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

ABBAGERE (4D3A9B1d) MICROWATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

The Bureau has been engaged in carrying out soil resource survey, agro-ecological and soil degradation mapping at the country, state and district levels for qualitative assessment and monitoring the soil health towards viable land use planning. The research activities have resulted in identifying the soil potentials and problems, and the various applications of the soil surveys with the ultimate objective of sustainable agricultural development. The Bureau has the mandate to correlate and classify soils of the country and maintain a National Register of all the established soil series. The Institute is also imparting in-service training to staff of the soil survey agencies in the area of soil survey, land evaluation and soil survey interpretations for land use planning. The Bureau in collaboration with Panjabrao Krishi Vidyapeeth, Akola is running post-graduate teaching and research programme in land resource management, leading to M.Sc. and Ph.D. degrees.

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PREFACE

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

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

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

The natural resources (land, water and vegetation) of the state need adequate and constant care and management, backed by site-specific technological interventions and investments particularly by the government. Detailed database pertaining to the nature of

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

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

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

Nagpur
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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

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

The present study covers an area of 721 ha in Koppal taluk and district, Karnataka. The climate is semiarid and categorized as drought - prone with an average annual rainfall of 662 mm, of which about 424 mm is received during south –west monsoon, 161 mm during north-east and the remaining 77 mm during the rest of the year. An area of about 86 per cent is covered by soils, 6 per cent by rock out crops,<1 per cent by mining/industrial area, 7 per cent by water bodies, settlements and others. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 14 soil series and 34 soil phases (management units) and 7 Land management Units.*
- *The length of crop growing period is <90 days and starts from 2nd week of August to 2nd week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 28 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area is suitable for agriculture.*
- *About 8 per cent of the soils are shallow (25-50 cm), 15 per cent is moderately shallow (50-75 cm), 51 per cent moderately deep (75- 100 cm) and 12 per cent has deep to very deep soils (100 ->150 cm).*
- *An area of about 9 per cent has sandy surface, 64 per cent loamy soils and 13 per cent has clayey soils at the surface.*
- *About 27 per cent of the area has non-gravelly (<15%) soils, 54 per cent has gravelly soils (15-35 % gravel), 6 per cent very gravelly (35- 60% gravel) and <1 per cent has extremely gravelly (60-80%) soils.*

- *With respect to available water capacity 63 per cent of the area has very low (<50mm/m), 15 per cent of the area has low (51-100 mm/m), 8 per cent medium (101-150 mm/m) and <1 per cent area has very high (>200mm/m).*
- *An area of about 5 per cent has nearly level (0-1%) lands, 81 per cent very gently sloping (1-3%) lands and <1 per cent has gently sloping lands(3-5%).*
- *An area of about 15 per cent is slightly eroded (e1) and 71 per cent is moderately eroded (e2) lands.*
- *An area of about 10 per cent moderately acid (pH 5.5 to 6.0), 15 per cent slightly acid (pH 6.0-6.5) 44 per cent has neutral (pH 6.5 to 7.3) soils, 13 per cent slightly alkaline (pH 7.3 to 7.8) and 5 per cent moderately alkaline (pH 7.8 to 8.4).*
- *The Electrical Conductivity (EC) of the soils are <2 dsm^{-1} indicating that the soils are non saline.*
- *Organic carbon is medium (0.5-0.75%) in 11 per cent and high (>0.75%) in 75 per cent area of the soils.*
- *Available phosphorus is low (<23 kg/ha) in 9 per cent, medium (23-57 kg/ha) in 34 per cent and high (>57 kg/ha) in 43 per cent of the soils.*
- *Available potassium is low (<145 kg/ha) in 28 per cent, medium (145-337 kg/ha) in 46 per cent and high (>337 kg/ha) in 12 per cent of the soils.*
- *Available sulphur is low (<10 ppm) in 57 per cent and medium (10-20 ppm) in 30 per cent area of the soils.*
- *Available boron is low (<0.5 ppm) in about 77 per cent and medium (0.5-1.0 ppm) in 9 per cent area of the soils.*
- *Available iron is deficient in 32 per cent of the area and sufficient (>4.5 ppm) in 55 per cent of the area.*
- *Available zinc is deficient (<0.6 ppm) in 47 per cent of the area and sufficient (>0.6 ppm) in 39 per cent of the area.*
- *Available manganese and copper are sufficient in the entire area.*
- *The land suitability for 28 major agricultural and horticultural crops grown in the microwatershed was assessed and the areas that are highly suitable (class S1) and moderately suitable (class S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price, and finally the demand and supply position.*

Land suitability for various crops in the microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*9 (1)*	*140(19)*		*Pomegranate*	-	*174(24)*
Maize	*9 (1)*	*140(19)*		*Guava*	-	*147(20)*
Bajra	*9 (1)*	*275(38)*		*Jackfruit*	-	*147(20)*
Redgram	-	*30(4)*		*Jamun*	-	*117(16)*
Bengal gram	*9(1)*	*158 (22)*		*Musambi*	-	*174 (24)*
Groundnut	-	*325 (45)*		*Lime*	-	*174 (24)*
Sunflower	-	*57(8)*		*Cashew*	-	*309(43)*
Cotton	-	*149 (20)*		*Custard apple*	-	*562 (78)*
Chilli	-	*122(17)*		*Amla*	-	*562(78)*
Tomato	*9(1)*	*113(15)*		*Tamarind*		*38(5)*
Drumstick	-	*143 (20)*		*Marigold*	-	*122(20)*
Mulbery	-	*470(65)*		*Chrysanthemum*	-	*122(20)*
Mango	-	-		*Jasmine*	-	*122 (17)*
Sapota	-	*147(20)*		*Crossandra*	-	*149(20)*

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 7 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 to crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested to these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation 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 supplementing the farm income, provide fodder and fuel, and generate lot of biomass which in turn would help in maintaining the ecological balance and contribute to mitigating the climate change.*

Chapter 1

INTRODUCTION

Land is a scarce resource and basic unit for any material production. It can support the needs of the growing population, provided they use the land in a rational and judicious manner. But what is happening in many areas of the state is a cause for concern to everyone involved in the management of land resources at the grassroots level. The area available for agriculture is about 51 per cent of the total geographical area and more than 60 per cent of the people are still dependant on agriculture for their livelihood. The limited land area is under severe stress and strain due to increasing population pressure and competing demands of various land uses. Due to this, every year there is significant diversion of farm lands and water resources for non-agricultural purposes. Apart from this, due to lack of interest in farmers for farming, large tracts of cultivable lands are turning into fallows in many areas and this trend is continuing at an alarming rate.

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

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

Therefore, the land resource inventory required for farm level planning is the one which investigates not only the surface but also consider the other parameters which are critical for productivity *viz.*, soils, climate, water, minerals and rocks, topography, geology, hydrology, vegetation, crops, land use pattern, animal population, socio-

economic conditions, infrastructure, marketing facilities and various schemes and developmental works of the government etc. From the data collected at farm level, the specific problems and potentials of the area can be identified and highlighted, conservation measures required for the area can be planned on a scientific footing, suitability of the area for various uses can be worked out and finally viable and sustainable land use options suitable for each and every land holding can be prescribed.

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

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

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

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Abbagiri micro-watershed is located in the central part of Karnataka in Koppal taluk and district (Fig2.1). It lies between17^{0}03' and 17^{0}08' North latitudes and 63^{0}50' and 61^{0}71' East longitudes and covers an area of about 721 ha. It comprises parts of Karadigudda, Abbigeri, Tavarageri, Kenchanadoni and Kukanapalli villages. It is about 67 km from Koppal town and is bounded by Tavarageri on the south, Kukanapalli on the east, Kenchanadoni on the north and Karadigudda on the western side of the microwatershed.

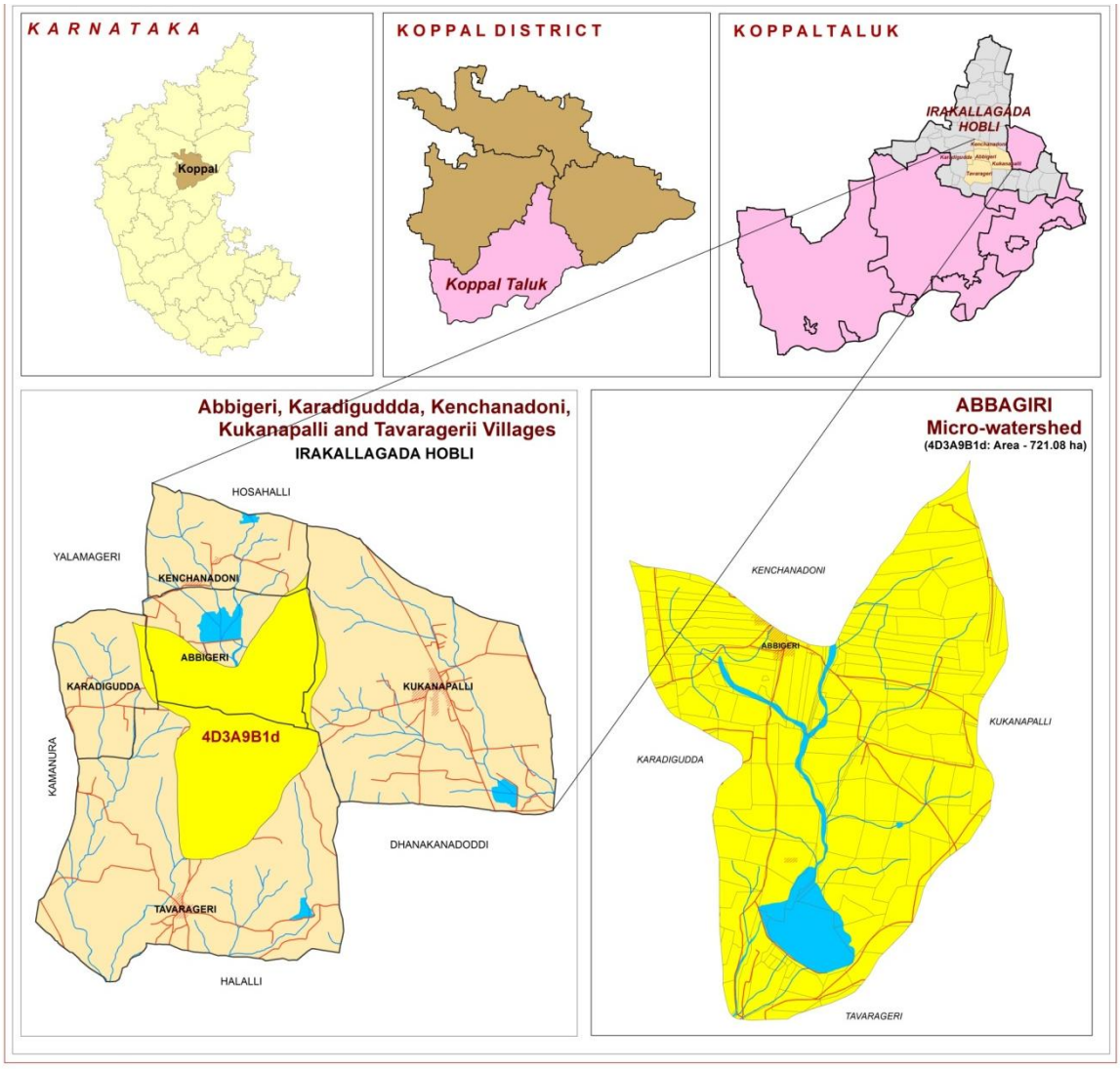


Fig.2.1 Location map of Abbagiri Microwatershed

2.2 Geology

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

medium grained. They consist primarily of quartz, feldspar, biotite and hornblende. The gray granite gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in Abbagiri village. The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent paleo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2a Granite and granite gneiss rocks

Fig.2.2b Alluvium

2.3 Physiography

Physiographically, the area has been identified as Granite gneiss and Alluvial landscapes based on geology. The microwatershed area has been further divided into mounds/ridges, summits, side slopes and very gently sloping uplands and nearly level plains based on slope and its relief features. The elevation ranges from 540 to 566 m in the gently sloping uplands. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

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

2.5 Climate

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

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

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

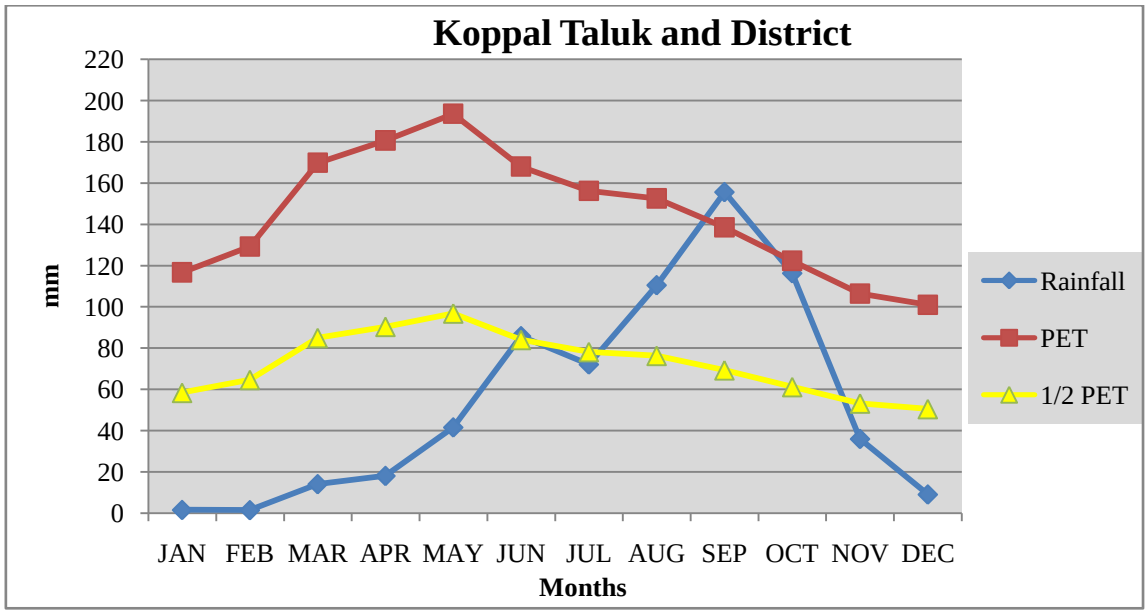


Fig. 2.3 Rainfall distribution in Koppal Taluk and District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Abbagiri microwatershed

2.7 Land Utilization

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

Table 2.2 Land Utilization in Koppal District

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

Fig.2.5 (a) Different crops and cropping systems in Abbagiri Microwatershed

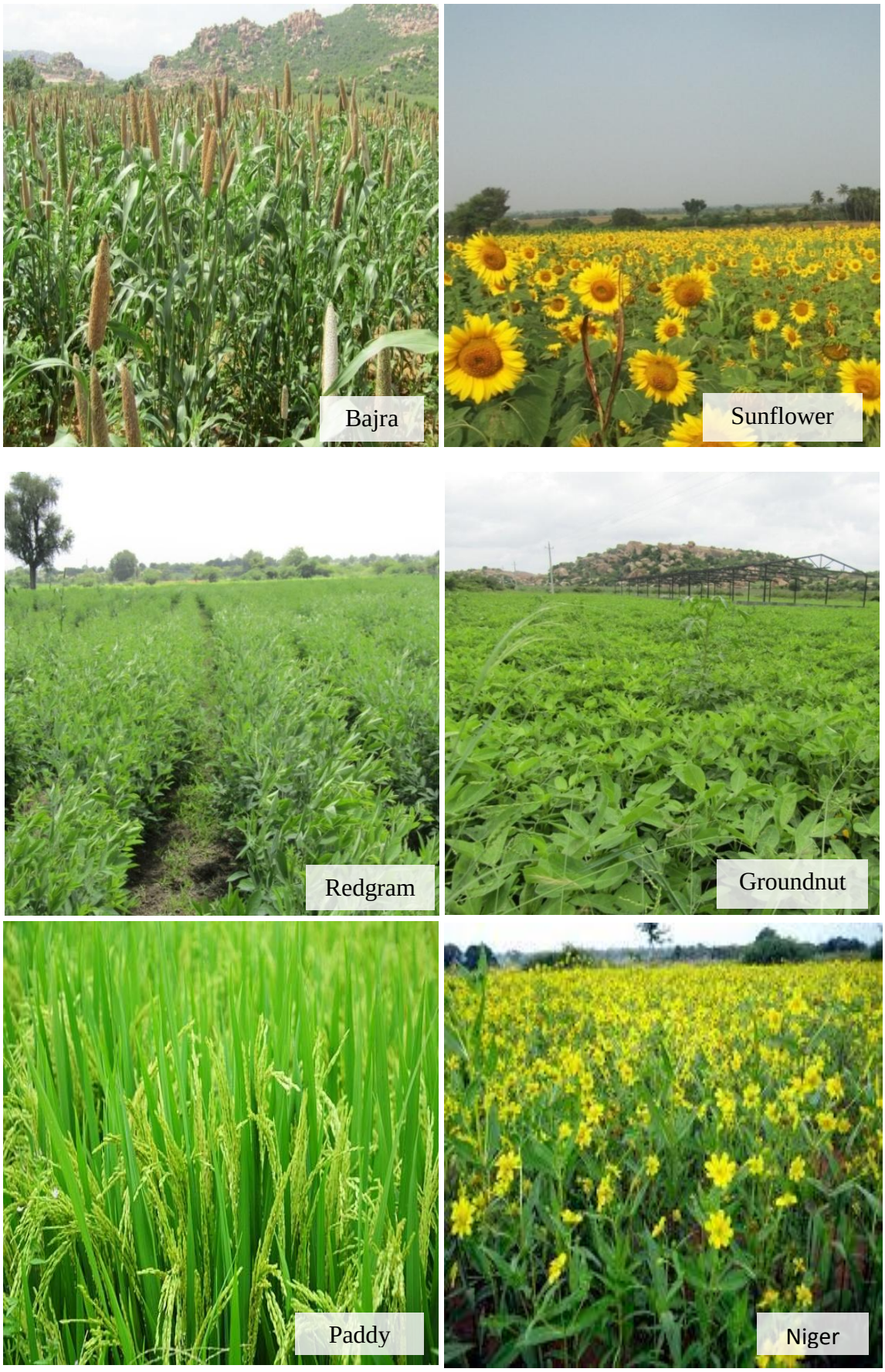


Fig.2.5(b) Different crops and cropping systems in Abbagiri Microwatershed

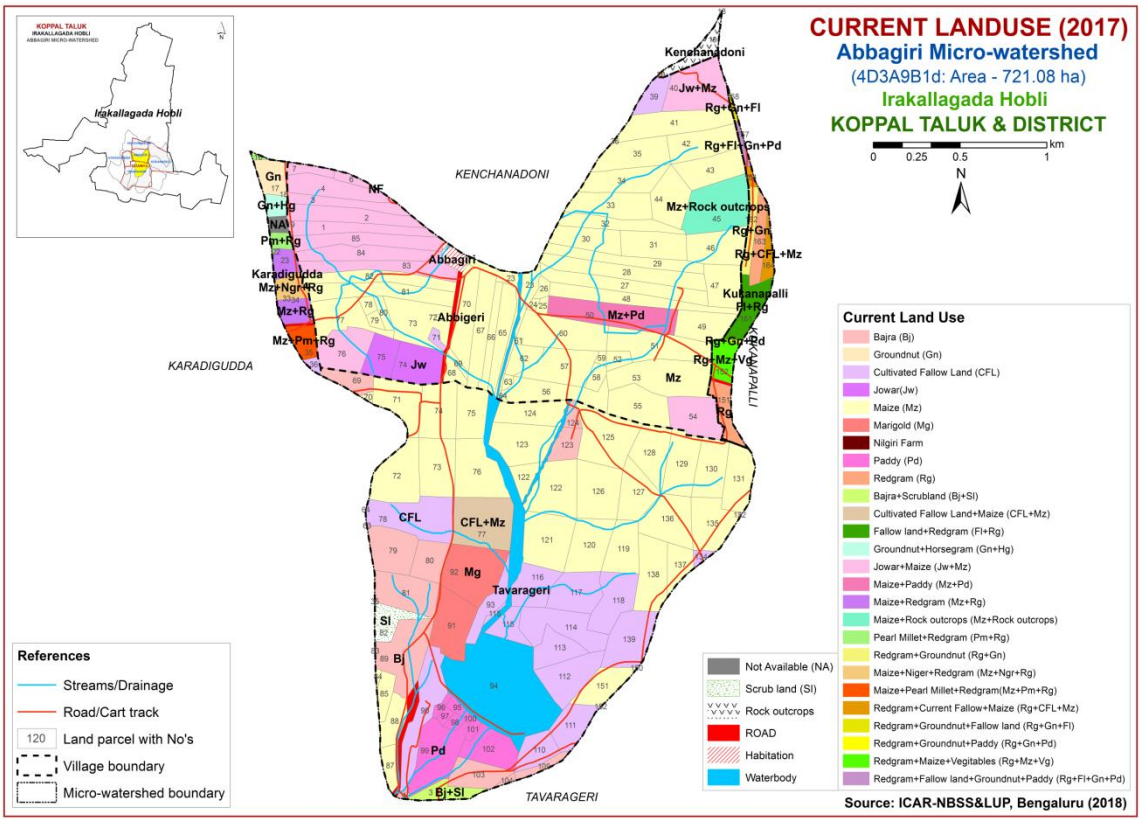


Fig.2.6 Current Land Use – AbbagiriMicrowatershed

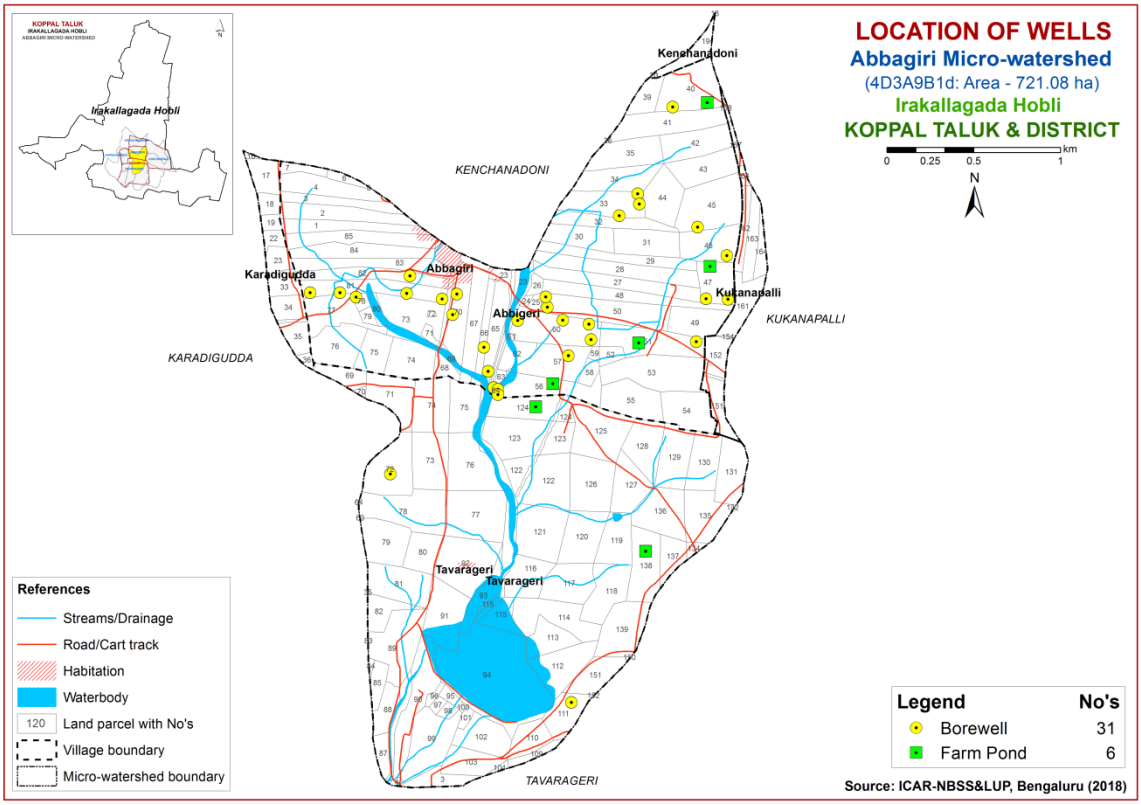


Fig.2.7 Location of wells and conservation structures– AbbagiriMicrowatershed

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 to a given level of management. This was achieved in Abbagiri 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 (slope, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units and showing their extent and geographic distribution on the microwatershed cadastral map. The detailed soil survey at 1:7920 scale was carried out in 721ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

Image Interpretation Legend for Physiography

G- Granite gneiss landscape

G1 Hills/ Ridges/ Mounds

G11 Summits

G12 Side slopes

G121 Side slopes with dark grey tones

G2 Uplands

G21 Summits

G22 Gently sloping uplands

G221 Gently sloping uplands, yellowish green (eroded)

G222 Gently sloping uplands, yellowish white (severely eroded)

G23 Very gently sloping uplands

G231 Very gently sloping uplands, yellowish green

G232 Very gently sloping uplands, medium green and pink

G233 Very gently sloping uplands, pink and green (scrub land)

G234 Very gently sloping uplands, medium greenish grey

G235 Very gently sloping uplands, yellowish white (eroded)

G236 Very gently sloping uplands, dark green

G237 Very gently sloping uplands, medium pink (coconut garden)

G238 Very gently sloping uplands, pink and bluish white (eroded)

DSe -Alluvial landscape

DSe1 Summit

DSe11Nearly level Summit with dark grey tone

DSe12 Nearly level Summit with medium grey tone

DSe13 Nearly level Summit with whitish grey tone

DSe14 Nearly level Summit with whitish tone (Calcareousness)

DSe15 Nearly level Summit with pinkish grey tone

DSe16 Nearly level Summit with medium pink tone

DSe17 Nearly level Summit with bluish white tone

DSe 18 Nearly level Summit with greenish grey tone

DSe2 Very gently sloping

DSe21 Very gently sloping, whitish tone

DSe22 Very gently sloping, greyish pink tone

DSe23 Very gently sloping, whitish grey tone

DSe24 Very gently sloping, medium grey tone

DSe25 Very gently sloping, medium pink tone

DSe26 Very gently sloping, dark grey tone

DSe27 Very gently sloping, bluish grey tone

DSe28 Very gently sloping, greenish grey tone

DSe 29 Very gently sloping, Pinkish grey

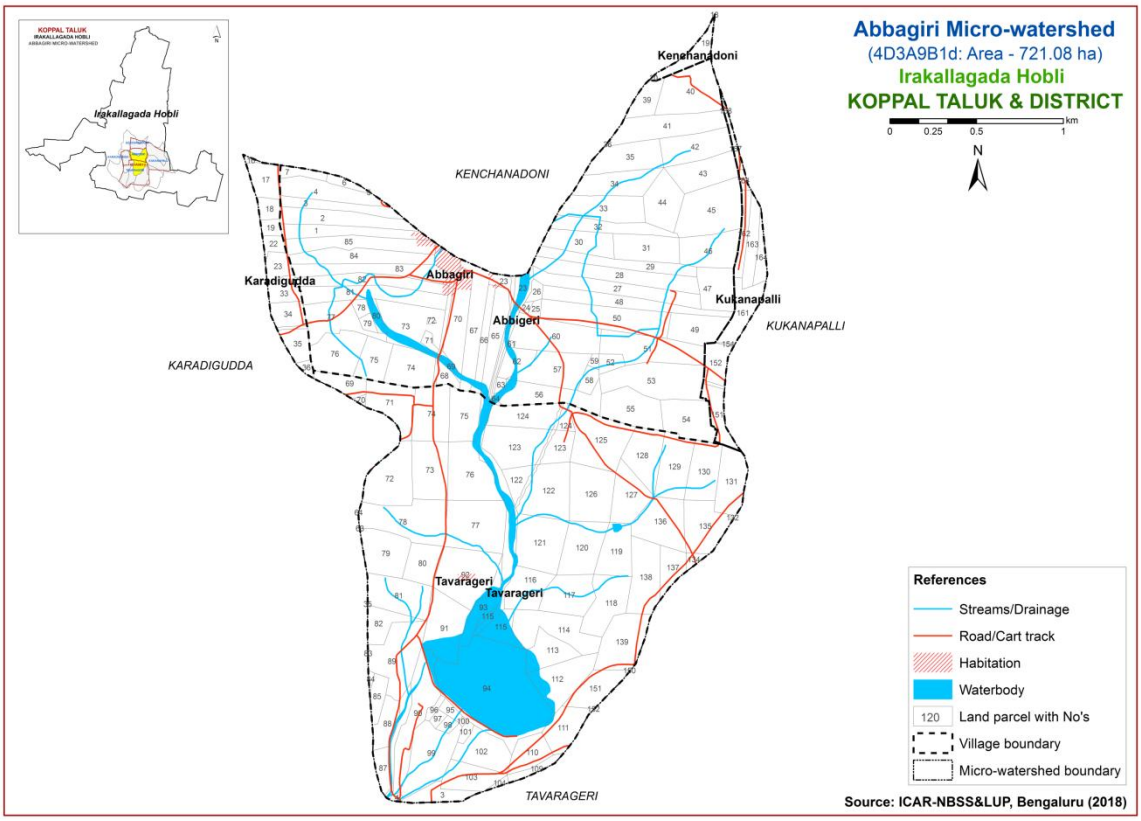


Fig 3.1 Scanned and Digitized Cadastral map of Abbagiri Microwatershed

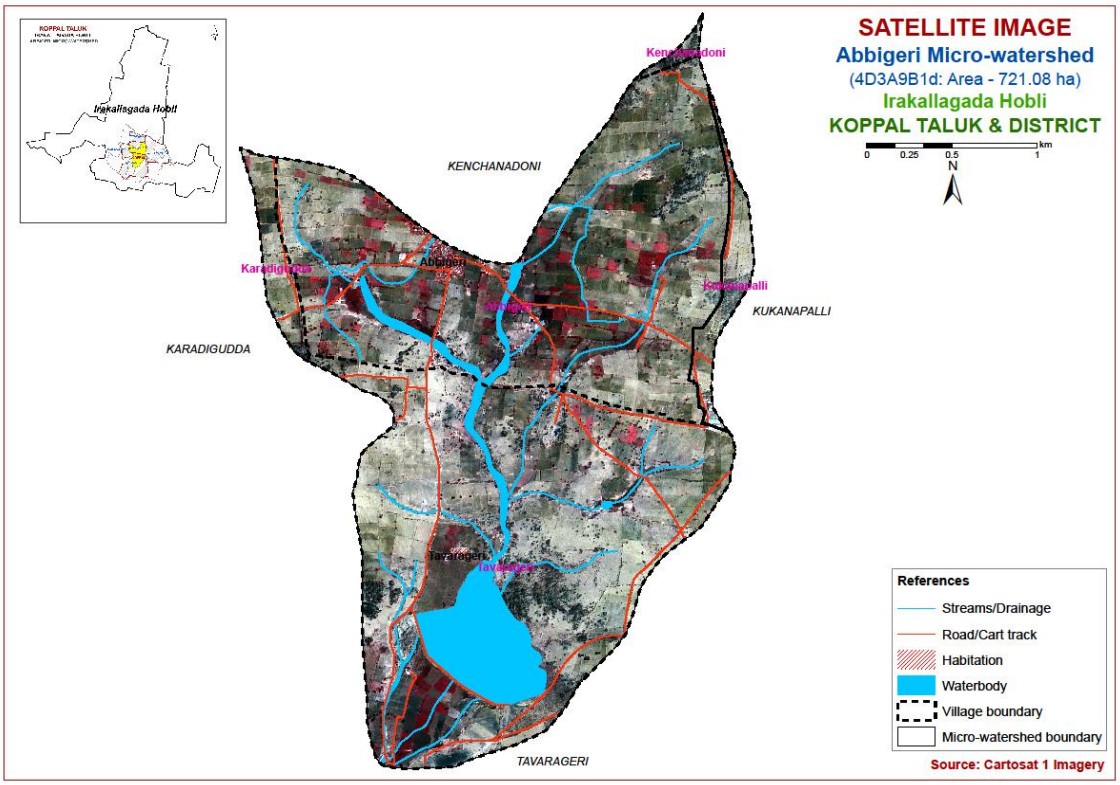


Fig.3.2 Satellite Image of Abbagiri Microwatershed

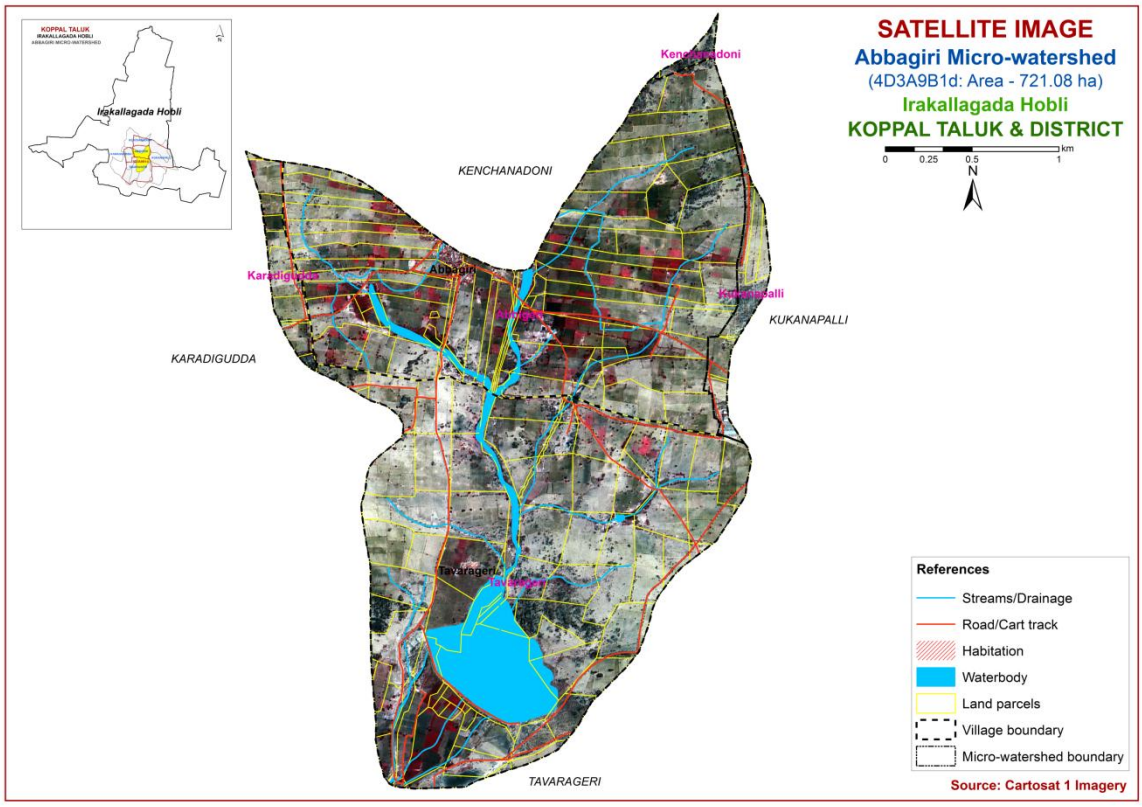


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Abbagiri Microwatershed

3.3 Field Investigation

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

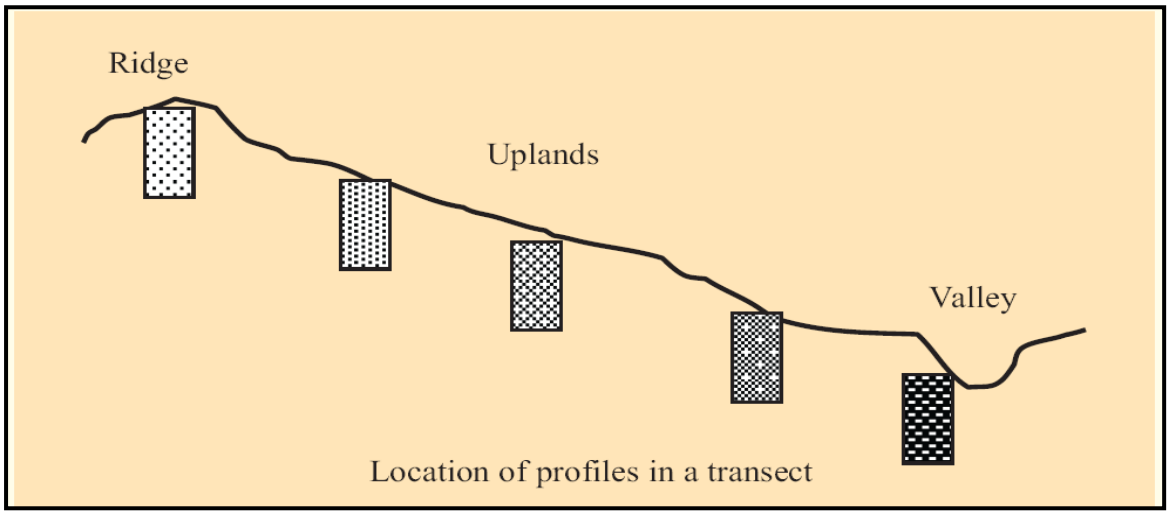


Fig: 3.4. Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, calcareousness, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 14soil series were identified in Abbagiri 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**	**Calcareo-usness**
1	Kaggalipura (KGP)	25-50	2.5YR2.5/4,3/4, 3/6	gscl-gsc	15-35	Ap-Bt-Cr	-
2	Harve (HRV)	25-50	2.5YR3/4,3/6 5YR3/3,4/4,3/4	gscl	>35	Ap-Bt-Cr-	-
3	Abbigeri (ABR)	25-50	2.5YR 3/3, 3/4	gsc-c	>35	Ap-Bt-Cr	-
4	Mukhadahalli (MKH)	50-75	5YR3/3,3/4,4/3,5/4, 6/6 2.5YR3/4	gscl	>35	Ap-Bt-Cr	-
5	Lakkur (LKR)	50-75	2.5YR 2.5/3, 2.5/4, 3/4, 3/6	gsc	40-60	Ap-Bt-Bc-Cr	-
6	Hatti (HTI)	50-75	5 YR 3/3, 3/4,	gsc	15-35	Ap-Bt-Cr	-
7	Hooradhahalli (HDH)	75-100	2.5YR2.5/4,3/4, 3/6	gsc-gc	>35	Ap-Bt-Cr	-
8	Bidanagere (BDG)	75-100	5YR3/3,3/4,4/3,5/4 2.5 YR 3/4	gc	35-60	Ap-Bt-Cr	-
9	Balapur (BPR)	100-150	2.5YR2.5/4,3/4	gsc-gc	>35	Ap-Bt-Cr	-
10	Nagalapur (NGP)	100-150	5YR2.5/2,3/2,2.5YR3/6,4/6	gsc-gc	>35	Ap-Bt-Cr	-
11	Honnenahalli (HNH)	50-75	7.5YR3/3,4/310YR 3/3	sc	-	Ap-Bw-Cr	-
12	Huliyapura (HLP)	75-100	7.5YR3/3,4/610YR 4/6	sc	-	Ap-Bw-C	-
13	Thimmasandra (TSD)	>150	10YR2/12/2,3/1, 3/2,4/1, 4/2,4/3	c	-	Ap-Bw	-
Soils of Alluvial Landscape							
14	Dambarahalli (DRL)	75-100	10YR 2/1, 3/1, 4/3	c	<15	Ap-Bw-Ck	e-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 any 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 34 mapping units representing 14soil 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 34 phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one soil phase will have similar management needs and have to be treated accordingly.

3.5 Land management Units

The 34 soil phases identified and mapped in the microwatershed were regrouped into seven 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 Abbagiri 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.

3.5 Laboratory Characterization

Soil samples for each series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2017 from farmer's fields in Abbagiri microwatershed (68 samples) for fertility status (major and micronutrients) at 320 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Abbagiri Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and granite gneiss				
	KGP	Kaggalipura soils are shallow (25-50 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay loam to sandy clay soils occurring on nearly level to moderately sloping uplands under cultivation		**8 (1.14)**
17		KGPhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	8 (1.14)
	HRV	Harve soils are shallow (25-50 cm), well drained, dark red to dark reddish brown, red gravelly sandy clay loam soils occurring on nearly level to gently sloping uplands under cultivation		**23 (3.23)**
25		HRVhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	9 (1.29)
465		HRVcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	14 (1.94)
	ABR	Abbigere soils are shallow (25-50 cm), well drained, have dark reddish brown red gravelly sandy clay to clay soils occurring on very gently sloping uplands under cultivation.		**30 (4.11)**

470		ABRbB2g2	Loamy sand surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	30 (4.11)
	MKH	Mukhadahalli soils are moderately shallow (50-75 cm), well drained, have dark brown to reddish brown red gravelly sandy clay loam soils occurring on very gently to gently sloping uplands under cultivation		**73 (10.18)**
89		MKHiB2	Sandy clay surface, slope 1-3%, moderate erosion	15 (2.13)
85		MKHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	38 (5.28)
82		MKHhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	5 (0.65)
78		MKHcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	8 (1.09)
77		MKHcB2g1	Sandy loam surface, slope 1-3%moderate erosion, gravelly (15-35%)	7 (1.03)
	LKR	Lakkur soils are moderately shallow (50-75 cm), well drained, have dark reddish brown to dark red, red gravelly sandy clay soils occurring on very gently to moderately sloping uplands under cultivation		**11 (1.45)**
49		LKRhC2g3	Sandy clay loam surface, slope 3-5%, moderate erosion, extremely gravelly (60-80%)	1 (0.08)
43		LKRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	10 (1.37)
	HTI	Hatti soils are moderately shallow (50-75 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation		**26 (3.5)**
102		HTIiB2g2	Sandy clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	3 (0.37)
101		HTIiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	19 (2.64)
92		HTIcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	4 (0.49)
	HDH	Hooradhahalli soils are moderately deep (75-100 cm), well drained, dark red to dark reddish brown, red gravelly sandy clay to clay soils occurring on nearly level to moderately sloping uplands under cultivation		**117 (16.24)**
123		HDHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	34 (4.78)
122		HDHhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	2 (0.21)
112		HDHcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	1 (0.13)
111		HDHcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	53 (7.41)
105		HDHbB2g1	Loamy sand surface, slope1-3%, moderate erosion, gravelly (15-35%)	27 (3.71)
	BDG	Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly clay soils occurring on nearly level to gently sloping uplands under cultivation		**192 (26.56)**
188		BDGhB2g1	Sandy clay loam surface, slope1-3%, moderate erosion, gravelly (15-35%)	36 (4.94)

187		BDGhB2	Sandy clay loam surface, slope1-3%, moderate erosion	72 (9.94)
184		BDGhA1	Sandy clay loam surface, slope 0-1%,slight erosion	29 (4.01)
180		BDGcB1g1	Sandy loam surface, slope1-3%, slight erosion, gravelly (15-35%)	55 (7.67)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation		**8 (1.05)**
249		NGPbB1	Loamy sand surface, slope1-3%, slight erosion	8 (1.05)
	BPR	Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation		**78 (10.45)**
231		BPRhB2g1	Sandy clay loam surface, slope1-3%, moderate erosion, gravelly (15-35%)	38 (5.31)
225		BPRcB2g1	Sandy loam surface, slope1-3%, moderate erosion, gravelly (15-35%)	37 (5.1)
215		BPRbB1g1	Loamy sand surface, slope1-3%, slight erosion, gravelly (15-35%)	3 (0.47)
	HNH	Honnenahalli soils are moderately deep (50-75 cm), moderately well drained, have brown to dark brown sandy clay soils occurring on nearly level to very gently sloping lowlands under cultivation		**1 (0.07)**
471		HNHiB2	Sandy clay surface, slope 1-3%, moderate erosion	1 (0.07)
	HLP	Huliyapura soils are moderately deep (75-100 cm), well drained, have dark yellowish brown to dark brown, black sandy clay soils occurring on very gently sloping lowlands under cultivation		**29(4.12)**
466		HLPmA1	Clay surface, slope 0-1%,slight erosion	9 (1.27)
438		HLPiB2	Sandy clay surface, slope 1-3%, moderate erosion	19 (2.66)
437		HLPhB1	Sandy clay loam surface, slope 1-3%, slight erosion,	1 (0.19)
	TSD	Thimmasandra soils are very deep (>150 cm), moderately well drained, have very dark brown to very dark grayish brown, black clay soils occurring on nearly level to very gently sloping lowlands under cultivation		**0.26 (0.04)**
446		TSDmA1	Clay surface, slope 0-1%,slight erosion	0.26 (0.04)
Soils of Alluvial landscape				
	DRL	Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have dark brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**27 (3.7)**
350		DRLmB2	Clay surface, slope1-3%, moderate erosion	27 (3.7)
994		Mining/ Industrial	Mining/Industrial area	**1 (0.15)**
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	45 (6.27)
1000		Others	Habitation	**53 (7.29)**

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

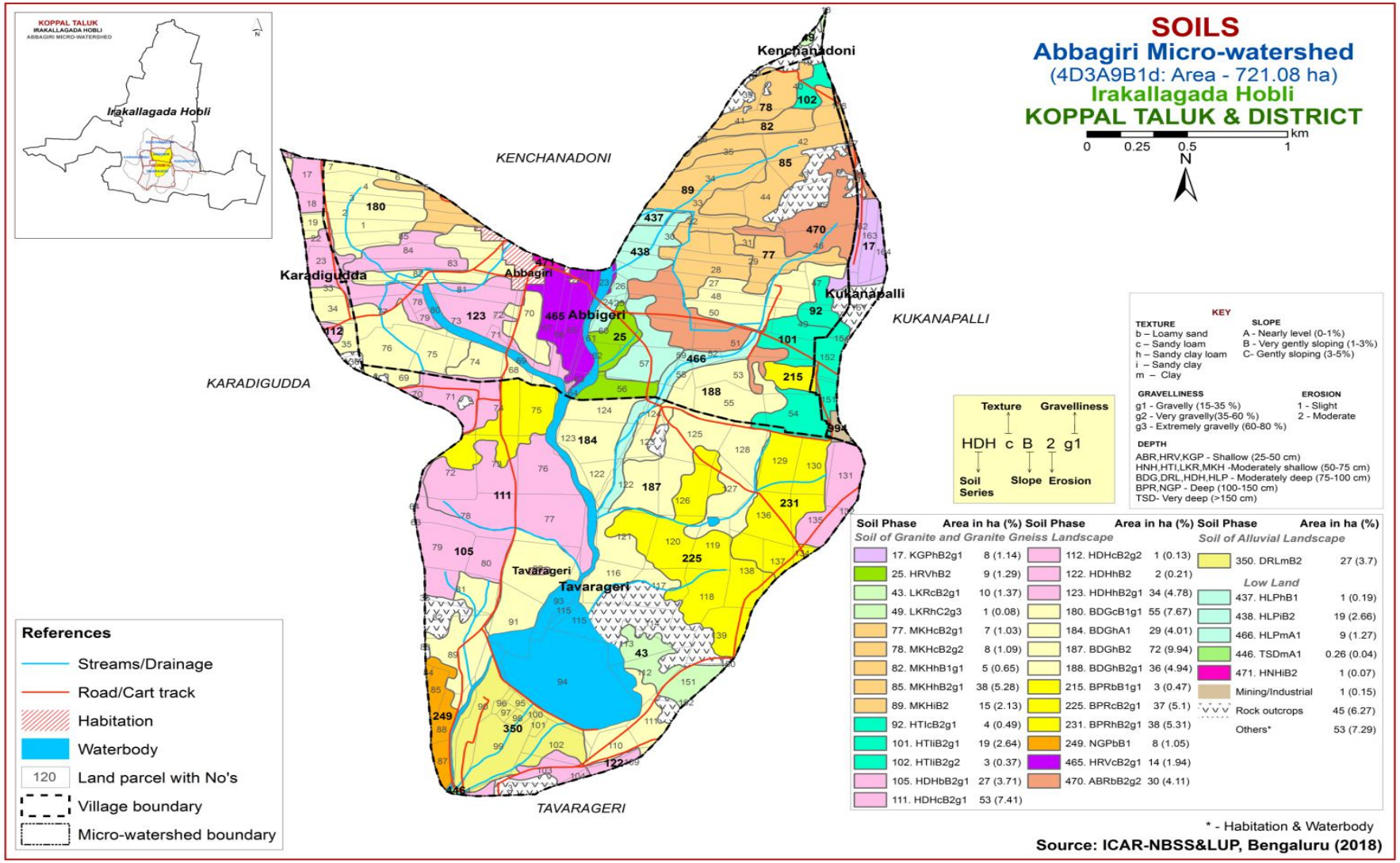


Fig 3.5 Soil Phase or Management Units- Abbagiri Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Abbagiri microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluvial landscapes based on geology. In all, 14soil series were identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by the parent material, climate, time and relief.

A brief description of each of the 14 soil series identified followed by 34 soil phases (management units) mapped (Fig. 3.5) are furnished below. The physical and chemical characteristics of soil series identified in Abbagiri microwatershed are given in Table 4.1along 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, 13soil series were identified and mapped. Of these series, Bidanagere (BDG) series occupies maximum area of 192 ha (27 %) followed by Hooradhahalli (HDH) 117 ha (16%). The brief description of the soil series along with the soil phases identified and mapped is given below.

4.1.1 Kaggalipura (KGP) Series: Kaggalipura soils are shallow (25-50 cm), well drained, have brown to dark reddish, brown gravelly sandy clay loam to sandy clay soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands. The Kaggalipura series has been tentatively classified as a member of the fine, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 30 to 50 cm. The thickness of A-horizon ranges from 10 to 17 cm. Its colour is in 7.5 YR, 5YR and 2.5 YR hue with value 2.5 to 4 and chroma 2 to 6. The texture varies from sandy clay loam to sandy clay with 10 to 25 per cent gravel. The thickness of B horizon ranges from 24 to 50 cm. Its colour is in 2.5 YR hue with value 2.5 and chroma 4. Its texture is sandy clay loam to sandy clay soils with gravel content of 15 to 35 per cent. The available water capacity is low (50-100 mm/m). One soil phase was identified and mapped.

Landscape and soil profile characteristics of Kaggalipura (KGP) Series

4.1.2 Harve (HRV) Series: Harve soils are shallow (25-50 cm), well drained, have reddish brown to dark red gravelly sandy clay loam soils. They have developed from weathered granite gneiss and occur on very gently to moderately sloping uplands. The Harve series has been tentatively classified as a member of the loamy- skeletal, mixed, isohyperthermic family of Typic Haplustalfs.

The thickness of the solum ranges from 28 to 48 cm. The thickness of A-horizon ranges from 12 to 17 cm. Its colour is in 5YR and 2.5 YR hue with value 3 to 4 and chroma 4 to 6. The texture varies from loamy sand to sandy loam with 20 to 60 per cent gravel. The thickness of B-horizon ranges from 16 to 32 cm. Its colour is in 2.5 YR and 5 YR hue with value 3 to 4 and chroma 4 to 6. Its texture is sandy clay loam with gravel content of more than 35 per cent. The available water capacity is very low (<50mm/m).Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Harve (HRV) Series

4.1.3 Abbigere Series (ABR): Abbigere soils are shallow (25-50 cm), well drained, have dark reddish brown, red gravelly sandy clay to clay soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 28 to 48 cm. The thickness of A-horizon ranges from 12 to 17 cm. Its colour is in 5YR and 2.5 YR hue with value 3 to 4 and chroma 3 to 4. The texture is sandy clay with 20 to 35 per cent gravel. The thickness of B-horizon ranges from 16 to 32 cm. Its colour is in 2.5 YR and 5 YR hue with value 2.5 to 4 and chroma 2 to 3. Its texture is sandy clay to clay with gravel content of more than 35 per cent. The available water capacity is very low (<50mm/m).One soil phase was identified and mapped.

Landscape and soil profile characteristics of Abbigere (ABR) Series

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

The thickness of the solum ranges from 51 to 72 cm. The thickness of A horizon ranges from 12 to 17 cm. Its colour is in 5 YR and 7.5 YR hue with value 3 to 4 and chroma 2 to 4. The texture varies from loamy sand to sandy loam with 20 to 45 per cent gravel. The thickness of B horizon ranges from 40 to 68 cm. Its colour is in 2.5 YR and 5 YR hue with value and chroma 3 to 6. Texture is sandy clay loam to sandy clay with 35 to 50 per cent gravel. The available water capacity is low (50-100 mm/m). Five soil phases were identified and mapped.

Landscape and soil profile characteristics of Mukhadahalli (MKH) Series

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

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

Landscape and soil profile characteristics of Lakkur (LKR) Series

4.1.6Hatti (HTI) Series: Hatti soils are moderately shallow (50-75cm), well drained, have dark reddish brown, gravelly sandy clay red soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 57 to 74 cm. The thickness of A horizon ranges from 16 to 20 cm. Its colour is in 5YR hue with value and chroma 3 to 4. The texture varies from sandy loam to sandy clay loam and sandy clay with 15 to 60 per cent gravel. The thickness of B horizon ranges from 45 to 56 cm. Its colour is in 5 YR hue with value 3 and chroma 3 to 4. Texture is sandy clay with 15 to 35 per cent gravel. The available water capacity is low (50-100 mm/m).Three soil phases were identified and mapped.

Landscape and soil profile characteristics of Hatti (HTI)Series

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

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

Landscape and soil profile characteristics of Hooradhahalli (HDH) Series

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

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

Landscape and soil profile characteristics of Bidanagere (BDG)Series.

4.1.9 Nagalapur (NGP) Series: Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands.

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

Landscape and soil profile characteristics of Nagalapur (NGP) Series

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

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

Landscape and soil profile characteristics of Balapur (BPR) Series

4.1.11 Honnenahalli (HNH) Series: Honnenahalli soils are moderately deep (50 to 75 cm), moderately well drained, have brown to dark brown sandy clay soils. They have developed from colluvio-alluvium and occur on nearly level to very gently sloping lowlands. The Honnenahalli series has been tentatively classified as a member of the fine, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 52 to 74 cm. The thickness of A horizon ranges from 12 to 21 cm. Its colour is in 7.5 YR and 10 YR hue with value 3 and chroma 3 to 4. The texture varies from sandy clay loam to sandy loam with 5 to 10 per cent gravel. The thickness of B horizon ranges from 45 to 62 cm. Its colour is in 7.5 YR and 10 YR hue with value 3 and chroma 3 to 4. Its texture is sandy clay. The available water capacity is medium (100-150 mm/m).One soil phase was identified and mapped.

Landscape and soil profile characteristics of Honnenahalli (HNH)Series

4.1.12 Huliyapura (HLP) Series: Huliyapura soils are moderately deep (75-100 cm), well drained, have dark-strong brown to dark yellowish brown sandy clay soils. They have developed from weathered granite gneiss and occur on very gently sloping low lands under cultivation.

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

Landscape and soil profile characteristics of Huliyapura (HLP)Series

4.1.13 Thimmasandra (TSD) Series: Thimmasandra soils are very deep (>150 cm), moderately well drained, have very dark brown to very dark grayish brown clay soils. They have developed from weathered granite gneiss and occur on nearly level to very gently sloping lowlands under cultivation. The Thimmasandra series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 11 to 17 cm. Its colour is in 10 YR hue with value 3 and chroma 3. The texture is sandy clay. The thickness of B horizon is more than 150 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 3. Its texture is sandy clay to clay. The available water capacity is very high (>200 mm/m). One soil phase was identified and mapped.

Landscape and soil profile characteristics of Thimmasandra (TSD) Series

4.2 Soils of Alluvial Landscape

In this landscape, only one soil series was identified and mapped. The brief description of soil series along with the soil phases identified and mapped is given below.

4.2.1 Dambarahalli (DRL) Series: Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have black and very dark gray to dark brown calcareous cracking clay soils. They have developed from alluvium and occur on very gently to gently sloping plains under cultivation.

The thickness of the solum ranges from 75 to 99 cm. The thickness of A horizon ranges from 13 to 24 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 2. The texture is clay. The thickness of B horizon ranges from 54 to 85 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 3. Its texture is clay and is calcareous. The available water capacity is high (150-200 mm/m).One soil phase was identified and mapped.

Landscape and soil profile characteristics of Dambarahalli (DRL)Series.

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

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-19	Ap	65.71	8.83	25.46	9.27	9.06	14.42	21.52	11.43	70	scl	16.54	8.60
19-32	Bt	55.89	11.13	32.98	6.47	9.18	11.89	19.19	9.18	50	scl	19.24	12.78
32-58	Bt	47.95	10.41	41.63	17.52	3.78	9.13	9.55	7.97	50	sc	24.03	16.02

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-19	7.38	-	-	0.09	0.2	0.00	8.97	4.32	0.26	0.22	13.77	14.84	0.58	93	1.49
19-32	7.5	-	-	0.106	0.41	0.00	15.98	3.27	0.16	0.50	19.91	20.88	0.63	95	2.38
32-58	7.46	-	-	0.173	0.49	0.00	19.71	4.53	0.23	1.32	25.79	25.76	0.62	100	5.11

Contd…

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-21	Ap	74.00	8.34	17.66	9.62	11.57	15.76	23.13	13.92	20	sl	-	-
21-35	Bt1	54.37	10.48	35.14	16.33	8.64	9.69	11.59	8.11	40	sc	-	-
35-56	Bt2	48.37	13.46	38.17	10.96	7.69	9.17	11.28	9.27	60	sc	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-21	8.18	-	-	0.30	0.56	0.94	-	-	0.31	0.55	-	12.19	0.69	100.00	4.51
21-35	8.17	-	-	0.30	0.52	1.29	-	-	0.19	0.84	-	22.18	0.63	100.00	3.79
35-56	7.95	-	-	0.46	0.48	1.99	-	-	0.24	0.58	-	22.94	0.60	100.00	2.53

Contd…

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-20	Ap	81.19	11.25	7.56	12.54	15.07	17.90	21.94	13.75	50	ls	-	-
20-35	Bt1	57.45	11.45	31.10	12.76	11.02	10.92	12.45	10.31	50	scl	-	-
35-92	Bt2	44.63	7.85	47.52	12.40	9.61	8.37	7.75	6.51	60	c	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-20	6.24	-	-	0.06	0.60	0.00	1.61	0.26	0.10	0.01	1.98	3.76	0.50	52.56	0.35
20-35	5.99	-	-	0.02	0.40	0.00	4.25	0.46	0.08	0.28	5.07	8.02	0.26	63.18	3.46
35-92	6.70	-	-	0.03	0.20	0.00	5.45	0.31	0.10	0.22	6.09	9.90	0.21	61.48	2.24

Contd…

Soil Series: Hooradhahalli (HDH), Pedon: RM-69
Location: $13^0$24'31"N, $76^0$33'41"E, (4D3D8G2d), Hesarahalli village, Chikkanayakanahalli taluk, Tumukur district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Rhodic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	72.56	15.17	12.27	4.57	8.33	17.38	23.88	18.39	35	sl	-	-
18-33	Bt1	56.29	10.75	32.96	7.88	10.24	13.41	14.43	10.34	55	scl	-	-
33-58	Bt2	46.66	10.79	42.55	10.79	9.87	8.43	9.04	8.53	55	sc	-	-
58-90	Bt3	43.09	13.63	43.27	9.90	8.25	7.32	8.76	8.87	45	c	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	6.54	-	-	0.07	0.60	0.00	2.68	1.38	0.44	0.42	4.91	5.84	0.48	84.07	7.11
18-33	5.90	-	-	0.07	0.52	0.00	3.99	1.27	0.09	0.37	5.71	8.61	0.26	66.32	4.29
33-58	6.16	-	-	0.07	0.44	0.00	4.92	1.67	0.08	0.55	7.22	10.00	0.24	72.23	5.50
58-90	6.39	-	-	0.06	0.40	0.00	4.30	2.02	0.08	0.46	6.87	9.21	0.21	74.61	5.05

Contd…

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-12	Ap	65.66	18.66	15.68	4.14	6.16	13.33	21.82	20.20	-	sl	-	-
12-34	Bt1	61.91	11.52	26.57	2.36	6.78	12.53	21.36	18.89	-	scl	-	-
34-60	Bt2	51.81	11.24	36.94	4.66	5.70	12.23	15.96	13.26	30	sc	-	-
60-84	Bt3	46.61	9.02	44.37	14.70	6.88	7.51	8.97	8.55	55	sc	-	-
84-112	Bt4	48.75	12.92	38.33	15.73	8.13	6.87	8.23	9.79	60	sc	-	-
112-127	Bc	50.98	24.74	24.28	5.25	4.63	5.15	10.92	25.03	50	scl	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-12	6.64	-	-	0.03	0.56	0.00	1.90	1.32	0.21	0.03	3.46	5.45	0.35	63.48	0.51
12-34	6.99	-	-	0.02	0.48	0.00	3.66	1.90	0.07	0.08	5.70	7.82	0.29	72.93	0.96
34-60	7.29	-	-	0.02	0.40	0.00	5.13	2.08	0.11	0.20	7.52	11.19	0.30	67.18	1.75
60-84	7.50	-	-	0.02	0.32	0.00	5.83	6.36	0.13	0.23	12.55	12.38	0.28	101.43	1.83
84-112	7.54	-	-	0.02	0.24	0.00	6.02	6.59	0.11	0.25	12.96	12.77	0.33	101.49	1.97
112-127	7.90	-	-	0.02	0.20	0.00	8.04	3.62	0.07	0.32	12.04	12.47	0.51	96.56	2.55

Contd…

Soil Series: Thimmasandra (TSD), Pedon: R-14
Location: 11°55'64.2"N, 76°51'82.9" E, (4B3A5K3b), Somanapura village, Chamarajanagara 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
0-19	Ap	12.27	25.92	61.81	0.98	0.98	1.52	3.91	4.89	-	c	-	-
19-33	Bw1	32.98	26.29	40.72	2.75	4.44	4.97	8.35	12.47	-	c	-	-
33-58	Bw2	10.21	27.99	61.81	0.98	1.30	1.19	2.17	4.56	-	c	-	-
58-83	Bw3	9.83	27.40	62.77	1.09	0.98	0.98	1.86	4.91	-	c	-	-
83-95	Bw4	6.17	26.07	67.76	0.99	0.77	0.55	0.99	2.86	-	c	-	-
95-116	Bw5	7.52	28.87	63.61	0.77	1.00	1.11	1.88	2.77	-	c	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-19	8.46	-	-	0.175	1.01	4.45	-	-	1.91	0.18	-	36.61	0.59	100	0.48
19-33	8.65	-	-	0.16	0.81	6.41	-	-	0.77	0.39	-	23.98	0.59	100	1.61
33-58	8.94	-	-	0.26	0.56	6.90	-	-	0.82	2.24	-	33.59	0.54	100	6.68
58-83	9.13	-	-	0.335	0.4	8.01	-	-	0.30	1.01	-	36.72	0.58	100	2.76
83-95	9.05	-	-	0.412	0.36	4.58	-	-	0.76	4.17	-	38.88	0.57	100	10.74
95-116	8.96	-	-	0.4	0.28	4.21	-	-	0.96	4.02	-	43.63	0.69	100	9.21

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The 34 soil map units identified in the Abbagiri microwatershed are grouped under two land capability classes and six land capability subclasses (Fig. 5.1).

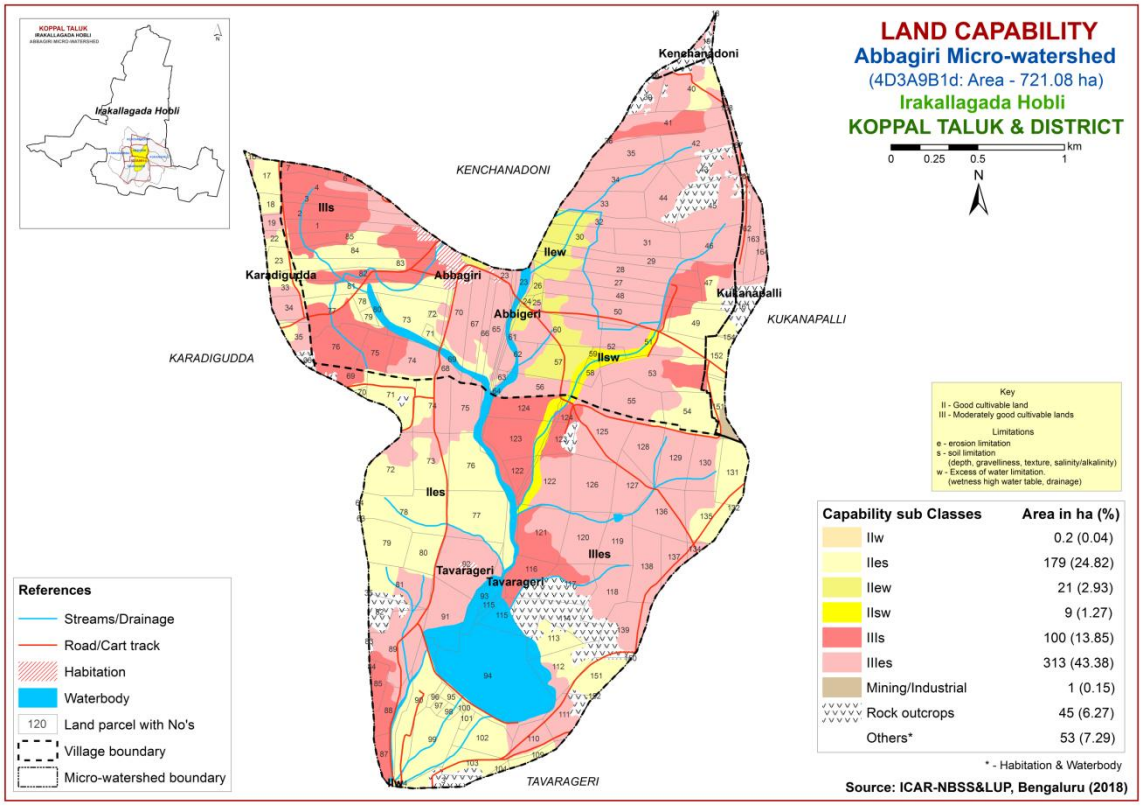


Fig. 5.1 Land Capability map of Abbagiri Microwatershed

Entire area in the microwatershed is suitable for agriculture. Good lands (Class II) cover an area of about 209 ha (29%) and distributed in the southern, western, eastern and northern part of the microwatershed with minor problems of drainage, soil and erosion. Moderately good lands (Class III) occupy an area of about 413 ha (57%) and distributed in the major part of the microwatershed with severe limitations of soil and erosion. An area of 45 ha(6%) is covered by rock lands and 53 ha(7%) by habitation and water bodies and about one ha area is under mining

5.2 Soil Depth

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

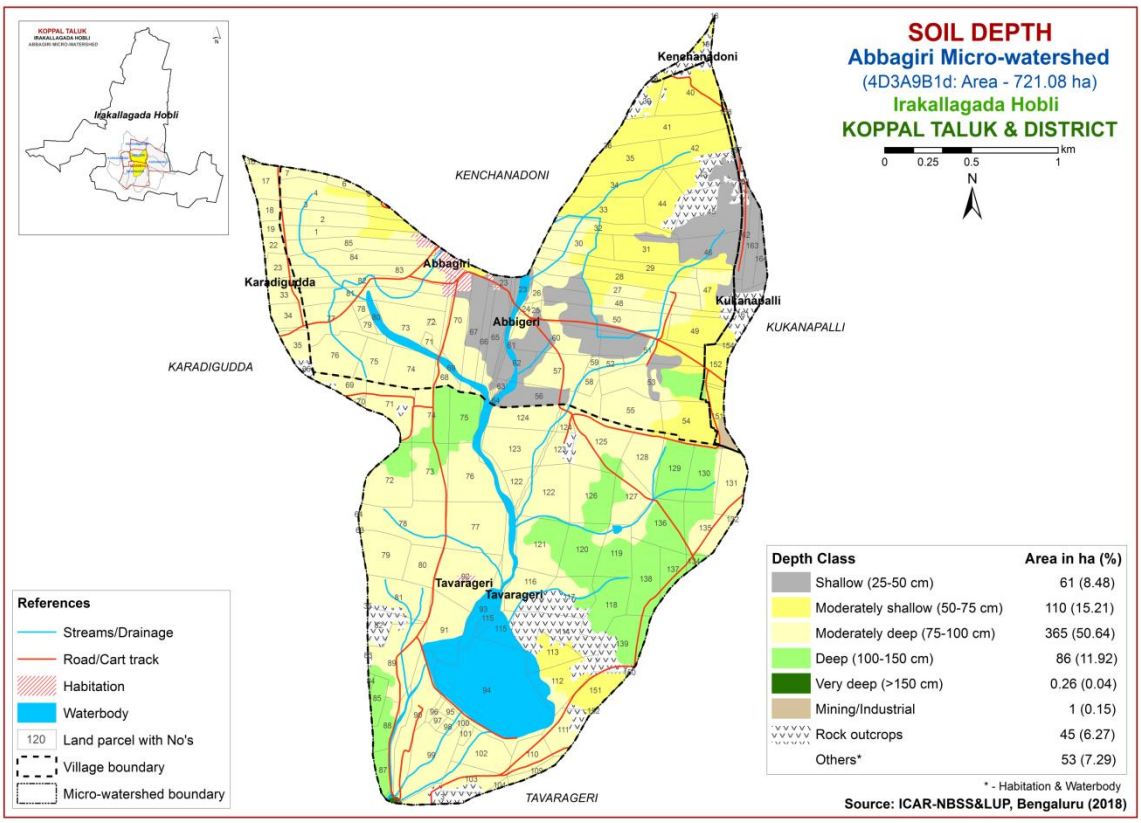


Fig. 5.2 Soil Depth map of Abbagiri Microwatershed

Shallow soils (25-50 cm) occupy an area of about 61 ha (8%) and distributed in the northeastern and northern part of the microwatershed. Moderately shallow soils (50-75 cm) occupy about 110 ha (15 %) and occur in the northeastern and eastern part of the microwatershed. Maximum area of about 365 ha (51%) is moderately deep (75-100 cm) and distributed in the major part of the microwatershed. Deep to very deep(100->150 cm) soils occupy 86 ha (12%) area and distributed in the eastern and western part of the microwatershed.

The most productive lands cover about 86 ha (12 %) where all climatically adapted long duration crops be grown. The problem lands cover about 61 ha (8%) where only short duration crops can be grown. The probability of crop failure is very high.

5.3 Surface Soil Texture

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

An area of about 67 ha (9%) is (loamy sand) sandy at the surface and distributed in the northeastern and western part of the microwatershed. Maximum area of about 462 ha (64%) is (sandy loam and sandy clay loam) loamy at the surface and distributed in the major part of the microwatershed. An area of about 93 ha (13 %) is clayey (sandy clay and clay) at the surface and distributed in the southern and northeastern part of the microwatershed.

The most productive lands with respect to surface soil texture are clayey soils that (13 %) have high potential for soil-water retention and availability and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other productive lands are loamy (64%) soils which also have high potential for soil- water retention and nutrient availability but have no drainage or other physical problems. The problem soils are sandy covering 9 per cent area that has moisture and nutrient constraints.

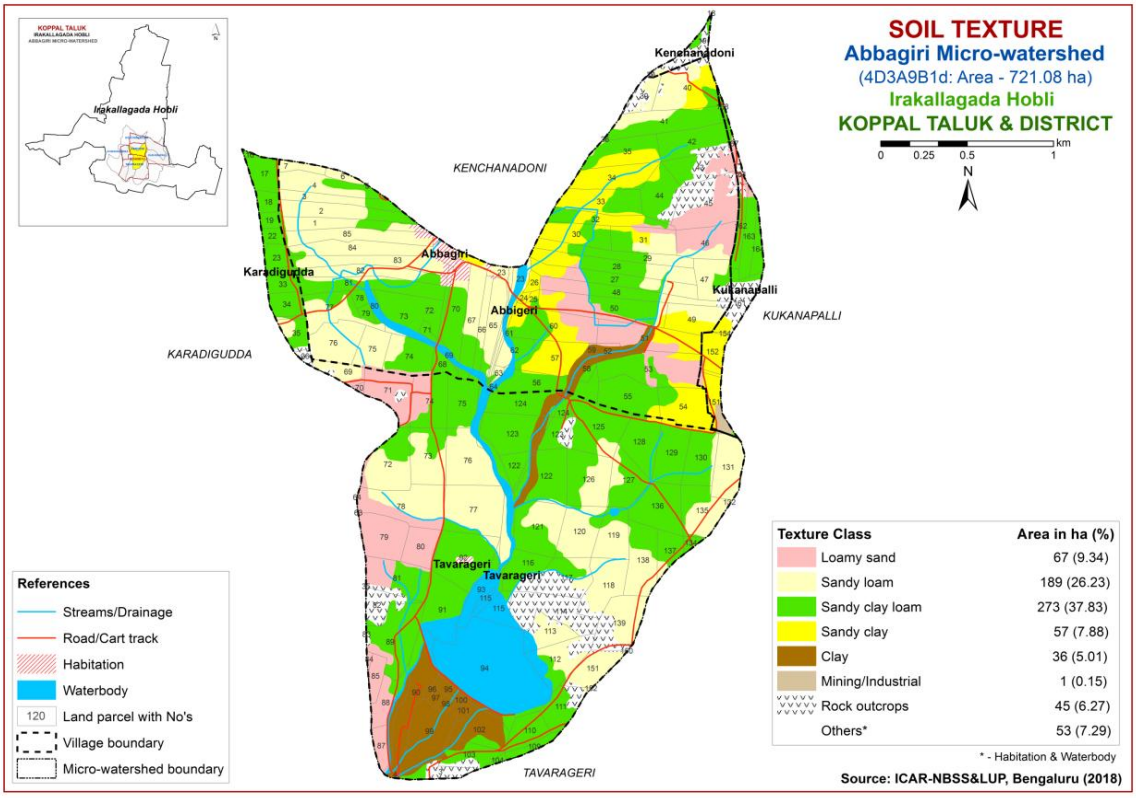


Fig. 5.3 Surface Soil Texture map of Abbagiri Microwatershed

5.4 Soil Gravelliness

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

The soils that are non-gravelly (<15% gravel) covers an area of about 192 ha (27%) and distributed in the southern, central and northern part of the microwatershed. Maximum area of about 389 ha (54%) is covered by gravelly (15-35% gravel) soils and are distributed in the major part of the microwatershed. An area of about 41 ha (6%) is covered by very gravelly (35-60%) soils and distributed in the northeastern part of the microwatershed. Extremely gravelly (60-80%) soils cover a small area of about 1 ha (<1 %) and distributed in the northern part of the microwatershed (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 27 per cent. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem soils that are very gravelly to extremely gravelly (35-80%) cover about 6 per cent where only short duration crops can be grown.

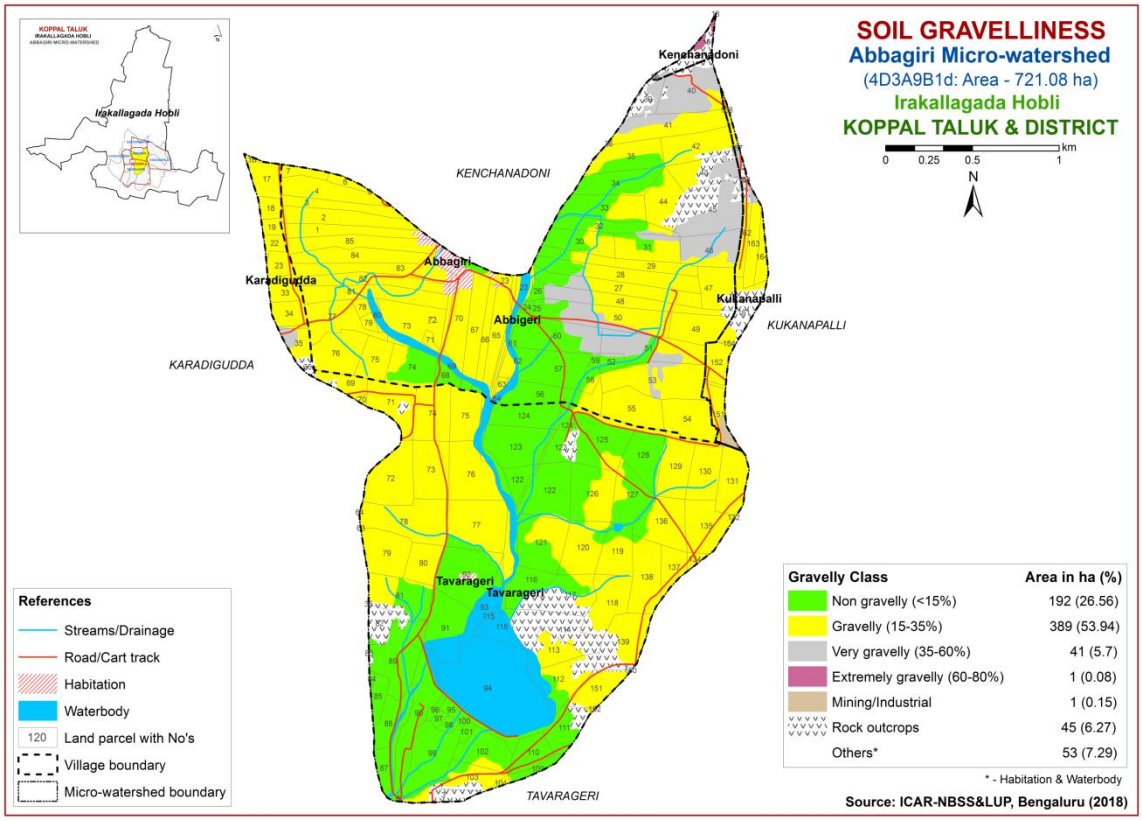


Fig. 5.4 Soil Gravelliness map of Abbagiri Microwatershed

5.5 Available Water Capacity

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

A maximum area of about 454 ha (63%) in the microwatershed has soils that are very low (<50 mm/m) in available water capacity and are distributed in the major part of the part of the microwatershed. An area of about 111 ha (15%) has soils that are low (51 to 100 mm/m) in available water capacity and are distributed in the eastern and central part of the microwatershed. An area of about 57 ha (8%) has soils that are medium (101-150 mm/m) in available water capacity and are distributed in the southern and northern part of the microwatershed. A small area of about <1 ha (<1%) is very high (>200 mm/min) in available water capacity and distributed in the southern part of the microwatershed.

An area of about 454 ha (63%) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. A small area of about 1 ha (<1%) has soils that have high potential (>200 mm/m) with regard to available water capacity where all climatically adapted long duration crops can be grown successfully.

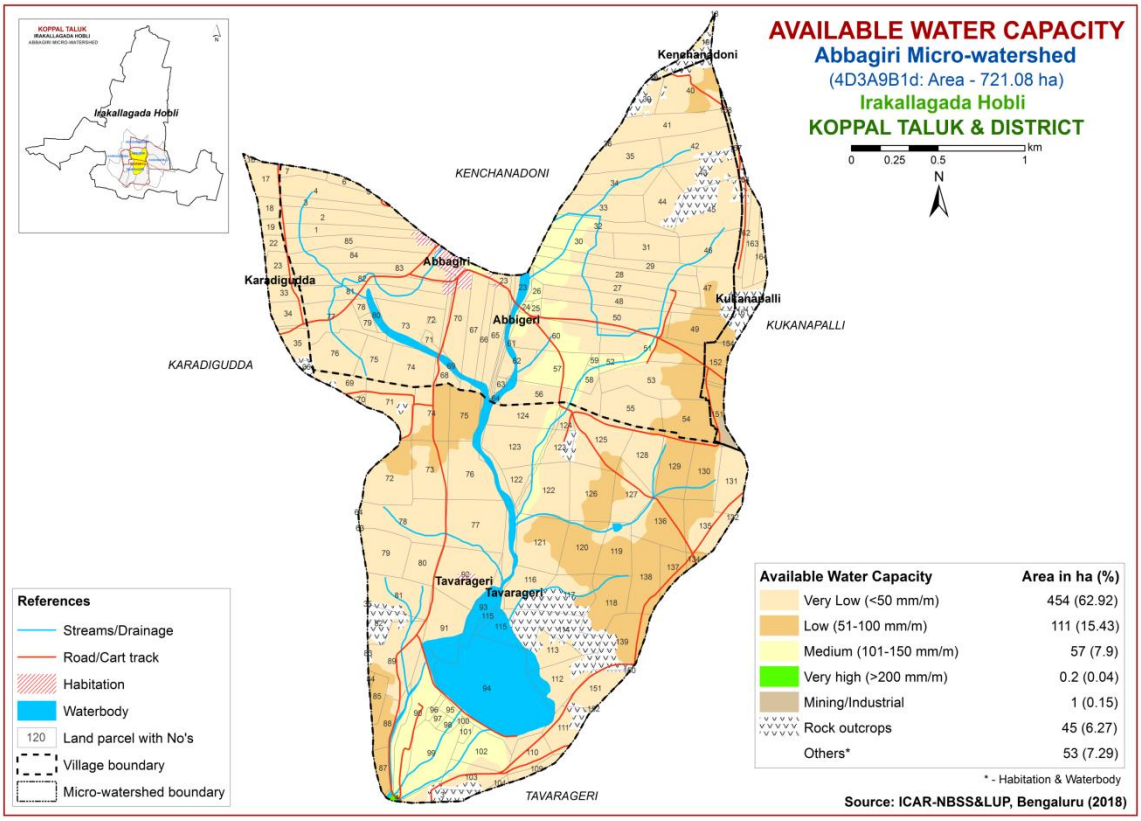


Fig. 5.5 Soil Available Water Capacity map of Abbagiri Microwatershed

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 two slope classes and a slope map was generated showing the area extent and their geographic distribution of different slope classes in the microwatershed (Fig. 5.6).

An area of about 38 ha (5%) falls under nearly level (0-1% slope) lands and distributed in the central part of the microwatershed. Very gently sloping (1-3%) lands cover a maximum area of about 583 ha (81%) and distributed in the major part of the microwatershed. A small area of about 1 ha (<1%) is gently sloping (3-5%) and distributed in the northern part of the microwatershed. In all these areas, all climatically

adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

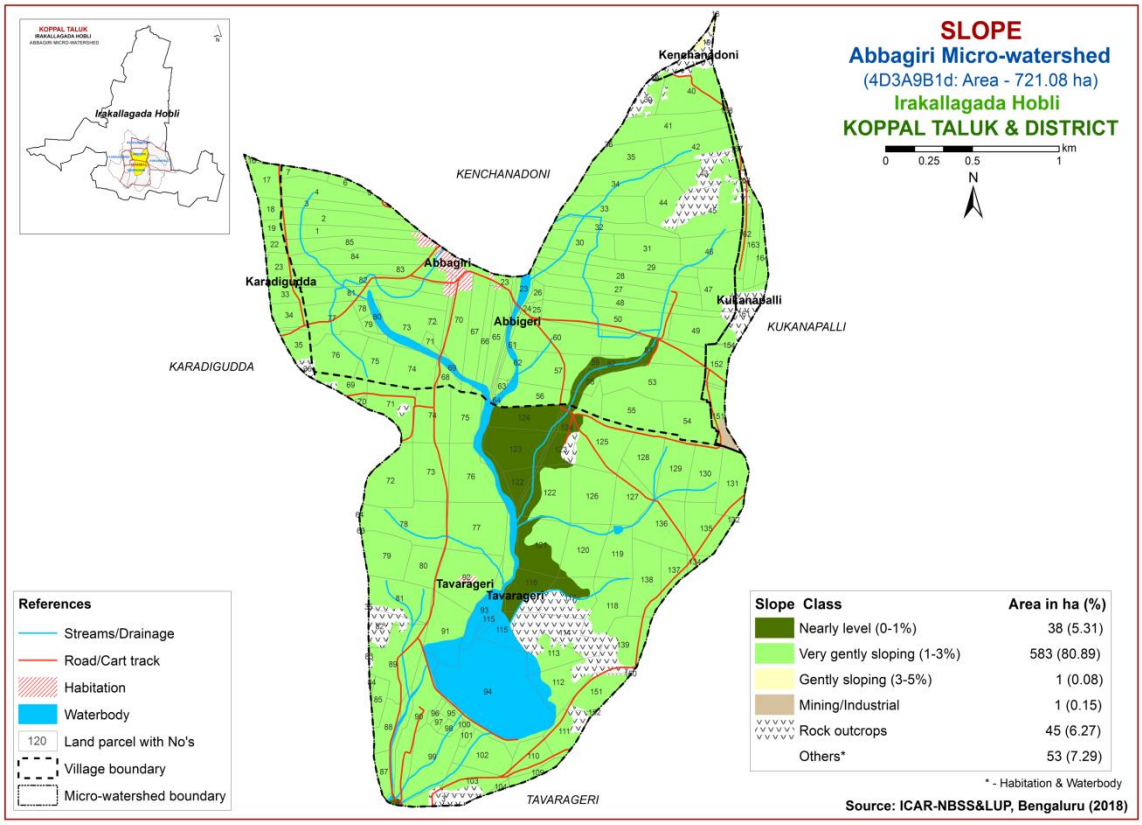


Fig. 5.6 Soil Slope map of Abbagiri Microwatershed

5.7 Soil Erosion

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

Slightly eroded lands cover an area of about 111 ha (15%) and distributed in the northwestern and central part of the microwatershed. An area of about 512 ha (71%) is moderately eroded (e2 class)and distributed in the major part of the microwatershed.
Moderately eroded lands are problematic and need appropriate soil and water conservation and other land development measures.

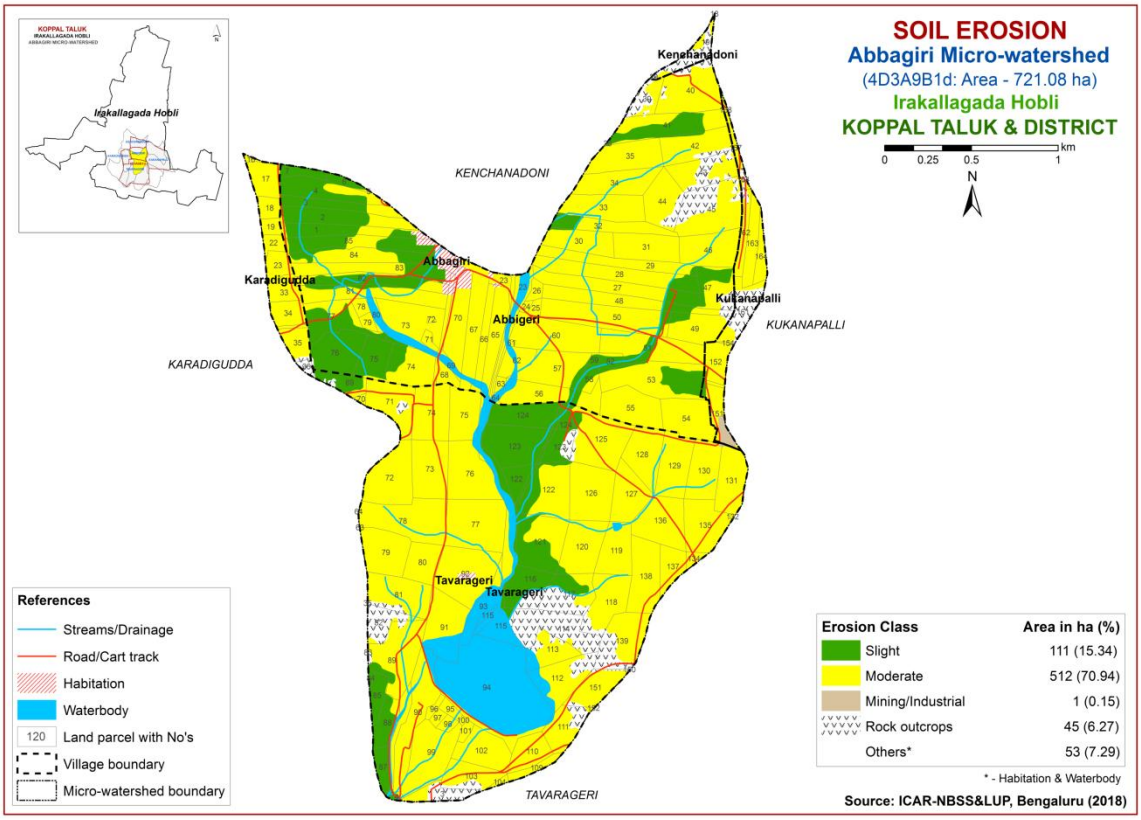


Fig. 5.7 Soil Erosion map of Abbagiri Microwatershed

Chapter 6

FERTILITY STATUS

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

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

6.1 Soil Reaction (pH)

The soil analysis of the Abbagiri microwatershed for soil reaction (pH) showed that moderately acid (pH 5.5-6.0) soils cover an area of about 74 ha (10%) and distributed in the central part of the microwatershed. Slightly acid (pH 6.0-6.5) soils cover an area of about 108 ha (15%) and distributed in the central part of the microwatershed. Neutral soils cover a maximum area of about 314 ha (44%) and distributed in the major part of the microwatershed. An area of about127 ha (18%) is slightly to moderately alkaline (pH 7.3-8.4) and is distributed in the northern and southern part of the microwatershed. (Fig.6.1). Thus, major portion of the soils in the microwatershed are either neutral or acid in reaction.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

An area of about 81 ha (11%)is medium (0.5-0.75%) in organic carbon content and distributed in the southern part of the microwatershed. Maximum area of about 543 ha (75%) is high (>0.75%) in OC and distributed in the major part of the microwatershed (Fig.6.3).

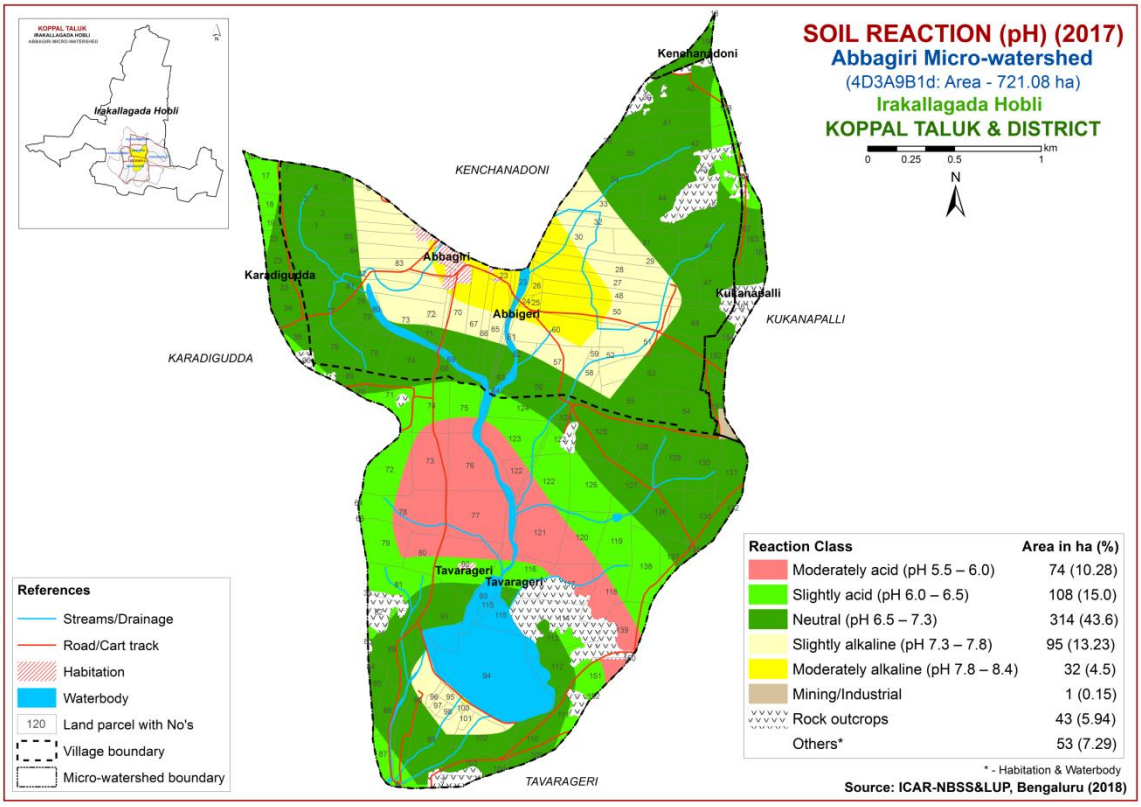


Fig.6.1 Soil Reaction (pH) map of Abbagiri Microwatershed

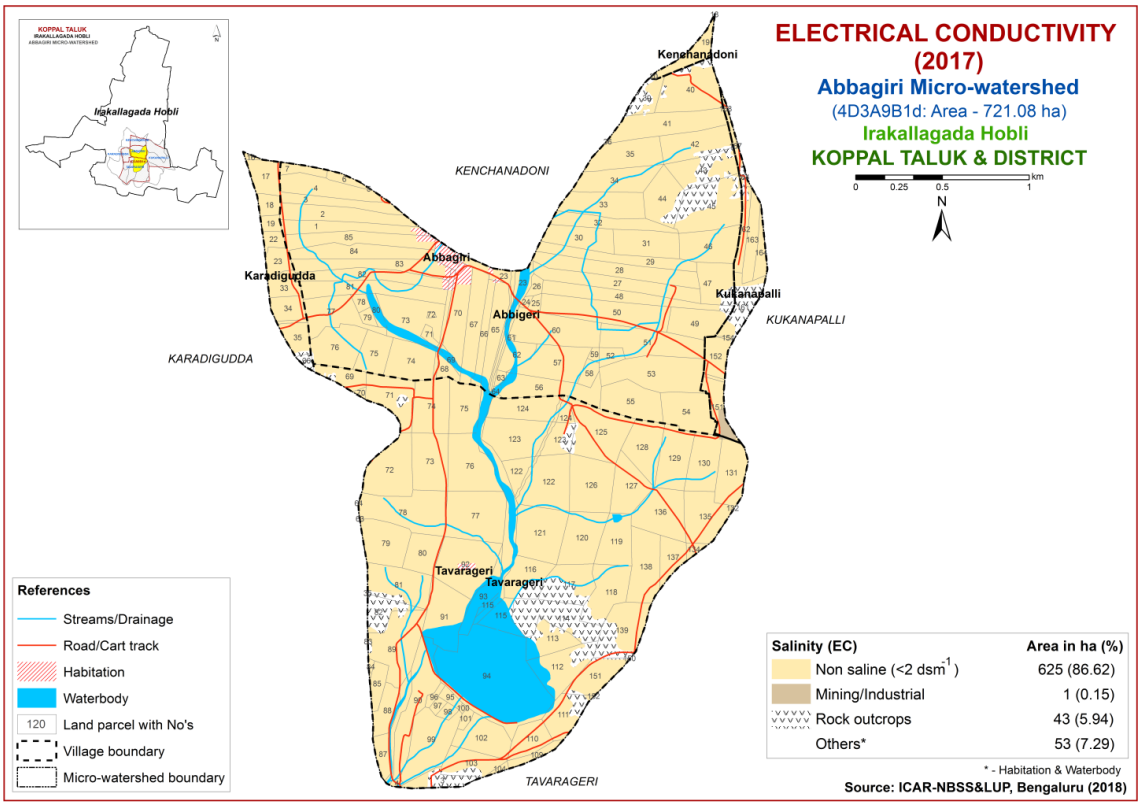


Fig.6.2 Electrical Conductivity (EC) map of Abbagiri Microwatershed

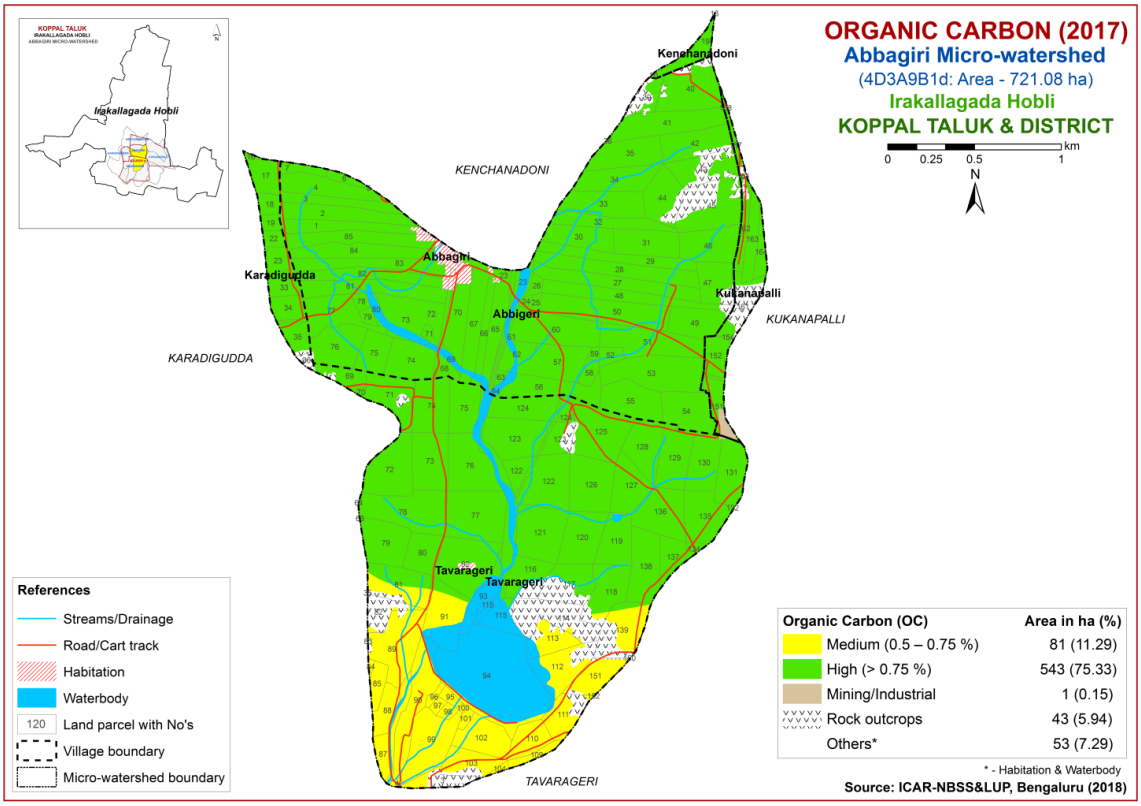


Fig.6.3 Soil Organic Carbon map of AbbagiriMicrowatershed

6.4 Available Phosphorus

An maximum area of about 67 ha (9 %) is low (<23 kg/ha) in available phosphorus and distributed in the eastern part of the microwatershed. Available phosphorus is medium (23-57 kg/ha) in an area of about 248 ha (34%) and distributed in the northwestern, western and eastern part of the microwatershed. An area of about 309 ha (43%) is high (>57 kg/ha) and distributed in the major part of the microwatershed. The areas with high phosphorus content reduce 25 per cent from the recommended dose to avoid the excess application of fertilizer and apply additional 25% phosphorus in areas where it is low and medium (Fig 6.4).

6.5 Available Potassium

An area of about 202 ha (28%) is low (<145 kg/ha) in available potassium and distributed in the central and western part of the microwatershed. Maximum area of about 334 ha(46%) is medium (145-337 kg/ha) in available potassium content and distributed in the major part of the microwatershed. An area of about 88 ha (12 %) is high in available potassium content and distributed in the northwestern and northern part of the microwatershed. The areas with high potassium content reduce 25 per cent from the recommended dose to avoid the excess application of fertilizer and apply additional 25% potassium in areas where it is low and medium (Fig 6.5).

6.6 Available Sulphur

Soil analysis of available sulphur content in Abbagiri microwatershed showed thata maximum area of about 409 ha (57 %) is low (<10 ppm) in available sulphur and distributed in the major part of the microwatershed. An area of about 215 ha (30%) is medium (10-20 ppm) and distributed in the southern, central, western and eastern part of the microwatershed (Fig.6.6).The areas that are low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or factomphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Soil analysis of available boron content in Abbagiri microwatershed showed that a maximum area of about 557 ha (77 %) is low (<0.5ppm) in available boron content and distributed in the major part of the microwatershed. An area of about 68 ha (9 %) is medium (0.5-1.0ppm) in available boron content and distributed in the southern part of the microwatershed (Fig.6.7).

6.8 Available Iron

Available iron content in the soils of the Abbagiri microwatershed is deficient (<4.5 ppm) ina maximum area of about 231 ha (32 %) and distributed in the northern and eastern part. Maximum area of about 394 ha (55 %) showed sufficiency (>4.5 ppm) with respect to iron content and distributed in the major part of the microwatershed (Fig 6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in a maximum area of about 341 ha (47 %) and distributed in the major part of the microwatershed. An area of about 283 ha (39 %) is sufficient (>0.6) in zinc content and distributed in the western and northern part of the microwatershed (Fig 6.11).

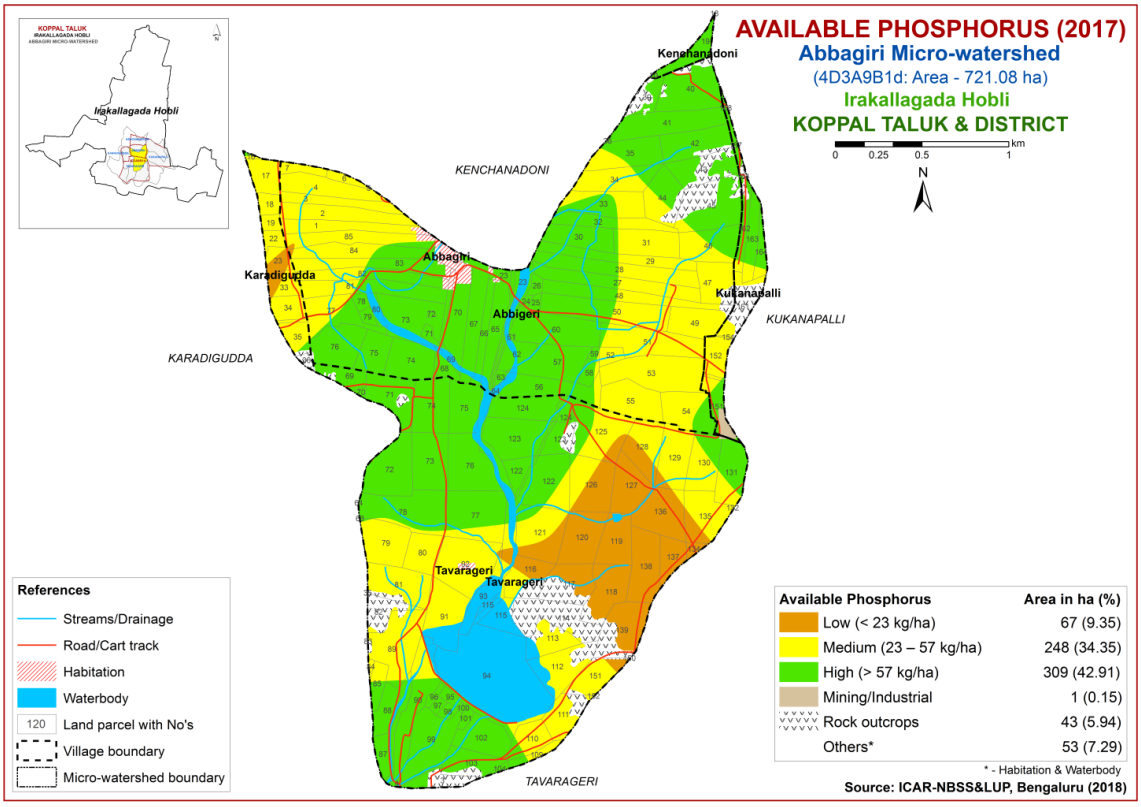


Fig.6.4 Soil Available Phosphorus map of AbbagiriMicrowatershed

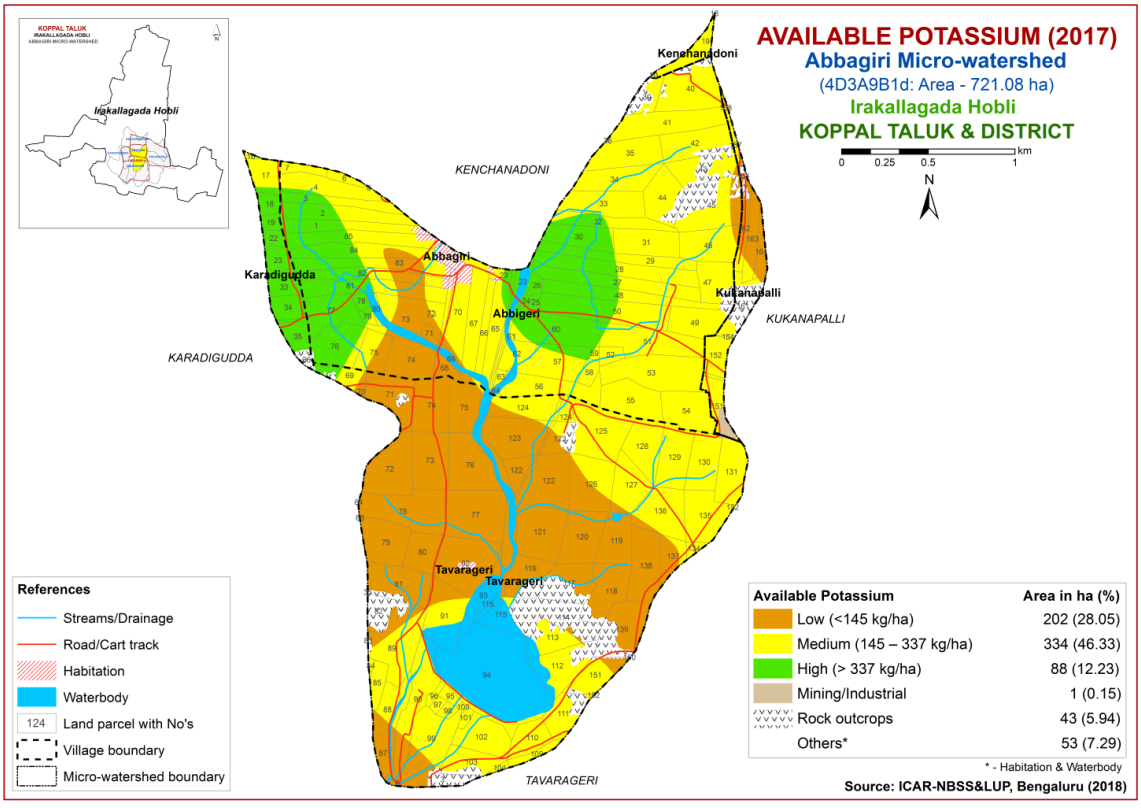


Fig.6.5 Soil Available Potassium map of Abbagiri Microwatershed

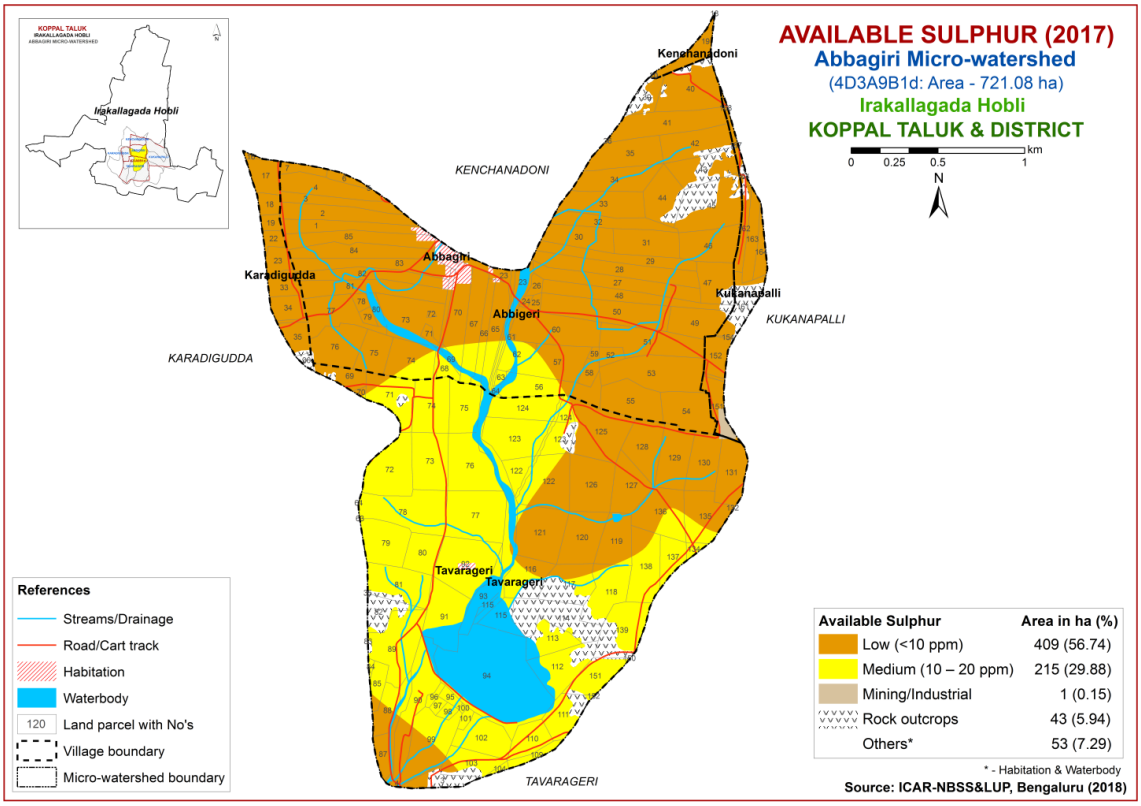


Fig.6.6 Soil Available Sulphur map of Abbagiri Microwatershed

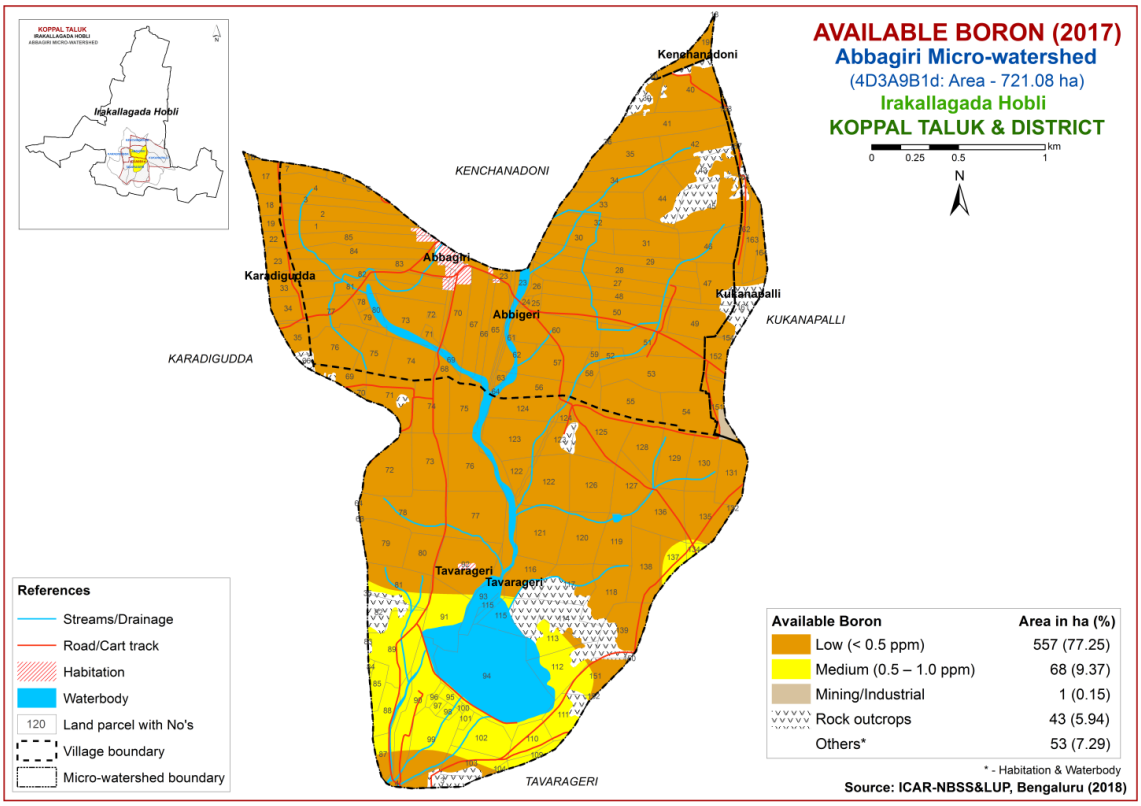


Fig.6.7 Soil Available Boron map of Abbagiri Microwatershed

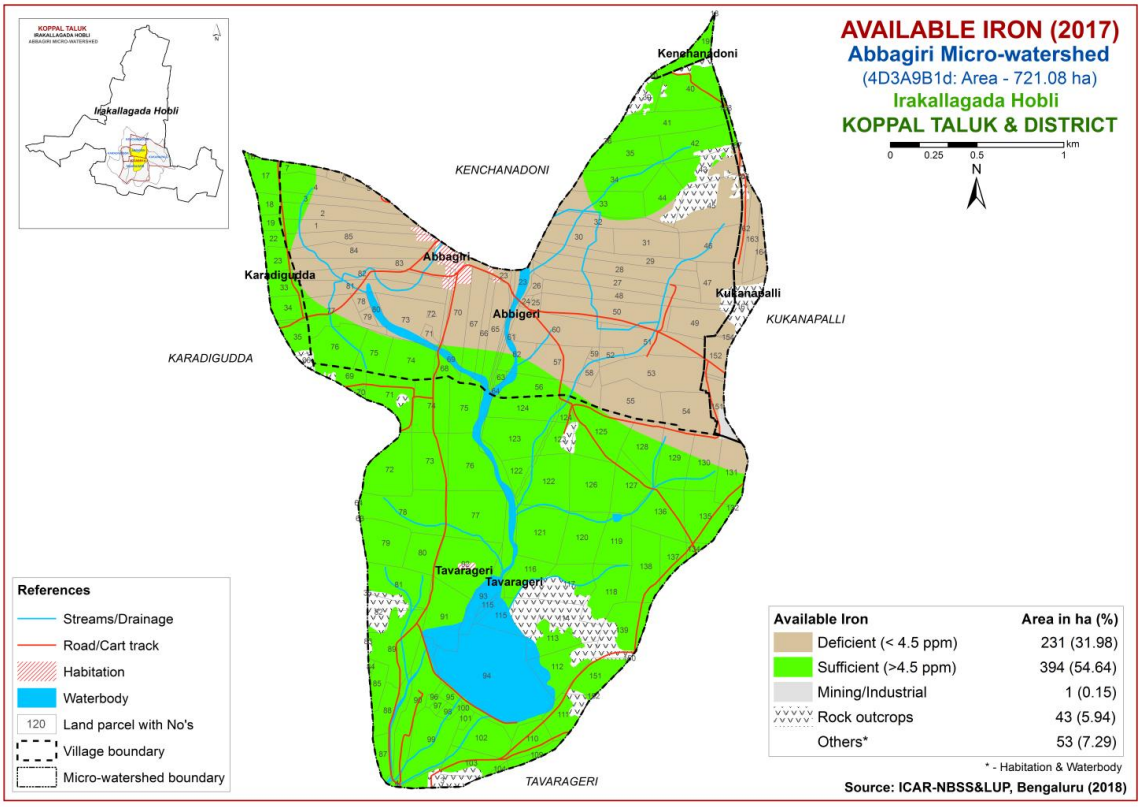


Fig.6.8 Soil Available Iron map of Abbagiri Microwatershed

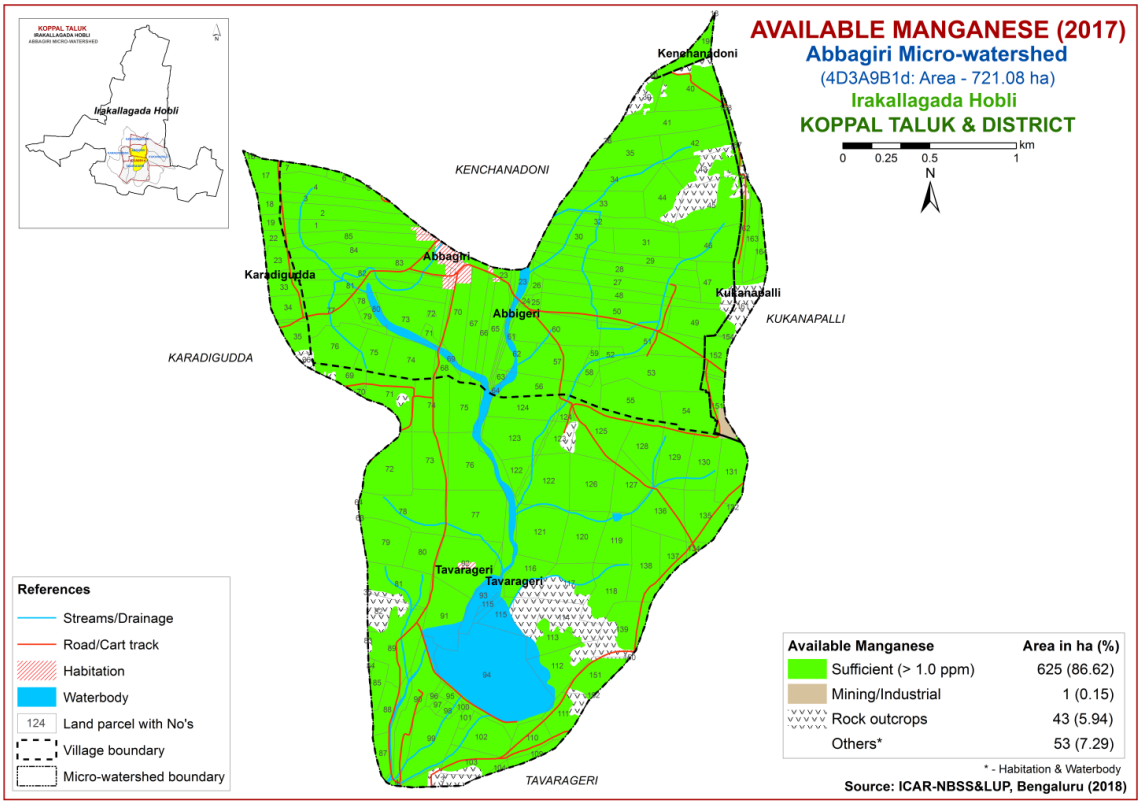


Fig.6.9 Soil Available Manganese map of Abbagiri Microwatershed

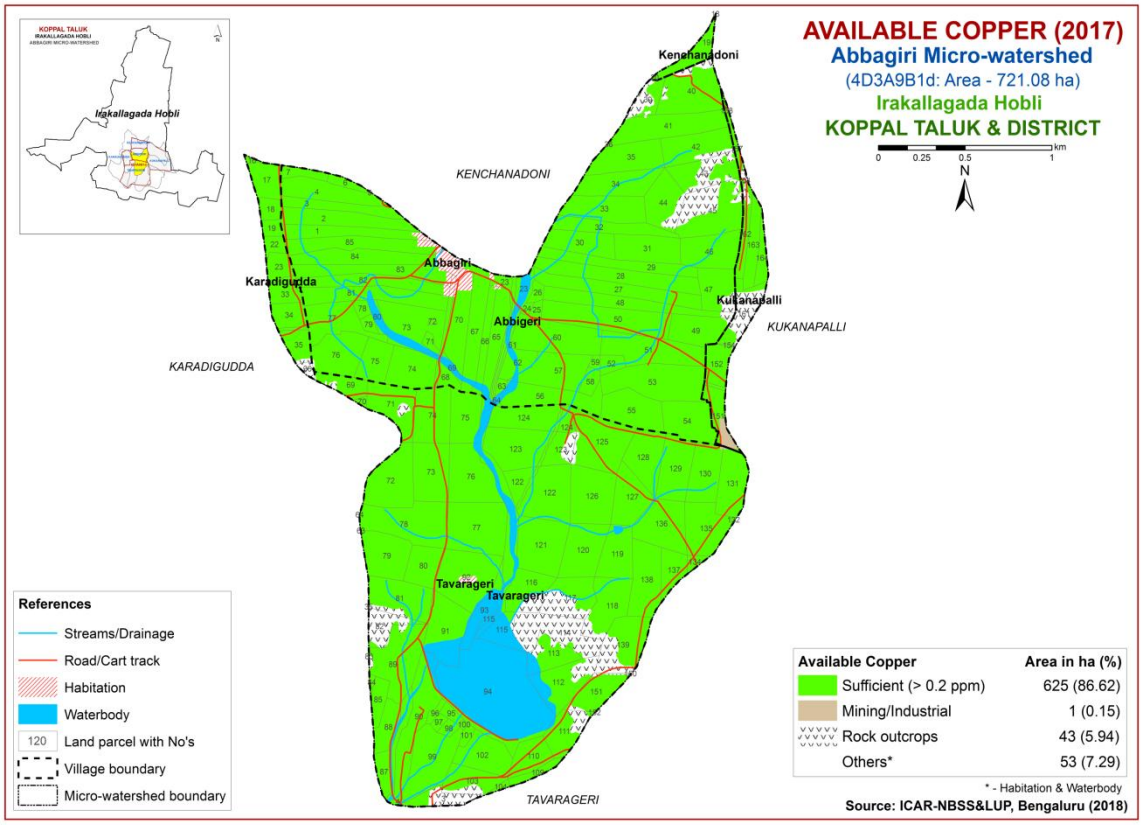


Fig.6.10 Soil Available Copper map of Abbagiri Microwatershed

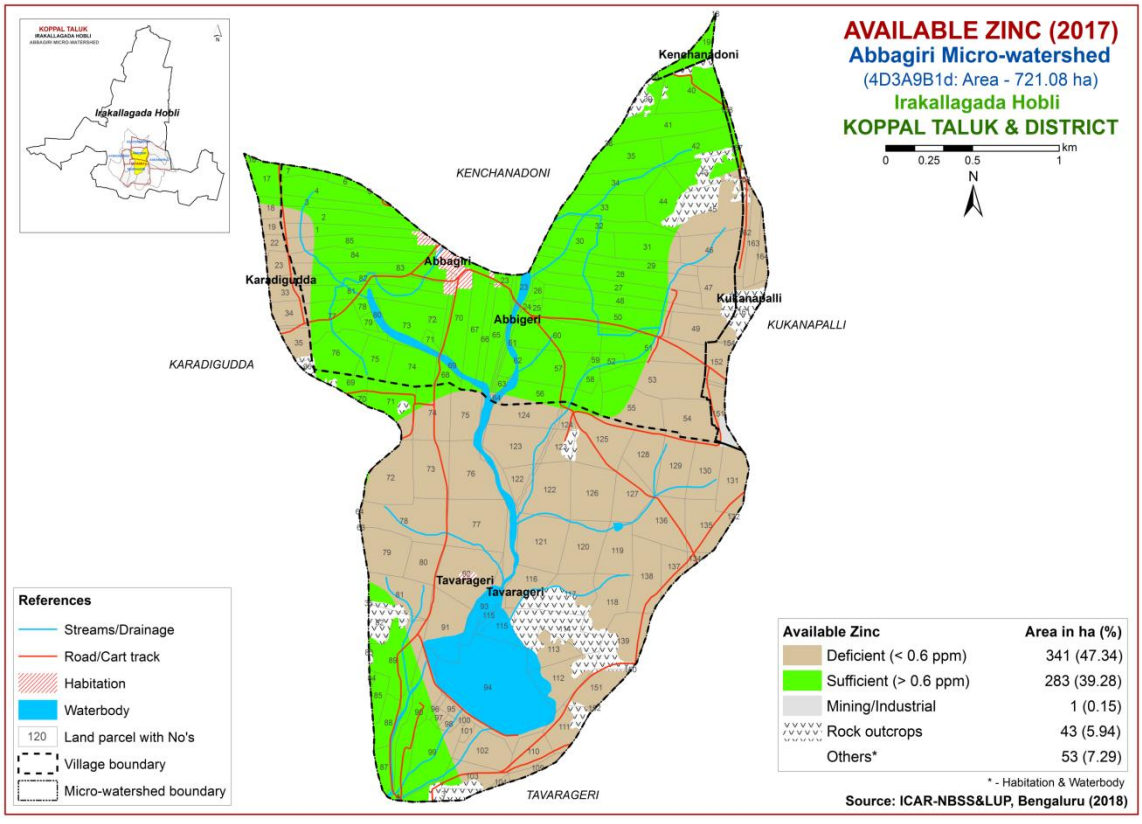


Fig.6.11 Soil Available Zinc map of Abbagiri Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Abbagiri 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 crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1- Highly Suitable, Class S2- Moderately Suitable and Class S3- Marginally Suitable. Order N has two Classes, N1- Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 's' for sodium, 'z' for calcareousness and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 28 major agriculture 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 crops grown in Karnataka in an area of 10.47 lakh ha in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad, Bellary, Chitradurga, Mysore and Chamarajnagar districts. The crop requirements for growing sorghum (Table 7.2) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing sorghum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.1.

Highly suitable (Class S1) lands occupy an area of about9 ha (1%) for growing sorghum and occur in the central part of the microwatershed. An area of about 140 ha (19%) is moderately suitable (Class S2) for growing sorghum and distributed in the southern and northeastern part of the microwatershed with minor limitations of calcareousness, nutrient availability, gravelliness, drainage and rooting depth.

Table 7.1 Soil-Site Characteristics of Abbagiri Microwatershed

Soil Map Units	Climate (P)(mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP	CEC [Cmol p^{+})kg^{-1}]	BS (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface								
KGPhB2g1	662	<90	WD	25-50	scl	gscl-gsc	15-35	15-35	50-100	1-3	moderate	-	-	-	-	-
HRVhB2	662	<90	WD	25-50	scl	gscl	-	>35	<50	1-3	moderate	-	-	-	-	-
HRVcB2g1	662	<90	WD	25-50	sl	gscl	15-35	>35	<50	1-3	moderate	-	-	-	-	-
ABRbB2g2	662	<90	WD	25-50	ls	sc-c	35-60	>35	<50	1-3	moderate	-	-	-	-	-
MKHiB2	662	<90	WD	50-75	sc	gscl	-	>35	51-100	1-3	moderate	7.38	0.09	1.49	14.84	93
MKHhB2g1	662	<90	WD	50-75	scl	gscl	15-35	>35	51-100	1-3	moderate	7.38	0.09	1.49	14.84	93
MKHhB1g1	662	<90	WD	50-75	scl	gscl	15-35	>35	51-100	1-3	slight	7.38	0.09	1.49	14.84	93
MKHcB2g2	662	<90	WD	50-75	scl	gscl	35-60	>35	51-100	1-3	moderate	7.38	0.09	1.49	14.84	93
MKHcB2g1	662	<90	WD	50-75	scl	gscl	15-35	>35	51-100	1-3	moderate	7.38	0.09	1.49	14.84	93
LKRhC2g3	662	<90	WD	50-75	scl	gsc	60-80	40-60	51-100	3-5	moderate	8.18	0.30	4.51	12.19	100
LKRcB2g1	662	<90	WD	50-75	sl	gsc	15-35	40-60	51-100	1-3	moderate	8.18	0.30	4.51	12.19	100
HTIiB2g2	662	<90	WD	50-75	sc	gsc	35-60	15-35	51-100	1-3	moderate	-	-	-	-	-
HTIiB2g1	662	<90	WD	50-75	sc	gsc	15-35	15-35	51-100	1-3	moderate	-	-	-	-	-
HTIcB2g1	662	<90	WD	50-75	sl	gsc	15-35	15-35	51-100	1-3	moderate	-	-	-	-	-
HDHhB2g1	662	<90	WD	75-100	scl	gsc-gc	15-35	>35	51-100	1-3	moderate	6.54	0.07	7.11	5.84	84.07
HDHhB2	662	<90	WD	75-100	scl	gsc-gc	-	>35	51-100	1-3	moderate	6.54	0.07	7.11	5.84	84.07
HDHcB2g2	662	<90	WD	75-100	sl	gsc-gc	35-60	>35	51-100	1-3	moderate	6.54	0.07	7.11	5.84	84.07
HDHcB2g1	662	<90	WD	75-100	sl	gsc-gc	15-35	>35	51-100	1-3	moderate	6.54	0.07	7.11	5.84	84.07
HDHbB2g1	662	<90	WD	75-100	ls	gsc-gc	15-35	>35	51-100	1-3	moderate	6.54	0.07	7.11	5.84	84.07
BDGhB2g1	662	<90	WD	75-100	scl	gc	15-35	35-60	<50	1-3	moderate	6.24	0.06	3.76	0.35	52.56
BDGhB2	662	<90	WD	75-100	scl	gc	-	35-60	<50	1-3	moderate	6.24	0.06	3.76	0.35	52.56
BDGhA1	662	<90	WD	75-100	scl	gc	-	35-60	<50	0-1	slight	6.24	0.06	3.76	0.35	52.56
BDGcB1g1	662	<90	WD	75-100	sl	gc	15-35	35-60	<50	1-3	slight	6.24	0.06	3.76	0.35	52.56
NGPbB1	662	<90	WD	100-150	ls	gsc-gc	-	>35	51-100	1-3	slight	-	-	-	-	-
BPRhB2g1	662	<90	WD	100-150	scl	gsc-gc	15-35	>35	101-150	1-3	moderate	6.64	0.03	0.51	5.45	63.48

Soil Map Units	Climate (P)(mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP	CEC [Cmol p^{+})kg^{-1}]	BS (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface								
BPRcB2g1	662	<90	WD	100-150	sl	gsc-gc	15-35	>35	101-150	1-3	moderate	6.64	0.03	0.51	5.45	63.48
BPRbB1g1	662	<90	WD	100-150	ls	gsc-gc	15-35	>35	101-150	1-3	slight	6.64	0.03	0.51	5.45	63.48
DRLmB2	662	<90	MWD	75-100	c	c	-	<15	151-200	1-3	moderate	-	-	-	-	-
HNHiB2	662	<90	MWD	50-75	sc	sc	-	-	101-150	1-3	moderate	-	-	-	-	-
HLPmA1	662	<90	WD	75-100	c	sc	-	-	51-100	0-1	slight	-	-	-	-	-
HLPiB2	662	<90	WD	75-100	sc	sc	-	-	51-100	1-3	moderate	-	-	-	-	-
HLPhB1	662	<90	WD	75-100	scl	sc	-	-	51-100	1-3	slight		-	-	-	-
TSDmA1	662	<90	MWD	>150	c	c	-	-	>200	0-1	slight	8.46	0.17	0.48	36.61	100

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

Maximum area of about 474 ha (66%) is marginally suitable (Class S3) for growing sorghum and distributed in the major part of the microwatershed. They have moderate limitation of gravelliness and rooting depth. Area currently not suitable (Class N1) for growing sorghum cover about 1 ha (<1 %) and distributed in the northern part of the microwatershed with severe limitations of gravelliness.

Table 7.2 Crop suitability criteria for Sorghum

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately suitable(S2)**	**Marginally suitable (S3)**	**Not suitable (N)**
Slope	%	2-3	3-8	8-15	>15
LGP	Days	120-150	120-90	<90	
Soil drainage	Class	Well to mod.Well drained	imperfect	Poorly/ excessively	V.poorly
Soil reaction	pH	6.0-8.0	5.5-5.9,8.1-8.5	<5.5,8.6-9.0	>9.0
Surface soil Texture	Class	c, cl, sicl, sc	l, sil, sic	sl, ls	s, fragmental skeletal
Soil depth	cm	100-75	50-75	30-50	<30
Gravel content	% vol.	5-15	15-30	30-60	>60
Salinity (EC)	dSm^{-1}	2-4	4-8	8-10	>10
Sodicity (ESP)	%	5-8	8-10	10-15	>15

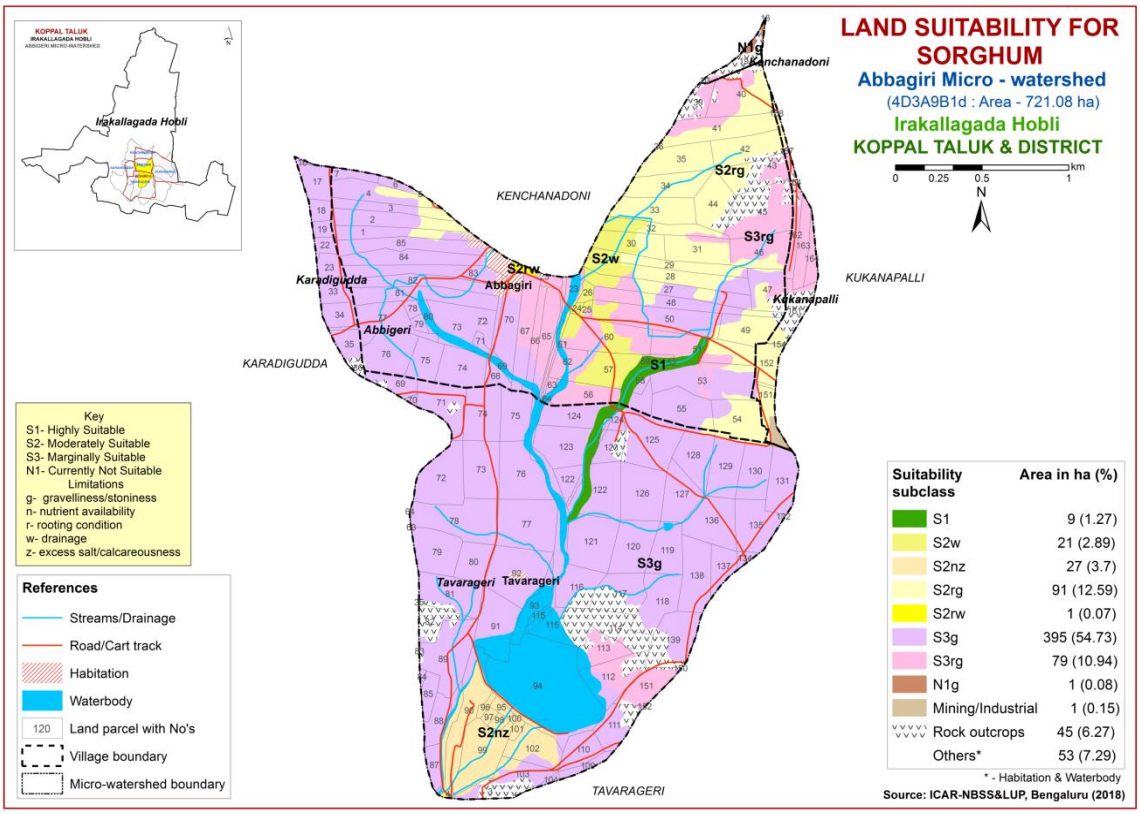


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

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

Table 7.3 Crop suitability criteria for Maize

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately suitable(S2)**	**Marginally suitable (S3)**	**Not suitable (N)**
Slope	%	<3	3.5	5-8	
LGP	Days	>100	100-80	60-80	
Soil drainage	Class	Well drained	Mod. to imperfectly	Poorly/excessively	V.poorly
Soil reaction	pH	5.5-7.5	7.6-8.5	8.6-9.0	
Surface soil texture	class	l, cl, scl, sil	sl, sicl, sic	c(s-s), ls	s,fragmental
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-50	>50
Salinity (EC)	dSm^{-1}	<1.0	1.0-2.0	2.0-4.0	
Sodicity (ESP)	%	<10	10-15	>15	

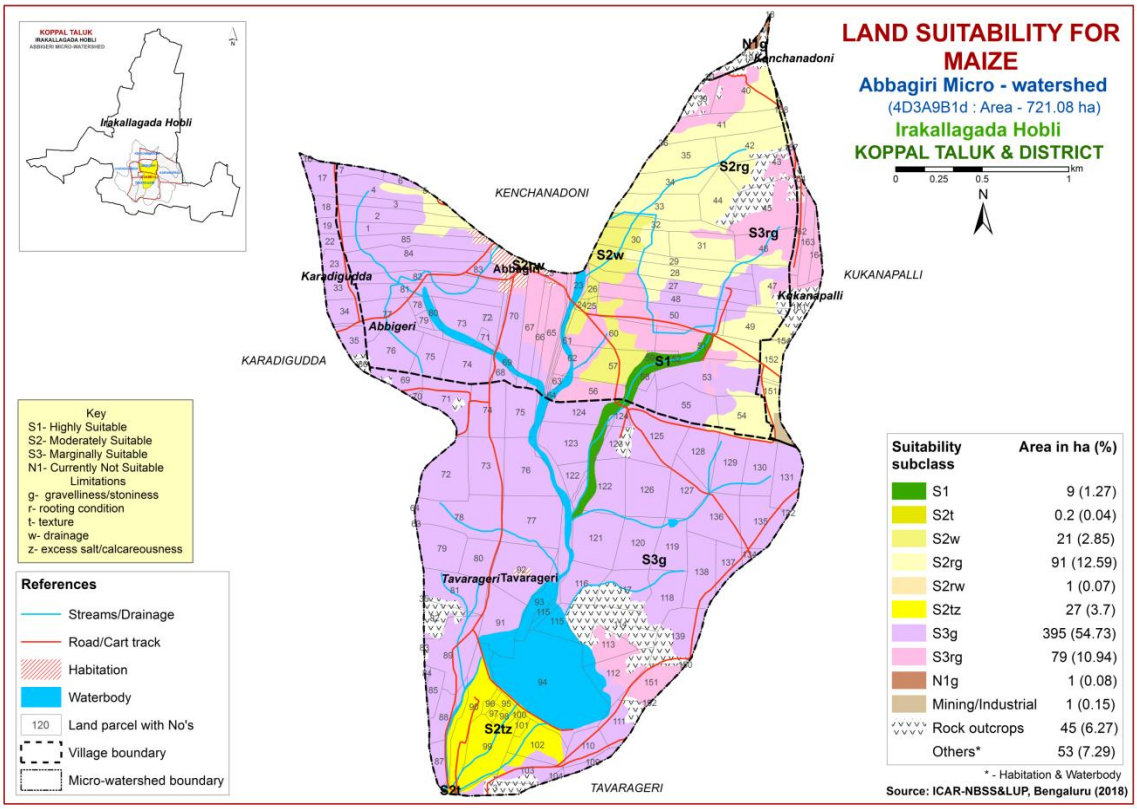


Fig. 7.2 Land Suitability map of Maize

Highly suitable (Class S1) lands occupy an area of about 9 ha (1 %) for growing maize and occur in the central part of the microwatershed. An area of about 140 ha (19%) is moderately suitable (Class S2) and distributed in the southern and northeastern part of the microwatershed with minor limitations of calcareousness, texture, drainage, gravelliness and rooting depth. Marginally suitable (Class S3) lands cover a maximum area of about 474 ha (66 %) and occur in the major part of the microwatershed. They have moderate limitations of gravelliness and rooting depth. Area currently not suitable (Class N1) for growing maize cover about 1 ha (<1 %) and distributed in the northern part of the microwatershed with severe limitation of gravelliness.

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

Highly suitable (Class S1) lands occupy an area of about 9 ha (1 %) for growing bajra and occur in the central part of the microwatershed. An area of about 275 ha (38 %) is moderately suitable (Class S2) and distributed in the southern, western, northern and eastern part of the microwatershed with minor limitations of calcareousness, gravelliness, drainage, rooting depth and texture. Marginally suitable (Class S3) lands cover a maximum area of about 340 ha (47 %) and occur in the major part of the microwatershed. They have moderate limitations of gravelliness and rooting depth.

Table 7.4 Crop suitability criteria for Bajra

Crop requirement		**Rating**			
Soil –site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Slope	%	2-3	3-8	8-15	>15
LGP	Days	120-150	120-90	<90	
Soil drainage	Class	Well to mod.Well drained	imperfect	Poorly/excessively	V.poorly
Soil reaction	pH	5.5-8.0	5.0-5.5,7.8-8.4	8.4-9.0	>9.0
Surface soil texture	Class	c(red), sicl, sc,sl, cl	l, c (black) scl, sil, sic	sl, ls	s, fragmental skeletal
Soil depth	cm	100-75	50-75	25-50	<25
Gravel content	% vol.	15-35	35-60	60-80	-
Salinity (EC)	dSm^{-1}	2-4	4-8	8-10	>10
Sodicity (ESP)	%	5-8	8-10	10-15	>15

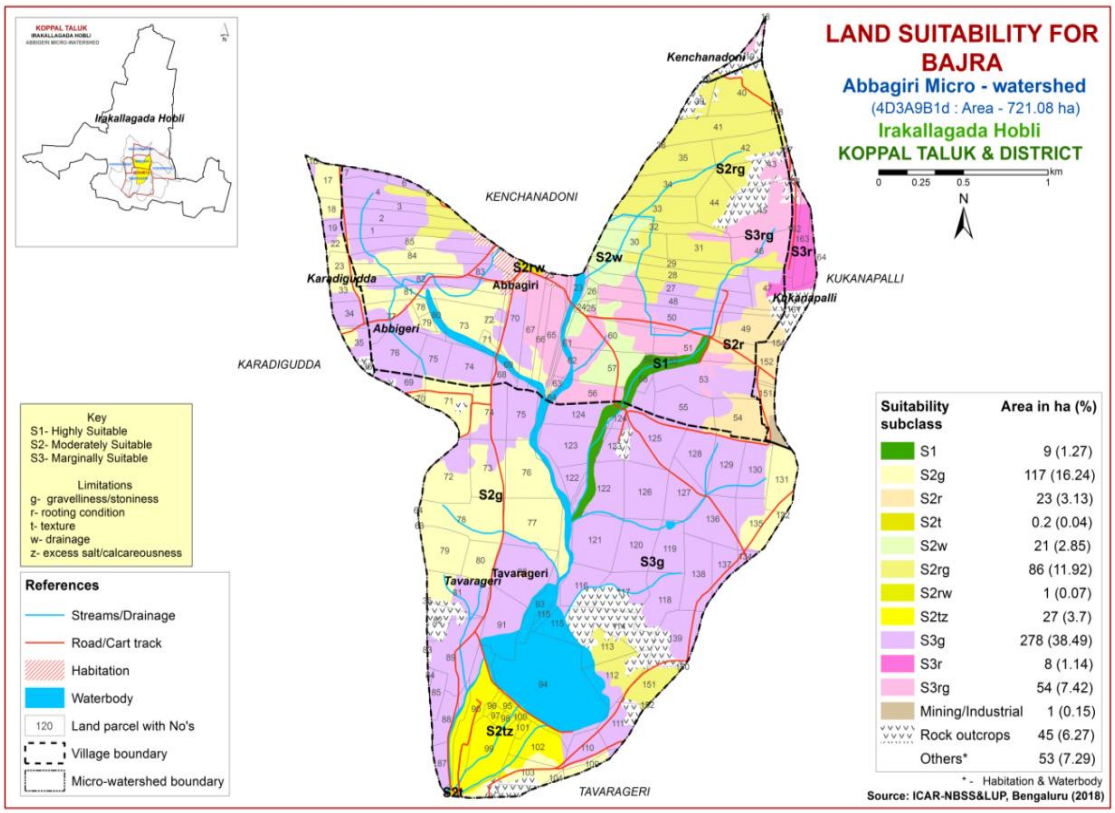


Fig. 7.3 Land Suitability map of Bajra

7.4 Land Suitability for Redgram (*Cajanus cajan*)

Redgram is one of the most important pulse crop grown in an area of 7.28 lakh ha in almost all the districts of the State. The crop requirements for growing redgram (Table 7.5) 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 7.4.

Table 7.5 crop suitability criteria for Red gram

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>210	180-210	150-180	<150
Soil drainage	Class	Well drained	Mod. well drained	Imperfectly drained	Poorly drained
Soil reaction	pH	6.5-7.5	5.0-6.5,7.6-8.0	8.0-9.0	>9.0
Sub Surface soil texture	Class	l, scl, sil, cl, sl	sicl, sic, c(m)	ls	
Soil depth	cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	3-60	>60
Salinity (EC)	dsm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

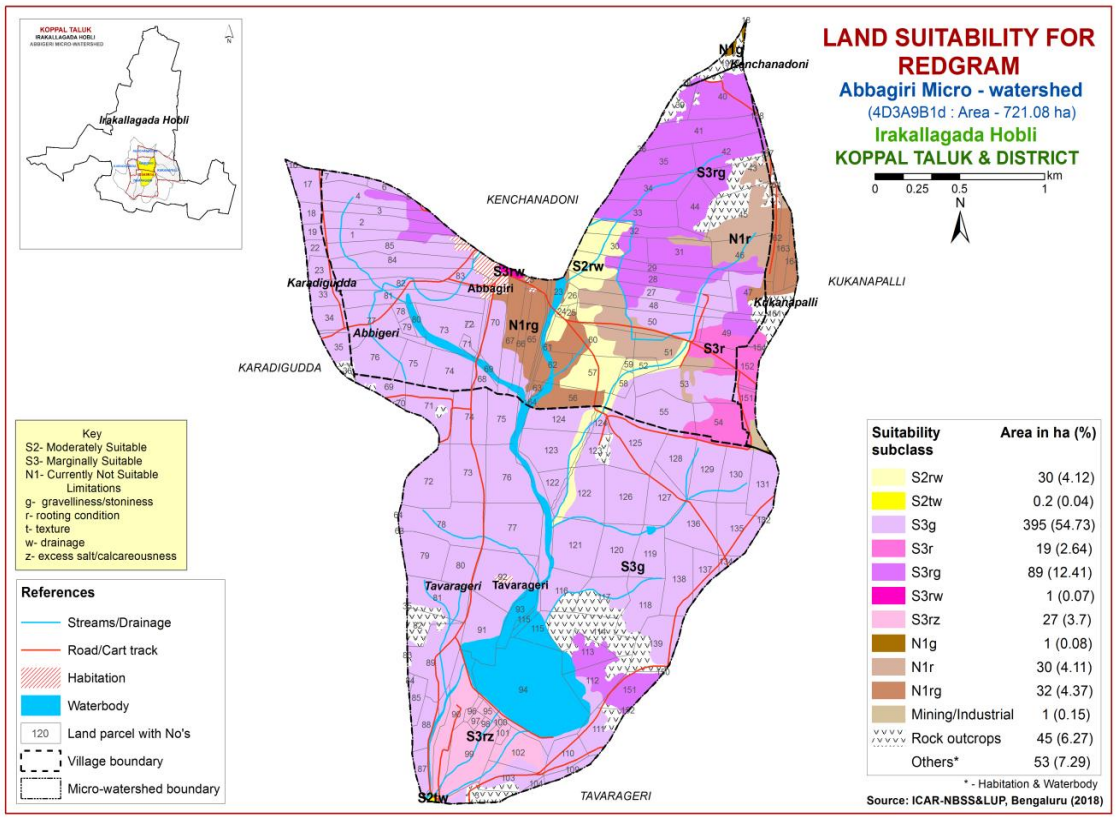


Fig. 7.4 Land Suitability map of Redgram

There are no highly suitable (Class S1) lands for growing redgram. An area of about 30 ha (4 %) is moderately suitable (Class S2) for growing redgram and occur in the northern part of the microwatershed. They have minor limitations of rooting depth, texture, and drainage. Marginally suitable lands (Class S3) occupy maximum area of about 531 ha (74 %) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness, drainage and calcareousness. Area currently not suitable (Class N1) for growing redgram cover about 63 ha (8 %) and distributed in the northern and eastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

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

Bengal gram is one of the major pulse crop grown in an area of 9.39 lakh ha in northern Karnataka in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad and Bellary districts. The crop requirements for growing Bengal gram (Table 7.6) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing Bengal gram was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.5.

Table 7.6 Crop suitability criteria for Bengal gram

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>100	90-100	70-90	<70
Soil drainage	Class	Well drained	Mod. to well drained; Imper. drained	Poorly drained; excessively drained	Very Poorly drained
Soil reaction	pH	6.0-7.5	5.5-5.77.6-8.0	8.1-9.0;4.5-5.4	>9.0
Surface soil texture	Class	l, scl, sil, cl,	sicl, sic, c	Sl, c>60%	S,fragmental
Soil depth	cm	>75	51-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (EC)	dSm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

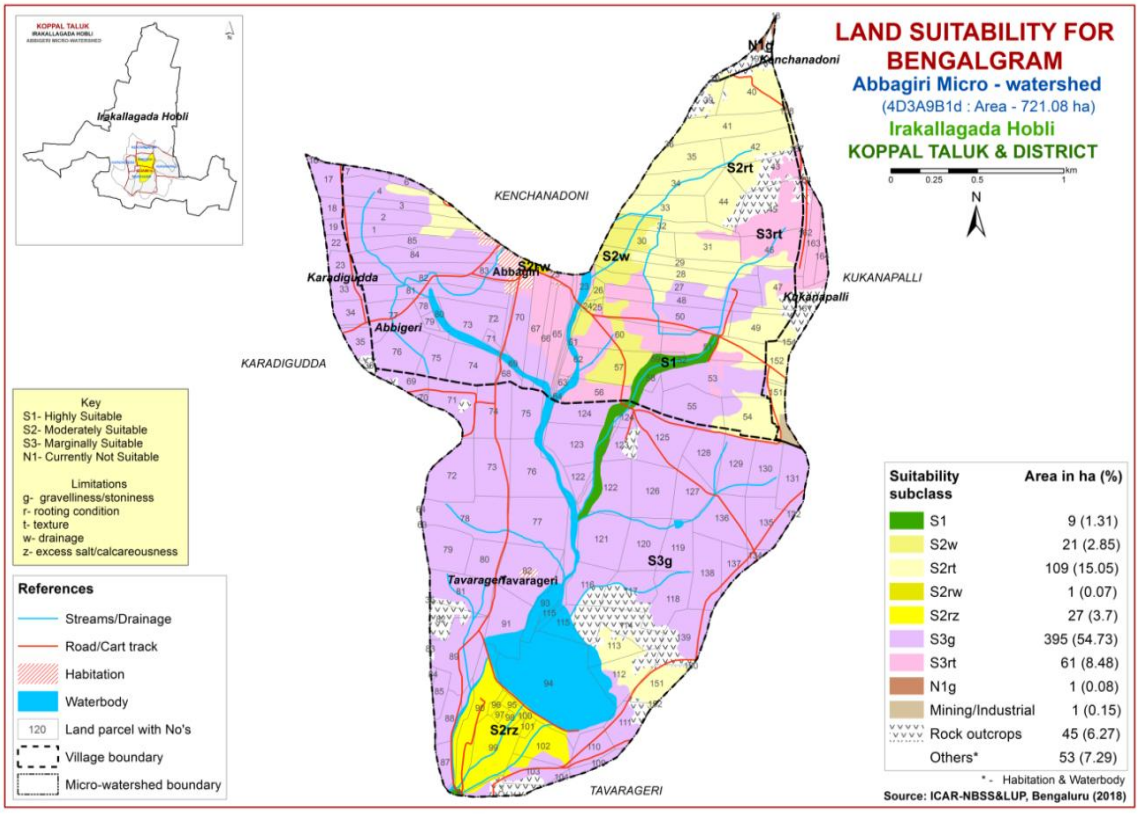


Fig. 7.5 Land Suitability map of Bengal gram

Highly suitable (Class S1) lands occupy an area of about 9 ha (1 %) for growing Bengal gram and occur in the central part of the microwatershed. An area of about 158 ha (22%) is moderately suitable (Class S2) and distributed in the southern and northeastern part of the microwatershed with minor limitations of calcareousness, drainage, rooting depth and texture. Marginally suitable (Class S3) lands cover a maximum area of about456 ha (63%) and occur in the major part of the microwatershed. They have

moderate limitations of gravelliness, texture and rooting depth. Area currently not suitable (Class N1) for growing Bengal gram cover about 1 ha (<1%) and distributed in the northern part of the microwatershed with severe limitation of gravelliness.

7.6 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 7.7) 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 7.6.

Maximum area of about 325 ha (45%) is moderately suitable (Class S2) for growing groundnut and distributed in the major part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage and texture. An area of about 298 ha (41 %) is marginally suitable (Class S3) for growing groundnut and distributed in the southern, central, and northern part of the microwatershed with moderate limitations of gravelliness, rooting depth, texture, drainage and calcareousness.

Table 7.7 Crop suitability criteria for Groundnut

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	100-125	90-105	75-90	
Soil drainage	Class	Well drained	Mod. Well drained	Imperfectly drained	Poorly drained
Soil reaction	pH	6.0-8.0	8.1-8.5,5.5-5.9	>8.5,<5.5	
Surface soil texture	Class	l, cl, sil, sc, sicl	sc, sic, c,	s, ls, sl,c (>60%)	s, fragmental
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<35	35-50	>50	
$CaCO_3$ in root zone	%	high	Medium	low	
Salinity (EC)	dSm^{-1}	<2.0	2.0-4.0	4.0-8.0	
Sodicity (ESP)	%	<5	5-10	>10	

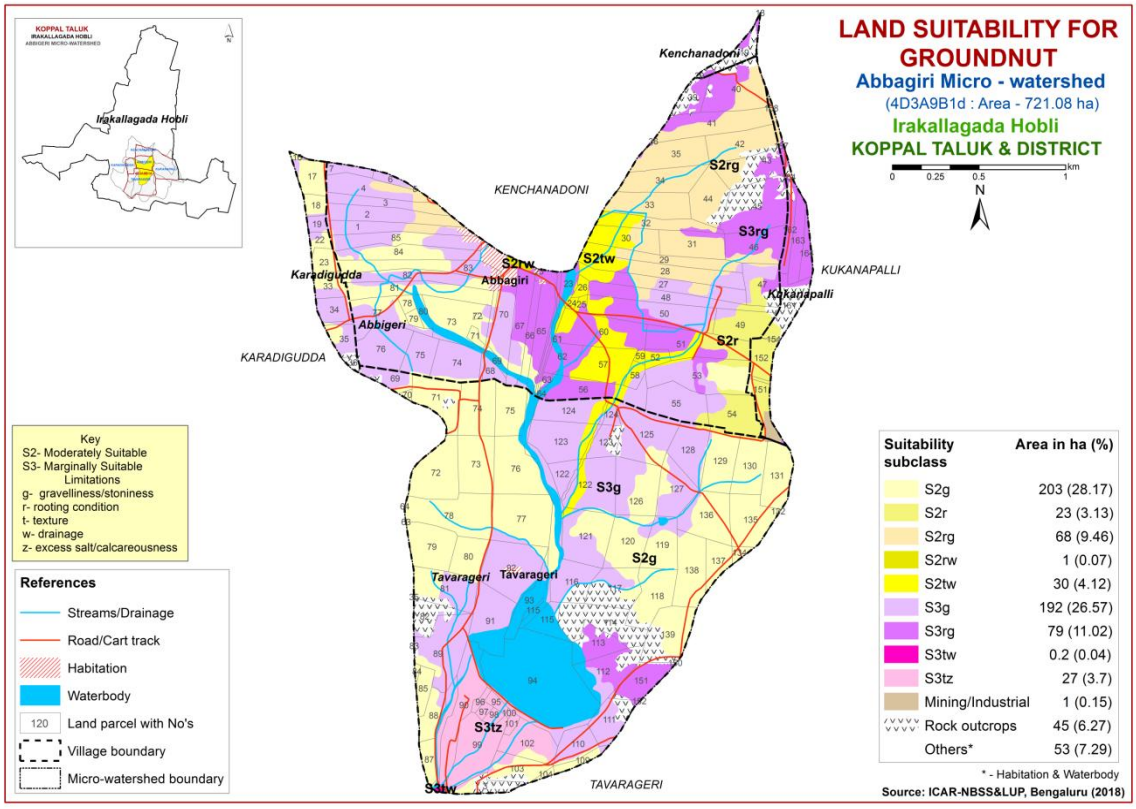


Fig. 7.6 Land Suitability map of Groundnut

7.7 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is one of the most important oilseed crop grown in an area of 3.56 lakh ha in the State in all the districts. The crop requirements for growing sunflower (Table 7.8) 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 7.7.

Table 7.8 Crop suitability criteria for Sunflower

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>90	80-90	70-80	<70
Soil drainage	class	Well drained	mod. Well drained	imperfectly drained	Poorly drained
Soil reaction	pH	6.5-8.0	8.1-8.5:5.5-6.4	8.6-9.0;4.5-5.4	>9.0:<4.5
Surface soil texture	Class	l, cl, sil, sc	scl, sic, c,	c (>60%), sl	ls, s
Soil depth	cm	>100	75-100	50-75	<50
Gravel content	%vol.	<15	15-35	35-60	>60
Salinity (EC)	dSm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

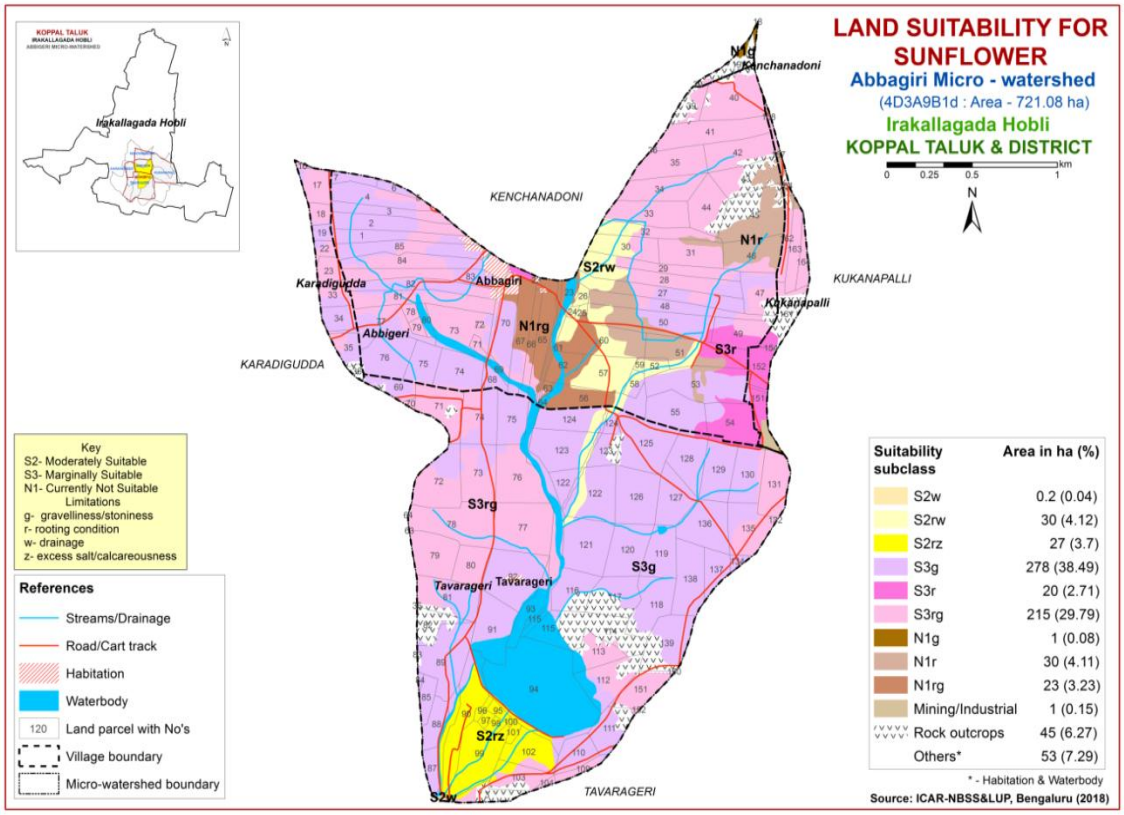


Fig. 7.7 Land Suitability map of Sunflower

An area of about 57 ha (8 %) is moderately suitable (Class S2) and distributed in the southern and northern part of the microwatershed. They have minor limitations of drainage, rooting depth and calcareousness. Marginally suitable (Class S3) lands occupy a maximum area of about 513 ha (71 %) and are distributed in the major part of the microwatershed with moderate limitations of rooting depth and gravelliness. Area currently not suitable (Class N1) for growing sunflower cover about 54 ha (7%) and distributed in the northern and eastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

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

An area of about 149 ha (20%) is moderately suitable (Class S2) for growing cotton and are distributed in the northern, southern and northeastern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, drainage and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 473

ha (66%) and are distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, rooting depth and texture. Area currently not suitable (Class N1) for growing cotton cover about 1 ha (<1 %) and distributed in the northeastern part of the microwatershed with severe limitation of gravelliness.

Table 7.9 Crop suitability criteria for Cotton

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	1-2	2-3	3-5	>5
LGP	Days	180-240	120-180	<120	
Soil drainage	Class	Well to mod. well	Imperfectly drained	Poor somewhat excessive	Stagnant/ Excessive
Soil reaction	pH	6.5-7.5	7.6-8.0	8.1-9.0	>9.0>6.5
Surface soil texture	Class	Sic, c	Sicl, cl	Si, sil, sc, scl, l	Sl, s,ls
Soil depth	cm	100-150	60-100	30-60	<30
Gravel content	% vol.	<5	5-10	10-15	15-35
$CaCO_3$ in root zone	%	<3	3-5	5-10	10-20
Salinity (EC)	dSm^{-1}	2-4	4.0-8.0	8.0-12	>12
Sodicity (ESP)	%	5-10	10-20	20-30	>30

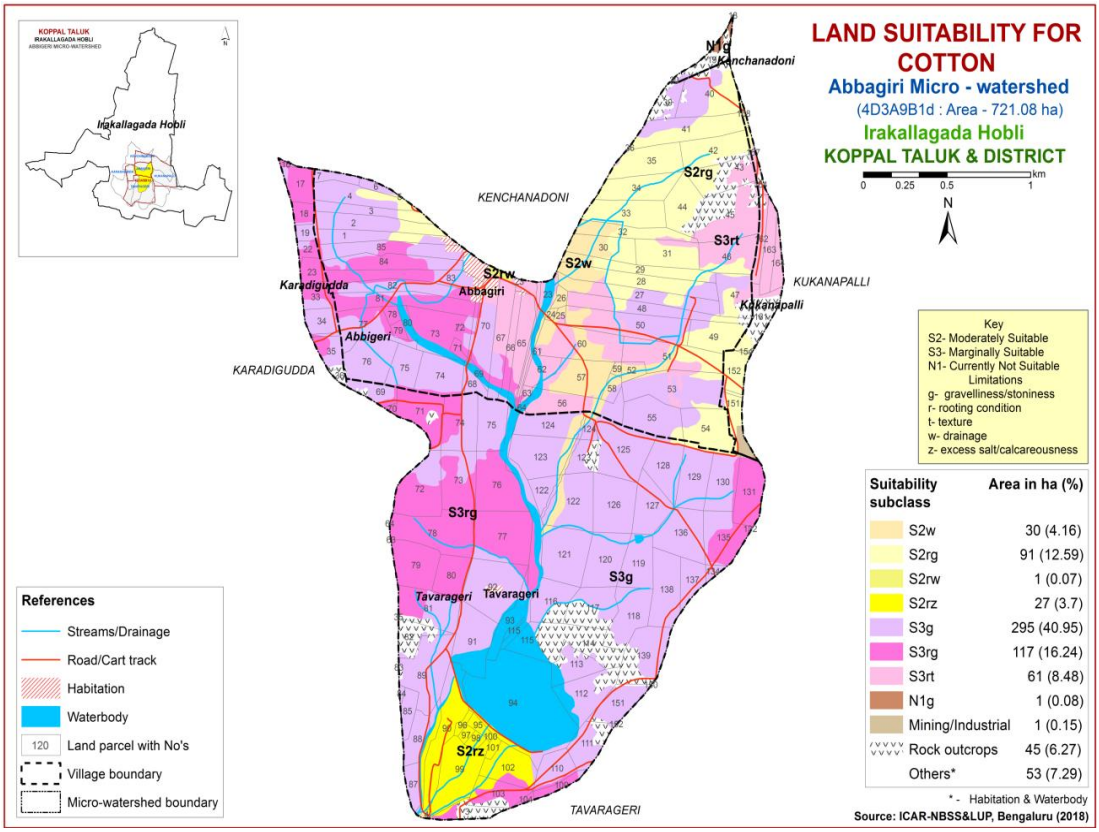


Fig. 7.8 Land Suitability map of Cotton

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

Chilli is one of the major spice crop grown in an area of 0.42 lakh ha in Karnataka State. The crop requirements for growing chilli (Table 7.10) were matched with the soil-

site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing chilli was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.9.

Table 7.10 Crop suitability criteria for Chilli

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Mean temperature in growing season	^{0}C	20-30	30-35 13-15	35-40 10-12	>40 <10
Slope	%	<3	3-5	5-10	>10
LGP	Days	>150	120-150	90-120	<90
Soil drainage	Class	Well drained	Moderately drained	Imp./ poor drained/excessively	Very poorly drained
Soil reaction	pH	6.5-7.8,6.0-7.0	7.8-8.4	8.4-9.0,5.0-5.9	>9.0
Surface soil texture	Class	scl, cl, sil	sl, sc, sic,c(m/k)	c(ss), ls, s	
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	<4
Sodicity (ESP)	%	<5	5-10	10-15	

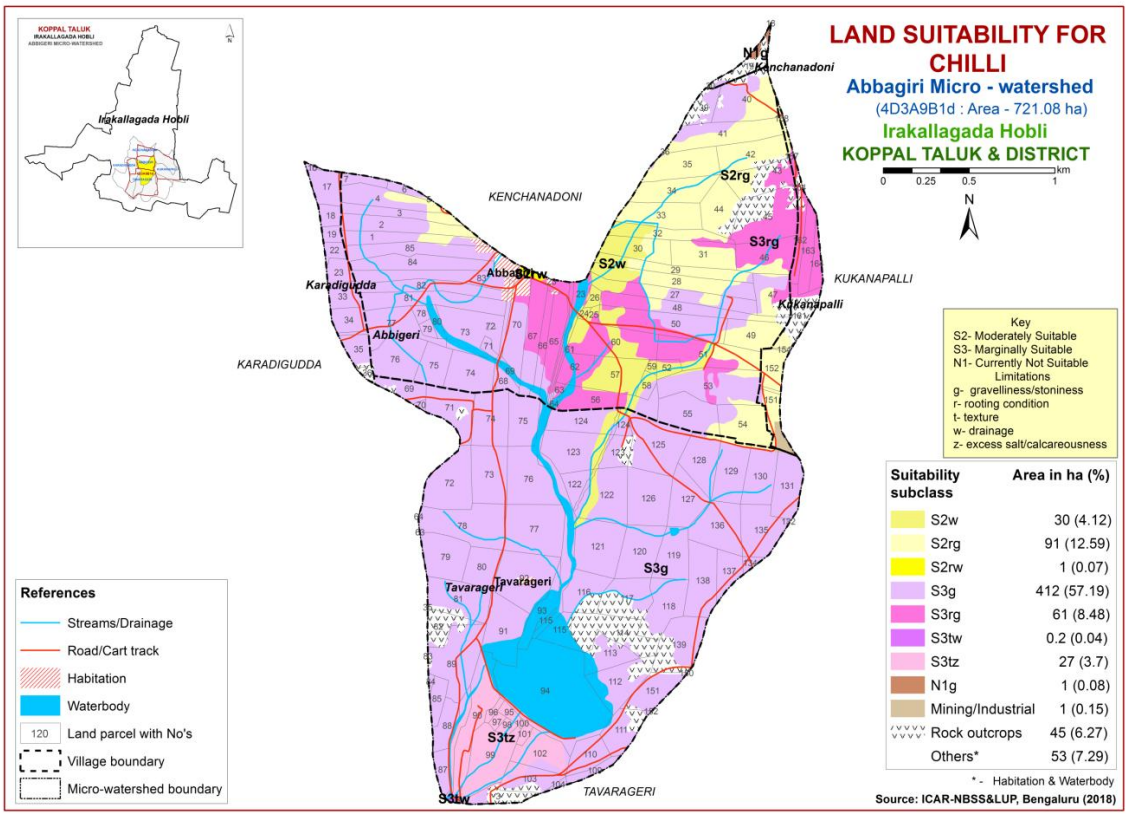


Fig. 7.9 Land Suitability map of Chilli

There are no highly suitable (S1) lands for growing Chilli. Moderately (S2) suitable lands cover an area of about 122 ha (17%) and distributed in the northeastern part of the microwatershed with moderate limitations of drainage, gravelliness and rooting

depth. Marginally suitable (Class S3) lands cover a maximum area of about500 ha (69%) and distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, rooting depth, texture, drainage and calcareousness. Area currently not suitable (Class N1) for growing chilli cover about 1 ha (<1%) and distributed in the northeastern part of the microwatershed with severe limitation of gravelliness

7.10 Land Suitability for Tomato (*Solanum lycopersicum*)

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

An area of about 9 ha (1%) in the microwatershed has soils that are highly suitable (Class S1) for growing tomato and distributed in the central part of the microwatershed. An area of about 113 ha (15 %) is moderately suitable (Class S2) for growing tomato and are distributed in the northeastern part of the microwatershed. They have minor limitations of rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 500 ha (69 %) and are distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, rooting depth, texture, drainage and calcareousness. Area currently not suitable (Class N1) for growing tomato cover about 1 ha (<1 %) and distributed in the northern part of the microwatershed with severe limitation of gravelliness.

Table 7.11 Crop suitability criteria for Tomato

Crop requirement			**Rating**			
Soil-site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	25-28	29-32 20-24	15-19 33-36	<15 >36
Soil moisture	Growing period	Days	>150	120-150	90-120	
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l, sl, cl, scl	sic,sicl,sc,c(m/k)	C (ss)	ls, s
	pH	1:2.5	6.0-7.0	5.0-5.9:7.1-8.5	<5;>8.5	
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	
Soil toxicity	Salinity	dS/m	Non saline	slight	strongly	
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	>10

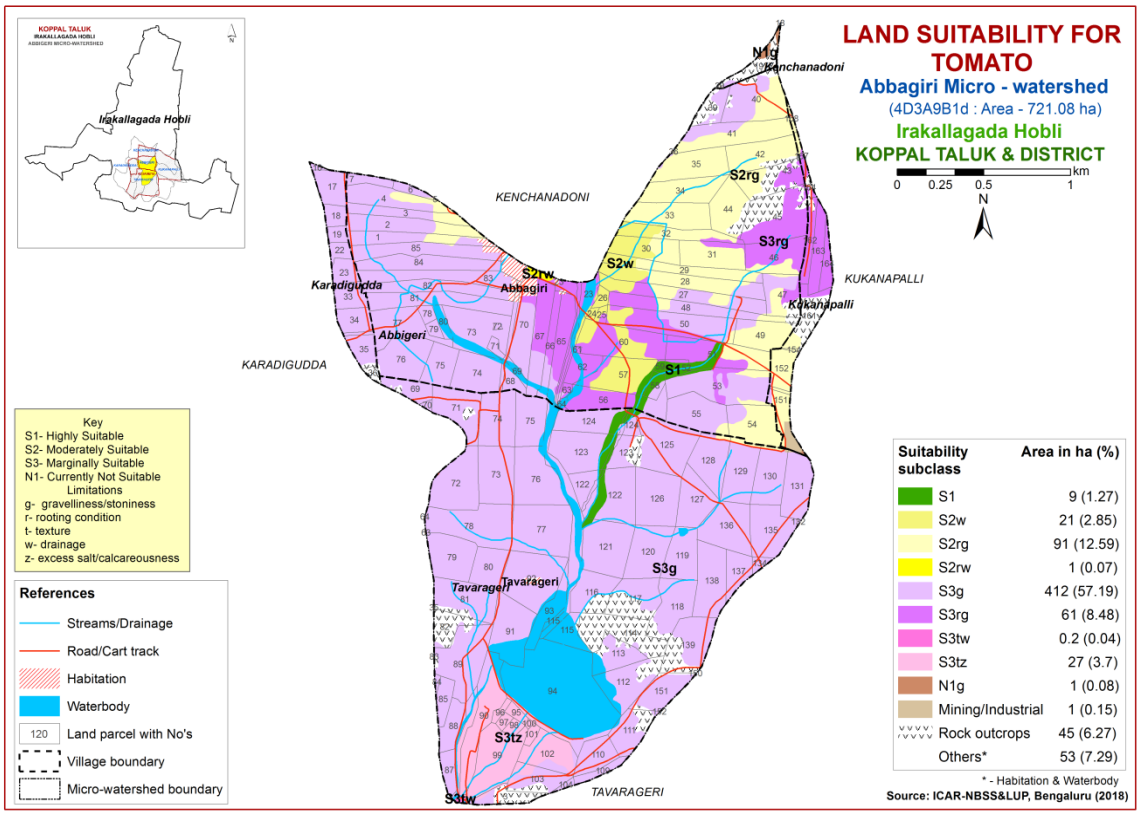


Fig. 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Drumstick (*Moringa oleifera)*

Drumstick is one of the most important vegetable crop grown in 2403 ha area in the state. The crop requirements for growing drumstick (Table 7.12) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing drumstick was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.11.

An area of about 143 ha (20 %) in the microwatershed has soils that are moderately suitable (Class S2) for growing drumstick and are distributed in the southern, eastern and central part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage, texture and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 420 ha (58 %) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, drainage and gravelliness. An area of about 61 ha (8 %) is currently not suitable (Class N1) and distributed in the northeastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.12 Crop suitability criteria for Drumstick

Crop requirement			Rating			
Soil-site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	sc, scl, cl, c (red)	sl, c (black)	ls	s
	pH	1:2.5	5.5-6.5	5-5.5:6.5-7.3	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	0-35	35-60	60-80	>80
Erosion	Slope	%	0-3	3-10	-	>10

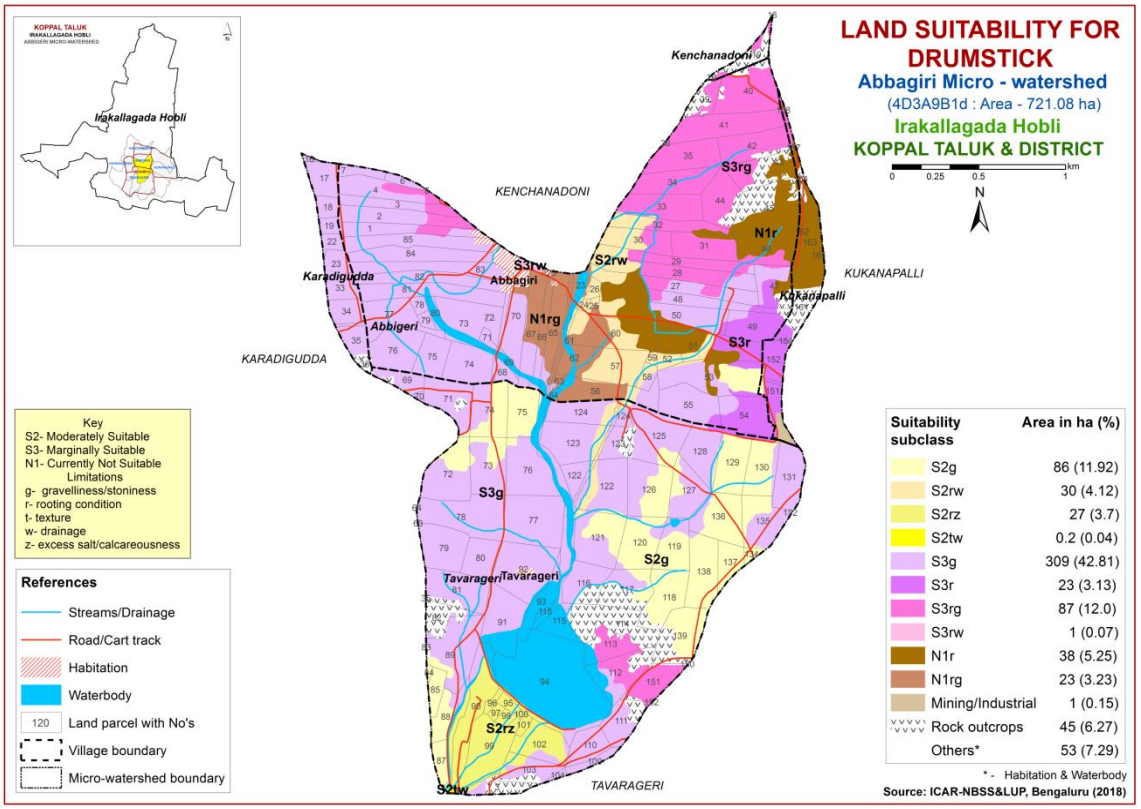


Fig. 7.11 Land Suitability map of Drumstick

7.12 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is the most important leaf crop grown for rearing silkworms in about 1.66 lakh ha in all the districts of the state. The crop requirements for growing mulberry (Table 7.13) 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 7.12.

Maximum area of about 470 ha (65%) in the microwatershed has soils that are moderately suitable (Class S2) and distributed in the major part of the microwatershed.

They have minor limitations of texture, gravelliness, rooting depth, drainage and calcareousness. Marginally suitable lands cover an area of about 92 ha (13 %) and occur in the northeastern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and drainage. An area of about 61 ha (8%) is currently not suitable (Class N1) for growing mulberry and distributed in the northern and northeastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.13 Crop suitability criteria for Mulberry

Crop requirement			Rating			
Soil-site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	sc, cl, scl	c (red)	c(black),sl, ls	-
	pH	1:2.5				
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	0-35	35-60	60-80	>80
Erosion	Slope	%	0-3	3-5	5-10	>10

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

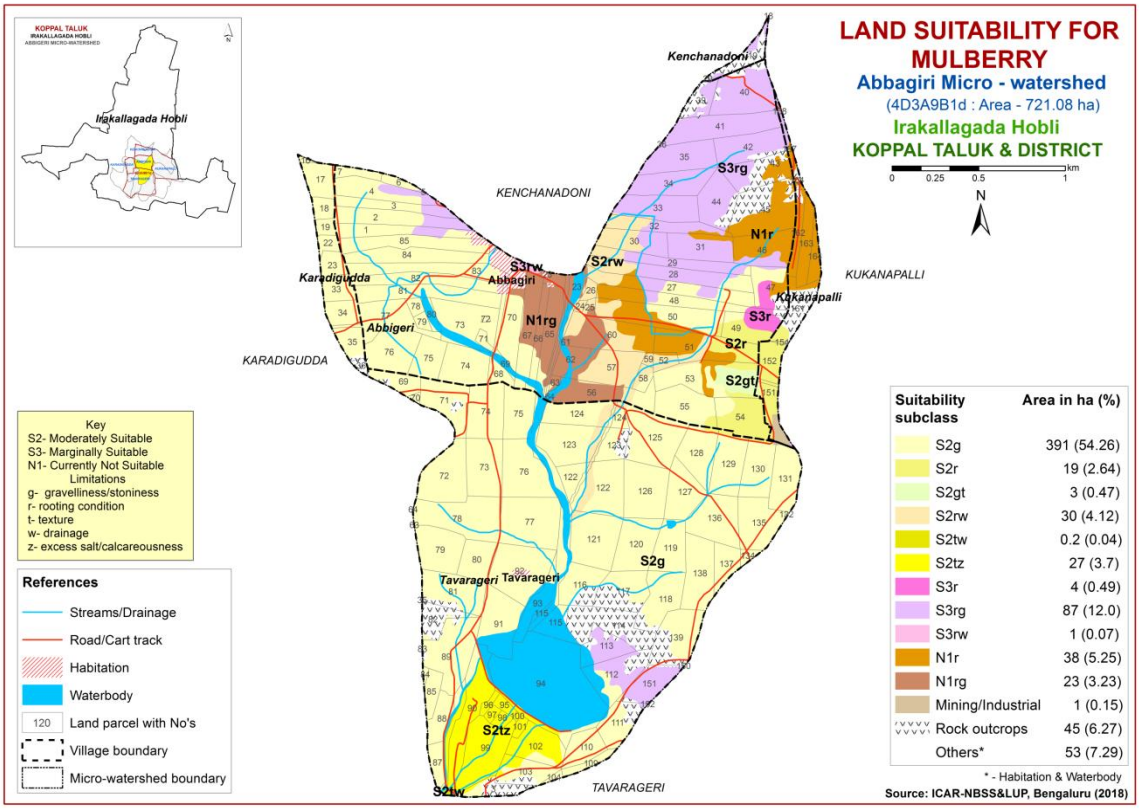


Fig. 7.12 Land Suitability map of Mulberry

7.13 Land suitability for Mango (*Mangifera indica*)

Mango is one of the most important fruit crop grown in about 1.73 lakh ha in almost all the districts of the State. The crop requirements (Table 7.14) for growing mango were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mango was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.13.

Marginally suitable (Class S3) lands cover a maximum area of about452 ha (63%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, texture, gravelliness, drainage and calcareousness. An area of about171 ha (24%) is currently not suitable (Class N1) for growing mango and occur in the northern and northeastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.14 Crop suitability criteria for Mango

Crop requirement			**Rating**			
Soil-site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Climate	Temp. in growingseason	^{0}C	28-32	24-27 33-35	36-40	20-24
	Min. temp. beforeflowering	^{0}C	10-15	15-22	>22	
Soil moisture	Growing period	Days	>180	150-180	120-150	<120
Soil aeration	Soil drainage	Class	Well drained	Mod. To imper. drained	Poor drained	Very poorly drained
	Water table	M	>3	2.50-3.0	2.5-1.5	<1.5
Nutrient availability	Texture	Class	sc,l, sil, cl	sl, sc, sic,l,c	c (<60%)	c(>60%),
	pH	1:2.5	5.5-7.5	7.6-8.5:5.0-5.4	8.6-9.0:4.0-4.9	>9.0<4.0
	OC	%	High	medium	low	
	$CaCO_3$ in root zone	%	Non calcareous	<5	5-10	>10
Rooting conditions	Soil depth	cm	>200	125-200	75-125	<75
	Gravel content	%vol	Non-gravelly	<15	15-35	>35
Soil toxicity	Salinity	dS/m	Nonsaline	<2.0	2.0-3.0	>3.0
	Sodicity	%	Non sodic	<10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

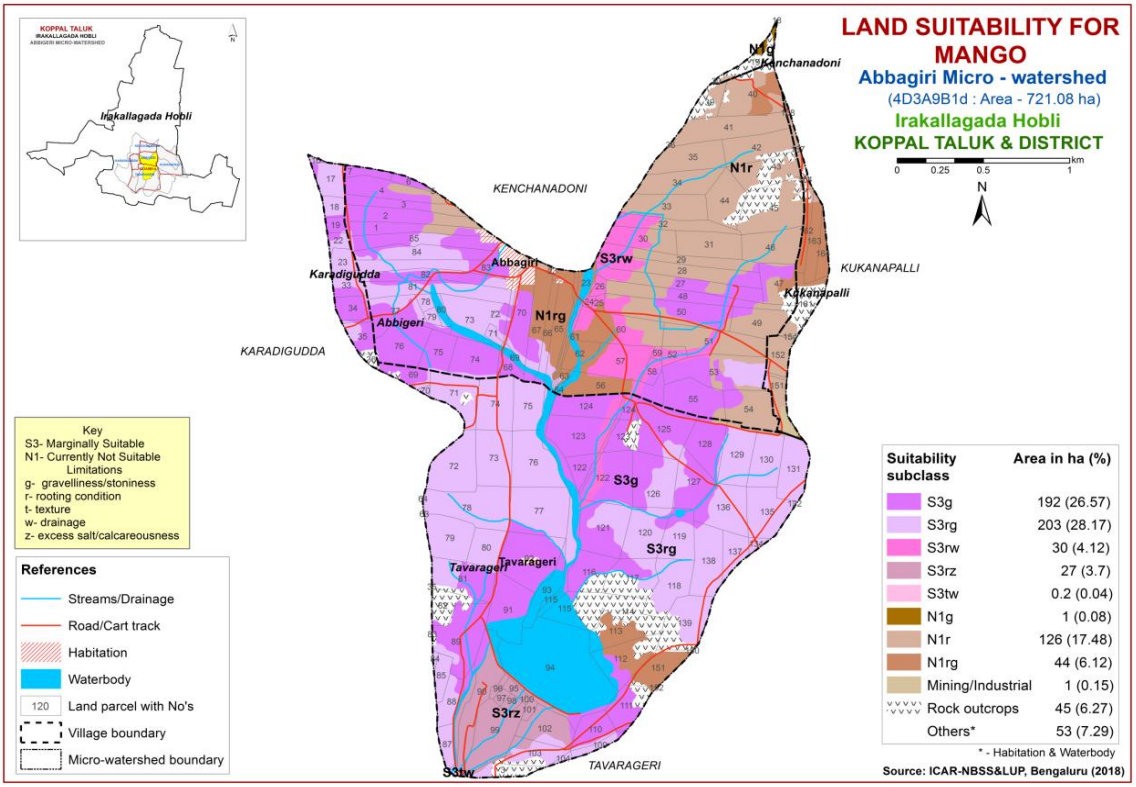


Fig. 7.13 Land Suitability map of Mango

7.14 Land suitability for Sapota (*Manilkara zapota*)

Sapota is one of the most important fruit crop grown in an area of about 29373 ha in almost all the districts of the state. The crop requirements (Table 7.15) for growing sapota were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sapota was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.14.

Table 7.15 Crop suitability criteria for Sapota

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	28-32	33-36 24-27	37-42 20-23	>42 <18
Soil moisture	Growing period	Days	>150	120-150	90-120	<120
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	scl, l, cl, sil	sl, sicl, sc	c (<60%)	ls,s,c(>60%)
	pH	1:2.5	6.0-7.5	7.6-8.0:5.0-5.9	8.1-9.0:4.5-4.9	>9.0:<4.5
	$CaCO_3$ in root zone	%	Non calcareous	<10	10-15	>15
Rooting conditions	Soil depth	cm	>150	75-150	50-75	<50
	Gravel content	%vol.	Non gravelly	<15	15-35	<35
Soil toxicity	Salinity	dS/m	Non saline	Up to 1.0	1.0-2.0	2.0-4.0
	Sodicity	%	Non sodic	10-15	15-25	>25
Erosion	Slope	%	<3	3-5	5-10	>10

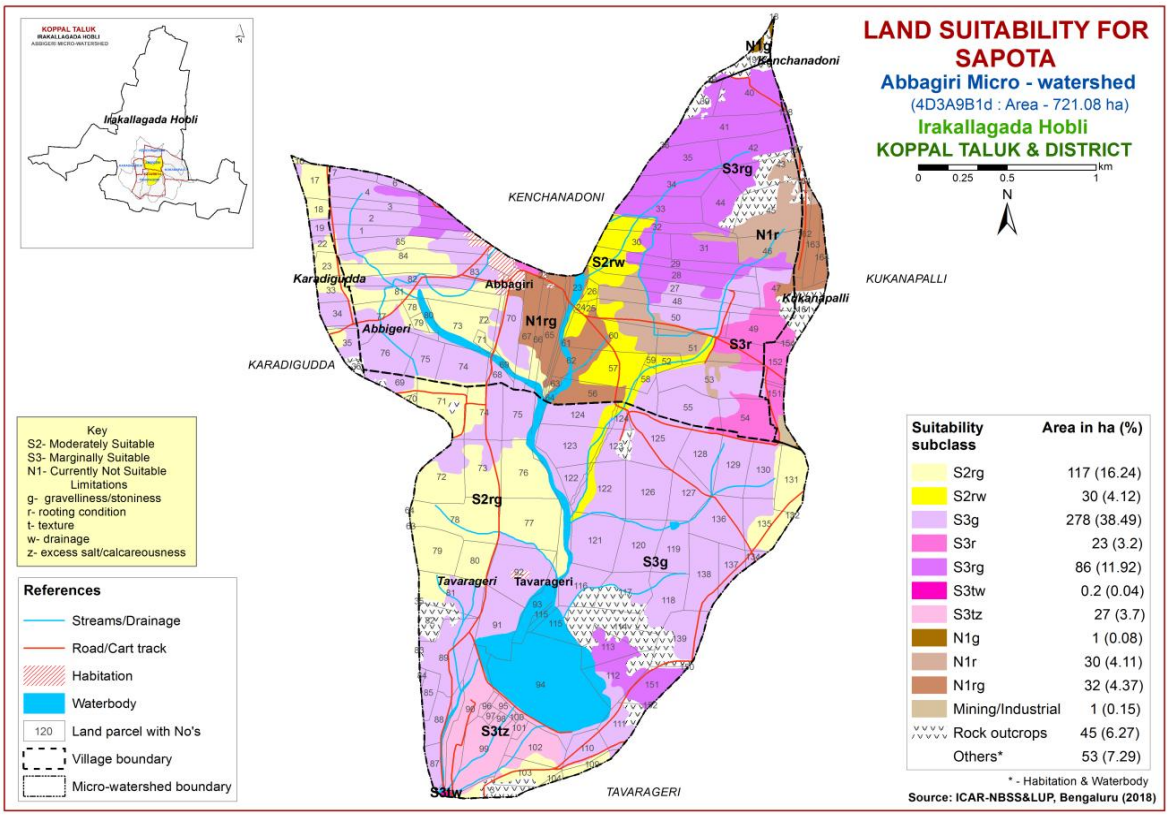


Fig. 7.14 Land Suitability map of Sapota

Moderately suitable (S2) lands cover an area of about 147 ha (20 %) and distributed in the eastern, western and northern part of the microwatershed. They have minor limitations of gravelliness, rooting depth and drainage. Marginally suitable (Class S3) lands cover an area of about 414 ha (57 %) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, texture, gravelliness, drainage and calcareousness. An area of about 63 ha (8 %) is currently not suitable (Class N1) for growing sapota and distributed in the northern and eastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

7.15 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the commercially grown fruit crop in about 18488 ha in Karnataka mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing pomegranate (Table 7.16) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing pomegranate was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.15.

Moderately suitable (Class S2) lands occupy an area of about 174 ha (24%) and are distributed in the northern, southern, eastern and western part of the microwatershed. They have minor limitations of rooting depth, drainage, gravelliness and texture. Marginally suitable (Class S3) lands for growing pomegranate occupy a maximum area of about 388 ha (54%) and are distributed in the major part of the microwatershed with

moderate limitations of gravelliness and rooting depth. An area of about 62 ha (8 %) is currently not suitable (Class N1) for growing pomegranate and distributed in the northern and northeastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.16 Crop suitability criteria for Pomegranate

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	30-34	35-38 25-29	39-40 15-24	
Soil moisture	Growing period	Days	>150	120-150	90-120	<90
Soil aeration	Soil drainage	Class	Well drained	imperfectly drained		
Nutrient availability	Texture	Class	sl, scl, l, cl	c, sic, sicl	cl, s, ls	s,fragmental
Rooting conditions	pH	1:2.5	5.5-7.5	7.6-8.5	8.6-9.0	
	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	%vol.	nil	15-35	35-60	>60
Soil toxicity	Salinity	dS/m	Nil	<9	>9	<50
	Sodicity	%	nil			
Erosion	Slope	%	<3	3-5	5-10	

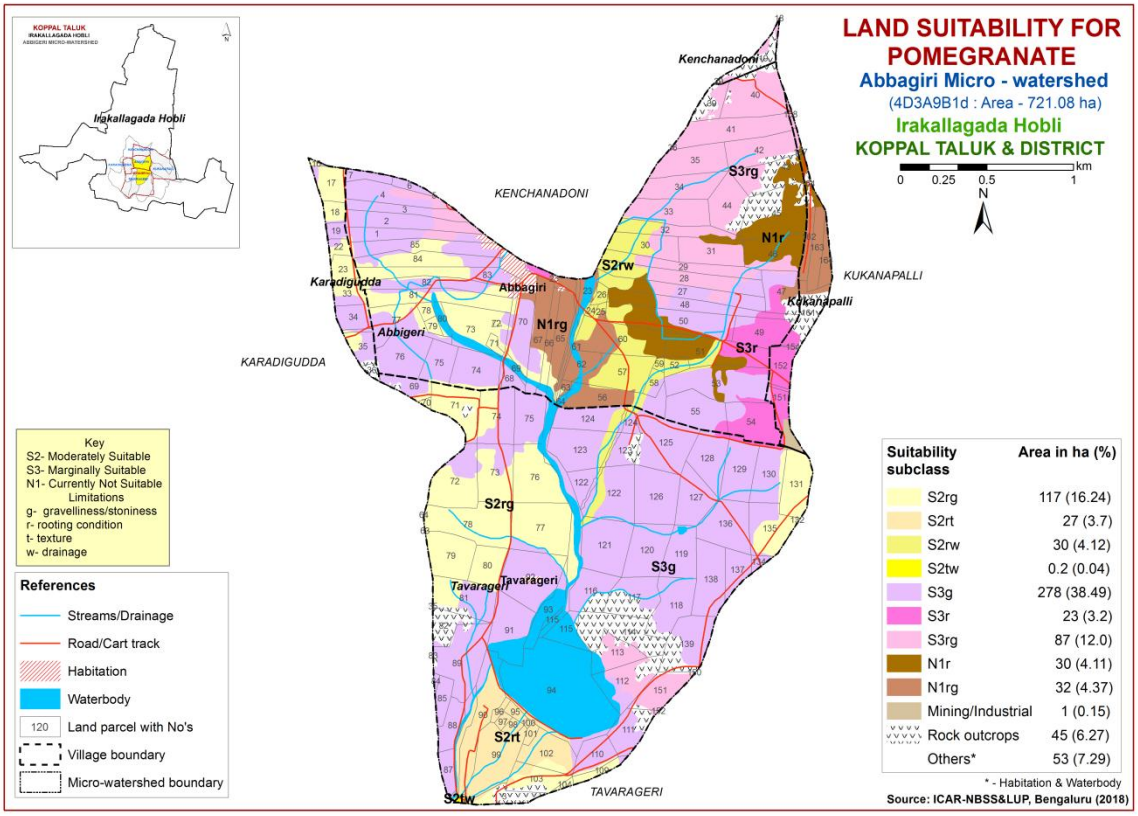


Fig. 7.15 Land Suitability map of Pomegranate

7.16 Land suitability for Guava (*Psidium guajava*)

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

Moderately suitable (Class S2) lands occupy an area of about 147 ha (20%) and are distributed in the northern, southern, eastern and western part of the microwatershed. They have minor limitations of rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands for growing pomegranate occupy a maximum area of about 414 ha (57 %) and are distributed in the major part of the microwatershed with moderate limitations of gravelliness, texture, drainage, calcareousness and rooting depth.An area of about 63 ha (8%) is currently not suitable (Class N1) for growing guava and distributed in the northern and northeastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.17 Crop suitability criteria for Guava

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	28-32	33-36 24-27	37-42 20-23	
Soil moisture	Growing period	Days	>150	120-150	90-120	<90
Soil aeration	Soil drainage	Class	Well drained	Mod. to imperfectly	poor	Very poor
Nutrient availability	Texture	Class	scl, l, cl, sil	sl,sicl,sic.sc,c	c (<60%)	c(>60%)
	pH	1:2.5	6.0-7.5	7.6-8.0:5.0-5.9	8.1-8.5,4.5-4.9	>8.5:<4.5
	$CaCO_3$ in root zone	%	Non calcareous	<10	10-15	>15
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	<15	15-35	>35	
Soil toxicity	Salinity	dS/m	<2.0	2.0-4.0	4.0-6.0	
	Sodicity	%	Non sodic	10-15	15-25	>25
Erosion	Slope	%	<3	3-5	5-10	>10

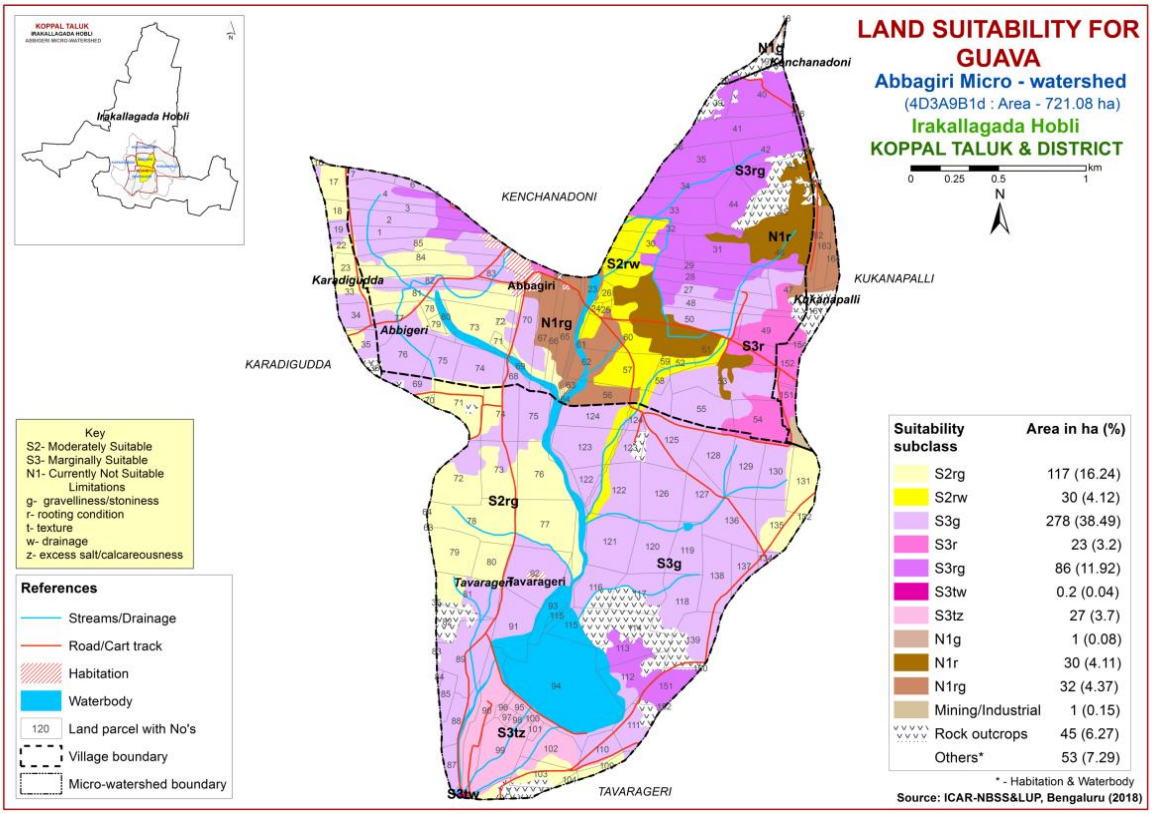


Fig. 7.16 Land Suitability map of Guava

7.17 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is one of the most important fruit crop grown in 5368 ha in all the districts of the state. The crop requirements (Table.7.18) for growing jackfruit were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jackfruit was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in figure 7.17.

Moderately suitable (Class S2) lands occupy an area of about 147 ha (20%) and are distributed in the northern, southern, eastern and western part of the microwatershed. They have minor limitations of rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands for growing jackfruit occupy a maximum area of about 414 ha (57 %) and are distributed in the major part of the microwatershed with moderate limitations of gravelliness, texture, drainage, calcareousness and rooting depth. An area of about 63 ha (8%) is currently not suitable (Class N1) for growing jackfruit and distributed in the northern and northeastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.18 crop suitability criteria for Jackfruit

Crop requirement			Rating			
Soil site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Soil aeration	Soil drainage	Class	well	Mod. well	Poorly	V. Poorly
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
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-5	>5	-

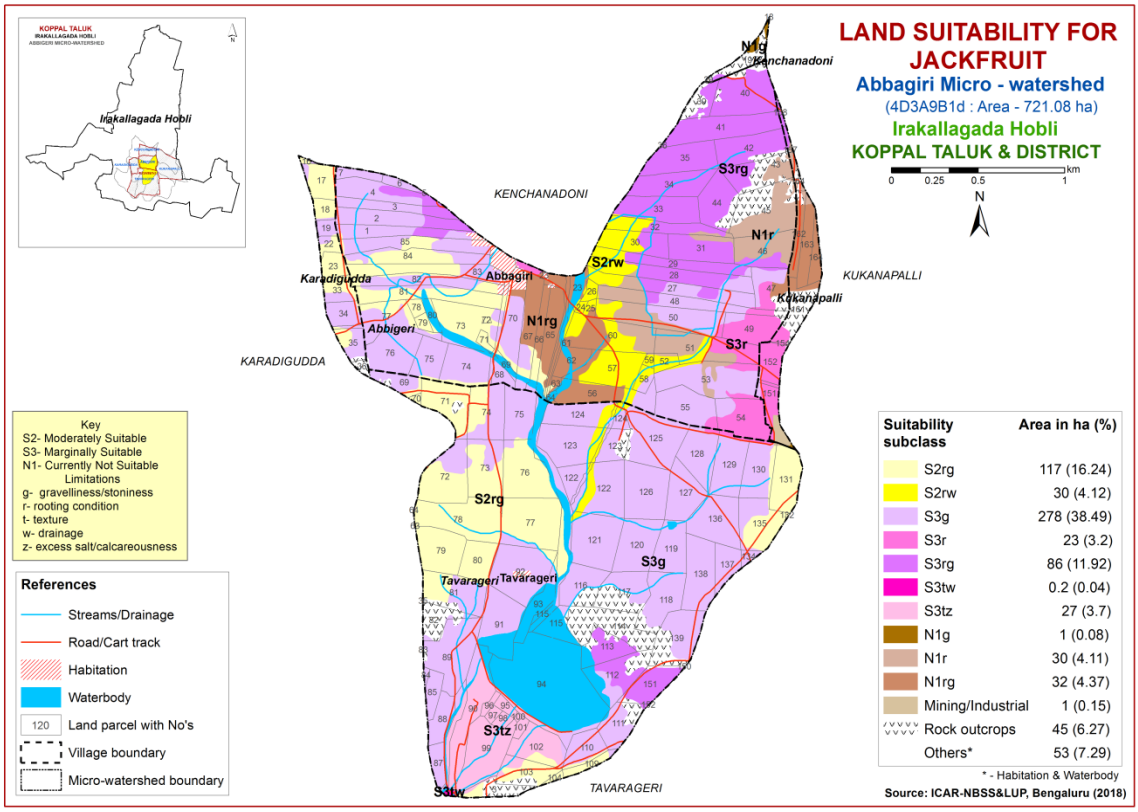


Fig. 7.17 Land Suitability map of Jackfruit

7.18 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the state. The crop requirements (Table 7.19) for growing jamun were matched with the soil-site characteristics and a land suitability map for growing jamun was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.18.

There are no highly suitable (Class S1) lands for growing jamun. An area of about 117 ha (16 %) is moderately suitable (Class S2) and occur in the western, southern and easternpart of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture and drainage. Marginally suitable (Class S3) lands cover a maximum

area of about 444ha (61%) and are distributed in the major part of the microwatershed with moderate limitations of rooting depth, calcareousness, gravelliness and drainage. An area of about 63 ha (8%) is currently not suitable (Class N1) for growing jamun and are distributed in the northern and northeastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.19 Crop suitability criteria for Jamun

Crop requirement			Rating			
Soil- site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well	Mod. well	Poorly	V. Poorly
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
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-5	5-10	>10

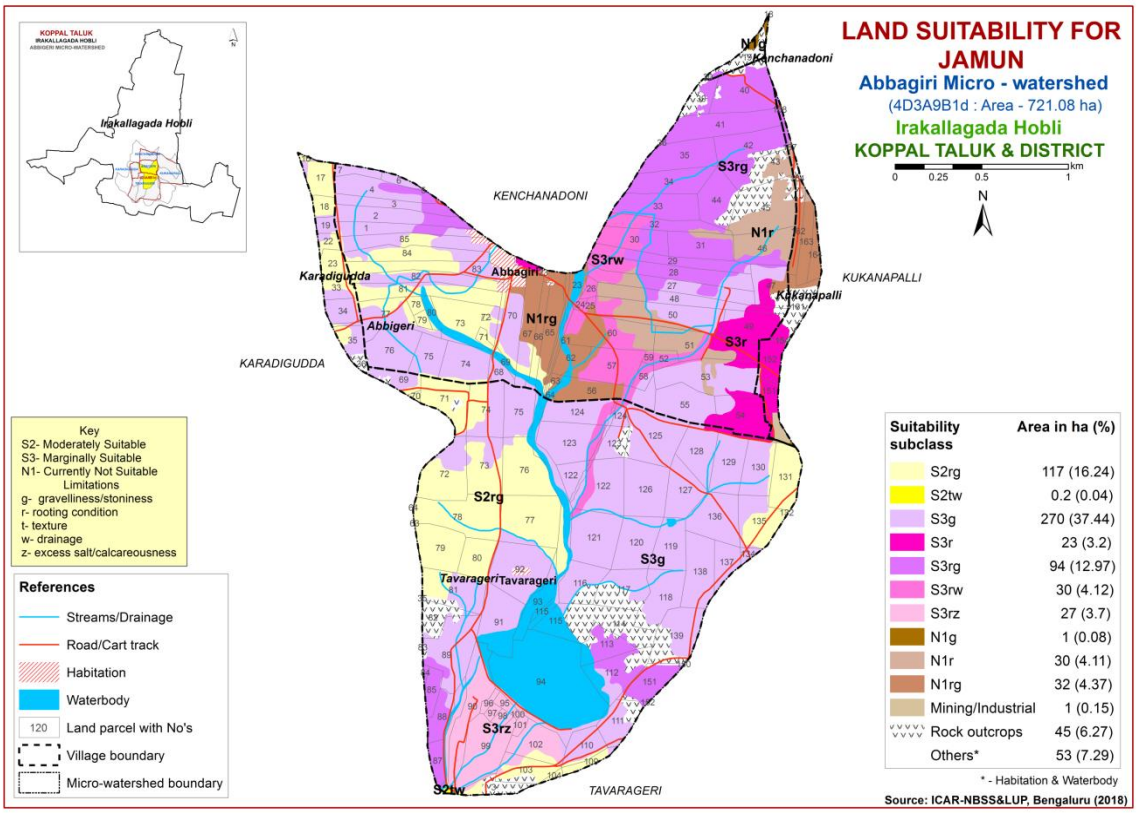


Fig. 7.18 Land Suitability map of Jamun

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the most important fruit crop grown in an area of 5446 ha in almost all the districts of the state. The crop requirements (Table 7.20) for growing musambi were matched with the soil-site characteristics (Table 7.1) and a land suitability

map for growing musambi was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.19.

Table 7.20 Crop suitability criteria for Musambi

Crop requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	28-30	31-35 24-27	36-40 20-23	>40 <20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imperfectly drained	Poorly	Very poorly
Nutrient availability	Texture	Class	scl,l,sicl,c	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.47.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
	$CaCO_3$ in root zone	%	Non calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

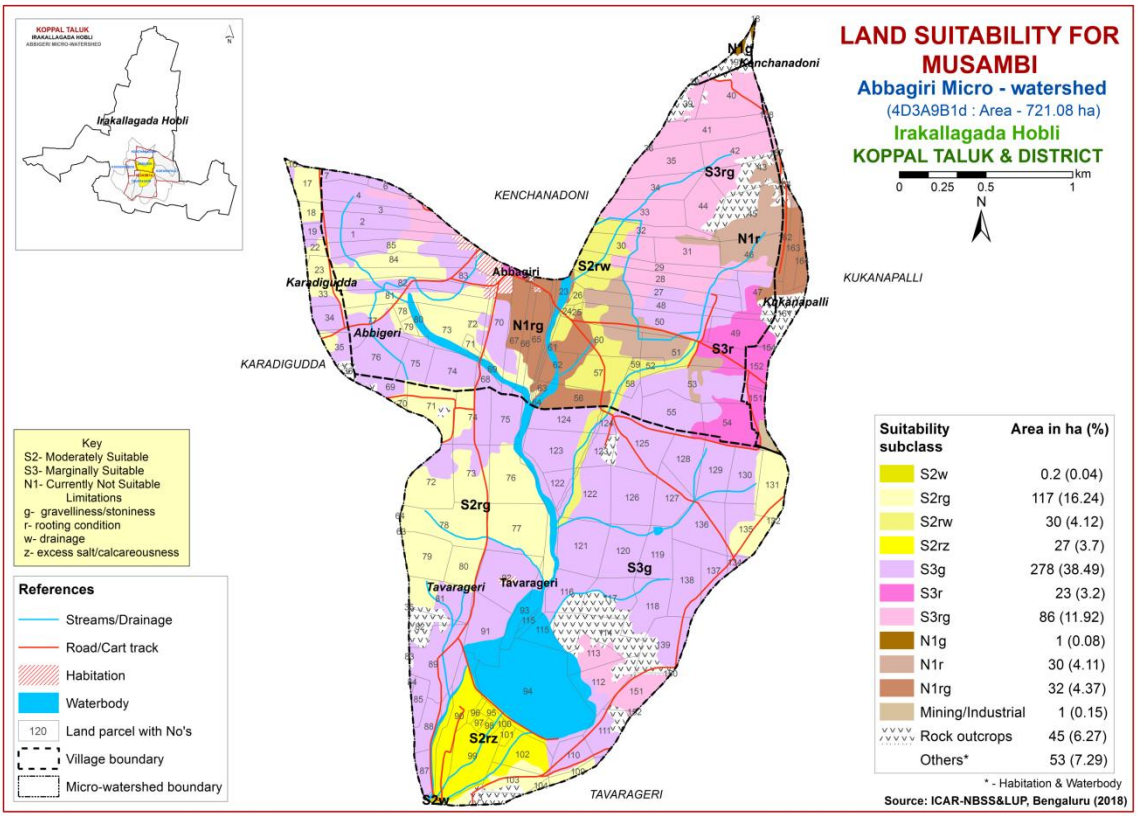


Fig. 7.19 Land Suitability map of Musambi

An area of about 174 ha (24 %) is moderately suitable (Class S2) and occur in the southern, western, northern and eastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage and calcareousness. Maximum area of about 387 ha (54 %) is marginally suitable (Class S3) for growing musambi and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth. An area of about 63 ha (8 %) is currently not suitable (Class N1) for growing musambi and distributed in the northern and eastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

7.20 Land Suitability for Lime (*Citrus sp*)

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

An area of about 174 ha (24%) is moderately suitable (Class S2) and occur in the southern, western, northern and eastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage and calcareousness. Maximum area of about 387 ha (54%) is marginally suitable (Class S3) for growing lime and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth. An area of about 63 ha (8 %) is currently not suitable (Class N1) for growing lime and distributed in the northern and eastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.21 Crop suitability criteria for Lime

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	28-30	31-35 24-27	36-40 20-23	>40 <20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imperfectly drained	Poorly	Very poorly
Nutrient availability	Texture	Class	scl,l,sicl,cl,s	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.4: 7.6-8.0	4.0-5.4 8.1-8.5	<4.0 >8.5
	$CaCO_3$ in root zone	%	Non calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

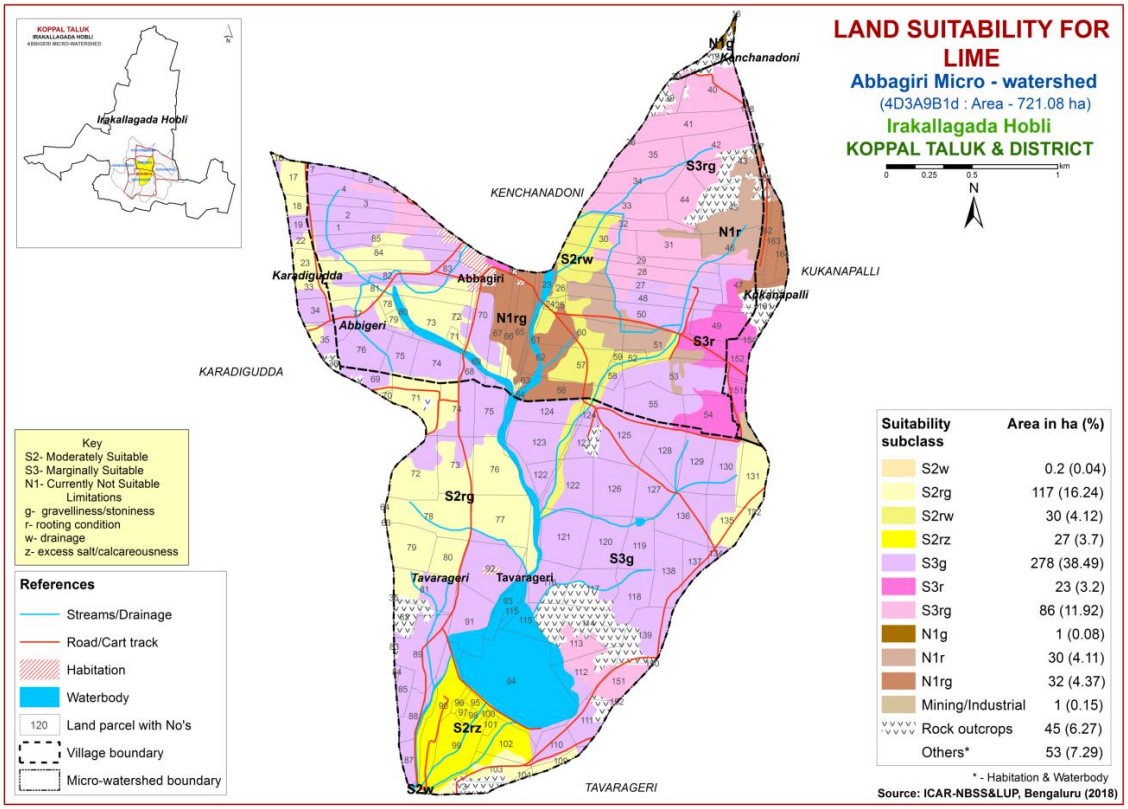


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important nut crop grown in an area of 7052 ha in almost all the districts of the State. The crop requirements for growing cashew (Table 7.22) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.21.

Moderately suitable lands cover an area of about 309 ha (43%) and distributed in the major part of the microwatershed with minor limitations of rooting depth and gravelliness. An area of about 195ha (27%) is marginally suitable (Class S3) for growing cashew and distributed in the eastern, northeastern and northern part of the microwatershed with moderate limitations of gravelliness and rooting depth. An area of about 120 ha (16 %) is currently not suitable (Class N1) for growing cashew and distributed in the southern and northeastern part of the microwatershed with severe limitations of texture, rooting depth, gravelliness, drainage and calcareousness.

Table 7.22 Crop suitability criteria for Cashew

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod. well drained	Poorly drained	V.Poorly drainage
Nutrient availability	Texture	Class				
	pH	1:2.5	5.5-6.5	5.0-5.5 6.5-7.3	7.3-7.8	>7.8
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-10	>10	

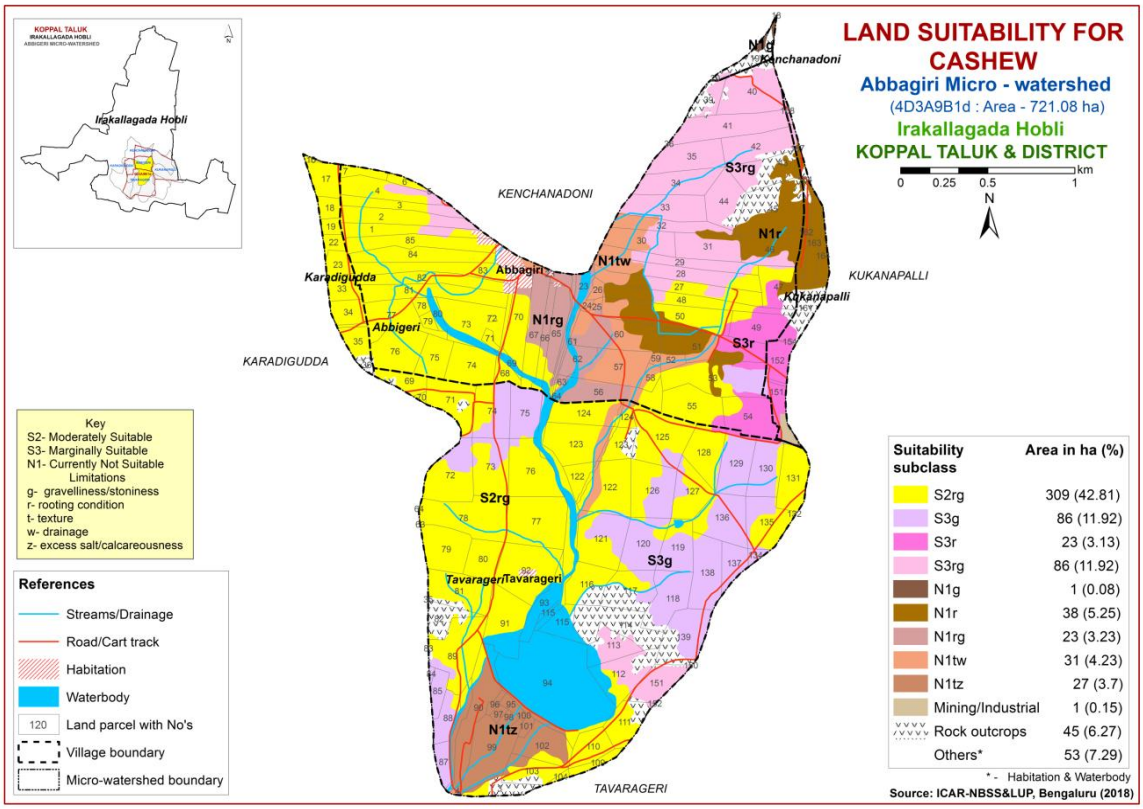


Fig. 7.21 Land Suitability map of Cashew

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

Custard apple is one of the most important fruit crop grown in 1426 ha in almost all the districts of the State. The crop requirements(Table 7.23) for growing custard apple were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated .The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.22.

Moderately suitable (Class S2) lands cover a maximum area of about 562 ha (78%) and occur in the major part of the microwatershed. They have minor limitations of rooting depth, gravelliness, drainage and calcareousness. An area of about 62 ha (9 %) is

marginally suitable (Class S3) for growing custard apple and are distributed in the northern and northeastern part of the microwatershed with moderate limitations of rooting depth and gravelliness.

Table 7.23 Crop suitability criteria for Custard apple

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately Suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod. well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	scl, cl, sc, c (red), c (black	-	sl, ls	-
	pH	1:2.5	6.0-7.3	7.3-8.4	5.0-5.5,8.4-9.0	>9.0
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15-35	35-60	60-80	-
Erosion	Slope	%	0-3	3-5	>5	-

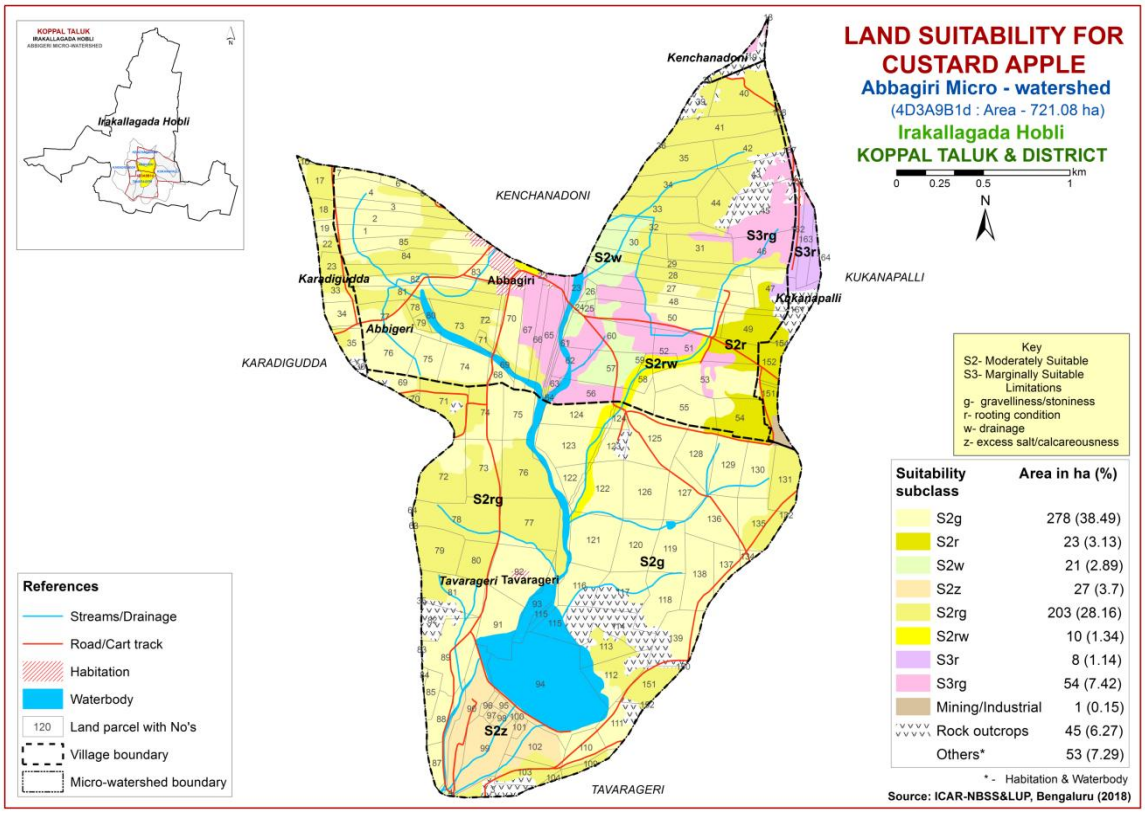


Fig. 7.22 Land Suitability map of Custard Apple

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the most important fruit and medicinal crop grown in an area of 151 ha and distributed in almost all the districts of the state. The crop requirements(Table 7.24) for growing amla were matched with the soil-site characteristics(Table 7.1) and a land suitability map for growing amla was generated. The area extent and their

geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.23.

Moderately suitable lands (Class S2) for growing amla occupy a maximum area of about 562 ha (78%) and distributed in the major part of the microwatershed. They have minor limitations of rooting depth, gravelliness, drainage, texture and calcareousness. An area of about 62 ha (9 %) is marginally suitable (Class S3) for growing amla and distributed in the northern and northeastern part of the microwatershed with moderate limitations of rooting depth and gravelliness.

Table 7.24 Crop suitability criteria for Amla

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod.well drained	Poorly drained	V. Poorly drained
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	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15-35	35-60	60-80	
Erosion	Slope	%	0-3	3-5	5-10	>10

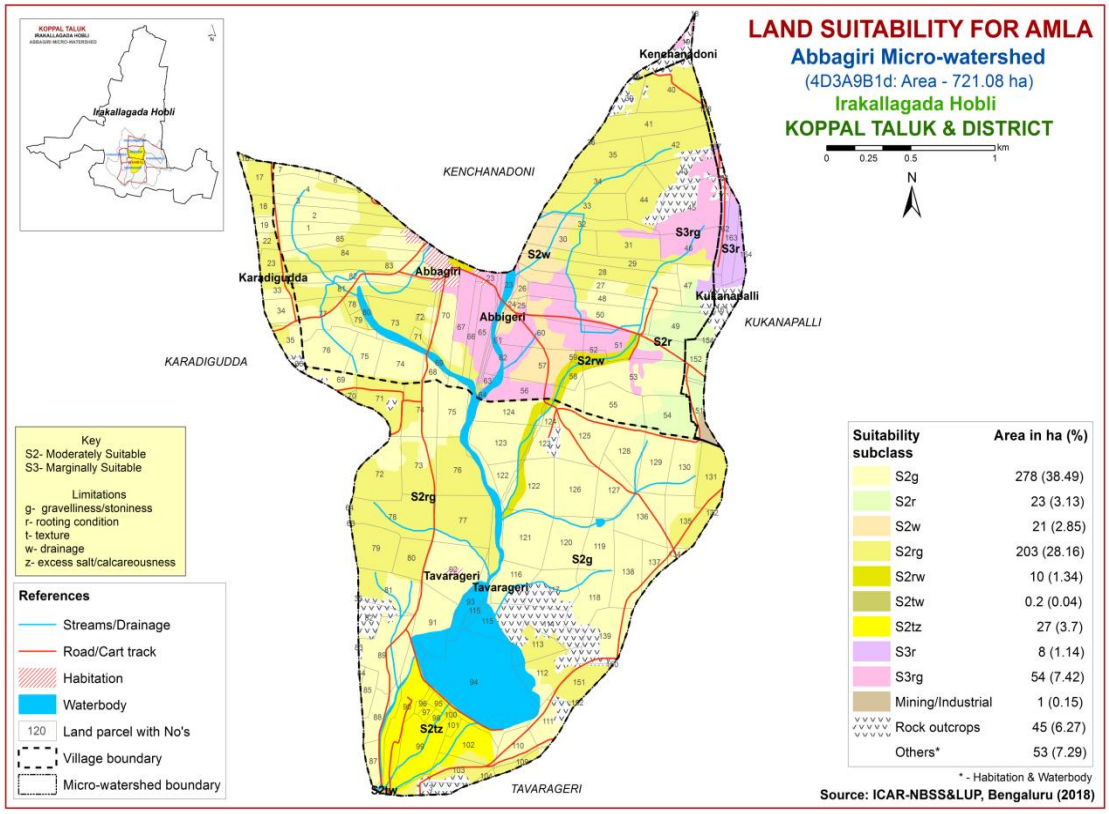


Fig. 7.23 Land Suitability map of Amla

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the most important spice crop grown in 14897 ha in all the districts of the state. The crop requirements (Table 7.25) for growing tamarind were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tamarind was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.24.

Table 7.25 Crop suitability criteria for Tamarind

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately Suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod.well drained	Poorly drained	V.Poorly drained
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
Rooting conditions	Soil depth	cm	>150	100-150	75-100	<75
	Gravel content	% vol.	<15	15-35	35-60	60-80
Erosion	Slope	%	0-3	3-5	5-10	>10

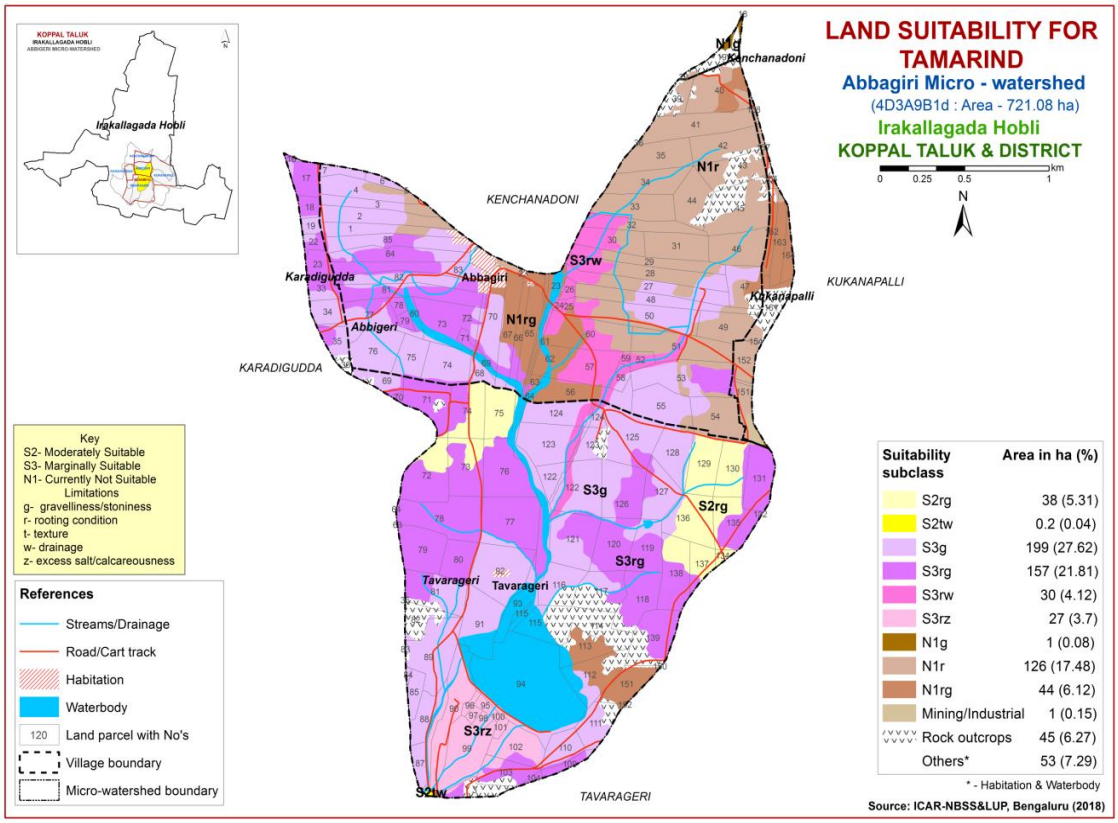


Fig. 7.21 Land Suitability map of Tamarind

There are no highly suitable lands (Class S1) for growing tamarind. An area of about 38 ha (5%) is moderately suitable (Class S2) and occur in the western and eastern part of the microwatershed. They have minor limitations of rooting depth, gravelliness,

texture and drainage. Maximum area of about 413 ha (57 %) is marginally suitable (Class S3) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness, drainage and calcareousness. An area of about 171 ha (24 %) is currently not suitable (Class N1) for growing tamarind and distributed in the northern and eastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

7.25 Land Suitability for Marigold (*Tagetes erecta*)

Marigold is one of the most important flower crop grown in an area of 9108 ha in almost all the districts of the state. The crop requirements (Table 7.26) for growing marigold were matched with the soil-site characteristics and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

An area of about 122 ha (20%) is moderately suitable (Class S2) for growing marigold and occur in the northern, southern and northeastern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, drainage, calcareousness and texture. Maximum area of about 473 ha (66%) is marginally suitable (Class S3) and distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth. An area of about 1 ha (<1) is currently not suitable (Class N1) for growing marigold and distributed in the northern part of the microwatershed with severe limitation of gravelliness.

Table 7.26 crop suitability criteria for Marigold

Crop requirement			**Rating**			
Soil–site characteristics		**Unit**	**Highly Suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	18-23	17-15 24-35	35-40 10-14	>40 <10
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l,sl,scl,cl,sil	sicl,sc,sic,c	c	ls, s
	pH	1:2.5	7.0-7.5	5.5-5.9,7.6-8.5	<5,>8.5	-
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	-
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	-
Soil toxicity	Salinity	ds/m	Non saline	Slightly	Strongly	-
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	-

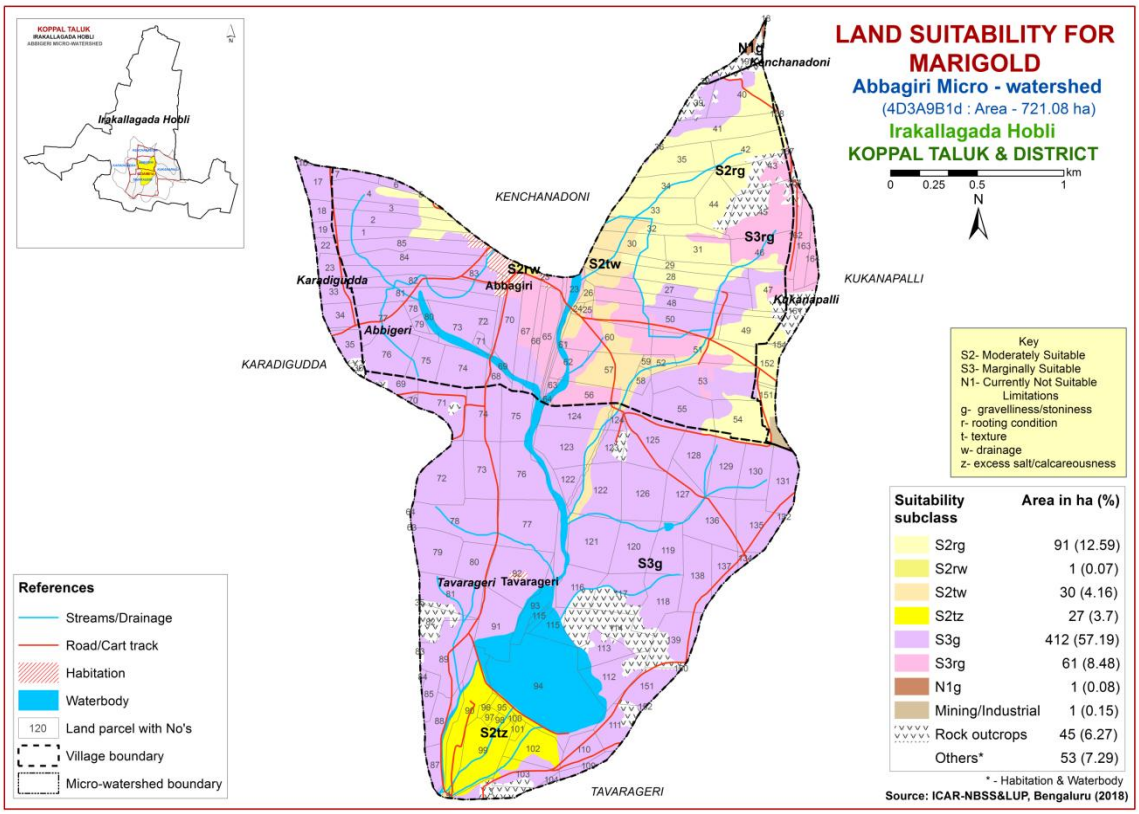


Fig. 7.25 Land Suitability map of Marigold

7.26 Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

Chrysanthemum is one of the most important flower crop grown in an area of 4978 ha in almost all the districts of the State. The crop requirements(Table 7.27) for growing chrysanthemum were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing chrysanthemum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.26.

An area of about 122 ha (20 %) is moderately suitable (Class S2) for growing chrysanthemum and occur in the northern, southern and northeastern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, drainage, calcareousness and texture. Maximum area of about 473 ha (66 %) is marginally suitable (Class S3) and distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth. An area of about 1 ha (<1%) is currently not suitable (Class N1) for growing chrysanthemum and distributed in the northern part of the microwatershed with severe limitation of gravelliness.

Table 7.27 crop suitability criteria for Chrysanthemum

Crop requirement			Rating			
Soil–site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	18-23	17-15 24-35	35-40 10-14	>40 <10
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l,sl,scl,cl,sil	sicl,sc,sic,c	c	ls, s
	pH	1:2.5	7.0-7.5	5.5-5.9,7.6-8.5	<5,>8.5	
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	

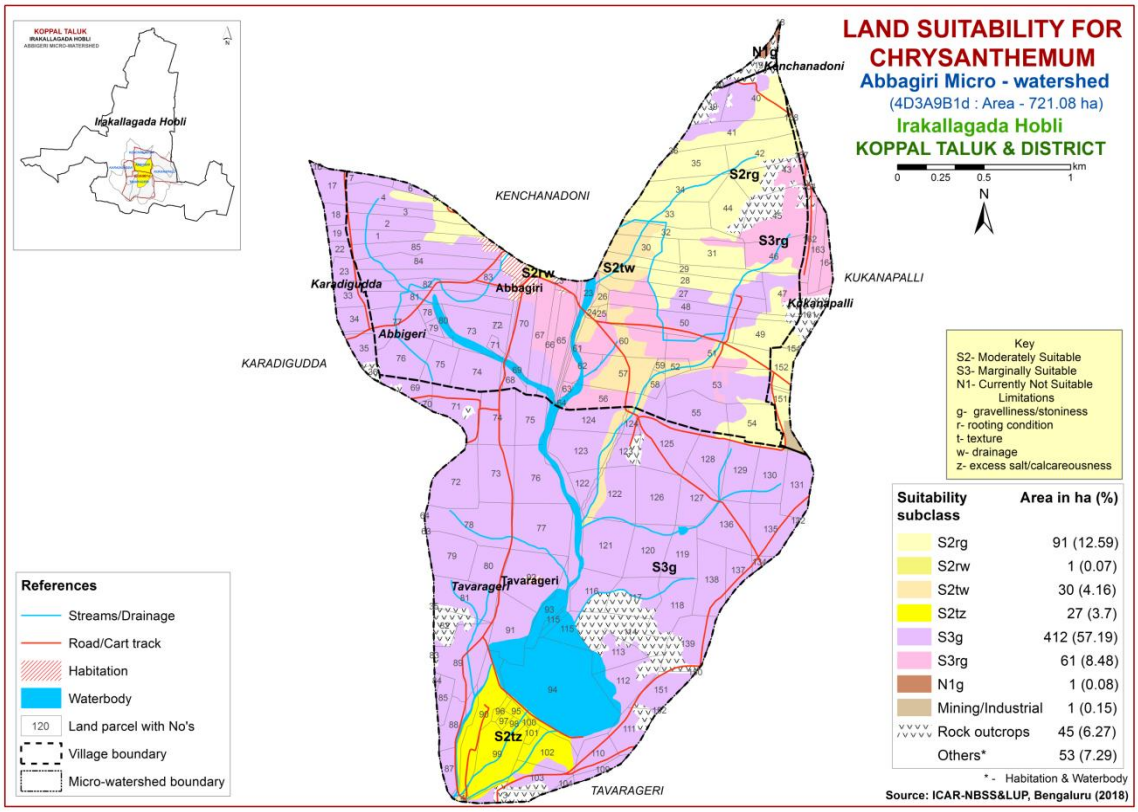


Fig. 7.26 Land Suitability map of Chrysanthemum

7. 27Land Suitability for Jasmine *(Jasminum sp.)*

Jasmine is one of the most important flower crop grown in an area of 803 ha in almost all the districts of the State. The crop requirements (Table 7.28) for growing jasmine were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jasmine was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.27.

Moderately suitable (Class S2) lands for growing jasmine cover an area of about 122 ha (17%) and occur in the northeastern and eastern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, drainage and texture. Maximum

area of about 500ha (69%) is marginally suitable (Class S3) for growing jasmine and occur in the major part of the microwatershed. They have moderate limitations of gravelliness, texture, rooting depth, drainage and calcareousness. An area of about 1 ha (<1 %) is currently not suitable (Class N1) for growing jasmine and distributed in the northern part of the microwatershed with severe limitation of gravelliness.

Table 7.28 crop suitability criteria for jasmine (irrigated)

Crop requirement			Rating			
Soil-site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	18-23	17-15 24-35	35-40 10-14	
Soil aeration	Soil drainage	Class	Well drained	Moderately drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	scl,l,scl,cl,sil	sicl,sc,sic,c(m/k	c(ss),	ls, s
	pH	1:2.5	6.0-7.5	5.5-5.9:7.6-8.5	<5: >8.5	
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strong calcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	
Soil toxicity	Salinity	ds/m	Non saline	Slight	Strongly	
	Sodicity	%	Non sodic	Slight	Strongly	
Erosion	Slope	%	1-3	3-5	5-10	

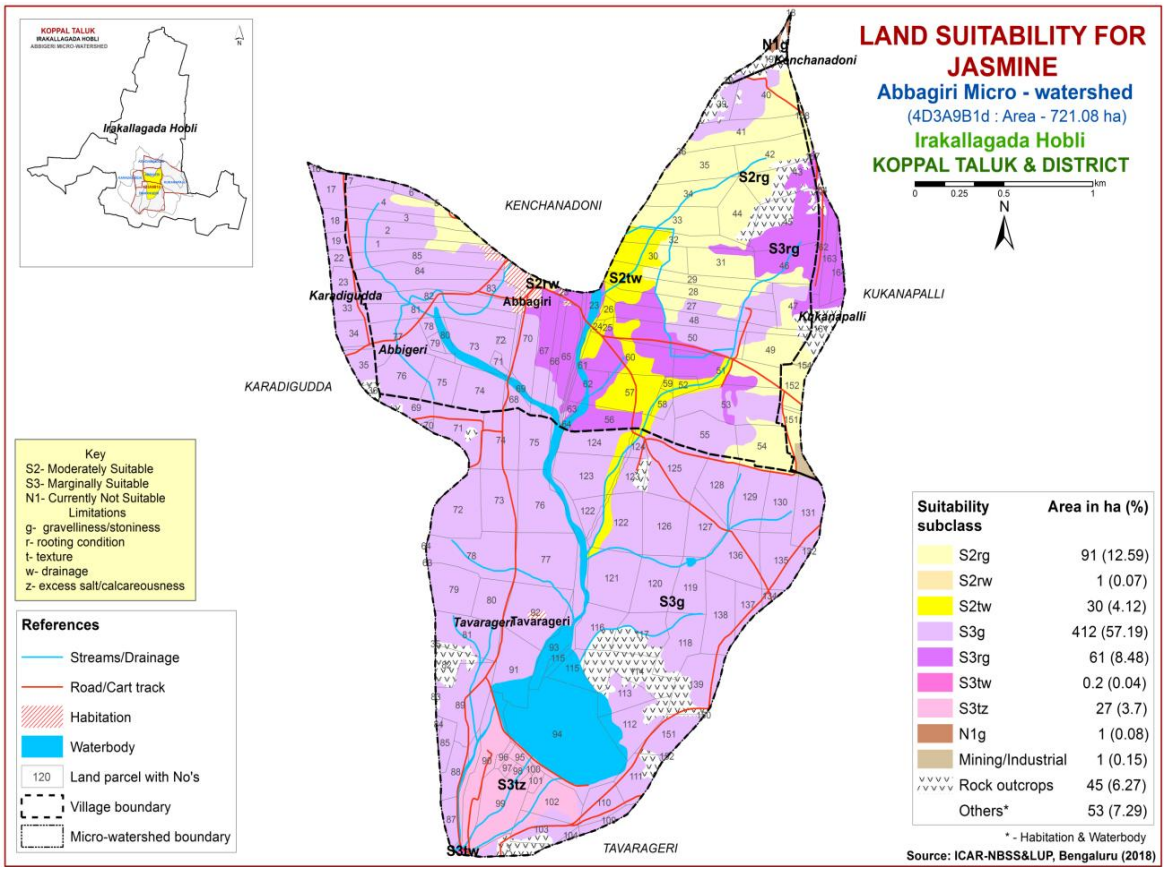


Fig. 7.27 Land Suitability map of Jasmine

7. 28Land Suitability for Crossandra *(Crossandra infundibuliformis)*

Crossandra is one of the most important flower crop grown in almost all the districts of the State. Land suitability map for growing crossandra was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.28.

Moderately suitable (Class S2) lands for growing crossandra cover an area of about 149 ha (20 %) and occur in the northeastern part of the microwatershed. They have minor limitations of texture, rooting depth, gravelliness, drainage and calcareousness. Maximum area of about 473ha (66 %) is marginally suitable (Class S3) for growing crossandra and occur in the major part of the microwatershed. They have moderate limitations of gravelliness, texture, rooting depth and drainage. An area of about 1 ha (<1%) is currently not suitable (Class N1) for growing crossandra and distributed in the northern part of the microwatershed with severe limitation of gravelliness.

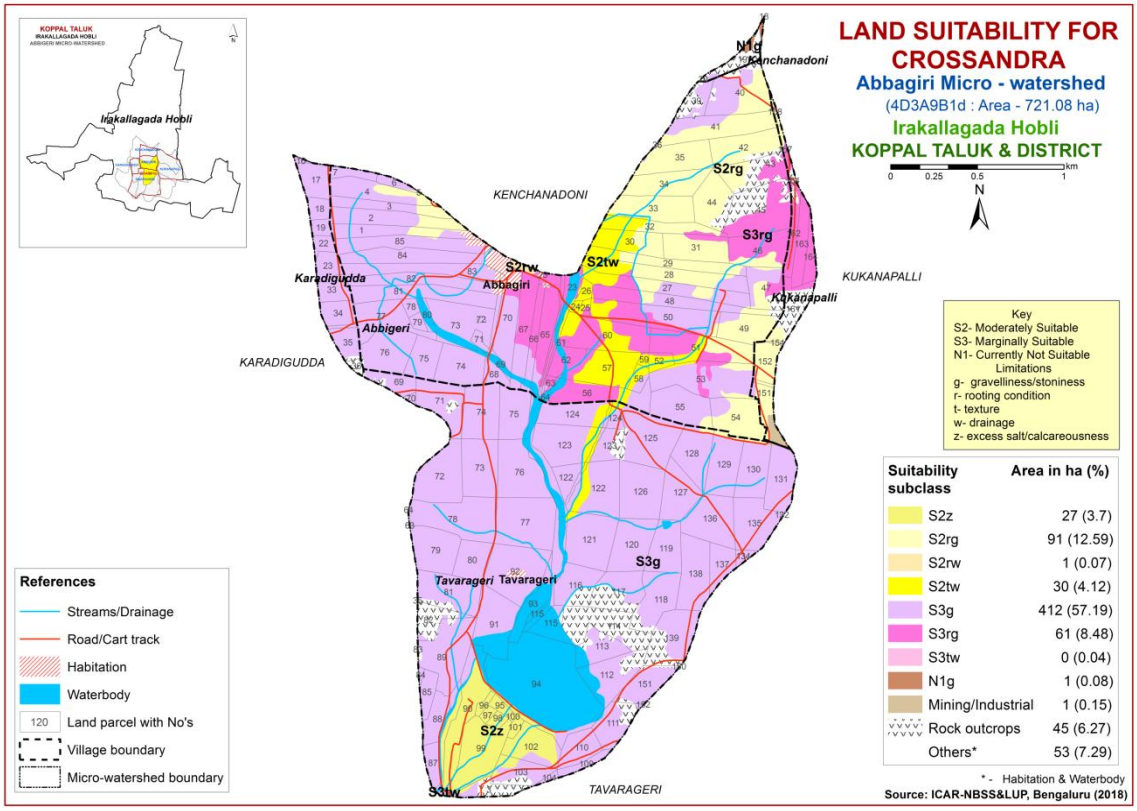


Fig. 7.28 Land Suitability map of Crossandra

7.29 Land management Units (LMUs)

The 34 soil map units identified in Abbagiri microwatershed have been grouped into sevenLand management Units (LMUs) for the purpose of preparing a Proposed Crop Plan. Land management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land management Units map (Fig.7.29) has been generated. These Land management Units are expected to behave similarly for a given level of management.

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

LMU	Mapping unit	Soil and site characteristics
1	TSDmA1, HLPhB1, HLPiB2, HLPmA1	Moderately deep to very deep, lowland sandy clay to clay soilswith slopes of 0-3%, slight to moderate erosion
2	BPRbB1g1,BPRcB2g1,BPRhB2g1, NGPbB1, BDGcB1g1,BDGhA1, BDGhB2,BDGhB2g1, HDHbB2g1, HDHcB2g1,HDHcB2g2,HDHhB2, HDHhB2g1	Moderately deep to deep, red gravelly sandy clay to clay soils with slopes of 0-3%, slight to moderate erosion, gravelly to very gravelly (15-60%)
3	DRLmB2	Moderately deep, black calcareous clayey soils with slopes of 1-3%, slight to moderate erosion
4	HNHiB2	Moderately shallow, lowland sandy clay soilswith slopes of 1-3%, moderate erosion,
5	HTIcB2g1, HTIiB2g1, HTIiB2g2	Moderately shallow, red sandy clay soils with slopes of 1-3%, moderate erosion gravelly to very gravelly (15-60%)
6	LKRcB2g1,LKRhC2g3,MKHcB2g1, MKHcB2g2,MKHhB1g1,MKHhB2g1, MKHiB2	Moderately shallow, red gravelly sandy clay to sandy clay loam soils with slopes of 1-5%, slight to moderate erosion,gravelly to very gravelly (15-60%)
7	ABRbB2g2, HRVcB2g1, HRVhB2, KGPhB2g1	Shallow, red gravelly sandy clay to sandy clay loam soils with slopes of 1-3%, moderate erosion, gravelly to very gravelly (15-60%)

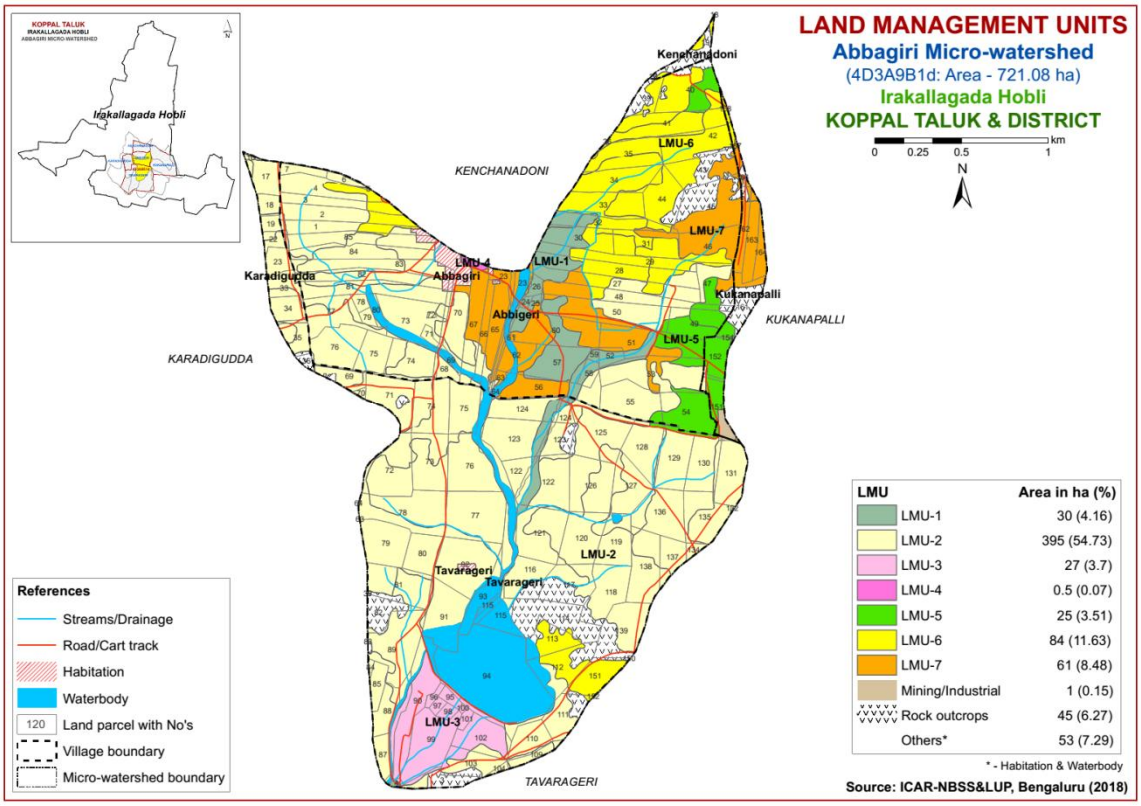


Fig 7.29 Land management Units map of Abbagiri microwatershed

7.30 Proposed Crop Plan for Abbagiri Microwatershed

After assessing the land suitability for the 28 crops, the proposed crop plan has been prepared for the seven identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 28 crops. The resultant proposed crop plan is presented in Table 7.29.

Table 7.28 Proposed Crop Plan for Abbagiri Microwatershed

Proposed LMU	Soil Map Units	Survey Number	Field Crops	Horticulture Crops	Suitable Interventions
1	446.TSDmA1 437.HLPhB1 438.HLPiB2 466.HLPmA1 (Moderately deep to very deep, lowland sandy clay to clay soils)	**Abbigeri:**24,25,26,30,52,57,58,59,60 **Tavarageri:** 4	Paddy, Sunflower, Maize	**Fruit crops:** Custard Apple, Amla **Vegetable crops:** Brinjal, Tomato, Chillies, Drumstick **Flower crops:** Marigold, Chrysanthemum, Jasmine	Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practises
2	215.BPRbB1g1, 225.BPRcB2g1 231.BPRhB2g1, 249.NGPbB1 180.BDGcB1g1, 184.BDGhA1 187.BDGhB2, 188.BDGhB2g1 105.HDHbB2g1,111.HDHcB2g1 112.HDHcB2g2, 122.HDHhB2 123.HDHhB2g1 (Moderately deep to deep, red gravelly sandy clay to clay soils)	**Abbigeri:**1,2,3,4,6,7,27,47,48, 50,53,55,68,70,71,72,73,74,75, 76,77,78,79,81,82,83,84, 85 **Karadigudda**:16,17,18,19,22, 23,33,34,35 **Tavarageri:**63,64,69,70,71,72, 73,74,75,76,77,78,79,80,81,84, 85,87,88,89,91,92,103,104,109 ,110,111,116,118,119,120,121, 122,123,124,125,126,127,128, 129,130,131,132,134,135,136, 137, 138,139	Groundnut, Red gram, Bajra, Horse gram, Castor	**Fruit crops:** Musambi, Lime, Jamun, Jackfruit Amla, Custard apple **Vegetable crops:** Drumstick	Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc)
3	350.DRLmB2 (Moderately deep, black calcareous clayey soils)	**Tavarageri:**90,95,96,97,98, 99,100,101,102	Maize, Sorghum, Sunflower, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Pomegranate, Jamun, Lime, Musambi, Amla, Custard apple **Vegetable crops:** Drumstick, Chilli, Coriander, Bhendi, Tomato **Flower crops:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practises

4	471.HNHiB2 (Moderately shallow, lowland sandy clay soils)	**Abbigeri:** 23,70	Maize	**Fruit crops:** Custard Apple, Amla **Vegetable crops:** Brinjal, Tomato, Chillies	Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practises
5	92.HTIcB2g1 101.HTIiB2g1 102.HTIiB2g2 (Moderately shallow, red sandy clay soils)	**Abbigeri:** 49,54 **Kukanapalli :** 151,152,154	Maize, Sorghum, Groundnut, Bajra, Castor	**Fruit crops:** Amla, Custard apple **Flower crops**: Marigold, Chrysanthemum **Vegetable crops:** Drumstick	Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc)
6	43.LKRcB2g1 49.LKRhC2g3 77.MKHcB2g1 78.MKHcB2g2 82.MKHhB1g1 85.MKHhB2g1 89.MKHiB2 (Moderately shallow, red gravelly sandy clay to sandy clay loam soils)	**Abbigeri :** 5,28,29,31,32,33, 34,35,36,40,41, 42,44 **Kenchanadoni :**18 **Kukanapalli :**168 **Tavarageri :** 112,113,151,152	Sorghum, Groundnut, Bajra, Castor	**Fruit crops:** Amla, Cashew, Custard apple	Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc)
7	470.ABRbB2g2 465.HRVcB2g1 25.HRVhB2 17.KGPhB2g1 (Shallow, red gravelly sandy clay to sandy clay loam soils)	**Abbigeri:**23,45,46,51,56,61,62,63,65,66, 67 **Kukanapalli:**162,163,164,167	Horse gram	**Agri**-Silvi-Pasture: Custard apple, Amla, Hybrid Napier, Styloxanthes hamata, Glyricidia, Styloxanthes scabra	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Abbagiri Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of BDG (192 ha), HDH (117 ha), BPR (78 ha), MKH (73 ha), ABR (30 ha),HLP (29 ha), DRL (27 ha),HTI (26 ha), HRV (23 ha), LKR (11 ha), NGP (8 ha), KGP (8 ha), HNH (1 ha) and TSD (<1 ha).
- As per land capability classification, entire area in the microwatershed falls under arable land category (Class II andIII). The major limitations identified in the arable lands were soil , wetness/drainage and erosion.

- On the basis of soil reaction, an area of about 74 ha (10%) is moderately acid (pH 5.5-6.0), 108 ha (15%) is slightly acid (pH 6.0-6.5), 314 ha (44%) is neutral (pH 6.5-7.3), 95ha (13 %) is slightly alkaline (pH 7.3-7.8) and 32 ha (5 %) is moderately alkaline (pH 7.8-8.4).Thus,major portion of the area is neutral to acid in reaction.

Soil Health Management

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

Acid soils

Acid soils occupy an area of about 182 ha(25%) in the microwatershed. The following measures recommended for reclaiming acid soils

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

Liming materials:

1. $CaCO_3$ (Calcium Carbonate). More than 90% use in India.
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

An area of about 127 ha (18%)is under alkaline soils. The following actions are recommended.

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 – 5 kg/ha (once in three years).

Neutral soils

Neutral soils cover about 314 ha(44%) and the following actions are recommended

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 factors affecting the soil health in the microwatershed. An area of about 512 ha (71 %) is under moderate erosion. The areas with moderate erosion need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning in IWMP is focusing on preparation of

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

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

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

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

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Abbagiri Microwatershed.
- **Organic Carbon:** An area of about 81 ha (11 %) is medium (0.5-0.75%) and 543 ha (75%) is high (>0.75)in OC content. The areas that are low and medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops costs Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be supplemented by 25% in addition to the recommended level in 81 ha area where OC is less than 0.75 per cent. For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus**: Available phosphorus is low (<23 kg/ha) in 67 ha (9%),medium (23-57 kg/ha) in 248ha (34%) and high (>57 kg/ha) in 309 ha (43%) of the soils.The areas with high phosphorus content reduce 25% from the RDF to avoid the excess application of fertilizer and apply additional 25%phosphorus in areas where it is low and medium.
- **Available Potassium:** Available potassium is low (<145 kg/ha) in 202 ha (28%), medium (145-337 kg/ha) in 334 ha (46%)and high(>337 kg/ha) in 88 ha (12%) area of the microwatershed. The areas with high potassium content reduce 25% from the RDF to avoid the excess application of fertilizer and apply additional 25% potassium in areas where it is low and medium.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. Available sulphur is low (<10 ppm) in 409 ha (57%) and medium (10-20 ppm) in 215 ha (30%).Areas with low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available iron:** It is deficient (<4.5 ppm) in 231ha (32%) and sufficient (>4.5 ppm) in 394 ha (55%) area of the microwatershed. To manage iron deficiency, iron sulphate @ 25 kg/ha needs to be applied for 2-3 years.
- **Available Zinc:** It is deficient (<0.6 ppm) in 341 ha (47 %) and sufficient (>0.6ppm) in 283 ha (39 %) area of the microwatershed. Application of zinc sulphate @ 25kg/ha is to be followed in areas that are deficient in available zinc.

- **Available Boron:** An a area of about 557 ha (77 %) is low (<0.5 ppm) in available boron and 68 ha (9 %) is medium (0.5-1.0 ppm) in available boron content. The areas with low and medium in boron content need to be applied with sodium borate @ 10kg/ha as a soil application or 0.2% borax as foliar spray to correct the deficiency.
- **Available manganese**: It is sufficient in the entire area of the microwatershed**.**
- **Available copper:** It is sufficient in the entire area of the microwatershed**.**
- **Soil acidity:** The microwatershed has 182 ha (25%) area with soils that are moderately to slightly acid. These areas need application of lime (Calcium Carbonate).
- **Soil alkalinity:** An area of about 127 ha (18%) in the microwatershed has soils that are alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

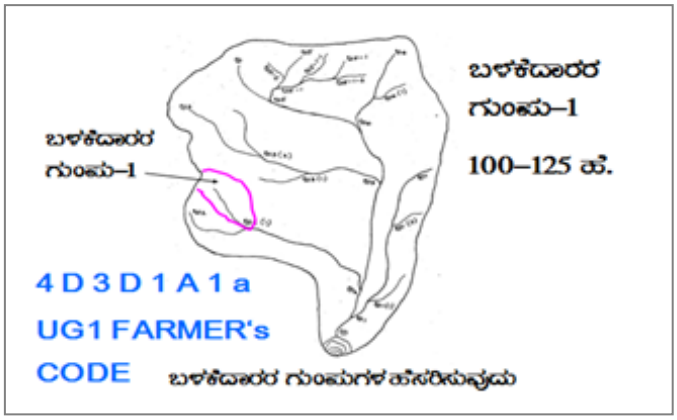
  Land Suitability for various crops: Areas that are highly, moderately and marginally suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

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

- Soil depth
- Surface soil texture
- Available water capacity
- Soil slope
- Soil gravelliness
- Land capability
- Present land use and land cover
- Crop suitability maps
- Rainfall map
- Hydrology
- Water Resources
- Socio-economic data



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

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

Steps for Survey and Preparation of Treatment Plan

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

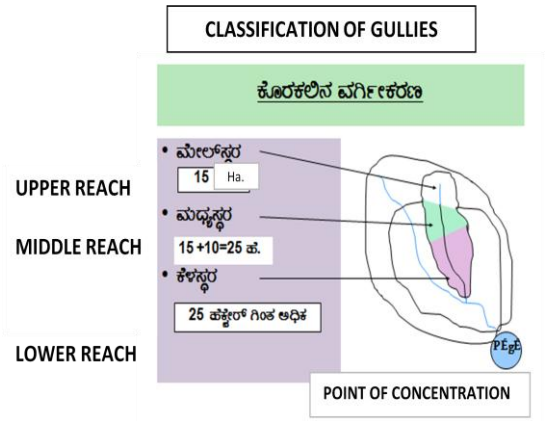
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

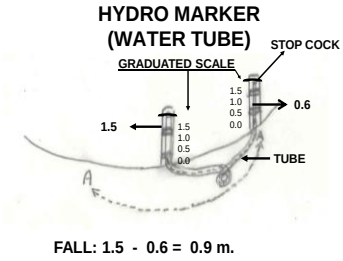
9.1.1 Arable Land Treatment

A. BUNDING

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

Measurement of Land Slope

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



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

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

Note: i) The above intervals are maximum.

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

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

Section of the Bund

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

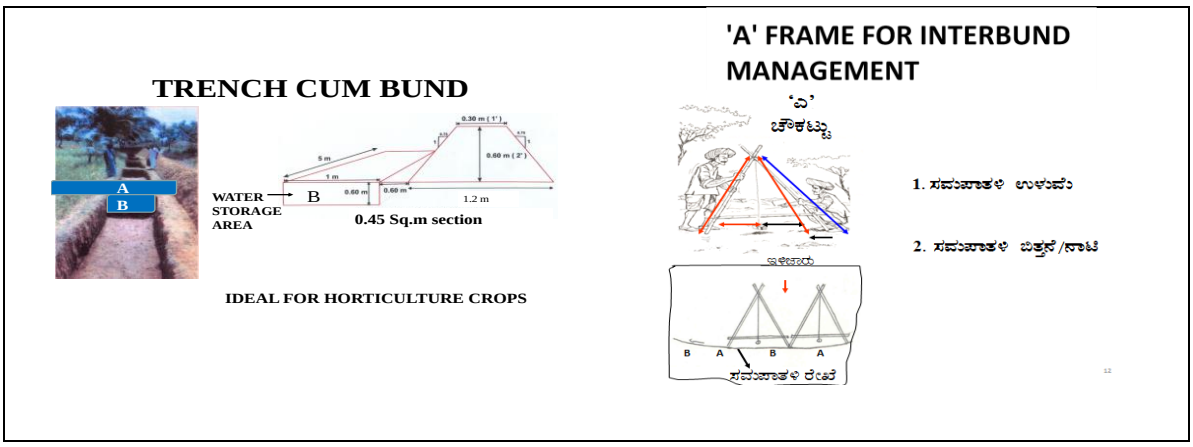
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below



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

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

B. Waterways

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

a) The cadastral map has to be updated as regards the network of drainge lines (gullies/ *nalas/hallas*) and existing structures are marked to the scale and storage capacity of the existing water bodies are documented (Fig 9.1).

b) The drainage line will be demarcated into Upper Reach, Middle Reach and Lower Reach.

c) Considering the Catchment, *Nala* bed and bank conditions, suitable structures are decided.

d) Number of storage structures (Check dam/*Nala* bund/ Percolation tank) will be decided considering the commitments and available runoff in water budgeting and quality of water in the wells and site suitability.

e) Detailed Leveling Survey using Dumpy Level / Total Station has to be carried out to arrive at the site-specific designs as shown in the Manual.

f) The location of ground water recharge structures are decided by examining the lineaments and fracture zones from geological maps.

g) Rainfall intensity data of the nearest Rain Gauge Station is considered for Hydrologic Designs.

h) Silt load to the Storage/Recharge Structures is reduced by providing vegetative, boulder and earthen checks in the natural water course. Location and design details are given in the Manual.

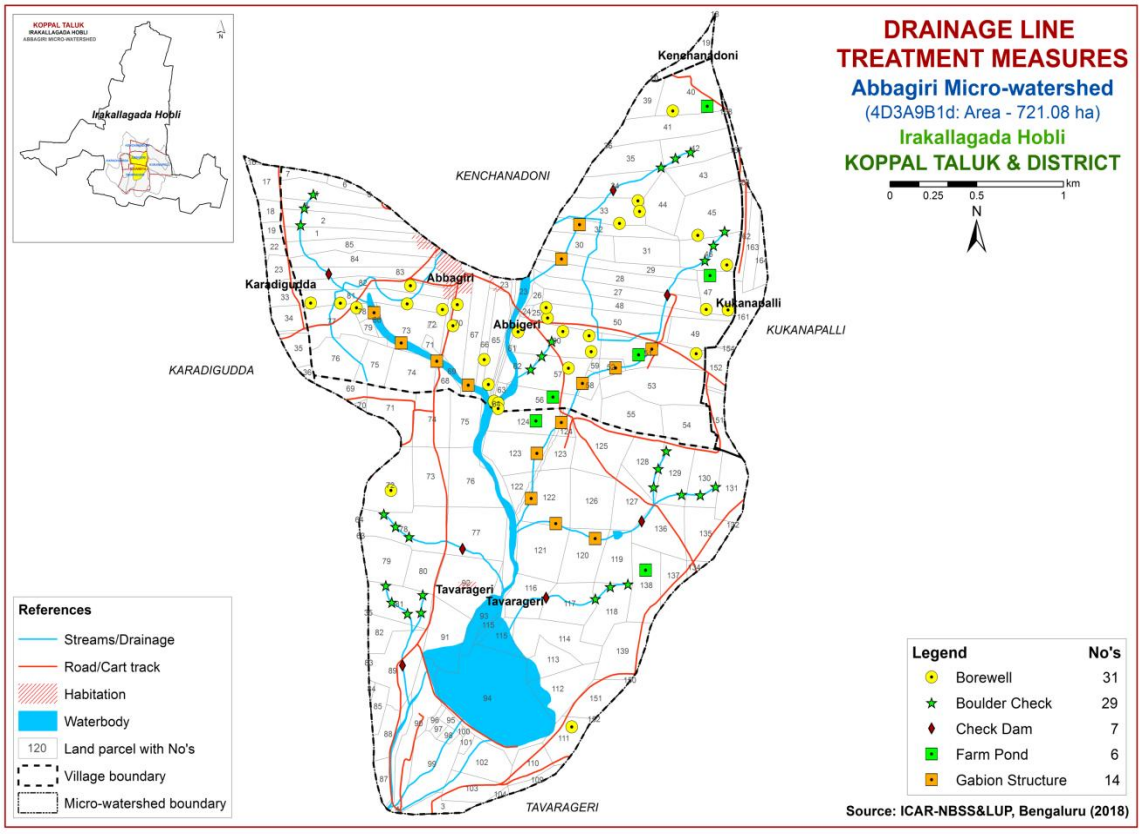


Fig 9.1 Drainage line treatment map of Abbagiri Microwatershed

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. 9.2) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. A maximum area of about 536 ha (74%) needs trench cum bunding, an area of about 38 ha (5 %) needs strengthening of existing bunds and about 48 ha (7%) requires graded bunding. The conservation plan prepared may be presented to all the stakeholders including farmers and after considering their suggestions, the conservation plan for the microwatershed may be finalized in a participatory approach.

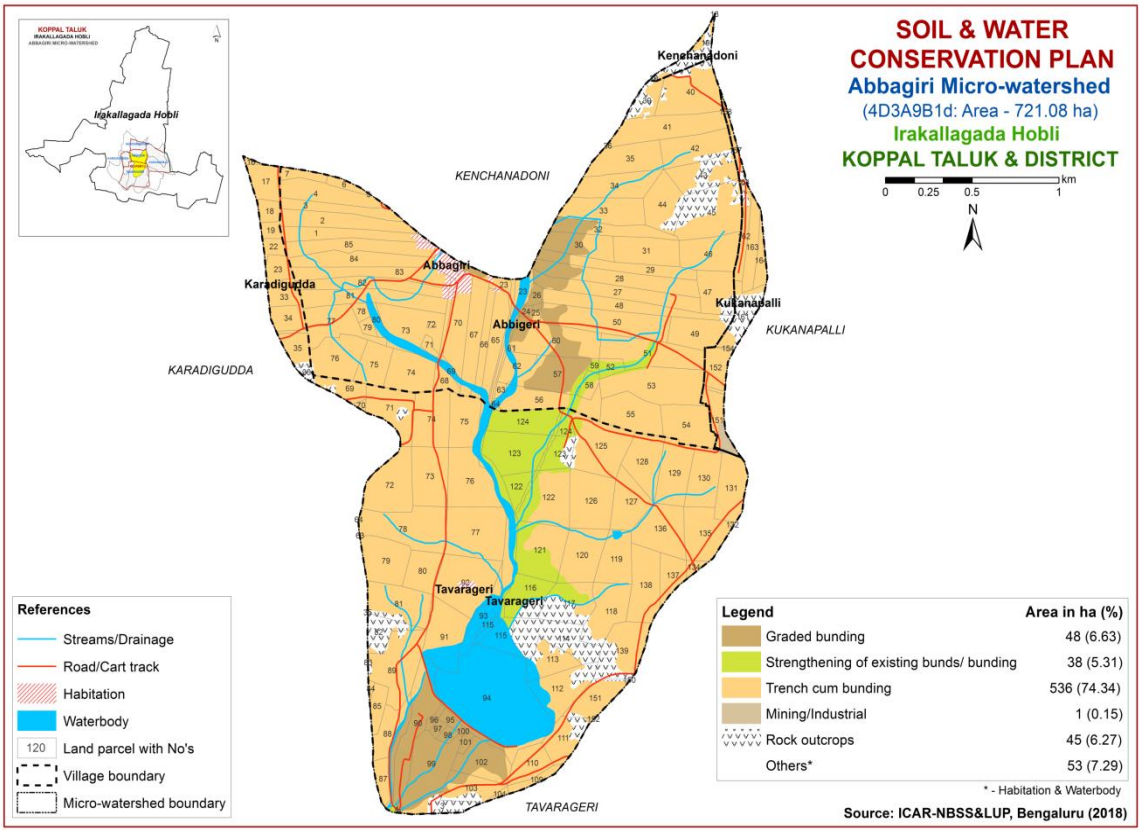


Fig. 9.2 Soil and Water Conservation Plan map of Abbagiri Microwatershed

9.3 Greening of Microwatershed

As part of the greening programme in the watersheds, it is envisaged to plant a variety of horticultural and other tree plants that are edible, economical and produce lot of

biomass which helps to restore the ecological balance in the watersheds. The lands that are suitable for greening programme are non-arable lands (land capability classes V, VI VII and VIII) and also the lands that are not suitable or marginally suitable for growing annual and perennial crops. The method of planting these trees is given below.

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

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

References

1. FAO (1976) Framework for Land Evaluation, Food and Agriculture Organization, Rome.72 pp.
2. FAO (1983) Guidelines for Land Evaluation for Rainfed Agriculture, FAO, Rome, 237 pp.
3. IARI (1971) Soil Survey Manual, All India Soil and Land Use Survey Organization, IARI, New Delhi, 121 pp.
4. Katyal, J.C. and Rattan, R.K. (2003) Secondary and Micronutrients; Research Gap and future needs. Fert. News 48 (4); 9-20.
5. Naidu, L.G.K., Ramamurthy, V., Challa, O., Hegde, R. and Krishnan, P. (2006) Manual Soil Site Suitability Criteria for Major Crops, NBSS Publ. No. 129, NBSS &LUP, Nagpur, 118 pp.
6. Natarajan, A. and Dipak Sarkar (2010) Field Guide for Soil Survey, National Bureau of Soil Survey and Land Use Planning (ICAR), Nagpur, India.
7. Natarajan, A., Rajendra Hegde, Raj, J.N. and Shivananda Murthy, H.G. (2015) Implementation Manual for Sujala-III Project, Watershed Development Department, Bengaluru, Karnataka.
8. Sarma, V.A.K., Krishnan, P. and Budihal, S.L. (1987) Laboratory Manual, Tech. Bull. 23, NBSS &LUP, Nagpur.
9. Sehgal, J.L. (1990) Soil Resource Mapping of Different States of India; Why and How? National Bureau of Soil Survey and Land Use Planning, Nagpur, 49 pp.
10. Shivaprasad, C.R., R.S. Reddy, J. Sehgal and M. Velayuthum (1998) Soils of Karnataka for Optimizing Land Use, NBSS Publ. No. 47b, NBSS & LUP, Nagpur, India.
11. Soil Survey Staff (2006) Keys to Soil Taxonomy, Tenth edition, U.S. Department of Agriculture/ NRCS, Washington DC, U.S.A.
12. Soil Survey Staff (2012) Soil Survey Manual, Handbook No. 18, USDA, Washington DC, USA.

Appendix I

Abbagiri Microwatershed

Soil Phase Information

Village	Survey No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Abbigeri	1	4.98	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	2	6.08	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	3	3.7	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	4	5.61	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	5	0.02	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Nilgiri Farm	Not Available	IIIes	Trench cum bunding
Abbigeri	6	1.01	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	7	1.41	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	23	3.35	HRVcB2g1	LMU-7	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	24	0.34	HLPiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIew	Graded bunding
Abbigeri	25	0.56	HLPiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIew	Graded bunding
Abbigeri	26	0.79	HLPiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIew	Graded bunding
Abbigeri	27	7.21	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	28	7.87	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	29	5.28	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	30	4.91	HLPiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIew	Graded bunding
Abbigeri	31	5.64	MKHcB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	32	4.56	MKHiB2	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	33	6.53	MKHiB2	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	3 Borewell	IIIes	Trench cum bunding
Abbigeri	34	5.89	MKHiB2	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	35	6.29	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	36	0.03	MKHhB1g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	39	2.82	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops

Village	Survey No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Abbigeri	40	8.65	MKHcB2g2	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	1 Borewell, 1 Farm Pond	IIIes	Trench cum bunding
Abbigeri	41	8.04	MKHhB1g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	42	6.18	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	43	5.86	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Abbigeri	44	5.63	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	45	9.84	ABRbB2g2	LMU-7	Shallow (25-50 cm)	Loamy sand	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Rock outcrops (Mz+Rock outcrops)	1 Borewell	IIIes	Trench cum bunding
Abbigeri	46	6.27	ABRbB2g2	LMU-7	Shallow (25-50 cm)	Loamy sand	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIIes	Trench cum bunding
Abbigeri	47	4.95	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	2 Borewell,1 Farm Pond	IIIs	Trench cum bunding
Abbigeri	48	6.51	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	49	5	HTIiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Abbigeri	50	9.66	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Paddy (Mz+Pd)	2 Borewell	IIIes	Trench cum bunding
Abbigeri	51	8.43	ABRbB2g2	LMU-7	Shallow (25-50 cm)	Loamy sand	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Farm Pond,1 Borewell	IIIes	Trench cum bunding
Abbigeri	52	1.31	HLPmA1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIsw	Strengthening of existing bunds
Abbigeri	53	10.14	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	54	6.22	HTIiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	Trench cum bunding
Abbigeri	55	6.47	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	56	6.56	HRVhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Farm Pond	IIIes	Trench cum bunding
Abbigeri	57	6.71	HLPiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIew	Graded bunding
Abbigeri	58	1.29	HLPmA1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIsw	Strengthening of existing bunds
Abbigeri	59	0.43	HLPmA1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIsw	Strengthening of existing bunds
Abbigeri	60	8.64	HLPiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	4 Borewell	IIew	Graded bunding
Abbigeri	61	0.15	HRVhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	62	2.54	HRVhB2	LMU-7	Shallow (25-50 cm)	Sandy	Non gravelly	Very Low (<50	Very gently	Moderate	Maize (Mz)	Not	IIIes	Trench cum

Village	Survey No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
						clay loam	(<15%)	mm/m)	sloping (1-3%)			Available		bunding
Abbigeri	63	0.43	HRVcB2g1	LMU-7	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	64	0.27	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	3 Borewell	Others	Others
Abbigeri	65	4.6	HRVcB2g1	LMU-7	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIIes	Trench cum bunding
Abbigeri	66	2.72	HRVcB2g1	LMU-7	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIIes	Trench cum bunding
Abbigeri	67	5.72	HRVcB2g1	LMU-7	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	68	1.31	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Abbigeri	69	0.55	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Abbigeri	70	5.92	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	2 Borewell	IIIes	Trench cum bunding
Abbigeri	71	0.65	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Trench cum bunding
Abbigeri	72	0.16	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Abbigeri	73	7.7	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Abbigeri	74	5.7	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar(Jw)	Not Available	IIIes	Trench cum bunding
Abbigeri	75	3.9	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar(Jw)	Not Available	IIIs	Trench cum bunding
Abbigeri	76	6.35	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	77	6.06	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Abbigeri	78	0.79	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIes	Trench cum bunding
Abbigeri	79	0.71	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Abbigeri	80	1.05	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Abbigeri	81	7.21	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	4 Borewell	IIes	Trench cum bunding
Abbigeri	82	5.57	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	1 Borewell	IIIs	Trench cum bunding
Abbigeri	83	6.31	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	Trench cum bunding
Abbigeri	84	6.29	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	Trench cum bunding
Abbigeri	85	6.52	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Karadigudda	16	0.26	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Pearl Millet+Redgram (Pm+Rg)	Not Available	IIes	Trench cum bunding

Village	Survey No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Karadigudda	17	3.25	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Trench cum bunding
Karadigudda	18	1.51	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Horsegram (Gn+Hg)	Not Available	IIes	Trench cum bunding
Karadigudda	19	1.03	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Trench cum bunding
Karadigudda	22	1.17	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Pearl Millet+Redgram (Pm+Rg)	Not Available	IIes	Trench cum bunding
Karadigudda	23	2.13	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIes	Trench cum bunding
Karadigudda	33	2.39	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Niger+Redgram (Mz+Ngr+Rg)	Not Available	IIes	Trench cum bunding
Karadigudda	34	2.64	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIIes	Trench cum bunding
Karadigudda	35	2.55	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Pearl+Millet+Redgram(Mz+Pm+Rg)	Not Available	IIIes	Trench cum bunding
Karadigudda	36	0.58	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Kenchanadoni	18	0	LKRhC2g3	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Extremely gravelly (60-80%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Kenchanadoni	19	3.04	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Kenchanadoni	20	0.09	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Kukanapalli	151	3.25	HTIiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Kukanapalli	152	3.02	HTIiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize+Vegitables (Rg+Mz+Vg)	Not Available	IIes	Trench cum bunding
Kukanapalli	154	0.14	HTIiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut+Paddy (Rg+Gn+Pd)	Not Available	IIes	Trench cum bunding
Kukanapalli	161	4.54	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Kukanapalli	162	2.38	KGPhB2g1	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IIIes	Trench cum bunding
Kukanapalli	163	3.17	KGPhB2g1	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Kukanapalli	164	2.24	KGPhB2g1	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+CurrentFallow+Maize (Rg+CFL+Mz)	Not Available	IIIes	Trench cum bunding
Kukanapalli	167	0.74	ABRbB2g2	LMU-7	Shallow (25-50 cm)	Loamy sand	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Fallowland+Groundnut+Paddy (Rg+Fl+Gn+Pd)	Not Available	IIIes	Trench cum bunding
Kukanapalli	168	0.36	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut+Fallow land (Rg+Gn+Fl)	Not Available	IIIes	Trench cum bunding
Tavarageri	3	2.85	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Tavarageri	4	0.27	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Bajra (Bj)	Not Available	IIw	Strengthening of existing bunds

Village	Survey No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Tavarageri	35	0	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Tavarageri	63	0.03	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Trench cum bunding
Tavarageri	64	0.01	BDGhA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIIs	Strengthening of existing bunds
Tavarageri	69	2.72	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Bajra (Bj)	Not Available	IIIs	Trench cum bunding
Tavarageri	70	0.28	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	71	6.05	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	72	7.82	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIes	Trench cum bunding
Tavarageri	73	6.85	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	74	6.48	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	75	4.98	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	76	8.04	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	77	9.6	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallowland+Maize (CFL+Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	78	9.75	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Trench cum bunding
Tavarageri	79	6.28	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	80	4.11	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	81	7.03	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Trench cum bunding
Tavarageri	82	3.26	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Tavarageri	83	0.01	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Tavarageri	84	0.25	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	85	2.02	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	87	1.97	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	88	3.18	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarager	89	9.14	BDGhB2	LMU-2	Moderately deep	Sandy	Non gravelly	Very Low (<50	Very gently	Moderate	Bajra (Bj)	Not	IIIes	Trench cum

Village	Survey No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
i					(75-100 cm)	clay loam	(<15%)	mm/m)	sloping (1-3%)			Available		bunding
Tavarageri	90	8.35	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Graded bunding
Tavarageri	91	7.52	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Marigold (Mg)	Not Available	IIIes	Trench cum bunding
Tavarageri	92	9.49	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Marigold (Mg)	Not Available	IIIes	Trench cum bunding
Tavarageri	93	3.29	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Tavarageri	94	26.27	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Tavarageri	95	0.83	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Tavarageri	96	0.59	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Tavarageri	97	0.57	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Tavarageri	98	0.73	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Tavarageri	99	8.46	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Tavarageri	100	0.16	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Tavarageri	101	0.65	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Tavarageri	102	5.56	DRLmB2	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Tavarageri	103	4.43	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	104	0.35	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	109	1.33	HDHhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	110	3.72	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIIes	Trench cum bunding
Tavarageri	111	4.56	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	1 Borewell	IIIes	Trench cum bunding
Tavarageri	112	6.67	LKRcB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Trench cum bunding
Tavarageri	113	4.24	LKRcB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Trench cum bunding
Tavarageri	114	7.66	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Tavarageri	115	3.13	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Tavarageri	116	5.16	BDGhA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Cultivated Fallow Land (CFL)	Not Available	IIIs	Strengthening of existing

Village	Survey No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
														bunds
Tavarageri	117	6.06	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Tavarageri	118	6.48	BPRcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIIes	Trench cum bunding
Tavarageri	119	5.2	BPRcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	120	6.66	BPRcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	121	8.26	BDGhA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIIs	Strengthening of existing bunds
Tavarageri	122	9.75	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	123	10.03	BDGhA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIIs	Strengthening of existing bunds
Tavarageri	124	6.15	BDGhA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	1 Farm Pond	IIIs	Strengthening of existing bunds
Tavarageri	125	9.23	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	126	7.71	BPRcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	127	5.48	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	128	5.81	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	129	6.27	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	130	5.65	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	131	5.66	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	132	0.06	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	134	0.69	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIIes	Trench cum bunding
Tavarageri	135	6.36	HDHcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	136	7.11	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	137	3.02	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	138	6.98	BPRcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Farm Pond	IIIes	Trench cum bunding
Tavarageri	139	7.44	BPRcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIIes	Trench cum bunding

Village	Survey No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Tavarageri	150	0.01	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Not Available	Rock outcrops	Rock outcrops
Tavarageri	151	4.51	LKRcB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	152	0	LKRcB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding

Appendix II

Abbagiri 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
Abbigeri	1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	2	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	3	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	4	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	5	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Abbigeri	6	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	7	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)
Abbigeri	23	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Others	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	24	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	25	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	26	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	27	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	28	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	29	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	30	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	31	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	32	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	33	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	34	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)
Abbigeri	35	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Abbigeri	36	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Abbigeri	39	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Abbigeri	40	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Abbigeri	41	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Abbigeri	42	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Abbigeri	43	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Abbigeri	44	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Abbigeri	45	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Abbigeri	46	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Abbigeri	47	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Abbigeri	48	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	49	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Abbigeri	50	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	51	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	52	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	53	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Abbigeri	54	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Abbigeri	55	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Abbigeri	56	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	57	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	58	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	59	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	60	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	61	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	62	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	63	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	64	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Abbigeri	65	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	66	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	67	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	68	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	69	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Abbigeri	70	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	71	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Abbigeri	72	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	73	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	74	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	75	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Abbigeri	76	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 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)	Sufficient (> 0.6 ppm)
Abbigeri	77	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	78	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	79	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	80	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Abbigeri	81	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	82	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	83	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	84	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Abbigeri	85	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Karadigudda	16	Slightly acid (pH 6.0 – 6.5)	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)
Karadigudda	17	Slightly acid (pH 6.0 – 6.5)	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)
Karadigudda	18	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 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)
Karadigudda	19	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 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)
Karadigudda	22	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 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)
Karadigudda	23	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Karadigudda	33	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 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)
Karadigudda	34	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 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)
Karadigudda	35	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 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)
Karadigudda	36	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Kenchanadoni	18	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Kenchanadoni	19	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Kenchanadoni	20	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Kukanapalli	151	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Kukanapalli	152	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kukanapalli	154	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kukanapalli	161	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Kukanapalli	162	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 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)
Kukanapalli	163	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 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)
Kukanapalli	164	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 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)
Kukanapalli	167	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Kukanapalli	168	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Tavarageri	3	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	4	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	35	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	63	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	64	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	69	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Tavarageri	70	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	71	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	72	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	73	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	74	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	75	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Tavarageri	76	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	77	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	78	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	79	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	80	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	81	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	82	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	83	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	84	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	85	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	87	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	88	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Tavarageri	89	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	90	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	91	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	92	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	93	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Tavarageri	94	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Tavarageri	95	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	96	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	97	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	98	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	99	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 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)	Sufficient (> 0.6 ppm)
Tavarageri	100	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Tavarageri	101	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	102	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	103	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	104	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	109	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	110	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	111	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	112	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	113	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	114	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	115	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Tavarageri	116	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	117	Moderately acid (pH 5.5 – 6.0)	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	118	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	119	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	120	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	121	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	122	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	123	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	124	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Tavarageri	125	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)
Tavarageri	126	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	127	Neutral (pH 6.5 – 7.3)	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)
Tavarageri	128	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)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Tavarageri	129	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)
Tavarageri	130	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)
Tavarageri	131	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 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)
Tavarageri	132	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)
Tavarageri	134	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	135	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)
Tavarageri	136	Neutral (pH 6.5 – 7.3)	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)
Tavarageri	137	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	138	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	139	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	150	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	151	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	152	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Appendix III

Abbagiri Microwatershed
Soil Suitability Information

Village	Survey No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crosandra	Drumstick	Mulbery
Abbigeri	1	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	2	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	3	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	4	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	5	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	6	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	7	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	23	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Abbigeri	24	S3rw	S2w	S2rw	S2w	S2rw	S2w	S3rw	S2rw	S2w	S2rw	S2rw	S2w	S2rw	S2w	N1tw	S3rw	S2rw	S2tw	S2w	S2w	S2tw	S2tw	S2rw	S2w	S2tw	S2tw	S2rw	S2rw
Abbigeri	25	S3rw	S2w	S2rw	S2w	S2rw	S2w	S3rw	S2rw	S2w	S2rw	S2rw	S2w	S2rw	S2w	N1tw	S3rw	S2rw	S2tw	S2w	S2w	S2tw	S2tw	S2rw	S2w	S2tw	S2tw	S2rw	S2rw
Abbigeri	26	S3rw	S2w	S2rw	S2w	S2rw	S2w	S3rw	S2rw	S2w	S2rw	S2rw	S2w	S2rw	S2w	N1tw	S3rw	S2rw	S2tw	S2w	S2w	S2tw	S2tw	S2rw	S2w	S2tw	S2tw	S2rw	S2rw
Abbigeri	27	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	28	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	29	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	30	S3rw	S2w	S2rw	S2w	S2rw	S2w	S3rw	S2rw	S2w	S2rw	S2rw	S2w	S2rw	S2w	N1tw	S3rw	S2rw	S2tw	S2w	S2w	S2tw	S2tw	S2rw	S2w	S2tw	S2tw	S2rw	S2rw
Abbigeri	31	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	32	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	33	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	34	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	35	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	36	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	39	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
Abbigeri	40	N1r	S3rg	S3rg	S3rg	S3rg	S3g	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Abbigeri	41	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	42	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	43	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
Abbigeri	44	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Abbigeri	45	N1r	S3rg	N1r	S3rg	N1r	S3rt	N1r	N1r	S3rt	N1r	N1r	S3rg	N1r	S3rg	N1r	N1r	N1r	S3rg	S3rg	S3rg	S3rg	S3rg	N1r	S3rg	S3rg	S3rg	N1r	N1r
Abbigeri	46	N1r	S3rg	N1r	S3rg	N1r	S3rt	N1r	N1r	S3rt	N1r	N1r	S3rg	N1r	S3rg	N1r	N1r	N1r	S3rg	S3rg	S3rg	S3rg	S3rg	N1r	S3rg	S3rg	S3rg	N1r	N1r
Abbigeri	47	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	48	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	49	N1r	S2rg	S3r	S2rg	S3r	S2rg	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S2r
Abbigeri	50	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g

Abbigeri	51	N1r	S3rg	N1r	S3rg	N1r	S3rt	N1r	N1r	S3rt	N1r	N1r	S3rg	N1r	S3rg	N1r	N1r	N1r	S3rg	S3rg	S3rg	S3rg	S3rg	N1r	S3rg	S3rg	S3rg	N1r	N1r
Abbigeri	52	S3rw	S1	S2rw	S1	S2rw	S2w	S3rw	S2rw	S1	S2rw	S2rw	S2rw	S2rw	S2rw	N1tw	S3rw	S2rw	S2tw	S2w	S1	S2tw	S2tw	S2rw	S1	S2tw	S2tw	S2rw	S2rw
Abbigeri	53	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	54	N1r	S2rg	S3r	S2rg	S3r	S2rg	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S2r
Abbigeri	55	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	56	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Abbigeri	57	S3rw	S2w	S2rw	S2w	S2rw	S2w	S3rw	S2rw	S2w	S2rw	S2rw	S2w	S2rw	S2w	N1tw	S3rw	S2rw	S2tw	S2w	S2w	S2tw	S2tw	S2rw	S2w	S2tw	S2tw	S2rw	S2rw
Abbigeri	58	S3rw	S1	S2rw	S1	S2rw	S2w	S3rw	S2rw	S1	S2rw	S2rw	S2rw	S2rw	S2rw	N1tw	S3rw	S2rw	S2tw	S2w	S1	S2tw	S2tw	S2rw	S1	S2tw	S2tw	S2rw	S2rw
Abbigeri	59	S3rw	S1	S2rw	S1	S2rw	S2w	S3rw	S2rw	S1	S2rw	S2rw	S2rw	S2rw	S2rw	N1tw	S3rw	S2rw	S2tw	S2w	S1	S2tw	S2tw	S2rw	S1	S2tw	S2tw	S2rw	S2rw
Abbigeri	60	S3rw	S2w	S2rw	S2w	S2rw	S2w	S3rw	S2rw	S2w	S2rw	S2rw	S2w	S2rw	S2w	N1tw	S3rw	S2rw	S2tw	S2w	S2w	S2tw	S2tw	S2rw	S2w	S2tw	S2tw	S2rw	S2rw
Abbigeri	61	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Abbigeri	62	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Abbigeri	63	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Abbigeri	64	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
Abbigeri	65	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Abbigeri	66	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Abbigeri	67	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Abbigeri	68	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	69	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
Abbigeri	70	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	71	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Abbigeri	72	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Abbigeri	73	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Abbigeri	74	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	75	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	76	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	77	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	78	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Abbigeri	79	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Abbigeri	80	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
Abbigeri	81	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Abbigeri	82	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Abbigeri	83	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Abbigeri	84	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Abbigeri	85	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Karadigudda	16	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Karadigudda	17	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Karadigudda	18	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Karadigudda	19	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Karadigudda	22	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Karadigudda	23	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Karadigudda	33	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Karadigudda	34	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Karadigudda	35	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Karadigudda	36	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
Kenchanadoni	18	N1g	N1g	N1g	N1g	N1g	N1g	N1g	N1g	N1g	N1g	N1g	S3rg	N1g	S3rg	N1g	N1g	N1g	S3rg	N1g	N1g	N1g	N1g	S3rg	S3rg	N1g	N1g	S3rg	S3rg
Kenchanadoni	19	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
Kenchanadoni	20	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
Kukanapalli	151	N1r	S2rg	S3r	S2rg	S3r	S2rg	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S2r
Kukanapalli	152	N1r	S2rg	S3r	S2rg	S3r	S2rg	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S2r

Kukanapalli	154	N1r	S2rg	S3r	S2rg	S3r	S2rg	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rg	S3r	S2r
Kukanapalli	161	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
Kukanapalli	162	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	S3rg	N1rg	S3r	N1rg	S3r	N1r	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3r	S3rg	S3rg	N1r	N1r
Kukanapalli	163	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	S3rg	N1rg	S3r	N1rg	S3r	N1r	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3r	S3rg	S3rg	N1r	N1r
Kukanapalli	164	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	S3rg	N1rg	S3r	N1rg	S3r	N1r	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3r	S3rg	S3rg	N1r	N1r
Kukanapalli	167	N1r	S3rg	N1r	S3rg	N1r	S3rt	N1r	N1r	S3rt	N1r	N1r	S3rg	N1r	S3rg	N1r	N1r	N1r	S3rg	S3rg	S3rg	S3rg	S3rg	N1r	S3rg	S3rg	S3rg	N1r	N1r
Kukanapalli	168	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Tavarageri	3	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
Tavarageri	4	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S3tw	S2tw	S2tw
Tavarageri	35	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
Tavarageri	63	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	64	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	69	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	70	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	71	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	72	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	73	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	74	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	75	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	76	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	77	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	78	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	79	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	80	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	81	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	82	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
Tavarageri	83	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
Tavarageri	84	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	85	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	87	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	88	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	89	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	90	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	91	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	92	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	93	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
Tavarageri	94	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Tavarageri	95	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	96	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	97	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	98	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	99	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	100	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	101	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	102	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Tavarageri	103	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	104	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	109	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	110	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	111	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g

Tavarageri	112	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Tavarageri	113	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Tavarageri	114	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
Tavarageri	115	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
Tavarageri	116	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	117	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
Tavarageri	118	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	119	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	120	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	121	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	122	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	123	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	124	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	125	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	126	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	127	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	128	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	129	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	130	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	131	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	132	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	134	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	135	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	136	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	137	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	138	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	139	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	150	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
Tavarageri	151	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Tavarageri	152	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg

RO-Rock outcrops

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

SALIENT FINDINGS OF THE STUDY

- *Results indicated that 34 farmers were sampled in Abbagiri micro watershed among them 7 (20.59%) were marginal farmers, 15 (44.12 %) were small farmers, 4 (11.76 %) were semi medium farmers, 2 (5.88%) were medium farmers, 1(2.94%) was large farmer and 5 (14.71 %) landless farmers were also interviewed for the survey.*
- *The data indicated that there were 142 population households were there in the studied micro watershed. Among them 79 (55.63%) men and 63 (44.37 %) were women. The average family size of landless was 3, marginal farmers and small farmers were 4, semi medium and medium farmers were 5 and large farmer was 10. On an average the family size was 4.*
- *The data indicated that 20 (14.08%) people were in 0-15 years of age, 73 (51.41 %) were in 16-35 years of age, 36 (25.35 %) were in 36-60 years of age and 13 (9.15 %) were above 61 years of age.*
- *The results indicated that the Abbagiri had 40.14 per cent illiterates, 0.70 per cent were functional literates, 26.06 per cent of them had primary school education, 10.56 per cent of them had both middle school, 14.79 per cent them had high school education, 4.93 per cent of them had PUC education, 0.70 per cent of them had degree education and 2.11 per cent them had others.*
- *The results indicated that, 55.88 per cent of households practicing agriculture, 35.29 per cent of the household heads were agricultural labour and 8.82 per cent of the household heads were general labour.*
- *The results indicated that agriculture was the major occupation for 45.07 per cent of the household members, 30.99 per cent were agricultural labourers, 7.75 per cent were general labours, 0.70 percent were in private sector, 12.68 per cent of them were students and 2.86 per cent of them were children. In case of landless households 14.29 per cent were agricultural labours, 64.29 per cent were general labourers and 21.43 per cent were students. In case of marginal farmers 39.29 per cent were both agriculturist and agricultural labour, 3.57 per cent of both were in private and 14.29 per cent were students. In case of small farmers 56.14 per cent of them were agriculturist, 22.81 per cent of them were agriculture labour, 3.51 per cent were general labour and 14.04 per cent of them were students. In case of semi medium farmers 27.27 per cent of the family members were agriculturist, 54.55 per cent were agriculture labour and 13.64 per cent of them were students. In case of medium farmers 45.45 per cent of the family members were agriculturist and 54.55 per cent of them were agriculture labours. In large farmers 100 per cent of them were doing agriculture.*
- *The results showed 100 per cent of the farmers have not participated in any local institutions.*

- *The results indicated that 50 per cent of the households possess Katcha house, 17.65 per cent of the households possess Pucca house and 32.35 per cent of them possess Thatched house.*
- *The results showed that, 82.35 per cent of the households possess TV, 67.65 per cent of the households possess Mixer grinder, 23.53 per cent of the households possess bicycle, 35.29 per cent of the households possess motor cycle, 2.94 per cent of the households possess Auto and 91.18 per cent of the households possess mobile phones.*
- *The results showed that the average value of television was Rs. 7178, mixer grinder was Rs.1630, bicycle was Rs.1375, motor cycle was Rs.30416, Auto was Rs. 300000 and mobile phone was Rs.1537.*
- *Results showed about 23.53 per cent of the households possess bullock cart, 44.12 per cent of them possess plough, 2.94 per cent of the households possess tractor, 32.35 per cent of the households possess sprayer, 91.18 per cent of the households possess weeder, 2.94 per cent of the households possess harvester and 11.76 per cent of the households possess chaff cutter.*
- *The results showed that the average value of bullock cart was Rs.17975; the average value of plough was Rs. 929, the average value of tractor was Rs. 300000, the average value of sprayer was Rs. 3125, the average value of weeder was Rs. 64, the average value of harvester was Rs. 48000 and the average value of chaff cutter was Rs. 3000.*
- *The results indicated that, 41.18 per cent of the households possess bullocks, 35.29 per cent of the households possess local cow, 8.82 per cent of the households possess sheep and 2.94 per cent of the households possess goat.*
- *The data indicated that in case of marginal farmers, 28.57 per cent of the households possess bullock and 42.86 per cent of household possess local cow. In case of small farmers, 46.67 per cent of households possess bullock, 26.67 per cent possess local cow, 13.33 per cent of the households possess sheep and 6.67 per cent possess goat. In case of semi medium farmers, 75 per cent of the households possess bullock and 50 per cent possess local cow. In medium farmers 50 per cent of the household possess bullock and 100 per cent of them have possess local cow. In case of large farmers 100 per cent of the farmers have possess bullock, local cow and sheep respectively.*
- *The results indicated that, average own labour men available in the micro watershed was 1.79, average own labour (women) available was 1.61, average hired labour (men) available was 8.34 and average hired labour (women) available was 7.79.*
- *The data showed that in case of marginal farmers, average own labour men available was 1, average own labour (women) was also 1.67, average hired labour (men) was 7.86 and average hired labour (women) available was also*

7.86. In case of small farmers, average own labour men available was 1.73, average own labour (women) was 1.40, average hired labour (men) was 8.87 and average hired labour (women) available was 8.40. In case of semi medium farmers, average own labour men available was 2.25, average own labour (women) was 1.50, average hired labour (men) was 9.25 and average hired labour (women) available was 6.75. In medium farmers average own labour men available was 2.50, average own labour (women) was 2, average hired labour (men) was 5 and average hired labour (women) available was 5. In large farmers average own labour men available was 4, average own labour (women) was 4, average hired labour (men) was 7 and average hired labour (women) available was 8.

- *The results indicated that, 85.29 per cent of the household opined that hired labour was adequate.*
- *The results indicated that, households of the Abbagiri micro watershed possess 33.19 ha (51.34 %) of dry land and 31.46 ha (48.66 %) of irrigated land. Marginal farmers possess 4.98 ha (91.11 %) of dry land and 0.49 ha (8.89%) of irrigated land. Small farmers possess 19.29 ha (93.38 %) of dry land and 1.37 ha (6.62 %) of irrigated land. Semi medium farmers possess 2.02 ha (30.94 %) of dry land and 4.52 ha (69.06 %) of irrigated land. Medium farmers possess 6.90 (81%) of dry land and 1.62 ha (19%) of irrigated land. Large farmers possess 23.47 ha (100%) of irrigated land.*
- *The results indicated that, the average value of dry land was Rs. 307,206.44 and average value of irrigated was Rs. 724665.73. In case of marginal famers, the average land value was Rs. 481,951.22 for dry land and Rs. 1,234,999.95 for irrigated land. In case of small famers, the average land value was Rs. 310,952.58 for dry land Rs. 1,023,076.96 for irrigated land. In case of semi medium famers, the average land value was Rs. 296,400 for dry land and Rs. 531,182.79 for irrigated land. In case of medium famers, the average land value was Rs. 173841.64 for dry land and was Rs. 494,000 for irrigated land. In case of large farmers the average land value was Rs. 340068.97 for irrigated land.*
- *The results indicated that, there were 9 functioning bore wells in the micro watershed.*
- *The results indicated that, bore well was the major irrigation source for 26.47 per cent of the farmers.*
- *The results indicated that on an average the depth of the bore well was 22.32 meters.*
- *The results indicated that, in case of small farmers there was 1.37 ha of irrigated land, in case of semi medium farmers there was 3.71 ha of irrigated land, medium farmers were having 1.62 ha of irrigated land and large farmers were having 6.48 ha of irrigated land. On an average there were 13.17 ha of irrigated land.*

- *The results indicated that, farmers have grown bajra (8.66 ha), maize (21.52 ha), paddy (2.66 ha), groundnut (4.86 ha), navane (0.88 ha), red gram (1.29 ha) and sunflower (0.81 ha) in kharif season. Also grown groundnut (1.28 ha) in Rabi season. Marginal farmers have grown Maize, Bajra, groundnut and paddy. Small farmers have grown bajra, maize, paddy, navane, red gram and sunflower. Semi medium farmers have grown Maize and groundnut. Medium farmers have grown bajra and maize. Large farmers have grown groundnut and paddy.*
- *The results indicated that, the cropping intensity in Abbagiri micro watershed was found to be 80.20 per cent. In case of marginal, semi medium and large farmers it was 100 per cent, in small farmers the cropping intensity was 87.02 per cent and in medium farmers it was 43.75 per cent.*
- *The results indicated that, 91.50 per cent of the households have bank account and 50 per cent of the households have savings. Among marginal farmers 40 percent of them possess bank account and 20 per cent possess savings. 100 per cent of small farmers possess bank account and 57.14 per cent of them possess savings. Semi medium farmers possess 100 per cent of bank account and 66.67 per cent possess savings. Medium category of farmers possesses 100 per cent of bank account and 50 per cent of them possess savings. 100 per cent of large farmers possess bank account.*
- *The results indicated that, 40 per cent of landless, 57.14 per cent of marginal, 66.67 per cent of small, 25 per cent of semi medium, 50 per cent of medium and 100 per cent of large farmers have borrowed credit from different sources.*
- *The results indicated that, 52.63 per cent have availed loan in commercial bank, 26.13 per cent have availed loan from Grameena bank and 21.05 per cent have availed loan from money lender.*
- *The results indicated that, marginal, small, semi medium, medium and large farmers have availed Rs.152500, Rs. 128000, Rs. 260000, Rs. 360000 and Rs. 300000 respectively. Overall average credit amount availed by households in the micro watershed is 147894.74.*
- *The results indicated that, 89.47 per cent of the households have borrowed loan for agriculture production.*
- *The results indicated that, agriculture production, income generating activities, purchase-vehicle and social functions like marriage reasons were the purpose for which marginal, small and semi medium farmers borrowed loan from private credit. About 25 percent of loan was taken for agriculture production, income generating activities, purchase-vehicle and social functions like marriage respectively.*
- *Results indicated that 10 per cent of the households have repaid their institutional credit partially, 80 percent of the households have unpaid their loan and 10 percent of the households have fully paid their loan.*

- *Results indicated that 75 per cent of the households have repaid their private credit partially and 25 percent of the households have unpaid their loan.*
- *The results indicated that 45 per cent of the households were opined that they were helped to perform timely agricultural operations, 25 per cent of farmers opined that higher rate of interest and 5 per cent of them opined that they forced to sell the produce at low price to repay loan in time respectively.*
- *The results indicated that, the total cost of cultivation for bajra was Rs. 21127.54. The gross income realized by the farmers was Rs. 26854.61. The net income from bajra cultivation was Rs. 5727.07, thus the benefit cost ratio was found to be 1:1.27.*
- *The results indicated that, the total cost of cultivation for maize was Rs. 22389.84. The gross income realized by the farmers was Rs. 26497.78. The net income from maize cultivation was Rs. 4107.93. Thus the benefit cost ratio was found to be 1:1.18.*
- *The results indicated that, the total cost of cultivation for paddy was Rs. 47014.73. The gross income realized by the farmers was Rs. 106400.81. The net income from paddy cultivation was Rs. 59386.09. Thus the benefit cost ratio was found to be 1:2.26.*
- *The results indicated that, the total cost of cultivation for groundnut was Rs. 46981.45. The gross income realized by the farmers was Rs. 63906.15. The net income from groundnut cultivation was Rs. 16924.70. Thus the benefit cost ratio was found to be 1:1.36.*
- *The results indicated that, the total cost of cultivation for Sunflower was Rs. 31003.53. The gross income realized by the farmers was Rs. 55575.00. The net income from Sunflower cultivation was Rs. 24571.47. Thus the benefit cost ratio was found to be 1:1.79.*
- *The results indicated that, the total cost of cultivation for red gram was Rs. 22829.07. The gross income realized by the farmers was Rs. 16311.32. The net income from red gram cultivation was Rs. -6517.75. Thus the benefit cost ratio was found to be 1:0.71.*
- *The results indicated that, 41.18 per cent of the households opined that dry fodder was adequate and 29.41 per cent of the households opined that green fodder was adequate.*
- *The table indicated that, in case of landless, the average income from business Rs. 8000 and wage Rs. 52000. In case marginal farmers the average income from service/salary was Rs.8571.43, business was Rs.11428.57, wage was Rs.5000, agriculture was Rs.44471.43 and dairy farm was Rs.3660.71. In small farmers, the average income from service/salary was Rs.11000, wage was Rs.18666.67, agriculture was Rs.43133.33, dairy farm was Rs.533.33 and goat farming was Rs.6000. In semi medium farmers the average income from business was*

Rs.28750, wage was Rs.10000 and agriculture was Rs.72200. In medium farmers the average income from wage was Rs.9000, agriculture was Rs.67500 and dairy farm was Rs.1500. In case of large farmers the average income from wage was Rs.10000, agriculture was Rs.130000 and goat farming was Rs.60000.

- *The results indicated that, in case of land less, the average expenditure from business Rs. 20000 and wage Rs. 30000. In marginal farmers, the average expenditure from business was Rs.30000, wage was Rs.1500, agriculture was Rs.23000 and dairy farm was Rs.5250. In small farmers, the average expenditure from service/salary was Rs.32500, wage was Rs.5714.29, agriculture was Rs.20642.86, dairy farm was Rs.333.33 and goat farming was Rs.20000.In semi medium farmers the average expenditure from business was Rs.60000, wage was Rs.5000 and agriculture was Rs.28750. In medium farmers the average expenditure from wage was Rs.2000, agriculture was Rs.27500 and dairy farm was Rs.1000. In case of large farmers the average expenditure from wage was Rs.2000, agriculture was Rs.50000 and goat farming was Rs.5000.*
- *The results indicated that, sampled households have grown 23 coconut trees and 17 mango trees in their field and also planted 2 coconut trees in their back yard.*
- *The results indicated that, households have planted 23 teak trees, 38 neem trees, 3 tamarind tress, 2 pongamia and 4 banyan trees in their field.*
- *The results indicate that, households have an average investment capacity of Rs. 1117.65 for land development, Rs. 294.14 in irrigation facility, Rs.823.53 for improved crop production and Rs.264.71 for improved livestock management.*
- *The result showed that small farmers have an average investment capacity of Rs. 1066.67 for land development, Rs.800 for improved crop production and Rs.200 for improved livestock management. Semi medium farmers have an average investment capacity of Rs. 5500 for land development, Rs. 2500 in irrigation facility, Rs.4000 for improved crop production and Rs.1500 for improved livestock management.*
- *The results indicated that for 14.71 per cent of the households were dependent on loan from the bank for land development, 5.88 per cent of the households were dependent on soft loans for irrigation facility. For improved crop production 5.88 per cent of the households were dependent on own funds and 8.82 per cent of them dependent on soft loan. For improved livestock management 8.82 per cent of the households were dependent on own funds.*
- *The results indicated that, maize and sunflower crops were sold to the extent of 100 per cent. Bajra, groundnut, paddy and red gram were sold to the extent of 90.20 per cent, 93.64 per cent, 90.83 per cent and 71.43 per cent respectively.*
- *The results indicated that, 5.88 percent of the households have sold their produce to agent/traders, 73.53 percent of the households have sold their produce to local/village merchant,14.71 percent of the households sold their produce in*

regulated markets and 8.82 percent of the households sold their produce to cooperative marketing Society.

- *The results indicated that 2.94 per cent of the households have used cart as a mode of transport, 55.88 per cent of them have used tractor and 44.12 per cent have used truck.*
- *The results indicated that, 35.29 per cent of the households have experienced the soil and water erosion problems i.e. 42.86 percent of marginal farmers, 33.33 per cent of small farmers, 50 per cent of semi medium farmers, 50 percent of medium farmers and 100 per cent of the large farmers.*
- *The results indicated that, 85.29 per cent of the households have shown interest in soil testing.*
- *The results indicated that, 100 percent used fire wood as a source of fuel.*
- *The results indicated that, piped supply was the major source of drinking water for 97.02 per cent households and 2.94 per cent of them were using bore well for drinking water.*
- *The results indicated that, electricity was the major source of light for 100 per cent of the households.*
- *The results indicated that, 55.88 per cent of the households possess sanitary toilet i.e. 60 per cent of landless, 100 per cent of marginal, semi medium, medium and large farmers and 13.33 small farmers had sanitary toilet facility.*
- *The results indicated that, 97.06 per cent of the sampled households possessed BPL card and 2.94 per cent of the sampled households have not possessed BPL card.*
- *The results indicated that, 47.06 per cent of the households participated in NREGA programme which included 60 per cent of the landless, 14.29 percent of the marginal, 33.33 per cent of the small, 100 per cent of the semi medium, medium and large farmers respectively.*
- *The results indicated that, cereals, pulses, oilseeds, vegetables, fruits , milk, egg and meat were adequate for 94.12 per cent, 67.65 per cent, 23.53 per cent, 44.12 per cent, 47.06 per cent, 52.94 per cent, 64.71 per cent and 50 per cent respectively.*
- *The results indicated that, cereals, pulses, oilseed, vegetables, fruits milk, egg and meat were inadequate for 5.88 per cent, 32.35 per cent, 73.53 per cent, 55.88 per cent, 52.94 per cent, 47.06 per cent,35.29 per cent and 50 per cent of the households.*
- *The results indicated that, 85.29 per cent of the households experienced by lower fertility status of the soil was the constraint and wild animal menace on farm field, frequent incidence of pest and diseases (67.65%), inadequacy of irrigation water (58.82%), high cost of Fertilizers and plant protection chemicals (79.41%), high rate of interest on credit (73.53%), low price for the agricultural*

commodities (79.41%), lack of marketing facilities in the area (61.76%), inadequate extension services (55.88%), lack of transport for safe transport of the agricultural produce to the market (85.29%), less rainfall (8.82%) and Source of Agri-technology information(Newspaper/TV/Mobile (2.94 %).

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

Koppal district is an administrative district in the state of Karnataka in India. In the past Koppal was referred to as 'Kopana Nagara'. Koppal, now a district headquarters is ancient Kopana a major holy place of the Jains. The district occupies an area of 7,190 km² and has a population of 1,196,089, which 16.58% were urban as of 2001. The Koppal district was formed after split of Raichur district. It consists of four taluks namely Koppal, Gangavathi, Kushtagi and Yelburga. The undulating topography with black cotton soil shrips, cut across by numerous nalas or streams is the major characteristic feature of the study region. The Koppal district is having partly red sandy and black soil suitable for agriculture and horticulture crops. Majority of Gangavathi taluk is having black soil. The taluk is also having very few hills with xerophilous vegetation. The partly red sandy soil and black soil of mixed geographical origin are found in the Yelburga taluk.

Three physiographic divisions have made considering the local conditions of landforms and crops grown in the district. On the basis of physiographic, Koppal district can be divided into three major divisions. They are (a) Koppal & Yelburga plateau, (b) Maidan division, (c) Tungabhadra valley. The district is part of Krishna basin the main streams draining the area are Maskinala, Ilkal-nadi and Hirenala. These are Ephemeral in nature, these come under Tungabhadra sub-basin. The drainage exhibit dendritic to subdendritic with drainage density varies from 1.4 to7.0kms/sq.km. According to the 2011 census Koppal district has a population of 1,391,292, roughly equal to the nation of Swaziland or the US state of Hawaii. This gives it a ranking of 350th in India (out of a total of 640). The district has a population density of 250 inhabitants per square kilometre (650/sq mi). Its population growth rate over the decade 2001-2011 was 16.32%. Koppal has a sex ratio of 983 females for every 1000 males, and a literacy rate of 67.28%.

Description of the micro-watershed

Abbagiri micro-watershed (Tavaregere sub-watershed, Koppal Taluk and District) is located at North latitude $15^0$26’57.841’’ to 15^0 24’32.688’’ and East longitude 76^0 16’39.552’’ to 76^0 12’5.421’’covering an area of 721.30 ha and spread across Abbagiri, Kardigudda, Kukanapalli and Tavarageri 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 34 households located in the micro-watershed were interviewed for the survey.

Chapter 3

SALIENT FEATURES OF THE SURVEY

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

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Abbagiri micro watershed is presented in Table 1 and it indicated that 34 farmers were sampled in Abbagiri micro watershed among them 7 (20.59%) were marginal farmers, 15 (44.12 %) were small farmers, 4 (11.76 %) were semi medium farmers, 2 (5.88%) were medium farmers, 1(2.94%) was large farmer and 5 (14.71 %) landless farmers were also interviewed for the survey.

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

S.N.	Particulars	LL (5)		MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	14.71	7	20.59	15	44.12	4	11.76	2	5.88	1	2.94	34	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Abbagiri micro watershed is presented in Table 2. The data indicated that there were 142 population households were there in the studied micro watershed. Among them 79 (55.63%) men and 63 (44.37 %) were women. The average family size of landless was 3, marginal farmers and small farmers were 4, semi medium and medium farmers were 5 and large farmer was 10. On an average the family size was 4.

Table 2: Population characteristics of Abbagiri micro-watershed

Sl.No.	Particulars	LL (14)		MF (28)		SF (57)		SMF (22)		MDF (11)		LF (10)		All (142)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Male	7	50	12	42.86	33	57.89	15	68.18	5	45.45	7	70	79	55.63
2	Female	7	50	16	57.14	24	42.11	7	31.82	6	54.55	3	30	63	44.37
Total		14	100	28	100	57	100	22	100	11	100	10	100	142	100
Average		3		4		4		5		5		10		4	

Age wise classification of population: The age wise classification of household members in Abbagiri micro watershed is presented in Table 3. The data indicated that 20 (14.08%) people were in 0-15 years of age, 73 (51.41 %) were in 16-35 years of age, 36 (25.35 %) were in 36-60 years of age and 13 (9.15 %) were above 61 years of age.

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

S.N.	Particulars	LL (14)		MF (28)		SF (57)		SMF (22)		MDF (11)		LF (10)		All (142)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years	3	21.43	5	17.86	10	17.54	2	9.09	0	0	0	0	20	14.08
2	16-35 years	7	50	13	46.43	30	52.63	10	45.45	6	54.55	7	70	73	51.41
3	36-60 years	3	21.43	4	14.29	15	26.32	7	31.82	5	45.45	2	20	36	25.35
4	> 61 years	1	7.14	6	21.43	2	3.51	3	13.64	0	0.00	1	10	13	9.15
Total		14	100	28	100	57	100	22	100	11	100	10	100	142	100

Education level of household members: Education level of household members in Abbagiri micro watershed is presented in Table 4. The results indicated that the Abbagiri had 40.14 per cent illiterates, 0.70 per cent were functional literates, 26.06 per cent of them had primary school education, 10.56 per cent of them had both middle school, 14.79 per cent them had high school education, 4.93 per cent of them had PUC education, 0.70 per cent of them had degree education and 2.11 per cent them had others.

Table 4: Education level of household members in Abbagiri micro watershed

S. N.	Particulars	LL (14)		MF (28)		SF (57)		SMF (22)		MDF (11)		LF (10)		All (142)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	4	28.57	14	50	21	36.84	6	27.27	5	45.45	7	70	57	40.14
2	Functional Literate	0	0	0	0	0	0	1	4.55	0	0	0	0	1	0.70
3	Primary School	4	28.57	7	25	19	33.33	6	27.27	0	0	1	10	37	26.06
4	Middle School	3	21.43	3	10.71	5	8.77	1	4.55	2	18.18	1	10	15	10.56
5	High School	3	21.43	3	10.71	8	14.04	4	18.18	3	27.27	0	0	21	14.79
6	PUC	0	0	0	0	2	3.51	3	13.64	1	9.09	1	10	7	4.93
7	Degree	0	0	0	0	0	0	1	4.55	0	0	0	0	1	0.70
8	Others	0	0	1	3.57	2	3.51	0	0	0	0	0	0	3	2.11
Total		14	100	28	100	57	100	22	100	11	10	10	100	142	100

Occupation of household heads: The data regarding the occupation of the household heads in Abbagiri micro watershed is presented in Table 5. The results indicated that, 55.88 per cent of households practicing agriculture, 35.29 per cent of the household heads were agricultural labour and 8.82 per cent of the household heads were general labour.

Table 5: Occupation of household heads in Abbagiri micro watershed

S. N.	Particulars	LL (5)		MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	5	71.43	11	73.33	1	25	1	50	1	100	19	55.88
2	Agricultural Labou	2	40	2	28.57	4	26.67	3	75	1	50	0	0	12	35.29
3	General Labour	3	60	0	0	0	0	0	0	0	0	0	0	3	8.82
Total		5	100	7	100	15	100	4	100	2	100	1	100	34	100

Occupation of the household members: The data regarding the occupation of the household members in Abbagiri micro watershed is presented in Table 6. The results indicated that agriculture was the major occupation for 45.07 per cent of the household members, 30.99 per cent were agricultural labourers, 7.75 per cent were general labours, 0.70 percent were in private sector, 12.68 per cent of them were students and 2.86 per cent of them were children. In case of landless households 14.29 per cent were agricultural labours, 64.29 per cent were general labourers and 21.43 per cent were students. In case of marginal farmers 39.29 per cent were both agriculturist and agricultural labour, 3.57 per cent of both were in private and 14.29 per cent were students. In case of small farmers 56.14 per cent of them were agriculturist, 22.81 per cent of them were agriculture labour, 3.51 per cent were general labour and 14.04 per cent of them were students. In case of semi medium farmers 27.27 per cent of the family members

were agriculturist, 54.55 per cent were agriculture labour and 13.64 per cent of them were students. In case of medium farmers 45.45 per cent of the family members were agriculturist and 54.55 per cent of them were agriculture labours. In large farmers 100 per cent of them were doing agriculture.

Table 6: Occupation of family members in Abbagiri micro watershed

S. N.	Particulars	LL (14)		MF (28)		SF (57)		SMF (22)		MDF (11)		LF (10)		All (142)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	11	39.29	32	56.14	6	27.27	5	45.45	10	100	64	45.07
2	Agricultural Labour	2	14.29	11	39.29	13	22.81	12	54.55	6	54.55	0	0	44	30.99
3	General Labour	9	64.29	0	0	2	3.51	0	0	0	0	0	0	11	7.75
4	Private Service	0	0	1	3.57	0	0	0	0	0	0	0	0	1	0.70
5	Student	3	21.43	4	14.29	8	14.04	3	13.64	0	0	0	0	18	12.68
6	Children	0	0	1	3.57	2	3.51	1	4.55	0	0	0	0	4	2.82
Total		14	100	28	100	57	100	22	100	11	100	10	100	142	100

Institutional participation of the household members: The data regarding the institutional participation of the household members in Abbagiri micro-watershed is presented in Table 7. The results showed 100 per cent of the farmers have not participated in any local institutions.

Table 7: Institutional Participation of household members in Abbagiri micro watershed

S. N.	Particulars	LL (14)		MF (28)		SF (57)		SMF (22)		MDF (11)		LF (10)		All (142)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	14	100	28	100	57	100	22	100	11	100	10	100	142	100
Total		14	100	28	100	57	100	22	100	11	100	10	100	142	100

Type of house owned: The data regarding the type of house owned by the households in Abbagiri micro watershed is presented in Table 8. The results indicated that 50 per cent of the households possess Katcha house, 17.65 per cent of the households possess Pucca house and 32.35 per cent of them possess Thatched house.

Table 8: Type of house owned by households in Abbagiri micro watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	3	60	1	14.29	3	20	2	50	1	50	1	100	11	32.35
2	Katcha	2	40	4	57.14	10	66.67	1	25	0	0	0	0	17	50
3	Pucca/RCC	0	0	2	28.57	2	13.33	1	25	1	50	0	0	6	17.65
Total		5	100	7	100	15	100	4	100	2	100	1	100	34	100

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Abbagiri micro watershed is presented in Table 9. The results showed that, 82.35 per cent of the households possess TV, 67.65 per cent of the households possess Mixer grinder, 23.53 per cent of the households possess bicycle, 35.29 per cent of the households possess motor cycle, 2.94 per cent of the households possess Auto and 91.18 per cent of the households possess mobile phones.

Table 9: Durable Assets owned by households in Abbagiri micro watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Television	2	40	6	85.71	13	86.67	4	100	2	100	1	100	28	82.35
2	Mixer/Grinder	1	20	4	57.14	12	80	3	75	2	100	1	100	23	67.65
3	Bicycle	0	0	2	28.57	4	26.67	2	50	0	0	0	0	8	23.53
4	Motor Cycle	0	0	2	28.57	7	46.67	1	25	1	50	1	100	12	35.29
5	Auto	1	20	0	0	0	0	0	0	0	0	0	0	1	2.94
6	Mobile Phone	4	80	6	85.71	15	100	3	75	2	100	1	100	31	91.18
7	Blank	1	20	1	14.29	0	0	0	0	0	0	0	0	2	5.88

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Abbagiri micro watershed is presented in Table 10. The results showed that the average value of television was Rs. 7178, mixer grinder was Rs.1630, bicycle was Rs.1375, motor cycle was Rs.30416, Auto was Rs. 300000 and mobile phone was Rs.1537.

Table 10: Average value of durable assets owned by households in Abbagiri micro watershed (Average value in Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (4)	MDF (2)	LF (1)	All (34)
1	Television	4,000	5,833	7,692	9,250	7,500.00	6,000	7,178
2	Mixer/Grinder	1,500	1,500	1,583	2,000	1,750.00	1,500	1,630
3	Bicycle	0	1,000	1,000	2,500	0	0	1,375
4	Motor Cycle	0	27,500	29,285	30,000	35,000	40,000	30,416
5	Auto	300,000	0	0	0	0	0	300,000
6	Mobile Phone	1,800	1,625	1,507	1,285	2,000	1,333	1,537

Farm Implements owned: The data regarding the farm implements owned by the households in Abbagiri micro watershed is presented in Table 11. About 23.53 per cent of the households possess bullock cart, 44.12 per cent of them possess plough, 2.94 per cent of the households possess tractor, 32.35 per cent of the households possess sprayer, 91.18 per cent of the households possess weeder, 2.94 per cent of the households possess harvester and 11.76 per cent of the households possess chaff cutter.

Table 11: Farm Implements owned by households in Abbagiri micro watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	1	14.29	3	20	2	50	1	50	1	100	8	23.53
2	Plough	0	0	3	42.86	7	46.67	3	75	1	50	1	100	15	44.12
3	Tractor	0	0	0	0	1	6.67	0	0	0	0	0	0	1	2.94
4	Sprayer	0	0	2	28.57	6	40	1	25	2	100	0	0	11	32.35
5	Weeder	4	80	6	85.71	14	93.33	4	100	2	100	1	100	31	91.18
6	Harvester	0	0	0	0	1	6.67	0	0	0	0	0	0	1	2.94
7	Chaff Cutter	0	0	2	28.57	1	6.67	1	25	0	0	0	0	4	11.76
8	Blank	1	20	1	14.29	0	0	0	0	0	0	0	0	2	5.88

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Abbagiri micro watershed is presented in Table

12. The results showed that the average value of bullock cart was Rs.17975; the average value of plough was Rs. 929, the average value of tractor was Rs. 300000, the average value of sprayer was Rs. 3125, the average value of weeder was Rs. 64, the average value of harvester was Rs. 48000 and the average value of chaff cutter was Rs. 3000.

Table 12: Average value of farm implements owned by households in Abbagiri micro watershed (Average value in Rs.)

S.N.	Particulars	LL (5)	MF (7)	SF (15)	SMF (4)	MDF (2)	LF (1)	All (34)
1	Bullock Cart	0	20000	22666	18000	18000	1800	17975
2	Plough	0	555	986	1200	1500	1500	929
3	Tractor	0	0	300000	0	0	0	300000
4	Sprayer	0	1666	3666	5000	2750	0	3125
5	Weeder	66	50	62	100	62	25	64
6	Harvester	0	0	48000	0	0	0	48000
7	Chaff Cutter	0	3000	3000	3000	0	0	3000

Livestock possession by the households: The data regarding the Livestock possession by the households in Abbagiri micro watershed is presented in Table 13. The results indicated that, 41.18 per cent of the households possess bullocks, 35.29 per cent of the households possess local cow, 8.82 per cent of the households possess sheep and 2.94 per cent of the households possess goat.

Table 13: Livestock possession by households in Abbagiri micro watershed

Sl.No.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	2	28.57	7	46.67	3	75	1	50	1	100	14	41.18
2	Local cow	3	42.86	4	26.67	2	50	2	100	1	100	12	35.29
3	Sheep	0	0	2	13.33	0	0	0	0	1	100	3	8.82
4	Goat	0	0	1	6.67	0	0	0	0	0	0	1	2.94
5	blank	3	42.86	4	26.67	1	25	0	0	0	0	13	38.24

Average Labour availability: The data regarding the average labour availability in Abbagiri micro watershed is presented in Table 14. The results indicated that, average own labour men available in the micro watershed was 1.79, average own labour (women) available was 1.61, average hired labour (men) available was 8.34 and average hired labour (women) available was 7.79.

In case of marginal farmers, average own labour men available was 1, average own labour (women) was also 1.67, average hired labour (men) was 7.86 and average hired labour (women) available was also 7.86. In case of small farmers, average own labour men available was 1.73, average own labour (women) was 1.40, average hired labour (men) was 8.87 and average hired labour (women) available was 8.40. In case of semi medium farmers, average own labour men available was 2.25, average own labour (women) was 1.50, average hired labour (men) was 9.25 and average hired labour (women) available was 6.75. In medium farmers average own labour men available was 2.50, average own labour (women) was 2, average hired labour (men) was 5 and average

hired labour (women) available was 5. In large farmers average own labour men available was 4, average own labour (women) was 4, average hired labour (men) was 7 and average hired labour (women) available was 8.

Table 14: Average Labour availability in Abbagiri micro watershed

Sl. No.	Particulars	MF(7)	SF(15)	SMF(4)	MDF(2)	LF(1)	All(34)
		N	N	N	N	N	N
1	Own labour Male	1.00	1.73	2.25	2.50	4.00	1.79
2	Own Labour Female	1.67	1.40	1.50	2.00	4.00	1.61
3	Hired labour Male	7.86	8.87	9.25	5.00	7.00	8.34
4	Hired labour Female	7.86	8.40	6.75	5.00	8.00	7.79

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Abbagiri micro watershed is presented in Table 15. The results indicated that, 85.29 per cent of the household opined that hired labour was adequate.

Table 15: Adequacy of Hired Labour in Abbagiri micro watershed

Sl.No.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	7	100	15	100	4	100	2	100	1	100	29	85.29

Distribution of land (ha): The data regarding the distribution of land (ha) in Abbagiri micro watershed is presented in Table 16. The results indicated that, households of the Abbagiri micro watershed possess 33.19 ha (51.34 %) of dry land and 31.46 ha (48.66 %) of irrigated land. Marginal farmers possess 4.98 ha (91.11 %) of dry land and 0.49 ha (8.89%) of irrigated land. Small farmers possess 19.29 ha (93.38 %) of dry land and 1.37 ha (6.62 %) of irrigated land. Semi medium farmers possess 2.02 ha (30.94 %) of dry land and 4.52 ha (69.06 %) of irrigated land. Medium farmers possess 6.90 (81%) of dry land and 1.62 ha (19%) of irrigated land. Large farmers possess 23.47 ha (100%) of irrigated land.

Table 16: Distribution of land (Ha) in Abbagiri micro watershed

S. N.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	4.98	91.11	19.29	93.38	2.02	30.94	6.90	81	0.00	0	33.19	51.34
2	Irrigated	0.49	8.89	1.37	6.62	4.52	69.06	1.62	19	23.47	100	31.46	48.66
Total		5.46	100	20.66	100	6.54	100	8.52	100	23.47	100	64.65	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Abbagiri micro watershed is presented in Table 17. The results indicated that, the average value of dry land was Rs. 307,206.44 and average value of irrigated was Rs. 724665.73. In case of marginal famers, the average land value was Rs. 481,951.22 for dry land and Rs. 1,234,999.95 for irrigated land. In case of small famers, the average land value was Rs. 310,952.58 for dry land Rs. 1,023,076.96 for irrigated land. In case of semi medium famers, the average land value was Rs. 296,400 for dry land and Rs. 531,182.79 for irrigated land. In case of medium famers, the average land value was Rs. 173841.64 for

dry land and was Rs. 494,000 for irrigated land. In case of large farmers the average land value was Rs. 340068.97 for irrigated land.

Table 17: Average land value (Rs. /ha) in Abbagiri micro watershed

S.N.	Particulars	MF (7)	SF (15)	SMF (4)	MDF (2)	LF (1)	All (34)
		N	N	N	N	N	N
1	Dry	481,951.22	310,952.58	296,400	173841.64	0	307,206.44
2	Irrigated	1,234,999.95	1,023,076.96	531,182.79	494,000	34,0068.97	724665.73

Status of bore wells: The data regarding the status of bore wells in Abbagiri micro watershed is presented in Table 18. The results indicated that, there were 9 functioning bore wells in the micro watershed.

Table 18: Status of bore wells in Abbagiri micro watershed

Sl.No.	Particulars	SF (15)	SMF (4)	MDF (2)	LF (1)	All (34)
		N	N	N	N	N
1	Functioning	2	4	1	2	9

Source of irrigation: The data regarding the source of irrigation in Abbagiri micro watershed is presented in Table 19. The results indicated that, bore well was the major irrigation source for 26.47 per cent of the farmers.

Table 19: Source of irrigation in Abbagiri micro watershed

Sl.No.	Particulars	SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%
1	Bore Well	2	13.33	4	100	1	50	1	100	9	26.47

Depth of water: The data regarding the depth of water in Abbagiri micro watershed is presented in Table 20.The results indicated that on an average the depth of the bore well was 22.32 meters.

Table 20: Depth of water in Abbagiri micro watershed

Sl.No.	Particulars	SF (15)	SMF (4)	MDF (2)	LF (1)	All (34)
		N	N	N	N	N
3	Bore Well	14.22	80.01	57.91	109.73	22.32

Irrigated Area (ha): The data regarding the irrigated area (ha) in Abbagiri micro watershed is presented in Table 21. The results indicated that, in case of small farmers there was 1.37 ha of irrigated land, in case of semi medium farmers there was 3.71 ha of irrigated land, medium farmers were having 1.62 ha of irrigated land and large farmers were having 6.48 ha of irrigated land. On an average there were 13.17 ha of irrigated land.

Table 21: Irrigated Area (ha) in Abbagiri micro watershed

Sl.No.	Particulars	SF (15)	SMF (4)	MDF (2)	LF (1)	All (34)
1	Kharif	1.37	3.71	1.62	3.24	9.94
2	Rabi	0	0	0	3.24	3.24
Total		1.37	3.71	1.62	6.48	13.17

Cropping pattern: The data regarding the cropping pattern in Abbagiri micro watershed is presented in Table 22. The results indicated that, farmers have grown bajra (8.66 ha),

maize (21.52 ha), paddy (2.66 ha), groundnut (4.86 ha), navane (0.88 ha), red gram (1.29 ha) and sunflower (0.81 ha) in kharif season. Also grown groundnut (1.28 ha) in Rabi season. Marginal farmers have grown Maize, Bajra, groundnut and paddy. Small farmers have grown bajra, maize, paddy, navane, red gram and sunflower. Semi medium farmers have grown Maize and groundnut. Medium farmers have grown bajra and maize. Large farmers have grown groundnut and paddy.

Table 22: Cropping pattern in Abbagiri micro watershed Area (ha)

Sl.No.	Particulars	MF(7)	SF(15)	SMF(4)	MDF(2)	LF(1)	All(34)
1	Kharif - Bajra	0.81	5.01	0.81	2.02	0	8.66
2	Kharif - Groundnut	1.62	0	1.62	0	1.62	4.86
3	Kharif - Maize	2.55	11.21	4.11	3.64	0	21.52
4	Kharif - Paddy	0.49	1.37	0	0	0.81	2.66
5	Kharif - Red gram	0	1.29	0	0	0	1.29
6	Kharif - Sunflower	0	0.81	0	0	0	0.81
7	Rabi - Groundnut	0	0	1.28	0	0	1.28
Total		5.47	19.69	7.82	5.67	2.43	41.08

Cropping intensity: The data regarding the cropping intensity in Abbagiri micro watershed is presented in Table 23. The results indicated that, the cropping intensity in Abbagiri micro watershed was found to be 80.20 per cent. In case of marginal, semi medium and large farmers it was 100 per cent, in small farmers the cropping intensity was 87.02 per cent and in medium farmers it was 43.75 per cent.

Table 23: Cropping intensity (%) in Abbagiri micro watershed

Sl.No.	Particulars	MF (7)	SF (15)	SMF (4)	MDF (2)	LF (1)	All (34)
1	Cropping Intensity	100	87.02	100	43.75	100	80.20

Possession of Bank account: The data regarding the possession of Bank account and savings in Abbagiri micro watershed is presented in Table 24. The results indicated that, 91.50 per cent of the households have bank account and 50 per cent of the households have savings. Among marginal farmers 40 percent of them possess bank account and 20 per cent possess savings. 100 per cent of small farmers possess bank account and 57.14 per cent of them possess savings. Semi medium farmers possess 100 per cent of bank account and 66.67 per cent possess savings. Medium category of farmers possesses 100 per cent of bank account and 50 per cent of them possess savings. 100 per cent of large farmers possess bank account.

Table 24: Possession of Bank account and savings in Abbagiri micro watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Account	2	40	7	100	15	100	4	100	2	100	1	100	31	91.18
2	Savings	1	20	4	57.14	10	66.67	1	25	1	50	0	0	17	50

Borrowing status: The data regarding the possession of borrowing status in Abbagiri micro watershed is presented in Table 25. The results indicated that, 40 per cent of landless, 57.14 per cent of marginal, 66.67 per cent of small, 25 per cent of semi medium,

50 per cent of medium and 100 per cent of large farmers have borrowed credit from different sources.

Table 25: Borrowing status in Abbagiri micro watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	2	40	4	57.14	10	66.67	1	25	1	50	1	100	19	55.88

Source of credit: The data regarding the source of credit availed by households in Abbagiri micro watershed is presented in Table 26. The results indicated that, 52.63 per cent have availed loan in commercial bank, 26.13 per cent have availed loan from Grameena bank and 21.05 per cent have availed loan from money lender.

Table 26: Source of credit availed by households in Abbagiri micro watershed

Sl.No.	Particulars	MF (4)		SF (10)		SMF (1)		MDF (1)		LF (1)		All (19)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Commercial Bank	2	50	7	70	1	100	0	0	0	0	10	52.63
2	Grameena Bank	2	50	3	30	0	0	0	0	0	0	5	26.13
3	Money Lender	1	25	2	20	1	100	0	0	0	0	4	21.05

Average credit amount: The data regarding the average credit amount availed by households in Abbagiri micro watershed is presented in Table 27. The results indicated that, marginal, small, semi medium, medium and large farmers have availed Rs.152500, Rs. 128000, Rs. 260000, Rs. 360000 and Rs. 300000 respectively. Overall average credit amount availed by households in the micro watershed is 147894.74.

Table 27: Average Credit amount availed by households in Abbagiri micro watershed

Sl.No.	Particulars	MF (4)	SF (10)	SMF (1)	MDF (1)	LF (1)	All (19)
		N	N	N	N	N	N
1	Average Credit	152500	128000	260000	360000	300000	147894.74

Purpose of credit borrowed (institutional Source): The data regarding the purpose of credit borrowed from institutional sources by households in Abbagiri micro watershed is presented in Table 28. The results indicated that, 89.47 per cent of the households have borrowed loan for agriculture production.

Table 28: Purpose of credit borrowed (institutional Source) by households in Abbagiri micro watershed

S. N.	Particulars	MF (4)		SF (10)		SMF (1)		MDF (1)		LF (1)		All (19)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	4	100	10	100	1	100	1	100	1	100	17	89.47

Purpose of credit borrowed (Private Credit): The data regarding the purpose of credit borrowed from private sources by households in Abbagiri micro watershed is presented in Table 29. The results indicated that, agriculture production, income generating activities, purchase-vehicle and social functions like marriage reasons were the purpose for which marginal, small and semi medium farmers borrowed loan from private credit. About 25 percent of loan was taken for agriculture production, income generating activities, purchase-vehicle and social functions like marriage respectively.

Table 29: Purpose of credit borrowed (Private Credit) by households in Abbagiri micro watershed

Sl.No.	Particulars	MF (1)		SF (2)		SMF (1)		All (4)	
		N	%	N	%	N	%	N	%
1	Agriculture production	0	0	0	0	1	100	1	25
2	Income generating activities	1	100	0	0	0	0	1	25
3	Purchase-vehicle	0	0	1	50	0	0	1	25
4	Social functions like marriage	0	0	1	50	0	0	1	25

Repayment status of households (Institutional): The data regarding the repayment status of credit borrowed from institutional sources by households in Abbagiri micro watershed is presented in Table 30. Results indicated that 10 per cent of the households have repaid their institutional credit partially, 80 percent of the households have unpaid their loan and 10 percent of the households have fully paid their loan.

Table 30: Repayment status of households (Institutional) in Abbagiri micro watershed

Sl.No.	Particulars	MF (4)		SF (11)		SMF (2)		MDF (2)		LF (1)		All (20)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Partially paid	1	25	1	9.09	0	0	0	0	0	0	2	10
2	Un paid	2	50	9	81.82	2	100	2	100	1	100	16	80
3	Fully paid	1	25	1	9.09	0	0	0	0	0	0	2	10

Repayment status of households (Private): The data regarding the repayment status of credit borrowed from private sources by households in Abbagiri micro watershed is presented in Table 31. Results indicated that 75 per cent of the households have repaid their private credit partially and 25 percent of the households have unpaid their loan.

Table 31: Repayment status of households (Private) in Abbagiri micro watershed

Sl.No.	Particulars	MF (1)		SF (2)		SMF (1)		All (4)	
		N	%	N	%	N	%	N	%
1	Partially paid	1	100	2	100	0	0	3	75
2	Un paid	0	0	0	0	1	100	1	25
3	Fully paid	0	0	0	0	0	0	0	0

Opinion on institutional sources of credit: The data regarding opinion on institutional sources of credit by households in Abbagiri micro watershed is presented in Table 32. The results indicated that 45 per cent of the households were opined that they were helped to perform timely agricultural operations, 25 per cent of farmers opined that higher rate of interest and 5 per cent of them opined that they forced to sell the produce at low price to repay loan in time respectively.

Table 32: Opinion on institutional sources of credit in Abbagiri micro watershed

Sl. No.	Particulars	MF (4)		SF (11)		SMF (2)		MDF (2)		All (20)	
		N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	2	50	6	54.55	1	50	0	0	9	45
2	Higher rate of interest	1	25	2	18.18	1	50	1	50	5	25
3	Forced to sell the produce at low price to repay loan in time	0	0	1	9.09	0	0	0	0	1	5

Cost of Cultivation of Bajra: The data regarding the cost of cultivation of bajra in Abbagiri micro watershed is presented in Table 33. The results indicated that, the total cost of cultivation for bajra was Rs. 21127.54. The gross income realized by the farmers was Rs. 26854.61. The net income from bajra cultivation was Rs. 5727.07, thus the benefit cost ratio was found to be 1:1.27.

Table 33: Cost of Cultivation of Bajra in Abbagiri micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	30.02	4520.71	21.40
2	Bullock		Pairs/day	1.93	1064.53	5.04
3	Tractor		Hours	2.65	1711.68	8.10
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	10.19	1222.89	5.79
6	Seed Inter Crop		Kgs.	0.72	86.50	0.41
7	FYM		Quintal	10.34	1410.05	6.67
8	Fertilizer + micronutrients		Quintal	4.38	4083.31	19.33
9	Pesticides (PPC)		Kgs / liters	0.49	494.00	2.34
10	Irrigation		Number	3.71	0.00	0.00
11	Depreciation charges			0.00	182.75	0.86
12	Land revenue and Taxes			0.00	4.23	0.02
II	**Cost B1**					
13	Interest on working capital				875.66	4.14
14	**Cost B1 = (Cost A1 + sum of 15 and 16)**				15656.32	74.10
III	**Cost B2**					
15	Rental Value of Land				652.38	3.09
16	**Cost B2 = (Cost B1 + Rental value)**				16308.70	77.19
IV	**Cost C1**					
17	Family Human Labour			15.55	2897.73	13.72
18	**Cost C1 = (Cost B2 + Family Labour)**				19206.43	90.91
V	**Cost C2**					
19	Risk Premium				0.43	0.00
20	**Cost C2 = (Cost C1 + Risk Premium)**				19206.86	90.91
VI	**Cost C3**					
21	Managerial Cost				1920.69	9.09
22	**Cost C3 = (Cost C2 + Managerial Cost)**				21127.54	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		16.59	25354.39	
		b) Main Crop Sales Price (Rs.)			1528.57	
	By Product	e) Main Product (q)		10.50	1500.22	
		f) Main Crop Sales Price (Rs.)			142.86	
b.	Gross Income (Rs.)				26854.61	
c.	Net Income (Rs.)				5727.07	
d.	Cost per Quintal (Rs./q.)				1273.74	
e.	Benefit Cost Ratio (BC Ratio)				1:1.27	

Cost of Cultivation of Maize: The data regarding the cost of cultivation of maize in Abbagiri micro watershed is presented in Table 34. The results indicated that, the total cost of cultivation for maize was Rs. 22389.84. The gross income realized by the farmers was Rs. 26497.78. The net income from maize cultivation was Rs. 4107.93. Thus the benefit cost ratio was found to be 1:1.18.

Table 34: Cost of Cultivation of Maize in Abbagiri micro watershed

Sl. No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	30.51	4563.26	20.38
2	Bullock		Pairs/day	1.50	837.44	3.74
3	Tractor		Hours	2.67	1793.52	8.01
4	Machinery		Hours	0.07	41.03	0.18
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	14.54	2244.26	10.02
6	Seed Inter Crop		Kgs.	0.21	24.70	0.11
7	FYM		Quintal	9.01	1290.37	5.76
8	Fertilizer + micronutrients		Quintal	4.73	4116.63	18.39
9	Pesticides (PPC)		Kgs / liters	0.84	836.28	3.74
10	Irrigation		Number	2.89	0.00	0.00
11	Depreciation charges			0.00	189.15	0.84
12	Land revenue and Taxes			0.00	4.12	0.02
II	**Cost B1**					
13	Interest on working capital				1021.53	4.56
14	**Cost B1 = (Cost A1 + sum of 15 and 16)**				16962.31	75.76
III	**Cost B2**					
15	Rental Value of Land				333.33	1.49
16	**Cost B2 = (Cost B1 + Rental value)**				17295.64	77.25
IV	**Cost C1**					
17	Family Human Labour			15.44	3058.26	13.66
18	**Cost C1 = (Cost B2 + Family Labour)**				20353.90	90.91
V	**Cost C2**					
19	Risk Premium				0.50	0.00
20	**Cost C2 = (Cost C1 + Risk Premium)**				20354.40	90.91
VI	**Cost C3**					
21	Managerial Cost				2035.44	9.09
22	**Cost C3 = (Cost C2 + Managerial Cost)**				22389.84	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		18.79	20825.36	
		b) Main Crop Sales Price (Rs.)			1108.33	
	By Product	e) Main Product (q)		20.44	5672.41	
		f) Main Crop Sales Price (Rs.)			277.50	
b.	Gross Income (Rs.)				26497.78	
c.	Net Income (Rs.)				4107.93	
d.	Cost per Quintal (Rs./q.)				1191.60	
e.	Benefit Cost Ratio (BC Ratio)				1:1.18	

Cost of Cultivation of Paddy: The data regarding the cost of cultivation of paddy in Abbagiri micro watershed is presented in Table 35. The results indicated that, the total cost of cultivation for paddy was Rs. 47014.73. The gross income realized by the farmers was Rs. 106400.81. The net income from paddy cultivation was Rs. 59386.09. Thus the benefit cost ratio was found to be 1:2.26.

Table 35: Cost of Cultivation of Paddy in Abbagiri micro watershed

Sl. No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	43.83	7139.45	15.19
2	Bullock		Pairs/day	0.28	140.34	0.30
3	Tractor		Hours	3.52	2286.41	4.86
4	Machinery		Hours	0.49	343.06	0.73
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	82.25	15009.74	31.93
6	FYM		Quintal	12.04	1809.30	3.85
7	Fertilizer + micronutrients		Quintal	7.36	6313.13	13.43
8	Pesticides (PPC)		Kgs /liters	1.37	1370.78	2.92
9	Irrigation		Number	24.80	0.00	0.00
10	Depreciation charges			0.00	313.60	0.67
11	Land revenue and Taxes			0.00	4.12	0.01
II	**Cost B1**					
12	Interest on working capital				2940.41	6.25
13	**Cost B1 = (Cost A1 + sum of 15 and 16)**				37670.34	80.12
III	**Cost B2**					
14	Rental Value of Land				279.17	0.59
15	**Cost B2 = (Cost B1 + Rental value)**				37949.50	80.72
IV	**Cost C1**					
16	Family Human Labour			24.15	4790.66	10.19
17	**Cost C1 = (Cost B2 + Family Labour)**				42740.16	90.91
V	**Cost C2**					
18	Risk Premium				0.50	0.00
19	**Cost C2 = (Cost C1 + Risk Premium)**				42740.66	90.91
VI	**Cost C3**					
20	Managerial Cost				4274.07	9.09
21	**Cost C3 = (Cost C2 + Managerial Cost)**				47014.73	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		72.96	100321.79	
		b) Main Crop Sales Price (Rs.)			1375.00	
	By Product	e) Main Product (q)		22.51	6079.02	
		f) Main Crop Sales Price (Rs.)			270.00	
b.	Gross Income (Rs.)				106400.81	
c.	Net Income (Rs.)				59386.09	
d.	Cost per Quintal (Rs./q.)				644.38	
e.	Benefit Cost Ratio (BC Ratio)				1:2.26	

Cost of Cultivation of Ground nut: The data regarding the cost of cultivation of groundnut in Abbagiri micro watershed is presented in Table 36. The results indicated that, the total cost of cultivation for groundnut was Rs. 46981.45. The gross income realized by the farmers was Rs. 63906.15. The net income from groundnut cultivation was Rs. 16924.70. Thus the benefit cost ratio was found to be 1:1.36.

Table 36: Cost of Cultivation of Groundnut in Abbagiri micro watershed

Sl. No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	32.99	5130.72	10.92
2	Bullock		Pairs/day	1.27	661.90	1.41
3	Tractor		Hours	2.57	1647.24	3.51
4	Machinery		Hours	0.47	375.19	0.80
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	130.89	21227.30	45.18
6	FYM		Quintal	13.33	1677.41	3.57
7	Fertilizer + micronutrients		Quintal	3.72	3320.02	7.07
8	Pesticides (PPC)		Kgs /liters	0.90	897.33	1.91
9	Irrigation		Number	1.87	0.00	0.00
10	Depreciation charges			0.00	61.02	0.13
11	Land revenue and Taxes			0.00	4.28	0.01
II	**Cost B1**					
12	Interest on working capital				3254.70	6.93
13	**Cost B1 = (Cost A1 + sum of 15 and 16)**				38257.12	81.43
III	**Cost B2**					
14	Rental Value of Land				383.33	0.82
15	**Cost B2 = (Cost B1 + Rental value)**				38640.45	82.25
IV	**Cost C1**					
16	Family Human Labour			20.32	4069.56	8.66
17	**Cost C1 = (Cost B2 + Family Labour)**				42710.01	90.91
V	**Cost C2**					
18	Risk Premium				0.40	0.00
19	**Cost C2 = (Cost C1 + Risk Premium)**				42710.41	90.91
VI	**Cost C3**					
20	Managerial Cost				4271.04	9.09
21	**Cost C3 = (Cost C2 + Managerial Cost)**				46981.45	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		18.19	63313.67	
		b) Main Crop Sales Price (Rs.)			3480.00	
	By Product	e) Main Product (q)		5.92	592.49	
		f) Main Crop Sales Price (Rs.)			100.00	
b.	Gross Income (Rs.)				63906.15	
c.	Net Income (Rs.)				16924.70	
d.	Cost per Quintal (Rs./q.)				2582.31	
e.	Benefit Cost Ratio (BC Ratio)				1:1.36	

Cost of Cultivation of Sunflower: The data regarding the cost of cultivation of Sunflower in Abbagiri micro watershed is presented in Table 37. The results indicated that, the total cost of cultivation for Sunflower was Rs. 31003.53. The gross income realized by the farmers was Rs. 55575.00. The net income from Sunflower cultivation was Rs. 24571.47. Thus the benefit cost ratio was found to be 1:1.79.

Table 37: Cost of Cultivation of Sunflower in Abbagiri micro watershed

Sl. No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	56.81	11485.50	37.05
2	Bullock		Pairs/day	3.71	1852.50	5.98
3	Tractor		Hours	2.47	1482.00	4.78
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	1.24	617.50	1.99
6	FYM		Quintal	0.00	0.00	0.00
7	Fertilizer + micronutrients		Quintal	4.94	3828.50	12.35
8	Pesticides (PPC)		Kgs / liters	1.24	1235.00	3.98
9	Irrigation		Number	0.00	0.00	0.00
10	Depreciation charges			0.00	607.62	1.96
11	Land revenue and Taxes			0.00	4.94	0.02
II	**Cost B1**					
12	Interest on working capital				681.72	2.20
13	**Cost B1 = (Cost A1 + sum of 15 and 16)**				21795.28	70.30
III	**Cost B2**					
14	Rental Value of Land				400.00	1.29
15	**Cost B2 = (Cost B1 + Rental value)**				22195.28	71.59
IV	**Cost C1**					
16	Family Human Labour			25.94	5989.75	19.32
17	**Cost C1 = (Cost B2 + Family Labour)**				28185.03	90.91
V	**Cost C2**					
18	Risk Premium				0.00	0.00
19	**Cost C2 = (Cost C1 + Risk Premium)**				28185.03	90.91
VI	**Cost C3**					
20	Managerial Cost				2818.50	9.09
21	**Cost C3 = (Cost C2 + Managerial Cost)**				31003.53	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		18.53	55575.00	
		b) Main Crop Sales Price (Rs.)			3000.00	
b.	Gross Income (Rs.)				55575.00	
c.	Net Income (Rs.)				24571.47	
d.	Cost per Quintal (Rs./q.)				1673.61	
e.	Benefit Cost Ratio (BC Ratio)				1:1.79	

Cost of Cultivation of Red gram: The data regarding the cost of cultivation of red gram in Abbagiri micro watershed is presented in Table 38. The results indicated that, the total cost of cultivation for red gram was Rs. 22829.07. The gross income realized by the farmers was Rs. 16311.32. The net income from red gram cultivation was Rs. -6517.75. Thus the benefit cost ratio was found to be 1:0.71.

Table 38: Cost of Cultivation of Red gram in Abbagiri micro watershed

Sl. No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	31.85	8349.84	36.58
2	Bullock		Pairs/day	2.33	1165.09	5.10
3	Tractor		Hours	3.11	1864.15	8.17
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	7.77	1165.09	5.10
6	FYM		Quintal	7.77	932.08	4.08
7	Fertilizer + micronutrients		Quintal	3.11	2407.86	10.55
8	Pesticides (PPC)		Kgs / liters	0.78	776.73	3.40
9	Irrigation		Number	0.00	0.00	0.00
10	Depreciation charges			0.00	102.53	0.45
11	Land revenue and Taxes			0.00	4.94	0.02
II	**Cost B1**					
12	Interest on working capital				633.81	2.78
13	**Cost B1 = (Cost A1 + sum of 15 and 16)**				17402.13	76.23
III	**Cost B2**					
14	Rental Value of Land				400.00	1.75
15	**Cost B2 = (Cost B1 + Rental value)**				17802.13	77.98
IV	**Cost C1**					
16	Family Human Labour			9.32	2951.57	12.93
17	**Cost C1 = (Cost B2 + Family Labour)**				20753.70	90.91
V	**Cost C2**					
18	Risk Premium				0.00	0.00
19	**Cost C2 = (Cost C1 + Risk Premium)**				20753.70	90.91
VI	**Cost C3**					
20	Managerial Cost				2075.37	9.09
21	**Cost C3 = (Cost C2 + Managerial Cost)**				22829.07	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		5.44	16311.32	
		b) Main Crop Sales Price (Rs.)			3000.00	
b.	Gross Income (Rs.)				16311.32	
c.	Net Income (Rs.)				-6517.75	
d.	Cost per Quintal (Rs./q.)				4198.75	
e.	Benefit Cost Ratio (BC Ratio)				1:0.71	

Adequacy of fodder: The data regarding the adequacy of fodder in Abbagiri micro watershed is presented in Table 39. The results indicated that, 41.18 per cent of the households opined that dry fodder was adequate and 29.41 per cent of the households opined that green fodder was adequate.

Table 39: Adequacy of fodder in Abbagiri micro watershed

Sl. No.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	4	57.14	4	26.67	3	75	2	100	1	100	14	41.18
2	Adequate-Green Fodder	1	14.29	5	33.33	3	75	1	50	0	0	10	29.41

Average Annual gross income of households: The results of the overall average annual gross income of the household in Abbagiri is presented in table 40. The table indicated that, in case of landless, the average income from business Rs. 8000 and wage Rs. 52000. In case marginal farmers the average income from service/salary was Rs.8571.43, business was Rs.11428.57, wage was Rs.5000, agriculture was Rs.44471.43 and dairy farm was Rs.3660.71. In small farmers, the average income from service/salary was Rs.11000, wage was Rs.18666.67, agriculture was Rs.43133.33, dairy farm was Rs.533.33 and goat farming was Rs.6000. In semi medium farmers the average income from business was Rs.28750, wage was Rs.10000 and agriculture was Rs.72200. In medium farmers the average income from wage was Rs.9000, agriculture was Rs.67500 and dairy farm was Rs.1500. In case of large farmers the average income from wage was Rs.10000, agriculture was Rs.130000 and goat farming was Rs.60000.

Table 40: Average Annual gross income (Rs.) of households in Abbagiri micro watershed

Sl. No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (4)	MDF (2)	LF (1)	All (34)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	8571.43	11000	0	0	0	6617.65
2	Business	8000	11428.57	0	28750	0	0	6911.76
3	Wage	52000	5000.00	18666.67	10000	9000	10000	18911.76
4	Agriculture	0	44471.43	43133.33	72200	67500	130000	44473.53
5	Dairy Farm	0	3660.71	533.33	0	1500	0	1077.21
6	Goat Farming	0	0	6000	0	0	60000	4411.76
Income(Rs.)		60000	73132.14	79333.33	110950	78000	200000	82403.68

Average Annual expenditure of households: The results of the overall average annual expenditure of the household in Abbagiri were presented in Table 41. The results indicated that, in case of land less, the average expenditure from business Rs. 20000 and wage Rs. 30000. In marginal farmers, the average expenditure from business was Rs.30000, wage was Rs.1500, agriculture was Rs.23000 and dairy farm was Rs.5250. In small farmers, the average expenditure from service/salary was Rs.32500, wage was Rs.5714.29, agriculture was Rs.20642.86, dairy farm was Rs.333.33 and goat farming was Rs.20000.In semi medium farmers the average expenditure from business was

Rs.60000, wage was Rs.5000 and agriculture was Rs.28750. In medium farmers the average expenditure from wage was Rs.2000, agriculture was Rs.27500 and dairy farm was Rs.1000. In case of large farmers the average expenditure from wage was Rs.2000, agriculture was Rs.50000 and goat farming was Rs.5000.

Table 41: Average Annual expenditure of households in Abbagiri micro watershed

Sl. No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (4)	MDF(2)	LF(1)	All (34)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	0	32500	0	0	0	1911.76
2	Business	20000	30000	0	60000	0	0	3235.29
3	Wage	30000	1500	5714.29	5000	2000	2000	4470.59
4	Agriculture	0	23000	20642.86	28750	27500	50000	19705.88
7	Dairy Farm	0	5250	333.33	0	1000	0	367.65
8	Goat Farming	0	0	20,000	0	0	5000	735.29
Total		50000	59750	79190.48	93750	30500	57000	370190.48
Average		10000	8535.71	5279.37	23437.50	15250	57000	10887.96

Horticulture species grown: The data regarding horticulture species grown in Abbagiri micro watershed is presented in Table 42. The results indicated that, sampled households have grown 23 coconut trees and 17 mango trees in their field and also planted 2 coconut trees in their back yard.

Table 42: Horticulture species grown in Abbagiri micro watershed

Sl.No.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	11	0	1	2	8	0	3	0	0	0	23	2
2	Mango	5	0	8	0	2	0	0	0	2	0	17	0

***F=Field & *B=Back yard**

Forest species grown: The data regarding forest species grown in Abbagiri micro watershed is presented in Table 43. The results indicated that, households have planted 23 teak trees, 38 neem trees, 3 tamarind tress, 2 pongamia and 4 banyan trees in their field.

Table 43: Forest species grown in Abbagiri micro watershed

Sl.No.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Teak	1	0	20	0	2	0	0	0	0	0	23	0
2	Neem	16	0	15	0	2	0	3	0	2	0	38	0
3	Tamarind	1	0	2	0	0	0	0	0	0	0	3	0
4	Pongamia	0	0	2	0	0	0	0	0	0	0	2	0
6	Banyan	1	0	2	0	0	0	1	0	0	0	4	0

***F=Field & *B=Back yard**

Average additional investment capacity: The data regarding average additional investment capacity in Abbagiri micro watershed is presented in Table 44. The results indicate that, households have an average investment capacity of Rs. 1117.65 for land development, Rs. 294.14 in irrigation facility, Rs.823.53 for improved crop production and Rs.264.71 for improved livestock management.

Small farmers have an average investment capacity of Rs. 1066.67 for land development, Rs.800 for improved crop production and Rs.200 for improved livestock management. Semi medium farmers have an average investment capacity of Rs. 5500 for land development, Rs. 2500 in irrigation facility, Rs.4000 for improved crop production and Rs.1500 for improved livestock management.

Table 44: Average additional investment capacity of households in Abbagiri micro watershed

Sl.No.	Particulars	SF (15)	SMF (4)	All (34)
		Rs.	Rs.	Rs.
1	Land development	1,066.67	5500	1,117.65
2	Irrigation facility	0	2500	294.12
3	Improved crop production	800	4000	823.53
4	Improved livestock management	200	1500	264.71

Source of funds for additional investment: The data regarding source of funds for additional investment in Abbagiri micro watershed is presented in Table 45. The results indicated that for 14.71 per cent of the households were dependent on loan from the bank for land development, 5.88 per cent of the households were dependent on soft loans for irrigation facility. For improved crop production 5.88 per cent of the households were dependent on own funds and 8.82 per cent of them dependent on soft loan. For improved livestock management 8.82 per cent of the households were dependent on own funds.

Table 45: Source of funds for additional investment capacity in Abbagiri micro watershed

Sl. No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Loan from bank	5	14.71	0	0.0	0	0.0	0	0.0
2	Own funds	0	0.0	0	0.0	2	5.88	3	8.82
3	Soft loan	0	0.0	2	5.88	3	8.82	0	0.0

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Abbagiri micro watershed is presented in Table 46. The results indicated that, maize and sunflower crops were sold to the extent of 100 per cent. Bajra, groundnut, paddy and red gram were sold to the extent of 90.20 per cent, 93.64 per cent, 90.83 per cent and 71.43 per cent respectively.

Table 46: Marketing of the agricultural produce in Abbagiri micro watershed

Sl. No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	153.0	15.0	138.0	90.2	1525.0
2	Groundnut	110.0	7.0	103.0	93.64	3480.0
3	Maize	378.0	0.0	378	100.0	1125.0
4	Paddy	218.0	20.0	198.0	90.83	1833.33
5	Redgram	7.0	2.0	5.0	71.43	3000.0
6	Sunflower	15.0	0.0	15.0	100.0	3000.0

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Abbagiri micro watershed is presented in Table 47. The results indicated that, 5.88 percent of the households have sold their produce to agent/traders, 73.53 percent of the households have sold their produce to local/village merchant,14.71 percent of the households sold their produce in regulated markets and 8.82 percent of the households sold their produce to cooperative marketing Society.

Table 47: Marketing Channels used for sale of agricultural produce in Abbagiri micro watershed

Sl. No.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agent/Traders	1	14.29	1	6.67	0	0	0	0	0	0	2	5.88
2	Local/village Merchant	6	85.71	11	73.33	4	100	2	100	1	100	25	73.53
3	Regulated Market	0	0	4	26.67	1	25	0	0	0	0	5	14.71
4	Cooperative marketing Society	0	0	2	13.33	0	0	1	50	0	0	3	8.82

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Abbagiri micro watershed is presented in Table 48. The results indicated that 2.94 per cent of the households have used cart as a mode of transport, 55.88 per cent of them have used tractor and 44.12 per cent have used truck.

Table 48: Mode of transport of agricultural produce in Abbagiri micro watershed

Sl.No.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cart	0	0	1	6.67	0	0	0	0	0	0	1	2.94
2	Tractor	5	71.43	9	60	1	25	3	150	1	100	19	55.88
3	Truck	2	28.57	8	53.33	5	125	0	0	0	0	15	44.12

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Abbagiri micro watershed is presented in Table 49. The results indicated that, 35.29 per cent of the households have experienced the soil and water erosion problems i.e. 42.86 percent of marginal farmers, 33.33 per cent of small farmers, 50 per cent of semi medium farmers, 50 percent of medium farmers and 100 per cent of the large farmers.

Table 49: Incidence of soil and water erosion problems in Abbagiri micro watershed

Sl. No.	Particulars	MF (7)		SF (15)		SMF (4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	3	42.86	5	33.33	2	50	1	50	1	100	12	35.29

Interest towards soil testing: The data regarding interest shown towards soil testing in Abbagiri micro watershed is presented in Table 50. The results indicated that, 85.29 per cent of the households have shown interest in soil testing.

Table 50: Interest shown towards soil testing in Abbagiri micro watershed

S. N.	Particulars	MF (7)		SF (15)		SMF(4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	7	100	15	100	4	100	2	100	1	100	29	85.29

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Abbagiri micro watershed is presented in Table 51. The results indicated that, 100 percent used fire wood as a source of fuel.

Table 51: Usage pattern of fuel for domestic use in Abbagiri micro watershed

S. N.	Particulars	LL (5)		MF (7)		SF (15)		SMF(4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	5	100	7	100	15	100	4	100	2	100	1	100	34	100

Source of drinking water: The data regarding source of drinking water in Abbagiri micro watershed is presented in Table 52. The results indicated that, piped supply was the major source of drinking water for 97.02 per cent households and 2.94 per cent of them were using bore well for drinking water.

Table 52: Source of drinking water in Abbagiri micro watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (15)		SMF(4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	4	80	7	100	15	100	4	100	2	100	1	100	33	97.06
2	Bore Well	1	20	0	0	0	0	0	0	0	0	0	0	1	2.94

Source of light: The data regarding source of light in Abbagiri 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.

Table 53: Source of light in Abbagiri micro watershed

S.N.	Particulars	LL (5)		MF (7)		SF (15)		SMF(4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100	7	100	15	100	4	100	2	100	1	100	34	100

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facili**y** in Abbagiri micro watershed is presented in Table 54. The results indicated that, 55.88 per cent of the households possess sanitary toilet i.e. 60 per cent of landless, 100 per cent of marginal, semi medium, medium and large farmers and 13.33 small farmers had sanitary toilet facility.

Table 54: Existence of Sanitary toilet facility in Abbagiri micro watershed

S. N.	Particulars	LL (5)		MF (7)		SF (15)		SMF (4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	3	60	7	100	2	13.33	4	100	2	100	1	100	19	55.88

Possession of PDS card: The data regarding possession of PDS card in Abbagiri micro watershed is presented in Table 55. The results indicated that, 97.06 per cent of the sampled households possessed BPL card and 2.94 per cent of the sampled households have not possessed BPL card.

Table 55: Possession of PDS card in Abbagiri micro watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (15)		SMF(4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100	7	100	14	93.33	4	100	2	100	1	100	33	97.06
2	Not Possessed	0	0	0	0	1	6.67	0	0	0	0	0	0	1	2.94

Participation in NREGA programme: The data regarding participation in NREGA programme in Abbagiri micro watershed is presented in Table 56. The results indicated that, 47.06 per cent of the households participated in NREGA programme which included 60 per cent of the landless, 14.29 percent of the marginal, 33.33 per cent of the small, 100 per cent of the semi medium, medium and large farmers respectively.

Table 56: Participation in NREGA programme in Abbagiri micro watershed

Sl. No.	Particulars	LL(5)		MF (7)		SF (15)		SMF(4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	3	60	1	14.29	5	33.33	4	100	2	100	1	100	16	47.06

Adequacy of food items: The data regarding adequacy of food items in Abbagiri micro watershed is presented in Table 57. The results indicated that, cereals, pulses, oilseeds, vegetables, fruits , milk, egg and meat were adequate for 94.12 per cent, 67.65 per cent, 23.53 per cent, 44.12 per cent, 47.06 per cent, 52.94 per cent, 64.71 per cent and 50 per cent respectively.

Table 57: Adequacy of food items in Abbagiri micro watershed

Sl. No.	Particulars	LL(5)		MF (7)		SF (15)		SMF(4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	3	60	7	100	15	100	4	100	2	100	1	100	32	94.12
2	Pulses	3	60	6	85.71	11	73.33	1	25	1	50	1	100	23	67.65
3	Oilseed	0	0	2	28.57	4	26.67	0	0	1	50	1	100	8	23.53
4	Vegetables	2	40	3	42.86	6	40.00	3	75	1	50	0	0	15	44.12
5	Fruits	2	40	2	28.57	7	46.67	4	100	1	50	0	0	16	47.06
6	Milk	3	60	2	28.57	8	53.33	4	100	1	50	0	0	18	52.94
7	Egg	3	60	3	42.86	9	60	4	100	2	100	1	100	22	64.71
8	Meat	2	40	2	28.57	8	53.33	4	100	1	50	0	0	17	50.00

Table 58: Response on Inadequacy of food items in Abbagiri micro watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (15)		SMF(4)		MDF(2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	2	40	0	0	0	0	0	0	0	0	0	0	2	5.88
2	Pulses	2	40	1	14.29	4	26.67	3	75	1	50	0	0	11	32.35
3	Oilseed	5	100	5	71.43	10	66.67	4	100	1	50	0	0	25	73.53
4	Vegetables	3	60	4	57.14	9	60	1	25	1	50	1	100	19	55.88
5	Fruits	3	60	5	71.43	8	53.33	0	0	1	50	1	100	18	52.94
6	Milk	2	40	5	71.43	7	46.67	0	0	1	50	1	100	16	47.06
7	Egg	2	40	4	57.14	6	40	0	0	0	0	0	0	12	35.29
8	Meat	3	60	5	71.43	7	46.67	0	0	1	50	1	100	17	50

Response on Inadequacy of food items: The data regarding inadequacy of food items in Abbagiri micro watershed is presented in Table 58. The results indicated that, cereals, pulses, oilseed, vegetables, fruits milk, egg and meat were inadequate for 5.88 per cent, 32.35 per cent, 73.53 per cent, 55.88 per cent, 52.94 per cent, 47.06 per cent,35.29 per cent and 50 per cent of the households.

Farming constraints: The data regarding farming constraints experienced by households in Abbagiri micro watershed is presented in Table 59. The results indicated that, 85.29 per cent of the households experienced by lower fertility status of the soil was the constraint and wild animal menace on farm field, frequent incidence of pest and diseases (67.65%), inadequacy of irrigation water (58.82%), high cost of Fertilizers and plant protection chemicals (79.41%), high rate of interest on credit (73.53%), low price for the agricultural commodities (79.41%), lack of marketing facilities in the area (61.76%), inadequate extension services (55.88%), lack of transport for safe transport of the agricultural produce to the market (85.29%), less rainfall (8.82%) and Source of Agri-technology information(Newspaper/TV/Mobile (2.94 %).

Table 59: Farming constraints Experienced in Abbagiri micro watershed

S. N.	Particulars	MF (7)		SF (15)		SMF (4)		MDF (2)		LF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	7	100	15	100	4	100	2	100	1	100	29	85.29
2	Wild animal menace on farm field	7	100	15	100	4	100	2	100	1	100	29	85.29
3	Frequent incidence of pest and diseases	5	71.43	14	93.33	4	100	0	0	0	0	23	67.65
4	Inadequacy of irrigation water	6	85.71	10	66.67	4	100	0	0	0	0	20	58.82
5	High cost of Fertilizers and plant protection chemicals	7	100	14	93.33	4	100	1	50	1	100	27	79.41
6	High rate of interest on credit	6	85.71	13	86.67	4	100	1	50	1	100	25	73.53
7	Low price for the agricultural commodities	7	100	14	93.33	4	100	1	50	1	100	27	79.41
8	Lack of marketing facilities in the area	5	71.43	10	66.67	4	100	2	100	0	0	21	61.76
9	Inadequate extension services	5	71.43	9	60	4	100	1	50	0	0	19	55.88
10	Lack of transport for safe transport of the Agril produce to the market.	7	100	15	100	4	100	2	100	1	100	29	85.29
11	Less rainfall	1	14.29	2	13.33	0	0	0	0	0	0	3	8.82
12	Source of Agri-technology information(Newspaper/TV/Mobile	1	14.29	0	0	0	0	0	0	0	0	1	2.94

Chapter 5

SUMMARY

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 34 households located in the micro watershed were interviewed for the survey.

Results indicated that 34 farmers were sampled in Abbagiri micro watershed among them 7 (20.59%) were marginal farmers, 15 (44.12 %) were small farmers, 4 (11.76 %) were semi medium farmers, 2 (5.88%) were medium farmers, 1(2.94%) was large farmer and 5 (14.71 %) landless farmers were also interviewed for the survey. The data indicated that there were 142 population households were there in the studied micro watershed. Among them 79 (55.63%) men and 63 (44.37 %) were women. The average family size of landless was 3, marginal farmers and small farmers were 4, semi medium and medium farmers were 5 and large farmer was 10. On an average the family size was 4.The data indicated that 20 (14.08%) people were in 0-15 years of age, 73 (51.41 %) were in 16-35 years of age, 36 (25.35 %) were in 36-60 years of age and 13 (9.15 %) were above 61 years of age.

The results indicated that the Abbagiri had 40.14 per cent illiterates, 0.70 per cent were functional literates, 26.06 per cent of them had primary school education, 10.56 per cent of them had both middle school, 14.79 per cent them had high school education, 4.93 per cent of them had PUC education, 0.70 per cent of them had degree education and 2.11 per cent them had others. The results indicated that, 55.88 per cent of households practicing agriculture, 35.29 per cent of the household heads were agricultural labour and 8.82 per cent of the household heads were general labour. The results indicated that agriculture was the major occupation for 45.07 per cent of the household members, 30.99 per cent were agricultural labourers, 7.75 per cent were general labours, 0.70 percent were in private sector, 12.68 per cent of them were students and 2.86 per cent of them were children. In case of landless households 14.29 per cent were agricultural labours, 64.29 per cent were general labourers and 21.43 per cent were students. In case of marginal farmers 39.29 per cent were both agriculturist and agricultural labour, 3.57 per cent of both were in private and 14.29 per cent were students. In case of small farmers 56.14 per cent of them were agriculturist, 22.81 per cent of them were agriculture labour, 3.51 per cent were general labour and 14.04 per cent of them were students. In case of semi medium farmers 27.27 per cent of the family members were agriculturist, 54.55 per cent were agriculture labour and 13.64 per cent of them were students. In case of medium farmers 45.45 per cent of the family members were agriculturist and 54.55 per cent of

them were agriculture labours. In large farmers 100 per cent of them were doing agriculture.

The results showed 100 per cent of the farmers have not participated in any local institutions. The results indicated that 50 per cent of the households possess Katcha house, 17.65 per cent of the households possess Pucca house and 32.35 per cent of them possess Thatched house. The results showed that, 82.35 per cent of the households possess TV, 67.65 per cent of the households possess Mixer grinder, 23.53 per cent of the households possess bicycle, 35.29 per cent of the households possess motor cycle, 2.94 per cent of the households possess Auto and 91.18 per cent of the households possess mobile phones. The results showed that the average value of television was Rs. 7178, mixer grinder was Rs.1630, bicycle was Rs.1375, motor cycle was Rs.30416, Auto was Rs. 300000 and mobile phone was Rs.1537.

Results showed about 23.53 per cent of the households possess bullock cart, 44.12 per cent of them possess plough, 2.94 per cent of the households possess tractor, 32.35 per cent of the households possess sprayer, 91.18 per cent of the households possess weeder, 2.94 per cent of the households possess harvester and 11.76 per cent of the households possess chaff cutter. The results showed that the average value of bullock cart was Rs.17975; the average value of plough was Rs. 929, the average value of tractor was Rs. 300000, the average value of sprayer was Rs. 3125, the average value of weeder was Rs. 64, the average value of harvester was Rs. 48000 and the average value of chaff cutter was Rs. 3000.

The results indicated that, 41.18 per cent of the households possess bullocks, 35.29 per cent of the households possess local cow, 8.82 per cent of the households possess sheep and 2.94 per cent of the households possess goat. The data indicated that in case of marginal farmers, 28.57 per cent of the households possess bullock and 42.86 per cent of household possess local cow. In case of small farmers, 46.67 per cent of households possess bullock, 26.67 per cent possess local cow, 13.33 per cent of the households possess sheep and 6.67 per cent possess goat. In case of semi medium farmers, 75 per cent of the households possess bullock and 50 per cent possess local cow. In medium farmers 50 per cent of the household possess bullock and 100 per cent of them have possess local cow. In case of large farmers 100 per cent of the farmers have possess bullock, local cow and sheep respectively.

The results indicated that, average own labour men available in the micro watershed was 1.79, average own labour (women) available was 1.61, average hired labour (men) available was 8.34 and average hired labour (women) available was 7.79.

The data showed that in case of marginal farmers, average own labour men available was 1, average own labour (women) was also 1.67, average hired labour (men) was 7.86 and average hired labour (women) available was also 7.86. In case of small farmers, average own labour men available was 1.73, average own labour (women) was 1.40, average hired labour (men) was 8.87 and average hired labour (women) available

was 8.40. In case of semi medium farmers, average own labour men available was 2.25, average own labour (women) was 1.50, average hired labour (men) was 9.25 and average hired labour (women) available was 6.75. In medium farmers average own labour men available was 2.50, average own labour (women) was 2, average hired labour (men) was 5 and average hired labour (women) available was 5. In large farmers average own labour men available was 4, average own labour (women) was 4, average hired labour (men) was 7 and average hired labour (women) available was 8.

The results indicated that, 85.29 per cent of the household opined that hired labour was adequate. The results indicated that, households of the Abbagiri micro watershed possess 33.19 ha (51.34 %) of dry land and 31.46 ha (48.66 %) of irrigated land. Marginal farmers possess 4.98 ha (91.11 %) of dry land and 0.49 ha (8.89%) of irrigated land. Small farmers possess 19.29 ha (93.38 %) of dry land and 1.37 ha (6.62 %) of irrigated land. Semi medium farmers possess 2.02 ha (30.94 %) of dry land and 4.52 ha (69.06 %) of irrigated land. Medium farmers possess 6.90 (81%) of dry land and 1.62 ha (19%) of irrigated land. Large farmers possess 23.47 ha (100%) of irrigated land. The results indicated that, the average value of dry land was Rs. 307,206.44 and average value of irrigated was Rs. 724665.73. In case of marginal famers, the average land value was Rs. 481,951.22 for dry land and Rs. 1,234,999.95 for irrigated land. In case of small famers, the average land value was Rs. 310,952.58 for dry land Rs. 1,023,076.96 for irrigated land. In case of semi medium famers, the average land value was Rs. 296,400 for dry land and Rs. 531,182.79 for irrigated land. In case of medium famers, the average land value was Rs. 173841.64 for dry land and was Rs. 494,000 for irrigated land. In case of large farmers the average land value was Rs. 340068.97 for irrigated land.

The results indicated that, there were 9 functioning bore wells in the micro watershed. The results indicated that, bore well was the major irrigation source for 26.47 per cent of the farmers. The results indicated that on an average the depth of the bore well was 22.32 meters. The results indicated that, in case of small farmers there was 1.37 ha of irrigated land, in case of semi medium farmers there was 3.71 ha of irrigated land, medium farmers were having 1.62 ha of irrigated land and large farmers were having 6.48 ha of irrigated land. On an average there were 13.17 ha of irrigated land. The results indicated that, farmers have grown bajra (8.66 ha), maize (21.52 ha), paddy (2.66 ha), groundnut (4.86 ha), navane (0.88 ha), red gram (1.29 ha) and sunflower (0.81 ha) in kharif season. Also grown groundnut (1.28 ha) in Rabi season. Marginal farmers have grown Maize, Bajra, groundnut and paddy. Small farmers have grown bajra, maize, paddy, navane, red gram and sunflower. Semi medium farmers have grown Maize and groundnut. Medium farmers have grown bajra and maize. Large farmers have grown groundnut and paddy. The results indicated that, the cropping intensity in Abbagiri micro watershed was found to be 80.20 per cent. In case of marginal, semi medium and large farmers it was 100 per cent, in small farmers the cropping intensity was 87.02 per cent and in medium farmers it was 43.75 per cent.

The results indicated that, 91.50 per cent of the households have bank account and 50 per cent of the households have savings. Among marginal farmers 40 percent of them possess bank account and 20 per cent possess savings. 100 per cent of small farmers possess bank account and 57.14 per cent of them possess savings. Semi medium farmers possess 100 per cent of bank account and 66.67 per cent possess savings. Medium category of farmers possesses 100 per cent of bank account and 50 per cent of them possess savings. 100 per cent of large farmers possess bank account. The results indicated that, 40 per cent of landless, 57.14 per cent of marginal, 66.67 per cent of small, 25 per cent of semi medium, 50 per cent of medium and 100 per cent of large farmers have borrowed credit from different sources. The results indicated that, 52.63 per cent have availed loan in commercial bank, 26.13 per cent have availed loan from Grameena bank and 21.05 per cent have availed loan from money lender. The results indicated that, marginal, small, semi medium, medium and large farmers have availed Rs.152500, Rs. 128000, Rs. 260000, Rs. 360000 and Rs. 300000 respectively. Overall average credit amount availed by households in the micro watershed is 147894.74. The results indicated that, 89.47 per cent of the households have borrowed loan for agriculture production. The results indicated that, agriculture production, income generating activities, purchase-vehicle and social functions like marriage reasons were the purpose for which marginal, small and semi medium farmers borrowed loan from private credit. About 25 percent of loan was taken for agriculture production, income generating activities, purchase-vehicle and social functions like marriage respectively.

Results indicated that 10 per cent of the households have repaid their institutional credit partially, 80 percent of the households have unpaid their loan and 10 percent of the households have fully paid their loan. Results indicated that 75 per cent of the households have repaid their private credit partially and 25 percent of the households have unpaid their loan. The results indicated that 45 per cent of the households were opined that they were helped to perform timely agricultural operations, 25 per cent of farmers opined that higher rate of interest and 5 per cent of them opined that they forced to sell the produce at low price to repay loan in time respectively. The results indicated that, the total cost of cultivation for bajra was Rs. 21127.54. The gross income realized by the farmers was Rs. 26854.61. The net income from bajra cultivation was Rs. 5727.07, thus the benefit cost ratio was found to be 1:1.27.

The results indicated that, the total cost of cultivation for maize was Rs. 22389.84. The gross income realized by the farmers was Rs. 26497.78. The net income from maize cultivation was Rs. 4107.93. Thus the benefit cost ratio was found to be 1:1.18. The results indicated that, the total cost of cultivation for paddy was Rs. 47014.73. The gross income realized by the farmers was Rs. 106400.81. The net income from paddy cultivation was Rs. 59386.09. Thus the benefit cost ratio was found to be 1:2.26. The results indicated that, the total cost of cultivation for groundnut was Rs. 46981.45. The gross income realized by the farmers was Rs. 63906.15. The net income from groundnut

cultivation was Rs. 16924.70. Thus the benefit cost ratio was found to be 1:1.36. The results indicated that, the total cost of cultivation for Sunflower was Rs. 31003.53. The gross income realized by the farmers was Rs. 55575.00. The net income from Sunflower cultivation was Rs. 24571.47. Thus the benefit cost ratio was found to be 1:1.79. The results indicated that, the total cost of cultivation for red gram was Rs. 22829.07. The gross income realized by the farmers was Rs. 16311.32. The net income from red gram cultivation was Rs. -6517.75. Thus the benefit cost ratio was found to be 1:0.71.

The results indicated that, 41.18 per cent of the households opined that dry fodder was adequate and 29.41 per cent of the households opined that green fodder was adequate. The table indicated that, in case of landless, the average income from business Rs. 8000 and wage Rs. 52000. In case marginal farmers the average income from service/salary was Rs.8571.43, business was Rs.11428.57, wage was Rs.5000, agriculture was Rs.44471.43 and dairy farm was Rs.3660.71. In small farmers, the average income from service/salary was Rs.11000, wage was Rs.18666.67, agriculture was Rs.43133.33, dairy farm was Rs.533.33 and goat farming was Rs.6000. In semi medium farmers the average income from business was Rs.28750, wage was Rs.10000 and agriculture was Rs.72200. In medium farmers the average income from wage was Rs.9000, agriculture was Rs.67500 and dairy farm was Rs.1500. In case of large farmers the average income from wage was Rs.10000, agriculture was Rs.130000 and goat farming was Rs.60000.

The results indicated that, in case of land less, the average expenditure from business Rs. 20000 and wage Rs. 30000. In marginal farmers, the average expenditure from business was Rs.30000, wage was Rs.1500, agriculture was Rs.23000 and dairy farm was Rs.5250. In small farmers, the average expenditure from service/salary was Rs.32500, wage was Rs.5714.29, agriculture was Rs.20642.86, dairy farm was Rs.333.33 and goat farming was Rs.20000.In semi medium farmers the average expenditure from business was Rs.60000, wage was Rs.5000 and agriculture was Rs.28750. In medium farmers the average expenditure from wage was Rs.2000, agriculture was Rs.27500 and dairy farm was Rs.1000. In case of large farmers the average expenditure from wage was Rs.2000, agriculture was Rs.50000 and goat farming was Rs.5000.

The results indicated that, sampled households have grown 23 coconut trees and 17 mango trees in their field and also planted 2 coconut trees in their back yard. The results indicated that, households have planted 23 teak trees, 38 neem trees, 3 tamarind tress, 2 pongamia and 4 banyan trees in their field. The results indicate that, households have an average investment capacity of Rs. 1117.65 for land development, Rs. 294.14 in irrigation facility, Rs.823.53 for improved crop production and Rs.264.71 for improved livestock management. The result showed that small farmers have an average investment capacity of Rs. 1066.67 for land development, Rs.800 for improved crop production and Rs.200 for improved livestock management. Semi medium farmers have an average investment capacity of Rs. 5500 for land development, Rs. 2500 in irrigation facility, Rs.4000 for improved crop production and Rs.1500 for improved livestock management.

The results indicated that for 14.71 per cent of the households were dependent on loan from the bank for land development, 5.88 per cent of the households were dependent on soft loans for irrigation facility. For improved crop production 5.88 per cent of the households were dependent on own funds and 8.82 per cent of them dependent on soft loan. For improved livestock management 8.82 per cent of the households were dependent on own funds.

The results indicated that, maize and sunflower crops were sold to the extent of 100 per cent. Bajra, groundnut, paddy and red gram were sold to the extent of 90.20 per cent, 93.64 per cent, 90.83 per cent and 71.43 per cent respectively. The results indicated that, 5.88 percent of the households have sold their produce to agent/traders, 73.53 percent of the households have sold their produce to local/village merchant,14.71 percent of the households sold their produce in regulated markets and 8.82 percent of the households sold their produce to cooperative marketing society. The results indicated that 2.94 per cent of the households have used cart as a mode of transport, 55.88 per cent of them have used tractor and 44.12 per cent have used truck.

The results indicated that, 35.29 per cent of the households have experienced the soil and water erosion problems i.e. 42.86 percent of marginal farmers, 33.33 per cent of small farmers, 50 per cent of semi medium farmers, 50 percent of medium farmers and 100 per cent of the large farmers. The results indicated that, 85.29 per cent of the households have shown interest in soil testing. The results indicated that, 100 percent used fire wood as a source of fuel. The results indicated that, piped supply was the major source of drinking water for 97.02 per cent households and 2.94 per cent of them were using bore well for drinking water. The results indicated that, electricity was the major source of light for 100 per cent of the households. The results indicated that, 55.88 per cent of the households possess sanitary toilet i.e. 60 per cent of landless, 100 per cent of marginal, semi medium, medium and large farmers and 13.33 small farmers had sanitary toilet facility. The results indicated that, 97.06 per cent of the sampled households possessed BPL card and 2.94 per cent of the sampled households have not possessed BPL card. The results indicated that, 47.06 per cent of the households participated in NREGA programme which included 60 per cent of the landless, 14.29 percent of the marginal, 33.33 per cent of the small, 100 per cent of the semi medium, medium and large farmers respectively.

The results indicated that, cereals, pulses, oilseeds, vegetables, fruits , milk, egg and meat were adequate for 94.12 per cent, 67.65 per cent, 23.53 per cent, 44.12 per cent, 47.06 per cent, 52.94 per cent, 64.71 per cent and 50 per cent respectively. The results indicated that, cereals, pulses, oilseed, vegetables, fruits milk, egg and meat were inadequate for 5.88 per cent, 32.35 per cent, 73.53 per cent, 55.88 per cent, 52.94 per cent, 47.06 per cent,35.29 per cent and 50 per cent of the households.

The results indicated that, 85.29 per cent of the households experienced by lower fertility status of the soil was the constraint and wild animal menace on farm field,

frequent incidence of pest and diseases (67.65%), inadequacy of irrigation water (58.82%), high cost of Fertilizers and plant protection chemicals (79.41%), high rate of interest on credit (73.53%), low price for the agricultural commodities (79.41%), lack of marketing facilities in the area (61.76%), inadequate extension services (55.88%), lack of transport for safe transport of the agricultural produce to the market (85.29%), less rainfall (8.82%) and Source of Agri-technology information(Newspaper/TV/Mobile (2.94 %).