadanahalli 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

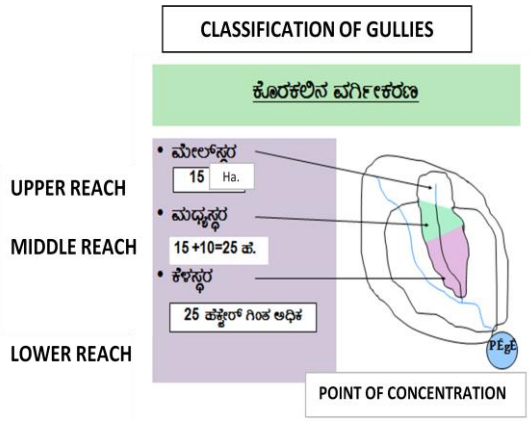
The treatment plan recommended for arable lands is briefly described below

9.1.1 Arable Land Treatment

A. BUNDING

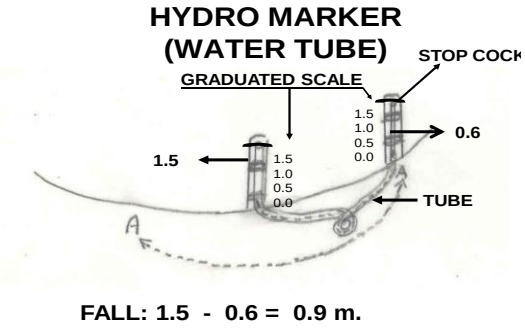
Steps for Survey and Preparation of Treatment Plan	
• Cadastral map (1:7920 scale) is enlarged to a scale of 1:2500 scale • Existing network of waterways, pothissa boundaries, grass belts, natural drainage lines/ watercourse, cut ups/ terraces are marked on the cadastral map to the scale • Drainage lines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

USER GROUP-1



Measurement of Land Slope

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



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

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

Note: (i) The above intervals are maximum.

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

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

Section of the Bund

Bund section is decided considering the soil texture class and gravelliness class ($bg_{0...}$ b=loamy sand, g_0 = <15% gravel). The recommended Sections for different soils are given below.

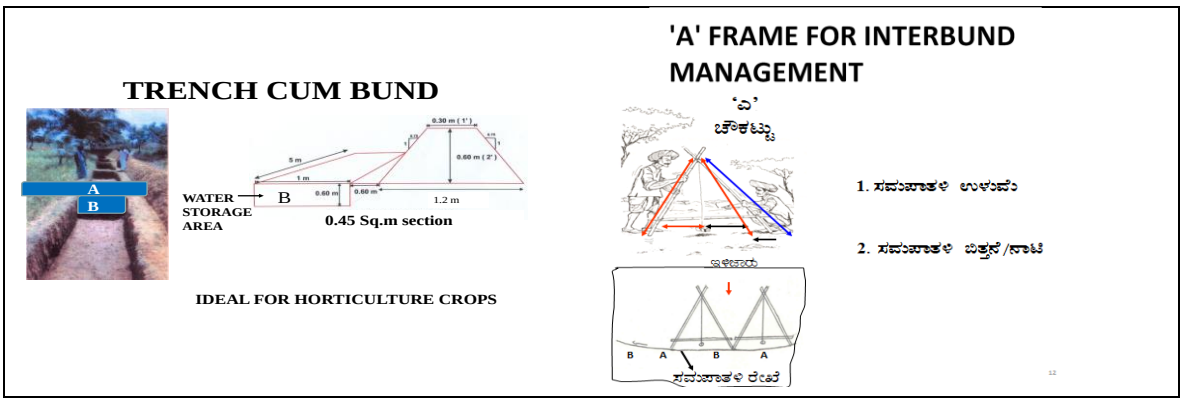
Recommended Bund Section

Top width (m)	Base width (m)	Height (m)	Side slope (Z:1;H:V)	Cross section (sq m)	Soil Texture	Remarks
0.3	0.9	0.3	01:01	0.18	Sandy loam	Vegetative bund
0.3	1.2	0.3	1.5:1	0.225	Sandy clay	
0.3	1.2	0.5	0.9:1	0.375	Red gravelly soils	
0.3	1.2	0.6	0.75:1	0.45		
0.3	1.5	0.6	01:01	0.54	Red sandy loam	
0.3	2.1	0.6	1.5:1	0.72	Very shallow 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 447 ha (57%) needs Graded Bunding and an area of 232 ha (28%) 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.

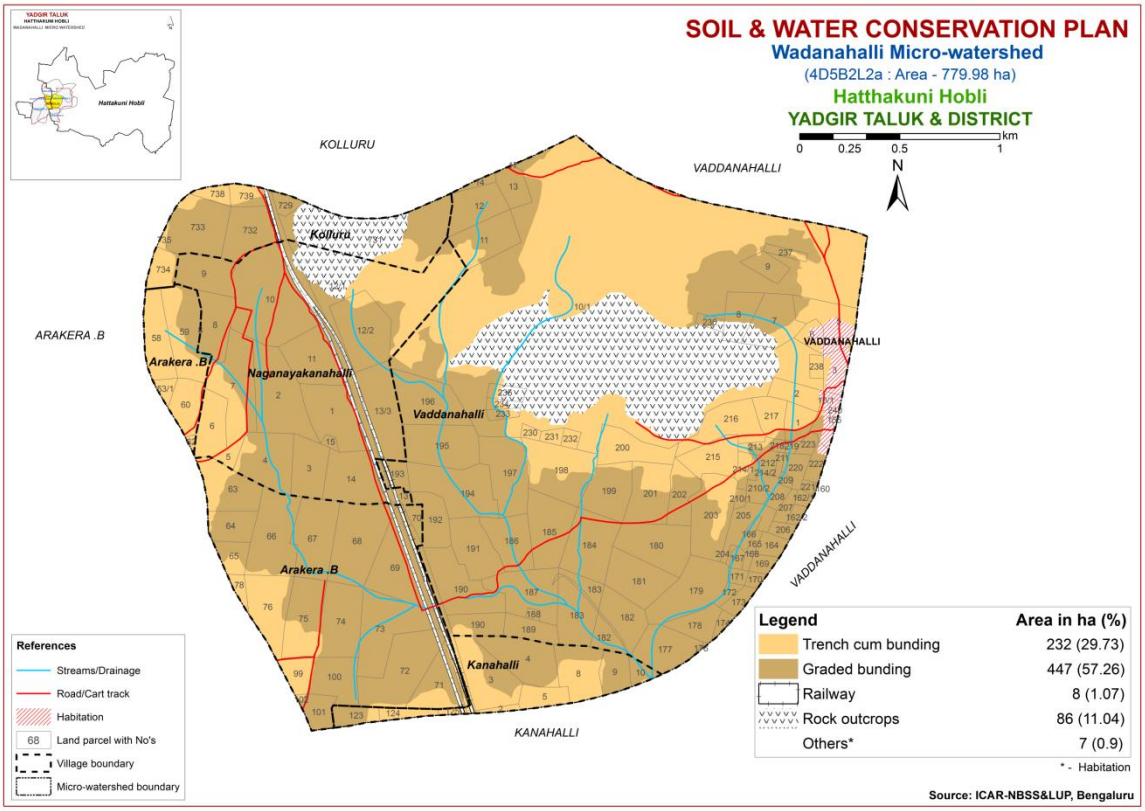


Fig. 9.1 Soil and Water Conservation Plan map of Wadanahalli Microwatershed

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

Wadanahalli _2L2a Microwatershed

Soil Phase Information

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Kolluru	729	1.16	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Graded bunding
Kolluru	731	18.6	RO	RO	RO	RO	RO	RO	RO	RO	Not Available (NA)	Not Available	RO	RO
Kolluru	732	5.48	SHTcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Kolluru	733	7.75	SHTcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Kolluru	734	2.52	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Kolluru	735	0.4	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Kolluru	738	1.31	YLRiB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Kolluru	739	1.82	YLRiB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Naganayakanahalli	1	7.65	SHTcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Naganayakanahalli	2	9.88	SHTcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Paddy+Redgram (Gg+Pd+Rg)	Not Available	IIes	Graded bunding
Naganayakanahalli	3	4.94	SHThB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Redgram (Pd+Rg)	1 Bore well	IIes	Graded bunding
Naganayakanahalli	4	7.09	YDRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	Not Available	IVes	Graded bunding
Naganayakanahalli	5	1.12	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Naganayakanahalli	6	4.37	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Naganayakanahalli	7	8.85	SHTcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	Not Available	IIes	Graded bunding
Naganayakanahalli	8	5.08	SHTcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Naganayakanahalli	9	5.05	SHTcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Redgram (Pd+Rg)	Not Available	IIes	Graded bunding
Naganayakanahalli	10	15.17	SHTcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Naganayakanahalli	11	6.54	YDRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Fallow land (Pd+Fl)	Not Available	IVes	Graded bunding
Naganayakanahalli	12/1	21.57	BDPiB2	LMU-7	Very shallow (<25 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land+Scrub land (Fl+Sl)	Not Available	IVs	Trench cum bunding
Naganayakanahalli	12/2	8.3	YDRcB2	LMU-1	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
Naganayakanahalli	13	0.56	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Naganayak anahalli	13/3	7.77	YDRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	Not Available	IVes	Graded bunding
Naganayak anahalli	14	6.79	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	Not Available	IIes	Graded bunding
Naganayak anahalli	15	0.44	SHThB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Arakera .B	53/1	0.93	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Trench cum bunding
Arakera .B	58	5.32	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Trench cum bunding
Arakera .B	59	7.76	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Arakera .B	60	3.7	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Arakera .B	62	0.26	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Trench cum bunding
Arakera .B	63	6.03	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Arakera .B	64	3.47	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Arakera .B	65	2.25	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Arakera .B	66	8.98	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Arakera .B	67	7.6	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Arakera .B	68	9.62	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Scrub land (Rg+Sl)	Not Available	IIes	Graded bunding
Arakera .B	69	8.28	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Scrub land (Jw+Sl)	Not Available	IIes	Graded bunding
Arakera .B	70	1	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Arakera .B	71	5.3	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Arakera .B	72	9.61	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Arakera .B	73	9.52	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Paddy+Scrub land (Ct+Pd+Sl)	Not Available	IIes	Graded bunding
Arakera .B	74	7.39	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Jowar (Gn+Jw)	Not Available	IIes	Graded bunding
Arakera .B	75	6.91	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Arakera .B	76	6.59	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Trench cum bunding
Arakera .B	78	0.93	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Arakera .B	99	2.25	YLRcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Arakera .B	100	5	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Arakera .B	101	2.38	MDGhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Arakera .B	102	0.24	BMNmB 2g1	LMU-3	Very deep (>150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Kanahalli	2	0.51	BDPcB2	LMU-7	Very shallow (<25 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jower (Ct+Jw)	Not Available	IVes	Trench cum bunding
Kanahalli	3	7.25	BDPcB2	LMU-7	Very shallow (<25 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Jowar (Gn+Jw)	Not Available	IVes	Trench cum bunding
Kanahalli	4	6.75	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIIes	Graded bunding
Kanahalli	5	2.5	BDPiB3	LMU-7	Very shallow (<25 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Severe	Jowar (Jw)	Not Available	IVes	Trench cum bunding
Kanahalli	8	5.62	BDPiB3	LMU-7	Very shallow (<25 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Severe	Jower+Redgram (Jw+Rg)	Not Available	IVes	Trench cum bunding
Kanahalli	9	2.88	VKSmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IVs	Graded bunding
Kanahalli	10	1.29	MDRhB2	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Kanahalli	123	2.12	HTKcB2	LMU-7	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Kanahalli	124	1.43	BDPcB2	LMU-7	Very shallow (<25 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jower (Ct+Jw)	Not Available	IVes	Trench cum bunding
Kanahalli	125	0.45	BDPcB2	LMU-7	Very shallow (<25 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Scrub land (Jw+Sl)	Not Available	IVes	Trench cum bunding
Vaddanahalli	1	2.35	BDPhB2	LMU-7	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
Vaddanahalli	2	2.63	BDPiB2	LMU-7	Very shallow (<25 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVs	Trench cum bunding
Vaddanahalli	3	2.52	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Vaddanahalli	5	5.34	BDPiB2	LMU-7	Very shallow (<25 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Habitation	Not Available	IVs	Trench cum bunding
Vaddanahalli	6	1.53	BDPiB2	LMU-7	Very shallow (<25 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Habitation	Not Available	IVs	Trench cum bunding
Vaddanahalli	7	5.6	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Vaddanahalli	8	3.54	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Vaddanahalli	9	2	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Rockout crop	Not Available	IIIes	Graded bunding
Vaddanahalli	10/1	201.8	RO	RO	RO	RO	RO	RO	RO	RO	Rockout crop	Not Available	RO	RO
Vaddanahalli	11	5.83	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vaddanahalli	12	4.95	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Vaddanahalli	13	2.57	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Vaddanahalli	14	0.62	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Vaddanahalli	17	0.01	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Vaddanahalli	155	0.26	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Vaddanahalli	160	0.07	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Vaddanahalli	162/1	0.56	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Graded bunding
Vaddanahalli	162/2	0.64	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Vaddanahalli	164	1.45	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Vaddanahalli	165	0.47	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	166	0.74	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	167	0.65	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	168	0.35	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	169	1.03	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	170	0.62	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	171	0.7	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	172	0.72	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IVes	Graded bunding
Vaddanahalli	173	1.32	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Vaddanahalli	174	0.72	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	176	0.13	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	177	5.44	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Vaddanahalli	178	2.95	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	179	7.89	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	180	7.29	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	181	6.26	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Vaddanahalli	182	6.23	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	183	6.72	MDRhB2	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Vaddanahalli	184	7.4	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vaddanahalli	185	6.99	MDRhB2	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Vaddanahalli	186	5.32	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Vaddanahalli	187	6.95	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Vaddanahalli	188	0.34	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Vaddanahalli	189	2.84	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIIes	Graded bunding
Vaddanahalli	190	10.53	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vaddanahalli	191	5.71	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIIes	Graded bunding
Vaddanahalli	192	3.77	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vaddanahalli	193	1.6	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Vaddanahalli	194	8.77	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Vaddanahalli	195	7.56	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IIes	Graded bunding
Vaddanahalli	196	7.45	MDRhB2	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Vaddanahalli	197	7.68	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IIes	Graded bunding
Vaddanahalli	198	8.43	VNKcB3	LMU-7	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Vaddanahalli	199	5.74	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	200	4.95	VNKcB3	LMU-7	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Severe	Groundnut (Gn)	Not Available	IIIes	Trench cum bunding
Vaddanahalli	201	6.11	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	202	3.7	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	203	7.87	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jower (Ct+Jw)	Not Available	IVes	Graded bunding
Vaddanahalli	204	0.2	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Graded bunding
Vaddanahalli	205	3.26	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Vaddanahalli	206	0.89	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Vaddanahalli	207	1	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	208	0.96	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IVes	Graded bunding
Vaddanahalli	209	0.41	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IVes	Graded bunding
Vaddanahalli	210/1	0.51	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	210/2	1.75	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	211	0.38	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IVes	Graded bunding
Vaddanahalli	212	0.96	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	213	1.01	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	214/1	1.15	BDPhB2	LMU-7	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
Vaddanahalli	214/2	0.52	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Vaddanahalli	215	4.4	BDPhB2	LMU-7	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
Vaddanahalli	216	6.05	BDPhB2	LMU-7	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
Vaddanahalli	217	2.79	BDPhB2	LMU-7	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
Vaddanahalli	218	0.37	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	219	0.42	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	220	1.66	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IVes	Graded bunding
Vaddanahalli	221	0.39	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IVes	Graded bunding
Vaddanahalli	222	1.41	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IVes	Graded bunding
Vaddanahalli	223	0.85	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Vaddanahalli	230	0.58	VNKcB3	LMU-7	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Vaddanahalli	231	0.77	VNKcB3	LMU-7	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Vaddanahalli	232	0.75	VNKcB3	LMU-7	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Vaddanahalli	233	0.8	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding

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Vaddanahalli	234	0.81	RO	RO	RO	RO	RO	RO	RO	RO	Groundnut (Gn)	Not Available	RO	RO
Vaddanahalli	235	1.31	RO	RO	RO	RO	RO	RO	RO	RO	Cotton (Ct)	Not Available	RO	RO
Vaddanahalli	236	0.82	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIIes	Graded bunding
Vaddanahalli	237	0.91	BDLbB2	LMU-7	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Rockout crop	Not Available	IIIes	Graded bunding
Vaddanahalli	238	0.79	BDPiB2	LMU-7	Very shallow (<25 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVs	Trench cum bunding
Vaddanahalli	240	0.29	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others

Appendix II

Wadanahalli _2L2a Microwatershed

Soil Fertility Information

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Kolluru	729	Neutral (pH 6.5 – 7.3)	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)
Kolluru	731	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kolluru	732	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 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)
Kolluru	733	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kolluru	734	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kolluru	735	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kolluru	738	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 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)
Kolluru	739	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 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)
Naganayak anahalli	1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	3	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	4	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	5	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	6	Slightly acid (pH 6.0 – 6.5)	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)
Naganayak anahalli	7	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	8	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	9	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	10	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	11	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	12/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	12/2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Naganayak anahalli	13	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Naganayak	13/3	Neutral (pH 6.5 –	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Low (<10	Medium (0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
anahalli		7.3)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	ppm)	– 1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Naganayak anahalli	14	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)
Naganayak anahalli	15	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	53/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	58	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	59	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	60	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	62	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	63	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	64	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	65	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	66	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	67	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)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	68	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Arakera .B	69	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Arakera .B	70	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Arakera .B	71	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	72	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	73	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	74	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	75	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	76	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)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	78	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	99	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	100	Moderately alkaline	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Low (<10	Low (< 0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		(pH 7.8 – 8.4)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Arakera .B	101	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Arakera .B	102	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	2	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	3	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	4	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	5	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	8	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	9	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	10	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	123	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	124	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kanahalli	125	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)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	1	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	2	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	3	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vaddanahalli	5	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	6	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	7	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	8	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	9	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	10/1	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Vaddanahalli	11	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	12	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanaha	13	Strongly alkaline (pH	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Low (<10	Low (< 0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
lli		8.4 – 9.0)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Vaddanahalli	14	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	17	Strongly alkaline (pH 8.4 – 9.0)	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)
Vaddanahalli	155	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vaddanahalli	160	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	162/1	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	162/2	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	164	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	165	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	166	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	167	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	168	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	169	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	170	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	171	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	172	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	173	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	174	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	176	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	177	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	178	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	179	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	180	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	181	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanaha	182	Very strongly	Non saline	Medium (0.5	Low (< 23	Medium (145 –	Low (<10	Low (< 0.5	Deficient (<	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
lli		alkaline (pH > 9.0)	(<2 dsm)	– 0.75 %)	kg/ha)	337 kg/ha)	ppm)	ppm)	4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Vaddanahalli	183	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	184	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	185	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	186	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Vaddanahalli	187	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	188	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	189	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	190	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Vaddanahalli	191	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Vaddanahalli	192	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Vaddanahalli	193	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Vaddanahalli	194	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	195	Strongly alkaline (pH 8.4 – 9.0)	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)
Vaddanahalli	196	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	197	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	198	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	199	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	200	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	201	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	202	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	203	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	204	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	205	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanaha	206	Very strongly	Non saline	Medium (0.5	Low (< 23	Medium (145 –	Low (<10	Low (< 0.5	Deficient (<	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
lli		alkaline (pH > 9.0)	(<2 dsm)	– 0.75 %)	kg/ha)	337 kg/ha)	ppm)	ppm)	4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Vaddanahalli	207	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	208	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	209	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	210/1	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	210/2	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	211	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	212	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	213	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	214/1	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	214/2	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	215	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	216	Strongly alkaline (pH 8.4 – 9.0)	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)
Vaddanahalli	217	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	218	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	219	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	220	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	221	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	222	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	223	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	230	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	231	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	232	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	233	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanaha	234	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
lli												
Vaddanahalli	235	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Vaddanahalli	236	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	237	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	238	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Vaddanahalli	240	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

Appendix III

Wadanahalli _2L2a 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
Kolluru	729	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3rt	S3rt	S3t	S3rt	S3t	N1n	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3rt	S3rt
Kolluru	731	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kolluru	732	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Kolluru	733	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Kolluru	734	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Kolluru	735	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Kolluru	738	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Kolluru	739	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Naganayakanahalli	1	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Naganayakanahalli	2	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Naganayakanahalli	3	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Naganayakanahalli	4	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
Naganayakanahalli	5	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Naganayakanahalli	6	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Naganayakanahalli	7	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Naganayakanahalli	8	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Naganayakanahalli	9	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Naganayakanahalli	10	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Naganayakanahalli	11	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
Naganayakanahalli	12/1	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
Naganayakanahalli	12/2	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
Naganayakanahalli	13	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Naganayakanahalli	13/3	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
Naganayakanahalli	14	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
Naganayakanahalli	15	S3r	S1	S2r	S2t	S2r	S3t	S3r	S2r	S3t	S2rt	S2rt	S1	S2r	S1	S3n	S3r	S2r	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Arakera .B	53/1	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Arakera .B	58	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Arakera .B	59	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Arakera .B	60	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Arakera .B	62	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Arakera .B	63	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
Arakera .B	64	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
Arakera .B	65	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
Arakera .B	66	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
Arakera .B	67	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
Arakera .B	68	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
Arakera .B	69	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
Arakera .B	70	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Arakera .B	71	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
Arakera .B	72	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
Arakera .B	73	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
Arakera .B	74	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
Arakera .B	75	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
Arakera .B	76	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Arakera .B	78	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r
Arakera .B	99	N1r	S2rt	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S3t	S2rg	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S3r

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Arakera .B	100	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
Arakera .B	101	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
Arakera .B	102	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
Kanahalli	2	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
Kanahalli	3	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
Kanahalli	4	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Kanahalli	5	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
Kanahalli	8	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
Kanahalli	9	N1n	S3n	N1n	S3n	N1n	S3nt	N1n	N1n	S3nt	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Kanahalli	10	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
Kanahalli	123	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Kanahalli	124	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
Kanahalli	125	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
Vaddanahalli	1	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
Vaddanahalli	2	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
Vaddanahalli	3	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vaddanahalli	5	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
Vaddanahalli	6	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
Vaddanahalli	7	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	8	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	9	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	10/1	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
Vaddanahalli	11	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	12	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	13	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	14	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r

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
Vaddanahalli	17	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	155	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
Vaddanahalli	160	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	162/1	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	162/2	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	164	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	165	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	166	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	167	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	168	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	169	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	170	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	171	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	172	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	173	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	174	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	176	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	177	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	178	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	179	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	180	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	181	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	182	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Vaddanahalli	183	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
Vaddanahalli	184	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
Vaddanahalli	185	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

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
Vaddanahalli	186	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
Vaddanahalli	187	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	188	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	189	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	190	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	191	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	192	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	193	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	194	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
Vaddanahalli	195	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
Vaddanahalli	196	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
Vaddanahalli	197	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
Vaddanahalli	198	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3rt	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	199	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
Vaddanahalli	200	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3rt	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	201	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
Vaddanahalli	202	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
Vaddanahalli	203	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
Vaddanahalli	204	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
Vaddanahalli	205	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
Vaddanahalli	206	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
Vaddanahalli	207	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
Vaddanahalli	208	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
Vaddanahalli	209	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
Vaddanahalli	210 /1	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
Vaddanahalli	210 /2	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

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
Vaddanahalli	211	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
Vaddanahalli	212	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
Vaddanahalli	213	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
Vaddanahalli	214 /1	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
Vaddanahalli	214 /2	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
Vaddanahalli	215	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
Vaddanahalli	216	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
Vaddanahalli	217	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
Vaddanahalli	218	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
Vaddanahalli	219	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
Vaddanahalli	220	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
Vaddanahalli	221	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
Vaddanahalli	222	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
Vaddanahalli	223	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
Vaddanahalli	230	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3rt	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	231	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3rt	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	232	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3rt	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	233	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
Vaddanahalli	234	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
Vaddanahalli	235	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
Vaddanahalli	236	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	237	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Vaddanahalli	238	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
Vaddanahalli	240	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

RO-Rock outcrops

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 105 (59.66%) men and 71 (40.34%) women among the sampled households.*
- *The average family size of landless farmers' was 4.40, marginal farmers' was 5.18, small farmers' was 5, semi medium farmers' was 4.67 and medium farmers' was 6.*
- *The data indicated that, 28 (15.91%) people were in 0-15 years of age, 83 (47.16%) were in 16-35 years of age, 60 (34.09%) were in 36-60 years of age and 5 (2.84%) were above 61 years of age.*
- *The results indicated that Wadanahalli had 54.55 per cent illiterates, 21.59 per cent of them had primary school education, 2.84 per cent of them had middle school education, 9.66 per cent of them had high school education, 5.11 per cent of them had PUC education, 1.14 per cent had diploma and 4.55 per cent of them had degree education.*
- *The results indicate that, 91.43 per cent of household heads were practicing agriculture and 8.57 per cent of the household heads were agricultural labourers.*
- *The results indicate that agriculture was the major occupation for 18.75 per cent of the household members, 55.68 per cent were agricultural laborers, 23.30 per cent were students and 2.27 per cent were housewives.*
- *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 37.14 per cent of the households possess thatched house, 37.14 per cent of the households possess katcha house and 25.71 per cent of them possess pucca/RCC house.*
- *The results show that 71.43 per cent of the households possess TV, 28.57 per cent of them possess mixer/grinder, 5.71 per cent of them possess bicycle, 22.86 per cent of the households possess motor cycle, 8.57 per cent possess auto, 2.86 per cent possess tempo and 82.86 per cent of the households possess mobile phones.*
- *The results show that the average value of television was Rs. 6680, mixer grinder was Rs.1950, bicycle was Rs.1000, motor cycle was Rs. 68,750, auto was Rs. 31,000, tempo was Rs. 350000 and mobile phone was Rs.2110.*
- *About 14.29 per cent of the households possess bullock cart, 22.86 per cent of them possess plough, 14.29 per cent of them possess sprayer, 20 per cent of them possess harvester and 28.57 per cent of them possess weeder.*
- *The results show that the average value of bullock cart was Rs. 25,000, plough was Rs. 4,750, sprayer was Rs. 3,428, harvester was Rs. 1430 and the average value of weeder was Rs.1015.*
- *The results indicate that, 25.71 per cent of the households possess bullocks, 22.86 per cent of the households possess local cow, 8.57 per cent possess buffalo and 5.71 per cent of the households possess goat.*

- *The results indicate that, average own labour men available in the micro watershed was 1.86, average own labour (women) available was 1.67, average hired labour (men) available was 6.06 and average hired labour (women) available was 6.23.*
- *The results indicate that, 100 per cent of the households opined that the hired labour was inadequate.*
- *The results indicate that, households of the Wadanahalli micro-watershed possess 36.56 ha (84.90%) of dry land and 6.50 ha (15.10%) of irrigated land. Marginal farmers possess 7.90 ha (100%) of dry land. Small farmers possess 17.66 ha (95.62%) of dry land and 0.81 ha (4.38%). Semi medium farmers possess 6.96 ha (100%) of dry land. Medium farmers possess 4.05 ha (41.55%) of dry land and 5.69 ha (58.45%) of irrigated land.*
- *The results indicate that, the average value of dry land was Rs. 317,157.41 and the average value of irrigated land was Rs. 215,183.57. In case of marginal famers, the average land value was Rs. 557,047.67 for dry land. In case of small famers, the average land value was Rs. 271,739.63 for dry land and Rs. 494,000 for irrigated land. In case of semi medium famers, the average land value was Rs. 172,325.58 for dry land. In case of medium farmers, the average land value was Rs. 296,400 for dry land and Rs. 175,550.82 for irrigated land.*
- *The results indicate that, there were 2 functioning bore well in the micro watershed.*
- *The results indicate that, bore well was the major irrigation source in the micro water shed for 5.71 per cent of the farmers and canal was the major source of irrigation for 2.86 per cent of the farmers.*
- *The results indicate that, the depth of bore well was found to be 2.53 meters.*
- *The results indicate that small and medium farmers had an irrigated area of 0.81 ha and 2.46 ha respectively.*
- *The results indicate that, farmers have grown red gram (17.28 ha), green gram (3.81 ha), sorghum (3.32 ha), cotton (14.84 ha) and groundnut (2.46 ha). Marginal and small farmers have grown cotton, green gram, red gram and sorghum. Semi medium farmers have grown cotton and red gram. Medium farmers have grown cotton and groundnut.*
- *The results indicate that, the cropping intensity in Wadanahalli micro-watershed was found to be 91.31 per cent.*
- *The results indicate that, 45.71 per cent of the households have bank account and savings.*
- *The results indicate that, 45.71 per cent of the households have availed credit from different sources.*
- *The results indicate that, 68.75 per cent of the households availed loan from commercial bank and 31.25 per cent of the households obtained loan from money lenders.*

- *The results indicate that, average credit availed in the micro watershed was Rs. 88,125.*
- *The results indicate that, 100 per cent of the households have borrowed loan from institutional sources for the purpose of agricultural production.*
- *The results indicate that, 100 per cent of the households have borrowed loan from private sources for the purpose of agricultural production.*
- *The results indicated that 50 per cent of the households partially paid and 50 per cent of the households did not repay their loan borrowed from institutional sources.*
- *The results indicated that 80 per cent of the households partially paid and 20 per cent of the households did not repay their loan borrowed from private sources.*
- *The results indicate that, around 41.67 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations, 50 per cent of the households opined that loan amount was adequate to fulfil the requirement and 8.33 per cent opined that they were forced to sell the produce at low price to repay loan in time.*
- *The results indicate that, around 60 per cent opined that the loan amount borrowed from non-institutional sources helped to perform timely agricultural operations and 40 per cent opined that loan amount was adequate to fulfil the requirement.*
- *The results indicate that, the total cost of cultivation for red gram was Rs. 30214.15. The gross income realized by the farmers was Rs. 62515.40. The net income from red gram cultivation was Rs. 32301.25. Thus the benefit cost ratio was found to be 1:2.07.*
- *The total cost of cultivation for green gram was Rs. 44142.08. The gross income realized by the farmers was Rs. 37093.34. The net income from green gram cultivation was Rs. -7048.75. Thus the benefit cost ratio was found to be 1:0.84.*
- *The total cost of cultivation for cotton was Rs. 40607.93. The gross income realized by the farmers was Rs. 77825.42. The net income from cotton cultivation was Rs. 37217.49. Thus the benefit cost ratio was found to be 1:1.92.*
- *The total cost of cultivation for sorghum was Rs. 32547.84. The gross income realized by the farmers was Rs. 34671.48. The net income from sorghum cultivation was Rs. 2123.64. Thus the benefit cost ratio was found to be 1:1.07.*
- *The total cost of cultivation for groundnut was Rs. 26959.04. The gross income realized by the farmers was Rs. 41505.76. The net income from groundnut cultivation was Rs. 14546.72. Thus the benefit cost ratio was found to be 1:1.54.*
- *The results indicate that, 20 per cent of the households opined that dry fodder was adequate, 2.86 per cent of the households opined that dry fodder was inadequate and green fodder was adequate for 5.71 per cent of the households.*
- *The results indicate that the annual gross income was Rs. 73,000 for landless farmers, for marginal farmers it was Rs. 98,136.36, for small farmers it was Rs.*

143,430.77, for semi medium farmers it was Rs. 228,333.33 and for medium farmers it was Rs. 255,666.67.

- *The results indicate that the average annual expenditure is Rs. 9,854.07. For landless households it was Rs. 5,320, for marginal farmers it was Rs. 6,872.73, for small farmers it was Rs. 4,437.87, for semi medium farmers it was Rs. 25,777.78 and for medium farmers it was Rs. 35,888.89.*
- *The results indicate that, sampled households have grown 2 lemon trees and 5 mango trees in their field.*
- *The results indicate that, households have planted 1 tamarind, 5 banyan and 114 neem trees in their field.*
- *The results indicated that, households have an average investment capacity of Rs. 4,857.14 for land development.*
- *The results indicated that loan from bank was the source of additional investment for 2.86 per cent for land development and soft loan was the source of additional investment for 45.71 per cent of the households for land development.*
- *The results indicated that, cotton green gram, groundnut and red gram were sold to the extent of 100 per cent and sorghum was sold to the extent of 69.44 per cent.*
- *The results indicated that, about 34.29 per cent of the farmers sold their produce to local/village merchants, 51.43 per cent of them sold in regulated markets and 2.86 per cent of them sold their produce through contract marketing arrangement.*
- *The results indicated that, 88.57 per cent of the households have used tractor as a mode of transportation for their agricultural produce.*
- *The results indicated that, 5.71 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, 100 per cent of the households used firewood as a source of fuel.*
- *The results indicated that, piped supply was the major source of drinking water for 82.86 per cent of the households in the micro watershed and bore well was the source of drinking water for 17.14 per cent of the households.*
- *Electricity was the major source of light for 100 per cent of the households in micro watershed.*
- *The results indicated that, 54.29 per cent of the households possess sanitary toilet facility.*
- *The results indicated that, 100 per cent of the sampled households possessed BPL card.*
- *The results indicated that, 71.43 per cent of the households participated in NREGA programme.*
- *The results indicated that, cereals were adequate for 45.71 per cent of the households, pulses were adequate for 51.43 per cent, oilseeds were adequate for*

57.14 per cent, vegetables were adequate for 77.14 per cent, fruits were adequate for 22.86 per cent, milk was adequate for 28.57 per cent and eggs were adequate for 14.29 per cent.

- *The results indicated that, cereals were inadequate for 51.43 per cent, pulses were inadequate for 51.43 per cent of the households, oilseeds were inadequate for 42.86 per cent, vegetables were inadequate for 22.86 per cent, fruits were inadequate for 71.43 per cent, milk was inadequate for 65.71 per cent, eggs were inadequate for 85.71 per cent and meat was inadequate for 80 per cent of the households.*
- *The results indicated that, lower fertility status of the soil was the constraint experienced by 85.71 per cent of the households, wild animal menace on farm field (82.86%), frequent incidence of pest and diseases (42.86%), inadequacy of irrigation water (45.71%), high cost of fertilizers and plant protection chemicals (42.86%), low price for the agricultural commodities (25.71%), lack of marketing facilities in the area (11.43%), lack of transport for safe transport of the agricultural produce to the market (31.43%), less rainfall (60%), inadequate extension services (2.86%) and Source of Agri-technology information (5.71%).*

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 agglomerations 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

Wadanahalli micro-watershed in Khanahalli sub-watershed (Yadgir taluk and district) is located in between $16^0$52’27.726’’ to 16^0 50’54.139” North latitudes and 77^0 3’47.188’’ to 77^0 1’44.755’’ East longitudes, covering an area of about 748.57 ha, bounded by Arekera.B, Vaddanahalli, Naganayakanahalli and Kanahalli 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.

Chapter 4

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Wadanahalli micro-watershed is presented in Table 1 and it indicated that 35 farmers were sampled in Wadanahalli micro-watershed among them 5 (14.29%) were landless, 11 (31.43%) were marginal farmers, 13 (37.14%) were small farmers, 3 (8.57%) were semi medium farmers and 3 (8.57 %) were medium farmers.

Table 1: Households sampled for socio economic survey in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	14.29	11	31.43	13	37.14	3	8.57	3	8.57	35	100.00

Population characteristics: The population characteristics of households sampled for socio-economic survey in Wadanahalli micro-watershed is presented in Table 2. The data indicated that there were 105 (59.66%) men and 71 (40.34%) women among the sampled households. The average family size of landless farmers' was 4.40, marginal farmers' was 5.18, small farmers' was 5, semi medium farmers' was 4.67 and medium farmers' was 6.

Table 2: Population characteristics of Wadanahalli micro-watershed

Sl.No.	Particulars	LL (22)		MF (57)		SF (65)		SMF (14)		MDF (18)		All (176)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	13	59.09	33	57.89	40	61.54	10	71.43	9	50.00	105	59.66
2	Women	9	40.91	24	42.11	25	38.46	4	28.57	9	50.00	71	40.34
Total		22	100.00	57	100.00	65	100.00	14	100.00	18	100.00	176	100.00
Average		4.40		5.18		5.00		4.67		6.00		5.03	

Age wise classification of population: The age wise classification of household members in Wadanahalli micro-watershed is presented in Table 3. The data indicated that, 28 (15.91%) people were in 0-15 years of age, 83 (47.16%) were in 16-35 years of age, 60 (34.09%) were in 36-60 years of age and 5 (2.84%) were above 61 years of age.

Table 3: Age wise classification of household members in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (22)		MF (57)		SF (65)		SMF (14)		MDF (18)		All (176)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	4	18.18	9	15.79	9	13.85	2	14.29	4	22.22	28	15.91
2	16-35 years of age	11	50.00	30	52.63	27	41.54	7	50.00	8	44.44	83	47.16
3	36-60 years of age	7	31.82	16	28.07	27	41.54	5	35.71	5	27.78	60	34.09
4	> 61 years	0	0.00	2	3.51	2	3.08	0	0.00	1	5.56	5	2.84
Total		22	100.00	57	100.00	65	100.00	14	100.00	18	100.00	176	100.00

Education level of household members: Education level of household members in Wadanahalli micro-watershed is presented in Table 4. The results indicated that Wadanahalli had 54.55 per cent illiterates, 21.59 per cent of them had primary school

education, 2.84 per cent of them had middle school education, 9.66 per cent of them had high school education, 5.11 per cent of them had PUC education, 1.14 per cent had diploma and 4.55 per cent of them had degree education.

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

Sl.No.	Particulars	LL (22)		MF (57)		SF (65)		SMF (14)		MDF (18)		All (176)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	13	59.09	32	56.14	38	58.46	6	42.86	7	38.89	96	54.55
2	Primary School	5	22.73	11	19.30	11	16.92	5	35.71	6	33.33	38	21.59
3	Middle School	0	0.00	1	1.75	3	4.62	1	7.14	0	0.00	5	2.84
4	High School	4	18.18	3	5.26	7	10.77	0	0.00	3	16.67	17	9.66
5	PUC	0	0.00	6	10.53	1	1.54	0	0.00	2	11.11	9	5.11
6	Diploma	0	0.00	2	3.51	0	0.00	0	0.00	0	0.00	2	1.14
7	Degree	0	0.00	2	3.51	4	6.15	2	14.29	0	0.00	8	4.55
8	Others	0	0.00	0	0.00	1	1.54	0	0.00	0	0.00	1	0.57
Total		22	100.00	57	100.00	65	100.00	14	100.00	18	100.00	176	100.00

Occupation of household heads: The data regarding the occupation of the household heads in Wadanahalli micro-watershed is presented in Table 5. The results indicate that, 91.43 per cent of household heads were practicing agriculture and 8.57 per cent of the household heads were agricultural labourers.

Table 5: Occupation of household heads in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	3	60.00	11	100.00	13	100.00	3	100.00	2	66.67	32	91.43
2	Agricultural Labour	2	40.00	0	0.00	0	0.00	0	0.00	1	33.33	3	8.57
Total		5	100.00	11	100.00	13	100.00	3	100.00	3	100.00	35	100.00

Occupation of the household members: The data regarding the occupation of the household members in Wadanahalli micro-watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 18.75 per cent of the household members, 55.68 per cent were agricultural laborers, 23.30 per cent were students and 2.27 per cent were housewives.

Table 6: Occupation of family members in Wadanahalli micro-watershed

Sl. No.	Particulars	LL (22)		MF (57)		SF (65)		SMF(14)		MDF(18)		All (176)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	3	13.64	11	19.30	14	21.54	3	21.43	2	11.11	33	18.75
2	Agricultural Labour	14	63.64	36	63.16	31	47.69	6	42.86	11	61.11	98	55.68
3	Student	5	22.73	10	17.54	17	26.15	4	28.57	5	27.78	41	23.30
4	Housewife	0	0.00	0	0.00	3	4.62	1	7.14	0	0.00	4	2.27
Total		22	100.00	57	100.00	65	100.00	14	100.00	18	100.00	176	100.00

Institutional participation of the household members: The data regarding the institutional participation of the household members in Wadanahalli 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 Wadanahalli micro-watershed

Sl.No.	Particulars	LL (22)		MF (57)		SF (65)		SMF (14)		MDF (18)		All (176)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	22	100.00	57	100.00	65	100.00	14	100.00	18	100.00	176	100.00
Total		22	100.00	57	100.00	65	100.00	14	100.00	18	100.00	176	100.00

Type of house owned: The data regarding the type of house owned by the households in Wadanahalli micro-watershed is presented in Table 8. The results indicate that 37.14 per cent of the households possess thatched house, 37.14 per cent of the households possess katcha house and 25.71 per cent of them possess pucca/RCC house.

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

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	4	80.00	5	45.45	4	30.77	0	0.00	0	0.00	13	37.14
2	Katcha	1	20.00	2	18.18	7	53.85	0	0.00	3	100.00	13	37.14
3	Pucca/RCC	0	0.00	4	36.36	2	15.38	3	100.00	0	0.00	9	25.71
Total		5	100.00	11	100.00	13	100.00	3	100.00	3	100.00	35	100.00

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Wadanahalli micro-watershed is presented in Table 9. The results show that 71.43 per cent of the households possess TV, 28.57 per cent of them possess mixer/grinder, 5.71 per cent of them possess bicycle, 22.86 per cent of the households possess motor cycle, 8.57 per cent possess auto, 2.86 per cent possess tempo and 82.86 per cent of the households possess mobile phones.

Table 9. Durable Assets owned by households in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	2	40.00	9	81.82	9	69.23	3	100.00	2	66.67	25	71.43
2	Mixer/Grinder	0	0.00	4	36.36	3	23.08	3	100.00	0	0.00	10	28.57
3	Bicycle	0	0.00	0	0.00	1	7.69	0	0.00	1	33.33	2	5.71
4	Motor Cycle	0	0.00	3	27.27	3	23.08	1	33.33	1	33.33	8	22.86
5	Auto	0	0.00	3	27.27	0	0.00	0	0.00	0	0.00	3	8.57
6	Tempo	0	0.00	1	9.09	0	0.00	0	0.00	0	0.00	1	2.86
7	Mobile Phone	4	80.00	9	81.82	10	76.92	3	100.00	3	100.00	29	82.86
8	Blank	1	20.00	1	9.09	1	7.69	0	0.00	0	0.00	3	8.57

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Wadanahalli micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 6680, mixer grinder was Rs.1950, bicycle was Rs.1000, motor cycle was Rs.68,750, auto was Rs.31,000, tempo was Rs. 350000 and mobile phone was Rs.2110.

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

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Television	8,000.00	6,555.00	6,777.00	5,666.00	7,000.00	6,680.00
2	Mixer/Grinder	0.00	1,750.00	2,000.00	2,166.00	0.00	1,950.00
3	Bicycle	0.00	0.00	1,000.00	0.00	1,000.00	1,000.00
4	Motor Cycle	0.00	73,333.00	65,000.00	70,000.00	65,000.00	68,750.00
5	Auto	0.00	31,000.00	0.00	0.00	0.00	31,000.00
6	Tempo	0.00	350,000.00	0.00	0.00	0.00	350,000.00
7	Mobile Phone	2,850.00	1,687.00	1,486.00	3,625.00	2,375.00	2,110.00

Farm Implements owned: The data regarding the farm implements owned by the households in Wadanahalli micro-watershed is presented in Table 11. About 14.29 per cent of the households possess bullock cart, 22.86 per cent of them possess plough, 14.29 per cent of them possess sprayer, 20 per cent of them possess harvester and 28.57 per cent of them possess weeder.

Table 11. Farm Implements owned by households in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0.00	2	18.18	1	7.69	1	33.33	1	33.33	5	14.29
2	Plough	0	0.00	4	36.36	3	23.08	1	33.33	0	0.00	8	22.86
3	Sprayer	0	0.00	2	18.18	1	7.69	2	66.67	0	0.00	5	14.29
4	Weeder	0	0.00	4	36.36	3	23.08	3	100.00	0	0.00	10	28.57
5	Harvester	0	0.00	2	18.18	3	23.08	2	66.67	0	0.00	7	20.00
5	Blank	5	100.00	7	63.64	10	76.92	0	0.00	2	66.67	24	68.57

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Wadanahalli micro-watershed is presented in Table 12. The results show that the average value of bullock cart was Rs.25,000, plough was Rs.4,750, sprayer was Rs.3,428, harvester was Rs. 1430 and the average value of weeder was Rs.1015.

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

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Bullock Cart	0.00	25,000.00	20,000.00	30,000.00	25,000.00	25,000.00
2	Plough	0.00	2,000.00	3,333.00	20,000.00	0.00	4,750.00
3	Sprayer	0.00	2,500.00	5,000.00	4,500.00	0.00	3,428.00
4	Weeder	0.00	681.00	2,355.00	813.00	0.00	1,015.00
5	Harvester	0.00	1,500.00	1,500.00	1,150.00	0.00	1,430.00

Livestock possession by the households: The data regarding the Livestock possession by the households in Wadanahalli micro-watershed is presented in Table 13. The results indicate that, 25.71 per cent of the households possess bullocks, 22.86 per cent of the households possess local cow, 8.57 per cent possess buffalo and 5.71 per cent of the households possess goat.

Table 13. Livestock possession by households in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0.00	4	36.36	2	15.38	1	33.33	2	66.67	9	25.71
2	Local cow	1	20.00	3	27.27	2	15.38	2	66.67	0	0.00	8	22.86
3	Buffalo	0	0.00	1	9.09	1	7.69	0	0.00	1	33.33	3	8.57
4	Goat	0	0.00	1	9.09	1	7.69	0	0.00	0	0.00	2	5.71
5	blank	4	80.00	5	45.45	9	69.23	1	33.33	1	33.33	20	57.14

Average Labour availability: The data regarding the average labour availability in Wadanahalli micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.86, average own labour (women) available was 1.67, average hired labour (men) available was 6.06 and average hired labour (women) available was 6.23.

Table 14. Average Labour availability in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
		N	N	N	N	N	N
1	Hired labour Female	1.00	5.36	8.69	3.33	10.33	6.23
2	Own Labour Female	0.60	2.00	1.67	1.00	3.50	1.67
3	Own labour Male	0.60	2.09	2.23	1.67	1.67	1.86
4	Hired labour Male	1.00	5.36	8.23	3.33	10.33	6.06

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Wadanahalli micro-watershed is presented in Table 15. The results indicate that, 100 per cent of the households opined that the hired labour was inadequate.

Table 15. Adequacy of Hired Labour in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Inadequate	5	100.00	11	100.00	13	100.00	3	100.00	3	100.00	35	100.00

Distribution of land (ha): The data regarding the distribution of land (ha) in Wadanahalli micro-watershed is presented in Table 16. The results indicate that, households of the Wadanahalli micro-watershed possess 36.56 ha (84.90%) of dry land and 6.50 ha (15.10%) of irrigated land. Marginal farmers possess 7.90 ha (100%) of dry land. Small farmers possess 17.66 ha (95.62%) of dry land and 0.81 ha (4.38%). Semi medium farmers possess 6.96 ha (100%) of dry land. Medium farmers possess 4.05 ha (41.55%) of dry land and 5.69 ha (58.45%) of irrigated land.

Table 16. Distribution of land (Ha) in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	0	0	7.90	100	17.66	95.62	6.96	100	4.05	41.55	36.56	84.90
2	Irrigated	0	0	0	0	0.81	4.38	0	0	5.69	58.45	6.50	15.10
Total		0	100	7.90	100	18.47	100	6.96	100	9.74	100	43.06	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Wadanahalli micro-watershed is presented in Table 17. The results indicate that, the

average value of dry land was Rs. 317,157.41 and the average value of irrigated land was Rs. 215,183.57. In case of marginal famers, the average land value was Rs. 557,047.67 for dry land. In case of small famers, the average land value was Rs. 271,739.63 for dry land and Rs.494,000 for irrigated land. In case of semi medium famers, the average land value was Rs. 172,325.58 for dry land. In case of medium farmers, the average land value was Rs. 296,400 for dry land and Rs.175,550.82 for irrigated land.

Table 17. Average land value (Rs./ha) in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Dry	0.00	557,047.67	271,739.63	172,325.58	296,400.00	317,157.41
2	Irrigated	0.00	0.00	494,000.00	0.00	175,550.82	215,183.57

Status of bore wells: The data regarding the status of bore wells in Wadanahalli micro-watershed is presented in Table 18. The results indicate that, there were 2 functioning bore well in the micro watershed.

Table 18. Status of bore wells in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
		N	N	N	N	N	N
1	Functioning	0	0	1	0	1	2

Source of irrigation: The data regarding the source of irrigation in Wadanahalli micro-watershed is presented in Table 19. The results indicate that, bore well was the major irrigation source in the micro water shed for 5.71 per cent of the farmers and canal was the major source of irrigation for 2.86 per cent of the farmers.

Table 19. Source of irrigation in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0.00	0	0.00	1	7.69	0	0.00	1	33.33	2	5.71
2	Canal	0	0.00	0	0.00	0	0.00	0	0.00	1	33.33	1	2.86

Depth of water (Avg in meters): The data regarding the depth of water in Wadanahalli micro-watershed is presented in Table 20. The results indicate that, the depth of bore well was found to be 2.53 meters.

Table 20. Depth of water (Avg in meters) in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Bore Well	0.00	0.00	3.28	0.00	15.24	2.53

Table 21. Irrigated Area (ha) in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Kharif	0.00	0.00	0.81	0.00	2.46	3.27
Total		0.00	0.00	0.81	0.00	2.46	3.27

Irrigated Area (ha): The data regarding the irrigated area (ha) in Wadanahalli micro-watershed is presented in Table 21. The results indicate that small and medium farmers had an irrigated area of 0.81 ha and 2.46 ha respectively.

Cropping pattern: The data regarding the cropping pattern in Wadanahalli micro-watershed is presented in Table 22. The results indicate that, farmers have grown red gram (17.28 ha), green gram (3.81 ha), sorghum (3.32 ha), cotton (14.84 ha) and groundnut (2.46 ha). Marginal and small farmers have grown cotton, greengram, redgram and sorghum. Semi medium farmers have grown cotton and redgram. Medium farmers have grown cotton and groundnut.

Table 22. Cropping pattern in Wadanahalli micro-watershed (Area in ha)

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Kharif - Cotton	0	1.26	3.87	2.43	7.29	14.84
2	Kharif - Greengram	0	2.19	1.62	0	0	3.81
3	Kharif - Groundnut	0	0	0	0	2.46	2.46
4	Kharif - Red gram (togari)	0	4.41	8.34	4.53	0	17.28
5	Kharif - Sorghum	0	0.49	2.83	0	0	3.32
Total		0	8.35	16.66	6.96	9.74	41.71

Cropping intensity: The data regarding the cropping intensity in Wadanahalli micro-watershed is presented in Table 23. The results indicate that, the cropping intensity in Wadanahalli micro-watershed was found to be 91.31 per cent.

Table 23. Cropping intensity (%) in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Cropping Intensity	0.00	53.67	100.00	100.00	149.78	91.31

Possession of Bank account and savings: The data regarding the possession of bank account and saving in Wadanahalli micro-watershed is presented in Table 24. The results indicate that, 45.71 per cent of the households have bank account and savings.

Table 24. Possession of Bank account and savings in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	0	0.00	5	45.45	6	46.15	2	66.67	3	100.00	16	45.71
2	Savings	0	0.00	5	45.45	6	46.15	2	66.67	3	100.00	16	45.71

Borrowing status: The data regarding the borrowing status in Wadanahalli micro-watershed is presented in Table 25. The results indicate that, 45.71 per cent of the households have availed credit from different sources.

Table 25. Borrowing status in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	0	0.00	5	45.45	6	46.15	2	66.67	3	100.00	16	45.71

Source of credit availed by households: The data regarding the cropping intensity in Wadanahalli micro watershed is presented in Table 26. The results indicate that, 68.75 per cent of the households availed loan from commercial bank and 31.25 per cent of the households obtained loan from money lenders.

Table 26. Source of credit availed by households in Wadanahalli micro watershed

Sl.No.	Particulars	LL (0)		MF (5)		SF (6)		SMF (2)		MDF (3)		All (16)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Commercial Bank	0	0.00	4	80.00	4	66.67	1	50.00	2	66.67	11	68.75
2	Money Lender	0	0.00	2	40.00	2	33.33	0	0.00	1	33.33	5	31.25

Avg. Credit amount: The data regarding the average credit amount availed by households in Wadanahalli micro watershed is presented in Table 27. The results indicate that, average credit availed in the micro watershed was Rs. 88,125.

Table 27. Average Credit amount (in Rs.) availed by households in Wadanahalli micro watershed

Sl.No.	Particulars	LL (0)	MF (5)	SF (6)	SMF (2)	MDF (3)	All (16)
1	Average Credit	0.00	83,000.00	110,833.33	75,000.00	60,000.00	88,125.00

Purpose of credit borrowed - Institutional Credit: The data regarding the purpose of credit borrowed from institutional sources by households in Wadanahalli micro watershed is presented in Table 28. The results indicate that, 100 per cent of the households have borrowed loan from institutional sources for the purpose of agricultural production.

Table 28. Purpose of credit borrowed (institutional Source) by households in Wadanahalli micro watershed

Sl.No.	Particulars	LL (0)		MF (4)		SF (4)		SMF (2)		MDF (2)		All (12)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0.00	4	100.00	4	100.00	2	100.00	2	100.00	12	100.00

Purpose of credit borrowed - Private Credit: The data regarding the purpose of credit borrowed from private sources by households in Wadanahalli micro watershed is presented in Table 29. The results indicate that, 100 per cent of the households have borrowed loan from private sources for the purpose of agricultural production.

Table 29. Purpose of credit borrowed (private Source) by households in Wadanahalli micro watershed

Sl.No.	Particulars	LL (0)		MF (2)		SF (2)		SMF (0)		MDF (1)		All (5)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0.00	2	100.00	2	100.00	0	0.00	1	100.00	5	100.00

Repayment status of households – Institutional: The data regarding the repayment status of credit borrowed from institutional sources by households in Wadanahalli micro watershed is presented in Table 30. The results indicated that 50 per cent of the households partially paid and 50 per cent of the households did not repay their loan borrowed from institutional sources.

Table 30. Repayment status of households (institutional sources) in Wadanahalli micro watershed

Sl.No.	Particulars	LL (0)		MF (4)		SF (4)		SMF (2)		MDF (2)		All (12)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Partially paid	0	0.00	2	50.00	2	50.00	0	0.00	2	100.00	6	50.00
2	Un paid	0	0.00	2	50.00	2	50.00	2	100.00	0	0.00	6	50.00

Repayment status of households – Private: The data regarding the repayment status of credit borrowed from private sources by households in Wadanahalli micro watershed is presented in Table 31. The results indicated that 80 per cent of the households partially paid and 20 per cent of the households did not repay their loan borrowed from private sources.

Table 31. Repayment status of households (private sources) in Wadanahalli micro watershed

Sl.No.	Particulars	LL (0)		MF (2)		SF (2)		SMF (0)		MDF (1)		All (5)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Partially paid	0	0.00	1	50.00	2	100.00	0	0.00	1	100.00	4	80.00
2	Un paid	0	0.00	1	50.00	0	0.00	0	0.00	0	0.00	1	20.00

Opinion on institutional sources of credit: The data regarding the opinion on institutional sources of credit in Wadanahalli micro watershed is presented in Table 32. The results indicate that, around 41.67 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations, 50 per cent of the households opined that loan amount was adequate to fulfil the requirement and 8.33 per cent opined that they were forced to sell the produce at low price to repay loan in time.

Table 32. Opinion on institutional sources of credit in Wadanahalli micro watershed

Sl.No.	Particulars	MF (4)		SF (4)		SMF (2)		MDF (2)		All (12)	
		N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	2	50	3	75	0	0	0	0	5	41.67
2	Loan amount was adequate to fulfil the requirement	1	25	1	25	2	100	2	100	6	50
3	Forced to sell the produce at low price to repay loan in time	1	25	0	0	0	0	0	0	1	8.33

Opinion on non-institutional sources of credit: The data regarding the opinion on non-institutional sources of credit in Wadanahalli micro watershed is presented in Table 33. The results indicate that, around 60 per cent opined that the loan amount borrowed from non-institutional sources helped to perform timely agricultural operations and 40 per cent opined that loan amount was adequate to fulfil the requirement.

Table 33. Opinion on non-institutional sources of credit in Wadanahalli micro watershed

Sl.No.	Particulars	LL (0)		MF (2)		SF (2)		SMF (0)		MDF (1)		All (5)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	0	0	1	50	2	100	0	0	0	0	3	60
2	Loan amount was adequate to fulfil the requirement	0	0	1	50	0	0	0	0	1	100	2	40

Cost of cultivation of Red gram: The data regarding the cost of cultivation of red gram in Wadanahalli micro-watershed is presented in Table 34. The results indicate that, the total cost of cultivation for red gram was Rs. 30214.15. The gross income realized by the farmers was Rs. 62515.40. The net income from red gram cultivation was Rs. 32301.25. Thus the benefit cost ratio was found to be 1:2.07.

Table 34. Cost of Cultivation of red gram in Wadanahalli micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	38.54	9454.30	31.29
2	Bullock		Pairs/day	1.32	726.00	2.40
3	Tractor		Hours	4.78	3581.29	11.85
4	Machinery		Hours	0.41	246.07	0.81
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	9.58	808.09	2.67
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	8.27	1568.82	5.19
8	Fertilizer + micronutrients		Quintal	1.96	1897.52	6.28
9	Pesticides (PPC)		Kgs /liters	1.52	2261.75	7.49
10	Irrigation		Number	0.00	0.00	0.00
13	Depreciation charges			0.00	182.55	0.60
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				785.54	2.60
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				21511.93	71.20
III	**Cost B2**					
18	Rental Value of Land				226.19	0.75
19	**Cost B2 = (Cost B1 + Rental value)**				21738.12	71.95
IV	**Cost C1**					
20	Family Human Labour			22.63	5719.29	18.93
21	**Cost C1 = (Cost B2 + Family Labour)**				27457.41	90.88
V	**Cost C2**					
22	Risk Premium				10.00	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**				27467.41	90.91
VI	**Cost C3**					
24	Managerial Cost				2746.74	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				30214.15	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		12.74	62234.57	
		b) Main Crop Sales Price (Rs.)			4885.71	
	By Product	e) Main Product (q)		5.62	280.83	
		f) Main Crop Sales Price (Rs.)			50.00	
b.	Gross Income (Rs.)				62515.40	
c.	Net Income (Rs.)				32301.25	
d.	Cost per Quintal (Rs./q.)				2371.96	
e.	Benefit Cost Ratio (BC Ratio)				1:2.07	

Cost of Cultivation of Green gram: The data regarding the cost of cultivation of green gram in Wadanahalli micro-watershed is presented in Table 35. The results indicate that, the total cost of cultivation for green gram was Rs. 44142.08. The gross income realized by the farmers was Rs. 37093.34. The net income from green gram cultivation was Rs. -7048.75. Thus the benefit cost ratio was found to be 1:0.84.

Table 35. Cost of Cultivation of Green gram in Wadanahalli micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	52.67	12774.82	28.94
2	Bullock		Pairs/day	1.98	1090.50	2.47
3	Tractor		Hours	4.31	3231.20	7.32
4	Machinery		Hours	0.85	509.38	1.15
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	7.80	701.86	1.59
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	16.98	3395.84	7.69
8	Fertilizer + micronutrients		Quintal	2.03	2053.78	4.65
9	Pesticides (PPC)		Kgs /liters	2.13	2911.77	6.60
10	Irrigation		Number	0.00	0.00	0.00
13	Depreciation charges			0.00	0.03	0.00
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				1088.79	2.47
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				27757.95	62.88
III	**Cost B2**					
18	Rental Value of Land				166.67	0.38
19	**Cost B2 = (Cost B1 + Rental value)**				27924.62	63.26
IV	**Cost C1**					
20	Family Human Labour			49.35	12194.55	27.63
21	**Cost C1 = (Cost B2 + Family Labour)**				40119.17	90.89
V	**Cost C2**					
22	Risk Premium				10.00	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**				40129.17	90.91
VI	**Cost C3**					
24	Managerial Cost				4012.92	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				44142.08	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		8.69	36947.01	
		b) Main Crop Sales Price (Rs.)			4250.00	
	By Product	e) Main Product (q)		5.85	146.33	
		f) Main Crop Sales Price (Rs.)			25.00	
b.	Gross Income (Rs.)				37093.34	
c.	Net Income (Rs.)				-7048.75	
d.	Cost per Quintal (Rs./q.)				5077.65	
e.	Benefit Cost Ratio (BC Ratio)				1:0.84	

Cost of Cultivation of cotton: The data regarding the cost of cultivation of cotton in Wadanahalli micro-watershed is presented in Table 36. The results indicate that, the total cost of cultivation for cotton was Rs. 40607.93. The gross income realized by the farmers was Rs. 77825.42. The net income from cotton cultivation was Rs. 37217.49. Thus the benefit cost ratio was found to be 1:1.92.

Table 36. Cost of Cultivation of cotton in Wadanahalli micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	62.00	14955.44	36.83
2	Bullock		Pairs/day	2.13	1170.19	2.88
3	Tractor		Hours	4.33	3248.36	8.00
4	Machinery		Hours	0.90	542.91	1.34
5	Seed Main Crop (Establishment and Maintenence)		Kgs (Rs.)	5.67	1416.67	3.49
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	11.51	2302.64	5.67
8	Fertilizer + micronutrients		Quintal	3.45	2733.30	6.73
9	Pesticides (PPC)		Kgs /liters	1.57	2043.66	5.03
10	Irrigation		Number	1.54	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	74.89	0.18
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				1020.75	2.51
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				29508.81	72.67
III	**Cost B2**					
18	Rental Value of Land				208.33	0.51
19	**Cost B2 = (Cost B1 + Rental value)**				29717.14	73.18
IV	**Cost C1**					
20	Family Human Labour			27.20	7189.16	17.70
21	**Cost C1 = (Cost B2 + Family Labour)**				36906.30	90.88
V	**Cost C2**					
22	Risk Premium				10.00	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**				36916.30	90.91
VI	**Cost C3**					
24	Managerial Cost				3691.63	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				40607.93	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		15.30	77825.42	
		b) Main Crop Sales Price (Rs.)			5087.50	
b.	Gross Income (Rs.)				77825.42	
c.	Net Income (Rs.)				37217.49	
d.	Cost per Quintal (Rs./q.)				2654.57	
e.	Benefit Cost Ratio (BC Ratio)				1:1.92	

Cost of cultivation of sorghum: The data regarding the cost of cultivation of sorghum in Wadanahalli micro-watershed is presented in Table 37. The results indicate that, the total cost of cultivation for sorghum was Rs. 32547.84. The gross income realized by the farmers was Rs. 34671.48. The net income from sorghum cultivation was Rs. 2123.64. Thus the benefit cost ratio was found to be 1:1.07.

Table 37. Cost of Cultivation of sorghum in Wadanahalli micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	57.22	13674.19	42.01
2	Bullock		Pairs/day	1.37	754.72	2.32
3	Tractor		Hours	3.43	2572.92	7.91
4	Machinery		Hours	0.96	576.33	1.77
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	11.94	1095.03	3.36
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	7.20	1440.83	4.43
8	Fertilizer + micronutrients		Quintal	1.65	1749.58	5.38
9	Pesticides (PPC)		Kgs / liters	1.44	1090.92	3.35
10	Irrigation		Number	0.00	0.00	0.00
13	Depreciation charges			0.00	0.02	0.00
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				646.36	1.99
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				23600.92	72.51
III	**Cost B2**					
18	Rental Value of Land				166.67	0.51
19	**Cost B2 = (Cost B1 + Rental value)**				23767.59	73.02
IV	**Cost C1**					
20	Family Human Labour			22.44	5811.36	17.85
21	**Cost C1 = (Cost B2 + Family Labour)**				29578.95	90.88
V	**Cost C2**					
22	Risk Premium				10.00	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**				29588.95	90.91
VI	**Cost C3**					
24	Managerial Cost				2958.89	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				32547.84	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		12.08	34214.07	
		b) Main Crop Sales Price (Rs.)			2833.33	
	By Product	e) Main Product (q)		13.72	457.41	
		f) Main Crop Sales Price (Rs.)			33.33	
b.	Gross Income (Rs.)				34671.48	
c.	Net Income (Rs.)				2123.64	
d.	Cost per Quintal (Rs./q.)				2695.35	
e.	Benefit Cost Ratio (BC Ratio)				1:1.07	

Cost of cultivation of Groundnut: The data regarding the cost of cultivation of groundnut in Wadanahalli micro-watershed is presented in Table 38. The results indicate that, the total cost of cultivation for groundnut was Rs. 26959.04. The gross income realized by the farmers was Rs. 41505.76. The net income from groundnut cultivation was Rs. 14546.72. Thus the benefit cost ratio was found to be 1:1.54.

Table 38. Cost of Cultivation of groundnut in Wadanahalli micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	17.90	4231.96	15.70
2	Bullock		Pairs/day	1.22	671.42	2.49
3	Tractor		Hours	2.44	1831.14	6.79
4	Machinery		Hours	0.81	488.30	1.81
5	Seed Main Crop (Establishment and Maintenence)		Kgs (Rs.)	101.73	9155.68	33.96
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	4.07	813.84	3.02
8	Fertilizer + micronutrients		Quintal	0.41	447.61	1.66
9	Pesticides (PPC)		Kgs /liters	0.81	1220.76	4.53
10	Irrigation		Number	2.03	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	0.01	0.00
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				1397.75	5.18
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				20258.46	75.15
III	**Cost B2**					
18	Rental Value of Land				333.33	1.24
19	**Cost B2 = (Cost B1 + Rental value)**				20591.80	76.38
IV	**Cost C1**					
20	Family Human Labour			16.28	3906.42	14.49
21	**Cost C1 = (Cost B2 + Family Labour)**				24498.22	90.87
V	**Cost C2**					
22	Risk Premium				10.00	0.04
23	**Cost C2 = (Cost C1 + Risk Premium)**				24508.22	90.91
VI	**Cost C3**					
24	Managerial Cost				2450.82	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				26959.04	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		8.14	40691.93	
		b) Main Crop Sales Price (Rs.)			5000.00	
b.	Gross Income (Rs.)				41505.76	
c.	Net Income (Rs.)				14546.72	
d.	Cost per Quintal (Rs./q.)				3312.58	
e.	Benefit Cost Ratio (BC Ratio)				1:1.54	

Adequacy of fodder: The data regarding the adequacy of fodder in Wadanahalli micro-watershed is presented in Table 39. The results indicate that, 20 per cent of the households opined that dry fodder was adequate, 2.86 per cent of the households opined that dry fodder was inadequate and green fodder was adequate for 5.71 per cent of the households.

Table 39. Adequacy of fodder in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0.00	2	18.18	3	23.08	1	33.33	1	33.33	7	20.00
2	Inadequate-Dry Fodder	1	20.00	2	18.18	1	7.69	0	0.00	1	33.33	5	14.29
3	Adequate-Green Fodder	0	0.00	1	9.09	0	0.00	0	0.00	1	33.33	2	5.71

Annual gross income: The data regarding the annual gross income in Wadanahalli micro-watershed is presented in Table 40. The results indicate that the annual gross income was Rs. 73,000 for landless farmers, for marginal farmers it was Rs. 98,136.36, for small farmers it was Rs. 143,430.77, for semi medium farmers it was Rs. 228,333.33 and for medium farmers it was Rs. 255,666.67.

Table 40. Annual gross income in Wadanahalli micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Service/salary	0.00	5,000.00	0.00	0.00	0.00	1,571.43
2	Wage	71,000.00	44,090.91	59,076.92	21,666.67	61,666.67	53,085.71
3	Agriculture	0.00	44,045.45	84,353.85	206,666.67	194,000.00	79,517.14
4	Dairy Farm	2,000.00	5,000.00	0.00	0.00	0.00	1,857.14
Income(Rs.)		73,000.00	98,136.36	143,430.77	228,333.33	255,666.67	136,031.43

Average annual expenditure: The data regarding the average annual expenditure in Wadanahalli micro-watershed is presented in Table 41. The results indicate that the average annual expenditure is Rs. 9,854.07. For landless households it was Rs. 5,320, for marginal farmers it was Rs. 6,872.73, for small farmers it was Rs. 4,437.87, for semi medium farmers it was Rs. 25,777.78 and for medium farmers it was Rs. 35,888.89.

Table 41. Average annual expenditure in Wadanahalli micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Service/salary	0.00	17,500.00	0.00	0.00	0.00	1,000.00
2	Wage	21,600.00	27,700.00	27,153.85	4,000.00	26,666.67	23,714.29
3	Agriculture	0.00	16,900.00	30,538.46	73,333.33	81,000.00	29,400.00
4	Dairy Farm	5,000.00	13,500.00	0.00	0.00	0.00	914.29
Total		26,600.00	75,600.00	57,692.31	77,333.33	107,666.67	344,892.31
Average		5,320.00	6,872.73	4,437.87	25,777.78	35,888.89	9,854.07

Horticulture species grown: The data regarding horticulture species grown in Wadanahalli micro-watershed is presented in Table 42. The results indicate that, sampled households have grown 2 lemon trees and 5 mango trees in their field.

Table 42. Horticulture species grown in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Lemon	0	0	0	0	0	0	2	0	0	0	2	0
2	Mango	0	0	1	0	1	0	3	0	0	0	5	0

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

Forest species grown: The data regarding forest species grown in Wadanahalli micro-watershed is presented in Table 43. The results indicate that, households have planted 1 tamarind, 5 banyan and 114 neem trees in their field.

Table 43: Forest species grown in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Neem	0	0	9	1	69	0	21	0	15	0	114	1
2	Tamarind	0	0	1	0	0	0	0	0	0	0	1	0
3	Banyan	0	0	0	0	1	0	4	0	0	0	5	0

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

Average Additional investment capacity: The data regarding average additional investment capacity in Wadanahalli micro-watershed is presented in Table 44. The results indicated that, households have an average investment capacity of Rs. 4,857.14 for land development.

Table 44: Additional investment capacity in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)	MF (11)	SF (13)	SMF (3)	MDF (3)	All (35)
1	Land development	0.00	4,090.91	6,000.00	10,000.00	5,666.67	4,857.14

Source of additional investment: The data regarding source of funds for additional investment in Wadanahalli micro-watershed is presented in Table 45. The results indicated that loan from bank was the source of additional investment for 2.86 per cent for land development and soft loan was the source of additional investment for 45.71 per cent of the households for land development.

Table 45: Source of funds for additional investment capacity in Hire Bagnalu-4 micro-watershed

Sl.No	Item	Land development	
		N	%
1	Loan from bank	1	2.86
2	Soft loan	16	45.71

Table 46. Marketing of the agricultural produce in Wadanahalli micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Cotton	186.0	0.0	186.0	100.0	5087.5
2	Green gram	33.0	0.0	33.0	100.0	4250.0
3	Groundnut	20.0	0.0	20.0	100.0	5000.0
4	Red gram	242.0	0.0	242.0	100.0	4560.0
5	Sorghum	36.0	11.0	25.0	69.44	2833.33

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Wadanahalli micro-watershed is presented in Table 46. The results indicated that, cotton green gram, groundnut and red gram were sold to the extent of 100 per cent and sorghum was sold to the extent of 69.44 per cent.

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Wadanahalli micro-watershed is presented in Table 47. The results indicated that, about 34.29 per cent of the farmers sold their produce to local/village merchants, 51.43 per cent of them sold in regulated markets and 2.86 per cent of them sold their produce through contract marketing arrangement.

Table 47. Marketing Channels used for sale of agricultural produce in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0.00	7	63.64	3	23.08	1	33.33	1	33.33	12	34.29
2	Regulated Market	0	0.00	4	36.36	10	76.92	2	66.67	2	66.67	18	51.43
3	Contract marketing arrangement	0	0.00	1	9.09	0	0.00	0	0.00	0	0.00	1	2.86

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Wadanahalli micro-watershed is presented in Table 48. The results indicated that, 88.57 per cent of the households have used tractor as a mode of transportation for their agricultural produce.

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

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Tractor	0	0.00	12	109.09	13	100.00	3	100.00	3	100.00	31	88.57

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Wadanahalli micro-watershed is presented in Table 49. The results indicated that, 5.71 per cent of the households have experienced soil and water erosion problems in the farm.

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

Sl. No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0.00	2	18.18	0	0.00	0	0.00	0	0.00	2	5.71

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Wadanahalli micro-watershed is presented in Table 50. The results indicated that, 85.71 per cent have shown interest in soil test.

Table 50. Interest shown towards soil testing in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0.00	11	100.00	13	100.00	3	100.00	3	100.00	30	85.71

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Wadanahalli micro-watershed is presented in Table 51. The results indicated that, 100 per cent of the households used firewood as a source of fuel.

Table 51. Usage pattern of fuel for domestic use in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	5	100.00	11	100.00	13	100.00	3	100.00	3	100.00	35	100.00

Source of drinking water: The data regarding source of drinking water in Wadanahalli micro-watershed is presented in Table 52. The results indicated that, piped supply was the major source of drinking water for 82.86 per cent of the households in the micro watershed and bore well was the source of drinking water for 17.14 per cent of the households.

Table 52. Source of drinking water in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	5	100.00	11	100.00	10	76.92	1	33.33	2	66.67	29	82.86
2	Bore Well	0	0.00	0	0.00	3	23.08	2	66.67	1	33.33	6	17.14

Source of light: The data regarding source of light in Wadanahalli micro-watershed is presented in Table 53. The results indicated that, Electricity was the major source of light for 100 per cent of the households in micro watershed.

Table 53. Source of light in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100.00	11	100.00	13	100.00	3	100.00	3	100.00	35	100.00

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facility in Wadanahalli micro-watershed is presented in Table 54. The results indicated that, 54.29 per cent of the households possess sanitary toilet facility.

Table 54. Existence of Sanitary toilet facility in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	2	40.00	6	54.55	7	53.85	2	66.67	2	66.67	19	54.29

Possession of PDS card: The data regarding possession of PDS card in Wadanahalli micro-watershed is presented in Table 55. The results indicated that, 100 per cent of the sampled households possessed BPL card.

Table 55. Possession of PDS card in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100.00	11	100.00	13	100.00	3	100.00	3	100.00	35	100.00

Participation in NREGA program: The data regarding participation in NREGA programme in Wadanahalli micro-watershed is presented in Table 56. The results indicated that, 71.43 per cent of the households participated in NREGA programme.

Table 56. Participation in NREGA programme in Wadanahalli micro-watershed

Sl. No.	Particulars	LL(5)		MF (11)		SF(13)		SMF(3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	3	60	9	81.82	9	69.23	2	66.67	2	66.67	25	71.43

Adequacy of food items: The data regarding adequacy of food items in Wadanahalli micro-watershed is presented in Table 57. The results indicated that, cereals were adequate for 45.71 per cent of the households, pulses were adequate for 51.43 per cent, oilseeds were adequate for 57.14 per cent, vegetables were adequate for 77.14 per cent, fruits were adequate for 22.86 per cent, milk was adequate for 28.57 per cent and eggs were adequate for 14.29 per cent.

Table 57. Adequacy of food items in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	0	0.00	6	54.55	4	30.77	3	100.00	3	100.00	16	45.71
2	Pulses	0	0.00	6	54.55	6	46.15	3	100.00	3	100.00	18	51.43
3	Oilseed	0	0.00	9	81.82	7	53.85	2	66.67	2	66.67	20	57.14
4	Vegetables	1	20.00	9	81.82	11	84.62	3	100.00	3	100.00	27	77.14
5	Fruits	0	0.00	1	9.09	6	46.15	0	0.00	1	33.33	8	22.86
6	Milk	0	0.00	3	27.27	4	30.77	1	33.33	2	66.67	10	28.57
7	Egg	0	0.00	1	9.09	0	0.00	2	66.67	2	66.67	5	14.29

Table 58. Response on Inadequacy of food items in Wadanahalli micro-watershed

Sl.No.	Particulars	LL (5)		MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	5	100.00	5	45.45	8	61.54	0	0.00	0	0.00	18	51.43
2	Pulses	5	100.00	5	45.45	8	61.54	0	0.00	0	0.00	18	51.43
3	Oilseed	5	100.00	2	18.18	6	46.15	1	33.33	1	33.33	15	42.86
4	Vegetables	4	80.00	2	18.18	2	15.38	0	0.00	0	0.00	8	22.86
5	Fruits	5	100.00	9	81.82	7	53.85	3	100.00	1	33.33	25	71.43
6	Milk	5	100.00	8	72.73	7	53.85	2	66.67	1	33.33	23	65.71
7	Egg	5	100.00	10	90.91	13	100.00	1	33.33	1	33.33	30	85.71
8	Meat	3	60.00	10	90.91	12	92.31	2	66.67	1	33.33	28	80.00

Response on Inadequacy of food items: The data regarding inadequacy of food items in Wadanahalli micro-watershed is presented in Table 58. The results indicated that, cereals were inadequate for 51.43 per cent, pulses were inadequate for 51.43 per cent of the households, oilseeds were inadequate for 42.86 per cent, vegetables were inadequate for 22.86 per cent, fruits were inadequate for 71.43 per cent, milk was inadequate for 65.71 per cent, eggs were inadequate for 85.71 per cent and meat was inadequate for 80 per cent of the households.

Farming constraints: The data regarding farming constraints experienced by households in Wadanahalli micro-watershed is presented in Table 59. The results indicated that, lower fertility status of the soil was the constraint experienced by 85.71 per cent of the households, wild animal menace on farm field (82.86%), frequent incidence of pest and diseases (42.86%), inadequacy of irrigation water (45.71%), high cost of fertilizers and plant protection chemicals (42.86%), low price for the agricultural commodities (25.71%), lack of marketing facilities in the area (11.43%), lack of transport for safe transport of the agricultural produce to the market (31.43%), less rainfall (60%), inadequate extension services (2.86%) and Source of Agri-technology information (5.71%).

Table 59. Farming constraints Experienced in Wadanahalli micro-watershed

Sl. No.	Particulars	MF (11)		SF (13)		SMF (3)		MDF (3)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	11	100	13	100	3	100	3	100	30	85.71
2	Wild animal menace on farm field	10	90.91	13	100	3	100	3	100	29	82.86
3	Frequent incidence of pest and diseases	5	45.45	7	53.85	2	66.67	1	33.33	15	42.86
4	Inadequacy of irrigation water	6	54.55	6	46.15	2	66.67	2	66.67	16	45.71
5	High cost of Fertilizers and plant protection chemicals	6	54.55	6	46.15	2	66.67	1	33.33	15	42.86
6	High rate of interest on credit	1	9.09	3	23.08	0	0	1	33.33	5	14.29
7	Low price for the agricultural commodities	4	36.36	3	23.08	1	33.33	1	33.33	9	25.71
8	Lack of marketing facilities in the area	0	0	3	23.08	1	33.33	0	0	4	11.43
9	Inadequate extension services	0	0	0	0	0	0	1	33.33	1	2.86
10	Lack of transport for safe transport of the Agril produce to the market.	4	36.36	7	53.85	0	0	0	0	11	31.43
11	Less rainfall	7	63.64	10	76.92	1	33.33	3	100	21	60
12	Source of Agri-technology information(Newspaper/TV/Mobile)	0	0	1	7.69	1	33.33	0	0	2	5.71

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 analyse the data. About 35 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 105 (59.66%) men and 71 (40.34%) women among the sampled households. The average family size of landless farmers' was 4.40, marginal farmers' was 5.18, small farmers' was 5, semi medium farmers' was 4.67 and medium farmers' was 6.

The data indicated that, 28 (15.91%) people were in 0-15 years of age, 83 (47.16%) were in 16-35 years of age, 60 (34.09%) were in 36-60 years of age and 5 (2.84%) were above 61 years of age.

The results indicated that Wadanahalli had 54.55 per cent illiterates, 21.59 per cent of them had primary school education, 2.84 per cent of them had middle school education, 9.66 per cent of them had high school education, 5.11 per cent of them had PUC education, 1.14 per cent had diploma and 4.55 per cent of them had degree education.

The results indicate that, 91.43 per cent of household heads were practicing agriculture and 8.57 per cent of the household heads were agricultural labourers. The results indicate that agriculture was the major occupation for 18.75 per cent of the household members, 55.68 per cent were agricultural laborers, 23.30 per cent were students and 2.27 per cent were housewives.

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 37.14 per cent of the households possess thatched house, 37.14 per cent of the households possess katcha house and 25.71 per cent of them possess pucca/RCC house.

The results show that 71.43 per cent of the households possess TV, 28.57 per cent of them possess mixer/grinder, 5.71 per cent of them possess bicycle, 22.86 per cent of the households possess motor cycle, 8.57 per cent possess auto, 2.86 per cent possess tempo and 82.86 per cent of the households possess mobile phones. The results show that the average value of television was Rs. 6680, mixer grinder was Rs.1950, bicycle was Rs.1000, motor cycle was Rs. 68,750, auto was Rs. 31,000, tempo was Rs. 350000 and mobile phone was Rs.2110.

About 14.29 per cent of the households possess bullock cart, 22.86 per cent of them possess plough, 14.29 per cent of them possess sprayer, 20 per cent of them possess harvester and 28.57 per cent of them possess weeder. The results show that the average value of bullock cart was Rs. 25,000, plough was Rs. 4,750, sprayer was Rs. 3,428, harvester was Rs. 1430 and the average value of weeder was Rs.1015.

The results indicate that, 25.71 per cent of the households possess bullocks, 22.86 per cent of the households possess local cow, 8.57 per cent possess buffalo and 5.71 per cent of the households possess goat.

The results indicate that, average own labour men available in the micro watershed was 1.86, average own labour (women) available was 1.67, average hired labour (men) available was 6.06 and average hired labour (women) available was 6.23. The results indicate that, 100 per cent of the households opined that the hired labour was inadequate.

The results indicate that, households of the Wadanahalli micro-watershed possess 36.56 ha (84.90%) of dry land and 6.50 ha (15.10%) of irrigated land. Marginal farmers possess 7.90 ha (100%) of dry land. Small farmers possess 17.66 ha (95.62%) of dry land and 0.81 ha (4.38%). Semi medium farmers possess 6.96 ha (100%) of dry land. Medium farmers possess 4.05 ha (41.55%) of dry land and 5.69 ha (58.45%) of irrigated land.

The results indicate that, the average value of dry land was Rs. 317,157.41 and the average value of irrigated land was Rs. 215,183.57. In case of marginal famers, the average land value was Rs. 557,047.67 for dry land. In case of small famers, the average land value was Rs. 271,739.63 for dry land and Rs. 494,000 for irrigated land. In case of semi medium famers, the average land value was Rs. 172,325.58 for dry land. In case of medium farmers, the average land value was Rs. 296,400 for dry land and Rs. 175,550.82 for irrigated land.

The results indicate that, there were 2 functioning bore well in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 5.71 per cent of the farmers and canal was the major source of irrigation for 2.86 per cent of the farmers. The results indicate that, the depth of bore well was found to be 2.53 meters.

The results indicate that small and medium farmers had an irrigated area of 0.81 ha and 2.46 ha respectively. The results indicate that, farmers have grown red gram (17.28 ha), green gram (3.81 ha), sorghum (3.32 ha), cotton (14.84 ha) and groundnut (2.46 ha). Marginal and small farmers have grown cotton, green gram, red gram and sorghum. Semi medium farmers have grown cotton and red gram. Medium farmers have grown cotton and groundnut.

The results indicate that, the cropping intensity in Wadanahalli micro-watershed was found to be 91.31 per cent. The results indicate that, 45.71 per cent of the households

have bank account and savings. The results indicate that, 45.71 per cent of the households have availed credit from different sources.

The results indicate that, 68.75 per cent of the households availed loan from commercial bank and 31.25 per cent of the households obtained loan from money lenders. The results indicate that, average credit availed in the micro watershed was Rs. 88,125. The results indicate that, 100 per cent of the households have borrowed loan from institutional sources for the purpose of agricultural production. The results indicate that, 100 per cent of the households have borrowed loan from private sources for the purpose of agricultural production.

The results indicated that 50 per cent of the households partially paid and 50 per cent of the households did not repay their loan borrowed from institutional sources. The results indicated that 80 per cent of the households partially paid and 20 per cent of the households did not repay their loan borrowed from private sources.

The results indicate that, around 41.67 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations, 50 per cent of the households opined that loan amount was adequate to fulfil the requirement and 8.33 per cent opined that they were forced to sell the produce at low price to repay loan in time.

The results indicate that, around 60 per cent opined that the loan amount borrowed from non-institutional sources helped to perform timely agricultural operations and 40 per cent opined that loan amount was adequate to fulfil the requirement.

The results indicate that, the total cost of cultivation for red gram was Rs. 30214.15. The gross income realized by the farmers was Rs. 62515.40. The net income from red gram cultivation was Rs. 32301.25. Thus the benefit cost ratio was found to be 1:2.07. The total cost of cultivation for green gram was Rs. 44142.08. The gross income realized by the farmers was Rs. 37093.34. The net income from green gram cultivation was Rs. -7048.75. Thus the benefit cost ratio was found to be 1:0.84. The total cost of cultivation for cotton was Rs. 40607.93. The gross income realized by the farmers was Rs. 77825.42. The net income from cotton cultivation was Rs. 37217.49. Thus the benefit cost ratio was found to be 1:1.92. The total cost of cultivation for sorghum was Rs. 32547.84. The gross income realized by the farmers was Rs. 34671.48. The net income from sorghum cultivation was Rs. 2123.64. Thus the benefit cost ratio was found to be 1:1.07. The total cost of cultivation for groundnut was Rs. 26959.04. The gross income realized by the farmers was Rs. 41505.76. The net income from groundnut cultivation was Rs. 14546.72. Thus the benefit cost ratio was found to be 1:1.54. The results indicate that, 20 per cent of the households opined that dry fodder was adequate, 2.86 per cent of the households opined that dry fodder was inadequate and green fodder was adequate for 5.71 per cent of the households. The results indicate that the annual gross income was Rs.

73,000 for landless farmers, for marginal farmers it was Rs. 98,136.36, for small farmers it was Rs. 143,430.77, for semi medium farmers it was Rs. 228,333.33 and for medium farmers it was Rs. 255,666.67.

The results indicate that the average annual expenditure is Rs. 9,854.07. For landless households it was Rs. 5,320, for marginal farmers it was Rs. 6,872.73, for small farmers it was Rs. 4,437.87, for semi medium farmers it was Rs. 25,777.78 and for medium farmers it was Rs. 35,888.89.

The results indicate that, sampled households have grown 2 lemon trees and 5 mango trees in their field. The results indicate that, households have planted 1 tamarind, 5 banyan and 114 neem trees in their field.

The results indicated that, households have an average investment capacity of Rs. 4,857.14 for land development. The results indicated that loan from bank was the source of additional investment for 2.86 per cent for land development and soft loan was the source of additional investment for 45.71 per cent of the households for land development.

The results indicated that, cotton green gram, groundnut and red gram were sold to the extent of 100 per cent and sorghum was sold to the extent of 69.44 per cent. The results indicated that, about 34.29 per cent of the farmers sold their produce to local/village merchants, 51.43 per cent of them sold in regulated markets and 2.86 per cent of them sold their produce through contract marketing arrangement. The results indicated that, 88.57 per cent of the households have used tractor as a mode of transportation for their agricultural produce.

The results indicated that, 5.71 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, 100 per cent of the households used firewood as a source of fuel. The results indicated that, piped supply was the major source of drinking water for 82.86 per cent of the households in the micro watershed and bore well was the source of drinking water for 17.14 per cent of the households.

Electricity was the major source of light for 100 per cent of the households in micro watershed. The results indicated that, 54.29 per cent of the households possess sanitary toilet facility. The results indicated that, 100 per cent of the sampled households possessed BPL card. The results indicated that, 71.43 per cent of the households participated in NREGA programme.

The results indicated that, cereals were adequate for 45.71 per cent of the households, pulses were adequate for 51.43 per cent, oilseeds were adequate for 57.14 per

cent, vegetables were adequate for 77.14 per cent, fruits were adequate for 22.86 per cent, milk was adequate for 28.57 per cent and eggs were adequate for 14.29 per cent.

The results indicated that, cereals were inadequate for 51.43 per cent, pulses were inadequate for 51.43 per cent of the households, oilseeds were inadequate for 42.86 per cent, vegetables were inadequate for 22.86 per cent, fruits were inadequate for 71.43 per cent, milk was inadequate for 65.71 per cent, eggs were inadequate for 85.71 per cent and meat was inadequate for 80 per cent of the households.

The results indicated that, lower fertility status of the soil was the constraint experienced by 85.71 per cent of the households, wild animal menace on farm field (82.86%), frequent incidence of pest and diseases (42.86%), inadequacy of irrigation water (45.71%), high cost of fertilizers and plant protection chemicals (42.86%), low price for the agricultural commodities (25.71%), lack of marketing facilities in the area (11.43%), lack of transport for safe transport of the agricultural produce to the market (31.43%), less rainfall (60%), inadequate extension services (2.86%) and Source of Agri-technology information (5.71%).