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

BANHATTI (4D5B2K2b) MICROWATERSHED

Yadgir Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

THE WORLD BANK

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

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

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PREFACE

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

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

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

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

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

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

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

Nagpur
Date: 10.05.2017

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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

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

The present study covers an area of 830 ha in Yadgir taluk & district, Karnataka. The climate is semiarid and categorized as drought-prone with an average annual rainfall of 866 mm, of which about 652 mm is received during south-west monsoon, 138 mm during north-east and the remaining 76 mm during the rest of the year. An area of 702 ha (85%) ha in the microwatershed is covered by soils, about 52 ha (6%) by rock outcrops and about 76 ha (9%) by others (Habitation and water body). The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 7 soil series and 12 soil phases (management units) and 5 land management units.*
- *The length of crop growing period is about 120-150 days starting from 1st week of June to 4th week of October.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 29 major agricultural and horticultural crops was assessed and maps showing the degree of suitability along with constraints were generated.*
- *An area of about 85 per cent is suitable for agriculture in the microwatershed.*
- *About 54 per cent area of the microwatershed has soils that are deep to very deep (100- >150 cm), 12 per cent soils are moderately deep (75-100), whereas 10 per cent soils are moderately shallow (50-75 cm) and 8 per cent soils are shallow (25-50 cm) in the microwatershed.*
- *About 2 percent soils are sandy, 22 percent soils are loamy and 60 per cent is clayey soils at the surface.*
- *An area of about 74 per cent is non gravelly (<15%) soils and about 11 per cent soils are gravelly (15-35%) soils in the microwatershed.*

- *About 54 per cent area of the microwatershed is very high (>200 mm/m) in available water capacity, 12 per cent soils are medium (101-150 mm/m) and 18 per cent soils are low (51-100 mm/m) and very low (<50mm/m) in available water capacity.*
- *An area of about 72 per cent is very gently sloping (1-3% slope) lands and about 13 per cent are nearly level (0-1% slope) lands.*
- *An area of about 13 per cent has slightly eroded (e1 class) and 72 per cent has* moderately eroded (e2 class).
- *An area of about 3 per cent is slightly acid (pH 6.0-6.5), 11 per cent has neutral (pH 6.5-7.3), 23 per cent has slightly alkaline (pH 7.3-7.8), 43 per cent has moderately alkaline (pH 7.8-8.4) and 5 per cent is strongly alkaline (pH 8.4-9.0) in soil reaction.*
- *The Electrical Conductivity (EC) of the soils in the entire cultivated area of the microwatershed is <2 ds^{m-1} indicating that the soils are non-saline.*
- *An area of <1 per cent is high (>0.75%), 53 percent is medium (0.50-0.75%) and 32 percent is low (<0.50%) in organic carbon content.*
- *An area of <1 percent is low (<23 kg/ha) in available phosphorus, about 36 percent is medium (23-57 kg/ha) and 48 percent soils are high (>57 kg/ha) in available phosphorus.*
- *An area of about 65 percent is high (>337kg/ha) and about 20 percent is medium (145-337kg/ha) in available potassium.*
- *An area of about 25 percent is high (>20ppm), 30 percent is medium (10-20ppm) and 29 percent area is low (<10ppm) in available sulphur.*
- *Available boron is low (<0.5 ppm) in an area of about 32 per cent and medium (0.5-1.0 ppm) in about 53 per cent soils.*
- *Available iron content is sufficient (>4.5 ppm) in an area of 49 per cent and dificient (<4.5 ppm) in about 35 per cent in the microwatershed.*
- *Available manganese and copper are sufficient in all the soils of the microwatershed.*
- *Available zinc content is deficient (<0.6 ppm) in the entire cultivated area of the microwatershed.*
- *The land suitability for 29 major crops grown in the microwatershed were assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the Microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	-	*504(61)*		*Guava*	-	-
Maize	-	*504(61)*		*Sapota*	-	-
Bajra	-	*504(61)*		*Pomegranate*	-	*399(48)*
Groundnut	-	*86(10)*		*Musambi*	-	*399(48)*
Sunflower	-	*399(48)*		*Lime*	-	*399(48)*
Redgram	-	*418(50)*		*Amla*	-	*86(10)*
Bengal gram	-	*399(48)*		*Cashew*	-	-
Cotton	-	*399(48)*		*Jackfruit*	-	-
Chilli	-	*485(58)*		*Jamun*	-	-
Tomato	-	*86(10)*		*Custard apple*	-	*485(58)*
Brinjal	-	*86(10)*		*Tamarind*	-	-
Onion	-	*86(10)*		*Mulberry*	-	-
Bhendi	-	*485(58)*		*Marigold*	-	*485(58)*
Drumstick	-	-		*Chrysanthemum*	-	*485(58)*
Mango	-	-				

- *Apart from the individual crop suitability, a proposed crop plan has been prepared for the identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fiber and 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 not only supplementing the farm income but also provide fodder and fuel to generate lot of biomass which would help in maintaining an ecological balance and also 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 an 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 the potential and problem areas, developing sustainable land use plans, estimation of surface run off and water harvesting potential, preparation of soil and water conservation plans, land degradation/desertification etc. The Bureau is presently engaged in developing an LRI methodology using high resolution satellite remote sensing data and Digital Elevation Model (DEM) data to prepare Landscape Ecological Units (LEU) map representing agro-ecosystem as a whole. The LEU is preferred over landform as the base map for LRI. LEU is the assemblage of landform, slope and land use. An attempt has already been made to upscale the soil resource information from 1:250000 and 1:50000 scale to the LEU map in Goa and other states.

The land resource inventory aims to provide site specific database for Banhatti microwatershed in Yadgir Taluk & 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 Banhatti microwatershed is located in the northern part of Karnataka in Yadgir Taluk & District, Karnataka State (Fig.2.1). It comprises parts of Holamkera, Bannahatti, Thalaka, Siddarthanagar and Achhola villages. It lies between 16^0 50' and 16^0 48' North latitudes and 76^0 58' and 77^0 0' East longitudes, covering an area of about 830 ha. It is in the northwestern side of Yadgir town and is surrounded by Holamkera on the northwest, Siddarthanagar on the north, Bannahatti on the west and south, Thalaka on the east, Achhola on the northeastern side of the microwatershed.

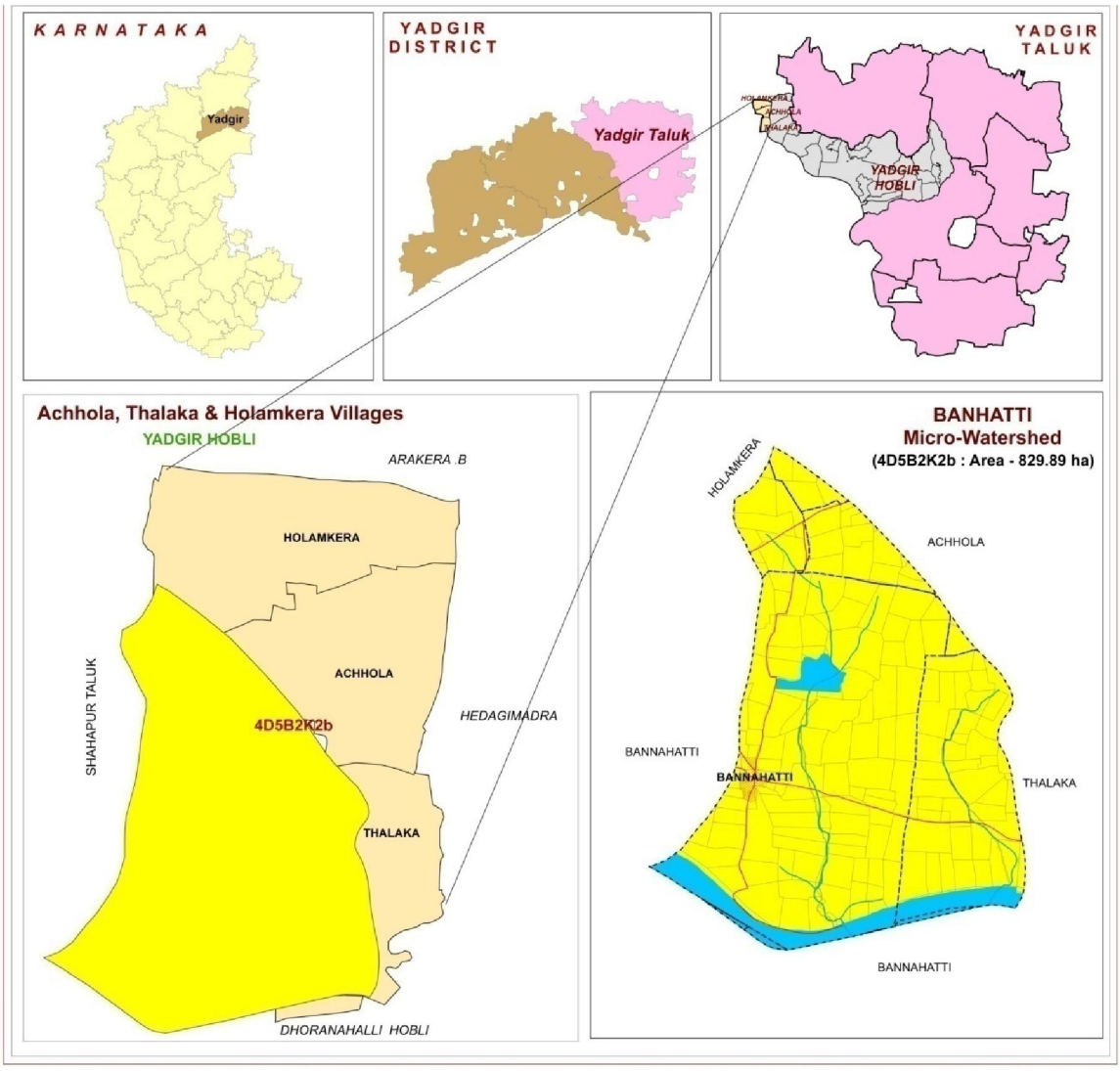

Fig.2.1 Location map of Banhatti Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are granite gneiss (Figs.2.2a). 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 Banhatti microwatershed.

Fig.2.2 Granite and granite gneiss rocks

2.3 Physiography

Physiographically, the area has been identified as granite gneiss based on geology. The area has been further subdivided into five landforms, *viz;* mounds/ridges, summits, side slopes and very gently sloping uplands, plains and valleys based on slope and its relief features. The elevation ranges from 367-374 m above MSL. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

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

2.5 Climate

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

October to early December contributes about 138 mm and the remaining 76 mm during the rest of the year. The summer season starts during the middle of February and continues up to the first week of June. The period from December to the middle of February is the coldest season. December is the coldest month with mean daily maximum and minimum temperatures being 29.5^{0}C and 10^{0}C respectively. During peak summer, temperature shoots up to 45^{0}C. Relative humidity varies from 26% in summer to 62% in winter. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo-Transpiration (PET) is 141 mm and varies from a low of 81 mm in December to 199 mm in the month of May. The PET is always higher than precipitation in all the months except end of June to end of September. Generally, the Length of crop Growing Period (LGP) is 120-150 days and starts from 1st week of June to 4th week of October.

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

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

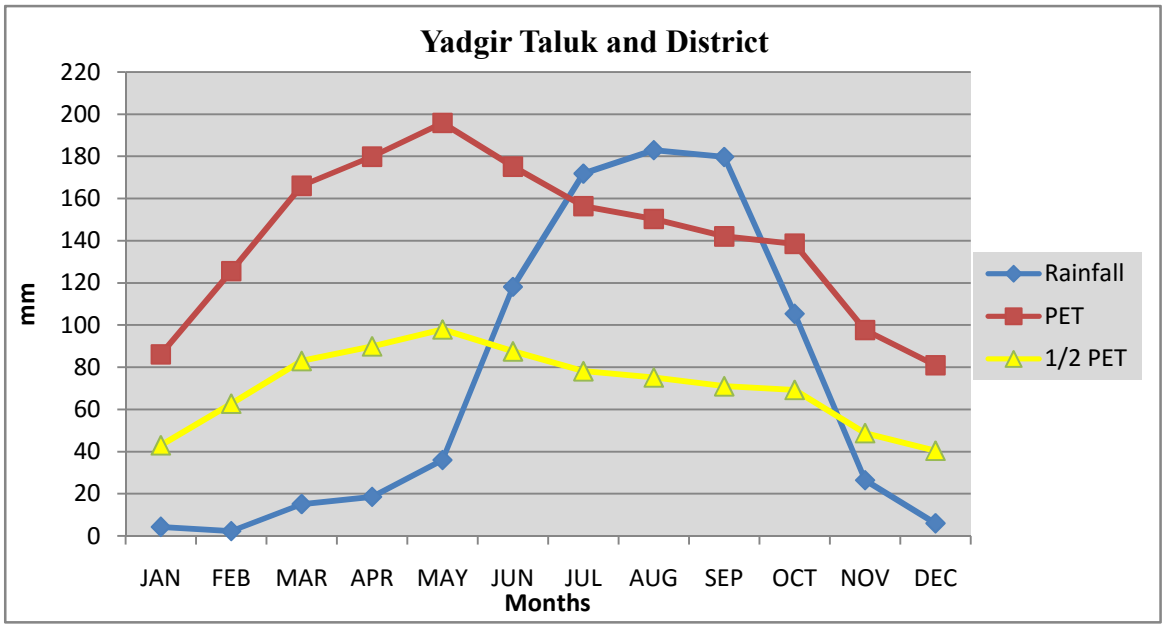

Fig 2.3 Rainfall distribution in Yadgir Taluk, Yadgir District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Banhatti Microwatershed

2.7 Land Utilization

About 72 per cent area (Table 2.2) in Yadgir district is cultivated at present. An area of about 2 per cent is permanently under pasture, 20 per cent under current fallows and 6 per cent under non-agricultural land and 5 per cent under currently barren. Forests occupy an area of about 7 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, cotton, sunflower, groundnut, red gram, mango, pomegranate, marigold and sapota. 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 Banhatti microwatershed is presented in Fig.2.5. The location of wells in the Banhatti microwatershed is shown in Fig. 2.6. The different crops and cropping systems adopted in the microwatershed are presented in Figures 2.7 a & b.

Table 2.2 Land Utilization in Yadgir District

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

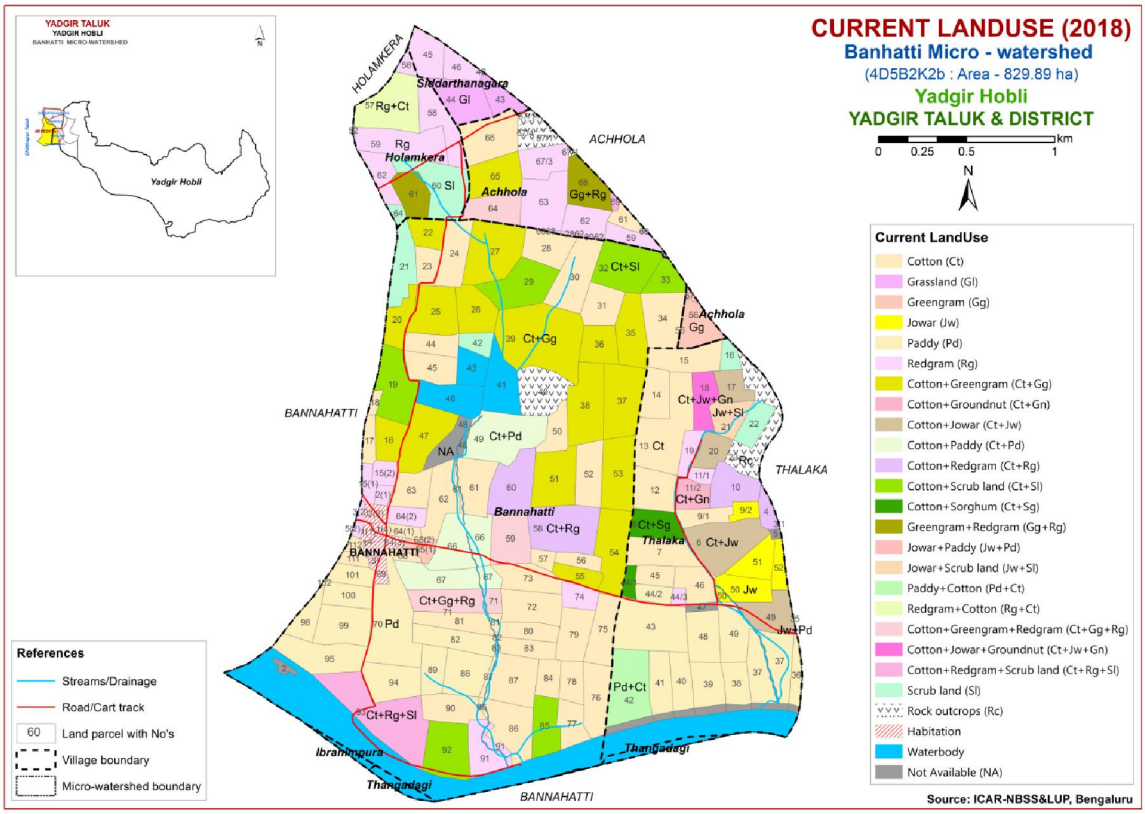

Fig.2.5 Current Land Use map of Banhatti Microwatershed

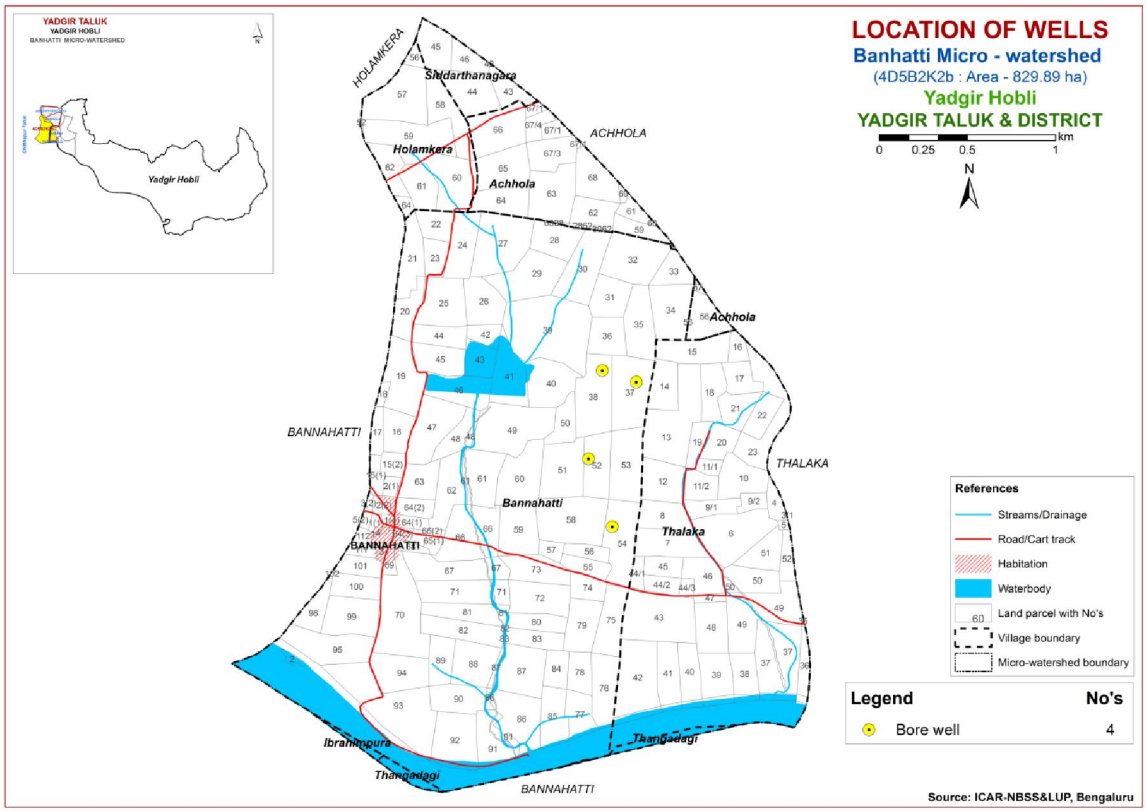

Fig.2.6 Location of wells map of Banhatti Microwatershed.

Fig. 2.7 a. Different Crops and Cropping Systems in Banhatti Microwatershed

Fig. 2.7 b. Different Crops and Cropping Systems in Banhatti Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly to a given level of management. This was achieved in Banhatti microwatershed by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site characteristics (slope of the land, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units, and showing the area extent and their geographic distribution on the microwatershed cadastral map. The detailed survey at 1:7920 scale was carried out in an area of 830 ha. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

Image Interpretation Legend for Physiography

G- Granite Gneiss Landscape

G1		**Hills/ Ridges/ Mounds**
	G11	Summits
	G12	Side slopes
	G121	Side slopes with dark grey tones
G2		**Uplands**
	G21	Summits
	G22	Gently sloping uplands
	G221	Gently sloping uplands, yellowish green (eroded)
	G222	Gently sloping uplands, yellowish white (severely eroded)
	G23	Very gently sloping uplands
	G231	Very gently sloping uplands, yellowish green
	G232	Very gently sloping uplands, medium green and pink
	G233	Very gently sloping uplands, pink and green (scrub land)
	G234	Very gently sloping uplands, medium greenish grey
	G235	Very gently sloping uplands, yellowish white (eroded)
	G236	Very gently sloping uplands, dark green
	G237	Very gently sloping uplands, medium pink (coconut garden)
	G238	Very gently sloping uplands, pink and bluish white (eroded)
G3		**Valleys/ lowlands**
	G31	Valleys, pink tones
	G32	Valleys gray mixed with pink tones

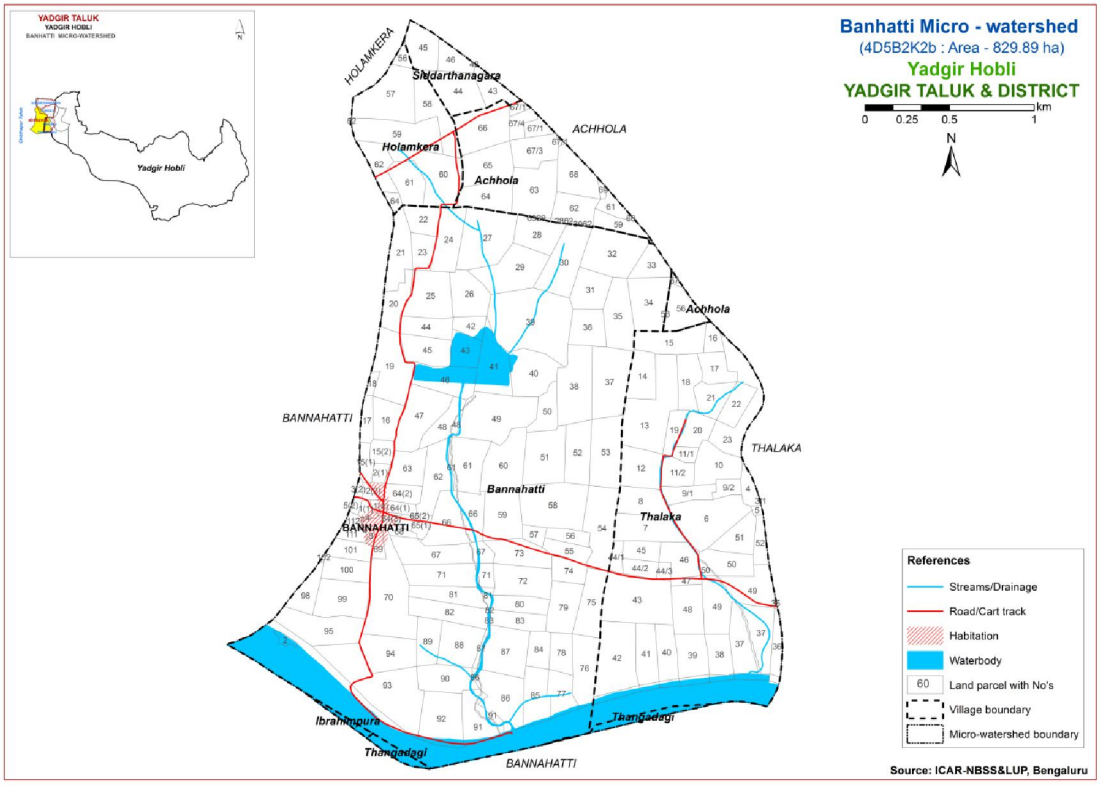

Fig 3.1 Scanned and Digitized Cadastral map of Banhatti Microwatershed

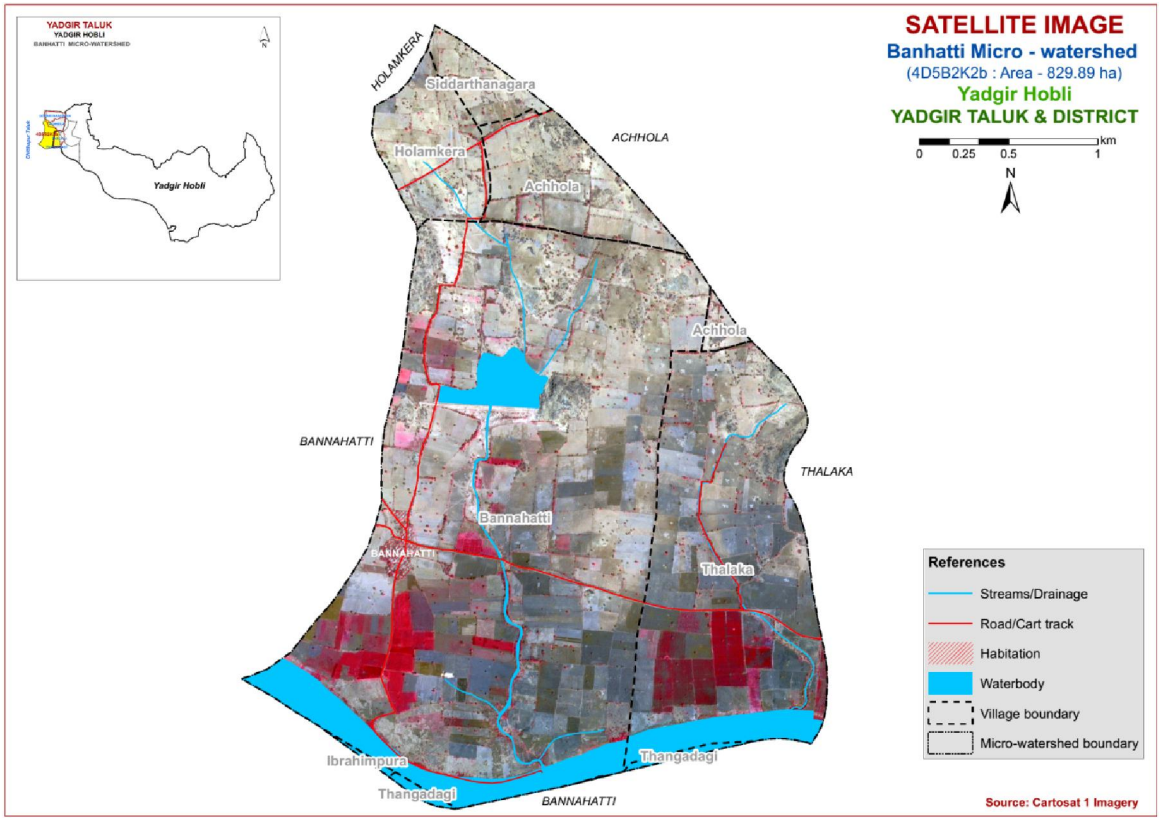

Fig.3.2 Satellite Image of Banhatti Microwatershed

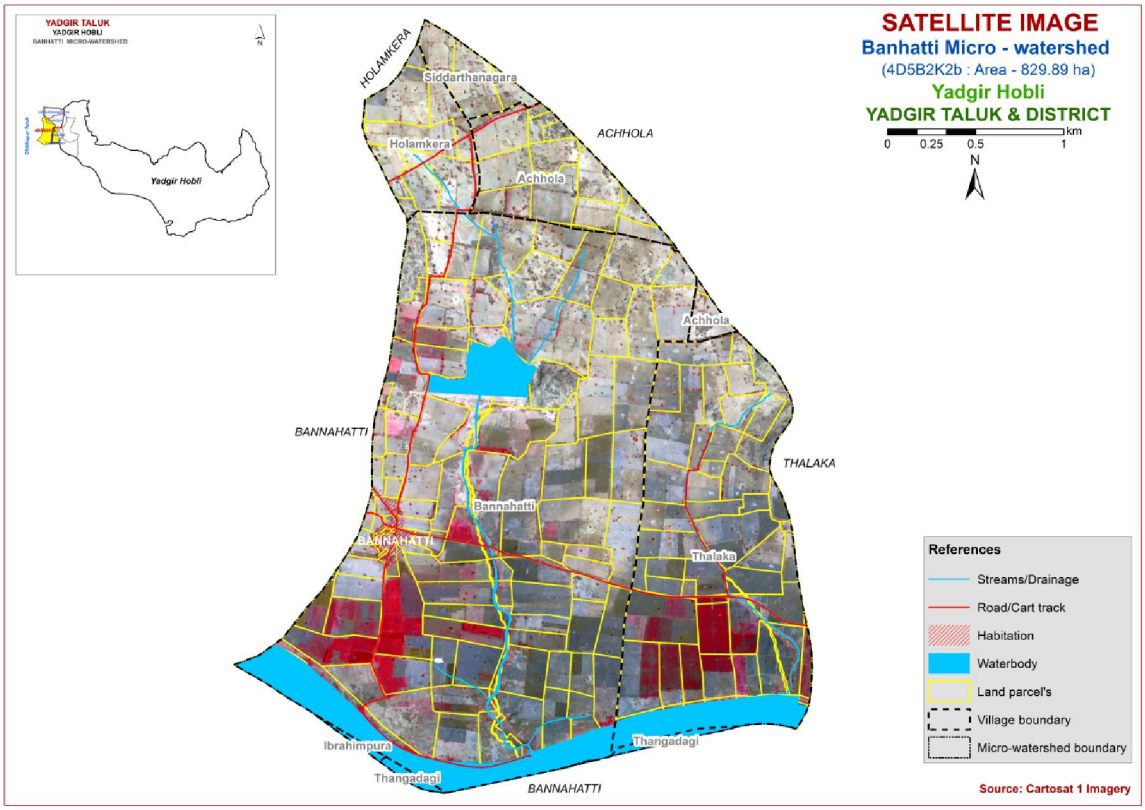

Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Banhatti Microwatershed

3.3 Field Investigation

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

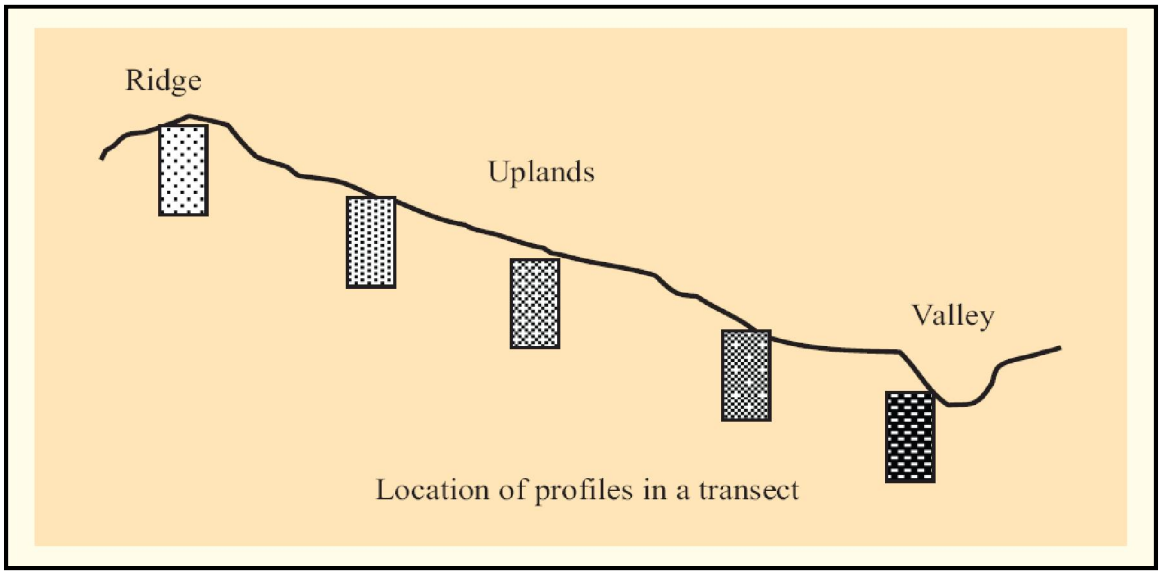

Fig: 3.4. Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, calcareousness, amount and nature of gravel present, nature of substratum etc, were used as the major differentiating characteristics for

identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 7 soil series were identified in the Banhatti 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**	**Calcareous-ness**
1	BDL (Badiyala)	25-50	7.5YR2.5/3,2.5/ 3/3,10YR 3/4,4/3	sl	<15	Ap-Bw	e
2	JNK (Jinkera)	50-75	10YR 3/1,3/2 7.5YR 3/4	scl	<15	Ap-Bw	e
3	GWD (Gowdagera)	75-100	10YR 3/1,3/2,4/2	scl	<15	Ap-Bw	es
4	NGP (Naglapur)	100-150	10YR 3/2,3/1,2/1	c	<15	Ap-Bss	es
5	ANR (Anur)	100-150	10YR 4/3,4/1	c	<15	Ap-Bw	es
6	MDG (Mundargi)	100-150	10YR 4/4,3/3 7.5YR 4/4	scl	<15	Ap-Bw	-
7	BMN (Bhimanahalli)	>150	10YR 3/1	c	<15	Ap-Bss	es

3.4 Soil Mapping

The area under each soil series was further separated into soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management. The soil mapping units are shown on the map (Fig.3.5) in the form of symbols. During the survey many 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 12 mapping units representing 7 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2. The soil phase map (management units) shows the distribution of 12 soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

3.5 Land Management Units

The 12 soil phases identified and mapped in the microwatershed were grouped into 5 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop

Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been choosen for identification and delineation of LMUs. For Banhatti microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope, erosion and gravel content have been considered for defining LMUs. The land use classes are expected to behave similarly for a given level of management.

3.6 Laboratory Characterization

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

Table 3.2 Soil map unit description of Banhatti Microwatershed

*Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite Gneiss Landscape				
	BDL	Badiyala soils are shallow (25-50 cm), well drained, have dark brown to very dark brown and dark yellowish brown, slightly calcareous sandy loam soils occurring on very gently to gently sloping uplands under cultivation		**63(7.65)**
2		BDLbB2	Loamy sand surface, slope 1-3%, moderate erosion	18 (2.18)
4		BDLhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	45 (5.47)
	JNK	Jinkera soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark grayish brown, slightly calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation		**85(10.31)**
20		JNKcB2	Sandy loam surface, slope 1-3%, moderate erosion	48 (5.8)
110		JNKhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	37 (4.51)
	GWD	Gowdagera soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown, calcareous sodic sandy clay loam soils occurring on very gently sloping uplands under cultivation		**102(12.37)**
35		GWDiB2	Sandy clay surface, slope 1-3%, moderate erosion	55 (6.66)
127		GWDmB2	Clay surface, slope 1-3%, moderate erosion	47 (5.71)

*Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
	NGP	Nagalapur soils are deep (100-150 cm), moderately well drained, have very dark gray to very dark grayish brown, black calcareous cracking clay soils occurring on very gently sloping uplands under cultivation		**205(24.74)**
49		NGPmB2	Clay surface, slope 1-3%, moderate erosion	114 (13.75)
146		NGPmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	91 (10.99)
	ANR	Anur soils are deep (100-150 cm), moderately well drained, have dark gray to brown, calcareous sodic cracking clay soils occurring on very gently sloping uplands under cultivation		**32 (3.83)**
53		ANRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	32 (3.83)
	MDG	Mundargi soils are deep (100-150 cm), well drained, have brown to dark yellowish brown, sandy clay loam soils occurring on very gently sloping uplands under cultivation		**19 (2.31)**
57		MDGcB2	Sandy loam surface, slope 1-3%, moderate erosion	19 (2.31)
	BMN	Bhimanahalli soils are very deep (>150 cm), moderately well drained, have very dark gray, calcareous cracking clay black soils occurring on very gently sloping uplands under cultivation		**193(23.35)**
159		BMNmA1	Clay surface, slope 0-1%,slight erosion	107 (12.94)
62		BMNmB2	Clay surface, slope 1-3%, moderate erosion	86 (10.41)
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	**52 (6.25)**
1000		Others	Habitation and water body	**76 (9.2)**

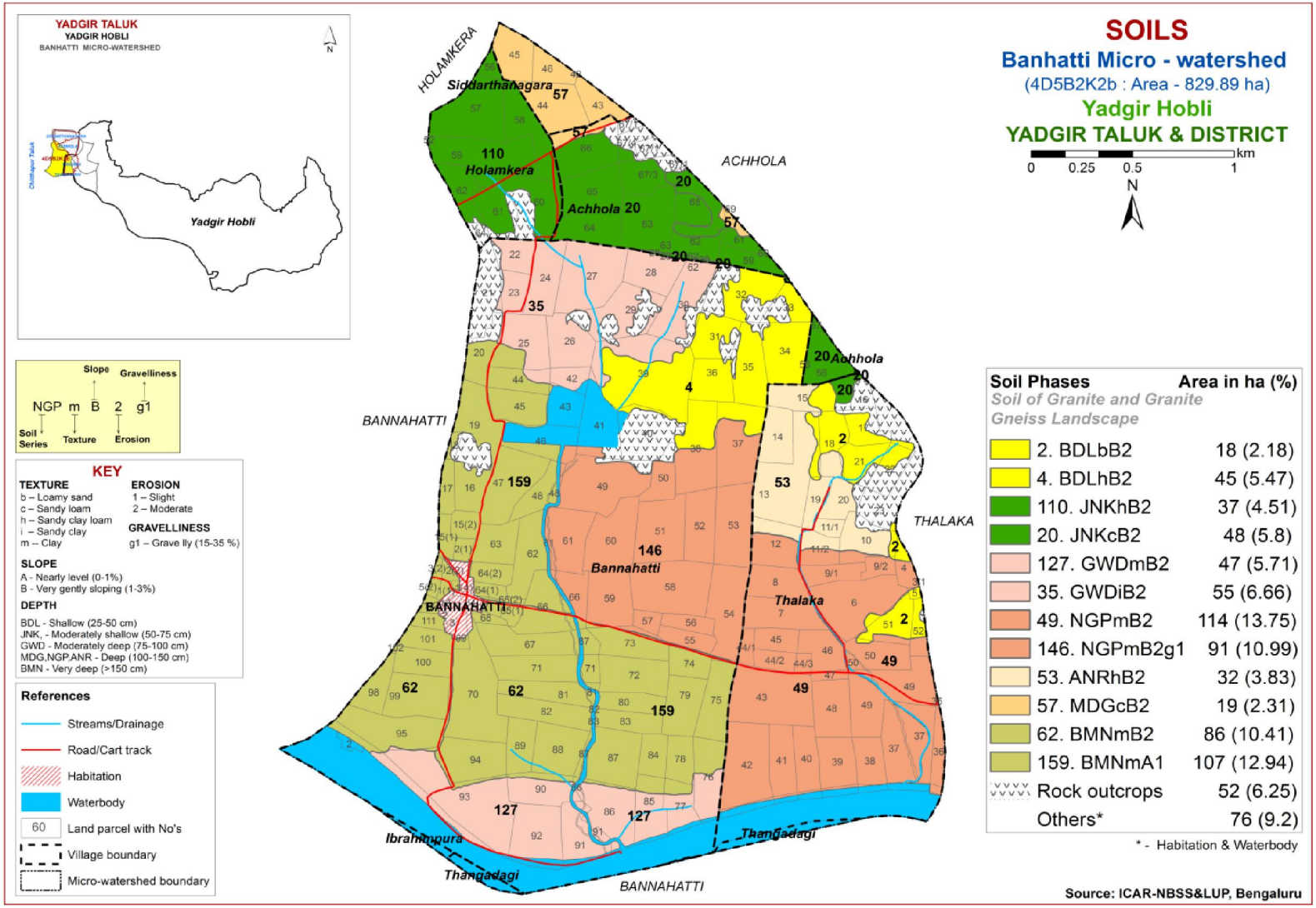

Fig 3.5 Soil Phase or Management Units - Banhatti Microwatershed

Chapter 4

THE SOILS

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

A brief description of each of the 7 soil series identified followed by 12 soil phases (management units) mapped under each series are furnished below. The physical and chemical characteristics of soil series identified in Banhatti microwatershed are given in Table 4.1 along with soil classification. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of granite gneiss landscape

In this landscape, 7 soil series are identified and mapped. NGP series occupies maximum area of 205 ha (25%) followed by BMN 193 ha (23%), GWD 102 ha (12%), JNK 85 ha (10%), BDL 63 ha (8%), ANR 32 ha (4%) and MDG 19 ha (2%).Brief description of each series identified and number of soil phases mapped is given below.

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

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

Landscape and Soil Profile characteristics of Badiyala (BDL) Series

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

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

Landscape and Soil Profile characteristics of Jinkera (JNK) Series

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

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

Landscape and Soil Profile characteristics of Gowdagera (GWD) Series

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

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

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Landscape and Soil Profile characteristics of Naglapur (NGP) Series

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

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

Landscape and Soil Profile characteristics of Anur (ANR) Series

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

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

Landscape and Soil Profile characteristics of Mundargi (MDG) Series

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

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

Landscape and Soil Profile characteristics of Bhimanahalli (BMN) Series

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

Soil Series: Badiyala (BDL) **Pedon:** R-5

Location: $16^0$37'10.0"N $77^0$20'21.5", Gudalagunta village, Balichakra hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Coarse-loamy, mixed, isohyperthermic, Fluventic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-12	Ap	87.13	7.04	5.83	10.03	24.32	23.61	23.51	5.67	<15	ls	6.27	2.44
12-28	Bw	64.63	13.30	22.07	6.74	13.07	22.30	17.01	5.50	<15	scl	16.34	7.83
28-50	BC	73.11	12.02	14.87	3.93	16.03	26.89	18.41	7.86	<15	sl	12.94	5.47

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

Contd…

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

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

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, mixed, isohyperthermic Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-15	Ap	66.84	13.62	19.54	12.15	21.22	11.23	12.56	9.68	10	sl	14.42	7.70
15-38	Bw1	59.08	12.11	28.81	12.53	12.42	17.85	8.77	7.52	20	scl	18.21	12.23
38-52	Bw2	68.21	11.68	20.11	17.90	21.81	10.60	10.80	7.10	10	scl	14.54	8.96

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

Contd…

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

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

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, mixed (calcareous), isohyperthermic Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	79.61	13.94	6.45	14.17	17.53	23.65	17.02	7.24	-	ls	11.36	3.86
18-42	BW1	69.09	10.58	21.06	10.54	16.58	22.01	14.43	5.53	-	scl	31.62	12.30
42-81	Bw2	51.37	13.51	35.60	7.59	10.55	16.24	11.60	5.38	-	sc	67.57	26.89

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

Contd…

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

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

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

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-10	7.42	-	-	0.24	0.84	1.30	-	-	0.84	0.15	-	67.10	0.92	100	0.22
10-35	8.52	-	-	0.291	0.64	2.86	-	-	0.17	0.29	-	65.20	0.87	100	0.45
35-60	7.89	-	-	0.134	0.62	4.55	-	-	0.15	0.20	-	65.00	0.90	100	0.30
60-102	8.68	-	-	0.213	0.54	8.32	-	-	0.17	0.15	-	64.10	0.88	100	0.24

Contd…

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

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

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	64.60	13.44	21.96	7.33	10.42	18.68	20.12	8.05	<15	scl	16.59	7.96
18-49	Bw1	56.66	12.19	31.15	4.73	9.80	18.66	17.02	6.45	-	scl	33.38	13.51
49-95	Bw2	39.94	17.81	42.25	3.09	3.30	15.44	10.65	7.45	<15	c	44.68	25.23
95-123	Bw3	30.65	17.58	51.77	1.50	5.57	10.18	9.65	3.75	<15	c	54.94	32.07

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	10.17	-	-	0.365	0.48	6.11	-	-	0.25	3.52	-	19.90	0.91	100	7.08
18-49	10.32	-	-	1.38	0.30	6.76	-	-	0.21	16.03	-	24.60	0.79	100	26.07
49-95	10.08	-	-	2.55	0.17	6.11	-	-	0.33	21.49	-	32.60	0.77	100	26.36
95-123	9.92	-	-	2.56	0.12	7.93	-	-	0.51	26.03	-	36.00	0.70	100	28.92

Contd…

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

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

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, mixed, isohyperthermic Fluventic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-9	Ap	81.23	12.97	5.80	4.84	10.19	14.83	37.94	13.42	<15	ls	11.75	3.31
9-20	A2	76.82	16.19	6.98	4.96	10.12	20.75	27.53	13.46	-	ls	14.52	3.99
20-46	Bw1	42.43	17.43	40.15	2.26	5.59	11.49	14.93	8.16	-	c	34.90	21.14
46-90	Bw2	54.51	16.56	28.93	4.72	5.03	19.92	16.67	8.18	-	scl	36.73	18.88
90-110	Bw3	53.69	11.00	35.30	9.57	9.89	16.23	13.01	4.99	-	sc	38.72	20.53

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-9	8.2	-	-	0.399	0.44	0.78	-	-	0.16	0.38	-	4.90	0.84	100	3.08
9-20	8.44	-	-	0.075	0.29	1.82	-	-	0.05	0.35	-	4.90	0.70	100	2.88
20-46	9.39	-	-	0.451	0.32	2.73	-	-	0.12	5.22	-	20.77	0.52	100	10.06
46-90	9.75	-	-	0.616	0.24	3.25	-	-	0.12	5.72	-	16.56	0.57	100	13.82
90-110	9.72	-	-	0.725	0.24	3.64	-	-	0.14	6.84	-	19.76	0.56	100	13.836

Contd…

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

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

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

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-8	8.2	-	-	0.284	0.72	4.94	-	-	1.20	0.34	-	52.70	0.88	100	0.65
8-40	8.44	-	-	0.139	0.40	7.28	-	-	0.30	0.48	-	52.06	0.90	100	0.93
40-70	8.32	-	-	0.202	0.40	6.37	-	-	0.18	0.40	-	52.52	0.86	100	0.77
70-120	9.3	-	-	0.282	0.36	6.89	-	-	0.27	0.38	-	50.97	0.87	100	0.75
120-170	8.47	-	-	0.305	0.37	8.19	-	-	0.28	0.91	-	58.19	0.85	100	1.57

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

Soil Characteristics: Depth, texture, gravelliness, calcareousness.

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

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

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

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

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

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

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

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

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

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

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

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

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

The 12 soil map units identified in the Banhatti microwatershed are grouped under 3 land capability classes and 4 subclasses. An area about 702 ha (85%) in the microwatershed is suitable for agriculture, about 52 ha (6%) covered by rock outcrops and about 76 ha (9%) covered by others in the microwatershed. (Fig. 5.1).

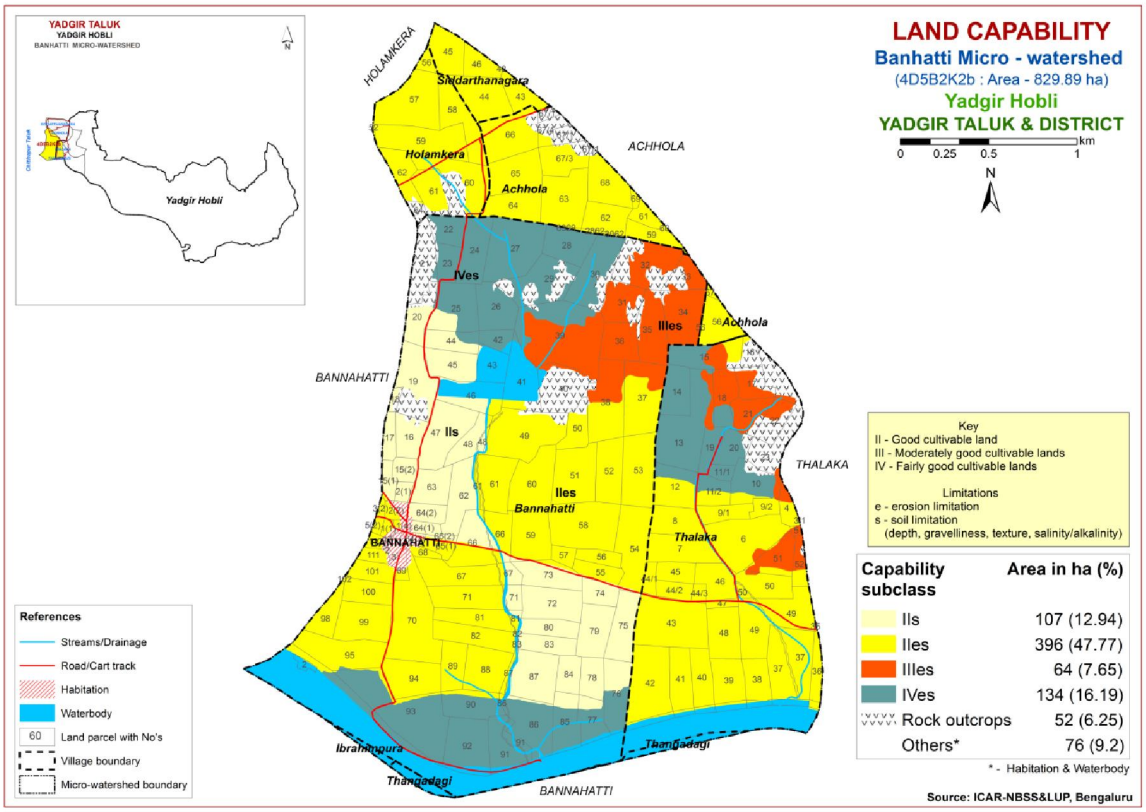

Fig. 5.1 Land Capability map of Banhatti Microwatershed

Good lands (Class II) cover an area of 503 ha (61%) and are distributed in the major part of the microwatershed. They have minor limitations of soil and erosion. Moderately good lands (Class III) cover an area of 64 ha (8%) and are distributed in the eastern, southeastern and northern part of the microwatershed. They have moderate limitations of soil and erosion. Fairly good lands (Class IV) cover an area of about 134 ha (16%) and are distributed in the southern, eastern and northern part of the microwatershed. They have very severe limitations of soil and erosion.

5.2 Soil Depth

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

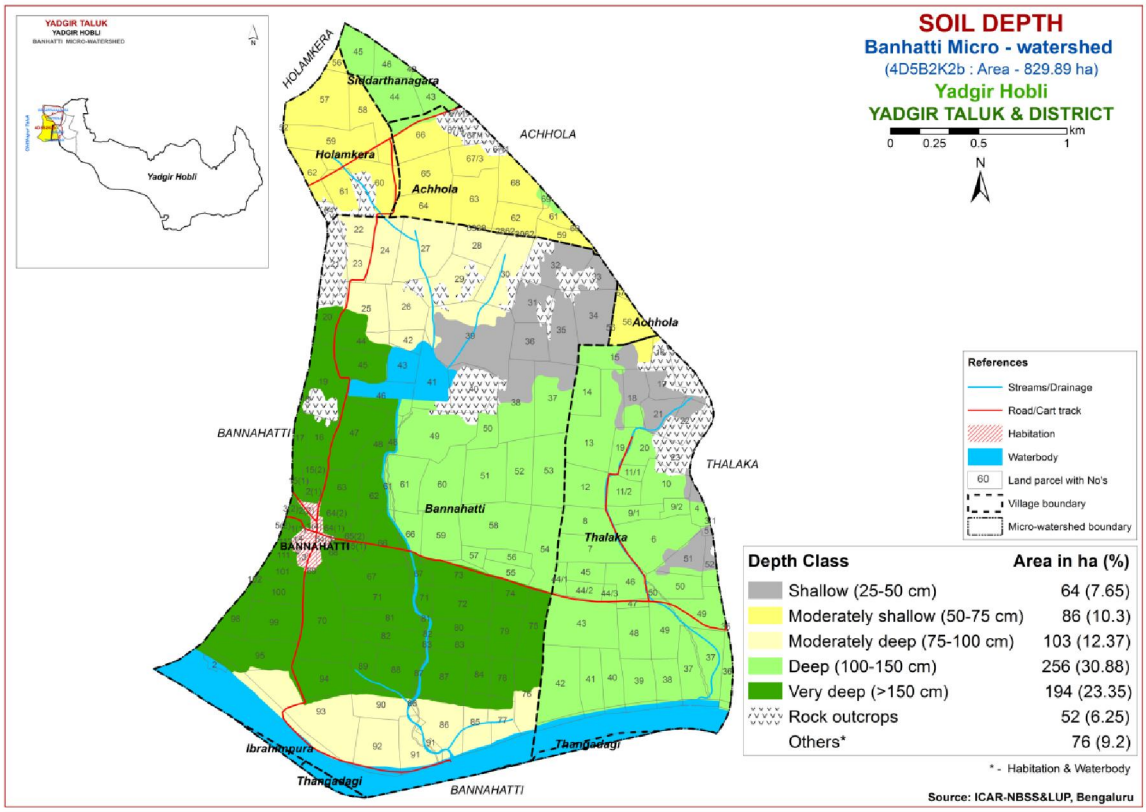

Fig. 5.2 Soil Depth map of Banhatti Microwatershed

Shallow (25-50 cm) soils cover an area of 64 ha (8%) and are distributed in the eastern, southeastern and northern part of the microwatershed. Moderately shallow (50-75 cm) soils cover an area of 86 ha (10%) and are distributed in the eastern, northern and northwestern part of the microwatershed. Moderately deep (75-100 cm) soils cover an area of 103 ha (12%) and are distributed in the northern and southern part of the microwatershed. Deep (100-150 cm) soils cover an area of 256 ha (31%) and are distributed in the major part of the microwatershed. Very deep (>150 cm) soils cover an area of 194 ha (23%) and are distributed in the western, southern and southwestern part of the microwatershed.

The most productive lands 450 ha (54%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep to very deep (100 - > 150 cm) soils. Shallow soils cover about 64 ha (8%) area where short duration crops can be grown and probability of crop failure is 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 behaviour, microbial activity and crop suitability. The textural classes used for LRI were used to classify and a surface soil texture map was generated. The area extent and their geographical distribution in the microwatershed is shown in Figure 5.3.

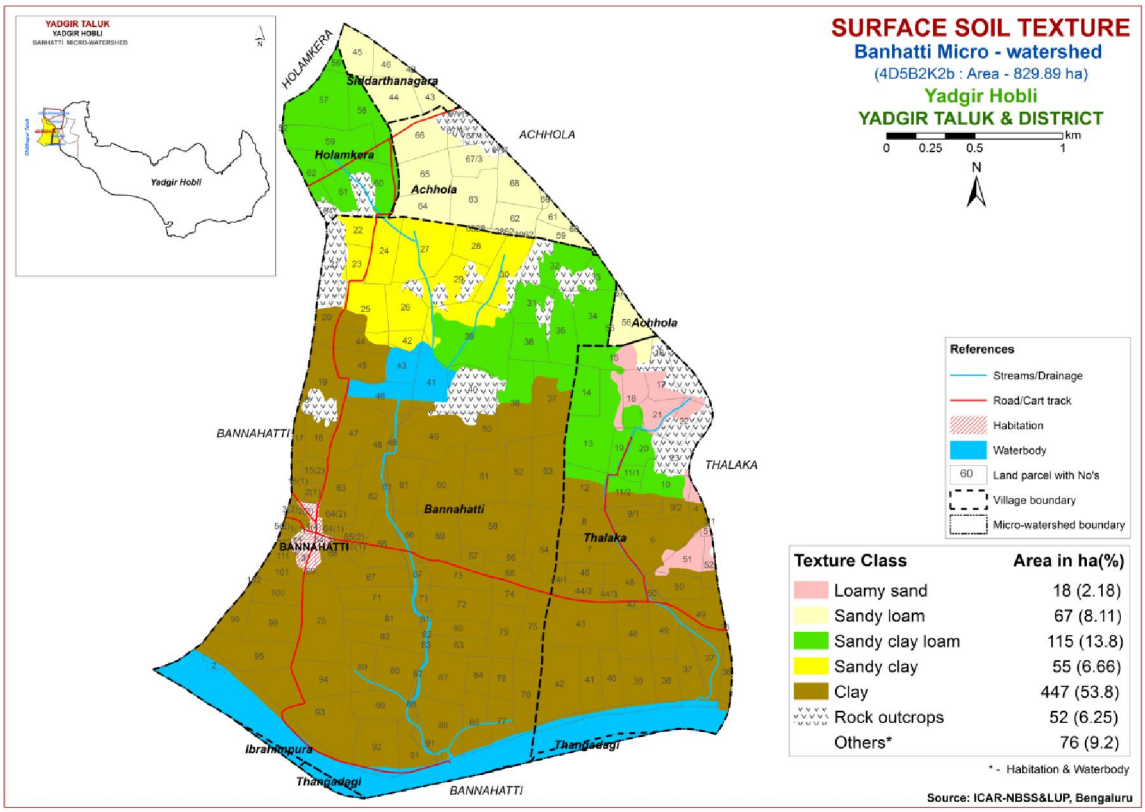

Fig. 5.3 Surface Soil Texture map of Banhatti Microwatershed

An area of 18 ha (2%) has soils that are sandy at the surface and occur in the eastern part of the microwatershed. An area of 182 ha (22%) has soils that are loamy at the surface and occur in the eastern, northern and northwestern part of the microwatershed. An area of 502 ha (60%) has soils that are clayey at the surface and occur in the major part of the microwatershed.

Major area of 684 ha (82%) the microwatershed is most productive with respect to surface soil texture. The clayey soils (60%) have high potential for soil-water retention and availability, and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other productive lands are loamy soils (22%) which also have high potential for soil-water retention and nutrient availability but have no drainage or other physical problems. The sandy soils (2%) are problematic but productive for root and tuber crops, but these soils have the major limitation of moisture and nutrient retention capacity, hence frequent and shallow irrigation with balanced fertilizer application is to be followed in order to get better crop yields.

5.4 Soil Gravelliness

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

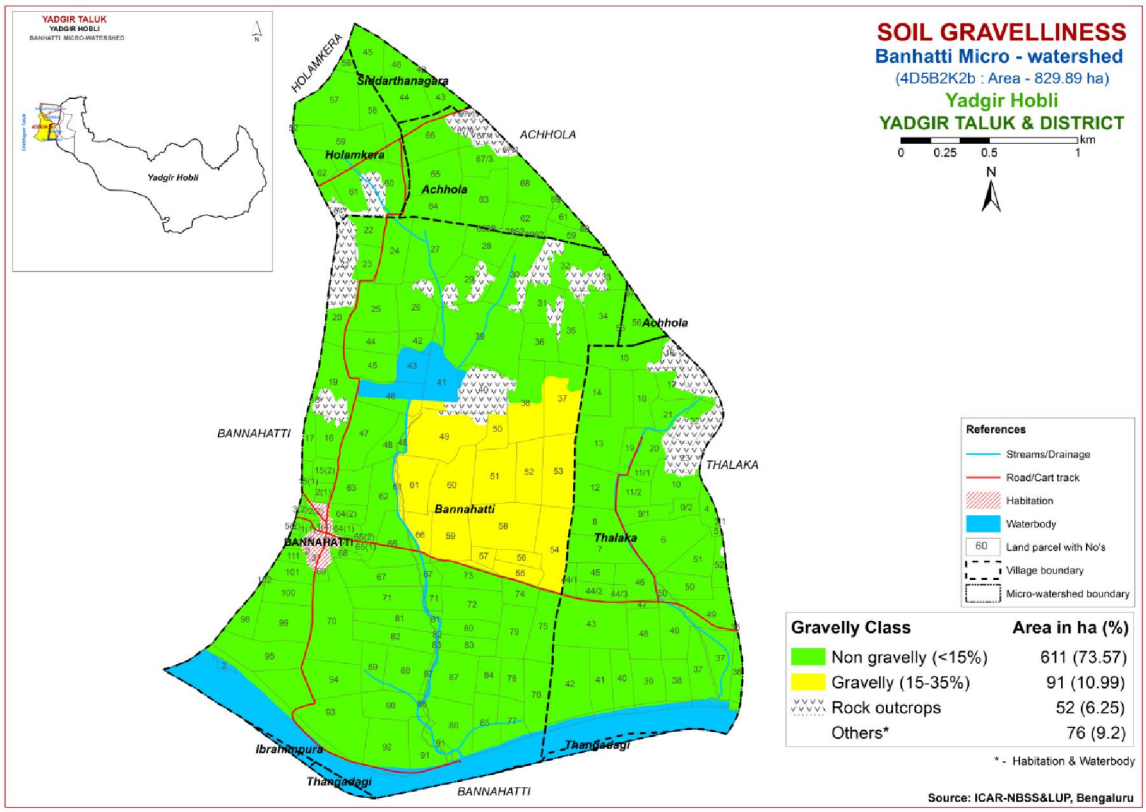

Fig. 5.4 Soil Gravelliness map of Banhatti Microwatershed

An area of about 611 ha (74%) is non gravelly (<15%), and are distributed in the major part of the microwatershed. About 91 ha (11%) is gravelly (15-35%) soils, and are distributed in the central part of the microwatershed

The most productive soils (74%) that are non gravelly (<15%), where all climatically adapted long duration crops can be grown.

5.5 Available Water Capacity

The soil available water capacity (AWC) is estimated based on the ability of the soil column to retain water between the tensions of 0.33 and 15 bar in a depth of 100 cm or the entire solum if the soil is shallower. The AWC of the soils (soil series) as estimated by considering the soil texture, mineralogy, soil depth and gravel content (Sehgal *et al.,*

1990) and accordingly the soil map units were grouped into five AWC classes *viz,* very low (<50 mm/m), low (50-100 mm/m), medium (100-150 mm/m), high (150-200 mm/m) and very high (>200 mm/m) and using these values, an AWC map was generated. The area extent and their geographic distribution of different AWC classes in the microwatershed is given in Figure 5.5.

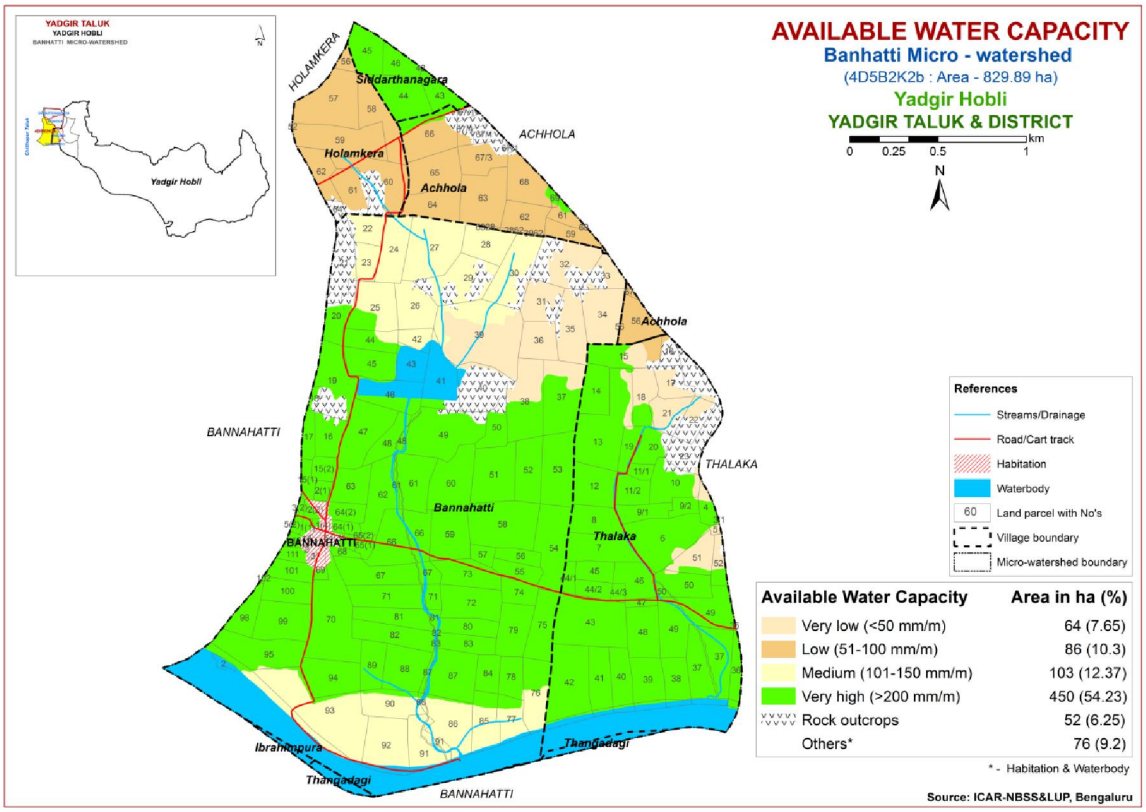

Fig. 5.5 Soil Available Water Capacity map of Banhatti Microwatershed

An area of about 86 ha (10%) and 64 ha (8%) that are low (51-100 mm/m) and very low (<50 mm) in available water capacity in the microwatershed and are distributed in the eastern, northern, northwestern and southeastern part of the microwatershed. About 103 ha (12%) is medium (101-150 mm/m) in available water capacity and are distributed in the southern and northern part of the microwatershed and about 450 ha (54%) is very high (>200 mm/m) in available water capacity and are distributed in the major part of the microwatershed.

An area of 150 ha (18%) in the microwatershed is problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. An area of 450 ha (54%) is potential, where all climatically adapted long duration crops can be grown.

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 in the microwatershed (Fig. 5.6).

Maximum area of about 594 ha (72%) falls under very gently sloping (1-3% slope) lands and are distributed in the major part of the microwatershed and about 107 ha (13%) falls under nearly level (0-1% slope) lands and are distributed in the western southern and western part of the microwatershed.

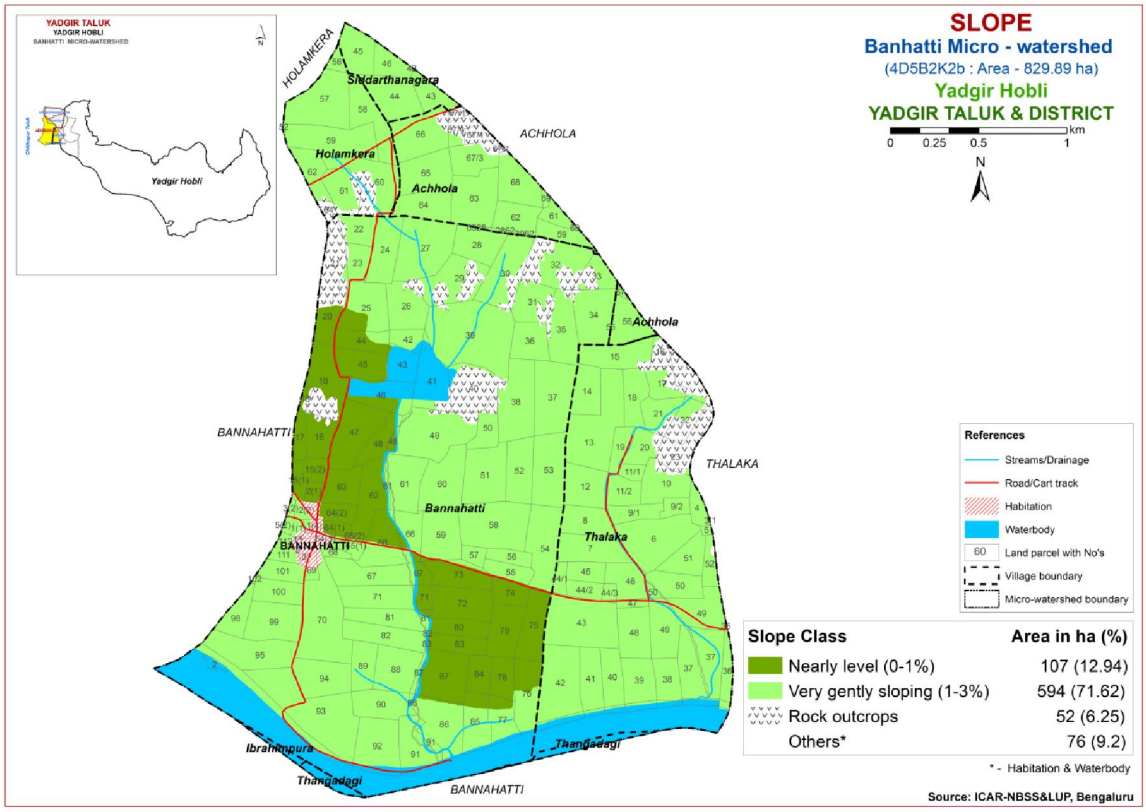

Fig. 5.6 Soil Slope map of Banhatti Microwatershed

Entire cultivated area in the microwatershed has high potential in respect of soil slopes. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

5.7 Soil Erosion

Soil erosion refers to the wearing away of the earth's surface by the forces of water, wind and ice involving detachment and transport of soil by raindrop impact. It is used for accelerated soil erosion resulting from disturbance of the natural landscape by

burning, excessive grazing and indiscriminate felling of forest trees and tillage, all usually by man. The erosion classes showing an estimate of the current erosion status as judged from field observations in the form of rills, gullies or a carpet of gravel on the surface are recorded. Four erosion classes, viz, slight erosion (e1), moderate erosion (e2), severe erosion (e3) and very severe erosion (e4) are recognized. The soil map units were grouped into different erosion classes and a soil erosion map generated. The area extent and their spatial distribution in the microwatershed is given in Figure 5.7.

Soils that are slightly eroded (e1 class) cover an area of 107 ha (13%) and are distributed in the western and southern part of the microwatershed. Soils that are moderately eroded (e2 class) cover a maximum area of 594 ha (72%) and are distributed in the major part of the microwatershed.

An area of about 594 ha (72%) in the microwatershed is problematic because of moderate erosion. For these areas, taking up soil and water conservation and other land development measures are needed.

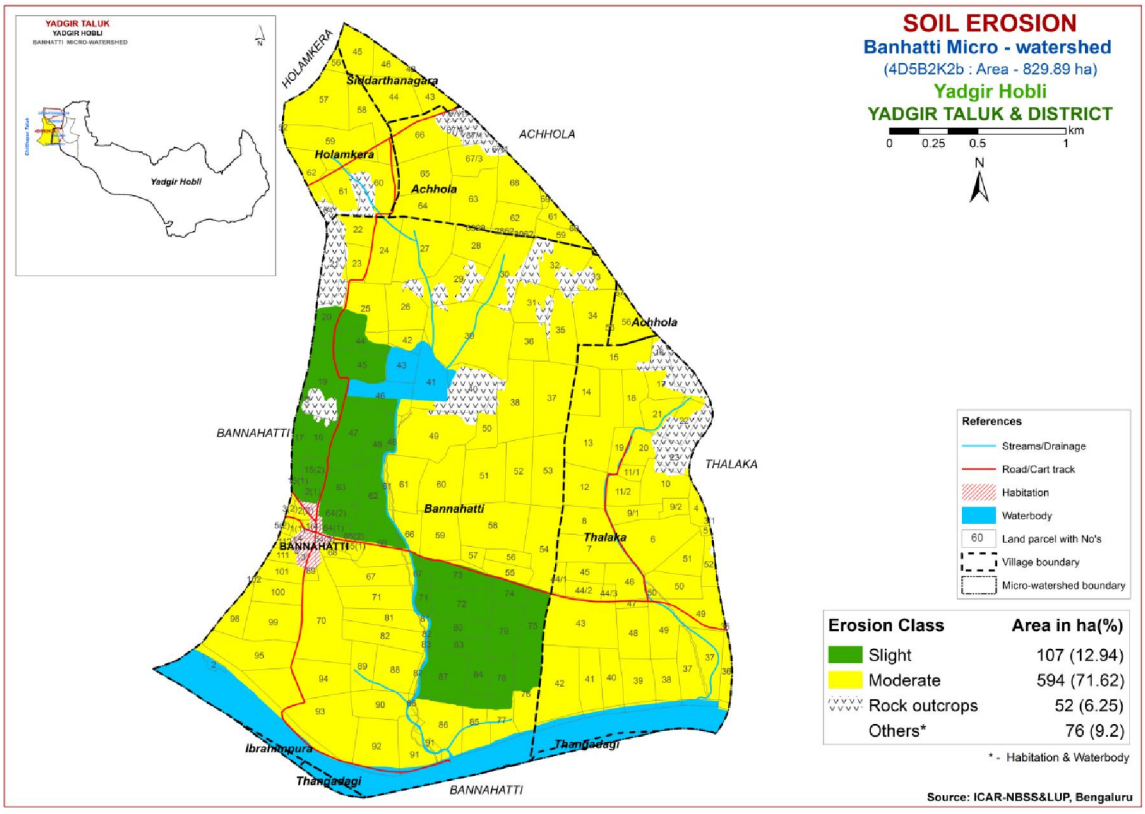

Fig. 5.7 Soil Erosion map of Banhatti Microwatershed

Chapter 6

FERTILITY STATUS

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

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

6.1 Soil Reaction (pH)

The soil analysis of the Banhatti microwatershed for soil reaction (pH) showed that showed that an area of 23 ha (3%) is slightly acid (pH 6.0-6.5) and distributed in the northern part of the microwatershed. An area of about 90 ha (11%) has neutral (pH 6.5-7.3) and distributed in the northern and eastern part of the microwatershed. An area of 189 ha (23%) has slightly alkaline (pH 7.3-7.8) and distributed the northern, western, eastern and southern part of the microwatershed. Moderately alkaline (pH 7.8-8.4) soils occur in a maximum area of 360 ha (43%) and distributed in all parts of the microwatershed. An area of 40 ha (5%) is strongly alkaline (pH 8.4-9.0) and distributed in the southern part of the microwatershed (Fig. 6.1).

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is low (<0.5%) in about 262 ha (32%) and are distributed in the northern, northwestern, western and southwestern part of the microwatershed. Medium (0.5-0.75%) in about 439 ha (53%) and are distributed in the major part of the microwatershed and <1 ha (<1%) is high (>0.75%) in organic carbon and are distributed in the eastern part of the microwatershed (Fig. 6.3).

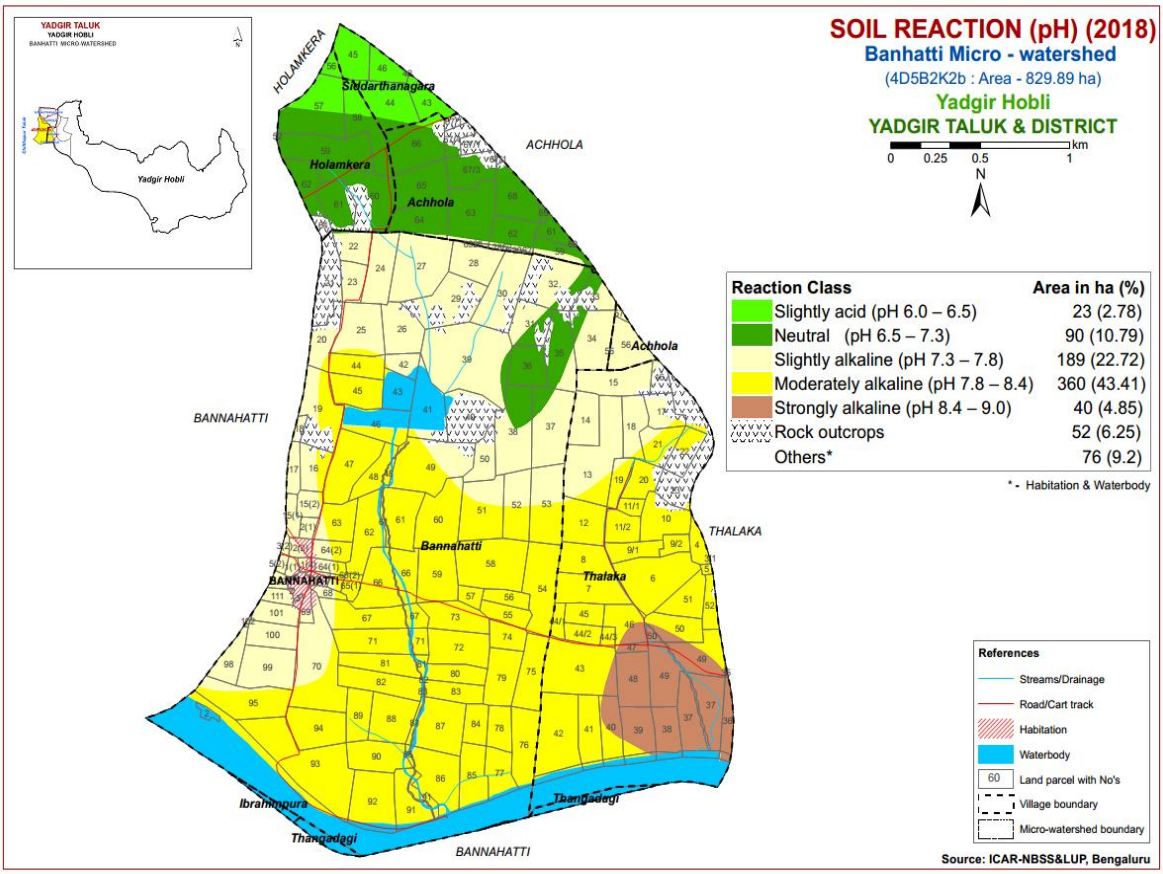

Fig.6.1 Soil Reaction (pH) map of Banhatti Microwatershed

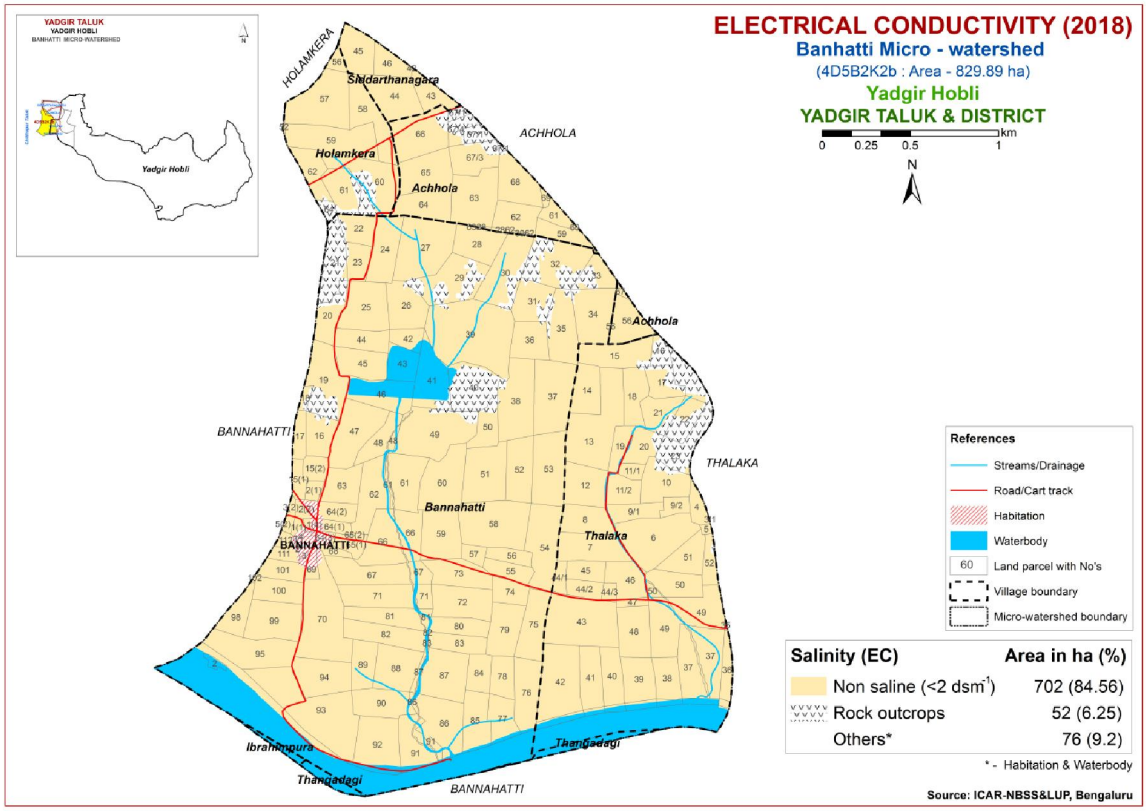

Fig.6.2 Electrical Conductivity (EC) map of Banhatti Microwatershed

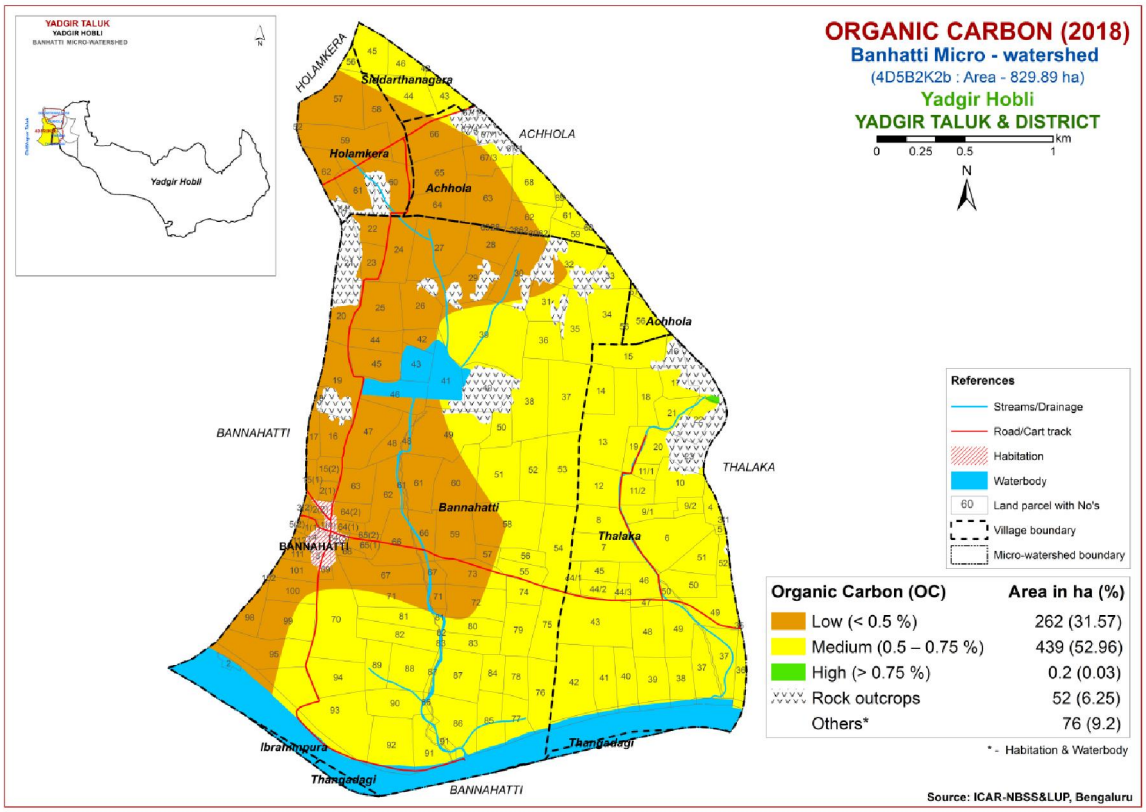

Fig.6.3 Soil Organic Carbon map of Banhatti Microwatershed

6.4 Available Phosphorus

Available phosphorus content is high (>57 kg/ha) covering an area of about 398 ha (48%) and occur in the major part of the microwatershed. Medium (23-57 kg/ha) in an area of about 296 ha (36%) and occur in the southern, central, northern, eastern, northwestern and southwestern part of the microwatershed and low (<23 kg/ha) in an area of about 8 ha (<1%) and occur in the southern and northwestern part of the microwatershed (Fig. 6.4).

6.5 Available Potassium

Available potassium content is medium (145-337 kg/ha) covering an area of about 164 ha (20%) and occur in the eastern, northern and northwestern part of the microwatershed and high (>337 kg/ha) covering an area of about 538 ha (65%) and occur in the major part of the microwatershed (Fig.6.5).

6.6 Available Sulphur

Available sulphur is low (<10ppm) which covers an area of about 243 ha (29%) and occur in the eastern, central, southern and northwestern part of the microwatershed. Medium (10-20 ppm) which covering a maximum area of about 248 ha (30%) and occur in the major part of the microwatershed and high (>20 ppm) in an area of about 211 ha (25%) and occur in the southern, southeastern and southwestern part of the microwatershed (Fig. 6.6).

6.7 Available Boron

Available boron content is medium (0.5-1.0 ppm) covering a maximum area of 439 ha (53%) and are distributed in the major part of the microwatershed and about 263 ha (32%) is low (<0.5 ppm) in available boron and are distributed in the northern, northwestern and southwestern part of the microwatershed (Fig. 6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) in an area of 410 ha (49%) and are distributed in the major part of the microwatershed and deficient (<4.5 ppm) in an area of 292 ha (35%) and are distributed in the eastern, western, southern and southwestern part of the microwatershed (Fig 6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

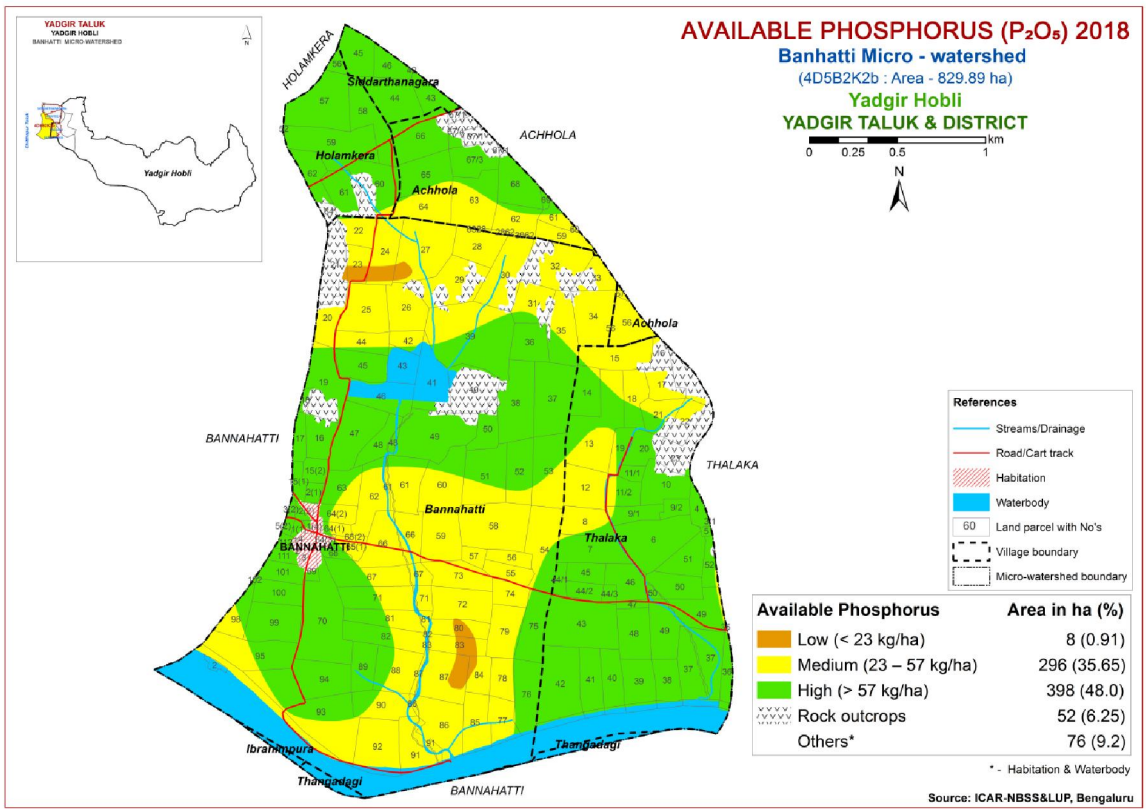

Fig.6.4 Soil Available Phosphorus map of Banhatti Microwatershed

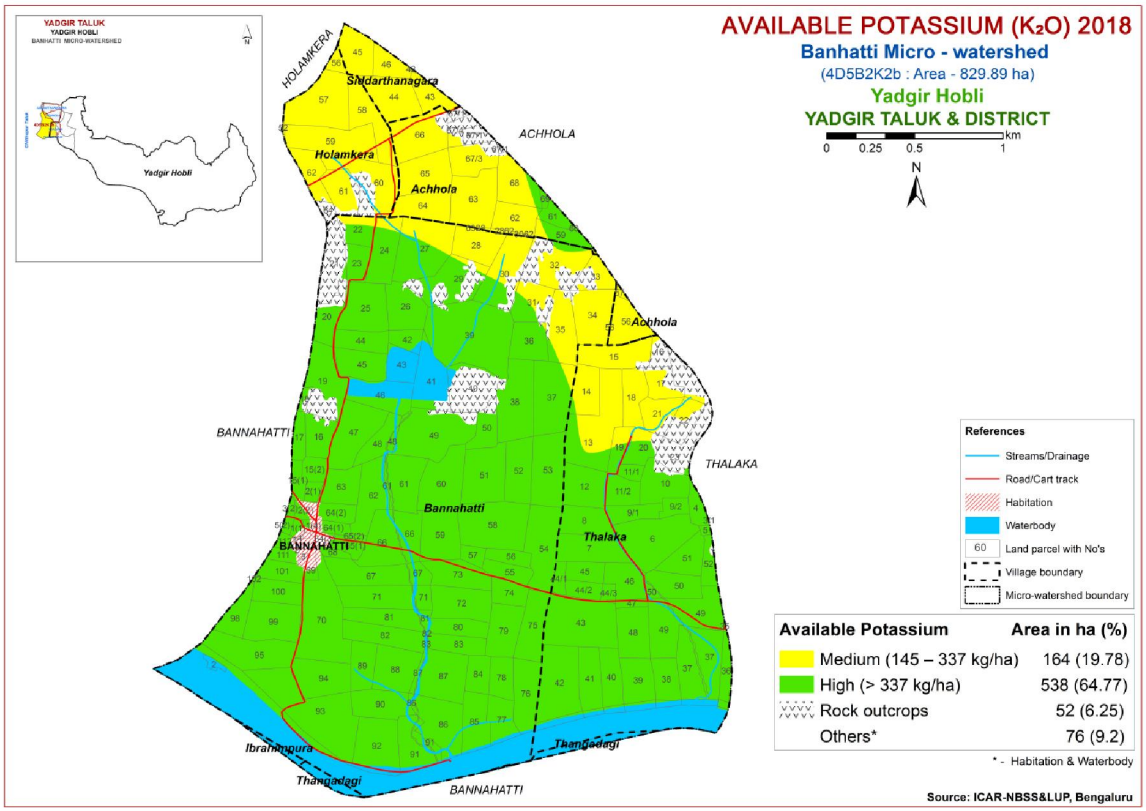

Fig.6.5 Soil Available Potassium map of Banhatti Microwatershed

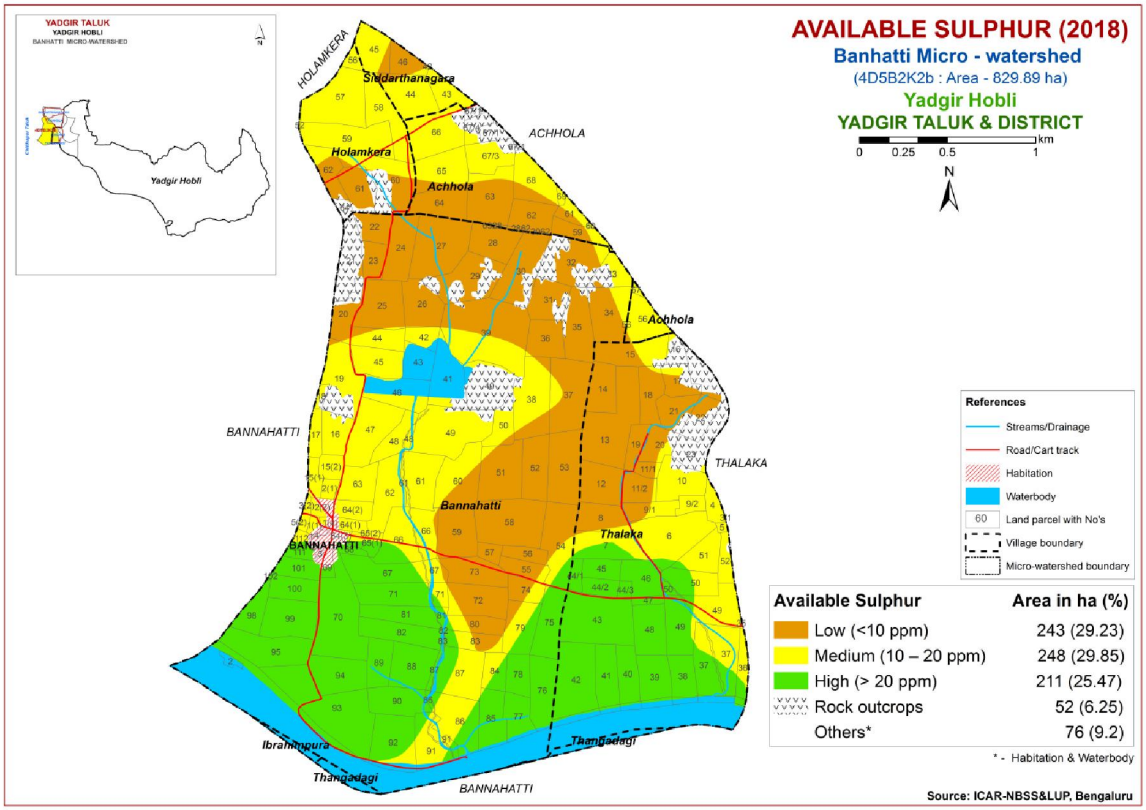

Fig.6.6 Soil Available Sulphur map of Banhatti Microwatershed

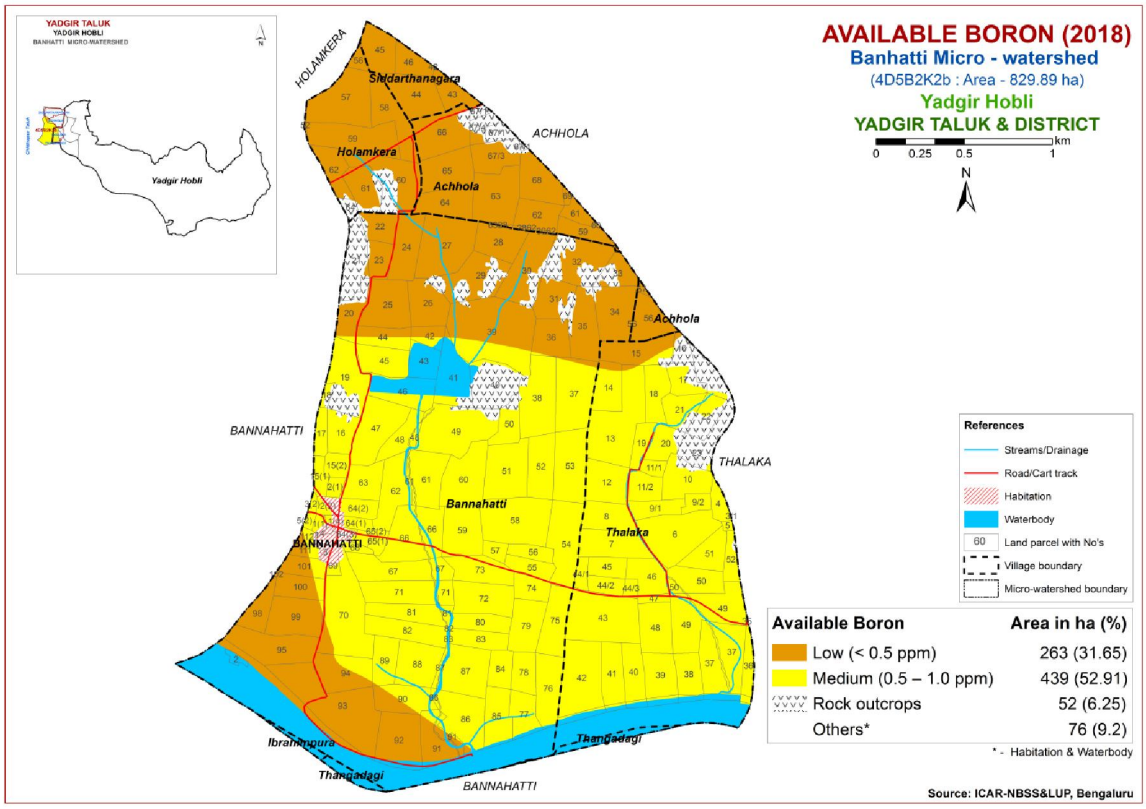

Fig.6.7 Soil Available Boron map of Banhatti Microwatershed

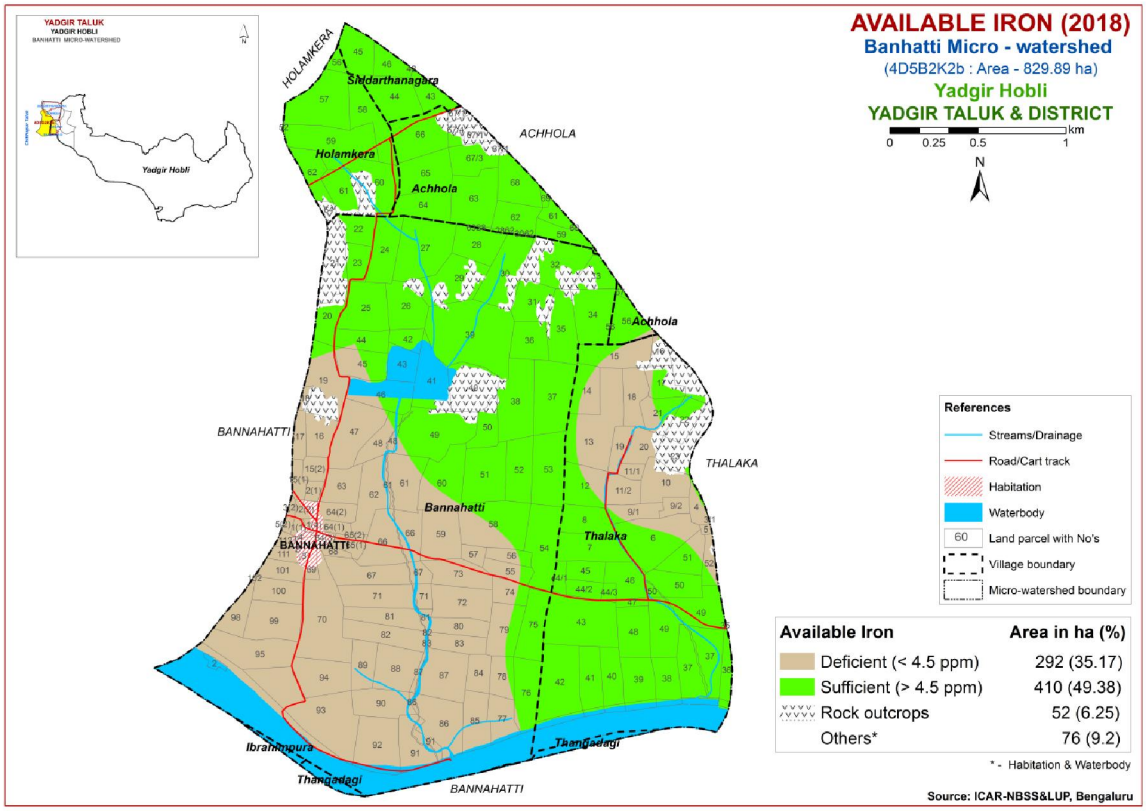

Fig.6.8 Soil Available Iron map of Banhatti Microwatershed

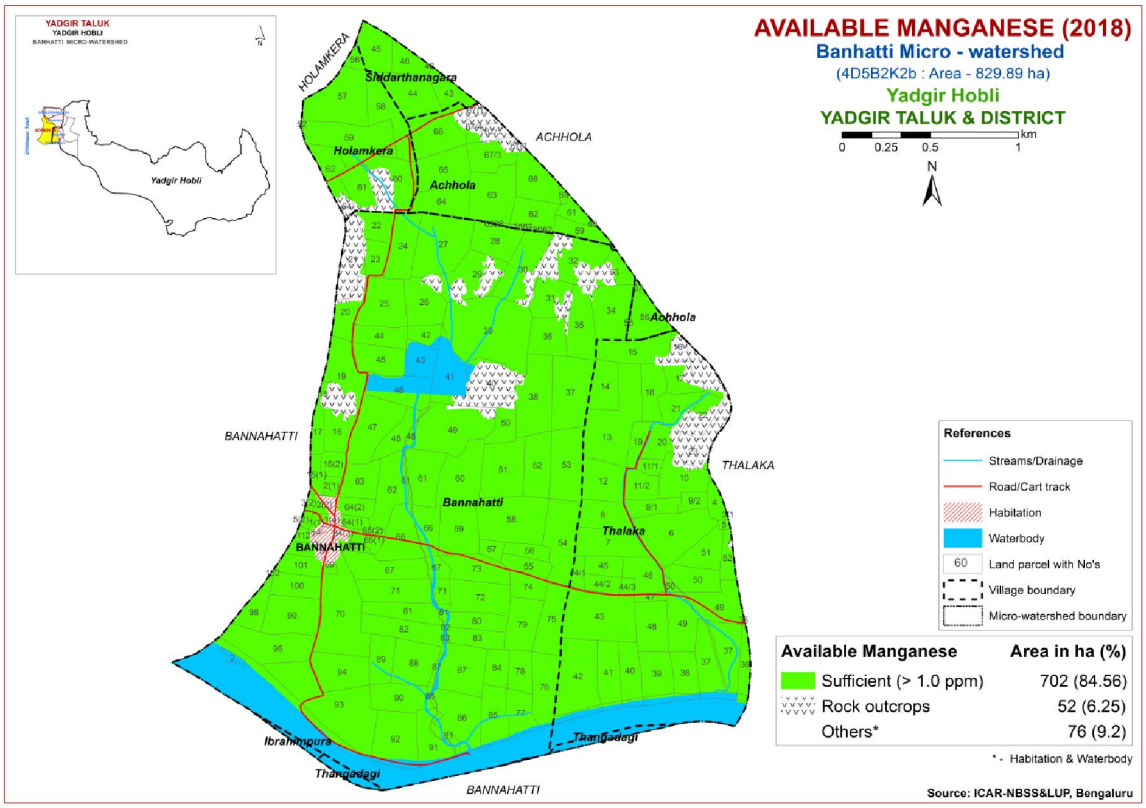

Fig.6.9 Soil Available Manganese map of Banhatti Microwatershed

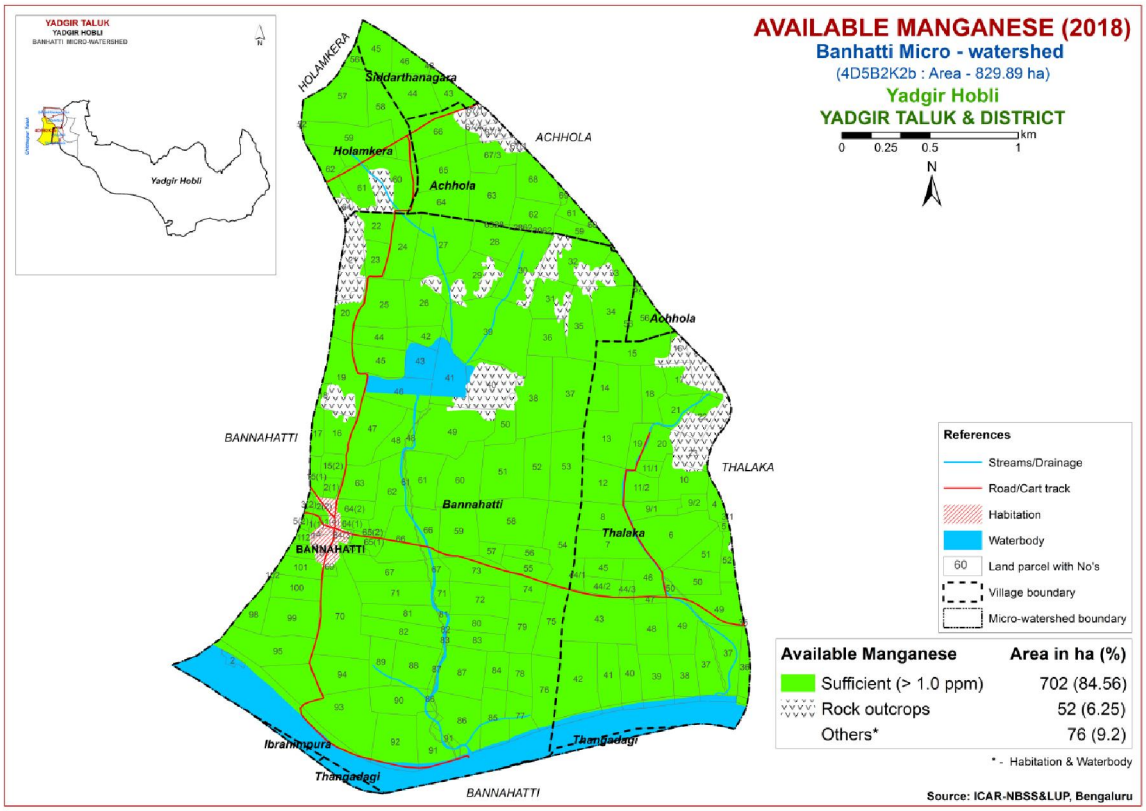

Fig.6.10 Soil Available Copper map of Banhatti Microwatershed

6.11 Available Zinc

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

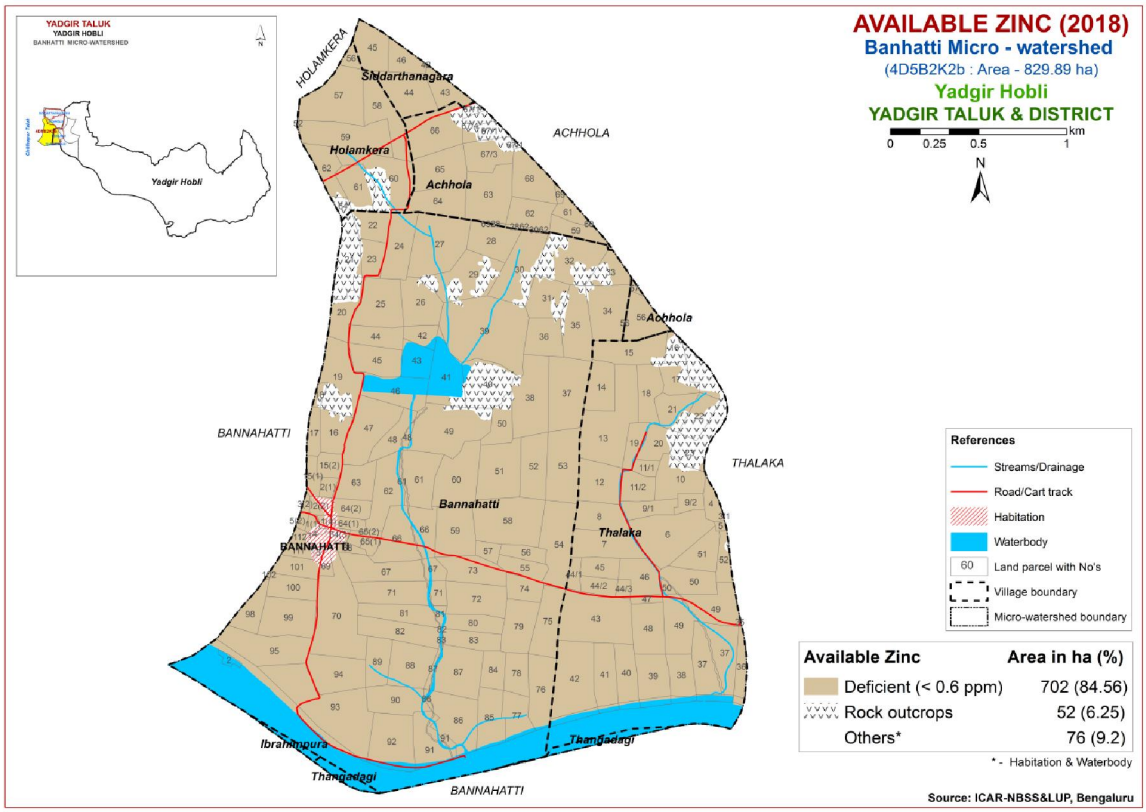

Fig.6.11 Soil Available Zinc map of Banhatti Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Banhatti microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The soil and land characteristics were matched with the crop requirement to arrive at the crop suitability. The soil and land characteristics (Table 7.1) and crop requirements (Table 7.2 to 7.30) are given at the end of the chapter. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3- Marginally Suitable. Order N has two classes, N1-Currently not Suitable and N2-Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 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, 'w' for drainage and 'z' for calcareousness. These limitations are indicated as lower case letters to the Class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 29 major annual and perennial 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-IV.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

An area of about 504 ha (61%) is moderately suitable (Class S2) for growing sorghum and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture, calcareousness and nutrient availability. About 199

ha (24%) is marginally suitable (Class S3) for growing sorghum and are distributed in the eastern, southern and northern part of the microwatershed with moderate limitations of rooting depth, texture, calcareousness and nutrient availability.

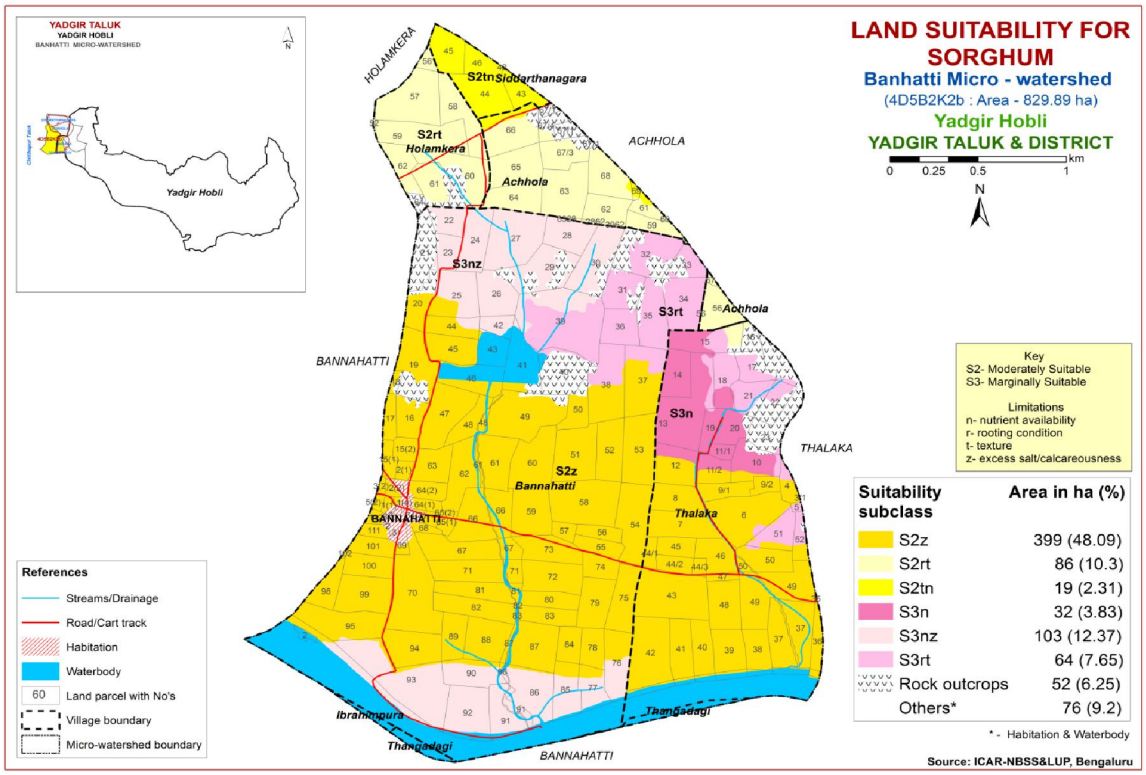

Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

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

An area of about 504 ha (61%) is moderately suitable (Class S2) for growing maize and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture, calcareousness and nutrient availability. About 199 ha (24%) is marginally suitable (Class S3) for growing maize and are distributed in the eastern, southern and northern part of the microwatershed with moderate limitations of rooting depth, texture, calcareousness and nutrient availability.

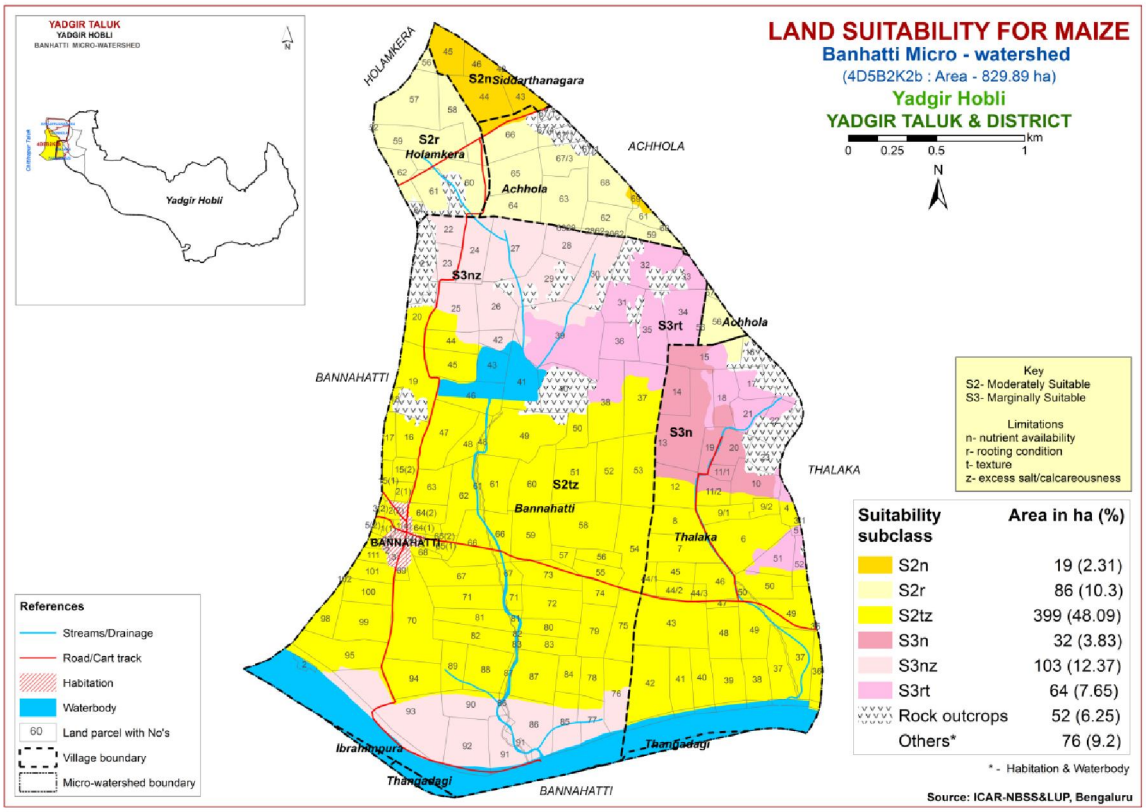

Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

An area of about 504 ha (61%) is moderately suitable (Class S2) for growing bajra and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture, calcareousness and nutrient availability. About 199 ha (24%) is marginally suitable (Class S3) for growing bajra and are distributed in the eastern, southern and northern part of the microwatershed with moderate limitations of rooting depth, calcareousness and nutrient availability.

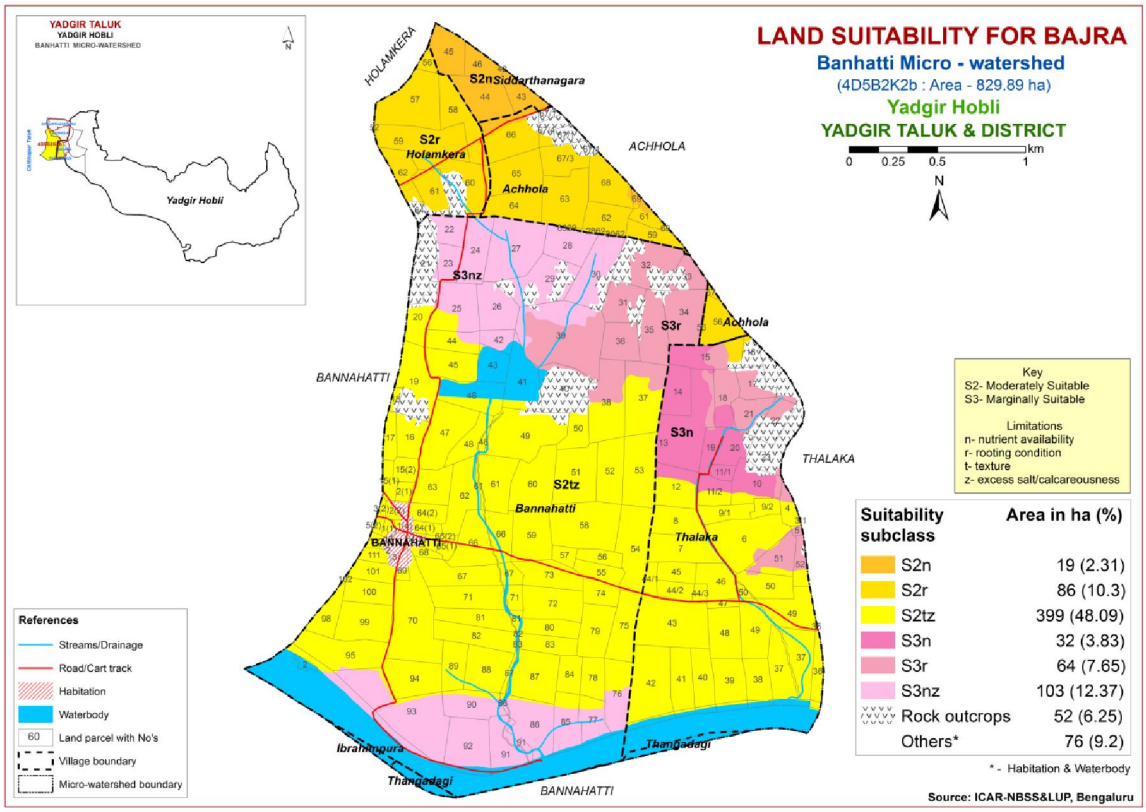

Fig. 7.3 Land Suitability map of Bajra

7.4 Land Suitability for Groundnut (*Arachis hypogaea*)

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

An area of about 86 ha (10%) is moderately suitable (Class S2) for growing groundnut and are distributed in the northern and northwestern part of the microwatershed. They have minor limitation of rooting depth. An area of about 482 ha (58%) is marginally suitable (Class S3) for growing groundnut and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, calcareousness, nutrient availability and texture. About 134 ha (16%) is currently not suitable (Class N1) for growing groundnut and are distributed in the eastern, northern and southern part of the microwatershed with severe limitation of nutrient availability.

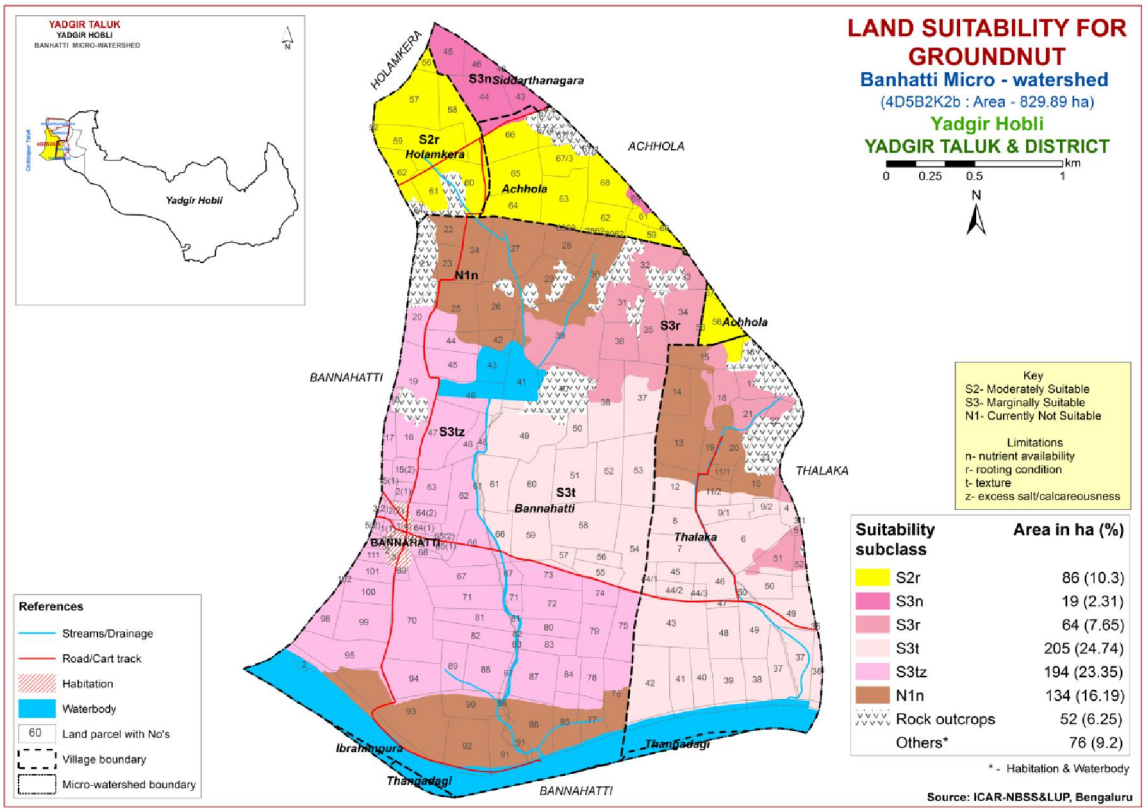

Fig. 7.4 Land Suitability map of Groundnut

7.5 Land Suitability for Sunflower (*Helianthus annus*)

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

An area of about 399 ha (48%) is moderately suitable (Class S2) for sunflower and are distributed in the major part of the microwatershed. They have minor limitation of calcareousness. An area of about 105 ha (13%) is marginally suitable (Class S3) for growing sunflower and are distributed in the northern and northwestern part of the microwatershed. They have moderate limitations of nutrient availability and rooting depth. About 198 ha (24%) is currently not suitable (Class N1) for growing sunflower and are distributed in the eastern, northern and southern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

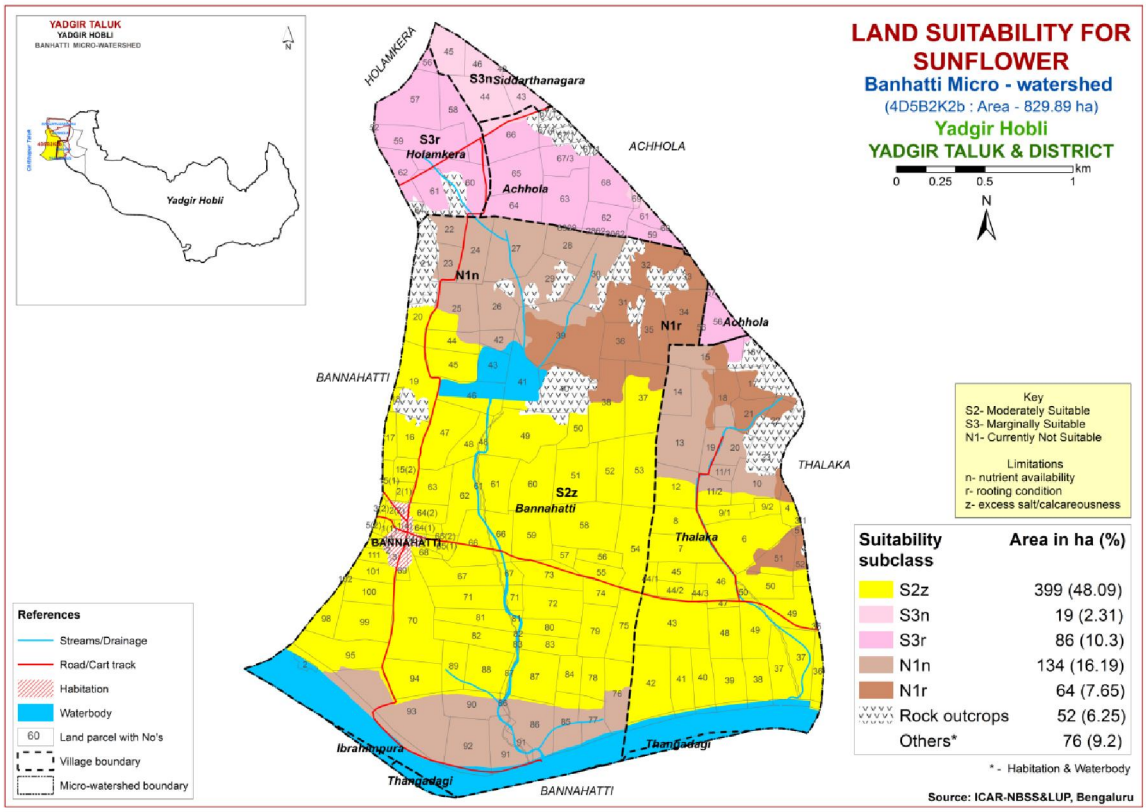

Fig. 7.5 Land Suitability map of Sunflower

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

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

An area of about 418 ha (50%) is moderately suitable (Class S2) for redgram and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture, nutrient availability and calcareousness. An area of about 221 ha (27%) is marginally suitable (Class S3) for growing redgram and are distributed in the eastern, northern, northwestern and southern part of the microwatershed. They have moderate limitations of rooting depth, nutrient availability and calcareousness. About 64 ha (8%) is currently not suitable (Class N1) for growing redgram and are distributed in the eastern and northern part of the microwatershed with severe limitation of rooting depth.

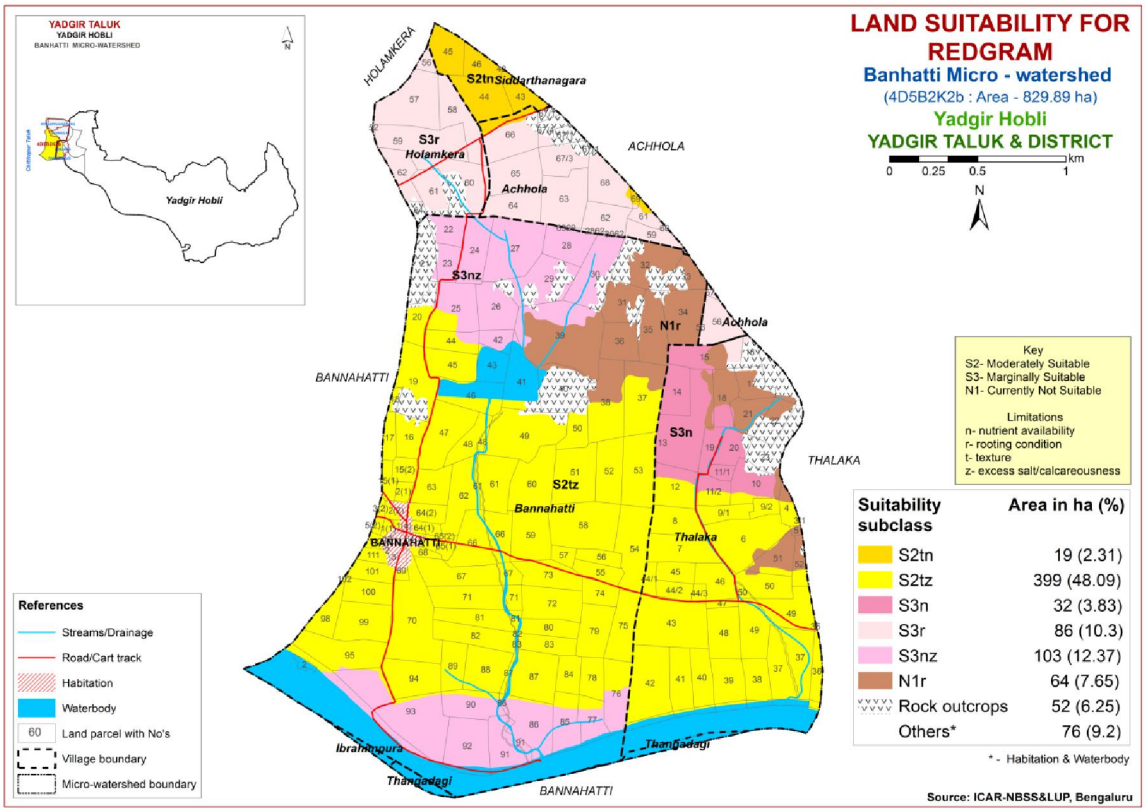

Fig. 7.6 Land Suitability map of Redgram

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

Bengal gram is one of the most important pulse crop grown in about 9.39 lakh ha area in Bijapur, Raichur, Kalaburgi, Dharwad, Belgaum and Bellary districts. The crop requirements for growing Bengal gram (Table 7.8) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Bengal gram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.7.

An area of about 399 ha (48%) is moderately suitable (Class S2) for bengalgram and are distributed in the major part of the microwatershed. They have minor limitation of calcareousness. Marginally suitable lands (Class S3) for growing bengal gram occupy an area of about 240 ha (29%) and occur in the eastern, northern, northwestern and southern part of the microwatershed. They have moderate limitations of nutrient availability, calcareousness and texture. About 64 ha (8%) is currently not suitable (Class N1) for growing bengalgram and are distributed in the eastern and northern part of the microwatershed with severe limitation of rooting depth.

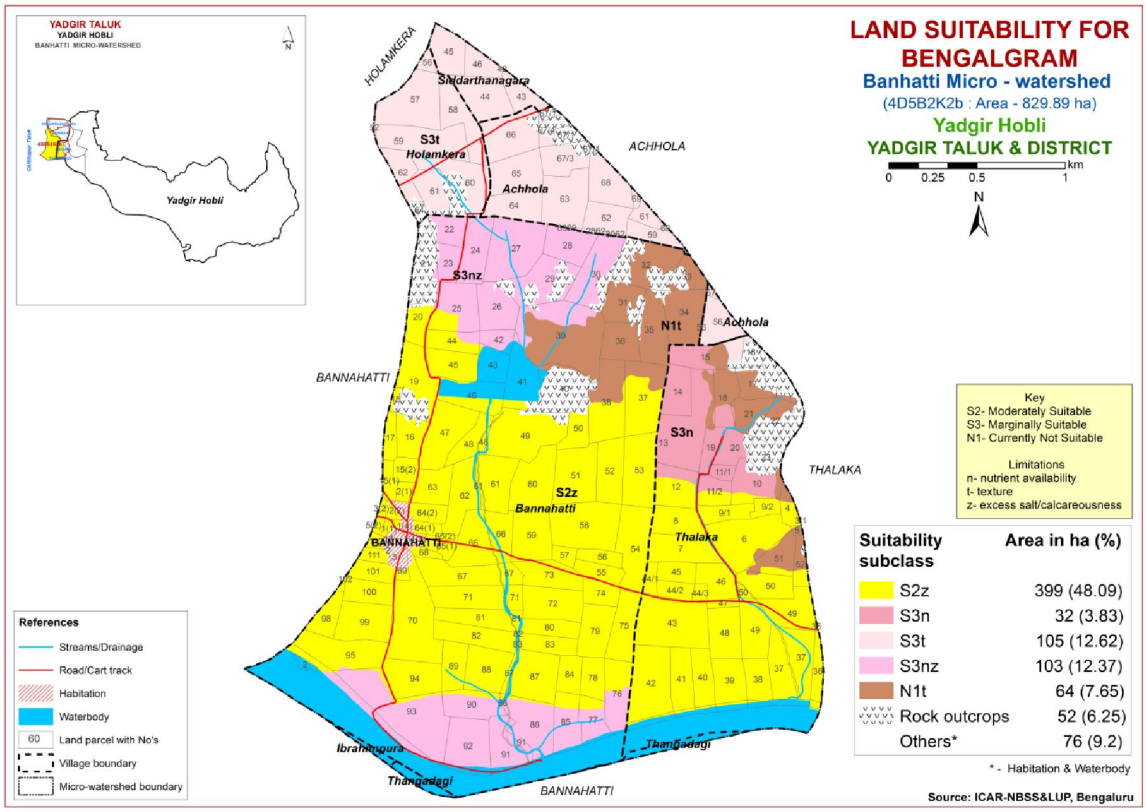

Fig. 7.7 Land Suitability map of Bengal gram.

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

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

An area of about 399 ha (48%) is moderately suitable (Class S2) for cotton and are distributed in the major part of the microwatershed. They have minor limitation of calcareousness. Marginally suitable lands (Class S3) for growing cotton occupy an area of about 240 ha (29%) and occur in the eastern, northern, northwestern and southern part of the microwatershed. They have moderate limitations of nutrient availability, calcareousness and texture. About 64 ha (8%) is currently not suitable (Class N1) for growing cotton and are distributed in the eastern, southeastern and northern part of the microwatershed with severe limitation of texture.

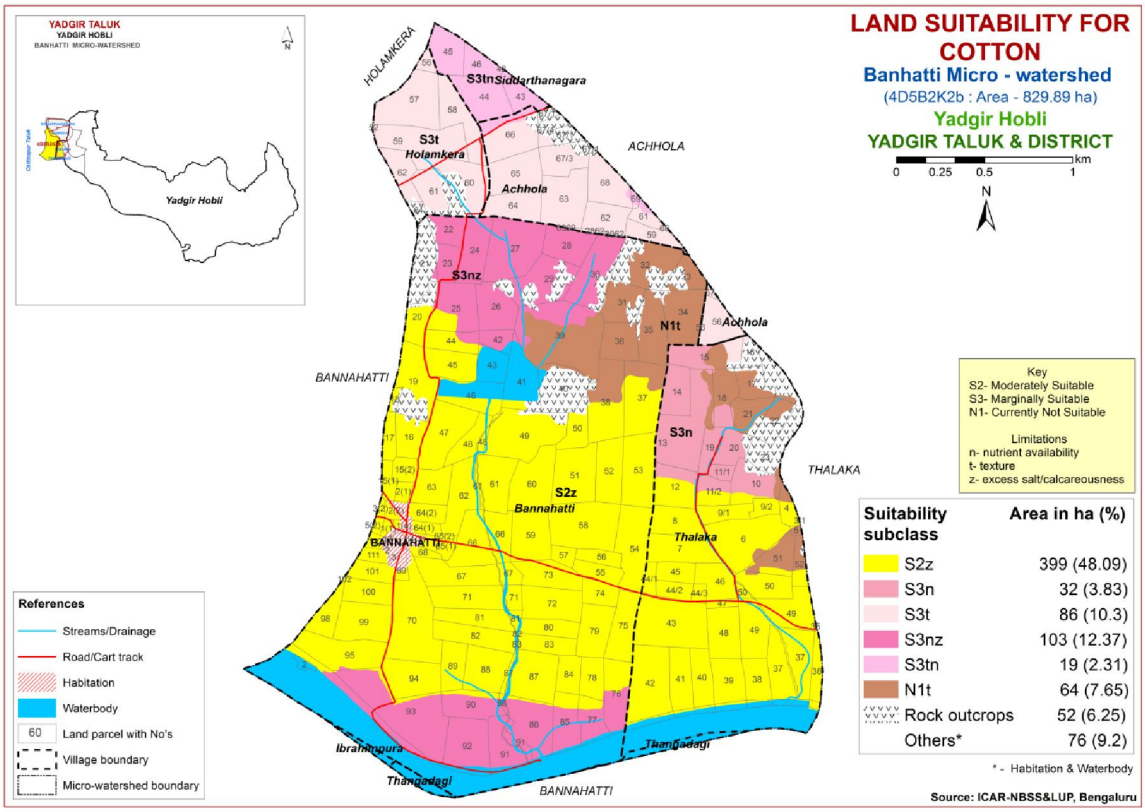

Fig. 7.8 Land Suitability map of Cotton

7.9 Land Suitability for Chilli (*Capsicum annuum)*

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

An area of about 485 ha (58%) is moderately suitable (Class S2) for growing chilli and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. About 83 ha (10%) is marginally suitable (Class S3) for growing chilli and are distributed in the eastern, northern and southeastern part of the microwatershed with moderate limitations of rooting depth and nutrient availability. About 134 ha (16%) is currently not suitable (Class N1) for growing chilli and are distributed in the eastern, northern and southern part of the microwatershed with severe limitation of nutrient availability.

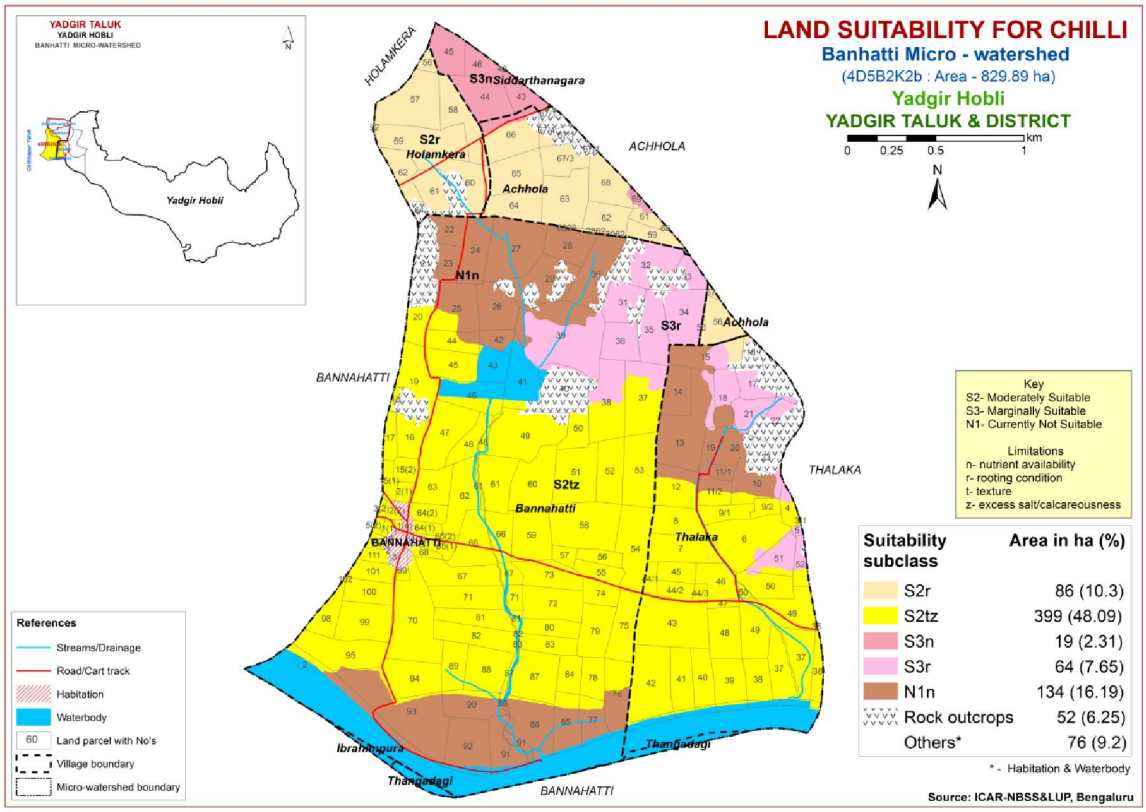

Fig 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato *(Lycopersicon esculentum)*

Tomato is one of the most important vegetable crop grown in about 0.61 lakh ha covering almost all the district of the state. The crop requirements for growing tomato (Table 7.11) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tomato was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.10.

An area of about 86 ha (10%) is moderately suitable (Class S2) for growing tomato and are distributed in the northern and northwestern part of the microwatershed. They have minor limitation of rooting depth. An area of about 482 ha (58%) is marginally suitable (Class S3) for growing tomato and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, nutrient availability and texture. About 134 ha (16%) is currently not suitable (Class N1) for growing tomato and are distributed in the eastern, northern and southern part of the microwatershed with severe limitation of nutrient availability.

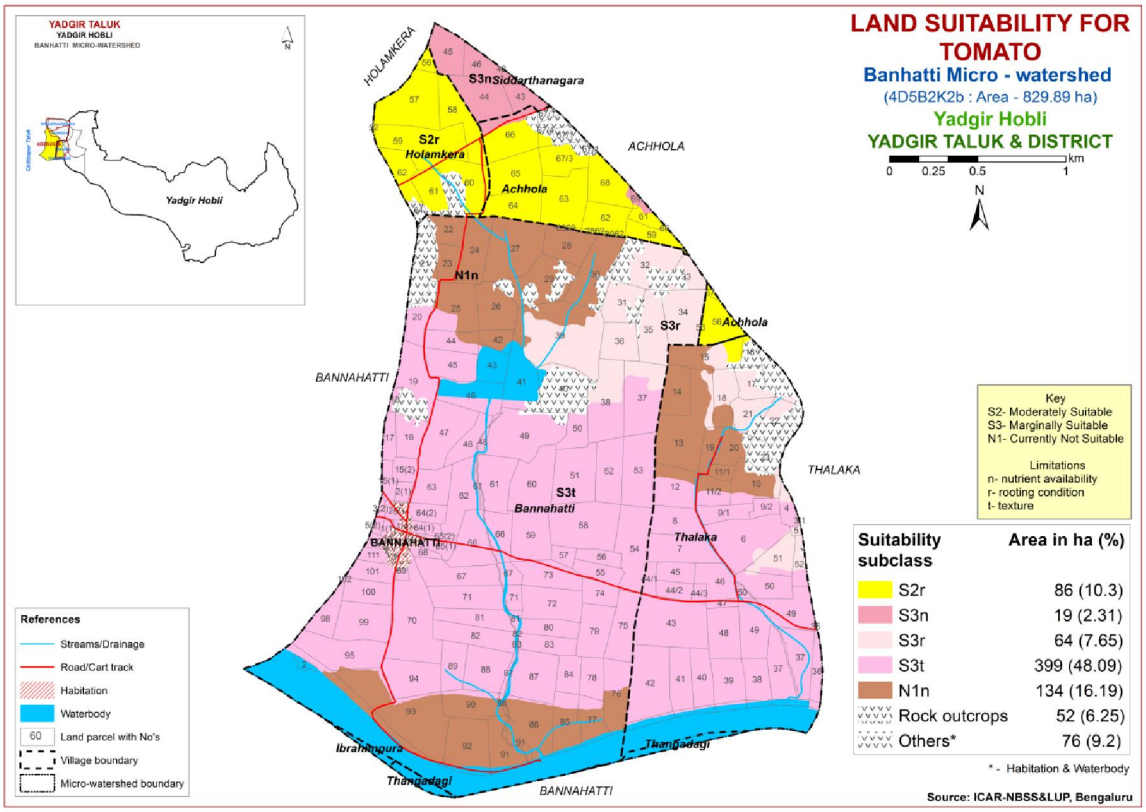

Fig 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Brinjal (*Solanum melongena*)

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

An area of about 86 ha (10%) is moderately suitable (Class S2) for growing brinjal and are distributed in the northern and northwestern part of the microwatershed. They have minor limitation of rooting depth. An area of about 482 ha (58%) is marginally suitable (Class S3) for growing brinjal and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, nutrient availability and texture. About 134 ha (16%) is currently not suitable (Class N1) for growing brinjal and are distributed in the eastern, northern and southern part of the microwatershed with severe limitation of nutrient availability.

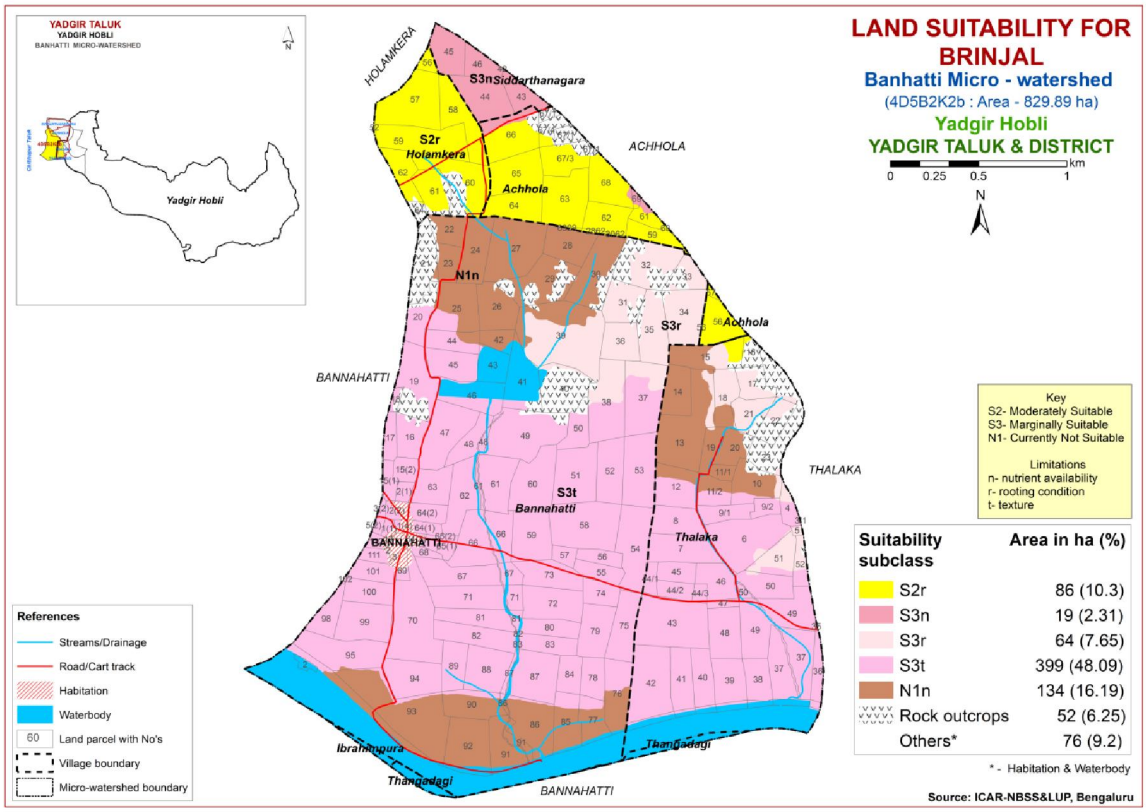

Fig 7.11 Land Suitability map of Brinjal

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

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

An area of about 86 ha (10%) is moderately suitable (Class S2) for growing onion and are distributed in the northern and northwestern part of the microwatershed. They have minor limitation of rooting depth. An area of about 463 ha (56%) is marginally suitable (Class S3) for growing onion and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and texture. About 154 ha (19%) is currently not suitable (Class N1) for growing onion and are distributed in the eastern, northern, northwestern and southern part of the microwatershed with severe limitation of nutrient availability.

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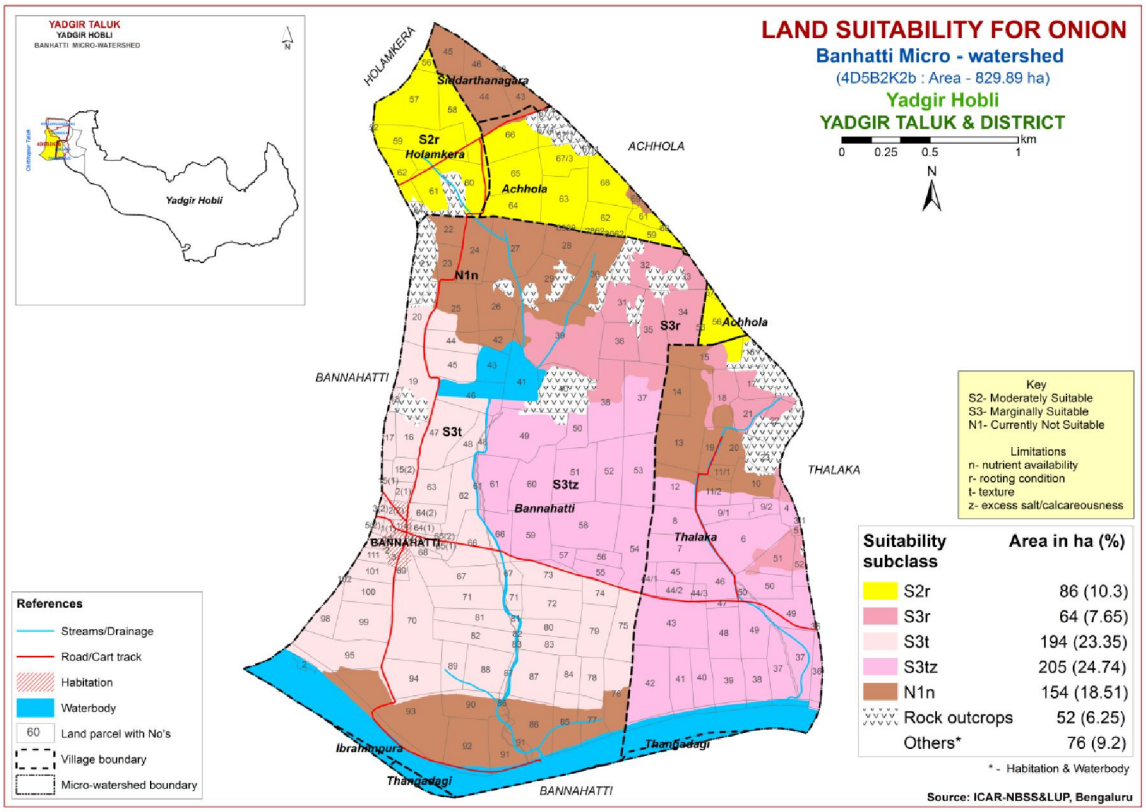

Fig 7.12 Land Suitability map of Onion

7.13 Land Suitability for Bhendi (*Abelmoschus esculentus*)

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

An area of about 485 ha (58%) is moderately suitable (Class S2) for growing bhendi and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. About 83 ha (10%) is marginally suitable (Class S3) for growing bhendi and are distributed in the eastern, northern, northeastern part of the microwatershed with moderate limitations of rooting depth and nutrient availability. About 134 ha (16%) is currently not suitable (Class N1) for growing bhendi and are distributed in the eastern, northern and southern part of the microwatershed with severe limitation of nutrient availability.

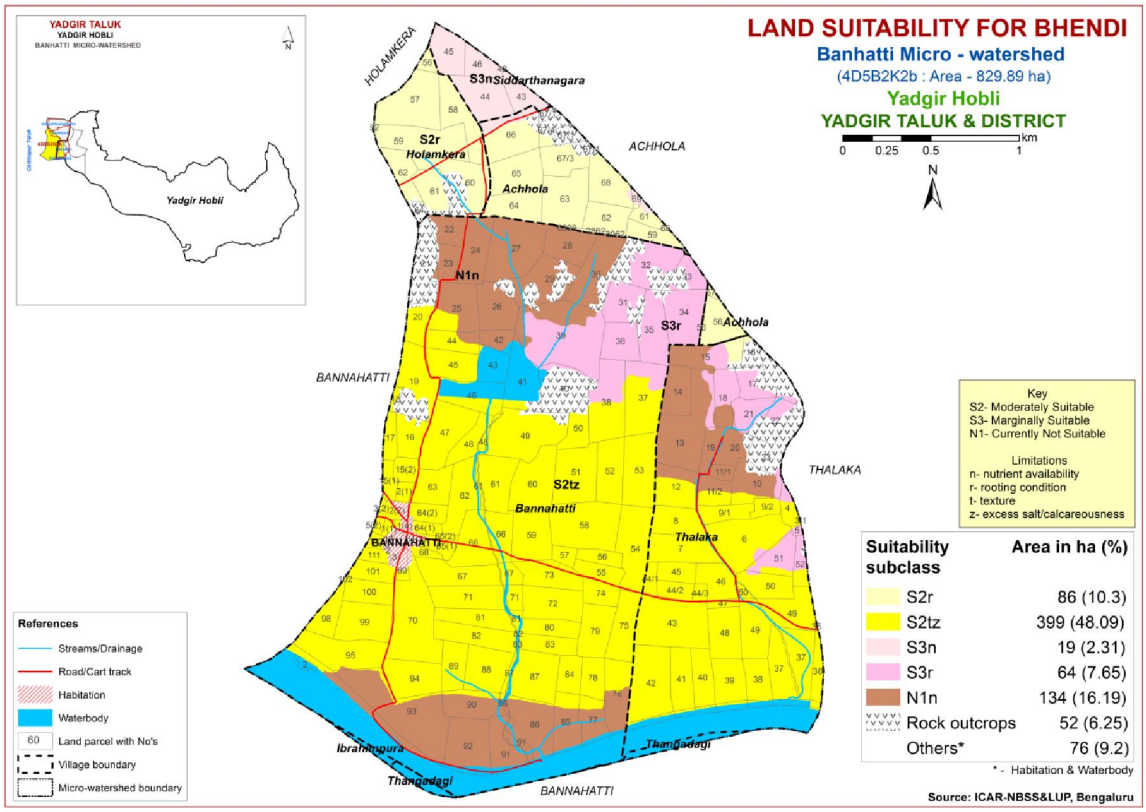

Fig 7.13 Land Suitability map of Bhendi

7.14 Land Suitability for Drumstick (*Moringa oleifera*)

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

An area of about 485 ha (58%) is marginally suitable (Class S3) for growing drumstick and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth and calcareousness. About 218 ha (26%) is currently not suitable (Class N1) for growing drumstick and are distributed in the southern, northern and eastern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

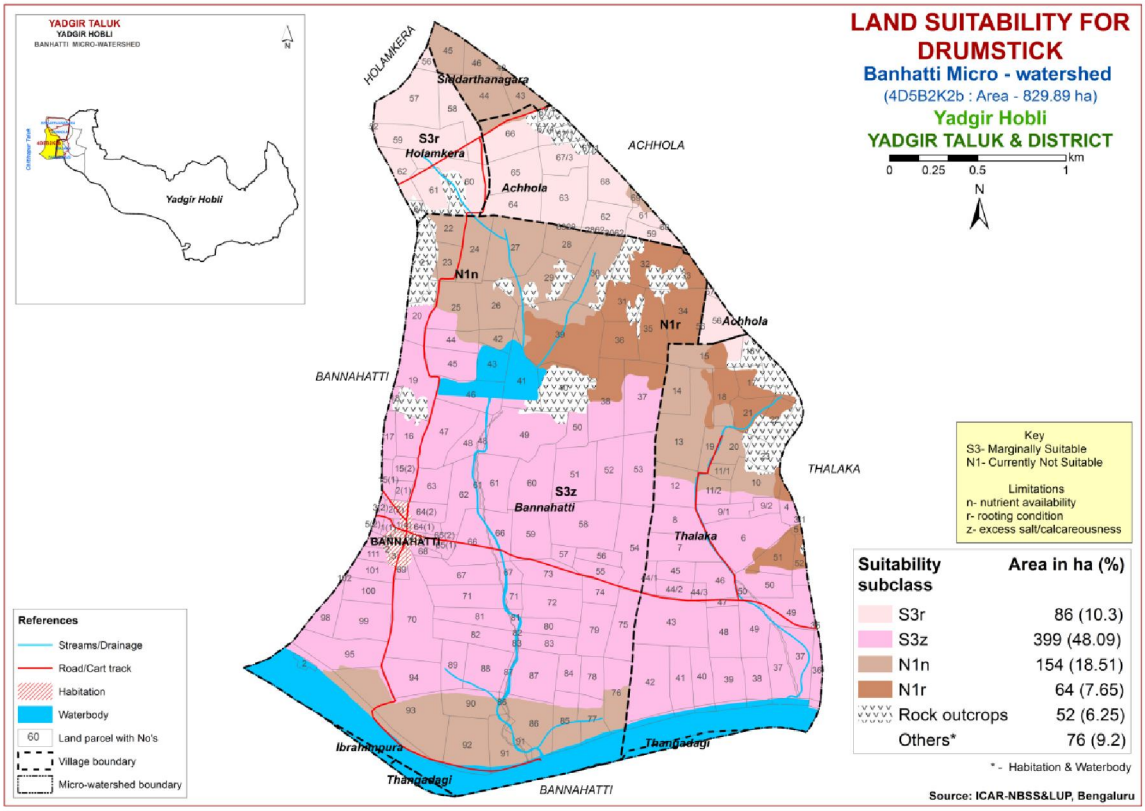

Fig 7.14 Land Suitability map of Drumstick

7.15 Land Suitability for Mango (*Mangifera indica*)

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

Marginally suitable (Class S3) lands for growing mango cover an area of about 418 ha (50%) and occur in the major part of the microwatershed. They have moderate limitations of nutrient availability and texture. Currently not suitable (Class N1) lands for growing mango occupy an area about 283 ha (34%) and occur in the eastern, northern, southern and northwestern part of the microwatershed. They have severe limitations of rooting depth and nutrient availability.

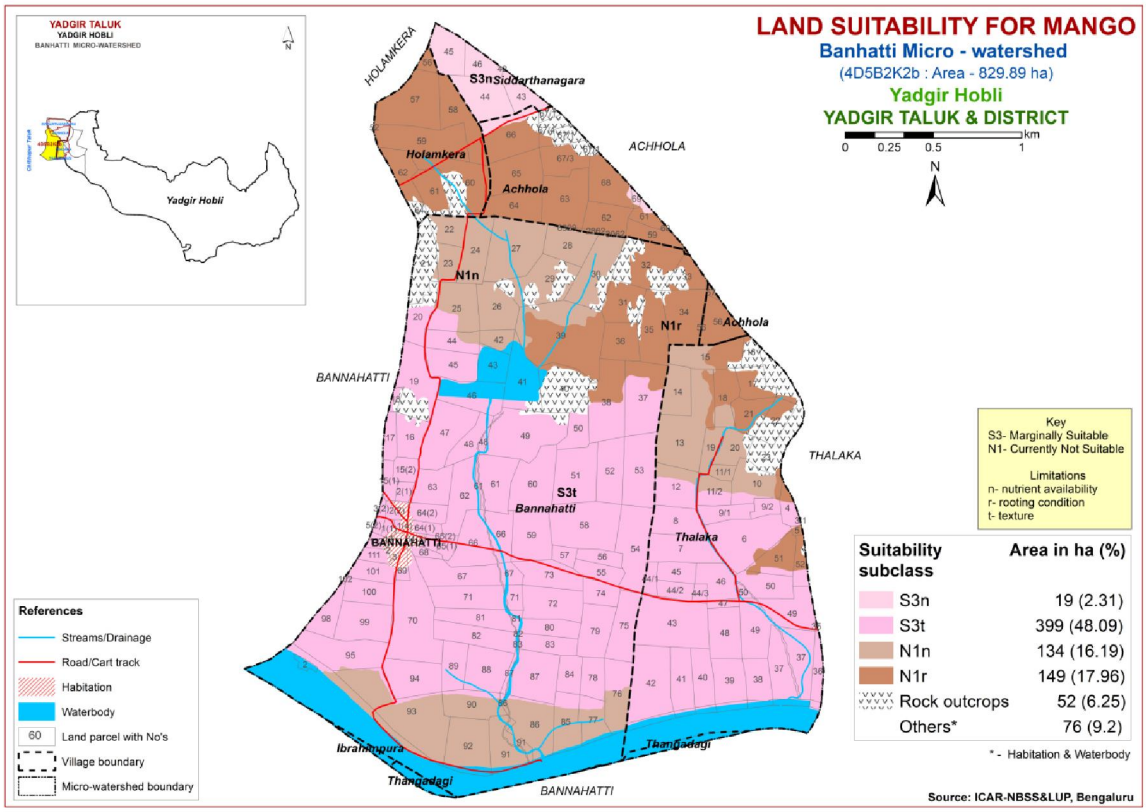

Fig. 7.15 Land Suitability map of Mango

7.16 Land Suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in an area of 0.06 lakh ha in almost all the districts of the State. The crop requirements (Table 7.17) for growing guava were matched with the soil-site characteristics (7.1) and a land suitability map for growing guava was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.16.

An area of about 485 ha (58%) is marginally suitable (Class S3) for growing guava and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, texture and calcareousness. About 218 ha (26%) is currently not suitable (Class N1) for growing guava and are distributed in the southern, northern, southeastern and eastern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

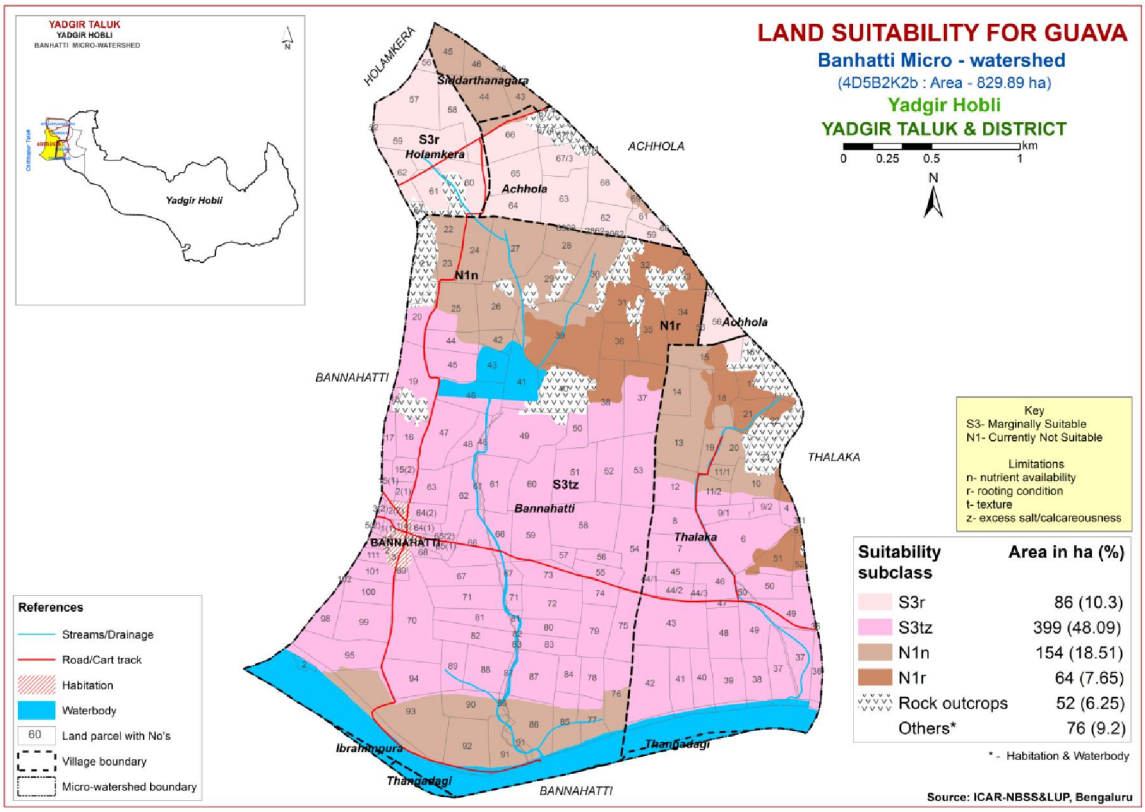

Fig. 7.16 Land Suitability map of Guava

7.17 Land Suitability for Sapota (*Manilkara zapota*)

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

An area of about 504 ha (61%) is marginally suitable (Class S3) for growing sapota and are distributed in the major part of the microwatershed. They have moderate limitations of texture, rooting depth and nutrient availability. About 198 ha (24%) is currently not suitable (Class N1) for growing sapota and are distributed in the southern, northern, northwestern and eastern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

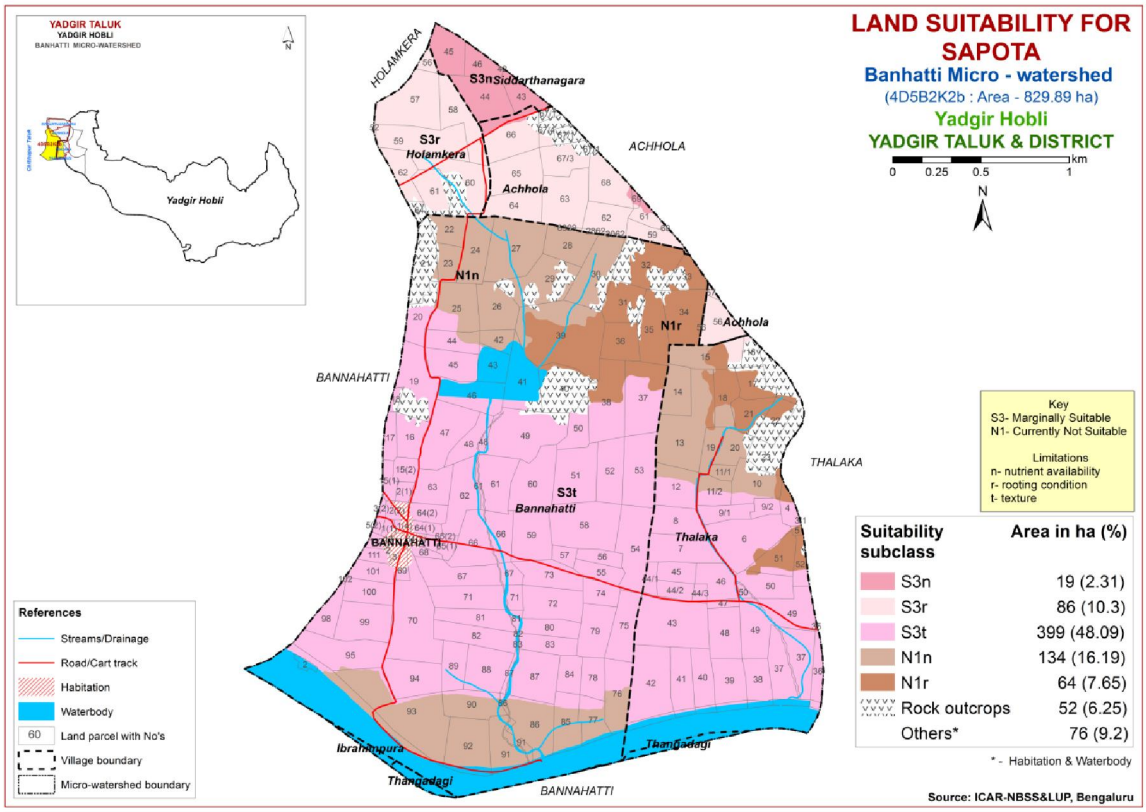

Fig. 7.17 Land Suitability map of Sapota

7.18 Land Suitability for Pomegranate (*Punica granatum*)

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

An area of about 399 ha (48%) is moderately suitable (Class S2) for pomegranate and are distributed in the major part of the microwatershed. They have minor limitations of texture and calcareousness. An area of about 105 ha (13%) is marginally suitable (Class S3) for growing pomegranate and are distributed in the northern and northwestern part of the microwatershed. They have moderate limitations of nutrient availability and rooting depth. About 198 ha (24%) is currently not suitable (Class N1) for growing pomegranate and are distributed in the eastern, northern and southern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

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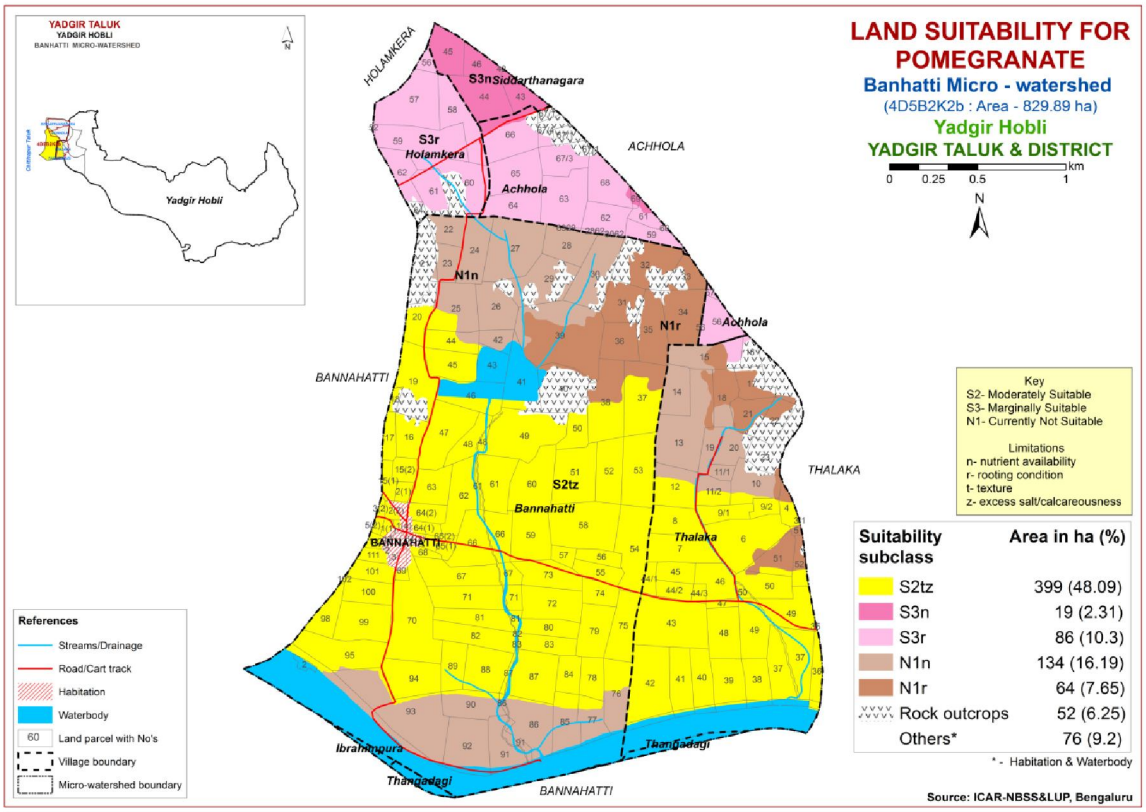

Fig 7.18 Land Suitability map of Pomegranate

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the important fruit crop grown in an area of 3446 ha in almost all the districts of the State. The crop requirements for growing musambi (Table 7.20) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing musambi was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.19.

An area of about 399 ha (48%) is moderately suitable (Class S2) for musambi and are distributed in the major part of the microwatershed. They have minor limitation of calcareousness. An area of about 105 ha (13%) is marginally suitable (Class S3) for growing muasambi and are distributed in the northern and northwestern part of the microwatershed. They have moderate limitations of nutrient availability and rooting depth. About 198 ha (24%) is currently not suitable (Class N1) for growing musambi and are distributed in the eastern, northern and southern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

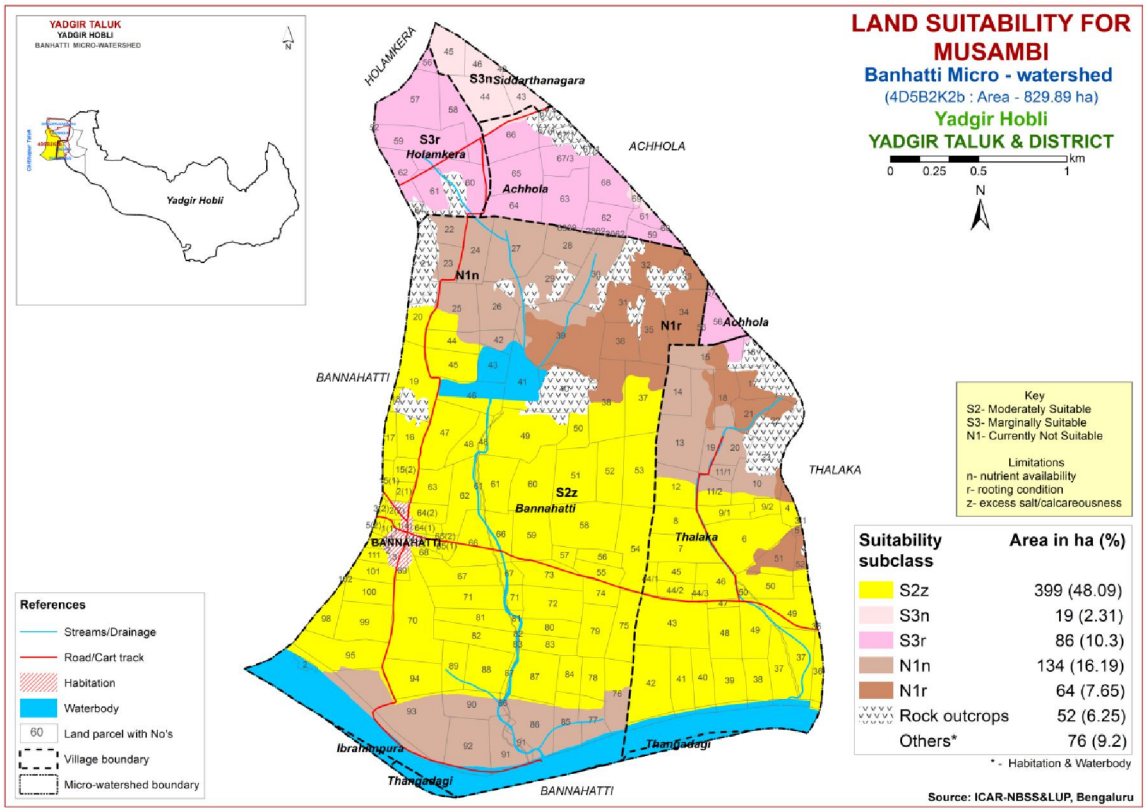

Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

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

An area of about 399 ha (48%) is moderately suitable (Class S2) for lime and are distributed in the major part of the microwatershed. They have minor limitation of calcareousness. An area of about 105 ha (13%) is marginally suitable (Class S3) for growing lime and are distributed in the northern and northwestern part of the microwatershed. They have moderate limitations of nutrient availability and rooting depth. About 198 ha (24%) is currently not suitable (Class N1) for growing lime and are distributed in the eastern, northern and southern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

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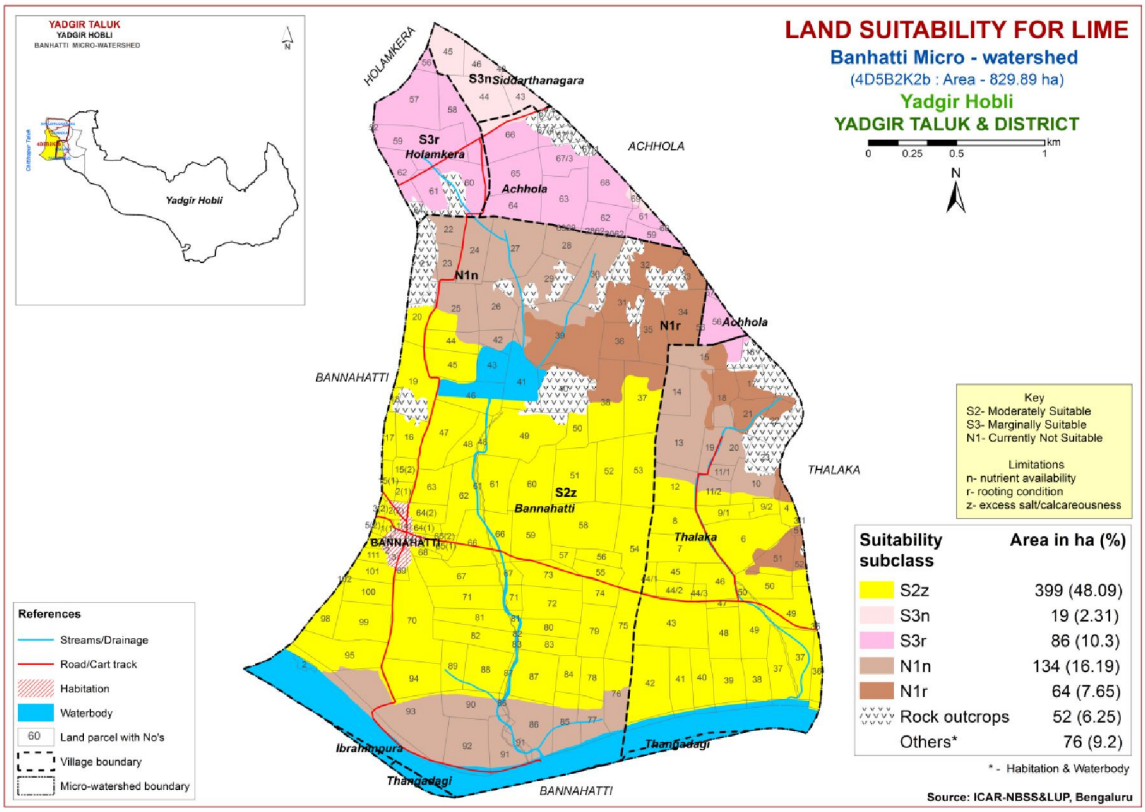


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Amla (*Phyllanthus emblica*)

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

An area of about 86 ha (10%) is moderately suitable (Class S2) for growing amla and are distributed in the northern and northwestern part of the microwatershed. They have minor limitation of rooting depth. An area of about 463 ha (56%) is marginally suitable (Class S3) for growing amla and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and texture. About 154 ha (19%) is currently not suitable (Class N1) for growing amla and are distributed in the eastern, northern, northwestern and southern part of the microwatershed with severe limitation of nutrient availability.

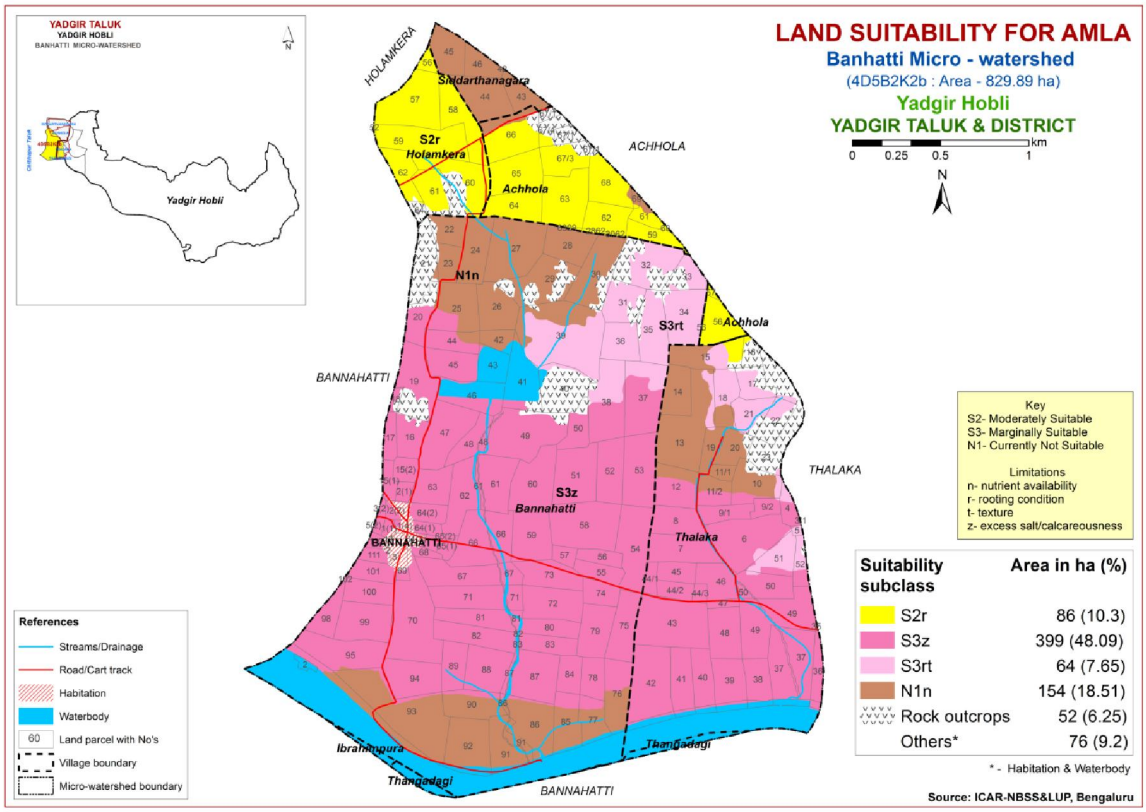


Fig. 7.21 Land Suitability map of Amla

7.22 Land Suitability for Cashew (*Anacardium occidentale)*

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

Entire cultivated area of about 702 ha (85%) is currently not suitable (Class N1) for growing cashew. They have severe limitations of texture and nutrient availability.

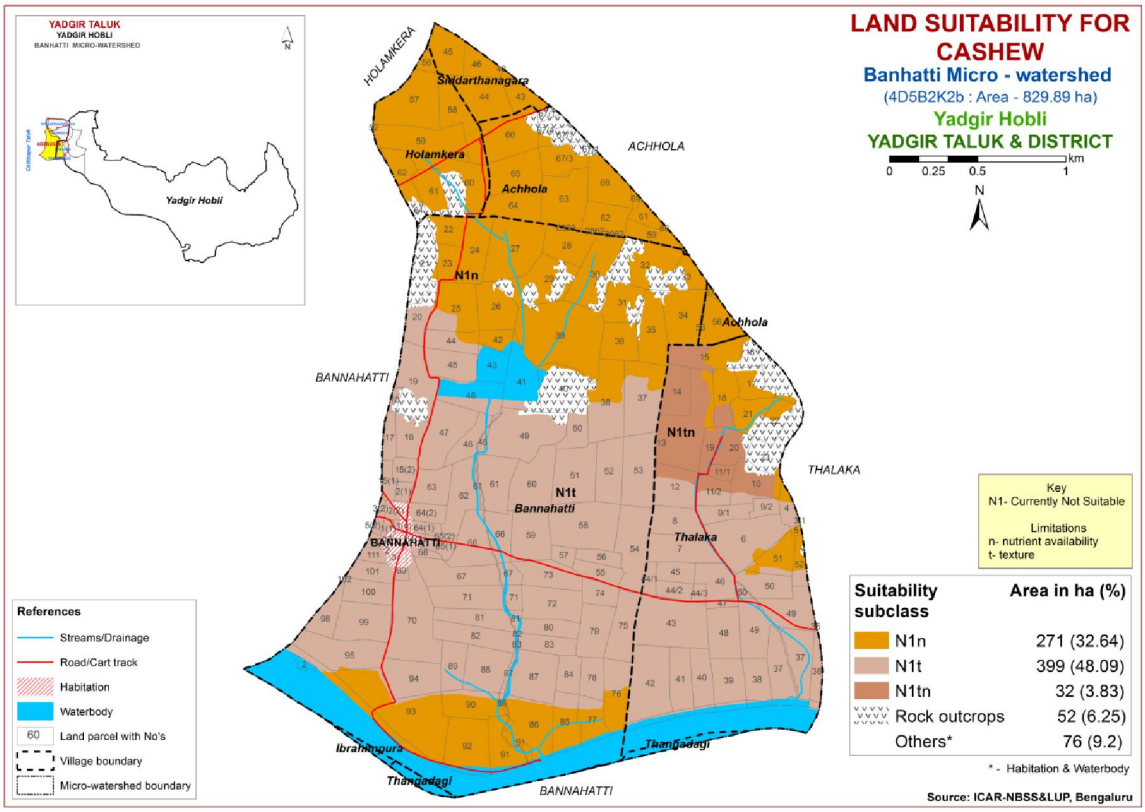


Fig. 7.22 Land Suitability map of Cashew

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

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

An area of about 485 ha (58%) is marginally suitable (Class S3) for growing jackfruit and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. About 218 ha (26%) is currently not suitable (Class N1) for growing jackfruit and are distributed in the southern, northern and eastern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

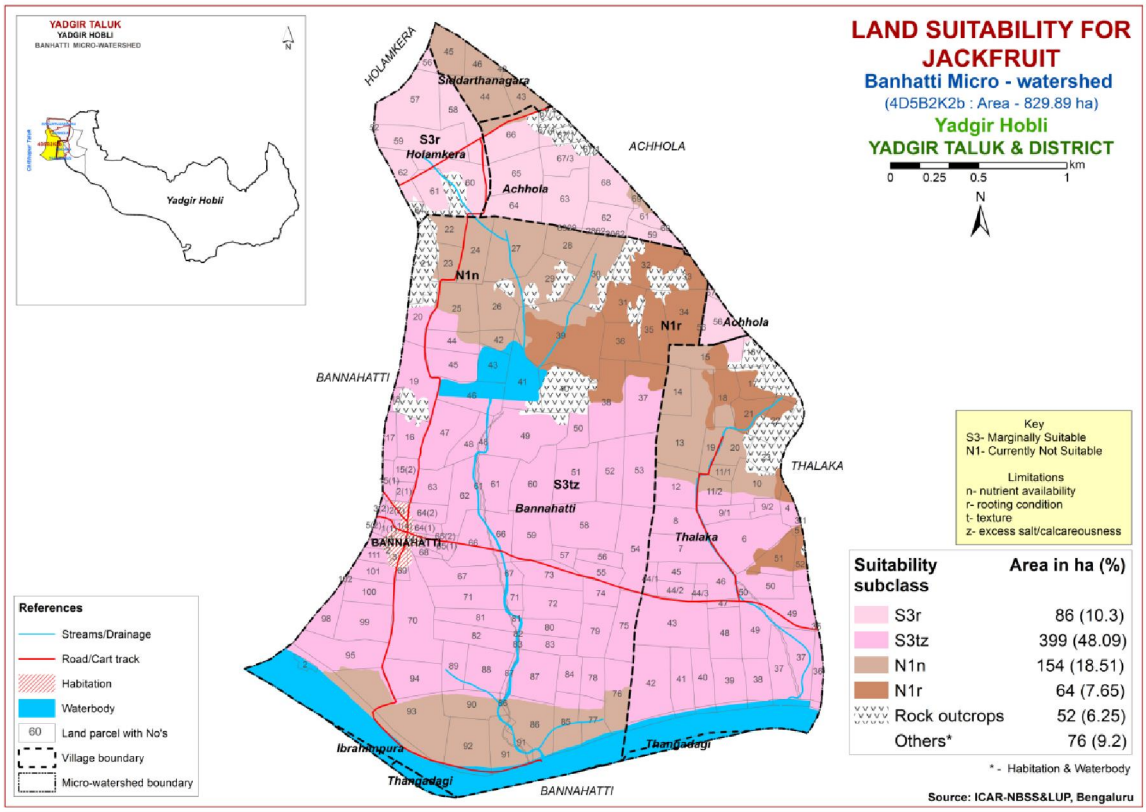


Fig. 7.23 Land Suitability map of Jackfruit

7.24 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun (Table 25) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jamun was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.24.

An area of about 485 ha (58%) is marginally suitable (Class S3) for growing jamun and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth and calcareousness. About 218 ha (26%) is currently not suitable (Class N1) for growing jamun and are distributed in the southern, northern, northwestern and eastern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

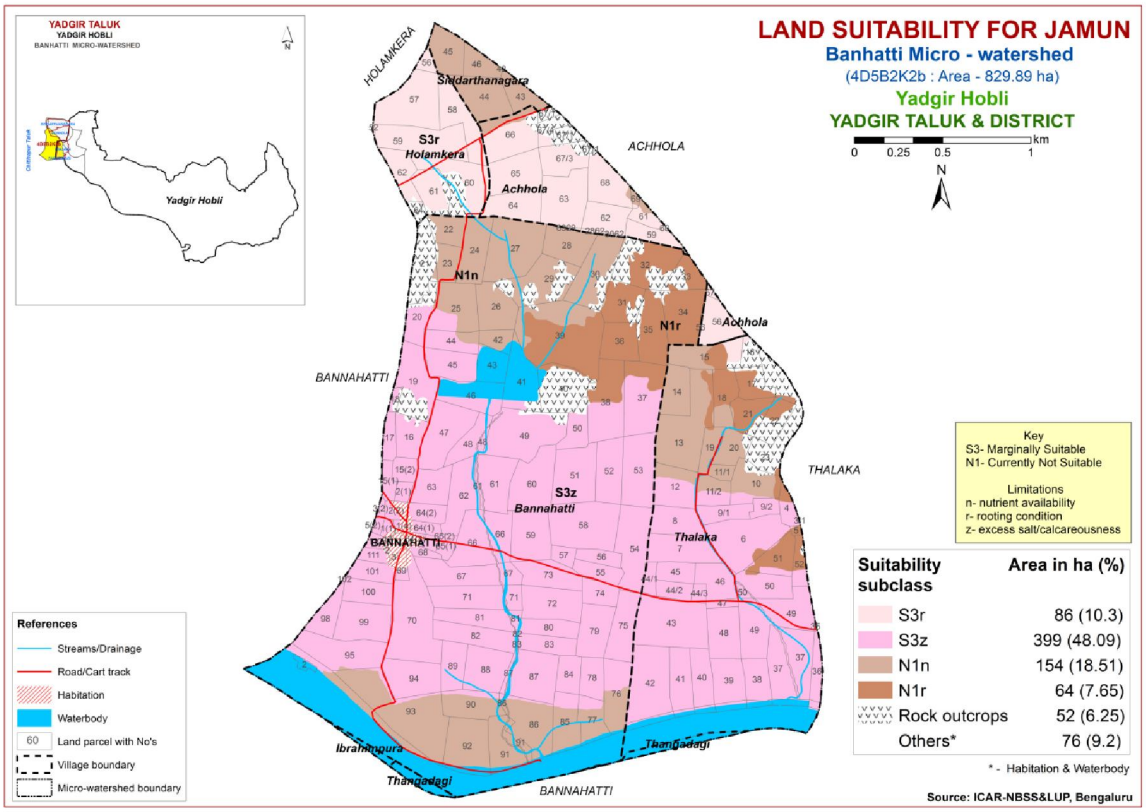


Fig. 7.24 Land Suitability map of Jamun

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

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing custard apple (Table7.26) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

An area of about 485 ha (58%) is moderately suitable (Class S2) for growing custard apple and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth and calcareousness. About 83 ha (10%) is marginally suitable (Class S3) for growing custard apple and are distributed in the eastern, northern, southeastern part of the microwatershed with moderate limitations of rooting depth and nutrient availability. About 134 ha (16%) is currently not suitable (Class N1) for growing custard apple and are distributed in the eastern, northern and southern part of the microwatershed with severe limitation of nutrient availability.

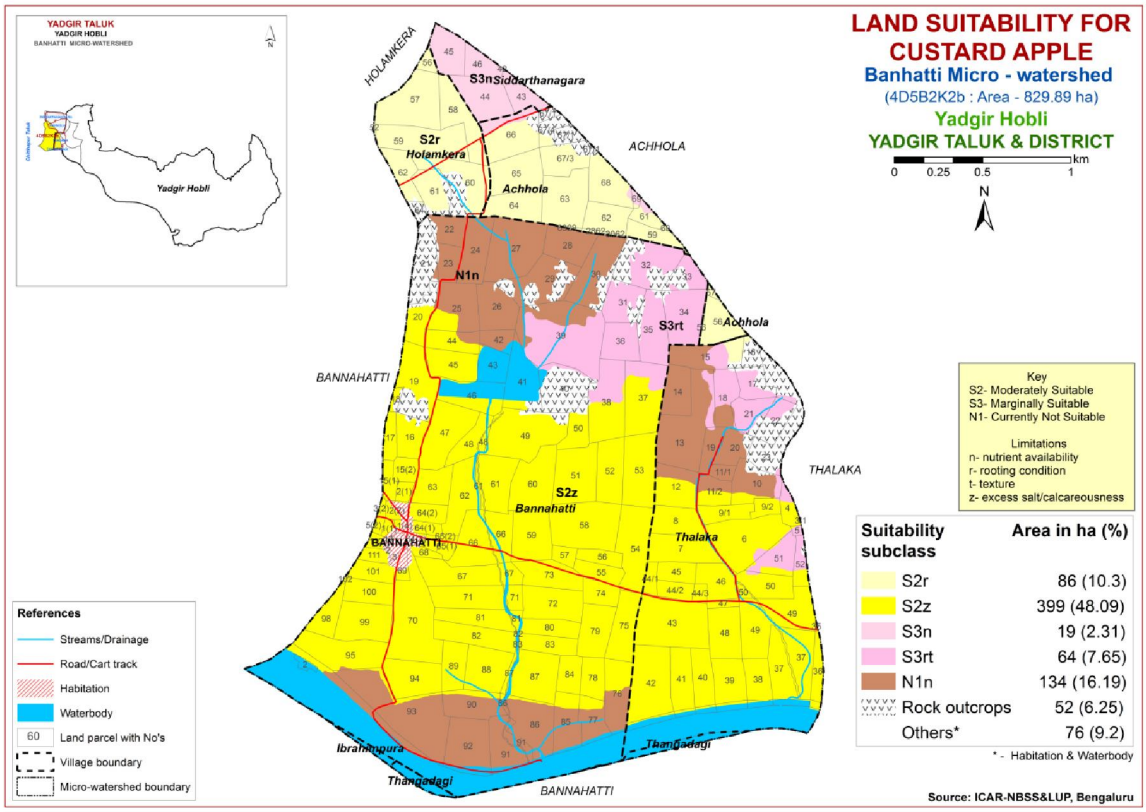


Fig. 7.25 Land Suitability map of Custard Apple

7.26 Land Suitability for Tamarind (*Tamarindus indica*)

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

An area of about 399 ha (48%) is marginally suitable (Class S3) for tamarind and are distributed in the major part of the microwatershed. They have moderate limitation of calcareousness. An area of about 303 ha (36%) is currently not suitable (Class N1) for growing tamarind and are distributed in the northern, eastern, northwestern and southern part of the microwatershed. They have severe limitations of nutrient availability and rooting depth.

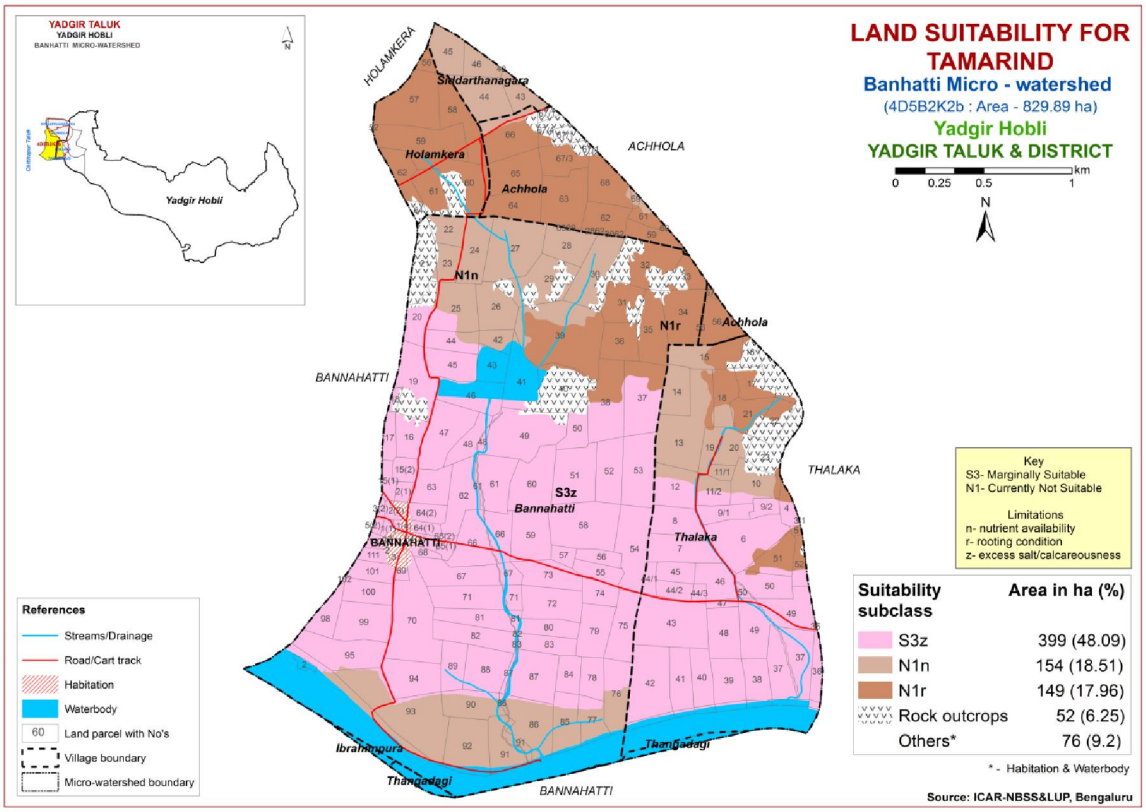


Fig. 7.26 Land Suitability map of Tamarind

7.27 Land Suitability for Mulberry (*Morus nigra*)

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

An area of about 485 ha (58%) is marginally suitable (Class S3) for growing mulberry and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, texture and calcareousness. About 218 ha (26%) is currently not suitable (Class N1) for growing mulberry and are distributed in the southern, northwestern, northern and eastern part of the microwatershed with severe limitations of nutrient availability and rooting depth.

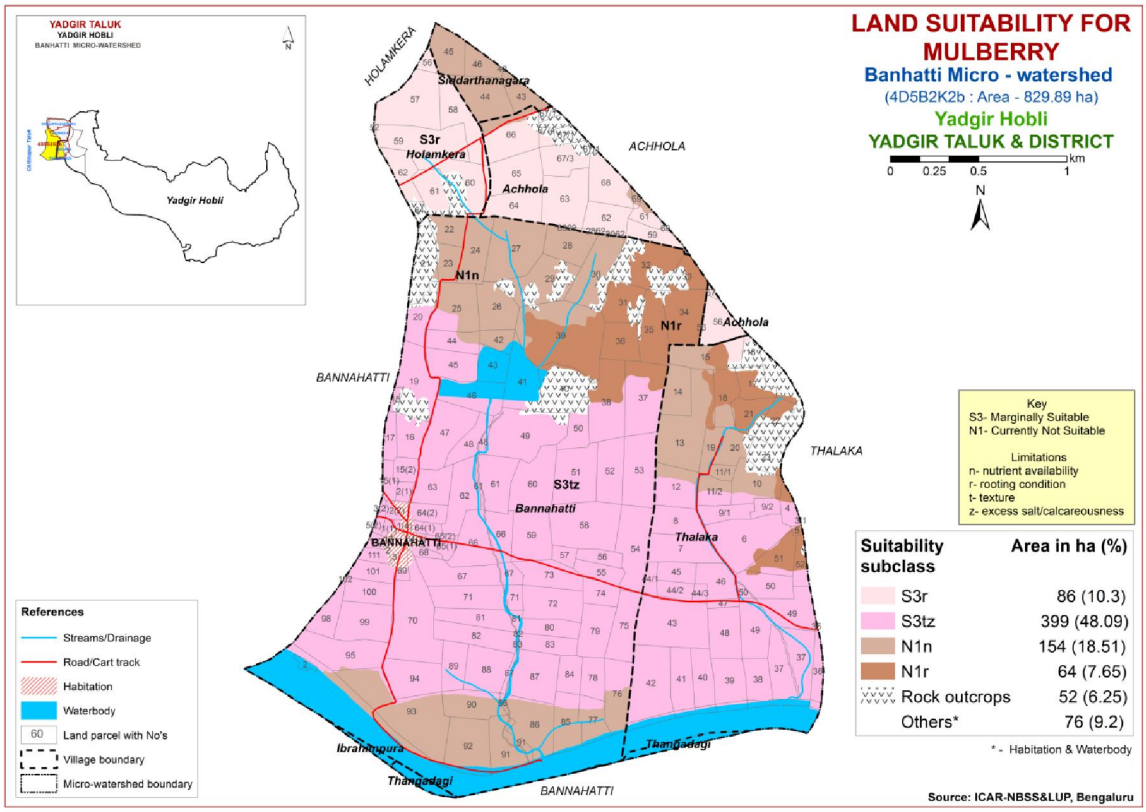


Fig 7.27 Land Suitability map of Mulberry

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

Marigold is one of the most important flower crop grown in an area of 9108 ha in almost all the districts of the State. The crop requirements (Table 7.29) for growing marigold were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.28.

An area of about 485 ha (58%) is moderately suitable (Class S2) for growing marigold and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. About 83 ha (10%) is marginally suitable (Class S3) for growing marigold and are distributed in the eastern, northern and northeastern part of the microwatershed with moderate limitations of rooting depth and nutrient availability. About 134 ha (16%) is currently not suitable (Class N1) for growing marigold and are distributed in the eastern, northern and southern part of the microwatershed with severe limitation of nutrient availability.

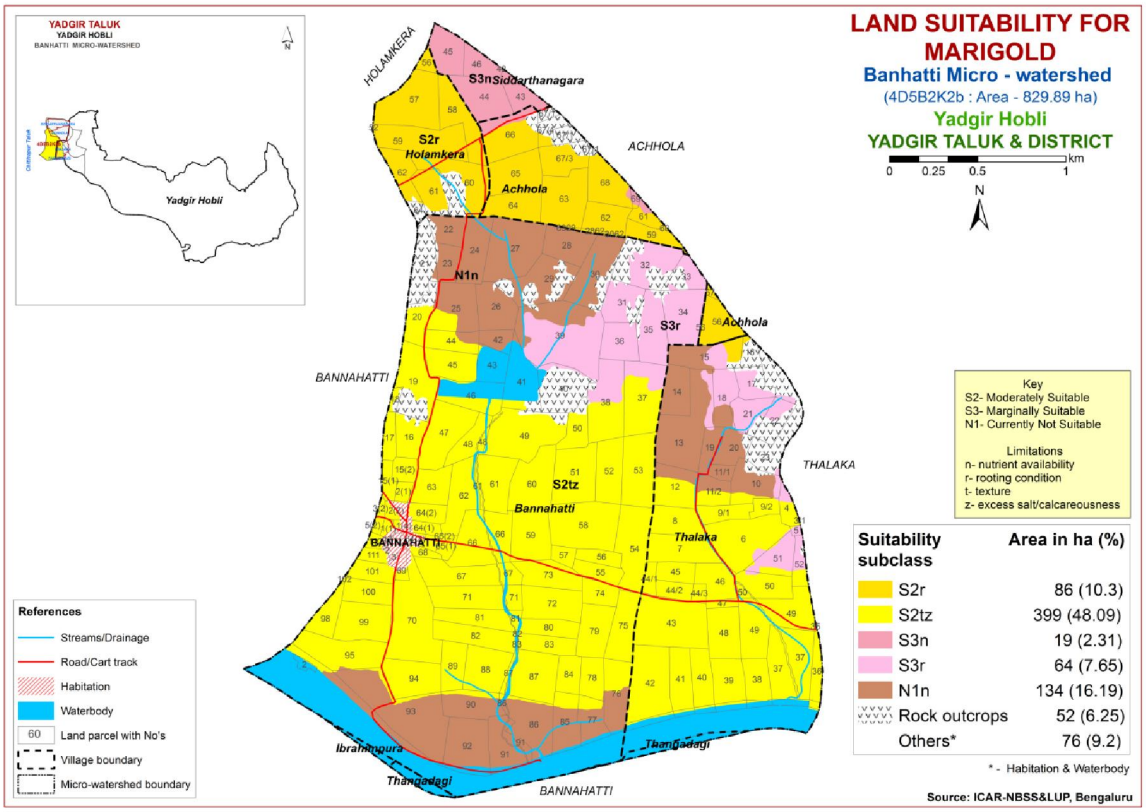


Fig. 7.28 Land Suitability map of Marigold

7.29 Land Suitability for Chrysanthemum (*Dendranthema grandiflora*)

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

An area of about 485 ha (58%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. About 83 ha (10%) is marginally suitable (Class S3) for growing chrysanthemum and are distributed in the eastern, northern, northwestern northeastern part of the microwatershed with moderate limitations of rooting depth and nutrient availability. About 134 ha (16%) is currently not suitable (Class N1) for growing chrysanthemum and are distributed in the eastern, northern and southern part of the microwatershed with severe limitation of nutrient availability.

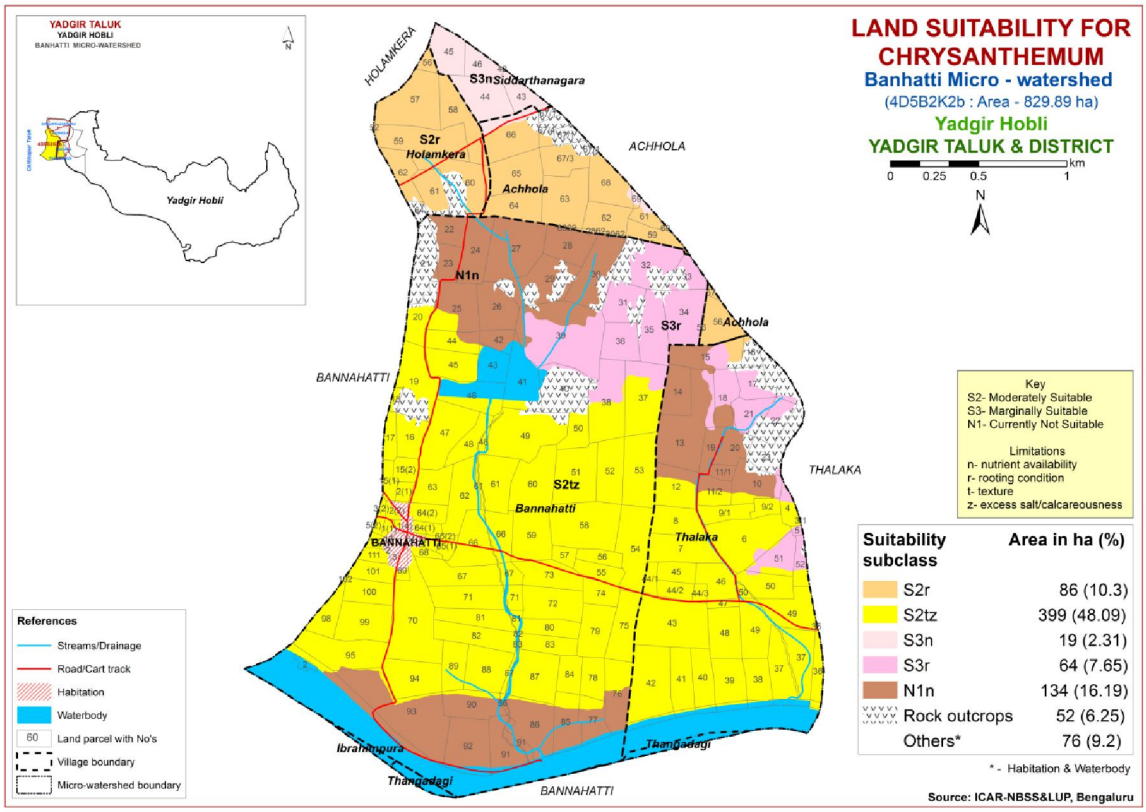


Fig. 7.29 Land Suitability map of Chrysanthemum

Table 7.1 Soil-Site Characteristics of Banhatti Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drain-age Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP (%)	CEC [Cmol (p^{+})kg^{-1}]	BS (%)
					Sur-face	Sub-surface	Surface (%)	Sub-surface (%)								
BDLbB2	866	150	WD	25-50	ls	sl	15-35	<15	<50	1-3	moderate	6.20	0.074	0.20	4.20	93
BDLhB2	866	150	WD	25-50	scl	sl	15-35	<15	<50	1-3	moderate	6.20	0.074	0.20	4.20	93
JNKcB2	866	150	W	50-75	sl	scl	35-60	<15	51-100	1-3	moderate	8.42	0.148	0.18	14.50	100
JNKhB2	866	150	W	50-75	scl	scl	35-60	<15	51-100	1-3	moderate	8.42	0.148	0.18	14.50	100
GWDiB2	866	150	MWD	75-100	sc	scl	15-35	<15	101-150	1-3	moderate	9.89	0.74	17.40	8.35	100
GWDmB2	866	150	MWD	75-100	c	scl	15-35	<15	101-150	1-3	moderate	9.89	0.74	17.40	8.35	100
NGPmB2	866	150	MWD	100-150	c	c	<15	<15	>200	1-3	moderate	7.42	0.24	0.22	67.10	100
NGPmB2g1	866	150	MWD	100-150	c	c	<15	15-35	>200	1-3	moderate	7.42	0.24	0.22	67.10	100
ANRhB2	866	150	MWD	100-150	scl	c	<15	<15	>200	1-3	moderate	10.17	0.365	7.08	19.90	100
MDGcB2	866	150	WD	100-150	sl	scl	<15	<15	>200	1-3	moderate	8.20	0.399	3.08	4.90	100
BMNmA1	866	150	MWD	>150	c	c	<15	<15	>200	0-1	slight	8.20	0.284	0.65	52.70	100
BMNmB2	866	150	MWD	>150	c	c	<15	<15	>200	1-3	moderate	8.20	0.284	0.65	52.70	100

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

Table 7.2 Land suitability criteria for Sorghum

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

Table 7.3 Land suitability criteria for Maize

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

Table 7.4 Land suitability criteria for Bajra

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

Table 7.5 Land suitability criteria for Groundnut

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

Table 7.6 Land suitability criteria for Sunflower

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

Table 7.7 Land suitability criteria for Redgram

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

Table 7.8 Land suitability criteria for Bengal gram

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

Table 7.9 Land suitability criteria for Cotton

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

Table 7.10 Land suitability criteria for Chilli

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

Table 7.11 Land suitability criteria for Tomato

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

Table 7.12 Land suitability criteria for Brinjal

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

Table 7.13 Land suitability criteria for Onion

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

Table 7.14 Land suitability criteria for Bhendi

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

Table 7.15 Land suitability criteria for Drumstick

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

Table 7.16 Land suitability criteria for Mango

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

Table 7.17 Land suitability criteria for Guava

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

Table 7.18 Land suitability criteria for Sapota

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

Table 7.19 Land suitability criteria for Pomegranate

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

Table 7.20 Land suitability criteria for Musambi

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

Table 7.21 Land suitability criteria for Lime

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

Table 7.22 Land suitability criteria for Amla

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

Table 7.23 Land suitability criteria for Cashew

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

Table 7.24 Land suitability criteria for Jackfruit

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

Table 7.25 Land suitability criteria for Jamun

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

Table 7.26 Land suitability criteria for Custard apple

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

Table 7.27 Land suitability criteria for Tamarind

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

Table 7.28 Land suitability criteria for Mulberry

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

Table 7.29 Land suitability criteria for Marigold

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

Table 7.30 Land suitability criteria for Chrysanthemum

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

7.30 Land Management Units (LMUs)

The 12 soil map units identified in Banhatti microwatershed have been grouped into 5 Land Management Units (LMUs) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig. 7.30) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

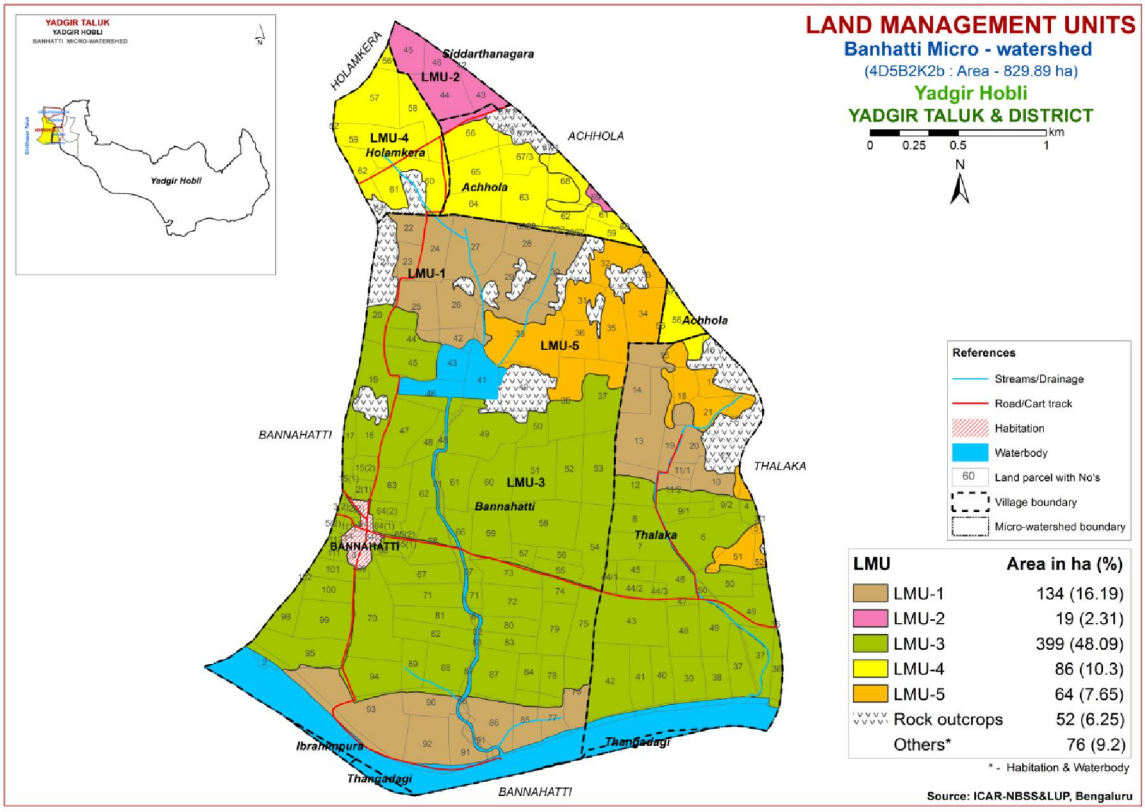


Fig. 7.30 Land Management Units Map Banhatti Microwatershed

The map units that have been grouped into 5 Land Management Units along with brief description of soil and site characteristics are given below.

LMU	Soil map units	Soil and site characteristics
1	53.ANRhB2 35.GWDiB2 127.GWDmB2	Moderately deep to deep, sodic soils (75 - 150cm), 1-3 % slopes non-gravelly (<15%), moderate erosion.
2	57.MDGcB2	Deep, sandy clay loam soils (100-150 cm), 1-3 % slopes, non-gravelly (<15%), moderate erosion.
3	159.BMNmA1 62.BMNmB2 49.NGPmB2 146.NGPmB2g1	Deep to very deep, black calcareous clay soils (100->150 cm), 0- 3% slopes, non- gravelly to gravelly (<15-35%), slight to moderate erosion.
4	20.JNKcB2 110.JNKhB2	Moderately shallow, sandy clay loam soils (50-75 cm), 1-3 % slopes, non-gravelly (<15%), moderate erosion.
5	2.BDLbB2 4.BDLhB2	Shallow, sandy loam soils (25-50 cm), 1-3 % slopes, non-gravelly (<15%), moderate erosion.

7.31 Proposed Crop Plan for Banhatti Microwatershed

After assessing the land suitability for the 29 crops, the Proposed Crop Plan has been prepared for the 5 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 29 crops. The resultant proposed crop plan is presented below in Table 7.31.

Table 7.31 Proposed Crop Plan for Banhatti Microwatershed

LMU	Soil Map Units	Survey Number	Soil and site characteristics	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	53.ANRhB2 35.GWDiB2 127.GWDmB2	**Bannahatti:**22,23,24,25,26, 27,28,29,30,42,76,77,85,86, 90,91,92,93 **Thalaka:**10,11/1,13,14,15,1 9, 20	Moderately deep to deep, sodic soils (75 - 150cm), 1-3 % slopes non-gravelly (<15%), moderate erosion.	-	**Agri-Silvi-Pasture:** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass	Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manure, green manure and providing subsurface drainage
2	57.MDGcB2	**Achhola:**69 **Siddarthanagara:**42,43,44, 45,46	Deep, sandy clay loam soils (100-150 cm), 1-3 % slopes, non-gravelly (<15%), moderate erosion.	Sunflower, Sorghum, Maize, Groundnut, Red gram, Bajra	**Fruit crops:** Mango, Musambi, Sapota, Tamarind, Pomegranate, Amla, Custard apple, Guava, Jackfruit, Jamun, Lime **Vegetables:** Tomato, Onion**,** Bhendi, Chilli, Brinjal, Drumstick, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
3	159.BMNmA1 62.BMNmB2 49.NGPmB2 146.NGPmB2g1	**Bannahatti:**1(1),2(1),3(2),5 (2),15(1),15(2),16,17,18,19, 20,37,38,44,45,47,48,49,50, 51,52,53,54,55,56,57,58,59, 60,61,62,63,64(1),64(2),65(1),65(2),66,67,68,70,71,72,73 ,74,75,78,79,80,81,82,83,84, 87,88,89,94,95,98,99,100,10 1,102, 111,112	Deep to very deep, black calcareous clay soils (100->150 cm), 0- 3% slopes, non-gravelly to gravelly (<15-35%), slight to moderate erosion.	Maize, Sorghum, Sunflower, Cotton, Red gram, Bengalgram, Bajra	**Fruit crops:** Lime, Musambi, Custard apple, Pomegranate **Vegetables:** Chilli, Bhendi **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices

LMU	Soil Map Units	Survey Number	Soil and site characteristics	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
		Thalaka:4,6,7,8,9/1,9/211/2,12,35,36,37,38,39,40,41,42,43,44/1,44/2,44/3,45,46,47,48,49,50				
4	20.JNKcB2 110.JNKhB2	**Achhola:**34,56,57,59,60,61,62,63,64, 65,66,67/3,68 **Holamkera:**52,56,57,58,59,60,61,62	Moderately shallow, sandy clay loam soils (50-75 cm), 1-3 % slopes, non-gravelly (<15%), moderate erosion.	Maize, Sorghum Groundnut, Bajra	**Fruit crops:** Amla, Custard apple **Vegetables:** Tomato, Chilli, Brinjal, Bhendi, Onion **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
5	2.BDLbB2 4.BDLhB2	**Bannahatti :** 31,32,33,34,35,36,39 **Thalaka :** 3/1,5,17,18,21,51,52	Shallow, sandy loam soils (25-50 cm), 1-3 % slopes, non-gravelly (<15%), moderate erosion.	-	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata, Styloxanthes scabra*	Use of short duration varieties, sowing across the slope, drip irrigation and mulching is recommended

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Banhatti Microwatershed

- The soil phases identified in the microwatershed belonged to different soil series, NGP series occupies maximum area of 205 ha (25%) followed by BMN 193 ha (23%), GWD 102 ha (12%), JNK 85 ha (10%), BDL 63 ha (8%), ANR 32 ha (4%) and MDG 2 ha (2%).
- As per land capability classification an area of 702 ha in the microwatershed falls under arable land category (Class II, III & IV). The major limitations identified in the arable lands were soil and erosion.
- On the basis of soil reaction, 23 ha (3%) is slightly acid (pH 6.0-6.5), 90 ha (11%) has neutral (pH 6.5-7.3), 189 ha (23%) has slightly alkaline (pH 7.3-7.8), 360 ha (43%)

has moderately alkaline (pH 7.8-8.4) and 40 ha (5%) is strongly alkaline (pH 8.4-9.0) in soil reaction.

Soil Health Management

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

Acid soils

Acid soils cover in 23 ha (3%) area of the microwatershed.

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

Liming materials:

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

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

Neutral soils

Neutral soils cover in 90 ha (11%) area of the microwatershed.

1. Regular addition of organic manure, green manuring, green leaf manuring, crop residue incorporation and mulching needs to be taken up to improve the soil organic matter status.
2. Application of biofertilizers (Azospirullum, 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.

Alkaline soils

Alkaline soils occur in 589 ha (71%) of the microwatershed.

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

Application of Boron – 5kg/ha (once in three years).

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. Out of total 830 ha area in the microwatershed, an area of about 594 ha (72%) is suffering from moderate erosion. These areas need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning (Saturation Plan) in IWMP is focusing on preparation of

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

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

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

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

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Banhatti microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is high (>0.75%) in an area of <1 ha (<1%), medium (0.5-0.75%) in 439 ha (53%) and low (<0.5%) in 262 ha (32%). The areas that are medium and low 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 701 ha area where OC is low and medium (<0.5-0.75%). For example, a 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 high (>57 kg/ha) covering an area of 398 ha (48%), medium (23-57 kg/ha) covering an area of 296 ha (36%) and low (<23 kg/ha) covering an area of 8 ha (<1%) in the microwatershed. For all the crops 25% additional P needs to be applied where available P is medium and low.
- **Available Potassium:** Available potasium is high (>337 kg/ha) covering an area of 538 ha (65%) and medium (145-337 kg/ha) covering an area of 164 ha (20%) in the microwatershed. All the plots, where available potassium is medium, additional 25% potassium may be applied.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. It is high (>20ppm) in 211 ha (25%), medium (10-20ppm) in an area of 248 ha (30%) and low (<10ppm) covers in an area of 243 ha (29%). Medium and low areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** An area of 263 ha (32%) is low (<0.5ppm) and about 439 ha (53%) is medium (0.5-1.0ppm) in available boron. For these low and medium areas, application of sodium borate @ 10 kg/ha as soil application or 0.2 % borax as foliar spray is recommended.

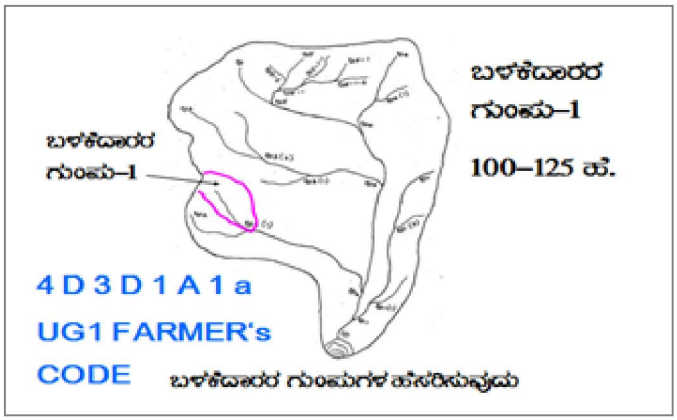
- **Available Iron:** Available iron content is sufficient (>4.5 ppm) in an area of 410 ha (49%) and deficient (<4.5 ppm) in about 292 ha (35%) in the microwatershed. The deficient areas need to be applied with iron sulphate @25 kg/ha as soil application for 2-3 years to correct iron deficiency.
- **Available Manganese:** Entire cultivated area in the microwatershed is sufficient in the available manganese content**.**
- **Available Copper:** Entire cultivated area in the microwatershed is sufficient in available copper content.
- **Available Zinc:** Available zinc content is deficient (<0.6 ppm) in the entire cultivated area of microwatershed. Application of zinc sulphate @25 kg/ha is recommended for the deficient areas.
- **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 the water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

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

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



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

Steps for Survey and Preparation of Treatment Plan

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

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

9.1 Treatment Plan

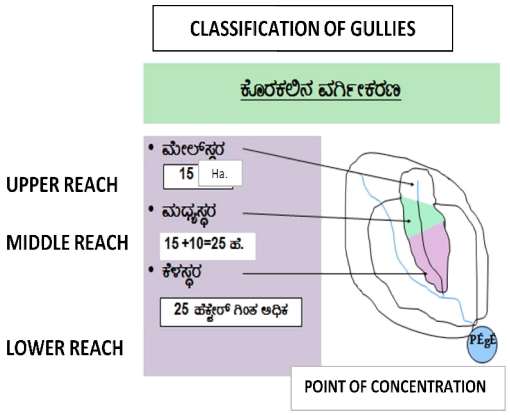
The treatment plan recommended for arable lands is briefly described below

9.1.1 Arable Land Treatment

A. BUNDING

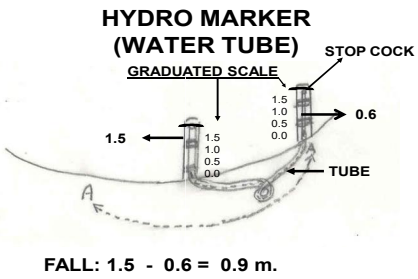
Steps for Survey and Preparation of Treatment Plan	
• Cadastral map (1:7920 scale) is enlarged to a scale of 1:2500 scale • Existing network of waterways, pothissa boundaries, grass belts, natural drainage lines/ watercourse, cut ups/ terraces are marked on the cadastral map to the scale • Drainage lines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

USER GROUP-1



Measurement of Land Slope

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



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

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

Note: (i) The above intervals are maximum.

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

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

Section of the Bund

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

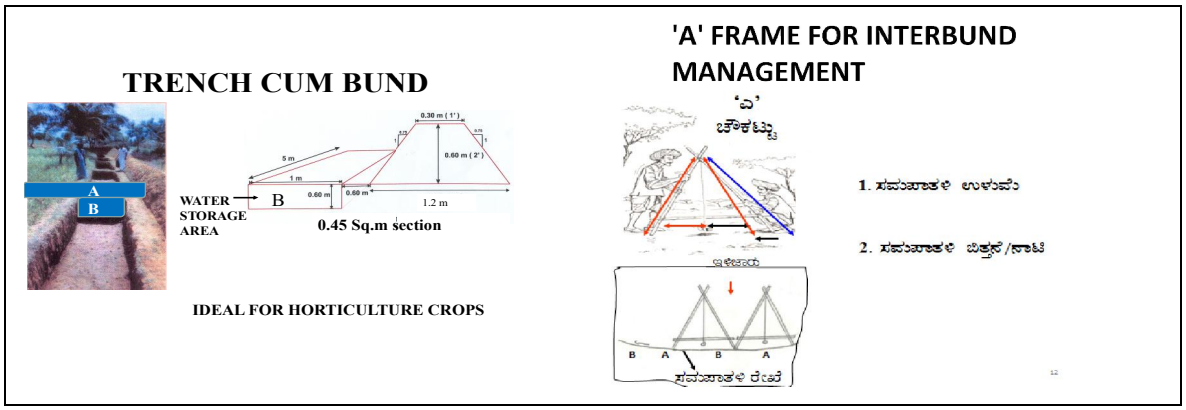
Recommended Bund Section

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

1. Existing waterways are marked on the cadastral map (1:7920 scale) and their dimensions are recorded.
2. Considering the contour plan of the MWS, additional waterways/ modernization of the existing ones can be thought of.
3. The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. An area of about 594 ha (72%) needs Graded bunding and about 107 ha (13%) requires strengthening of existing bunds.

The conservation plan prepared may be presented to all the stakeholders including farmers and after considering their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

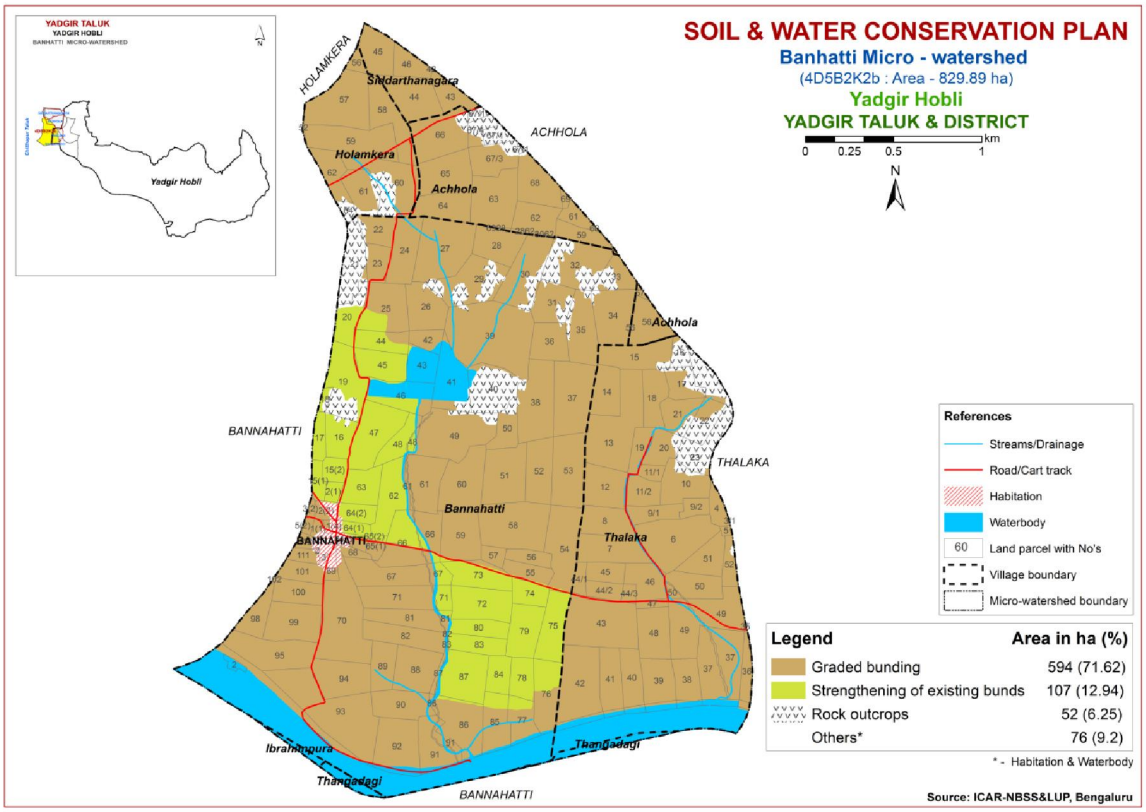


Fig. 9.1 Soil and Water Conservation Plan map of Banhatti Microwatershed

9.3 Greening of Microwatershed

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

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

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

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

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Appendix I

Banhatti 2K2b Microwatershed

Soil Phase Information

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Holamkera	52	0.1	JNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Holamkera	56	1.02	JNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Holamkera	57	9	JNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding
Holamkera	58	6.11	JNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Holamkera	59	8.01	JNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Holamkera	60	8.56	JNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Holamkera	61	4.27	JNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	Not Available	IIes	Graded bunding
Holamkera	62	3.61	JNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Holamkera	64	0.86	RO	RO	RO	RO	RO	RO	RO	RO	Scrub land (Sl)	Not Available	RO	RO
Achhola	28	0.37	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate		Not Available	IIes	Graded bunding
Achhola	30	0.2	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate		Not Available	IIes	Graded bunding
Achhola	56	4.53	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IIes	Graded bunding
Achhola	57	0.31	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IIes	Graded bunding
Achhola	59	2.69	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Achhola	60	0.08	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Achhola	61	1.67	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Achhola	62	4.34	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Achhola	63	7.76	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Achhola	64	4.98	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram+Redgram (Ct+Gg+Rg)	Not Available	IIes	Graded bunding
Achhola	65	6.1	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IIes	Graded bunding
Achhola	66	7.49	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Achhola	67/1	2.24	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Achhola	67/3	4.55	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Achhola	67/4	1.8	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Achhola	68	5.36	JNKcB2	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	Not Available	IIes	Graded bunding
Achhola	69	0.4	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram +Scrub land (Ct+Rg+Sl)	Not Available	IIes	Graded bunding
Bannahatti	1(1)	0.67	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Habitation	Not Available	IIes	Graded bunding
Bannahatti	1(2)	0.13	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	1(3)	0.06	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	1(4)	0.54	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	15(1)	1.55	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Bannahatti	15(2)	1.91	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Bannahatti	2(1)	0.97	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Bannahatti	2(2)	1.3	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	3(2)	0.4	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Bannahatti	5(2)	0.53	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Bannahatti	64(1)	1.34	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	64(2)	2.29	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Bannahatti	64(3)	0.76	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	65(1)	1.23	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IIes	Graded bunding
Bannahatti	65(2)	0.66	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IIes	Graded bunding
Bannahatti	1	0.05	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	2	0.65	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Bannahatti	3	0.09	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	4	0.06	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	16	3.64	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Greengram (Ct+Gg)	Not Available	IIs	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Bannahatti	17	1.89	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	18	0.69	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	19	7.75	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Scrub land (Ct+Sl)	Not Available	IIs	Graded bunding
Bannahatti	20	3.66	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Greengram (Ct+Gg)	Not Available	IIs	Graded bunding
Bannahatti	21	5.24	RO	RO	RO	RO	RO	RO	RO	RO	Scrub land (Sl)	Not Available	RO	RO
Bannahatti	22	3.16	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IVes	Graded bunding
Bannahatti	23	2.71	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Bannahatti	24	5.62	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Bannahatti	25	6.9	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IVes	Graded bunding
Bannahatti	26	5.29	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IVes	Graded bunding
Bannahatti	27	9.79	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IVes	Graded bunding
Bannahatti	28	4.89	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Bannahatti	29	8.02	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Scrub land (Ct+Sl)	Not Available	IVes	Graded bunding
Bannahatti	30	7.8	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Bannahatti	31	4.6	BDLhB2	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIIes	Graded bunding
Bannahatti	32	8.36	BDLhB2	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Scrub land (Ct+Sl)	Not Available	IIIes	Graded bunding
Bannahatti	33	3.11	BDLhB2	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Scrub land (Ct+Sl)	Not Available	IIIes	Graded bunding
Bannahatti	34	6.68	BDLhB2	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIIes	Graded bunding
Bannahatti	35	6.29	BDLhB2	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IIIes	Graded bunding
Bannahatti	36	4.33	BDLhB2	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IIIes	Graded bunding
Bannahatti	37	8.67	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	1 Bore well	IIes	Graded bunding
Bannahatti	38	8.61	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	1 Bore well	IIes	Graded bunding
Bannahatti	39	16.73	BDLhB2	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IIIes	Graded bunding
Bannahatti	40	6.64	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Bannahatti	41	6.24	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Bannahatti	42	2.06	GWDiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IVes	Graded bunding
Bannahatti	43	3.26	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Bannahatti	44	3.51	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	45	4.57	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	46	5.81	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Bannahatti	47	7.75	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Greengram (Ct+Gg)	Not Available	IIs	Graded bunding
Bannahatti	48	3.55	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIs	Graded bunding
Bannahatti	49	10.46	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Paddy (Ct+Pd)	Not Available	IIes	Graded bunding
Bannahatti	50	3.17	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Bannahatti	51	7.57	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IIes	Graded bunding
Bannahatti	52	5.4	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	1 Bore well	IIes	Graded bunding
Bannahatti	53	7.47	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IIes	Graded bunding
Bannahatti	54	7.86	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	1 Bore well	IIes	Graded bunding
Bannahatti	55	2.6	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram (Ct+Gg)	Not Available	IIes	Graded bunding
Bannahatti	56	2	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Bannahatti	57	1.35	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Bannahatti	58	9.98	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Bannahatti	59	6.29	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram+Redgram (Ct+Gg+Rg)	Not Available	IIes	Graded bunding
Bannahatti	60	7.49	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Bannahatti	61	5.98	NGPmB2g1	LMU-3	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Bannahatti	62	5.87	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	63	4.24	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	66	9.32	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Paddy (Ct+Pd)	Not Available	IIes	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Bannahatti	67	7.13	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Paddy (Ct+Pd)	Not Available	IIes	Graded bunding
Bannahatti	68	0.92	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Bannahatti	69	1.02	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Bannahatti	70	12.27	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	71	6.75	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Greengram+Redgram (Ct+Gg+Rg)	Not Available	IIes	Graded bunding
Bannahatti	72	6.11	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	73	4.97	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	74	2.7	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Bannahatti	75	5.35	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	76	5.65	GWDmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Bannahatti	77	3.71	GWDmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Bannahatti	78	3.09	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	79	5.25	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	80	3.17	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	81	4.81	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Bannahatti	82	5.29	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	83	3.28	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	84	2.8	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	85	4.9	GWDmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Scrubland (Ct+Sl)	Not Available	IVes	Graded bunding
Bannahatti	86	7.3	GWDmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Bannahatti	87	7.55	BMNmA1	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Bannahatti	88	5.87	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	89	3.71	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	90	5.07	GWDmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Bannahatti	91	5.26	GWDmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Bannahatti	92	7.62	GWDmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Scrub land (Ct+Sl)	Not Available	IVes	Graded bunding
Bannahatti	93	14.67	GWDmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram +Scrub land (Ct+Rg+Sl)	Not Available	IVes	Graded bunding
Bannahatti	94	6.16	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	95	7.73	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	98	3.2	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	99	6.52	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	100	3.61	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	101	2.74	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	102	0.11	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Bannahatti	111	1.24	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Bannahatti	112	0.76	BMNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Siddarthanagara	42	0.03	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Siddarthanagara	43	3.03	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Grassland (Gl)	Not Available	IIes	Graded bunding
Siddarthanagara	44	6.29	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Grassland (Gl)	Not Available	IIes	Graded bunding
Siddarthanagara	45	4.49	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Siddarthanagara	46	2.74	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Thalaka	3/1	0.01	BDLbB2	LMU-5	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Thalaka	4	1.78	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Thalaka	5	0.33	BDLbB2	LMU-5	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Thalaka	6	9.58	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIes	Graded bunding
Thalaka	7	5.97	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Thalaka	8	4.4	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Sorghum (Ct+Sg)	Not Available	IIes	Graded bunding
Thalaka	9/1	2.84	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Thalaka	9/2	1.55	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Thalaka	10	5.24	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IVes	Graded bunding
Thalaka	11/1	1.18	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Thalaka	11/2	3.13	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Thalaka	12	5.37	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Thalaka	13	11.6	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Thalaka	14	4.29	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Thalaka	15	5.8	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IVes	Graded bunding
Thalaka	16	1.62	RO	RO	RO	RO	RO	RO	RO	RO	Scrub land (Sl)	Not Available	RO	RO
Thalaka	17	3.16	BDLbB2	LMU-5	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIIes	Graded bunding
Thalaka	18	4.04	BDLbB2	LMU-5	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar+Groundnut (Ct+Jw+Gn)	Not Available	IIIes	Graded bunding
Thalaka	19	2.36	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Thalaka	20	3.11	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IVes	Graded bunding
Thalaka	21	3.63	BDLbB2	LMU-5	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Scrub land (Jw+Sl)	Not Available	IIIes	Graded bunding
Thalaka	22	3.22	RO	RO	RO	RO	RO	RO	RO	RO	Scrub land (Sl)	Not Available	RO	RO
Thalaka	23	7.87	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Thalaka	35	0.07	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Paddy (Jw+Pd)	Not Available	IIes	Graded bunding
Thalaka	36	2.09	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	37	9.32	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	38	3.4	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	39	4.49	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	40	3.78	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	41	4.38	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	42	9.2	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Cotton (Pd+Ct)	Not Available	IIes	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Thalaka	43	11.1	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	44/1	1.24	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Sorghum (Ct+Sg)	Not Available	IIes	Graded bunding
Thalaka	44/2	1.99	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	44/3	0.82	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Thalaka	45	2.47	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Thalaka	46	4.11	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Thalaka	47	0.83	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Thalaka	48	5.25	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Thalaka	49	10.38	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIes	Graded bunding
Thalaka	50	4.4	NGPmB2	LMU-3	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Thalaka	51	3.95	BDLbB2	LMU-5	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Thalaka	52	1.99	BDLbB2	LMU-5	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding

Appendix II

Banhatti 2K2b 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
Holamkera	52	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Holamkera	56	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 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)
Holamkera	57	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Holamkera	58	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Holamkera	59	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Holamkera	60	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Holamkera	61	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Holamkera	62	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Holamkera	64	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Achhola	28	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Achhola	30	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Achhola	56	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Achhola	57	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Achhola	59	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Achhola	60	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Achhola	61	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Achhola	62	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Achhola	63	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Achhola	64	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Achhola	65	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Achhola	66	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Achhola	67/1	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Achhola	67/3	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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)

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Achhola	67/4	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Achhola	68	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)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Achhola	69	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	1(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	1(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	1(3)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	1(4)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	15(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	15(2)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	2(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	2(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	3(2)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	5(2)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	64(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	64(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	64(3)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	65(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	65(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	2	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	3	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	4	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	16	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	17	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	18	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	19	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bannahatti	20	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	21	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Bannahatti	22	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	23	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	24	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	25	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	26	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	27	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	28	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	29	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	30	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Bannahatti	31	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	32	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	33	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	34	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	35	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	36	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	37	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	38	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	39	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	40	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Bannahatti	41	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	42	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	43	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	44	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bannahatti	45	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	46	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	47	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	48	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	49	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	50	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	51	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	52	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	53	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	54	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	55	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	56	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	57	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	58	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	59	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	60	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	61	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	62	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	63	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	66	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	67	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	68	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	69	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	70	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	71	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bannahatti	72	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	73	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	74	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	75	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	76	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	77	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	78	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	79	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	80	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	81	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	82	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	83	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	84	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	85	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	86	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	87	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	88	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	89	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	90	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	91	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	92	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	93	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	94	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	95	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bannahatti	98	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	99	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	100	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	101	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	102	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	111	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bannahatti	112	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Siddarthan agara	42	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 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)
Siddarthan agara	43	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 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)
Siddarthan agara	44	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 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)
Siddarthan agara	45	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 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)
Siddarthan agara	46	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 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)
Thalaka	3/1	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	4	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	5	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	6	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	7	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	8	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	9/1	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	9/2	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	10	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	11/1	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	11/2	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	12	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Thalaka	13	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	14	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)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	15	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	16	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Thalaka	17	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	18	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	19	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	20	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	21	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	22	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Thalaka	23	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Thalaka	35	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	36	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	37	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	38	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	39	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	40	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	41	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	42	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	43	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	44/1	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	44/2	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	44/3	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	45	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	46	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey NO	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Thalaka	47	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	48	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	49	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	50	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	51	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thalaka	52	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Appendix III

Banhatti 2K2b Microwatershed

Soil Suitability Information

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Holamkera	52	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Holamkera	56	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Holamkera	57	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Holamkera	58	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Holamkera	59	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Holamkera	60	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Holamkera	61	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Holamkera	62	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Holamkera	64	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
Achhola	28	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	30	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	56	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	57	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	59	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	60	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	61	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	62	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	63	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	64	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	65	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	66	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	67/1	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Achhola	67/3	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	67/4	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Achhola	68	N1r	S2r	S3r	S2rt	S3r	S3t	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	N1n	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Achhola	69	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Bannahatti	1(1)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	1(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	1(3)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	1(4)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	15(1)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	15(2)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	2(1)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	2(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	3(2)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	5(2)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	64(1)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	64(2)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	64(3)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	65(1)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	65(2)	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	2	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	3	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	4	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	16	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	17	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	18	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	19	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Bannahatti	20	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	21	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
Bannahatti	22	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	23	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	24	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	25	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	26	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	27	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	28	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	29	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	30	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	31	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Bannahatti	32	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Bannahatti	33	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Bannahatti	34	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Bannahatti	35	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Bannahatti	36	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Bannahatti	37	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	38	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	39	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Bannahatti	40	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
Bannahatti	41	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	42	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	43	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bannahatti	44	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	45	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	46	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Bannahatti	47	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	48	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	49	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	50	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	51	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	52	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	53	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	54	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	55	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	56	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	57	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	58	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	59	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	60	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	61	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	62	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	63	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	66	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	67	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	68	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	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	Others
Bannahatti	70	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	71	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	72	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	73	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	74	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	75	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Bannahatti	76	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	77	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	78	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	79	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	80	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	81	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	82	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	83	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	84	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	85	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	86	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	87	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	88	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	89	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	90	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	91	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	92	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	93	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bannahatti	94	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	95	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	98	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	99	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	100	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	101	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	102	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	111	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Bannahatti	112	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Siddarthanagara	42	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Siddarthanagara	43	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Siddarthanagara	44	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Siddarthanagara	45	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Siddarthanagara	46	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Thalaka	3/1	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Thalaka	4	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	5	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Thalaka	6	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	7	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	8	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	9/1	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	9/2	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	10	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Thalaka	11/1	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Thalaka	11/2	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	12	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	13	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Thalaka	14	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Thalaka	15	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Thalaka	16	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
Thalaka	17	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Thalaka	18	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Thalaka	19	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Thalaka	20	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Thalaka	21	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Thalaka	22	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
Thalaka	23	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
Thalaka	35	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	36	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	37	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	38	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	39	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	40	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	41	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	42	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	43	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	44/1	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	44/2	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	44/3	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	45	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	46	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	47	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	48	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	49	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	50	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Thalaka	51	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Thalaka	52	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1n	N1r	N1r	S3r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r

RO-Rock outcrops

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

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Chapter 1

SALIENT FINDINGS OF THE SURVEY

- *The data on households sampled for socio economic survey indicated that 36 farmers were sampled in Banhatti micro-watershed among them 7 (20 %) were landless, 8 (22.86 %) were marginal farmers, 9 (25.71 %) were small farmers, 5 (14.29 %) were semi medium farmers and 6 (17.14 %) were medium farmers.*
- *The data indicated that there were 102 (61.82 %) men and 63 (38.18 %) women among the sampled households. The average family size of landless farmers' was 5, marginal farmers' was 4.5, small farmers' was 4.77, semi medium farmers' was 4.2 and medium farmers' was 5.*
- *The data indicated that, 20 (12.12 %) people were in 0-15 years of age, 86 (52.12 %) were in 16-35 years of age, 52 (31.52 %) were in 36-60 years of age and 7 (4.24 %) were above 61 years of age.*
- *The results indicated that Banhatti had 33.33 per cent illiterates, 21.82 per cent of them had Primary School, 3.64 per cent of them had Middle School education, 21.21 per cent of them had High School education, 3.64 per cent of them had PUC education, 1.82 per cent of them had Diploma education, 0.61 per cent of them had ITI education and 10.30 per cent had degree education.*
- *The results indicate that, 77.14 per cent of household heads were practicing agriculture, 14.29 per cent of the household heads were agricultural labourer, 2.86 per cent were Trade & Business and 5.71 per cent were Housewife.*
- *The results indicate that agriculture was the major occupation for 35.76 per cent of the household members, 25.45 per cent were agricultural laborers, 0.61 per cent were general laborers and Household industry, 1.21 per cent were in private service, 13.94 per cent were students, 16.36 per cent were Housewife and 2.42 per cent were children.*
- *The results show that, 100 per cent of the population in the micro watershed has not participated in any local institutions.*
- *The results indicate that 94.29 per cent of the households possess Katcha house and 5.71 per cent of them possess pucca/RCC house.*
- *The results show that 82.86 per cent of the households possess TV, 2.86 per cent of the households possess DVD/VCD Player, 31.43 per cent of them possess mixer/grinder, 5.71 per cent of the households possess Refrigerator,17.14 per cent of the households possess motor cycle and 94.44 per cent of the households possess mobile phones.*
- *The results show that the average value of television was Rs. 8,785, mixer/grinder was Rs. 2,000, motor cycle was Rs. 59,333, tempo was Rs. 180,000 and mobile phone was Rs. 3,002.*

- *About 2.86 per cent each of the households possess Tractor, Thresher, Sprinkler, Chaff Cutter and Drip system, 31.43 per cent of the households possess Sprayer, 25.71 per cent of them possess weeder and 22.86 per cent of them possess Harvester.*
- *For tractor it was Rs. 7,500, Sprayer was Rs. 4,090, Sprinkler was Rs. 10,000, Weeder was Rs. 957, Harvester was Rs. 600, Thresher was Rs. 400, Chaff Cutter was Rs. 200 and Drip system was Rs. 300.*
- *The results indicate that, 11.43 per cent of the households possess bullocks, 8.57 per cent of the households possess local cow and 2.86 per cent of the households possess buffalo and Poultry birds.*
- *The results indicate that, average own labour men available in the micro watershed was 1.47, average own labour (women) available was 1.07, average hired labour (men) available was 5.52 and average hired labour (women) available was 5.24.*
- *The results indicate that, 74.29 per cent of the households opined that the hired labour was adequate and 5.71 per cent of the households opined that the hired labour was inadequate.*
- *The results indicate that, households of the Banhatti micro-watershed possess 43.23 ha (78.38 %) of dry land and 11.92 ha (21.62 %) of irrigated land. Marginal farmers possess 5.49 ha (100 %) of dry land. Small farmers possess 10.60 ha (85.44 %) of dry land and 1.80 ha (14.56 %) of irrigated land. Semi medium farmers possess 11.36 ha (90.34 %) of dry land and 1.21 ha (9.66 %) of irrigated land. Medium farmers possess 15.78 ha (63.93 %) of dry land and 8.90 ha (36.07 %) of irrigated land.*
- *The results indicate that, the average value of dry land was Rs. 518,191.29 and the average value of irrigated land was Rs. 326,986.58. In case of marginal famers, the average land value was Rs. 1,130,375.39 for dry land. In case of small famers, the average land value was Rs. 594,385.03 for dry land and the average value of irrigated land was Rs.1,107,623.31. In case of semi medium famers, the average land value was Rs. 598,361.24 for dry land and the average land value was Rs. 1,157,812.48 of irrigated land. In case of medium famers, the average land value was Rs. 196,333.33 for dry land and the average land value was Rs. 213,318.18 of irrigated land.*
- *The results indicate that, there were 4 functioning and De-functioning bore well in the micro watershed.*
- *The results indicate that, bore well was the major irrigation source in the micro water shed for 11.43 per cent of the farmers.*
- *The results indicate that, the depth of bore well was found to be 4.96 meters.*
- *The results indicate that small, semi-medium and medium farmers had an irrigated area*
- *The results indicate that, farmers have grown red gram (28.22 ha), Paddy (6.07 ha), cotton (17.08 ha) and sorghum (0.16 ha).*

- *The results indicate that, the cropping intensity in Banhatti micro-watershed was found to be 96.22 per cent.*
- *The results indicate that, 77.14 per cent of the households have bank account and savings.*
- *The results indicate that, 80 per cent of the households have availed credit from different sources.*
- *The results indicate that, 42.86 per cent of the households have borrowed from Commercial Bank, 3.57 per cent from Friends/Relatives and 21.43 per cent from Grameena Bank.*
- *The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs. 54,214.29.*
- *The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production.*
- *The results indicate that, 100 per cent of the households borrowed from private credit for the purpose of agricultural production.*
- *The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources.*
- *The results indicated that 100 per cent of the households did not repay their loan borrowed from Private source.*
- *The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations.*
- *The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to Easy accessibility of credit.*
- *The results indicate that, the total cost of cultivation for red gram was Rs. 49387.42. The gross income realized by the farmers was Rs. 78695.08. The net income from red gram cultivation was Rs. 29307.65. Thus the benefit cost ratio was found to be 1: 1.59*
- *The results indicate that, the total cost of cultivation for cotton was Rs. 37760.88. The gross income realized by the farmers was Rs. 62872.09. The net income from cotton cultivation was Rs. 25111.21. Thus the benefit cost ratio was found to be 1: 1.67.*
- *The results indicate that, the total cost of cultivation for Paddy was Rs. 28165.58. The gross income realized by the farmers was Rs. 76570. The net income from Paddy cultivation was Rs. 48404.42. Thus the benefit cost ratio was found to be 1: 2.72.*
- *The results indicate that, the total cost of cultivation for sorghum was Rs. 60649.60. The gross income realized by the farmers was Rs. 76000. The net income from sorghum cultivation was Rs. 15350.40. Thus the benefit cost ratio was found to be 1: 1.25.*
- *The results indicate that, 22.86 per cent of the households opined that dry fodder was adequate and 2.86 per cent of the households opined that dry fodder was inadequate.*

- *The results indicate that the annual gross income was Rs. 19,142.86 for landless farmers, for marginal farmers it was Rs. 80,000, for small farmers it was Rs. 118,333.33, for semi medium farmers it was Rs. 184,000 and for medium farmers it was Rs. 343,333.33.*
- *The results indicate that the average annual expenditure is Rs. 13,509.52. For landless households it was Rs. 8,285.71, for marginal farmers it was Rs. 5,500, for small farmers it was Rs. 6,888.89, for semi medium farmers it was Rs. 16,600 and for medium farmers it was Rs. 37,638.89 .*
- *The results indicate that, sampled households have grown 5 coconut, 2 madarin, 5 mango and 2 lime trees in their field and 1 mango in backyard.*
- *The results indicate that, households have planted 68 neem, 14Tamarind and 2 Pongamia trees in their field and 1 neem in backyard.*
- *The results indicated that, households have an average investment capacity of Rs. 8,485.71 for land development.*
- *The results indicated that Soft loan was the source of additional investment for 74.29per cent for land development.*
- *The results indicated that, Paddy was sold to the extent of 83.33 per cent, cotton was sold to the extent of 100 per cent, Redgram was sold to the extent of 85.22 per cent and sorghum was sold to the extent of 60 per cent.*
- *The results indicated that, about 57.14 per cent of the farmers sold their produce to agent/ traders, 5.71 per cent of the farmers sold their produce to local/village merchants, 14.29 per cent of them sold in regulated markets and 5.71 per cent of them sold in Cooperative marketing Society.*
- *The results indicated that, 82.86 per cent of the households have used tractor as a mode of transportation for their agricultural produce.*
- *The results indicated that, 5.71 per cent of the households have experienced soil and water erosion problems in the farm.*
- *The results indicated that, 57.14 per cent have shown interest in soil test.*
- *The results indicated that, Summer Graded Bund, Contour Cultivation and Bore Well Recharge Pit were adopted for 2.86 per cent, Summer Ploughing was adopted for 54.29 per cent, Dead Furrow was adopted for 22.86 per cent, Mulching was adopted for 54.29 per cent and Combination of deep and shallow root crops was adopted for 5.71per cent.*
- *The results indicated that, 91.43 per cent of the households used firewood as a source of fuel and 5.71 per cent of the households used Dung Cake.*
- *The results indicated that, piped supply was the major source of drinking water for 85.71 per cent of the households in the micro watershed and Bore Well was the major source of drinking water for 2.86 per cent of the households in the micro watershed .*

- *The results indicated that, Electricity was the major source of light for 97.14 per cent of the households in micro watershed.*
- *The results indicated that, 25.71 per cent of the households possess sanitary toilet facility.*
- *The results indicated that, 97.14 per cent of the sampled households possessed BPL card.*
- *The results indicated that, 94.29 per cent of the households participated in NREGA programme.*
- *The results indicated that, cereals and pulses were adequate for 85.71 per cent of the households, oilseed and Vegetables were adequate for 62.86 per cent, Milk were adequate for 8.57 per cent, fruits was adequate for 48.57 per cent, eggs were adequate for 5.71 per cent and meat were adequate for 2.86 per cent.*
- *The results indicated that, Cereals and pulses were inadequate for 2.86 per cent of the households, oilseed were inadequate for 25.71 per cent of the households, vegetables were inadequate for 28.57 per cent, fruits was inadequate for 37.14 per cent, milk were inadequate for 71.43 per cent, Meat were inadequate for 85.71 per cent and eggs were inadequate for 77.14 per cent.*
- *The results indicated that, lower fertility status of the soil was the constraint experienced by 71.43 per cent, Wild animal menace on farm field was the constraint experienced by 48.57 per cent, frequent incidence of pest and diseases was the constraint experienced by 65.71 per cent, Inadequacy of irrigation water, high cost of fertilizer and plant protection chemicals and high rate of interest on credit was the constraint experienced by 68.57 per cent of the households and Low price for the agricultural commodities (57.14 %), Lack of marketing facilities in the area (40 %), Inadequate extension services (20 %) and Lack of transport for safe transport of the Agril produce to the market (14.29 %).*

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

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

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

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

Description of the micro watershed

Banhatti micro-watershed in Hadagimadara sub-watershed (Yadgiri taluk and district) is located in between $16^0$50’59.955’’ to $16^0$48’44.847’’ North latitudes and $77^0$0’6.649’’ to $76^0$58’54.358’’ East longitudes, covering an area of about 276.21 ha, bounded by Achhola, Thalaka and Siddarthanagara villages.

Methodology followed in assessing socio-economic status of households

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

Chapter 4

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Banhatti micro-watershed is presented in Table 1 and it indicated that 36 farmers were sampled in Banhatti micro-watershed among them 7 (20 %) were landless, 8 (22.86 %) were marginal farmers, 9 (25.71 %) were small farmers, 5 (14.29 %) were semi medium farmers and 6 (17.14 %) were medium farmers.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	7	20	8	22.86	9	25.71	5	14.29	6	17.14	35	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Banhatti micro-watershed is presented in Table 2. The data indicated that there were 102 (61.82 %) men and 63 (38.18 %) women among the sampled households. The average family size of landless farmers' was 5, marginal farmers' was 4.5, small farmers' was 4.77, semi medium farmers' was 4.2 and medium farmers' was 5.

Table 2: Population characteristics of Banhatti micro-watershed

Sl.No.	Particulars	LL (35)		MF (36)		SF (43)		SMF (21)		MDF (30)		All (165)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	23	65.71	22	61.11	27	62.79	12	57.14	18	60	102	61.82
2	Women	12	34.29	14	38.89	16	37.21	9	42.86	12	40	63	38.18
Total		35	100	36	100	43	100	21	100	30	100	165	100
Average		5		4.5		4.77		4.2		5		4.71	

Age wise classification of population: The age wise classification of household members in Banhatti micro-watershed is presented in Table 3. The data indicated that, 20 (12.12 %) people were in 0-15 years of age, 86 (52.12 %) were in 16-35 years of age, 52 (31.52 %) were in 36-60 years of age and 7 (4.24 %) were above 61 years of age.

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

Sl.No.	Particulars	LL (35)		MF (36)		SF (43)		SMF (21)		MDF (30)		All (165)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	10	28.57	1	2.78	3	6.98	3	14.29	3	10	20	12.12
2	16-35 years of age	18	51.43	18	50	26	60.47	8	38.10	16	53.33	86	52.12
3	36-60 years of age	6	17.14	16	44.44	12	27.91	9	42.86	9	30	52	31.52
4	> 61 years	1	2.86	1	2.78	2	4.65	1	4.76	2	6.67	7	4.24
Total		35	100	36	100	43	100	21	100	30	100	165	100

Education level of household members: Education level of household members in Banhatti micro-watershed is presented in Table 4. The results indicated that Banhatti had 33.33 per cent illiterates, 21.82 per cent of them had Primary School, 3.64 per cent of them had Middle School education, 21.21 per cent of them had High School education,

3.64 per cent of them had PUC education, 1.82 per cent of them had Diploma education, 0.61 per cent of them had ITI education and 10.30 per cent had degree education.

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

Sl. No.	Particulars	LL (35)		MF (36)		SF (43)		SMF (21)		MDF (30)		All (165)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	10	28.57	13	36.11	19	44.19	8	38.10	5	16.67	55	33.33
2	Primary School	9	25.71	8	22.22	10	23.26	3	14.29	6	20	36	21.82
3	Middle School	5	14.29	0	0	1	2.33	0	0	0	0	6	3.64
4	High School	8	22.86	7	19.44	9	20.93	2	9.52	9	30	35	21.21
5	PUC	1	2.86	2	5.56	1	2.33	2	9.52	0	0	6	3.64
6	Diploma	0	0	0	0	0	0	2	9.52	1	3.33	3	1.82
7	ITI	0	0	0	0	0	0	0	0	1	3.33	1	0.61
8	Degree	1	2.86	5	13.89	3	6.98	1	4.76	7	23.33	17	10.30
9	Others	1	2.86	1	2.78	0	0	3	14.29	1	3.33	6	3.64
Total		35	100	36	100	43	100	21	100	30	100	165	100

Occupation of household heads: The data regarding the occupation of the household heads in Banhatti micro-watershed is presented in Table 5. The results indicate that, 77.14 per cent of household heads were practicing agriculture, 14.29 per cent of the household heads were agricultural labourer, 2.86 per cent were Trade & Business and 5.71 per cent were Housewife.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	1	14.29	8	100	8	88.89	5	100	5	83.33	27	77.14
2	Agricultural Labour	5	71.43	0	0	0	0	0	0	0	0	5	14.29
3	Trade & Business	1	14.29	0	0	0	0	0	0	0	0	1	2.86
4	Housewife	0	0	0	0	1	11.11	0	0	1	16.67	2	5.71
Total		7	100	8	100	9	100	5	100	6	100	35	100

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

Sl. No.	Particulars	LL (35)		MF (36)		SF (43)		SMF (21)		MDF (30)		All (165)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	2	5.71	13	36.11	20	46.51	11	52.38	13	43.33	59	35.76
2	Agricultural Labour	16	45.71	9	25	11	25.58	4	19.05	2	6.67	42	25.45
3	General Labour	0	0	0	0	1	2.33	0	0	0	0	1	0.61
4	Household industry	0	0	0	0	1	2.33	0	0	0	0	1	0.61
5	Private Service	0	0	2	5.56	0	0	0	0	0	0	2	1.21
6	Trade & Business	4	11.43	0	0	0	0	0	0	1	3.33	5	3.03
7	Student	8	22.86	5	13.89	3	6.98	1	4.76	6	20	23	13.94
8	Others	1	2.86	0	0	0	0	0	0	0	0	1	0.61
9	Housewife	4	11.43	7	19.44	7	16.28	2	9.52	7	23.33	27	16.36
10	Children	0	0	0	0	0	0	3	14.29	1	3.33	4	2.42
Total		35	100	36	100	43	100	21	100	30	100	165	100

Occupation of the household members: The data regarding the occupation of the household members in Banhatti micro-watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 35.76 per cent of the household members, 25.45 per cent were agricultural laborers, 0.61 per cent were general laborers and Household industry, 1.21 per cent were in private service, 13.94 per cent were students, 16.36 per cent were Housewife and 2.42 per cent were children.

Institutional participation of the household members: The data regarding the institutional participation of the household members in Banhatti micro-watershed is presented in Table 7. The results show that, 100 per cent of the population in the micro watershed has not participated in any local institutions.

Table 7. Institutional Participation of household members in Banhatti micro-watershed

Sl. No.	Particulars	LL (35)		MF (36)		SF (43)		SMF (21)		MDF (30)		All (165)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	35	100	36	100	43	100	21	100	30	100	165	100
Total		35	100	36	100	43	100	21	100	30	100	165	100

Type of house owned: The data regarding the type of house owned by the households in Banhatti micro-watershed is presented in Table 8. The results indicate that 94.29 per cent of the households possess Katcha house and 5.71 per cent of them possess pucca/RCC house.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Katcha	7	100	8	100	8	88.89	5	100	5	83.33	33	94.29
2	Pucca/RCC	0	0	0	0	1	11.11	0	0	1	16.67	2	5.71
Total		7	100	8	100	9	100	5	100	6	100	35	100

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Banhatti micro-watershed is presented in Table 9. The results show that 82.86 per cent of the households possess TV, 2.86 per cent of the households possess DVD/VCD Player, 31.43 per cent of them possess mixer/grinder, 5.71 per cent of the households possess Refrigerator, 17.14 per cent of the households possess motor cycle and 94.44 per cent of the households possess mobile phones.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	6	85.71	6	75	9	100	4	80	4	66.67	29	82.86
2	DVD/VCD Player	0	0	0	0	0	0	0	0	1	16.67	1	2.86
3	Mixer/Grinder	0	0	2	25	4	44.44	2	40	3	50	11	31.43
4	Refrigerator	0	0	0	0	1	11.11	0	0	1	16.67	2	5.71
5	Motor Cycle	0	0	1	12.50	1	11.11	2	40	2	33.33	6	17.14
6	Mobile Phone	6	85.71	6	75	6	66.67	3	60	4	66.67	25	71.43

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Banhatti micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 8,785, mixer/grinder was Rs. 2,000, motor cycle was Rs. 59,333, tempo was Rs. 180,000 and mobile phone was Rs. 3,002.

Table 10. Average value of durable assets owned by households in Banhatti micro-watershed

Average value (Rs.)

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
1	Television	24,333	6,500	7,333	7,500	8,750	10,896
2	DVD/VCD Player	0	0	0	0	5,000	5,000
3	Mixer/Grinder	0	2,000	26,500	2,000	1,333	10,727
4	Refrigerator	0	0	1,000	0	4,000	2,500
5	Motor Cycle	0	30,000	45,000	60,000	60,000	51,428
6	Mobile Phone	1,688	2,090	2,090	2,600	3,500	2,420

Farm Implements owned: The data regarding the farm implements owned by the households in Banhatti micro-watershed is presented in Table 11. About 2.86 per cent each of the households possess Tractor, Thresher, Sprinkler, Chaff Cutter and Drip system, 31.43 per cent of the households possess Sprayer, 25.71 per cent of them possess weeder and 22.86 per cent of them possess Harvester.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Tractor	0	0	0	0	0	0	0	0	1	16.67	1	2.86
2	Sprayer	0	0	2	25	4	44.44	2	40	3	50	11	31.43
3	Sprinkler	0	0	0	0	0	0	0	0	1	16.67	1	2.86
4	Weeder	0	0	2	25	3	33.33	1	20	3	50	9	25.71
5	Harvester	0	0	2	25	4	44.44	1	20	1	16.67	8	22.86
6	Thresher	0	0	0	0	0	0	0	0	1	16.67	1	2.86
7	Chaff Cutter	0	0	1	12.50	0	0	0	0	0	0	1	2.86
8	Drip system	0	0	0	0	1	11.11	0	0	0	0	1	2.86

Table 12. Average value of farm implements owned by households in Banhatti micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
1	Tractor	0	0	0	0	7,500	7,500
2	Sprayer	0	5,000	3,500	4,000	4,333	4,090
3	Sprinkler	0	0	0	0	10,000	10,000
4	Weeder	0	2,666	240	200	950	957
5	Harvester	0	2,666	181	200	200	600
6	Thresher	0	0	0	0	400	400
7	Chaff Cutter	0	200	0	0	0	200
8	Drip system	0	0	300	0	0	300

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Banhatti micro-watershed is presented in Table 12. For tractor it was Rs. 7,500, Sprayer was Rs. 4,090, Sprinkler was Rs. 10,000, Weeder

was Rs. 957, Harvester was Rs. 600, Thresher was Rs. 400, Chaff Cutter was Rs. 200 and Drip system was Rs. 300.

Livestock possession by the households: The data regarding the Livestock possession by the households in Banhatti micro-watershed is presented in Table 13. The results indicate that, 11.43 per cent of the households possess bullocks, 8.57 per cent of the households possess local cow and 2.86 per cent of the households possess buffalo and Poultry birds.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	1	12.50	2	22.22	1	20	0	0	4	11.43
2	Local cow	0	0	1	12.50	1	11.11	0	0	1	16.67	3	8.57
3	Buffalo	0	0	0	0	0	0	0	0	1	16.67	1	2.86
4	Poultry birds	0	0	0	0	1	11.11	0	0	0	0	1	2.86

Average Labour availability: The data regarding the average labour availability in Banhatti micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.47, average own labour (women) available was 1.07, average hired labour (men) available was 5.52 and average hired labour (women) available was 5.24.

Table 14. Average Labour availability in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
		N	N	N	N	N	N
1	Hired labour Female	0	5.63	6.75	6.50	4.50	5.24
2	Own Labour Female	0	1	1.22	1.25	1.33	1.07
3	Own labour Male	0	1.75	1.56	1.75	1.50	1.47
4	Hired labour Male	0	6.13	6.63	6.75	5.17	5.52

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Banhatti micro-watershed is presented in Table 15. The results indicate that, 74.29 per cent of the households opined that the hired labour was adequate and 5.71 per cent of the households opined that the hired labour was inadequate.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	1	14.29	8	100	7	77.78	4	80	6	100	26	74.29
2	Inadequate	1	14.29	0	0	1	11.11	0	0	0	0	2	5.71

Distribution of land (ha): The data regarding the distribution of land (ha) in Banhatti micro-watershed is presented in Table 16. The results indicate that, households of the Banhatti micro-watershed possess 43.23 ha (78.38 %) of dry land and 11.92 ha (21.62 %) of irrigated land. Marginal farmers possess 5.49 ha (100 %) of dry land. Small farmers possess 10.60 ha (85.44 %) of dry land and 1.80 ha (14.56 %) of irrigated land. Semi medium farmers possess 11.36 ha (90.34 %) of dry land and 1.21 ha (9.66 %) of irrigated

land. Medium farmers possess 15.78 ha (63.93 %) of dry land and 8.90 ha (36.07 %) of irrigated land.

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

Sl. No.	Particulars	MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	5.49	100	10.60	85.44	11.36	90.34	15.78	63.93	43.23	78.38
2	Irrigated	0	0	1.80	14.56	1.21	9.66	8.90	36.07	11.92	21.62
Total		5.49	100	12.40	100	12.57	100	24.69	100	55.15	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Banhatti micro-watershed is presented in Table 17. The results indicate that, the average value of dry land was Rs. 518,191.29 and the average value of irrigated land was Rs. 326,986.58. In case of marginal famers, the average land value was Rs. 1,130,375.39 for dry land. In case of small famers, the average land value was Rs. 594,385.03 for dry land and the average value of irrigated land was Rs.1,107,623.31. In case of semi medium famers, the average land value was Rs. 598,361.24 for dry land and the average land value was Rs. 1,157,812.48 of irrigated land. In case of medium famers, the average land value was Rs. 196,333.33 for dry land and the average land value was Rs. 213,318.18 of irrigated land.

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

Sl. No.	Particulars	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
		N	N	N	N	N
1	Dry	1,130,375.39	594,385.03	598,361.24	196,333.33	518,191.29
2	Irrigated	0	1,107,623.31	1,157,812.48	213,318.18	326,986.58

Status of bore wells: The data regarding the status of bore wells in Banhatti micro-watershed is presented in Table 18. The results indicate that, there were 4 functioning and De-functioning bore well in the micro watershed.

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

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
		N	N	N	N	N	N
1	De-functioning	0	0	2	0	2	4
2	Functioning	0	0	2	0	2	4

Source of irrigation: The data regarding the source of irrigation in Banhatti micro-watershed is presented in Table 19. The results indicate that, bore well was the major irrigation source in the micro water shed for 11.43 per cent of the farmers.

Table 19. Source of irrigation in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	0	0	2	22.22	0	0	2	33.33	4	11.43

Depth of water (Avg in meters): The data regarding the depth of water in Banhatti micro-watershed is presented in Table 20. The results indicate that, the depth of bore well was found to be 4.96 meters.

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

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
		N	N	N	N	N	N
1	Bore Well	0	0	6.43	0	19.30	4.96

Irrigated Area (ha): The data regarding the irrigated area (ha) in Banhatti micro-watershed is presented in Table 21. The results indicate that small, semi-medium and medium farmers had an irrigated area of 1.81, 1.21 and 4.05 ha respectively.

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

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
1	Kharif	0	0	1.81	1.21	4.05	7.07

Cropping pattern: The data regarding the cropping pattern in Banhatti micro-watershed is presented in Table 22. The results indicate that, farmers have grown red gram (28.22 ha), Paddy (6.07 ha), cotton (17.08 ha) and sorghum (0.16 ha).

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

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
1	Kharif - Red gram	0	3.48	2.85	11.36	10.53	28.22
2	Kharif - Cotton	0	1.85	7.94	0	7.29	17.08
3	Kharif - Paddy	0	0	0	1.21	4.86	6.07
4	Summer - Sorghum	0	0.16	0	0	0	0.16
Total		0	5.49	10.79	12.58	22.67	51.53

Cropping intensity: The data regarding the cropping intensity in Banhatti micro-watershed is presented in Table 23. The results indicate that, the cropping intensity in Banhatti micro-watershed was found to be 96.22 per cent.

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

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
1	Cropping Intensity	0	100	100	100	91.80	96.22

Possession of Bank account and savings: The data regarding the possession of bank account and saving in Banhatti micro-watershed is presented in Table 24. The results indicate that, 77.14 per cent of the households have bank account and savings.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	0	0	8	100	8	88.89	5	100	6	100	27	77.14
2	Savings	0	0	8	100	8	88.89	5	100	6	100	27	77.14

Borrowing status: The data regarding the borrowing status in Banhatti micro-watershed is presented in Table 25. The results indicate that, 80 per cent of the households have availed credit from different sources.

Table 25. Borrowing status in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	0	0	8	100	8	88.89	5	100	7	116.67	28	80

Source of credit availed by households: The data regarding the borrowing status in Banhatti micro-watershed is presented in Table 26. The results indicate that, 42.86 per cent of the households have borrowed from Commercial Bank, 3.57 per cent from Friends/Relatives and 21.43 per cent from Grameena Bank.

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

Sl.No.	Particulars	LL (0)		MF (8)		SF (8)		SMF (5)		MDF (7)		All (28)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Commercial Bank	0	0	2	25	6	75	2	40	2	28.57	12	42.86
2	Friends/Relatives	0	0	0	0	0	0	1	20	0	0	1	3.57
3	Grameena Bank	0	0	0	0	2	25	1	20	3	42.86	6	21.43

Avg. Credit amount: The data regarding the avg. Credit amount in Banhatti micro-watershed is presented in Table 27. The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs. 54,214.29.

Table 27. Avg. credit amount by household in Banhatti micro-watershed

Sl.No.	Particulars	MF (8)	SF (8)	SMF (5)	MDF (7)	All (28)
		N	N	N	N	N
1	Average Credit	11,250	48,750	78,000	92,571.43	54,214.29

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

Table 28. Purpose of credit borrowed - Institutional Credit by household in Banhatti

Sl.No.	Particulars	MF (2)		SF (8)		SMF (3)		MDF (5)		All (18)	
		N	%	N	%	N	%	N	%	N	%
1	Agriculture production	2	100	8	100	3	100	5	100	18	100

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

Table 29. Purpose of credit borrowed - Private Credit by household in Banhatti micro-watershed

Sl.No.	Particulars	SMF (1)		All (1)	
		N	%	N	%
1	Agriculture production	1	100	1	100

Table 30. Repayment status of households – Institutional Credit in Banhatti micro-watershed

Sl.No.	Particulars	LL (0)		MF (2)		SF (8)		SMF (3)		MDF (5)		All (18)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Un paid	0	0	2	100	8	100	3	100	5	100	18	100

Repayment status of households – Institutional: The data regarding the repayment status of credit borrowed from institutional sources by households in Banhatti micro

watershed is presented in Table 30. The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources.

Repayment status of households – Private: The data regarding the repayment status of credit borrowed from Private source by households in Banhatti micro watershed is presented in Table 31. The results indicated that 100 per cent of the households did not repay their loan borrowed from Private source.

Table 31. Repayment status of households – Private source in Banhatti micro-watershed

Sl.No.	Particulars	SMF (1)		All (1)	
		N	%	N	%
1	Un paid	1	100	1	100

Opinion on institutional sources of credit: The data regarding the opinion on institutional sources of credit in Banhatti micro watershed is presented in Table 32. The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations.

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

Sl.No.	Particulars	MF (2)		SF (8)		SMF (3)		MDF (5)		All (18)	
		N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	2	100	8	100	3	100	5	100	18	100

Opinion on Non-institutional sources of credit: The data regarding the opinion on non-institutional sources of credit in Banhatti micro watershed is presented in Table 33. The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to Easy accessibility of credit.

Table 33. Opinion on Non-institutional sources of credit in Banhatti micro watershed

Sl.No.	Particulars	SMF (1)		All (1)	
		N	%	N	%
1	Easy accessibility of credit	1	100	1	100

Cost of cultivation of Red gram: The data regarding the cost of cultivation of red gram in Banhatti micro-watershed is presented in Table 34. The results indicate that, the total cost of cultivation for red gram was Rs. 49387.42. The gross income realized by the farmers was Rs. 78695.08. The net income from red gram cultivation was Rs. 29307.65. Thus the benefit cost ratio was found to be 1: 1.59

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

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	61.86	13281.60	26.89
2	Bullock		Pairs/day	0.62	382.76	0.78
3	Tractor		Hours	0.69	663.06	1.34
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	20.92	2648.60	5.36
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	8.97	13258.26	26.85
8	Fertilizer + micronutrients		Quintal	3.89	3205.20	6.49
9	Pesticides (PPC)		Kgs / liters	2.11	2529.35	5.12
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	133.33	0.27
13	Depreciation charges			0	24.70	0.05
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				2608.20	5.28
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				38735.05	78.43
III	**Cost B2**					
18	Rental Value of Land				0	0
19	**Cost B2 = (Cost B1 + Rental value)**				38735.05	78.43
IV	**Cost C1**					
20	Family Human Labour			26.12	6069.04	12.29
21	**Cost C1 = (Cost B2 + Family Labour)**				44804.09	90.72
V	**Cost C2**					
22	Risk Premium				93.57	0.19
23	**Cost C2 = (Cost C1 + Risk Premium)**				44897.66	90.91
VI	**Cost C3**					
24	Managerial Cost				4489.77	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				49387.42	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		15.63	78695.08	
		b) Main Crop Sales Price (Rs.)			5033.33	
b.	Gross Income (Rs.)				78695.08	
c.	Net Income (Rs.)				29307.65	
d.	Cost per Quintal (Rs./q.)				3158.82	
e.	Benefit Cost Ratio (BC Ratio)				1:1.59	

Cost of Cultivation of Cotton: The data regarding the cost of cultivation of cotton in Banhatti micro-watershed is presented in Table 35. The results indicate that, the total cost of cultivation for cotton was Rs. 37760.88. The gross income realized by the farmers was Rs. 62872.09. The net income from cotton cultivation was Rs. 25111.21. Thus the benefit cost ratio was found to be 1: 1.67.

Table 35. Cost of Cultivation of Cotton in Banhatti micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	29.45	6496.60	17.20
2	Bullock		Pairs/day	5.29	3234.71	8.57
3	Tractor		Hours	5.51	3506.21	9.29
4	Machinery		Hours	0.79	117.15	0.31
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	5.41	3626.31	9.60
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	4.66	3498.08	9.26
8	Fertilizer + micronutrients		Quintal	4.57	3663.34	9.70
9	Pesticides (PPC)		Kgs / liters	2.68	3287.02	8.70
10	Irrigation		Number	1.45	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	45.45	0.12
13	Depreciation charges			0	138.24	0.37
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				1699.99	4.50
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				29313.12	77.63
III	**Cost B2**					
18	Rental Value of Land				31.82	0.08
19	**Cost B2 = (Cost B1 + Rental value)**				29344.93	77.71
IV	**Cost C1**					
20	Family Human Labour			21.09	4891.32	12.95
21	**Cost C1 = (Cost B2 + Family Labour)**				34236.26	90.67
V	**Cost C2**					
22	Risk Premium				91.82	0.24
23	**Cost C2 = (Cost C1 + Risk Premium)**				34328.07	90.91
VI	**Cost C3**					
24	Managerial Cost				3432.81	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				37760.88	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		13.75	62872.09	
		b) Main Crop Sales Price (Rs.)			4572.73	
b.	Gross Income (Rs.)				62872.09	
c.	Net Income (Rs.)				25111.21	
d.	Cost per Quintal (Rs./q.)				2746.37	
e.	Benefit Cost Ratio (BC Ratio)				1:1.67	

Cost of Cultivation of Paddy: The data regarding the cost of cultivation of Paddy in Banhatti micro-watershed is presented in Table 36. The results indicate that, the total cost of cultivation for Paddy was Rs. 28165.58. The gross income realized by the farmers was Rs. 76570. The net income from Paddy cultivation was Rs. 48404.42. Thus the benefit cost ratio was found to be 1: 2.72.

Table 36. Cost of Cultivation of Paddy in Banhatti micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	20.07	3921.13	13.92
2	Bullock		Pairs/day	1.24	1111.50	3.95
3	Tractor		Hours	6.18	3705	13.15
4	Machinery		Hours	2.47	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	72.04	3087.50	10.96
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	2.16	2593.50	9.21
8	Fertilizer + micronutrients		Quintal	4.94	4075.50	14.47
9	Pesticides (PPC)		Kgs / liters	2.47	2964	10.52
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	100.24	0.36
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				1538.46	5.46
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				23096.83	82
III	**Cost B2**					
18	Rental Value of Land				0	0
19	**Cost B2 = (Cost B1 + Rental value)**				23096.83	82
IV	**Cost C1**					
20	Family Human Labour			9.88	2408.25	8.55
21	**Cost C1 = (Cost B2 + Family Labour)**				25505.08	90.55
V	**Cost C2**					
22	Risk Premium				100	0.36
23	**Cost C2 = (Cost C1 + Risk Premium)**				25605.08	90.91
VI	**Cost C3**					
24	Managerial Cost				2560.51	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				28165.58	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		37.05	74100	
		b) Main Crop Sales Price (Rs.)			2000	
	By Product	e) Main Product (q)		1.24	2470	
		f) Main Crop Sales Price (Rs.)			2000	
b.	Gross Income (Rs.)				76570	
c.	Net Income (Rs.)				48404.42	
d.	Cost per Quintal (Rs./q.)				760.20	
e.	Benefit Cost Ratio (BC Ratio)				1:2.72	

Cost of cultivation of sorghum: The data regarding the cost of cultivation of sorghum in Banhatti micro-watershed is presented in Table 37. The results indicate that, the total cost of cultivation for sorghum was Rs. 60649.60. The gross income realized by the farmers was Rs. 76000. The net income from sorghum cultivation was Rs. 15350.40. Thus the benefit cost ratio was found to be 1: 1.25.

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

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	82.33	15580	25.69
2	Bullock		Pairs/day	0	0	0
3	Tractor		Hours	0	0	0
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	63.33	7600	12.53
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	0	0	0
8	Fertilizer + micronutrients		Quintal	12.67	9500	15.66
9	Pesticides (PPC)		Kgs / liters	0	0	0
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	25.33	0.04
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				2064	3.40
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				34769.33	57.33
III	**Cost B2**					
18	Rental Value of Land				0	0
19	**Cost B2 = (Cost B1 + Rental value)**				34769.33	57.33
IV	**Cost C1**					
20	Family Human Labour			107.67	20266.67	33.42
21	**Cost C1 = (Cost B2 + Family Labour)**				55036	90.74
V	**Cost C2**					
22	Risk Premium				100	0.16
23	**Cost C2 = (Cost C1 + Risk Premium)**				55136	90.91
VI	**Cost C3**					
24	Managerial Cost				5513.60	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				60649.60	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		31.67	69666.67	
		b) Main Crop Sales Price (Rs.)			2200	
	By Product	e) Main Product (q)		6.33	6333.33	
		f) Main Crop Sales Price (Rs.)			1000	
b.	Gross Income (Rs.)				76000	
c.	Net Income (Rs.)				15350.40	
d.	Cost per Quintal (Rs./q.)				1915.25	
e.	Benefit Cost Ratio (BC Ratio)				1:1.25	

Adequacy of fodder: The data regarding the adequacy of fodder in Banhatti micro-watershed is presented in Table 38. The results indicate that, 22.86 per cent of the households opined that dry fodder was adequate and 2.86 per cent of the households opined that dry fodder was inadequate.

Table 38. Adequacy of fodder in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	4	50	1	11.11	2	40	1	16.67	8	22.86
2	Inadequate-Dry Fodder	0	0	0	0	0	0	1	20	0	0	1	2.86

Annual gross income: The data regarding the annual gross income in Banhatti micro-watershed is presented in Table 39. The results indicate that the annual gross income was Rs. 19,142.86 for landless farmers, for marginal farmers it was Rs. 80,000, for small farmers it was Rs. 118,333.33, for semi medium farmers it was Rs. 184,000 and for medium farmers it was Rs. 343,333.33.

Table 39. Annual gross income in Banhatti micro-watershed (Avg. value in Rs.)

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
1	Service/salary	0	0	22,222.22	0	25,000	10,000
2	Business	7,142.86	0	0	0	0	1,428.57
3	Wage	12,000	27,500	38,888.89	32,000	60,000	33,542.86
4	Agriculture	0	52,500	57,222.22	152,000	258,333.33	92,714.29
Income(Rs.)		19,142.86	80,000	118,333.33	184,000	343,333.33	137,685.71

Average annual expenditure: The data regarding the average annual expenditure in Banhatti micro-watershed is presented in Table 40. The results indicate that the average annual expenditure is Rs. 13,509.52. For landless households it was Rs. 8,285.71, for marginal farmers it was Rs. 5,500, for small farmers it was Rs. 6,888.89, for semi medium farmers it was Rs. 16,600 and for medium farmers it was Rs. 37,638.89 .

Table 40. Average annual expenditure in Banhatti micro-watershed

(Avg. value in Rs.)

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
1	Service/salary	0	0	10,000	0	50,000	1,714.29
2	Business	10,000	0	0	0	0	285.71
3	Wage	48,000	14,000	12,000	13,000	27,500	13,485.71
4	Agriculture	0	30,000	40,000	70,000	148,333.33	51,428.57
Total		58,000	44,000	62,000	83,000	225,833.33	472,833.33
Average		8,285.71	5,500	6,888.89	16,600	37,638.89	13,509.52

Table 41. Horticulture species grown in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	0	0	1	2	2	0	2	4	5	6
2	Mandarin	0	0	0	0	0	0	0	0	2	0	2	0
3	Mango	0	0	0	0	1	0	2	0	2	1	5	1
4	lime	0	0	0	0	1	0	0	0	1	0	2	0

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

Horticulture species grown: The data regarding horticulture species grown in Banhatti micro-watershed is presented in Table 41. The results indicate that, sampled households have grown 5 coconut, 2 madarin, 5 mango and 2 lime trees in their field and 1 mango in backyard.

Forest species grown: The data regarding forest species grown in Banhatti micro-watershed is presented in Table 42. The results indicate that, households have planted 68 neem, 14Tamarind and 2 Pongamia trees in their field and 1 neem in backyard.

Table 42: Forest species grown in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Neem	0	0	12	-1	8	0	5	1	43	2	68	2
2	Tamarind	0	0	2	0	2	0	2	0	8	0	14	0
3	Pongamia	0	0	0	0	0	0	0	0	2	0	2	0

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

Average Additional investment capacity: The data regarding average additional investment capacity in Banhatti micro-watershed is presented in Table 43. The results indicated that, households have an average investment capacity of Rs. 8,485.71 for land development.

Table 43: Average Additional investment capacity in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)	MF (8)	SF (9)	SMF (5)	MDF (6)	All (35)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Land development	0	8,750	11,111.11	12,000	11,166.67	8,485.71

Source of additional investment: The data regarding source of funds for additional investment in Banhatti micro-watershed is presented in Table 44. The results indicated that Soft loan was the source of additional investment for 74.29per cent for land development.

Table 44: Source of funds for additional investment capacity in Banhatti micro-watershed

Sl.No	Item	Land development	
		N	%
1	Soft loan	26	74.29

Table 45. Marketing of the agricultural produce in Banhatti micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Cotton	210	0	210	100	4572.73
2	Paddy	180	30	150	83.33	2000.0
3	Redgram	494	73	421	85.22	5033.33
4	Sorghum	5	2	3	60	2200.0

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Banhatti micro-watershed is presented in Table 45. The results

indicated that, Paddy was sold to the extent of 83.33 per cent, cotton was sold to the extent of 100 per cent, Redgram was sold to the extent of 85.22 per cent and sorghum was sold to the extent of 60 per cent.

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Banhatti micro-watershed is presented in Table 46. The results indicated that, about 57.14 per cent of the farmers sold their produce to agent/ traders, 5.71 per cent of the farmers sold their produce to local/village merchants, 14.29 per cent of them sold in regulated markets and 5.71 per cent of them sold in Cooperative marketing Society.

Table 46. Marketing Channels used for sale of agricultural produce in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agent/Traders	0	0	8	100	8	88.89	1	20	3	50	20	57.14
2	Local/village Merchant	0	0	0	0	1	11.11	0	0	1	16.67	2	5.71
3	Regulated Market	0	0	1	12.50	0	0	3	60	1	16.67	5	14.29
4	Cooperative marketing Society	0	0	0	0	0	0	1	20	1	16.67	2	5.71

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Banhatti micro-watershed is presented in Table 47. The results indicated that, 82.86 per cent of the households have used tractor as a mode of transportation for their agricultural produce.

Table 47. Mode of transport of agricultural produce in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Tractor	0	0	9	112.50	9	100	5	100	6	100	29	82.86

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Banhatti micro-watershed is presented in Table 48. The results indicated that, 5.71 per cent of the households have experienced soil and water erosion problems in the farm.

Table 48. Incidence of soil and water erosion problems in Banhatti micro-watershed

Sl. No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	1	12.50	1	11.11	0	0	0	0	2	5.71

Table 49. Interest shown towards soil testing in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	7	87.50	6	66.67	2	40	5	83.33	20	57.14

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Banhatti micro-watershed is presented in Table 49. The results indicated that, 57.14 per cent have shown interest in soil test.

Soil and water conservation practices and structures adopted: The data regarding soil and water conservation practices and structures adopted in Banhatti micro-watershed is presented in Table 50. The results indicated that, Summer Graded Bund, Contour Cultivation and Bore Well Recharge Pit were adopted for 2.86 per cent, Summer Ploughing was adopted for 54.29 per cent, Dead Furrow was adopted for 22.86 per cent, Mulching was adopted for 54.29 per cent and Combination of deep and shallow root crops was adopted for 5.71per cent.

Table 50. Soil and water conservation practices and structures adopted in Banhatti micro-watershed

Sl. No.	Particulars	MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Graded Bund	0	0	0	0	1	20	0	0	1	2.86
2	Bore Well Recharge Pit	0	0	1	11.11	0	0	0	0	1	2.86
3	Summer Ploughing	5	62.50	6	66.67	4	80	4	66.67	19	54.29
4	Dead Furrow	2	25	2	22.22	1	20	3	50	8	22.86
5	Mulching	1	12.50	1	11.11	2	40	2	33.33	6	17.14
6	Contour Cultivation	0	0	0	0	0	0	1	16.67	1	2.86
7	Combination of deep and shallow root crops	1	12.50	0	0	0	0	1	16.67	2	5.71

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Banhatti micro-watershed is presented in Table 51. The results indicated that, 91.43 per cent of the households used firewood as a source of fuel and 5.71 per cent of the households used Dung Cake.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Dung Cake	0	0	2	25	0	0	0	0	0	0	2	5.71
2	Fire Wood	6	85.71	6	75	9	100	5	100	6	100	32	91.43

Source of drinking water: The data regarding source of drinking water in Banhatti micro-watershed is presented in Table 52. The results indicated that, piped supply was the major source of drinking water for 85.71 per cent of the households in the micro watershed and Bore Well was the major source of drinking water for 2.86 per cent of the households in the micro watershed .

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	4	57.14	8	100	8	88.89	5	100	5	83.33	30	85.71
2	Bore Well	1	14.29	0	0	0	0	0	0	0	0	1	2.86

Table 53. Source of light in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	6	85.71	8	100	9	100	5	100	6	100	34	97.14

Source of light: The data regarding source of light in Banhatti micro-watershed is presented in Table 53. The results indicated that, Electricity was the major source of light for 97.14 per cent of the households in micro watershed.

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facility in Banhatti micro-watershed is presented in Table 54. The results indicated that, 25.71 per cent of the households possess sanitary toilet facility.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	2	28.57	4	50	1	11.11	1	20	1	16.67	9	25.71

Possession of PDS card: The data regarding possession of PDS card in Banhatti micro-watershed is presented in Table 55. The results indicated that, 97.14 per cent of the sampled households possessed BPL card.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	APL	0	0	0	0	0	0	0	0	0	0	0	0
2	BPL	6	85.71	8	100	9	100	5	100	6	100	34	97.14

Participation in NREGA program: The data regarding participation in NREGA programme in Banhatti micro-watershed is presented in Table 56. The results indicated that, 94.29 per cent of the households participated in NREGA programme.

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	6	85.71	8	100	8	88.89	5	100	6	100	33	94.29

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

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	2	28.57	8	100	9	100	5	100	6	100	30	85.71
2	Pulses	2	28.57	8	100	9	100	5	100	6	100	30	85.71
3	Oilseed	1	14.29	7	87.50	6	66.67	3	60	5	83.33	22	62.86
4	Vegetables	1	14.29	6	75	8	88.89	2	40	5	83.33	22	62.86
5	Fruits	0	0	7	87.50	4	44.44	1	20	5	83.33	17	48.57
6	Milk	0	0	1	12.50	1	11.11	0	0	1	16.67	3	8.57
7	Egg	0	0	0	0	1	11.11	0	0	1	16.67	2	5.71
8	Meat	0	0	0	0	1	11.11	0	0	0	0	1	2.86

Adequacy of food items: The data regarding adequacy of food items in Banhatti micro-watershed is presented in Table 57. The results indicated that, cereals and pulses were adequate for 85.71 per cent of the households, oilseed and Vegetables were adequate for 62.86 per cent, Milk were adequate for 8.57 per cent, fruits was adequate for 48.57 per cent, eggs were adequate for 5.71 per cent and meat were adequate for 2.86 per cent.

Inadequacy of food items: The data regarding inadequacy of food items in Banhatti micro-watershed is presented in Table 58. The results indicated that, Cereals and pulses were inadequate for 2.86 per cent of the households, oilseed were inadequate for 25.71 per cent of the households, vegetables were inadequate for 28.57 per cent, fruits was inadequate for 37.14 per cent, milk were inadequate for 71.43 per cent, Meat were inadequate for 85.71 per cent and eggs were inadequate for 77.14 per cent.

Table 58. Inadequacy of food items in Banhatti micro-watershed

Sl.No.	Particulars	LL (7)		MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	1	14.29	0	0	0	0	0	0	0	0	1	2.86
2	Pulses	1	14.29	0	0	0	0	0	0	0	0	1	2.86
3	Oilseed	2	28.57	1	12.50	3	33.33	2	40	1	16.67	9	25.71
4	Vegetables	2	28.57	2	25	2	22.22	3	60	1	16.67	10	28.57
5	Fruits	3	42.86	1	12.50	4	44.44	4	80	1	16.67	13	37.14
6	Milk	3	42.86	7	87.50	7	77.78	4	80	4	66.67	25	71.43
7	Egg	3	42.86	8	100	6	66.67	5	100	5	83.33	27	77.14
8	Meat	3	42.86	8	100	9	100	5	100	5	83.33	30	85.71

Table 59. Farming constraints Experienced in Banhatti micro-watershed

Sl. No.	Particulars	MF (8)		SF (9)		SMF (5)		MDF (6)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	5	62.50	9	100	5	100	6	100	25	71.43
2	Wild animal menace on farm field	4	50	8	88.89	1	20	4	66.67	17	48.57
3	Frequent incidence of pest and diseases	4	50	9	100	5	100	5	83.33	23	65.71
4	Inadequacy of irrigation water	5	62.50	9	100	4	80	6	100	24	68.57
5	High cost of Fertilizers and plant protection chemicals	5	62.50	8	88.89	5	100	6	100	24	68.57
6	High rate of interest on credit	3	37.50	9	100	6	120	6	100	24	68.57
7	Low price for the agricultural commodities	5	62.50	7	77.78	4	80	4	66.67	20	57.14
8	Lack of marketing facilities in the area	3	37.50	5	55.56	4	80	2	33.33	14	40
9	Inadequate extension services	1	12.50	1	11.11	2	40	3	50	7	20
10	Lack of transport for safe transport of the Agril produce to the market.	1	12.50	0	0	1	20	3	50	5	14.29

Farming constraints: The data regarding farming constraints experienced by households in Banhatti micro-watershed is presented in Table 59. The results indicated that, lower fertility status of the soil was the constraint experienced by 71.43 per cent, Wild animal menace on farm field was the constraint experienced by 48.57 per cent, frequent

incidence of pest and diseases was the constraint experienced by 65.71 per cent, Inadequacy of irrigation water, high cost of fertilizer and plant protection chemicals and high rate of interest on credit was the constraint experienced by 68.57 per cent of the households and Low price for the agricultural commodities (57.14 %), Lack of marketing facilities in the area (40 %), Inadequate extension services (20 %) and Lack of transport for safe transport of the Agril produce to the market (14.29 %).

Chapter 5

SUMMARY

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

The data on households sampled for socio economic survey indicated that 36 farmers were sampled in Banhatti micro-watershed among them 7 (20 %) were landless, 8 (22.86 %) were marginal farmers, 9 (25.71 %) were small farmers, 5 (14.29 %) were semi medium farmers and 6 (17.14 %) were medium farmers.

The data indicated that there were 102 (61.82 %) men and 63 (38.18 %) women among the sampled households. The average family size of landless farmers' was 5, marginal farmers' was 4.5, small farmers' was 4.77, semi medium farmers' was 4.2 and medium farmers' was 5.

The data indicated that, 20 (12.12 %) people were in 0-15 years of age, 86 (52.12 %) were in 16-35 years of age, 52 (31.52 %) were in 36-60 years of age and 7 (4.24 %) were above 61 years of age.

The results indicated that Banhatti had 33.33 per cent illiterates, 21.82 per cent of them had Primary School, 3.64 per cent of them had Middle School education, 21.21 per cent of them had High School education, 3.64 per cent of them had PUC education, 1.82 per cent of them had Diploma education, 0.61 per cent of them had ITI education and 10.30 per cent had degree education.

The results indicate that, 77.14 per cent of household heads were practicing agriculture, 14.29 per cent of the household heads were agricultural labourer, 2.86 per cent were Trade & Business and 5.71 per cent were Housewife.

The results indicate that agriculture was the major occupation for 35.76 per cent of the household members, 25.45 per cent were agricultural laborers, 0.61 per cent were general laborers and Household industry, 1.21 per cent were in private service, 13.94 per cent were students, 16.36 per cent were Housewife and 2.42 per cent were children.

The results show that, 100 per cent of the population in the micro watershed has not participated in any local institutions. The results indicate that 94.29 per cent of the households possess Katcha house and 5.71 per cent of them possess pucca/RCC house.

The results show that 82.86 per cent of the households possess TV, 2.86 per cent of the households possess DVD/VCD Player, 31.43 per cent of them possess mixer/grinder, 5.71 per cent of the households possess Refrigerator,17.14 per cent of the households possess motor cycle and 94.44 per cent of the households possess mobile phones.

The results show that the average value of television was Rs. 8,785, mixer/grinder was Rs. 2,000, motor cycle was Rs. 59,333, tempo was Rs. 180,000 and mobile phone was Rs. 3,002. About 2.86 per cent each of the households possess Tractor, Thresher, Sprinkler, Chaff Cutter and Drip system, 31.43 per cent of the households possess Sprayer, 25.71 per cent of them possess weeder and 22.86 per cent of them possess Harvester.

For tractor it was Rs. 7,500, Sprayer was Rs. 4,090, Sprinkler was Rs. 10,000, Weeder was Rs. 957, Harvester was Rs. 600, Thresher was Rs. 400, Chaff Cutter was Rs. 200 and Drip system was Rs. 300.

The results indicate that, 11.43 per cent of the households possess bullocks, 8.57 per cent of the households possess local cow and 2.86 per cent of the households possess buffalo and Poultry birds.

The results indicate that, average own labour men available in the micro watershed was 1.47, average own labour (women) available was 1.07, average hired labour (men) available was 5.52 and average hired labour (women) available was 5.24.

The results indicate that, 74.29 per cent of the households opined that the hired labour was adequate and 5.71 per cent of the households opined that the hired labour was inadequate. The results indicate that, households of the Banhatti micro-watershed possess 43.23 ha (78.38 %) of dry land and 11.92 ha (21.62 %) of irrigated land. Marginal farmers possess 5.49 ha (100 %) of dry land. Small farmers possess 10.60 ha (85.44 %) of dry land and 1.80 ha (14.56 %) of irrigated land. Semi medium farmers possess 11.36 ha (90.34 %) of dry land and 1.21 ha (9.66 %) of irrigated land. Medium farmers possess 15.78 ha (63.93 %) of dry land and 8.90 ha (36.07 %) of irrigated land.

The results indicate that, the average value of dry land was Rs. 518,191.29 and the average value of irrigated land was Rs. 326,986.58. In case of marginal famers, the average land value was Rs. 1,130,375.39 for dry land. In case of small famers, the average land value was Rs. 594,385.03 for dry land and the average value of irrigated land was Rs.1,107,623.31. In case of semi medium famers, the average land value was Rs. 598,361.24 for dry land and the average land value was Rs. 1,157,812.48 of irrigated land. In case of medium famers, the average land value was Rs. 196,333.33 for dry land and the average land value was Rs. 213,318.18 of irrigated land.

The results indicate that, there were 4 functioning and De-functioning bore well in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 11.43 per cent of the farmers. The results indicate that, the depth of bore well was found to be 4.96 meters.

The results indicate that small, semi-medium and medium farmers had an irrigated area. The results indicate that, farmers have grown red gram (28.22 ha), Paddy (6.07 ha), cotton (17.08 ha) and sorghum (0.16 ha). The results indicate that, the cropping intensity in Banhatti micro-watershed was found to be 96.22 per cent. The results indicate that, 77.14 per cent of the households have bank account and savings.

The results indicate that, 80 per cent of the households have availed credit from different sources. The results indicate that, 42.86 per cent of the households have borrowed from Commercial Bank, 3.57 per cent from Friends/Relatives and 21.43 per cent from Grameena Bank. The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs. 54,214.29.

The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production. The results indicate that, 100 per cent of the households borrowed from private credit for the purpose of agricultural production. The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources.The results indicated that 100 per cent of the households did not repay their loan borrowed from Private source.

The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations. The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to Easy accessibility of credit.

The results indicate that, the total cost of cultivation for red gram was Rs. 49387.42. The gross income realized by the farmers was Rs. 78695.08. The net income from red gram cultivation was Rs. 29307.65. Thus the benefit cost ratio was found to be 1: 1.59

The results indicate that, the total cost of cultivation for cotton was Rs. 37760.88. The gross income realized by the farmers was Rs. 62872.09. The net income from cotton cultivation was Rs. 25111.21. Thus the benefit cost ratio was found to be 1: 1.67.

The results indicate that, the total cost of cultivation for Paddy was Rs. 28165.58. The gross income realized by the farmers was Rs. 76570. The net income from Paddy cultivation was Rs. 48404.42. Thus the benefit cost ratio was found to be 1: 2.72.

The results indicate that, the total cost of cultivation for sorghum was Rs. 60649.60. The gross income realized by the farmers was Rs. 76000. The net income from

sorghum cultivation was Rs. 15350.40. Thus the benefit cost ratio was found to be 1: 1.25.

The results indicate that, 22.86 per cent of the households opined that dry fodder was adequate and 2.86 per cent of the households opined that dry fodder was inadequate. The results indicate that the annual gross income was Rs. 19,142.86 for landless farmers, for marginal farmers it was Rs. 80,000, for small farmers it was Rs. 118,333.33, for semi medium farmers it was Rs. 184,000 and for medium farmers it was Rs. 343,333.33.

The results indicate that the average annual expenditure is Rs. 13,509.52. For landless households it was Rs. 8,285.71, for marginal farmers it was Rs. 5,500, for small farmers it was Rs. 6,888.89, for semi medium farmers it was Rs. 16,600 and for medium farmers it was Rs. 37,638.89 .

The results indicate that, sampled households have grown 5 coconut, 2 madarin, 5 mango and 2 lime trees in their field and 1 mango in backyard. The results indicate that, households have planted 68 neem, 14Tamarind and 2 Pongamia trees in their field and 1 neem in backyard.

The results indicated that, households have an average investment capacity of Rs. 8,485.71 for land development. The results indicated that Soft loan was the source of additional investment for 74.29per cent for land development. The results indicated that, Paddy was sold to the extent of 83.33 per cent, cotton was sold to the extent of 100 per cent, Redgram was sold to the extent of 85.22 per cent and sorghum was sold to the extent of 60 per cent.

The results indicated that, about 57.14 per cent of the farmers sold their produce to agent/ traders, 5.71 per cent of the farmers sold their produce to local/village merchants, 14.29 per cent of them sold in regulated markets and 5.71 per cent of them sold in Cooperative marketing Society.

The results indicated that, 82.86 per cent of the households have used tractor as a mode of transportation for their agricultural produce. The results indicated that, 5.71 per cent of the households have experienced soil and water erosion problems in the farm. The results indicated that, 57.14 per cent have shown interest in soil test.

The results indicated that, Summer Graded Bund, Contour Cultivation and Bore Well Recharge Pit were adopted for 2.86 per cent, Summer Ploughing was adopted for 54.29 per cent, Dead Furrow was adopted for 22.86 per cent, Mulching was adopted for 54.29 per cent and Combination of deep and shallow root crops was adopted for 5.71per cent.

The results indicated that, 91.43 per cent of the households used firewood as a source of fuel and 5.71 per cent of the households used Dung Cake. The results indicated

that, piped supply was the major source of drinking water for 85.71 per cent of the households in the micro watershed and Bore Well was the major source of drinking water for 2.86 per cent of the households in the micro watershed .

The results indicated that, Electricity was the major source of light for 97.14 per cent of the households in micro watershed. The results indicated that, 25.71 per cent of the households possess sanitary toilet facility. The results indicated that, 97.14 per cent of the sampled households possessed BPL card. The results indicated that, 94.29 per cent of the households participated in NREGA programme.

The results indicated that, cereals and pulses were adequate for 85.71 per cent of the households, oilseed and Vegetables were adequate for 62.86 per cent, Milk were adequate for 8.57 per cent, fruits was adequate for 48.57 per cent, eggs were adequate for 5.71 per cent and meat were adequate for 2.86 per cent.

The results indicated that, Cereals and pulses were inadequate for 2.86 per cent of the households, oilseed were inadequate for 25.71 per cent of the households, vegetables were inadequate for 28.57 per cent, fruits was inadequate for 37.14 per cent, milk were inadequate for 71.43 per cent, Meat were inadequate for 85.71 per cent and eggs were inadequate for 77.14 per cent.

The results indicated that, lower fertility status of the soil was the constraint experienced by 71.43 per cent, Wild animal menace on farm field was the constraint experienced by 48.57 per cent, frequent incidence of pest and diseases was the constraint experienced by 65.71 per cent, Inadequacy of irrigation water, high cost of fertilizer and plant protection chemicals and high rate of interest on credit was the constraint experienced by 68.57 per cent of the households and Low price for the agricultural commodities (57.14 %), Lack of marketing facilities in the area (40 %), Inadequate extension services (20 %) and Lack of transport for safe transport of the Agril produce to the market (14.29 %).