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

KONDAPUR (4D5B1R1f) MICROWATERSHED

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

KONDAPUR (4D5B1R1f) MICROWATERSHED

Balichakra Hobli, Yadgir Taluk and District, Karnataka

Karnataka Watershed Development Project – II

Sujala-III

World Bank funded Project

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

WATERSHED DEVELOPMENT DEPARTMENT, GOVT. OF KARNATAKA, BANGALORE

PREFACE

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

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

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

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

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

ICAR-NBSS&LUP, Regional Centre, Bangalore has taken up a project sponsored by the Karnataka Watershed Development Project-II, (Sujala-III), Government of Karnataka funded by the World Bank under Component-1 Land Resource Inventry. This study was taken up to demonstrate the utility of such a database in reviewing, monitoring and evaluating all the land based watershed development programs on a scientific footing. To meet the requirements of various land use planners at grassroots level, the present study on "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of Kondapur 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
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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Kondapur 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 352 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 331 ha (94%) in the microwatershed is covered by soils and 20 ha (6%) by others (habitation and water bodies). The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 3 soil series and 5 soil phases (management units) and one land use class.*
- *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.*
- *Entire area in the microwatershed is suitable for agriculture.*
- *About 45 per cent area of the microwatershed has soils that are very deep (>150 cm), 13 per cent soils are deep (100-150 cm) and 36 per cent soils are moderately deep (75-100 cm).*
- *About 23 per cent area in the microwatershed has loamy soils and 71 per cent clayey soils.*
- *Entire area of the microwatershed has non gravelly (<15%) soils at the surface.*
- *About 36 per cent area is medium (101-150 mm/m) and 58 per cent area is very high (>200 mm/m) in available water capacity.*

- *An area of about 10 per cent has nearly level (0-1%) and 84 per cent has very gently sloping (1-3% slope) lands in the microwatershed.*
- *An area of about 10 per cent are slightly eroded (e1), 68 per cent are moderately (e2) eroded and 16 per cent area is severely (e3) eroded.*
- *An area of about 13 per cent is moderately alkaline (pH 7.8-8.4), 69 per cent is strongly alkaline (pH 8.4-9.0) and 12 per cent is very strongly alkaline (pH >9.0) in relation.*
- *The Electrical Conductivity (EC) of the soils in the entire area of the microwatershed is <2 dsm^{-1} indicating that the soils are non-saline.*
- *About 23 per cent of soils are low (<0.5%), 28 per cent of soils are medium (0.5-0.75%) and 43 per cent of soils are high (>0.75%) in organic carbon.*
- *About 86 per cent area is low (<23 kg/ha), 4 per cent area is medium (23-57 kg/ha) and 4 per cent area is high (>57 kg/ha) in available phosphorus.*
- *About 45 per cent is medium (145-337 kg/ha) and 49 per cent is high (>337 kg/ha) in available potassium.*
- *Available sulphur is low (<10 ppm) in an area of about 52 per cent and medium (10 -20 ppm) in 42 per cent area of the microwatershed.*
- *Available boron is low (<0.5 ppm) in an area of about 16 per cent, medium (0.5-1.0 ppm) in an area of 41 per cent and high (>1.0 ppm) in 37 per cent area of the microwatershed.*
- *Available iron is deficient (<4.5 ppm) in an area of about 84 per cent and sufficient (>4.5 ppm) in 10 per cent area of the microwatershed.*
- *Available manganese is sufficient in the entire soils of the microwatershed.*
- *Available copper is sufficient in the entire soils of the microwatershed.*
- *Available zinc is deficient (<0.6 ppm) in a maximum area of about 91 per cent and sufficient (>0.6 ppm) in 4 per cent area of the microwatershed.*
- *The land suitability for 29 major agricultural and horticultural crops grown in the microwatershed was assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the Microwatershed

Crop	Suitability Area in ha (%)		Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)		Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*331(94)*	-	*Guava*	-	-
Maize	-	*331(94)*	*Sapota*	-	-
Bajra	-	*331(94)*	*Pomegranate*	-	*331(94)*
Groundnut	-	-	*Musambi*	*205(58)*	*126(36)*
Sunflower	*205(58)*	*126(36)*	*Lime*	*205(58)*	*126(36)*
Redgram	-	*331(94)*	*Amla*	*205(58)*	*126(36)*
Bengal gram	*331(94)*	-	*Cashew*	-	-
Cotton	*205(58)*	*126(36)*	*Jackfruit*	-	-
Chilli	-	*331(94)*	*Jamun*	-	*205(58)*
Tomato	-	-	*Custard apple*	*331(94)*	-
Drumstick	-	*331(94)*	*Tamarind*	-	*205(58)*
Brinjal	-	*331(94)*	*Mulberry*	-	-
Bhendi	-	*331(94)*	*Marigold*	-	*331(94)*
Onion	-	*47(13)*	*Chrysanthemum*	-	*331(94)*
Mango	-	-			

- *Apart from the individual crop suitability, a proposed crop plan has been prepared for the identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and other horticulture crops.*
- *Maintaining soil-health is vital for crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested for these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation treatment plan has been prepared that would help in identifying the sites to be treated and also the type of structures required.*
- *As part of the greening programme, several tree species have been suggested to be planted in marginal and submarginal lands, field bunds and also in the hillocks, mounds and ridges. This would help in not only supplementing the farm income but also provide fodder and fuel and generate lot of biomass which would help in maintaining an ecological balance and also contribute to mitigating the climate change.*

Chapter 1

INTRODUCTION

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 Kondapur 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 Kondapur microwatershed is located in the northern part of Karnataka in Yadgir Taluk & District, Karnataka State (Fig.2.1). It lies between 18° 24’ and 18° 27’ North latitudes and 74° 14’ and 74° 19’ East longitudes covering an area of about 352 ha. It is about 21 km south of Yadgir town. It comprises and surrounded by Sangavara and Kondapura villages on the northern and northwestern side and Badiyala village on the southwestern, eastern and southern side.

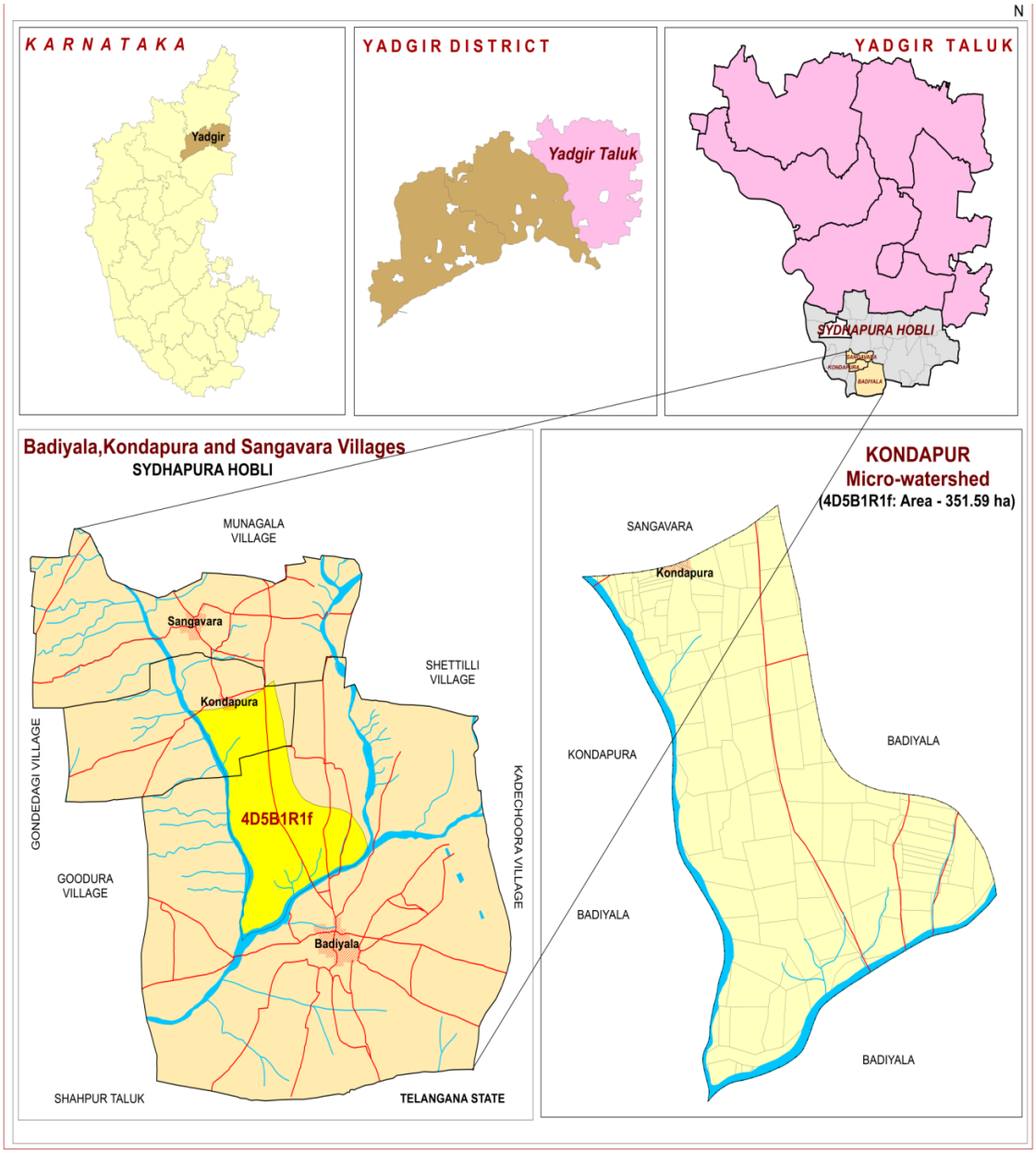


Fig.2.1 Location map of Kondapur Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are alluvium (Figs.2.2). The most widespread and characteristic development of alluvium in the watershed region lying between the rivers Krishna and Bhima is a wide belt, the underlying formation is gneiss and alluvial soils occur over gneiss, limestone and shale. The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig. 2.2 Alluvium

2.3 Physiography

Physiographically, the area has been identified as alluvial landscapes based on geology. The area has been further subdivided into four landforms, *viz;* summits, very gently sloping uplands, plains and valleys based on slope and its relief features. The elevation ranges from 354-363 m above MSL.

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

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

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

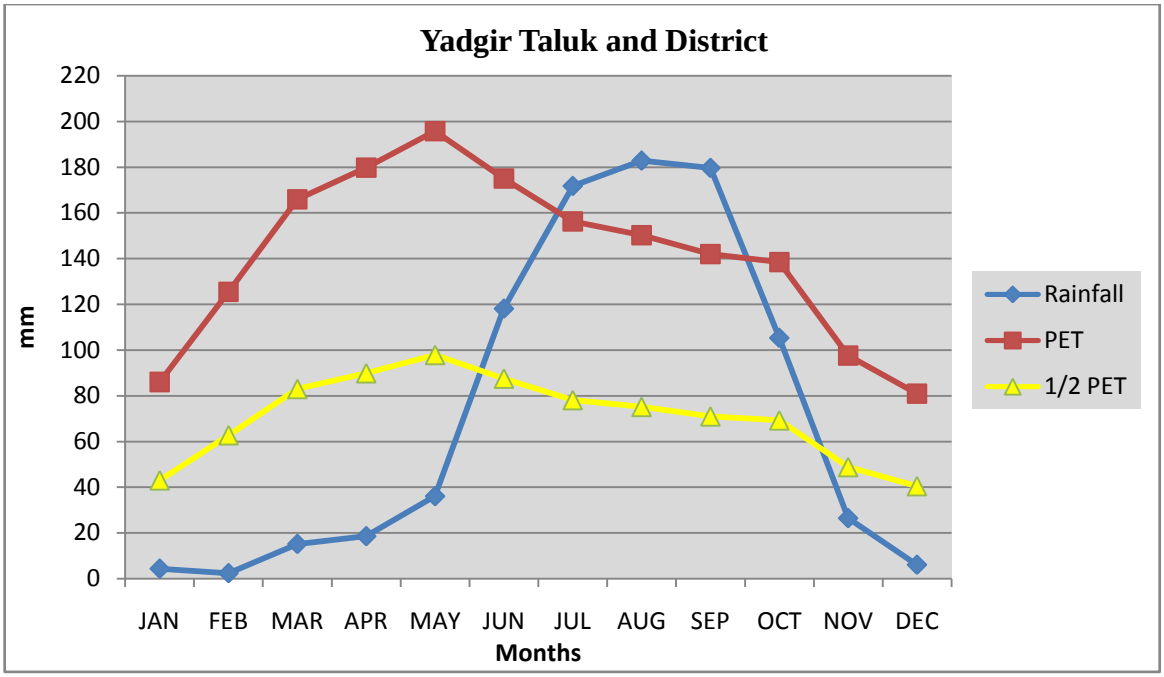


Fig 2.3 Rainfall distribution in Yadgir Taluk, Yadgir District

2.6 Natural Vegetation

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

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.

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. The cropping intensity is 120 per cent in the taluk. While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map

of Kondapur microwatershed is presented in Fig.2.4. The different crops and cropping systems adopted in the microwatershed is presented in Figures 2.5 a & b. Simultaneously, enumeration of existing wells (bore wells and open wells) and conservation structures is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells and conservation structures in Kondapur microwatershed is presented in Fig.2.6.

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

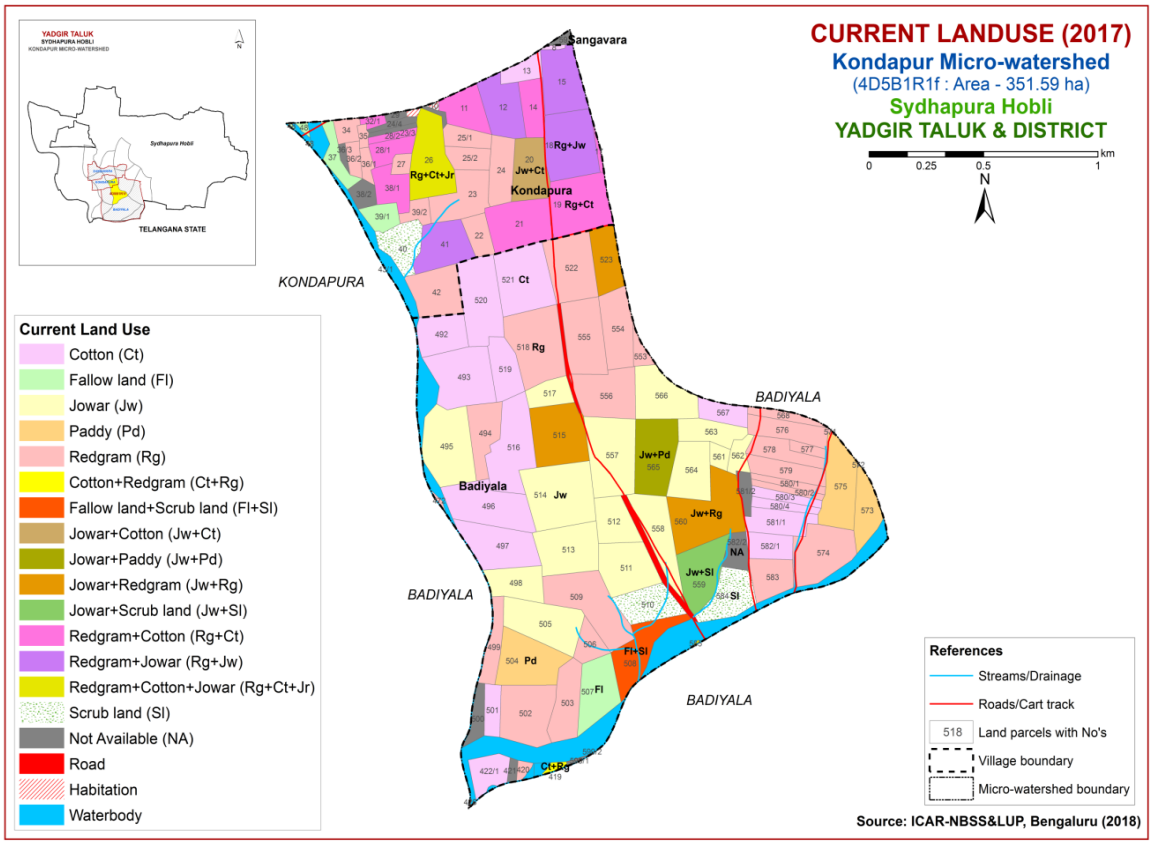


Fig.2.4 Current Land Use map of Kondapur Microwatershed

Fig 2.5 a. Different Crops and Cropping Systems in Kondapur Microwatershed

Fig. 2.5 b. Different Crops and Cropping Systems in Kondapur Microwatershed

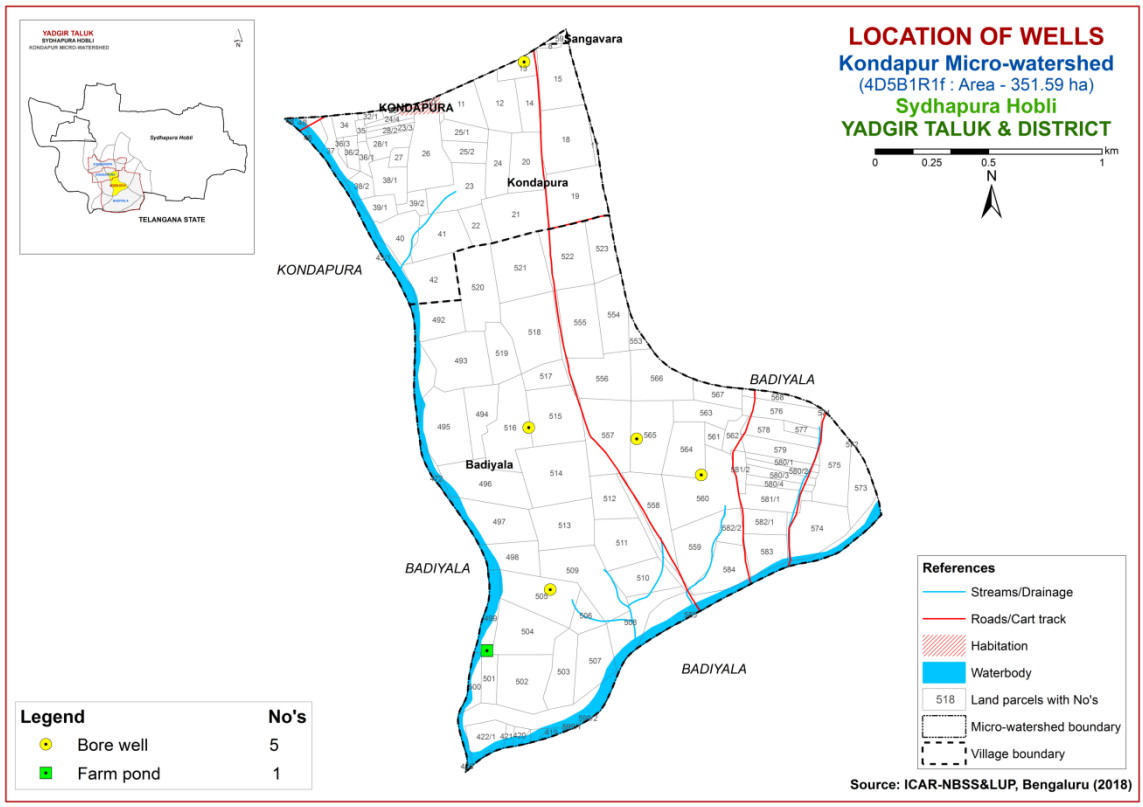


Fig. 2.6 Location of wells and conservation structures map of Kondapur Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly for a given level of management. This was achieved in Kondapur 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 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 351 ha. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.*, 2015) which is briefly described below.

3.1 Base Maps

The detailed survey of the land resources occurring in the microwatershed was carried out by using digitized cadastral map and satellite imagery as base supplied by KSRSAC. The cadastral map shows field boundaries with their survey numbers, location of tanks, streams and other permanent features of the area (Fig. 3.1). Apart from the cadastral map, remote sensing data products from Cartosat-1 and LISS IV merged at the scale of 1:7920 were used in conjunction with the cadastral map to identify the landscapes, landforms and other surface features. The imagery helped in the identification and delineation of boundaries between hills, uplands and lowlands, water bodies, forest and vegetated areas, roads, habitations and other cultural features of the area (Fig. 3.2). The cadastral map was overlaid on the satellite imagery (Fig. 3.3) that helped 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 alluvial landscape. They were divided into four landforms, *viz;* summits, 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

DSe – Alluvial Landscape

DSe 1 – Summit

DSe 11 –

DSe 12 –

DSe 2 – Very genetly sloping

DSe 21 – Very gently sloping, dark gray tone

DSe 22 – Very gently sloping, medium gray tone

DSe 23 – Very gently sloping, yellowish grey tone

DSe 24 – Very gently sloping, whitish grey tone

DSe 25 – Very gently sloping, whitish/ eroded/ calcareous tone

DSe 26- Very gently sloping, medium pink

DSe 3 – Valley/ Lowland

DSe 31 – Whitish gray/Calcareous

DSe 32 – Gray with pink patches

DSe 33 – Medium gray tone

DSe 34 – Lightish gray tone

DSe 35 – Dark gray tone

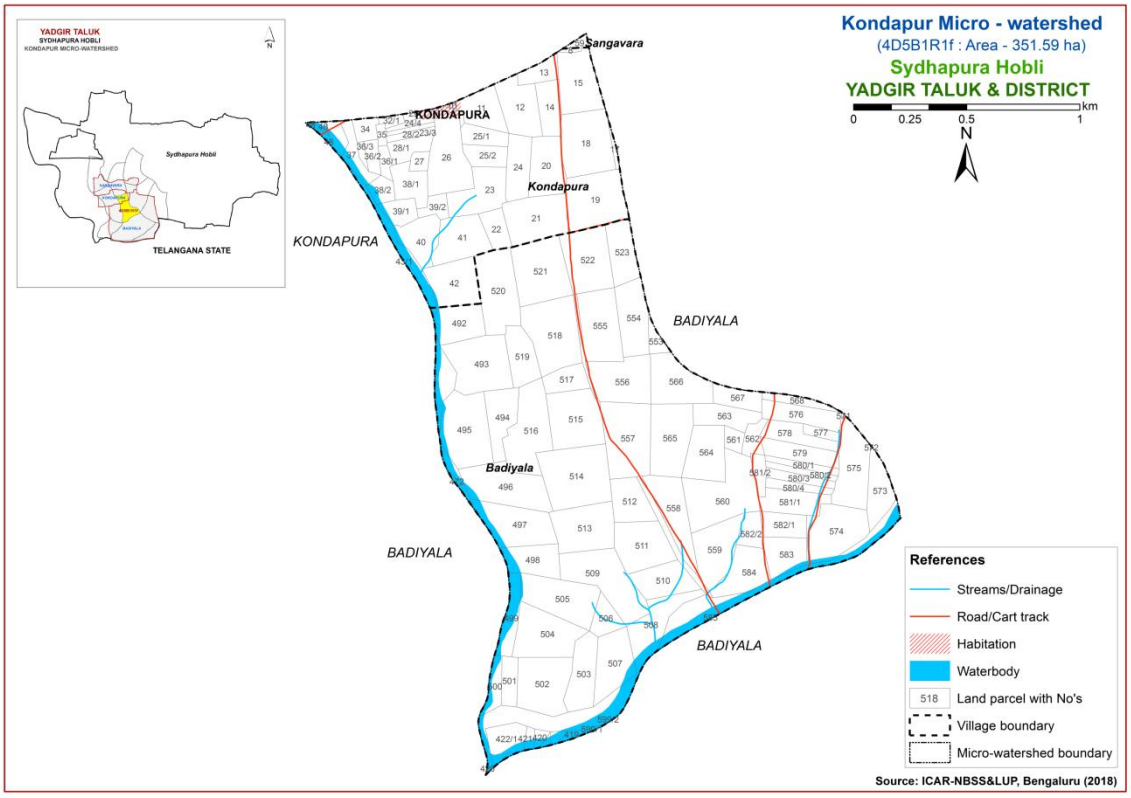


Fig 3.1 Scanned and Digitized Cadastral map of Kondapur Microwatershed

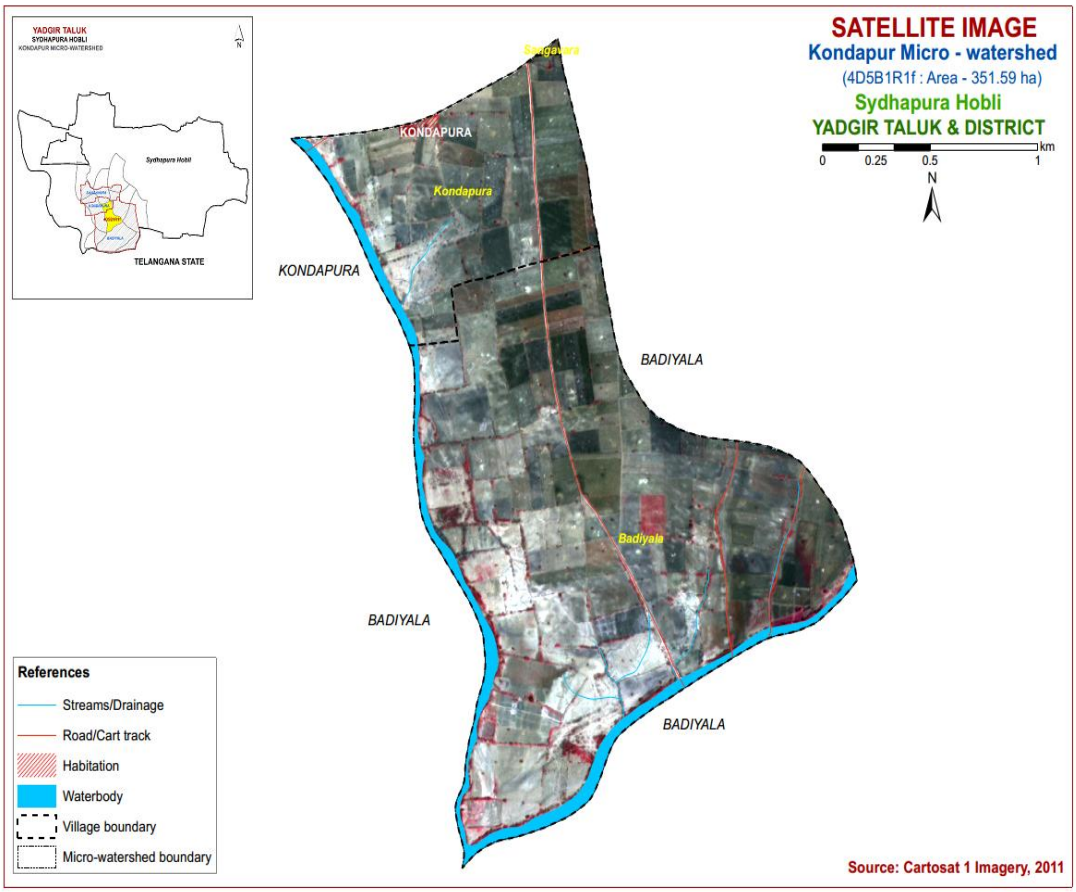


Fig.3.2 Satellite Image of Kondapur Microwatershed

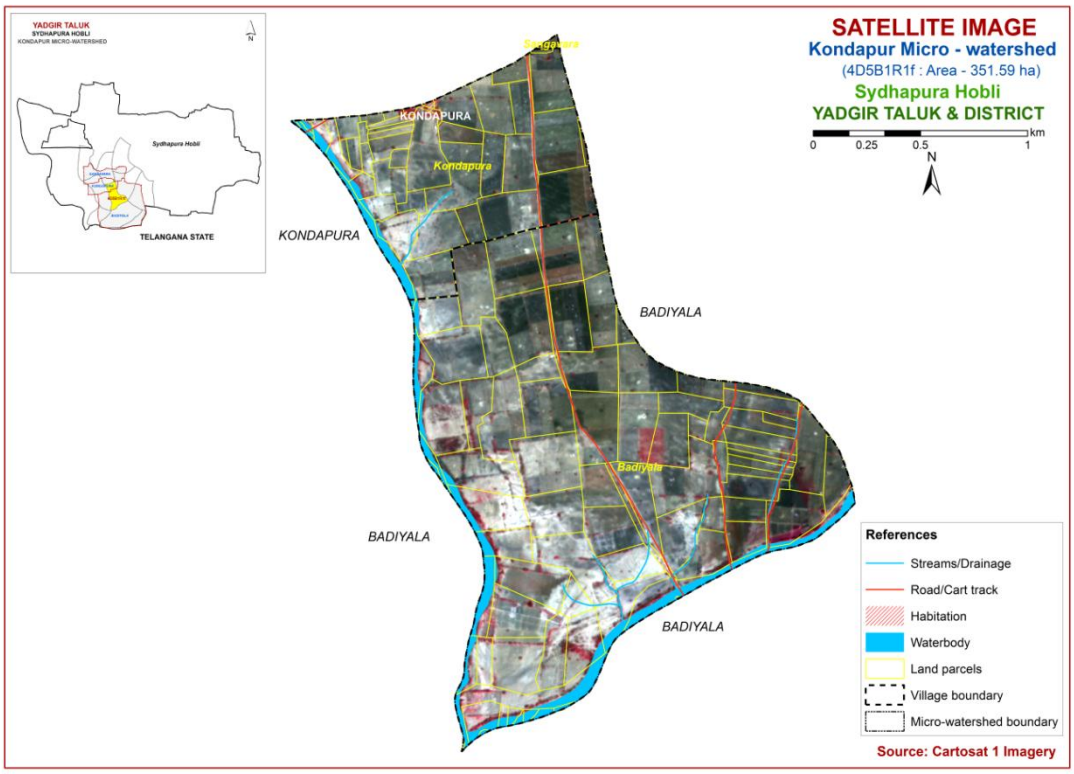


Fig. 3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Kondapur Microwatershed

3.3 Field Investigation

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

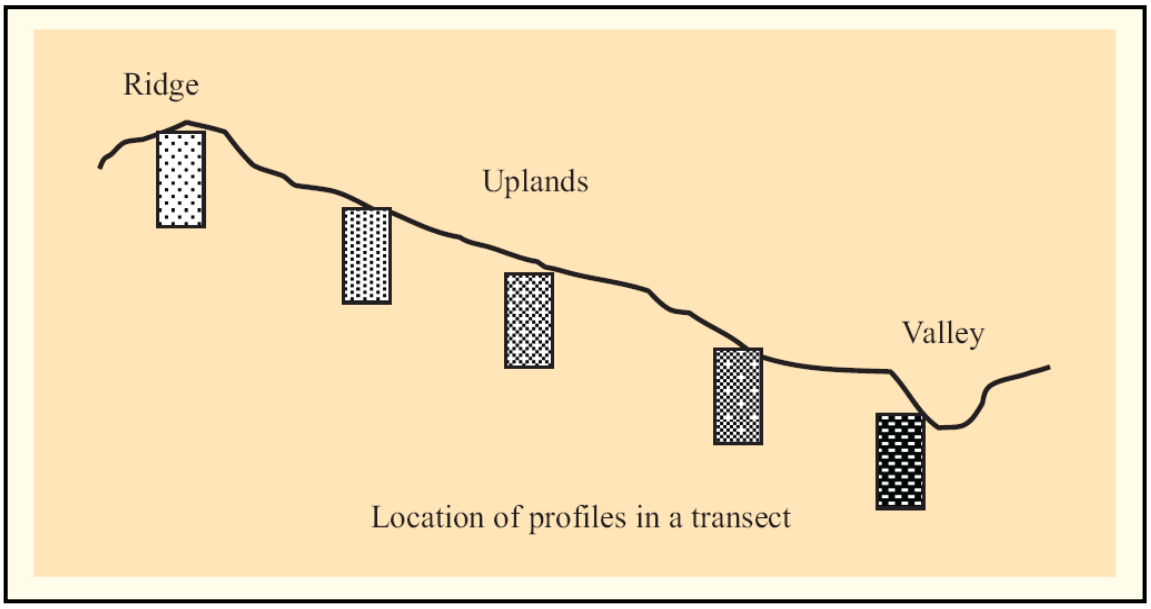


Fig: 3.4. Location of profiles in a transect

In the selected transect, soil profiles were located (Fig. 3.4) at closely spaced intervals to take care of any change in the land features like break in slope, erosion, gravel, stones etc. In the selected sites, soil profiles (vertical cut showing the soil layers from surface to the rock) were opened upto 200 cm or to the depth limited by rock or hard substratum and studied in detail for all their morphological and physical characteristics. The soil and site characteristics were recorded for all profile sites on a standard proforma as per the guidelines given in USDA Soil Survey Manual (Soil Survey Staff, 2012). Apart from the transect study, soil 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, 3 soil series were identified in the Kondapur microwatershed.

Table 3.1 Differentiating Characteristics used for identifying Soil Series

(Characteristics are of Series Control Section)

Sl. no.	Soil Series	Depth (cm)	Colour (moist)	Texture	Gravel (%)	Horizon sequence	Calcare ousness
Soils of Alluvial Landscape							
1	MGL (Mungala)	75-100	10 YR 3/1, 4/1	c	-	Ap-Bw-Bss	e
2	KDR (Kudlura)	100-150	10 YR 3/1, 3/2, 4/1,5/2	c	-	Ap-Bw	es
3	HGN (Hegganakera)	>150	10 YR 4/2, 4/1, 3/1, 4/1	c	-	Ap-BA-Bss	e

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 map unit boundaries on the soil map. The soil map shows the geographic distribution of 5 soil mapping units representing 3 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 soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one soil phase will have similar management needs and have to be treated accordingly.

3.5 Land Management Units (LMU's)

The 5 soil phases identified and mapped in the microwatershed were grouped into one Land Use Class (LMU) 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 Use Class (LMU) 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 LMU. For Kondapur microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope,

erosion and gravel content have been considered for defining LMU. The land use class are expected to behave similarly for a given level of management.

3.6 Laboratory Characterization

Soil samples for each soil series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected from farmer's fields (33 samples) 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 using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Kondapur Microwatershed

Soil No*	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
Soils of Alluvial Landscape				
	MGL	Mungala soils are moderately deep (75-100 cm), moderately well drained, have dark gray to very dark gray, slightly calcareous, cracking clay alluvial black soils occurring on very gently sloping plains under cultivation		**126 (35.84)**
81		MGLcB3	Sandy loam surface, slope 1-3%, severe erosion	45 (12.76)
82		MGLmB2	Clay surface, slope 1-3%, moderate erosion	81 (23.08)
	KDR	Kudlura soils are deep (100-150 cm), moderately well drained, have dark gray to very dark grayish brown, calcareous, cracking clay alluvial soils occurring on nearly level to very gently sloping plains under cultivation		**47 (13.35)**
86		KDRhA1	Sandy clay loam surface, slope 0-1%, slight erosion	35 (9.86)
88		KDRiB3	Sandy clay surface, slope 1-3%, severe erosion	12 (3.49)
	HGN	Hegganakera soils are very deep (>150 cm), moderately well drained, have dark gray to very dark grayish brown and brown, sodic, slightly calcareous, cracking clay alluvial black soils occurring on very gently sloping plains under cultivation		**158 (45.07)**
95		HGNmB2	Clay surface, slope 1-3%, moderate erosion	158 (45.07)
1000	Others		Habitation and waterbody	20 (5.75)

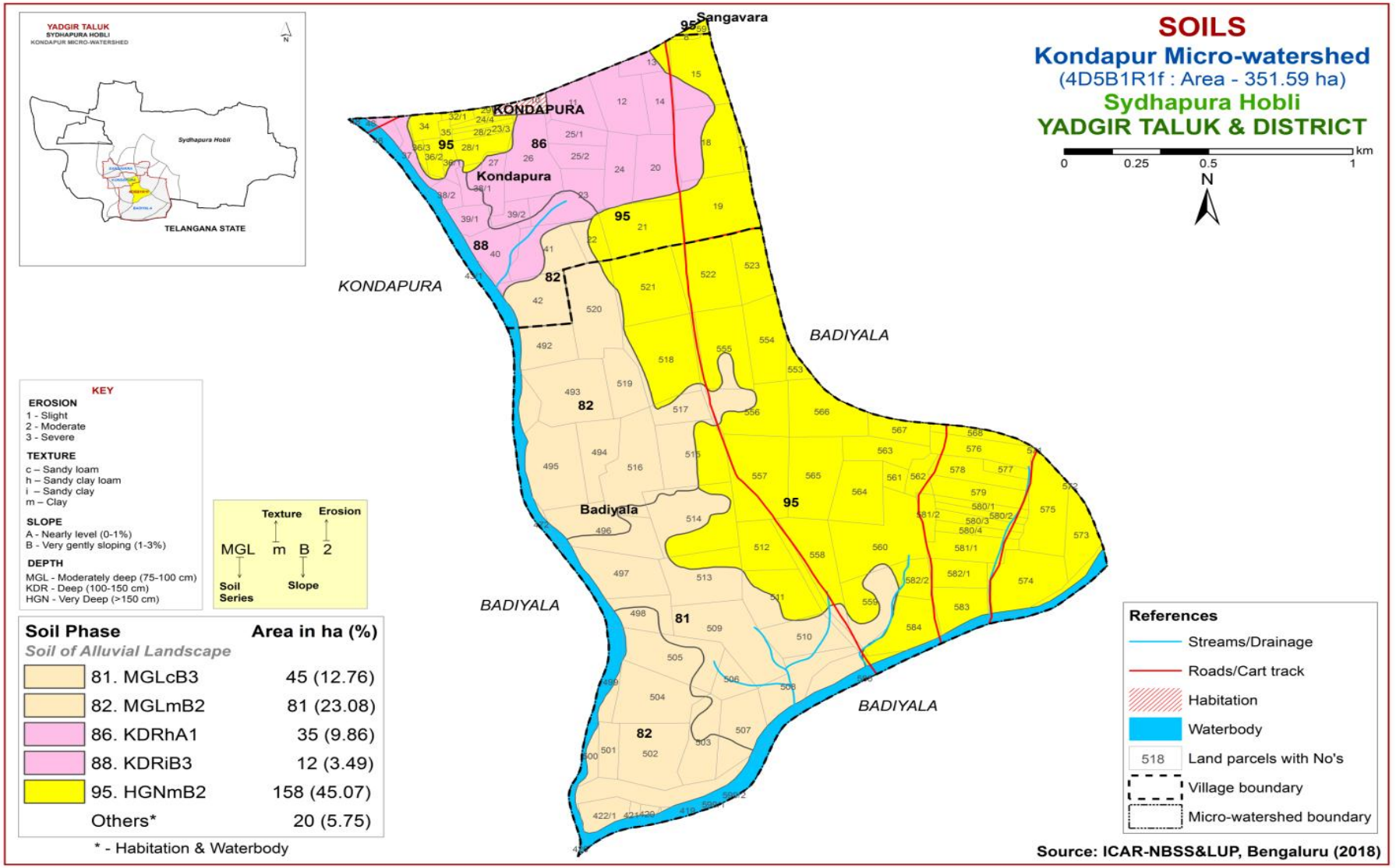


Fig 3.5 Soil Phase or Management Units - Kondapur Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and their distribution of different kinds of soils occurring in Kondapur microwatershed is provided in this chapter. The microwatershed area has been identified as alluvial landscape based on geology. In all, 3 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 this landscape, it is by parent material, relief, time and climate.

A brief description of each of the 3 soil series identified followed by 5 soil phases (management units) mapped are furnished below. The physical and chemical characteristics of soil series identified in Kondapur 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 Alluvial landscape

In this landscape, 3 soil series are identified and mapped. Of these, HGN series occupies an area of 158 ha (45%) followed by MGL 126 ha (36%) and KDR 47 ha (13%). Brief description of each series identified and number of soil phases mapped is given below.

4.1.1 Mungala (MGL) Series: Mungala soils are moderately deep (75-100 cm), moderately well drained, very dark gray to dark gray, slightly calcareous cracking clay alluvial soils. They have developed from alluvium and occur on very gently sloping plains under cultivation. The Mungala series has been classified as a member of the fine, smectitic, isohyperthermic family of Typic Haplusterts.

The thickness of the solum ranges from 75 to 100 cm. The thickness of A horizon ranges from 9 to 12 cm. Its colour is in hue 10 YR with value 3 to 4 and chroma 2. Its texture is clay and is calcareous. The thickness of B horizon ranges from 64 to 89 cm. Its colour is in hue 10 YR with value 3 and chroma 1 to 3. Its texture is clay and is slightly calcareous. The available water capacity is medium (101-150 mm/m). Two soil phases were identified and mapped.

Landscape and Soil Profile characteristics of Mungala (MGL) Series

4.1.2 Kudlura (KDR) Series: Kudlura soils are deep (100-150 cm), moderately well drained, have very dark gray to grayish brown, calcareous, sodic, cracking clay alluvial soils. They have developed from alluvium and occur on nearly level to very gently sloping plains under cultivation. The Kudlura series has been classified as a member of the fine, mixed, (calcareous), isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum ranges from 110 to 149 cm. The thickness of A horizon ranges from 6 to 22 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 2. The texture ranges from sandy loam, sandy clay loam, sandy clay and clay. The thickness of B horizon ranges from 115 to 143 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 3. Texture is sandy clay loam, sandy clay to clay and is calcareous sodic soils. The available water capacity is very high (>200 mm/m). Five phases were identified and mapped. Two soil phases were identified and mapped.

Landscape and Soil Profile characteristics of Kudlura (KDR) Series

4.1.3 Hegganakera (HGN) Series: Hegganakera soils are very deep (>150 cm), moderately well drained, have very dark gray to dark grayish brown, slightly calcareous cracking clay alluvial soils. They have developed from alluvium and occur on very gently sloping plains under cultivation. The Hegganakera series has been classified as a member of the fine, smectitic, isohyperthermic family of Typic Haplusterts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 7 to 9 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 3 with clay texture. The thickness of B horizon ranges from 152 to 175 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 3. Its texture is clay and is slightly calcareous. The available water capacity is very high (>200 mm/m). Only one soil phase was identified and mapped.

Landscape and Soil Profile characteristics of Hegganakera (HGN) Series

Table: 4.1 Physical and Chemical characteristics of soil series identified in Kondapur microwatershed

Soil Series: Mungala (MGL) **Pedon:** R-31

Location: $16^0$43'23.3"N 77^{0-}21'07.7"E, Yaleri village, Balichakra hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, smectitic, 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 coars (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	31.82	22.28	45.90	3.13	4.10	7.34	11.43	5.83	-	c	28.62	18.29
9-24	BA	27.18	20.72	52.10	2.87	3.20	5.64	9.72	5.75	-	c	29.01	20.46
24-41	Bss1	21.90	23.49	54.61	3.58	3.24	4.25	6.03	4.80	-	c	34.49	24.32
41-84	Bss2	20.13	22.62	57.24	1.68	3.13	4.36	6.38	4.59	-	c	37.07	25.99

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	8.25	-	-	0.23	0.46	1.92	-	-	0.58	0.36	-	49.11	1.07	100	0.74
9-24	8.47	-	-	0.14	0.42	4.56	-	-	0.30	0.30	-	50.83	0.98	100	0.59
24-41	8.59	-	-	0.14	0.42	5.64	-	-	0.13	0.35	-	56.18	1.03	100	0.62
41-84	8.58	-	-	0.15	0.35	4.44	-	-	0.17	0.56	-	60.13	1.05	100	0.93

Contd…

Soil Series: Kudlura (KDR) **Pedon:** T_1/P_2

Location: $16^0$34'03.1"N $77^0$14'71.7"E, Kyathanala village, Sydhapura Hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, mixed, (calcareous), 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
0-6	Ap	49.52	14.58	35.90	5.71	7.41	14.81	15.66	5.93	-	sc	26.86	12.10
6-26	BA	50.79	13.31	35.90	7.41	9.10	15.56	13.12	5.61	-	sc	25.65	12.24
26-67	Bw1	43.49	15.97	40.54	5.86	7.38	13.56	10.85	5.86	-	c	31.22	16.48
67-115	Bw2	37.42	18.93	43.66	6.51	6.83	10.95	8.68	4.45	-	c	36.13	22.34
115-144	Bw3	39.74	18.88	41.38	8.16	7.84	10.63	8.70	4.40	-	c	35.83	20.57

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-6	8.34	-	-	0.15	0.72	3.55	-	-	0.42	0.07	-	33.20	0.92	100	0.22
6-26	8.55	-	-	0.11	0.85	4.90	-	-	0.33	0.25	-	32.70	0.91	100	0.76
26-67	9.08	-	-	0.17	0.60	5.02	-	-	0.18	1.34	-	36.20	0.89	100	3.69
67-115	9.44	-	-	0.37	0.52	6.61	-	-	0.25	6.72	-	39.30	0.90	100	17.09
115-144	9.53	-	-	0.43	0.56	6.10	-	-	0.26	7.85	-	33.70	0.81	100	23.29

Contd…

Soil Series: Hegganakera (HGN) **Pedon:** R-12

Location: $16^0$46'19.9"N $77^0$04'34.0"E, Thumakura village, Yadgir hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, smectitic, 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	20.20	25.22	54.58	2.32	2.76	3.53	8.17	3.42	-	c	42.47	25.59
8-24	BA	21.18	21.70	57.12	2.07	3.28	4.69	7.31	3.82	-	c	41.88	24.67
24-50	Bss1	18.76	21.67	59.57	1.20	2.51	3.93	7.09	4.03	-	c	40.46	23.34
50-86	Bss2	16.74	22.24	61.02	0.88	1.53	4.27	6.02	4.05	-	c	42.18	24.76
86-146	Bss3	18.64	20.20	61.16	2.30	2.41	3.73	6.36	3.84	-	c	40.03	28.61
146-170	Bss4	16.08	19.33	64.59	0.88	2.75	3.41	5.95	3.08	-	c	40.28	29.90

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	8.77	-	-	1.33	1.16	8.19	-	-	1.10	5.21	-	36.23	0.66	100	14.38
8-24	8.93	-	-	1.11	0.64	5.46	-	-	0.87	4.23	-	35.50	0.62	100	11.93
24-50	8.85	-	-	0.984	0.32	3.38	-	-	0.71	3.78	-	36.69	0.62	100	10.30
50-86	8.54	-	-	0.562	0.24	3.38	-	-	0.58	3.07	-	39.16	0.64	100	7.84
86-146	8.45	-	-	0.526	0.24	3.38	-	-	0.62	2.82	-	38.52	0.63	100	7.31
146-170	8.64	-	-	0.517	0.20	4.29	-	-	0.60	2.99	-	36.87	0.57	100	8.12

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

Soil Characteristics: Depth, texture, gravelliness, calcareousness.

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

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

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

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

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

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

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

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

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

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

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

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

The land capability subclasses have been further subdivided into land capability units based on the kinds of limitations present in each subclass. Ten land capability units are 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 5 soil map units identified in the Kondapur microwatershed are grouped under 2 land capability classes and 3 land capability subclasses. Entire area in the microwatershed is suitable for agriculture and about 20 ha (6%) is covered by others (habitation and water bodies) (Fig. 5.1).

Good cultivable lands (Class II) cover a maximum area of about 78 per cent and are distributed in the major part of the microwatershed with minor problems of soil and erosion. Moderately good cultivable lands (class III) cover an area of about 16 per cent and are distributed in the northern and southern part of the microwatershed with major problems of soil and erosion.

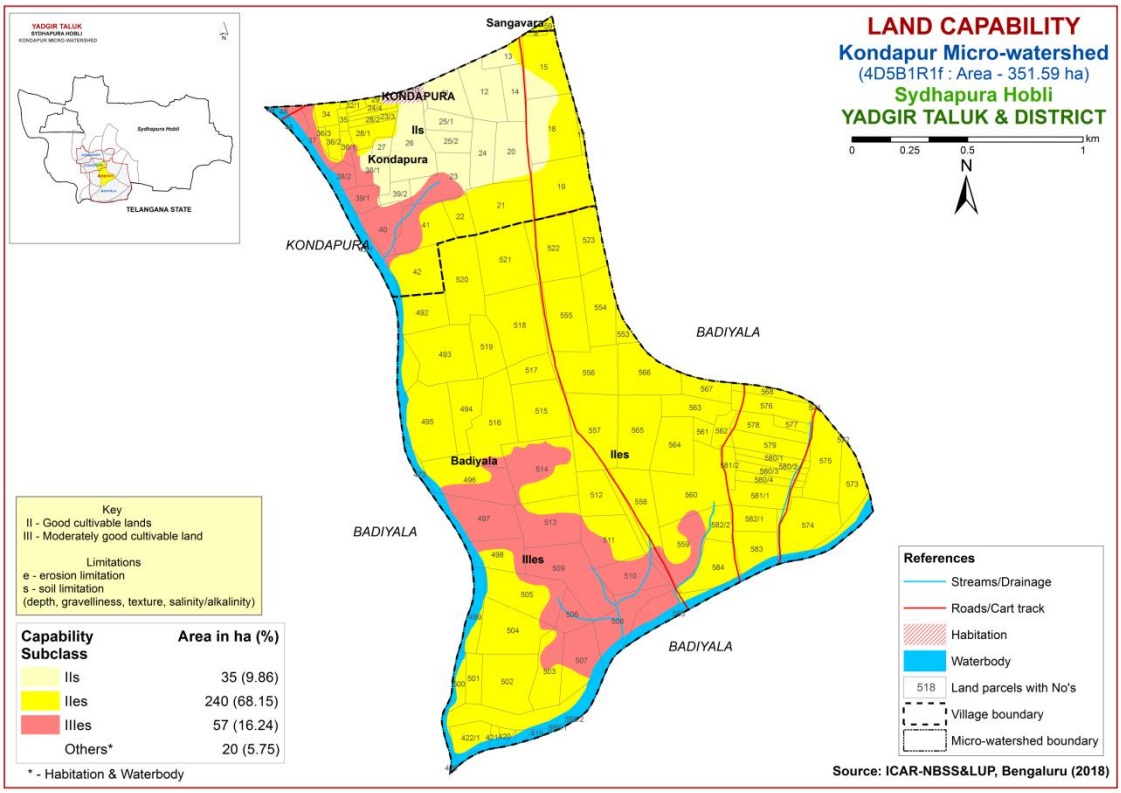


Fig. 5.1 Land Capability map of Kondapur Microwatershed

5.2 Soil Depth

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

Moderately deep (75-100 cm) soils occur in an area of about 126 ha (36%) and are distributed in the central, western and southern part of the microwatershed. Deep (100-150 cm) soils occur in an area of 47 ha (13%) and are distributed in the northern part of the microwatershed. Very deep (>150 cm) soils occur in a maximum area of about 158 ha (45%) and are distributed in all parts of the microwatershed.

The most productive lands 205 ha (58%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep to very deep (100 to >150cm) soils occurring in the microwatershed.

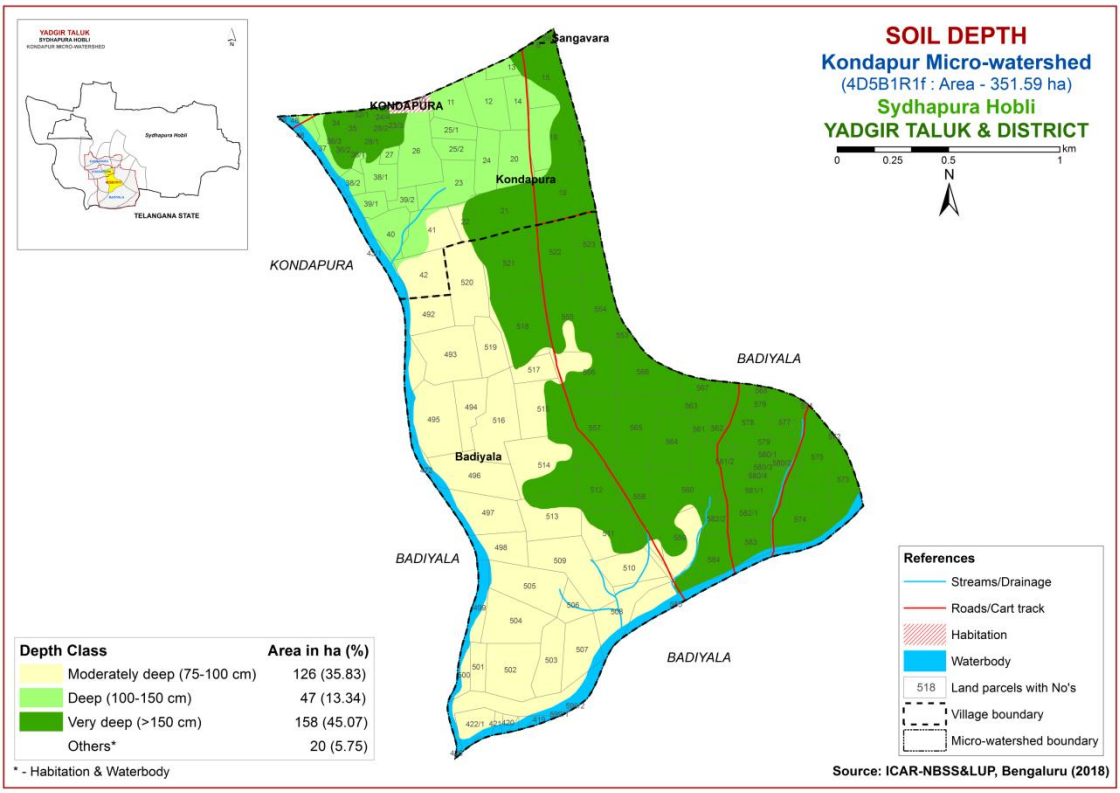


Fig. 5.2 Soil Depth map of Kondapur Microwatershed

5.3 Surface Soil Texture

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

An area of about 80 ha (23%) has soils that are loamy at the surface and are distributed in the northern and southern part of the microwatershed. Maximum area of about 252 ha (71%) has soils that are clayey at the surface and are distributed in all parts of the microwatershed.

The most productive lands with respect to surface soil texture are clayey and loamy soils (94%) that have high potential for soil-water retention and availability, and nutrient retention and availability, but clayey soils have more problems of drainage, infiltration, workability and other physical problems.

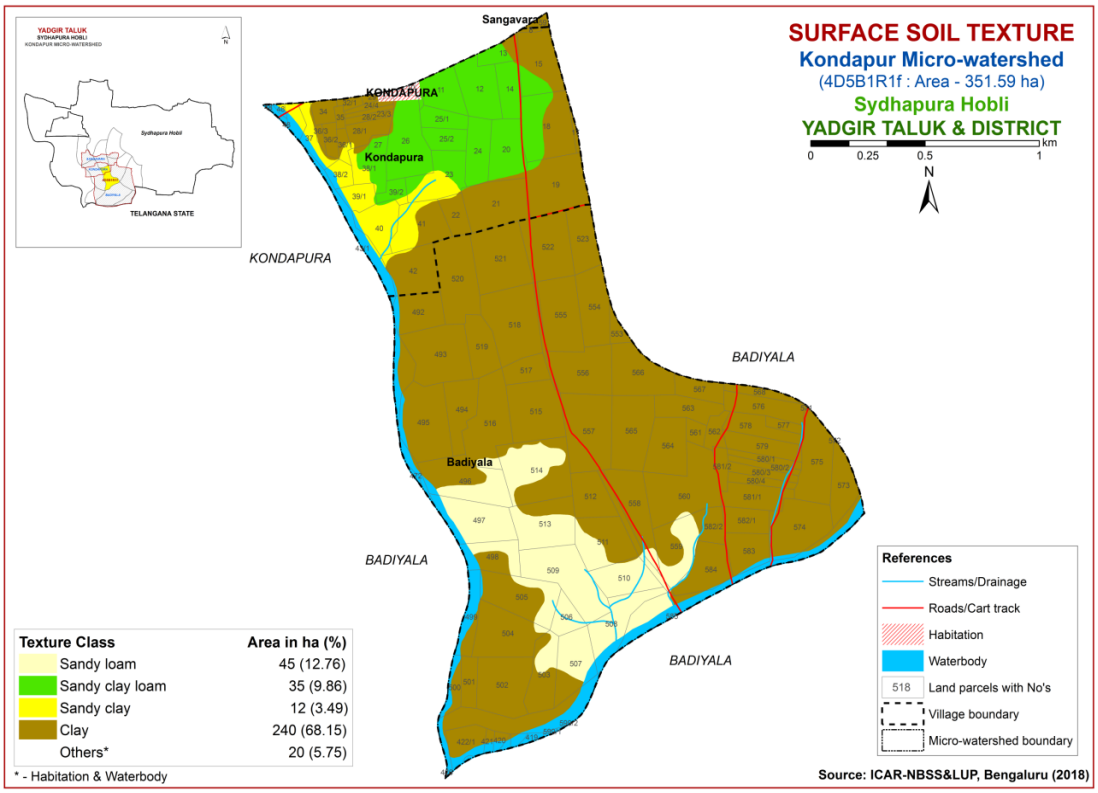


Fig. 5.3 Surface Soil Texture map of Kondapur Microwatershed

5.4 Soil Gravelliness

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

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

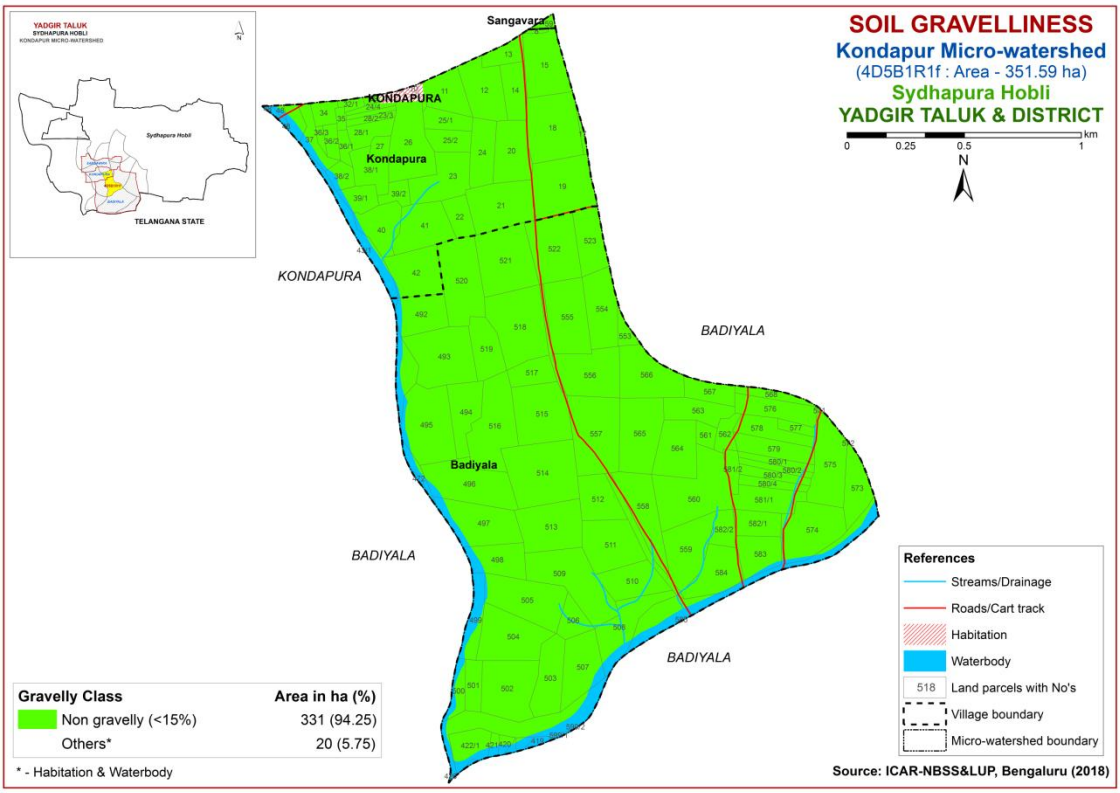


Fig. 5.4 Soil Gravelliness map of Kondapur Microwatershed

5.5 Available Water Capacity

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

An area of about 126 ha (36%) are medium (101-150 mm/m) in available water capacity and are distributed in the central, western and southern part of the microwatershed. Maximum area of about 205 ha (58%) are very high (>200 mm/m) in available water capacity and are distributed in all parts of the microwatershed.

About 126 ha (36%) area in the microwatershed has soils that are relatively problematic with regard to available water capacity. Here, only short or medium duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. The most productive soils cover about 205 ha (58%) where all climatically adapted long duration crops can be grown.

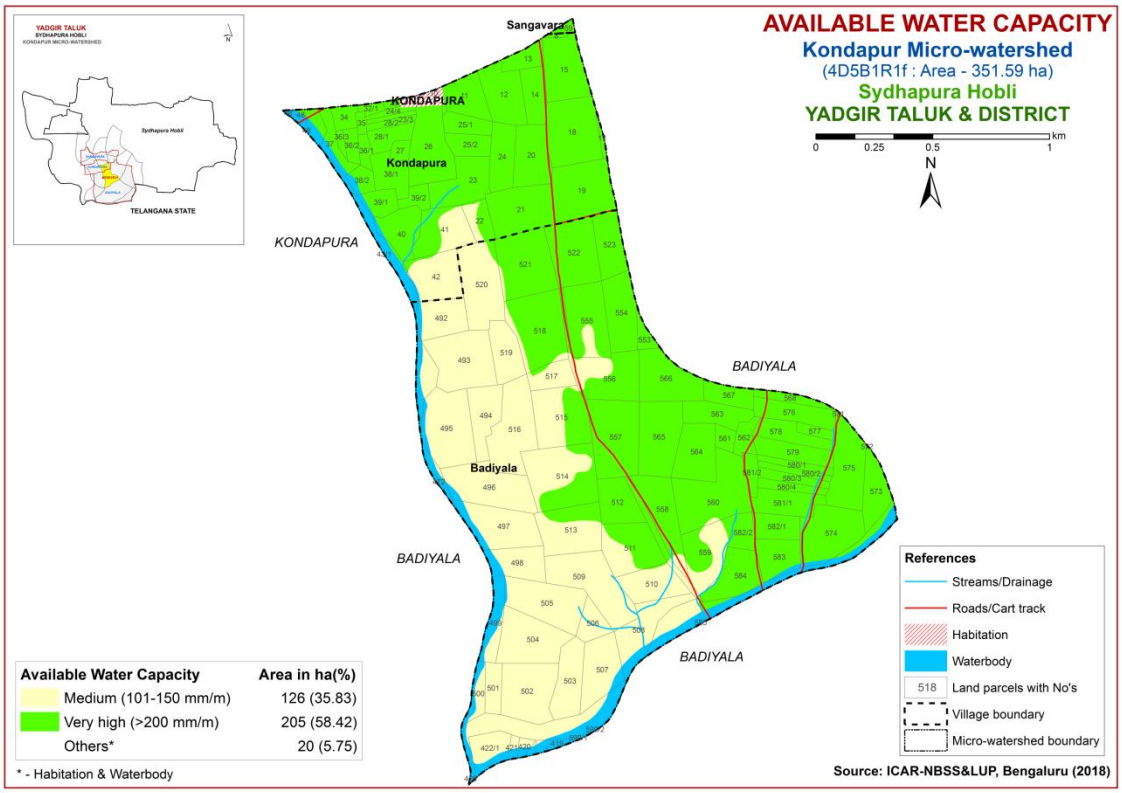


Fig. 5.5 Soil Available Water Capacity map of Kondapur Microwatershed

5.6 Soil Slope

Soil slope refers to the inclination of the surface of the land. It is defined by gradient, shape and length, and is an integral feature of any soil as a natural body. Slope is considered important in soil genesis, land use and land development. The length and gradient of slope influences the rate of runoff, infiltration, erosion and deposition. The soil map units were grouped into a single slope class and a slope map was generated showing the area extent and their geographic distribution in the microwatershed (Fig. 5.6).

An area of about 35 ha (10%) lands falls under nearly level (0-1%) lands. The remaining area (84%) of the microwatershed falls under very gently sloping (1-3% slope) lands and have high potential in respect of soil slopes. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

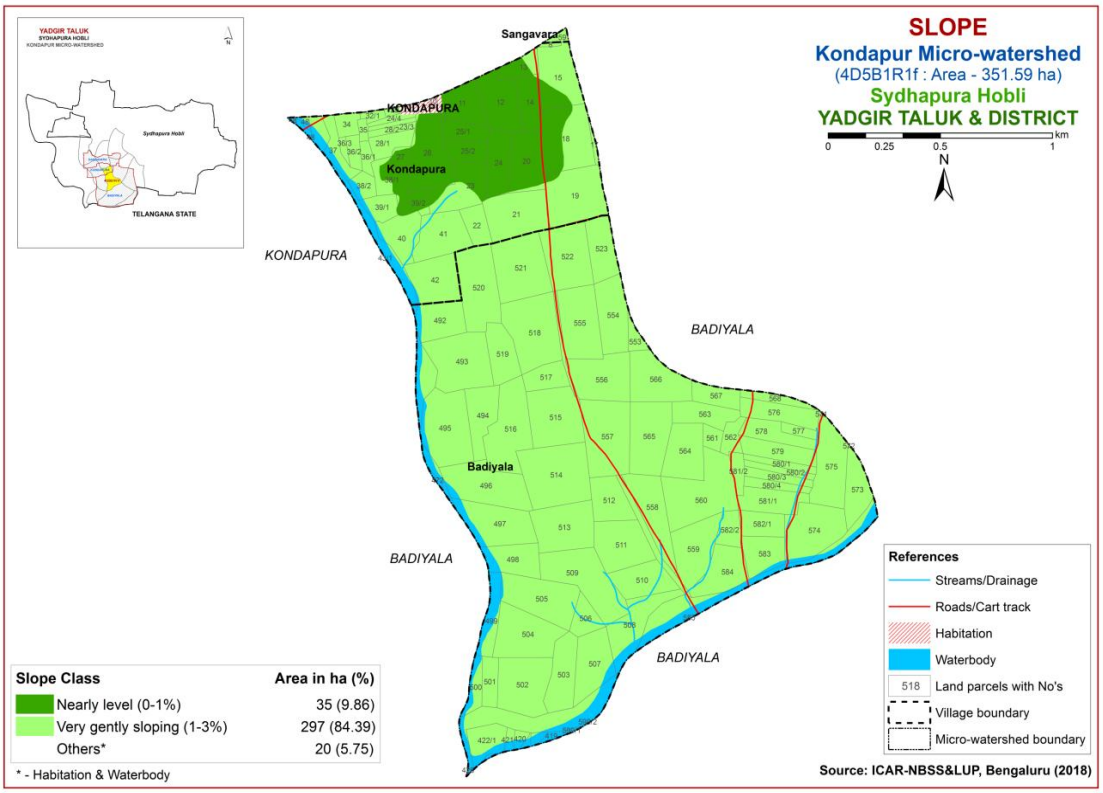


Fig. 5.6 Soil Slope map of Kondapur Microwatershed

5.7 Soil Erosion

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

Slightly eroded (e1) soils cover an area of about 35 ha (10%) and are distributed in the northern part of the microwatershed. Soils that are moderately eroded (e2) cover a maximum area of 240 ha (68%) and are distributed in all parts of the microwatershed. Severely eroded (e3) soils cover an area of about 57 ha (16%) and are distributed in the northern and southern part of the microwatershed.

An area of 297 ha (84%) in the microwatershed is problematic because of moderate and severe erosion. For these areas, taking up soil and water conservation and other land development measures are needed.

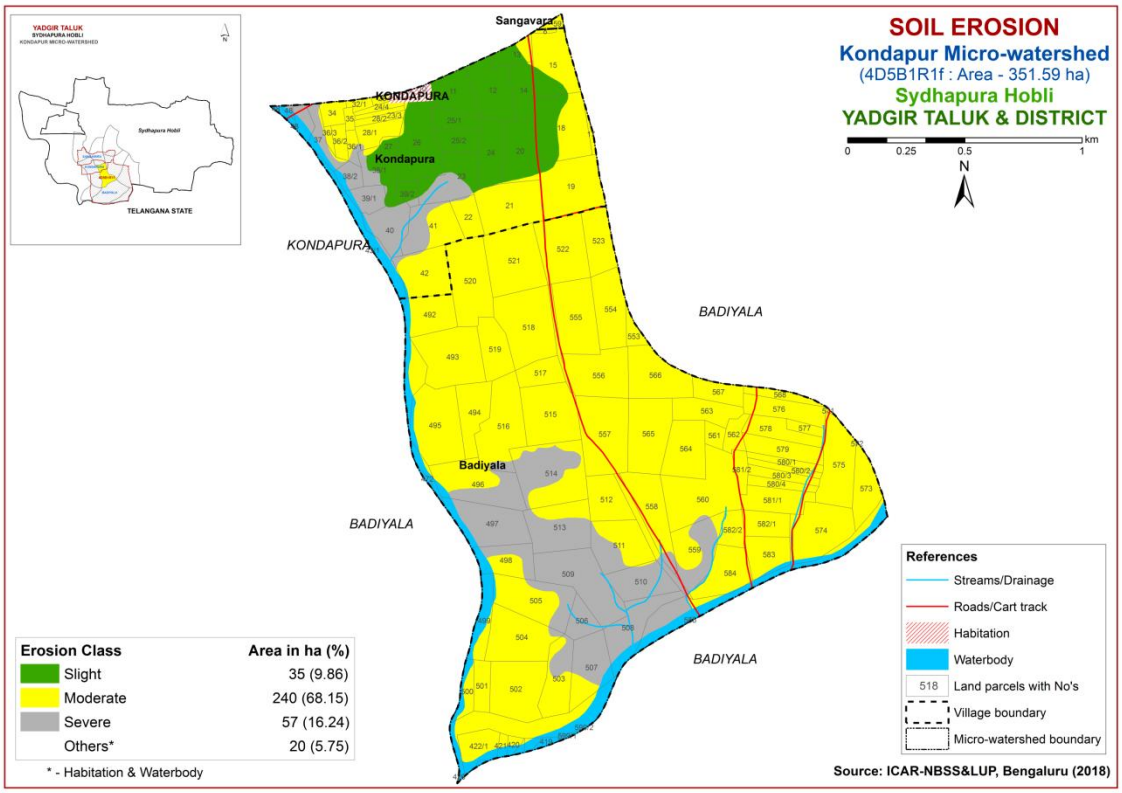


Fig. 5.7 Soil Erosion map of Kondapur Microwatershed

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 Kondapur microwatershed for soil reaction (pH) showed that an area of about 44 ha (13%) is moderately alkaline (pH 7.8-8.4) and are distributed in the southern and northern part of the microwatershed. Strongly alkaline (pH 8.4-9.0) soils occupy a maximum area of about 244 ha (69%) and are distributed in all parts of the microwatershed (Fig. 6.1). An area of about 43 ha (12%) is very strongly alkaline (pH >9.0) soils and are distributed in the eastern, southeastern and southern part of the microwatershed. Thus, all the soils in the microwatershed are alkaline in reaction.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is low (<0.5%) in an area of about 82 ha (23%) and are distributed in the northern, western, eastern and southern part of the microwatershed. Medium (0.5-0.75%) in an area of about 99 ha (28%) and are distributed in the northern, central, eastern, western and southern part of the microwatershed. Maximum area of about 150 ha (43%) are high (>0.75%) in organic carbon and are distributed in all parts of the microwatershed (Fig. 6.3).

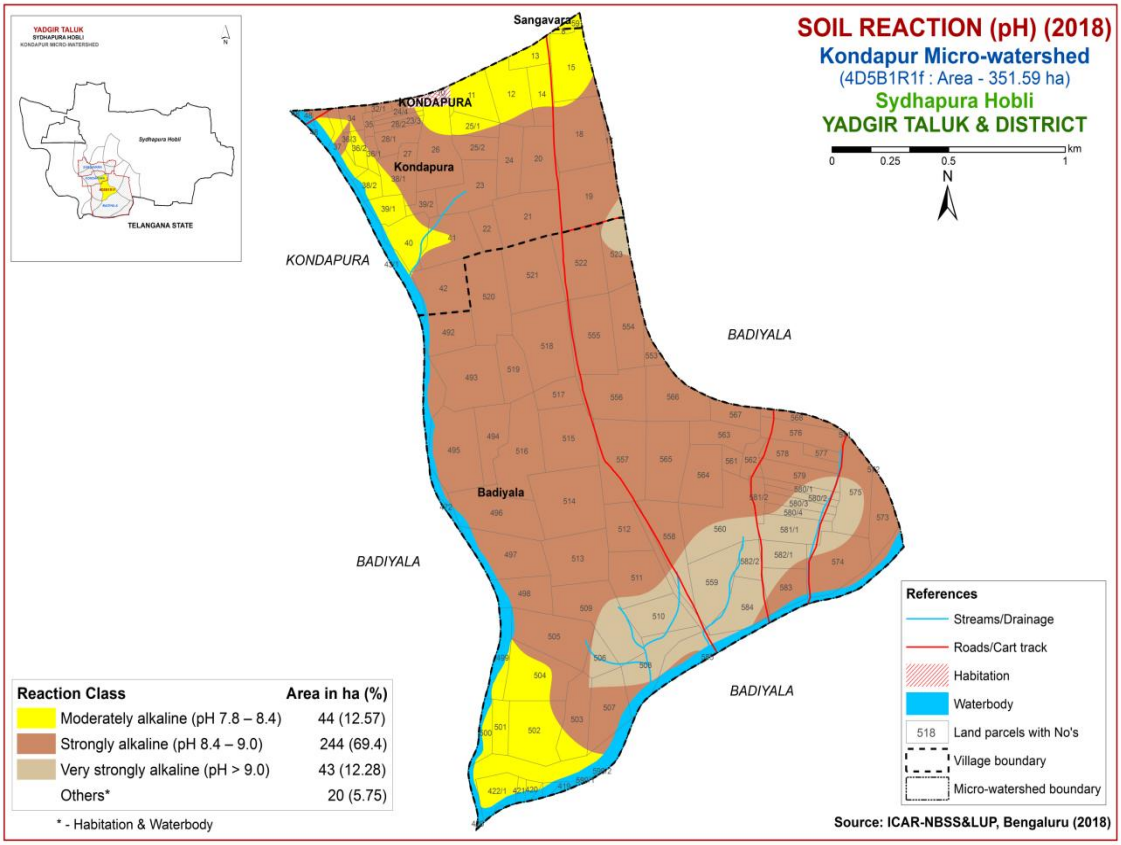


Fig.6.1 Soil Reaction (pH) map of Kondapur Microwatershed

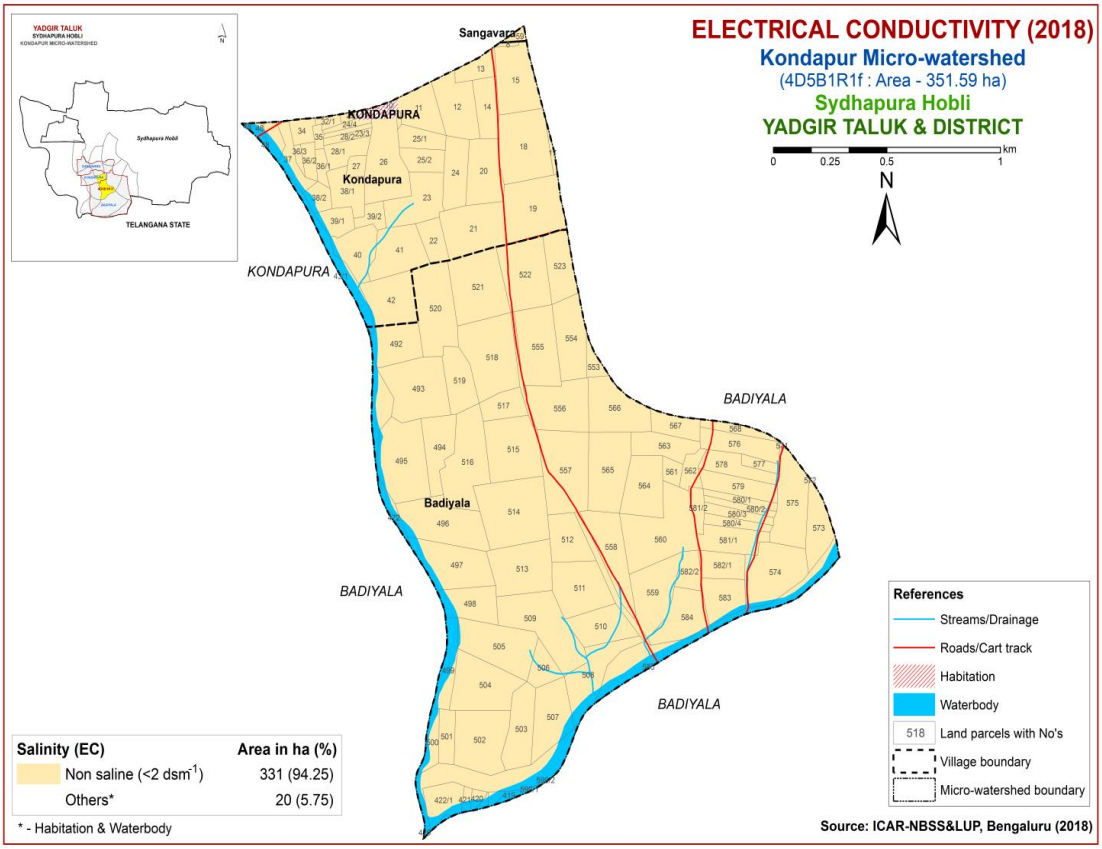


Fig.6.2 Electrical Conductivity (EC) map of Kondapur Microwatershed

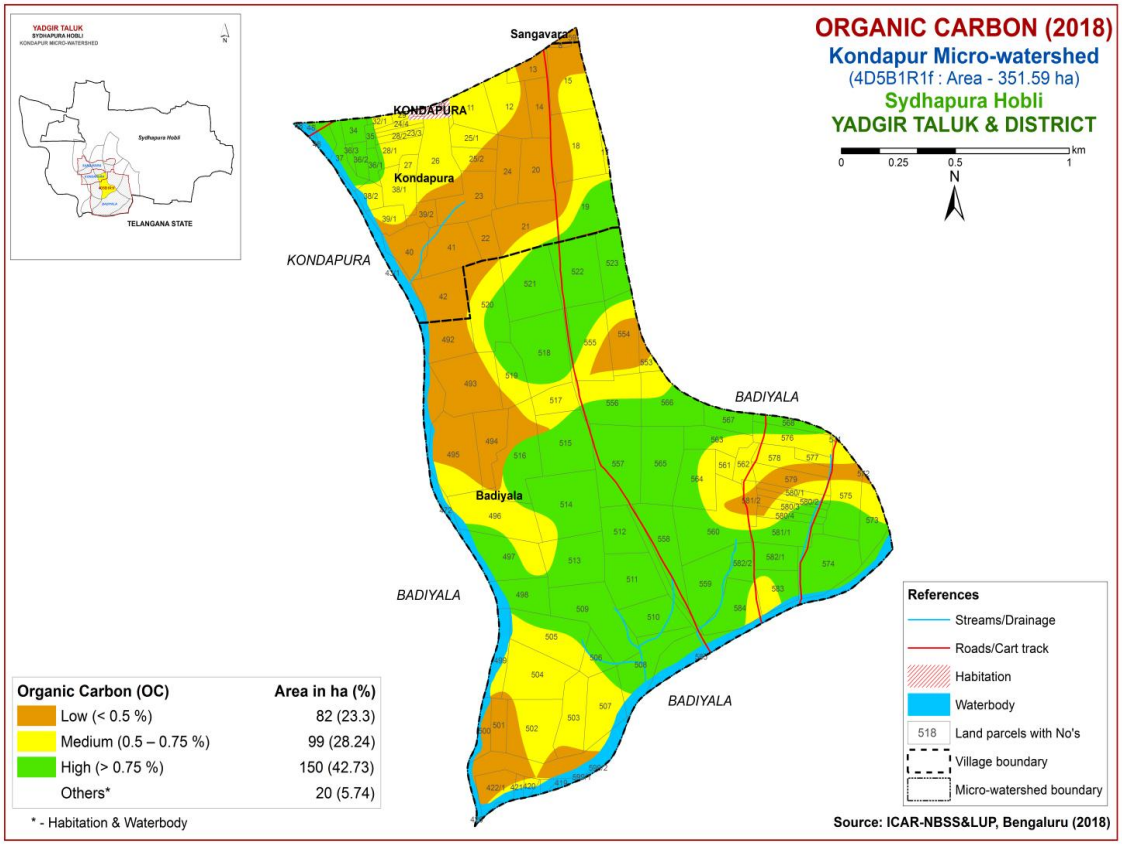


Fig.6.3 Soil Organic Carbon map of Kondapur Microwatershed

6.4 Available Phosphorus

Available phosphorus content is low (<23 kg/ha) in a maximum area of 304 ha (86%) and are distributed in all parts of the microwatershed. Medium (23-57 kg/ha) in an area of about 15 ha (4%) and are distributed in the southern part of the microwatershed (Fig. 6.4). An area of about 13 ha (4%) is high (>57 kg/ha) in available phosphorous and are distributed in the southern part of the microwatershed.

6.5 Available Potassium

Medium (145-337 kg/ha) in an area of about 160 ha (46%) and are distributed in the northern, central and western part of the microwatershed (Fig. 6.5). High (>337 kg/ha) in a maximum area of 171 ha (49%) and are distributed in all parts of the microwatershed.

6.6 Available Sulphur

Maximum area of about 183 ha (52%) is low (<10 ppm) in available sulphur content and are distributed in all parts of the microwatershed. Medium (10-20 ppm) in an area of about 148 ha (42%) and are distributed in the northern, western and southern part of the microwatershed (Fig. 6.6).

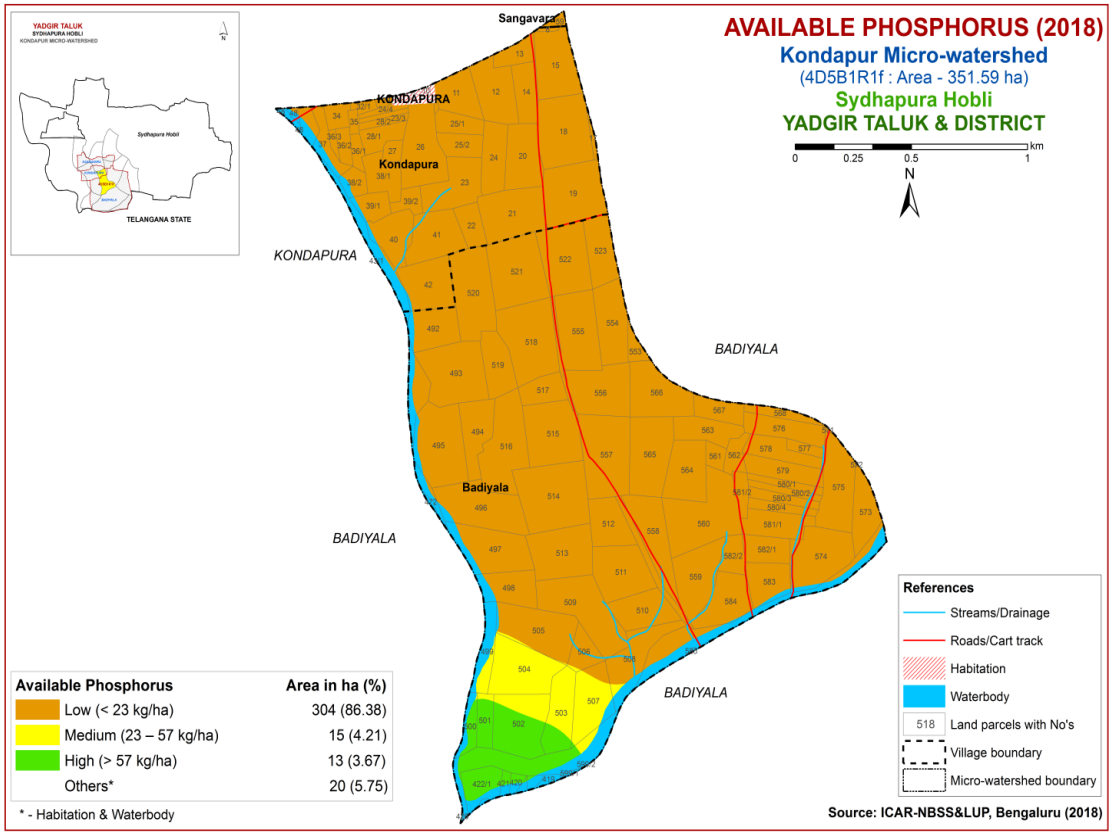


Fig. 6.4 Soil Available Phosphorus map of Kondapur Microwatershed

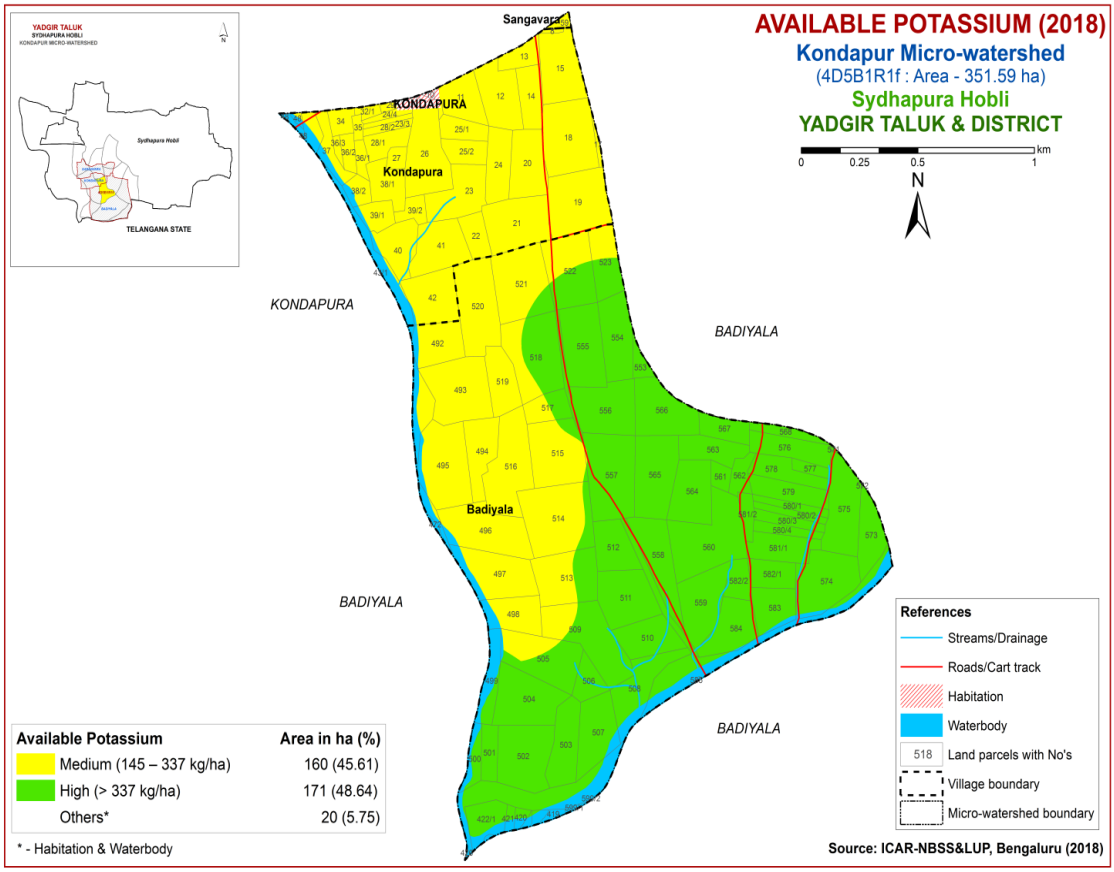


Fig.6.5 Soil Available Potassium map of Kondapur Microwatershed

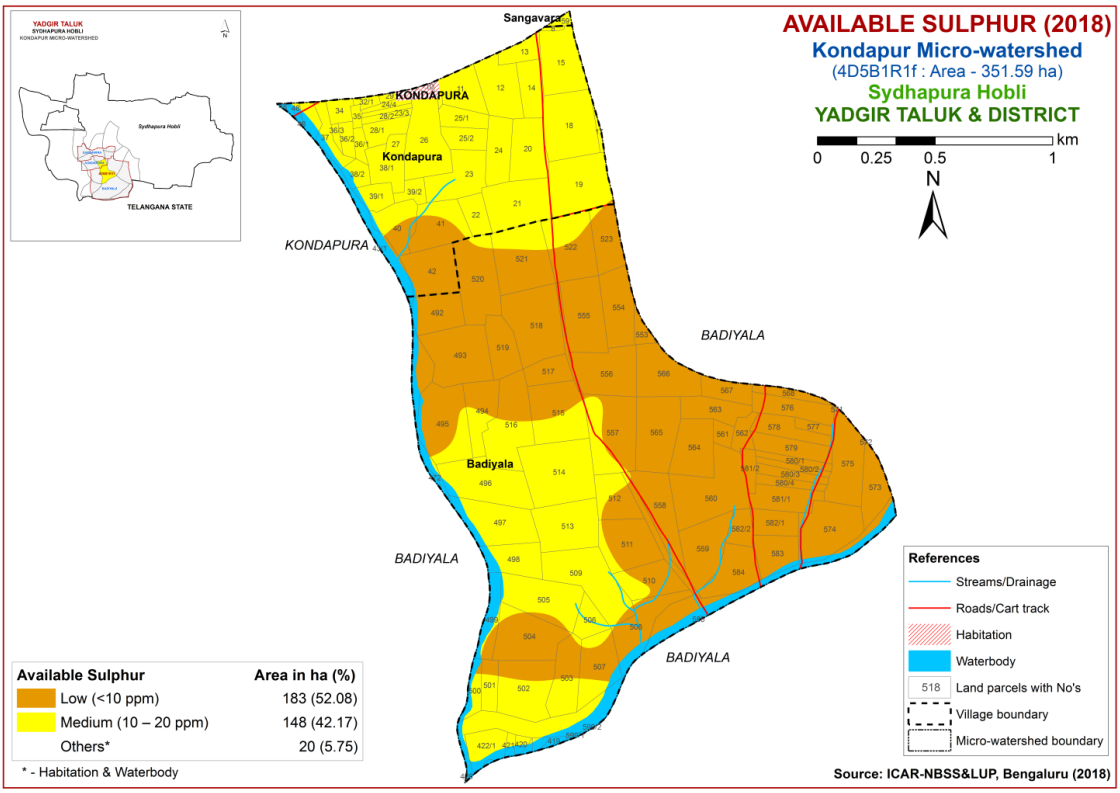


Fig.6.6 Soil Available Sulphur map of Kondapur Microwatershed

6.7 Available Boron

An area of about 55 ha (16%) is low (<0.5 ppm) in available boron content and are distributed in the northern part of the microwatershed. Medium (0.5-1.0 ppm) in a maximum area of 146 ha (41%) and are distributed in all parts of the microwatershed. An area of about 131 ha (37%) is high (>1.0 ppm) in available boron and are distributed in the central, eastern, western and southern part of the microwatershed (Fig. 6.7).

6.8 Available Iron

Available iron content is deficient (<4.5 ppm) in a maximum area of about 297 ha (84%) and are distributed in all parts of the microwatershed. Sufficient (>4.5 ppm) in an area of 34 ha (10%) and are distributed in the western and eastern part of the microwatershed (Fig .6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

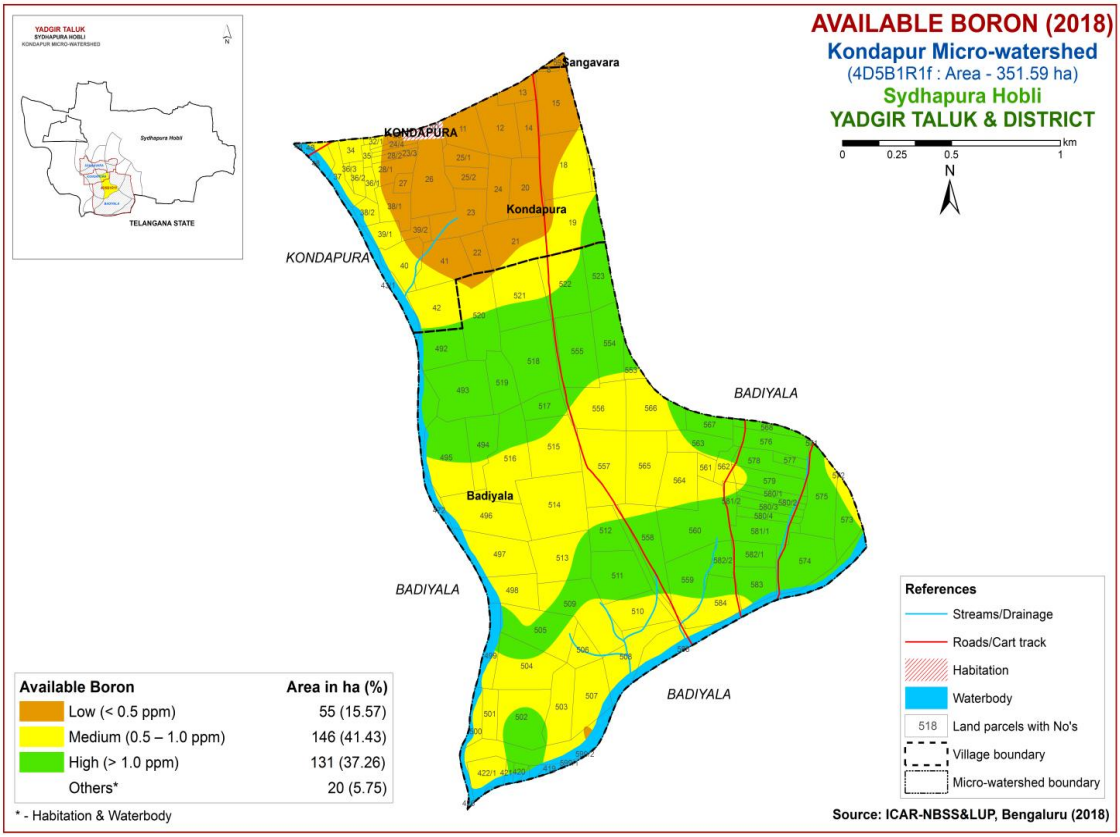


Fig.6.7 Soil Available Boron map of Kondapur Microwatershed

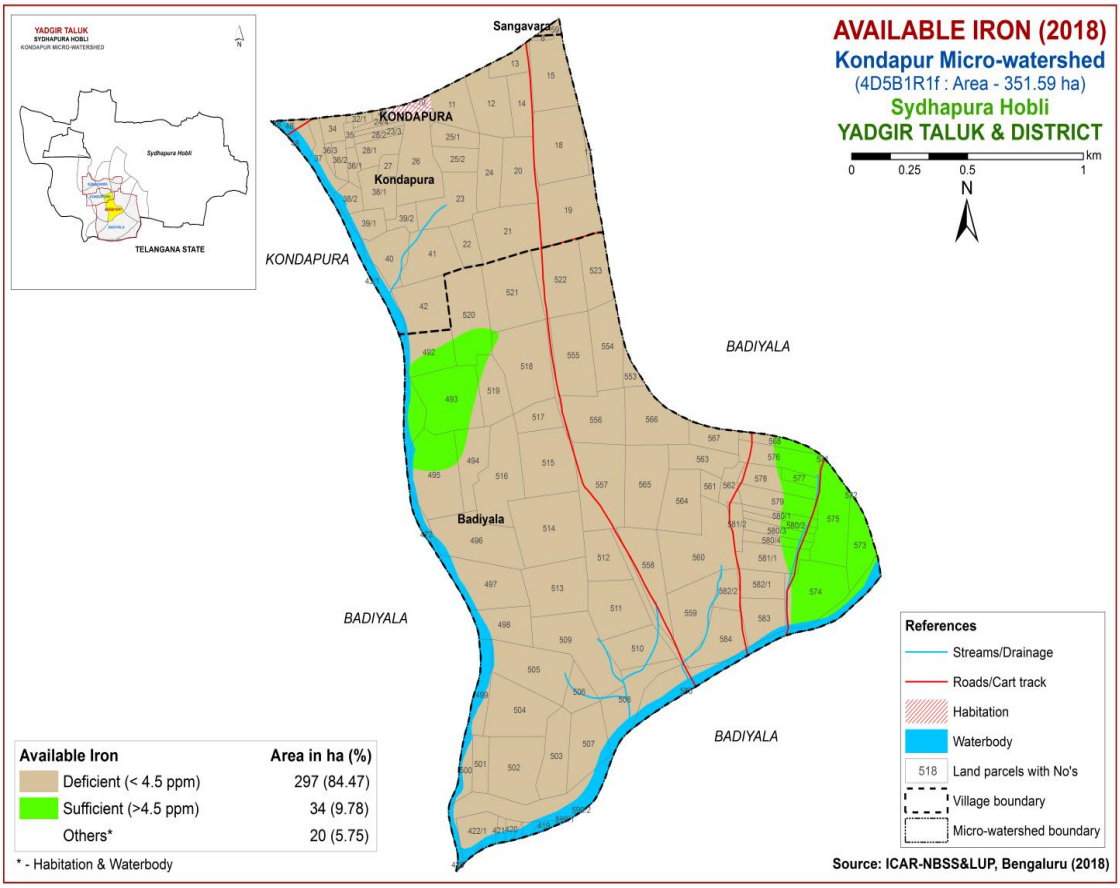


Fig.6.8 Soil Available Iron map of Kondapur Microwatershed

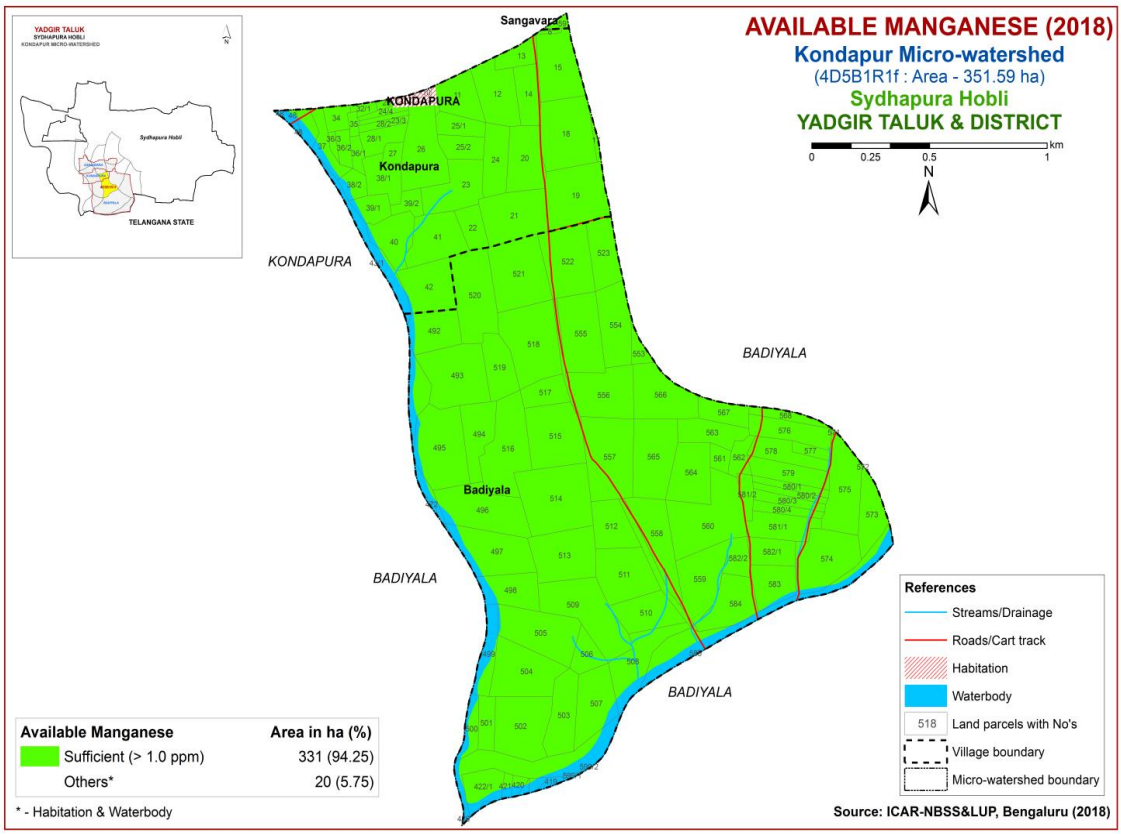


Fig.6.9 Soil Available Manganese map of Kondapur Microwatershed

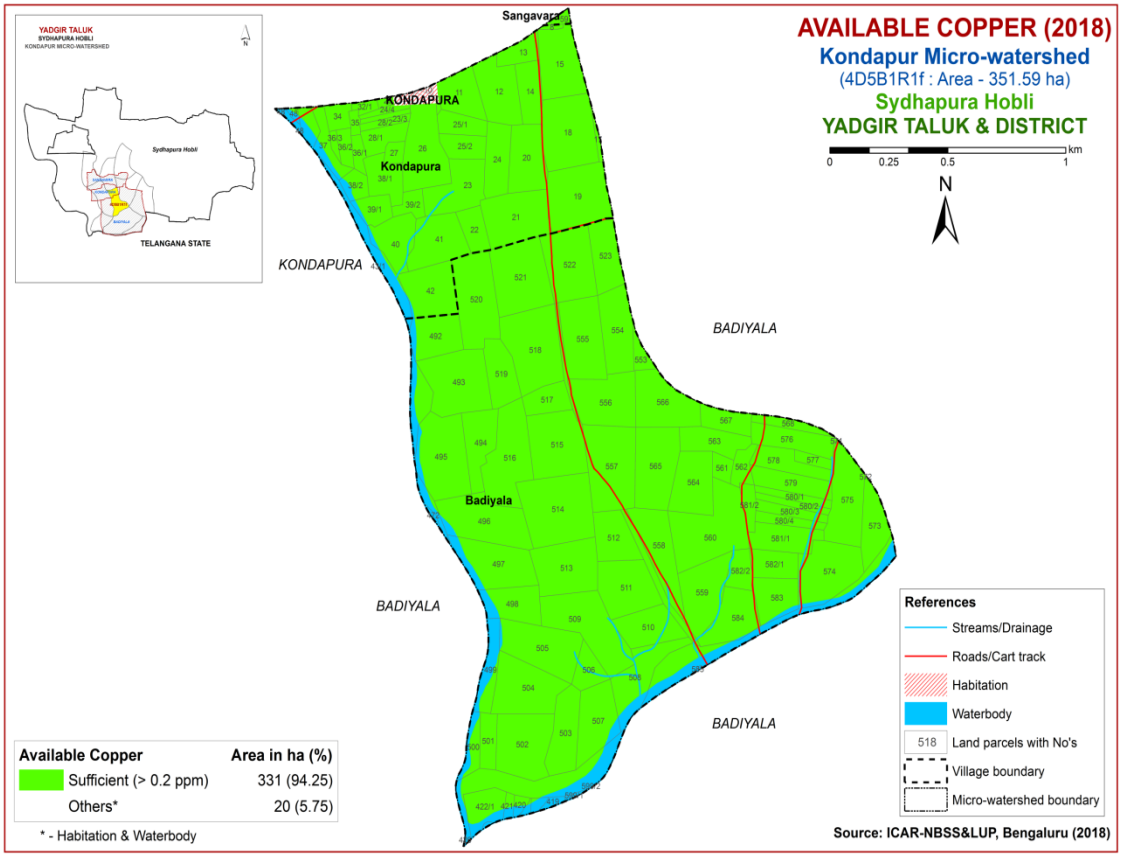


Fig.6.10 Soil Available Copper map of Kondapur Microwatershed

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in a maximum area of about 318 ha (91%) and are distributed in all parts of the microwatershed. Sufficient in an area of about 13 ha (4%) and are distributed in the western and southern part of the microwatershed (Fig 6.11).

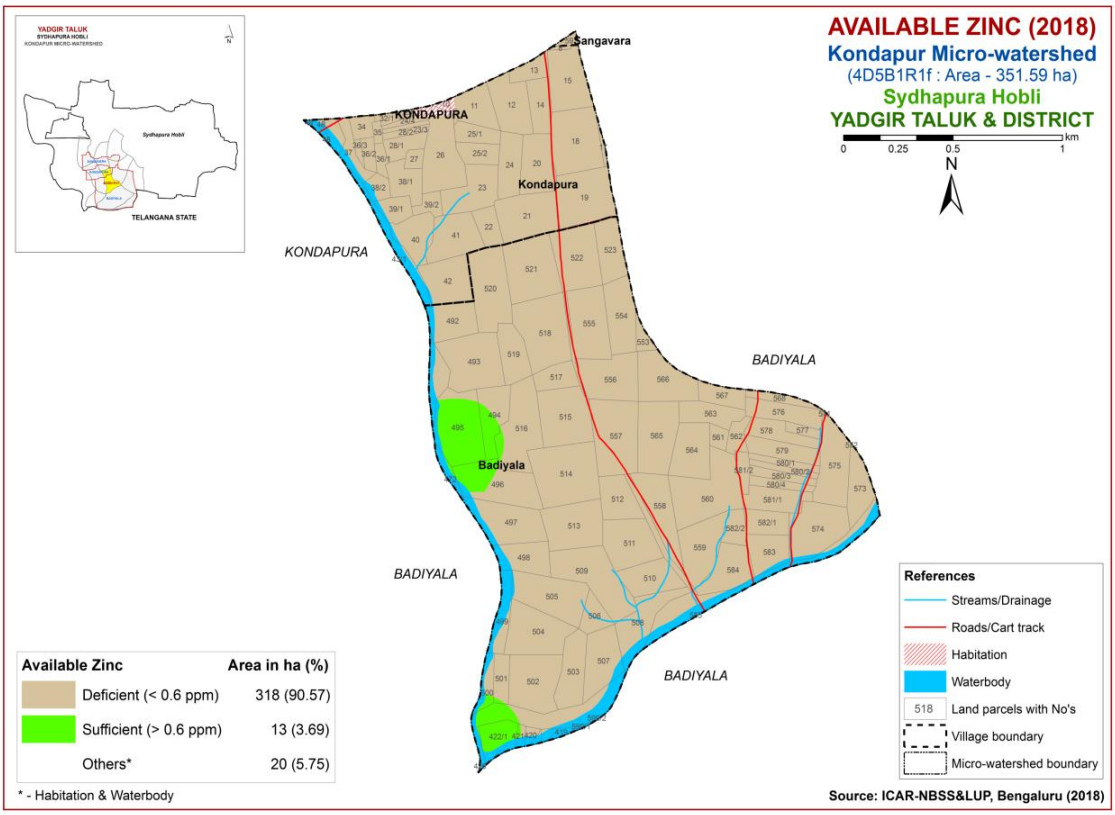


Fig.6.11 Soil Available Zinc map of Kondapur Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Kondapur microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3- Marginally Suitable. Order N has two classes, N1-Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability,'l' for topography, 'm' for moisture availability, 'w' for drainage, 's' for sodicity and 'z' for calcareousness. These limitations are indicated as lower case letters to the Class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 29 major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

Sorghum is one of the major 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.

Entire area of the microwatershed is highly suitable (Class S1) for growing sorghum and is distributed in all parts of the microwatershed.

Table 7.1 Soil-Site Characteristics of Kondapur Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP (%)	CEC [Cmol (p^{+})kg^{-1}]	BS (%)
					Sur-face	Sub-surface	Surface (%)	Sub-surface (%)								
MGLcB3	866	150	MWD	75-100	sl	c	-	-	101-150	1-3	severe	8.25	0.23	0.74	49.11	100
MGLmB2	866	150	MWD	75-100	c	c	-	-	101-150	1-3	moderate	8.25	0.23	0.74	49.11	100
KDRhA1	866	150	MWD	100-150	scl	c	-	-	>200	0-1	slight	8.34	0.15	0.22	33.20	100
KDRiB3	866	150	MWD	100-150	sc	c	-	-	>200	1-3	severe	8.34	0.15	0.22	33.20	100
HGNmB2	866	150	MWD	>150	c	c	-	-	>200	1-3	moderate	8.77	1.33	14.38	36.23	100

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

Table 7.2 Crop suitability criteria for Sorghum

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

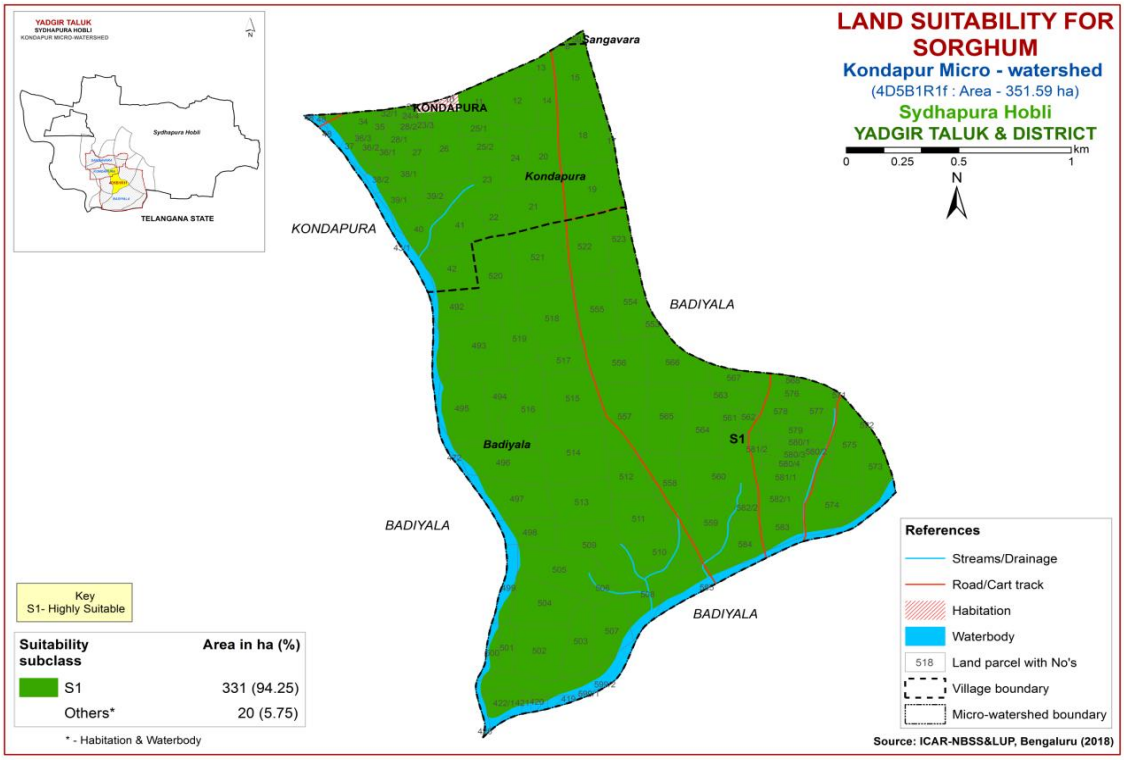


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

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

Entire area of the microwatershed is moderately suitable (Class S2) for growing maize and is distributed in all parts of the microwatershed with minor limitation of texture.

Table 7.3 Crop suitability criteria for Maize

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

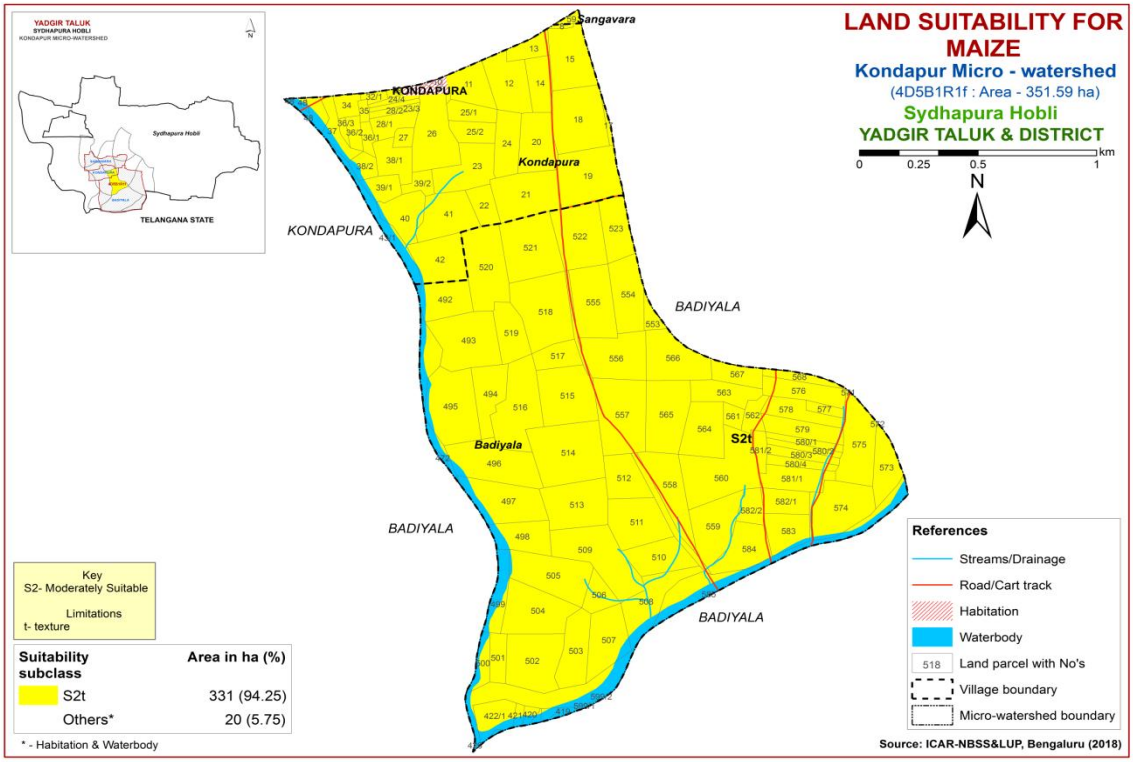


Fig. 7.2 Land Suitability map of Maize

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.

Entire area of the microwatershed is moderately suitable (Class S2) for growing bajra and is distributed in all parts of the microwatershed with minor limitations of texture, rooting depth and drainage.

Table 7.4 Crop suitability criteria for Bajra

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

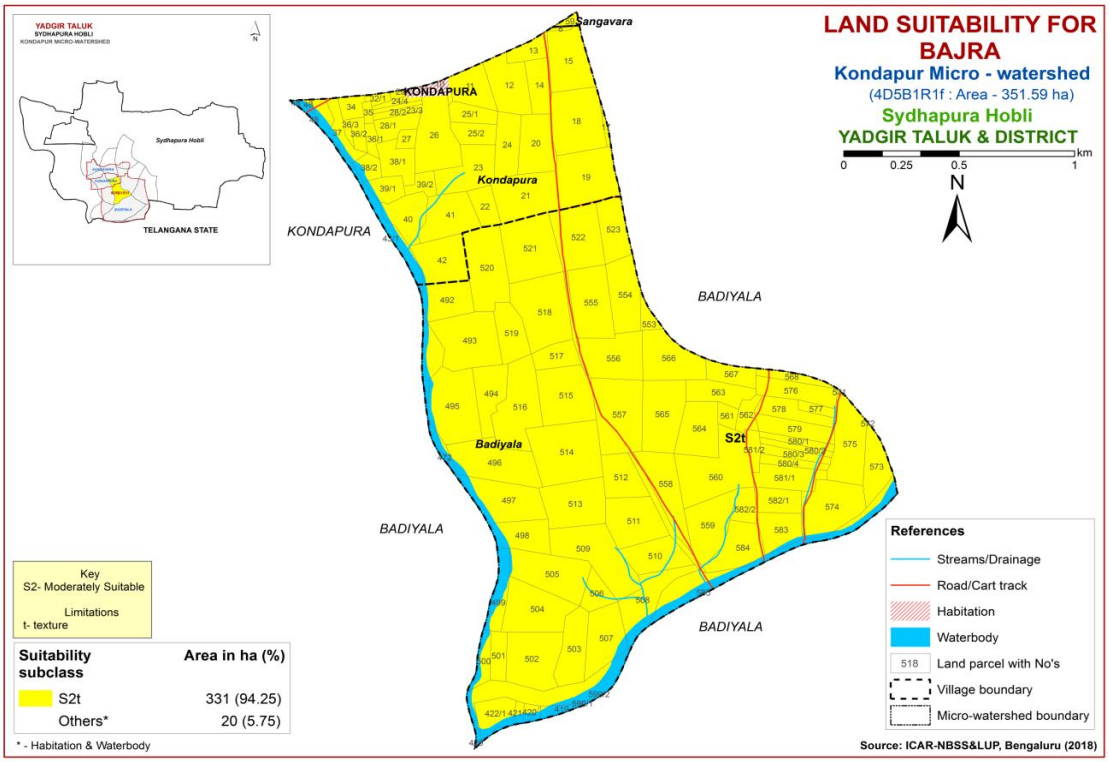


Fig. 7.3 Land Suitability map of Bajra

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.

Table 7.5 Crop suitability criteria for Groundnut

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

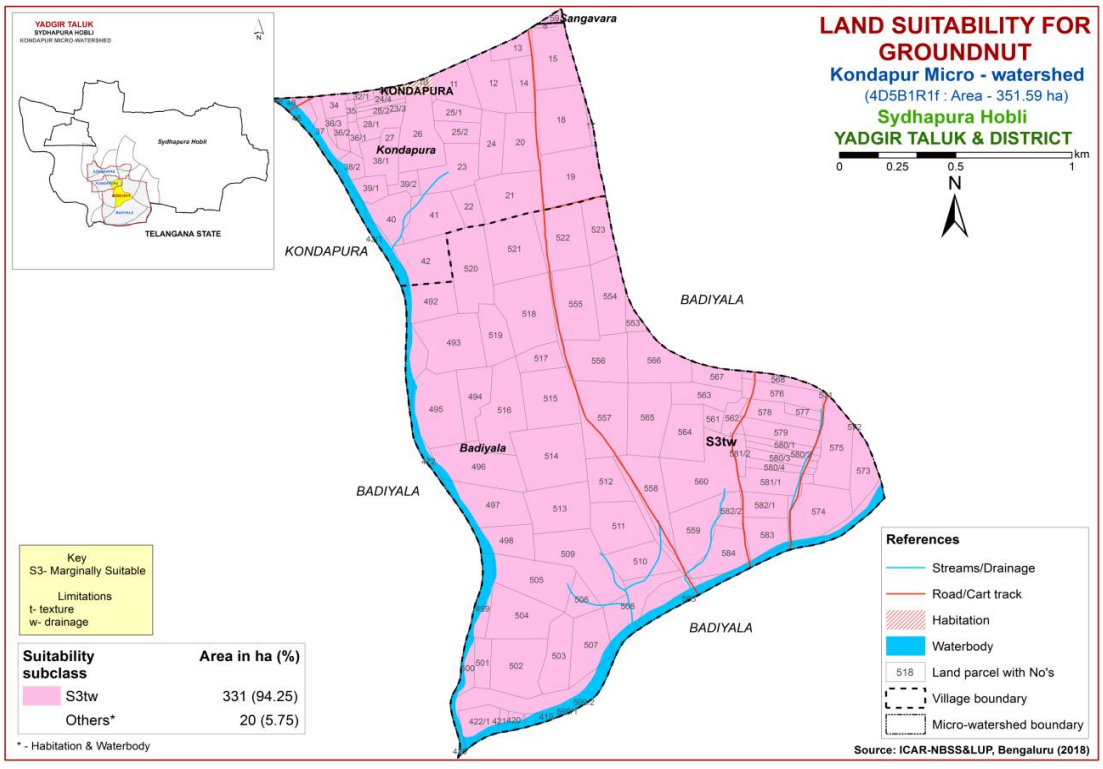


Fig. 7.4 Land Suitability map of Groundnut

Entire area of the microwatershed is marginally suitable (Class S3) for growing groundnut and is distributed in all parts of the microwatershed with major limitations of texture and drainage.

7.5 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is one of the most important oilseed crop grown in an area of 4.1 lakh ha in the State in all the districts. The crop requirements for growing sunflower (Table 7.6) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sunflower was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.5.

Table 7.6 Crop suitability criteria for Sunflower

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>90	80-90	70-80	<70
Soil drainage	Class	Well drained	Mod. well rained	Imperfectly drained	Poorly drained
Soil reaction	pH	6.5-8.0	8.1-8.55.5-6.4	8.6-9.0;4.5-5.4	>9.0<4.5
Surface soil texture	Class	l, cl, sil, sc	scl, sic, c,	c (>60%), sl	ls, s
Soil depth	cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (EC)	dS m^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

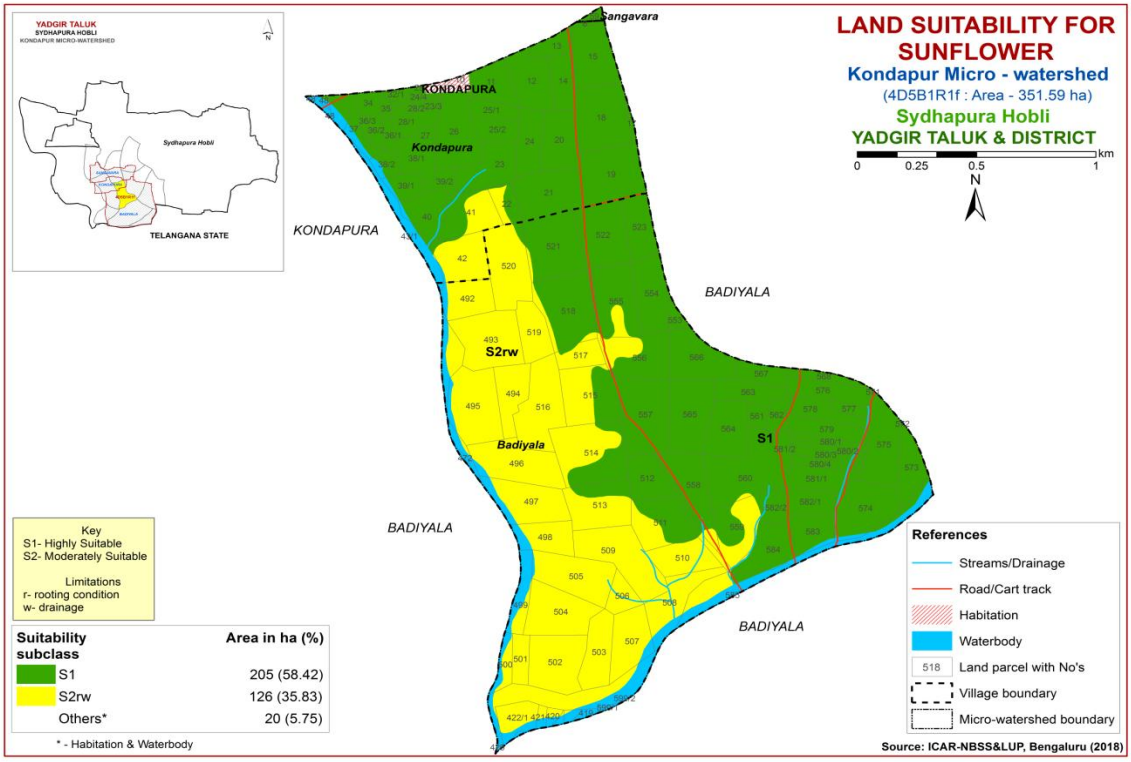


Fig. 7.5 Land Suitability map of Sunflower

Maximum area of about 205 ha (58%) is highly suitable (S1) for growing sunflower and are distributed in all parts of the microwatershed. An area of about 126 ha (36%) is moderately suitable (Class S2) for growing sunflower and are distributed in the western, central and southern part of the microwatershed with minor limitations of drainage and rooting depth.

7.6 Land suitability criteria 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.

Entire area of the microwatershed is moderately suitable (Class S2) for growing redgram and is distributed in all parts of the microwatershed with minor limitations of texture, rooting depth and drainage.

Table 7.7 Land suitability criteria for Redgram

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

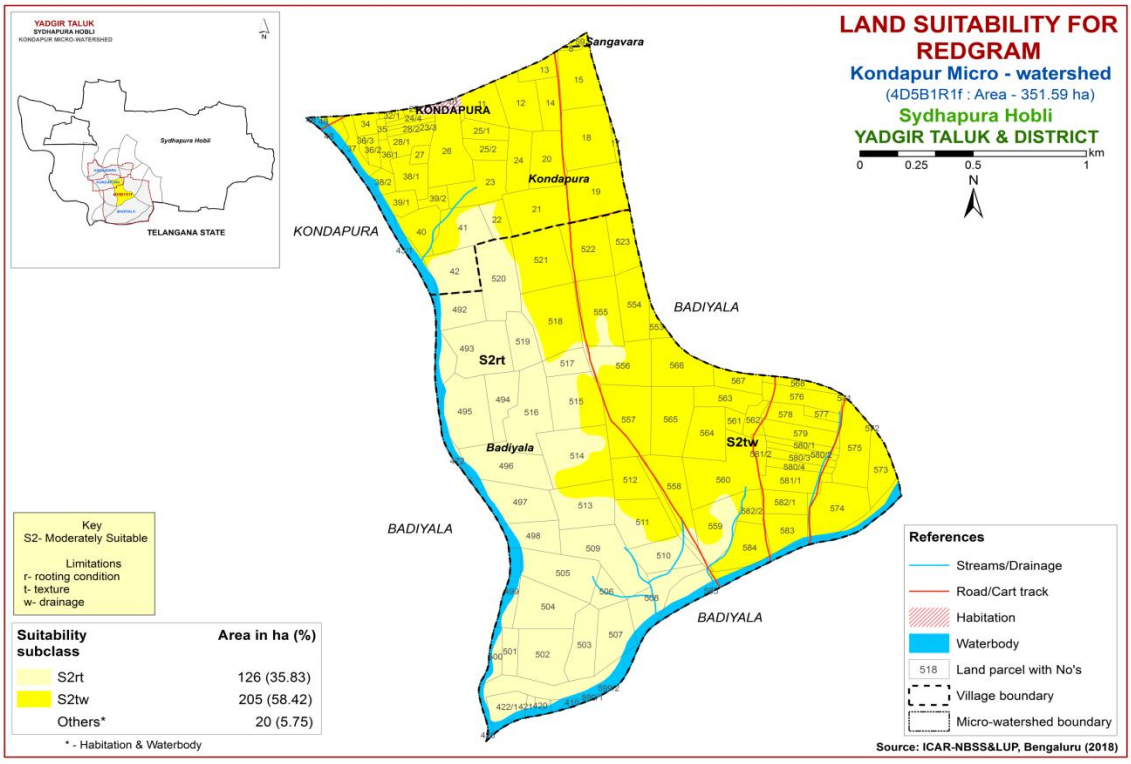


Fig. 7.6 Land Suitability map of Redgram

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 are given in Figure 7.7.

Entire area of the microwatershed is highly suitable (Class S1) for growing bengalgram and is distributed in all parts of the microwatershed.

Table 7.8 Crop suitability criteria for Bengal gram

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>100	90-100	70-90	<70
Soil drainage	Class	Well drained	Mod. to well drained; imperfectly drained	Poorly drained; excessively drained	Very Poorly drained
Soil reaction	pH	6.0-7.5	5.5-5.7, 7.6-8.0	8.1-9.0;4.5-5.4	>9.0
Surface soil texture	Class	l, scl, sil, cl,	sicl, sic, c	sl, c>60%	
Soil depth	cm	>75	51-75	25-50	<25
Gravel content	% vol.	<15	15-35	>35	
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

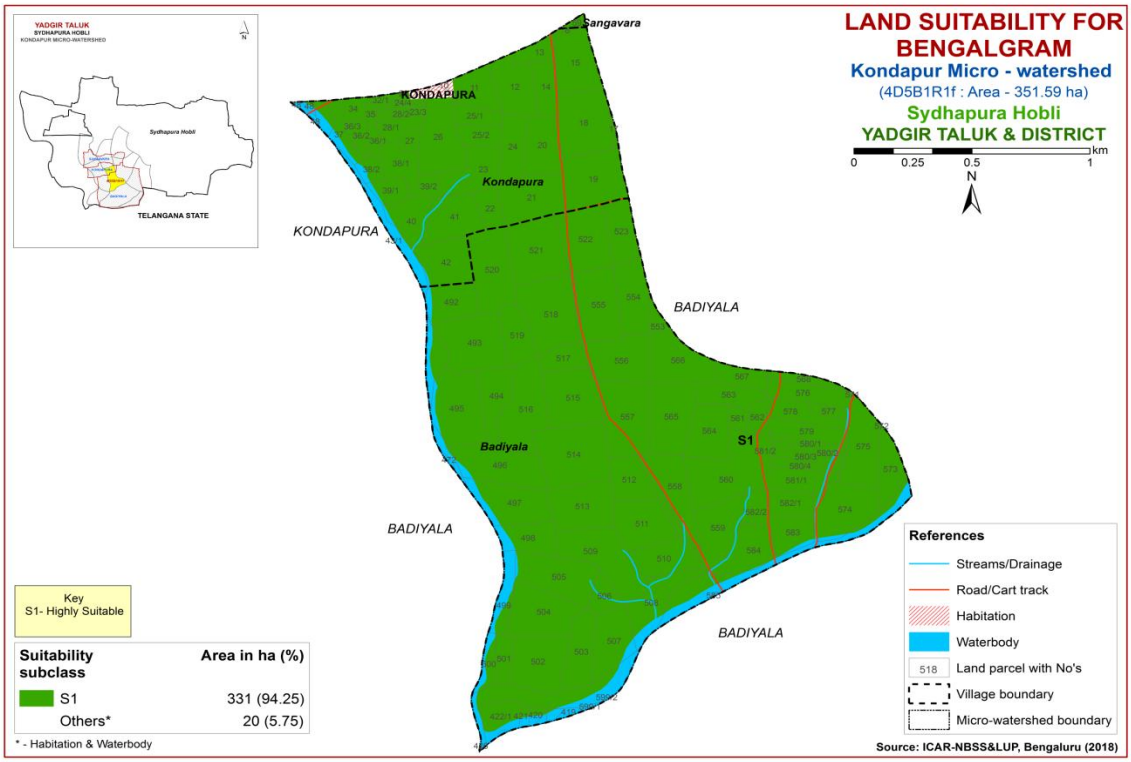


Fig. 7.7 Land Suitability map of Bengal gram

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

Cotton is 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.

Table 7.9 Crop suitability criteria for Cotton

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

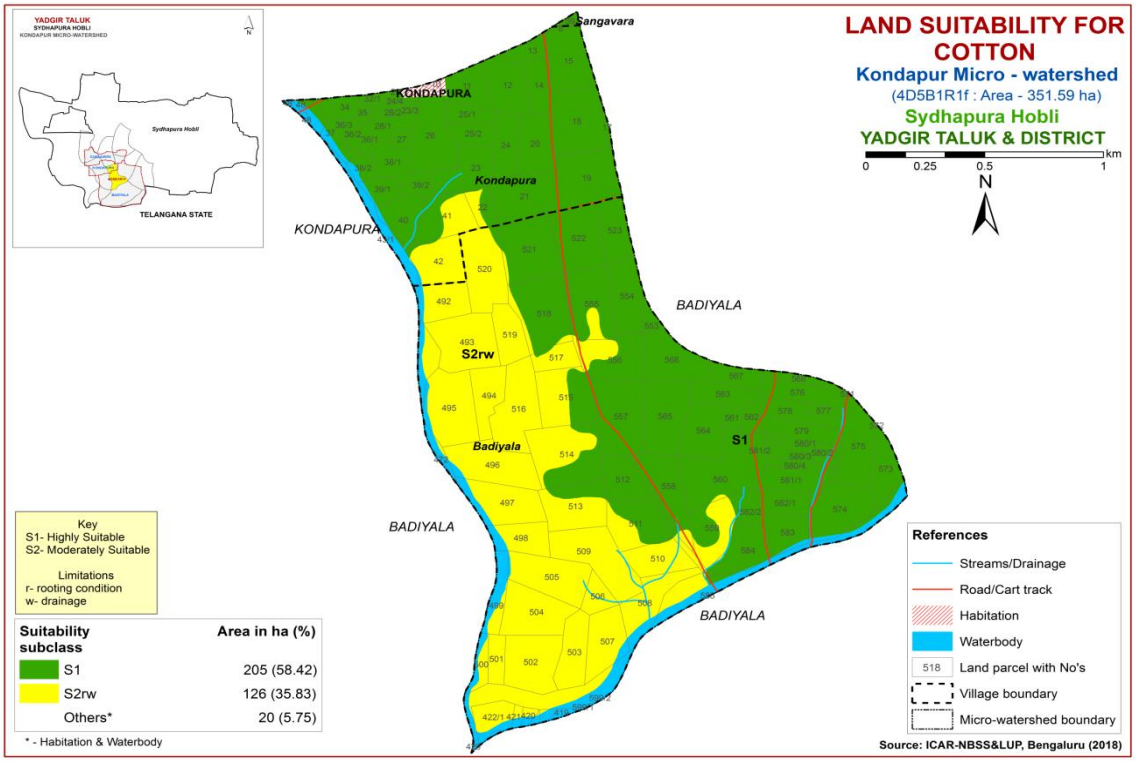


Fig. 7.8 Land Suitability map of Cotton

Maximum area of about 205 ha (58%) is highly suitable (S1) for growing cotton and are distributed in all parts of the microwatershed. An area of about 126 ha (36%) is moderately suitable (Class S2) for growing cotton and are distributed in the western, central and southern part of the microwatershed with minor limitations of drainage and rooting depth.

7.9 Land Suitability for Chilli (*Capsicum annuum)*

Chilli is one of the most important vegetable and 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.

Entire area of the microwatershed is moderately suitable (Class S2) for growing chilli and are distributed in all parts of the microwatershed with minor limitations of texture and drainage.

Table 7.10 Crop suitability criteria for Chilli

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

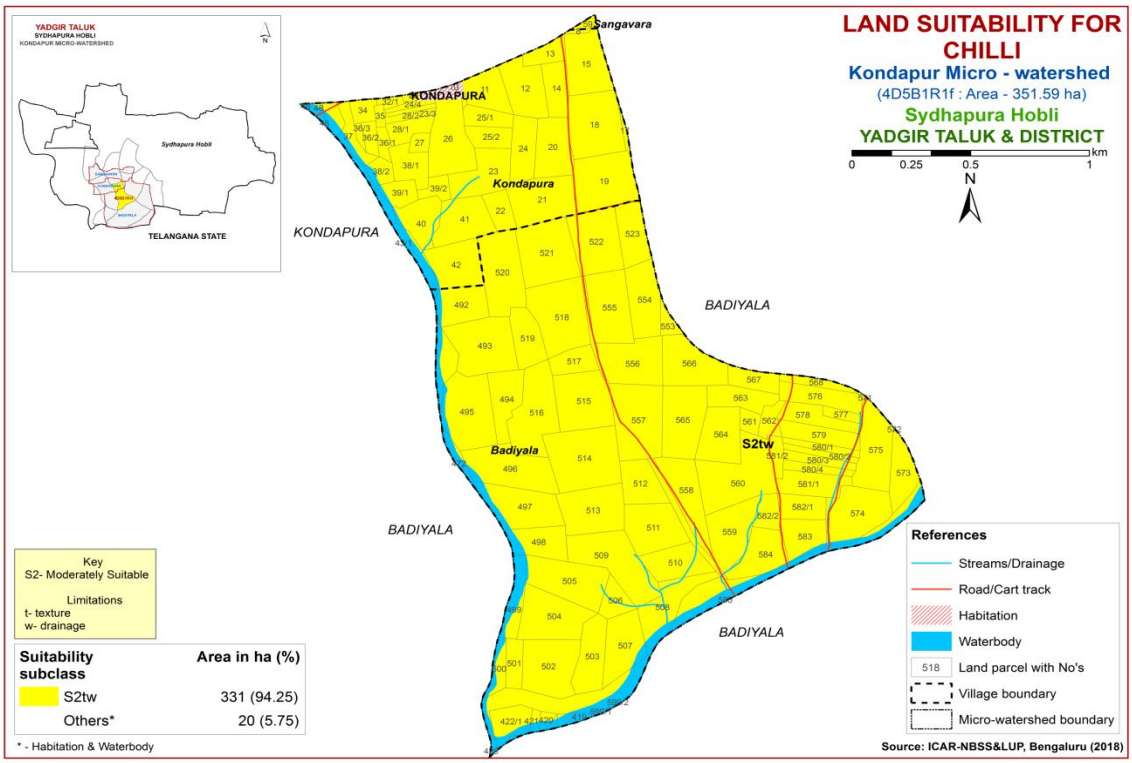


Fig 7.9 Land Suitability map of Chilli

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.

Entire area of the microwatershed is marginally suitable (Class S3) for growing tomato and is distributed in all parts of the microwatershed with major limitations of texture and drainage.

Table 7.11 Crop suitability criteria for Tomato

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	25-28	29-32 , 20-24	15-19 33-36	<15, >36
Soil moisture	Growing period	Days	>150	120-150	90-120	
Soil aeration	Soil drainage	class	Well drained	Moderately well drained	Poorly drained	V. poorly drained
Nutrient availability	Texture	Class	l, sl, cl, scl	sic,sicl, sc,c(m/k)	c (ss), ls	s
	pH	1:2.5	6.0-7.3	5.5-6.0 7.3-8.4	8.4-9.0	>9.0
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	%vol.	<15	15-35	>35	
Soil toxicity	Salinity	dS/m	Non saline	slight	strongly	
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	>10

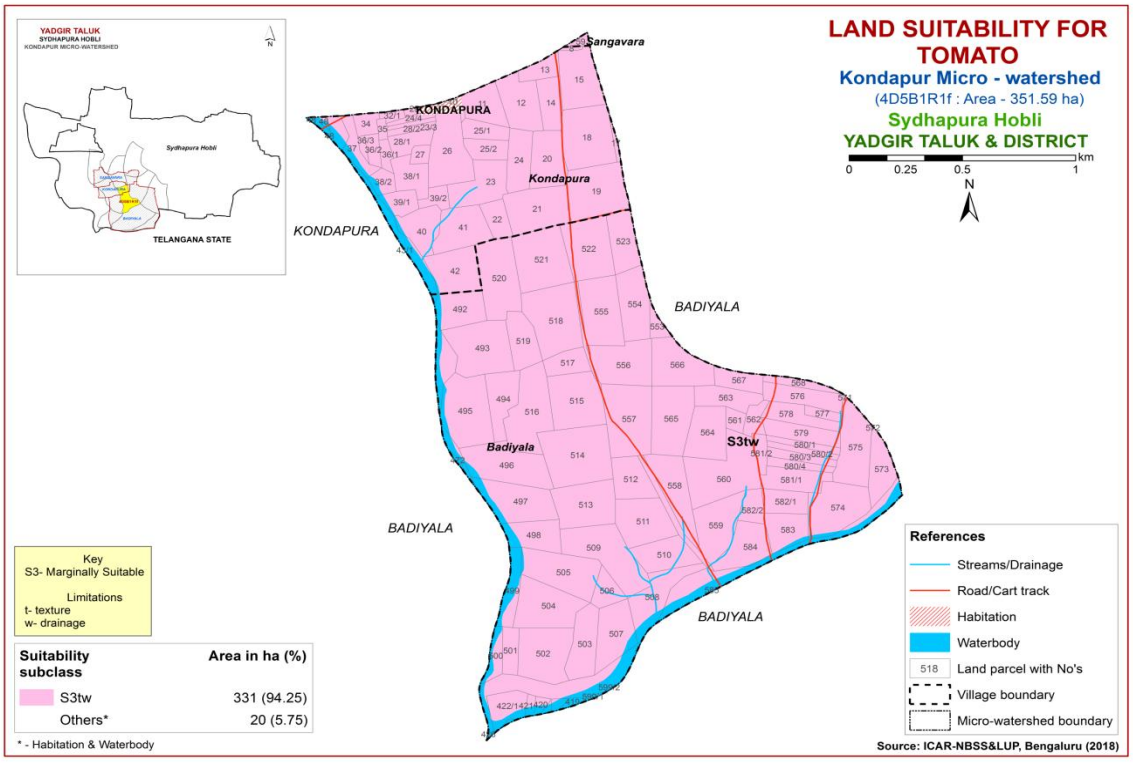


Fig 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Drumstick (*Moringa oleifera*)

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

Entire area of the microwatershed is moderately suitable (Class S2) for growing drumstick and are distributed in all parts of the microwatershed with minor limitations of texture, rooting depth and drainage.

Table 7.12 Crop suitability criteria for Drumstick

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

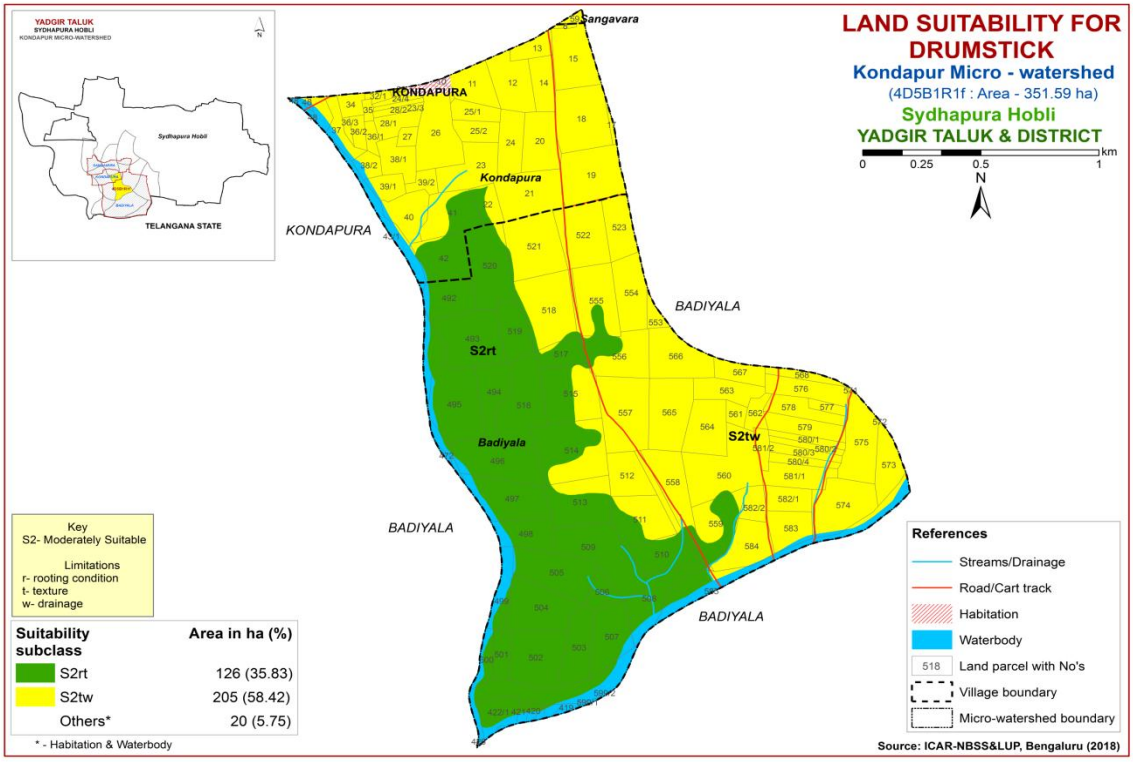


Fig 7.11 Land Suitability map of Drumstick

7.12 Land suitability for Brinjal (*Solanum melongena*)

Brinjal is one of the most important vegetable crop grown in all the districts. The crop requirements for growing brinjal (Table 7.13) 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 are given in Figure 7.12.

Entire area of the microwatershed is moderately suitable (Class S2) for growing brinjal and is distributed in all parts of the microwatershed with minor limitation of texture.

Table 7.13 Land suitability criteria for Brinjal

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	sl, scl, cl, sc	c (red)	ls,c(black)	-
	pH	1:2.5	6.0-7.3	7.3-8.4,5.5-6.0	8.4-9.0	>9.0
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	%vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-5	5-10	>10

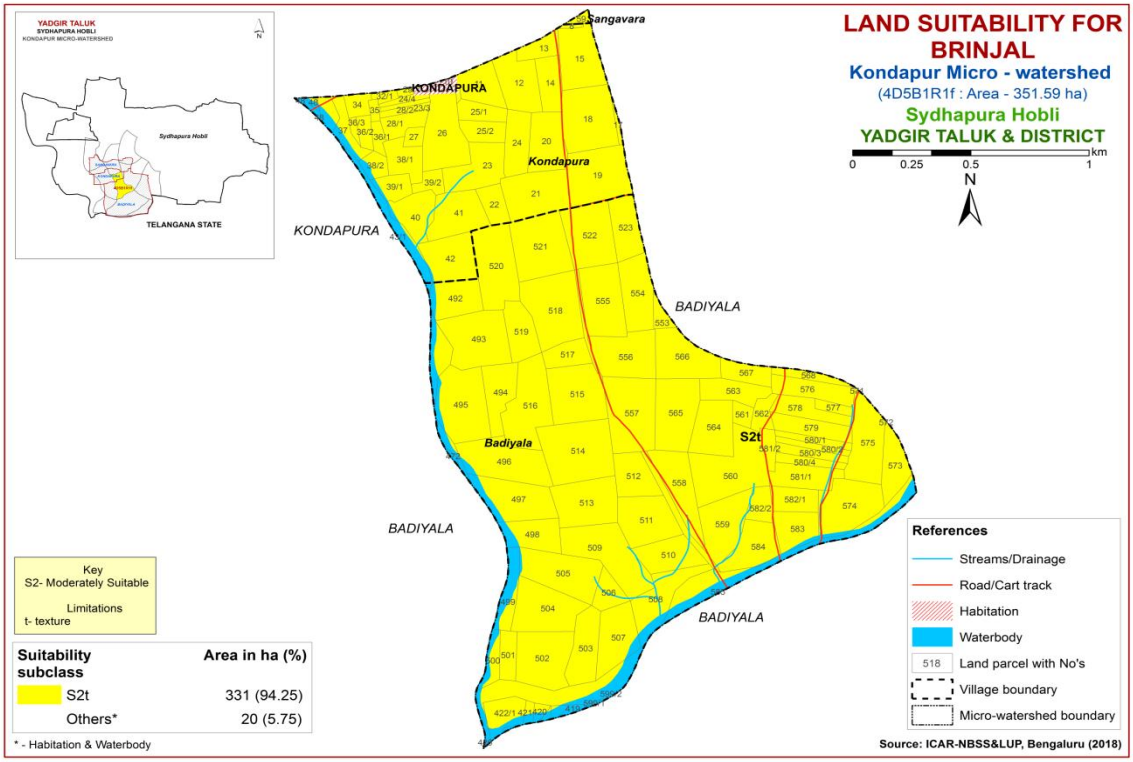


Fig 7.12 Land Suitability map of Brinjal

7.13 Land suitability for Bhendi (*Abelmoschus esculentus*)

Bhendi is one of the most important vegetable crop grown in all the districts. 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 are given in Figure 7.13.

Table 7.14 Land suitability criteria for Bhendi

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	25-28	29-32 20-24	15-19 33-36	<15 >36
Soil moisture	Growing period	Days	>150	120-150	90-120	<90
Soil aeration	Soil drainage	class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l, sl, cl, scl	sic,sicl,sc,c(m/k)	c (ss)	ls, s
	pH	1:2.5	6.1-7.3	5.6-6.0,7.4-7.8	<5.6,7.9-8.4	>8.4
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	>60
Soil toxicity	Salinity	ds/m	Non saline	Slight	Strongly	
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	>10

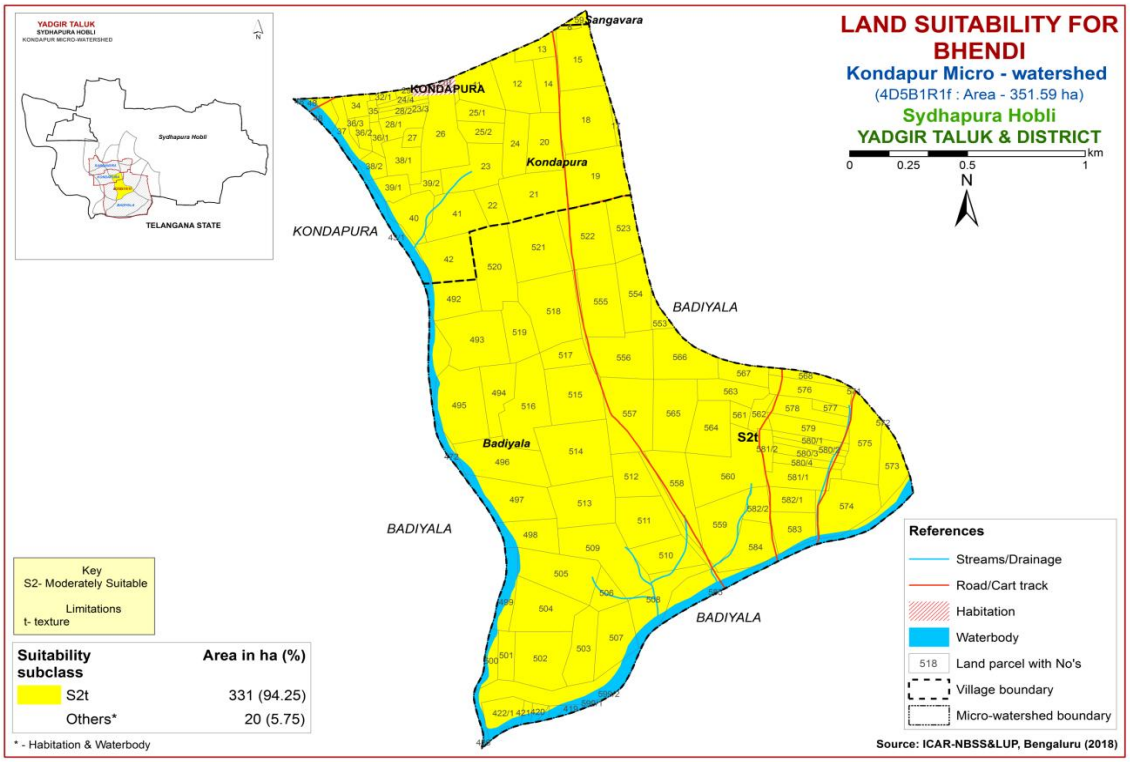


Fig 7.13 Land Suitability map of Bhendi

Entire area of the microwatershed is moderately suitable (Class S2) for growing bhendi and are distributed in all parts of the microwatershed with minor limitation of texture.

7.14 Land Suitability for Onion (*Allium cepa*)

Onion is one of the most important vegetable crop grown in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and Tumakuru districts. The crop requirements for growing onion (Table 7.15) 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 are given in Figure 7.14.

An area of about 47 ha (13%) is moderately suitable (Class S2) for growing onion and are distributed in the northern part of the microwatershed with minor limitation of texture. Maximum area of about 284 ha (81%) is marginally suitable (Class S3) for growing onion and are distributed in all parts of the microwatershed with major limitation of texture.

Table 7.15 Land suitability criteria for Onion

Crop requirement		**Rating**			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Mean temp. in growing season	^{0}C	20-30	30-35	35-40	>40
Slope	%	<3	3-5	5-10	>10
Soil drainage	Class	Well drained	Moderately /imperfectly	Poor drained	Very poorly drained
Soil reaction	pH	6.5-7.3	7.3-7.8,5.0-5.4	7.8-8.4,<5.0	>8.4
Surface soil texture	Class	scl, sil, sl	sc, sicl, c (red)	sc, c(black)	ls
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	60-80
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	<4
Sodicity (ESP)	%	<5	5-10	10-15	>15

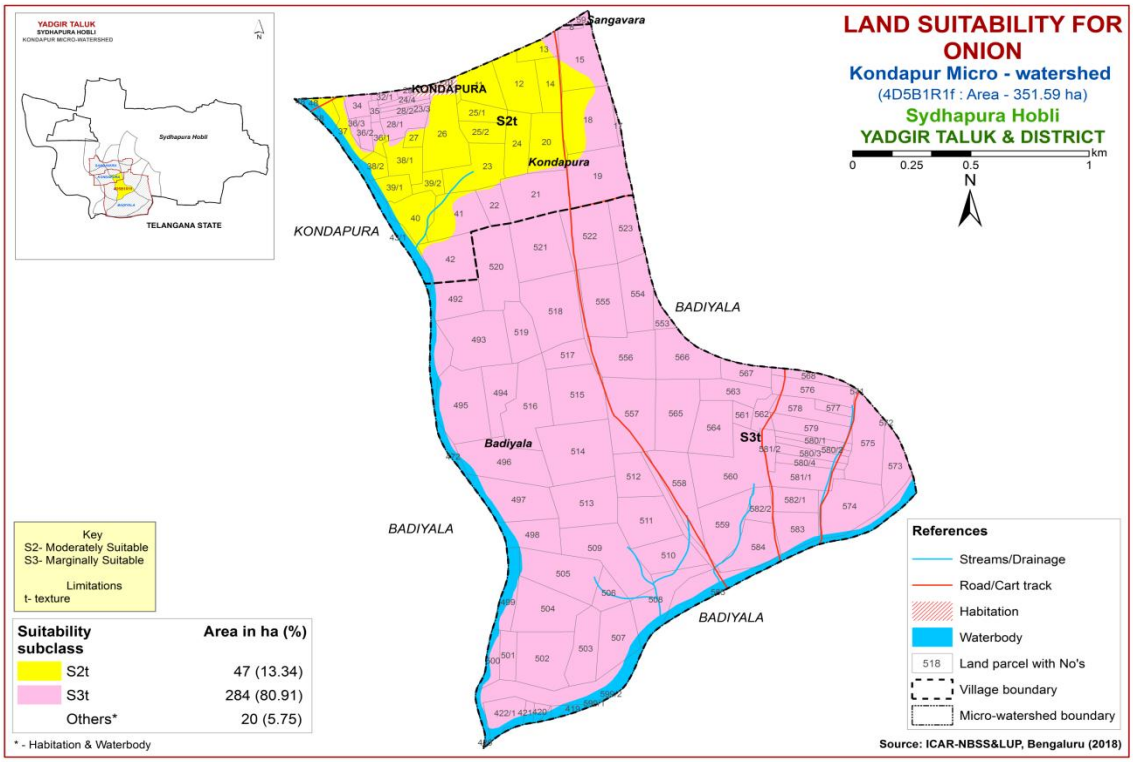


Fig 7.14 Land Suitability map of Onion

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.

Entire area of the microwatershed is marginally suitable (Class S3) for growing mango and is distributed in all parts of the microwatershed with major limitations of texture and rooting depth.

Table 7.16 Crop suitability criteria for Mango

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

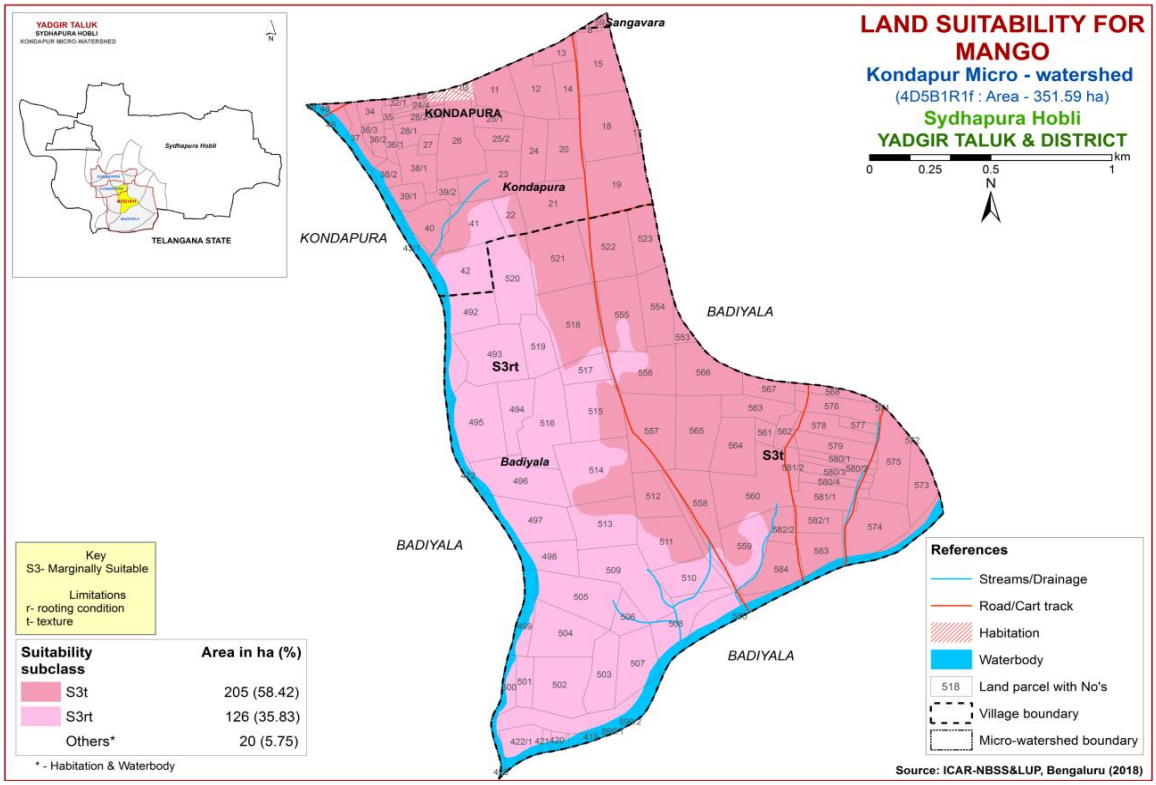


Fig. 7.15 Land Suitability map of Mango

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.

Entire area of the microwatershed is marginally suitable (Class S3) for growing guava and is distributed in all parts of the microwatershed with major limitation of texture.

Table 7.17 Crop suitability criteria for Guava

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

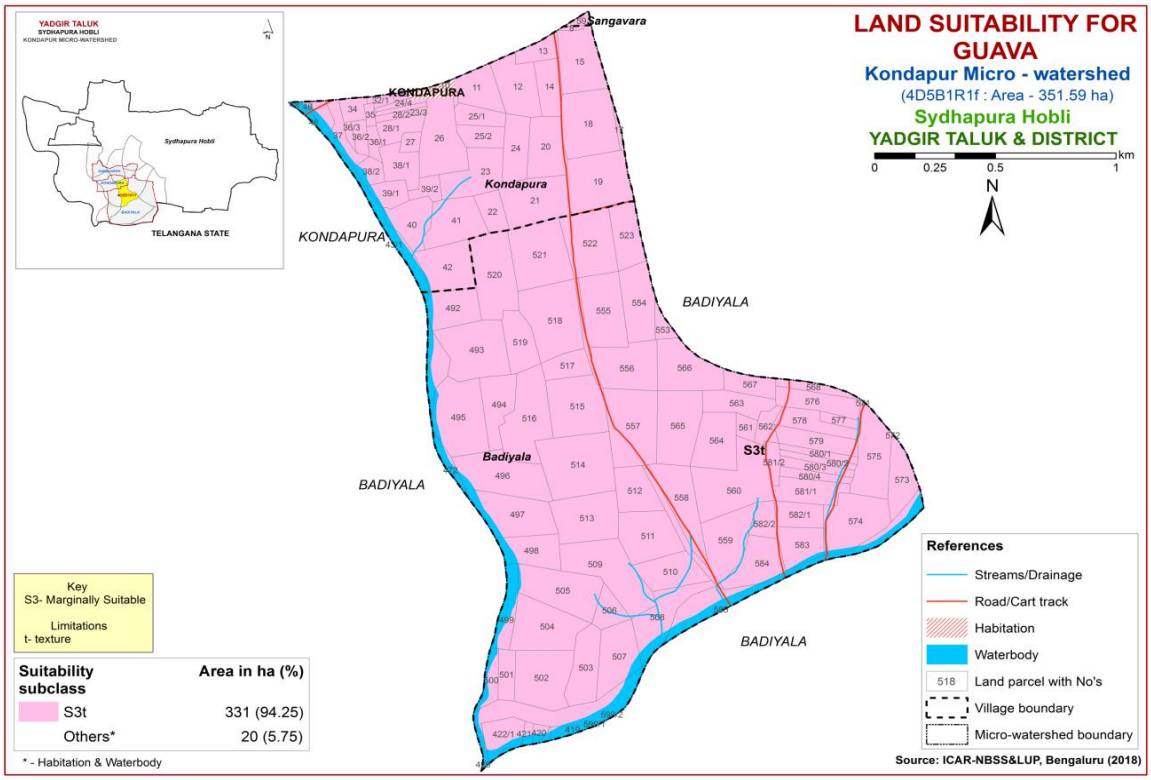


Fig. 7.16 Land Suitability map of Guava

7.17 Land suitability for 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.

Table 7.18 Crop suitability criteria for Sapota

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

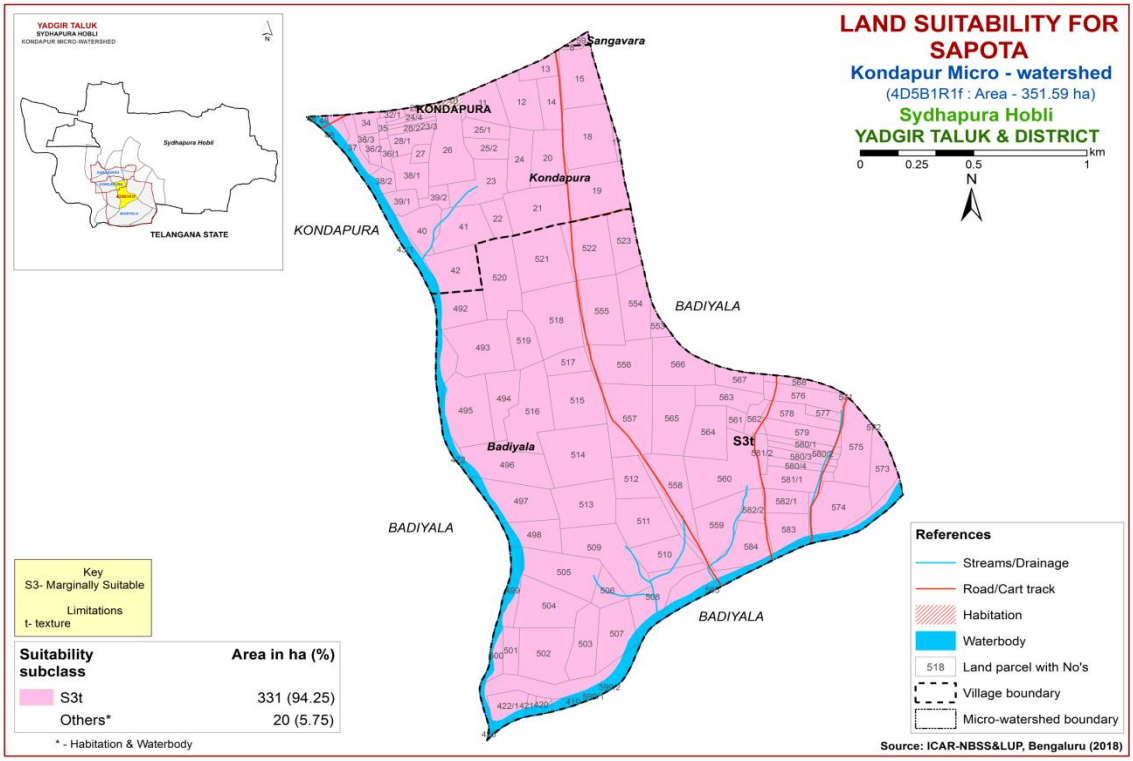


Fig. 7.17 Land Suitability map of Sapota

Entire area of the microwatershed is marginally suitable (Class S3) for growing sapota and is distributed in all parts of the microwatershed with major limitation of texture.

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.

Entire area of the microwatershed is moderately suitable (Class S2) for growing pomegranate and are distributed in all parts of the microwatershed with minor limitations of texture and rooting depth.

Table 7.19 Crop suitability criteria for Pomegranate

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

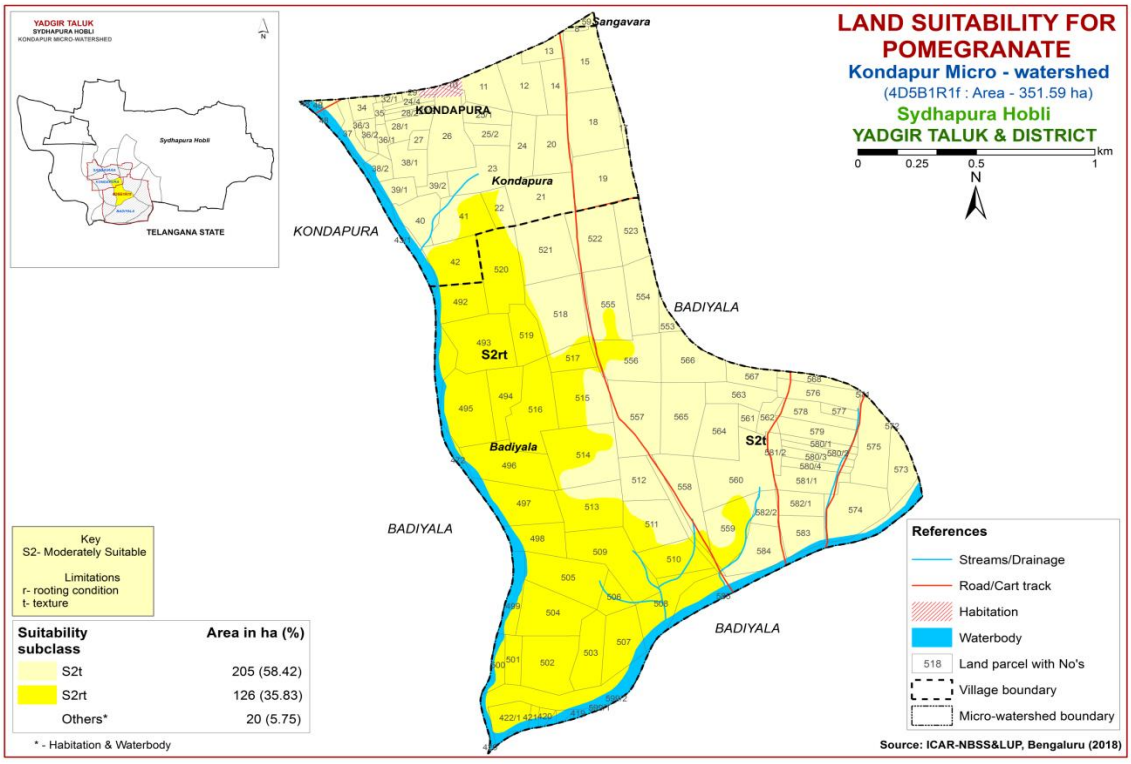


Fig 7.18 Land Suitability map of Pomegranate

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.

Maximum area of about 205 ha (58%) is highly suitable (S1) for growing musambi and are distributed in all parts of the microwatershed. An area of about 126 ha (36%) is moderately suitable (Class S2) for growing musambi and are distributed in the western, central and southern part of the microwatershed with minor limitations of calcareousness and rooting depth.

Table 7.20 Crop suitability criteria for Musambi

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable (S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod. to imperfectly drained	poorly	Very poorly
Nutrient availability	Texture	Class	scl, l, sicl, cl, s	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.47.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Erosion	Slope	%	<3	3-5	5-10	

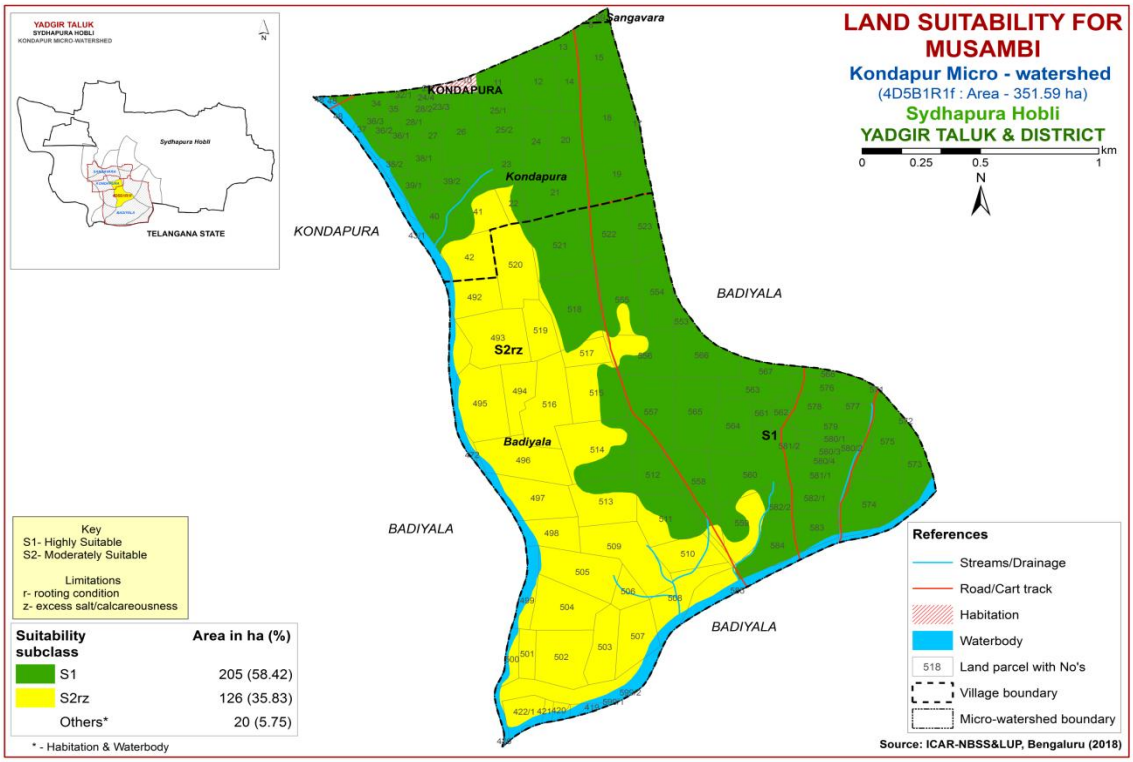


Fig. 7.19 Land Suitability map of Musambi

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.

Maximum area of about 205 ha (58%) is highly suitable (S1) for growing lime and are distributed in all parts of the microwatershed. An area of about 126 ha (36%) is moderately suitable (Class S2) for growing lime and are distributed in the western, central and southern part of the microwatershed with minor limitations of calcareousness and rooting depth.

Table 7.21 Crop suitability criteria for Lime

Crop requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	28-30	31-35 24-27	36-40 20-23	>40 <20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imp. drained	poorly	Very poorly
Nutrient availability	Texture	Class	scl,l,sicl,cl,s	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.4,7.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
	$CaCO_3$ in root zone	%	Non 34calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	%vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

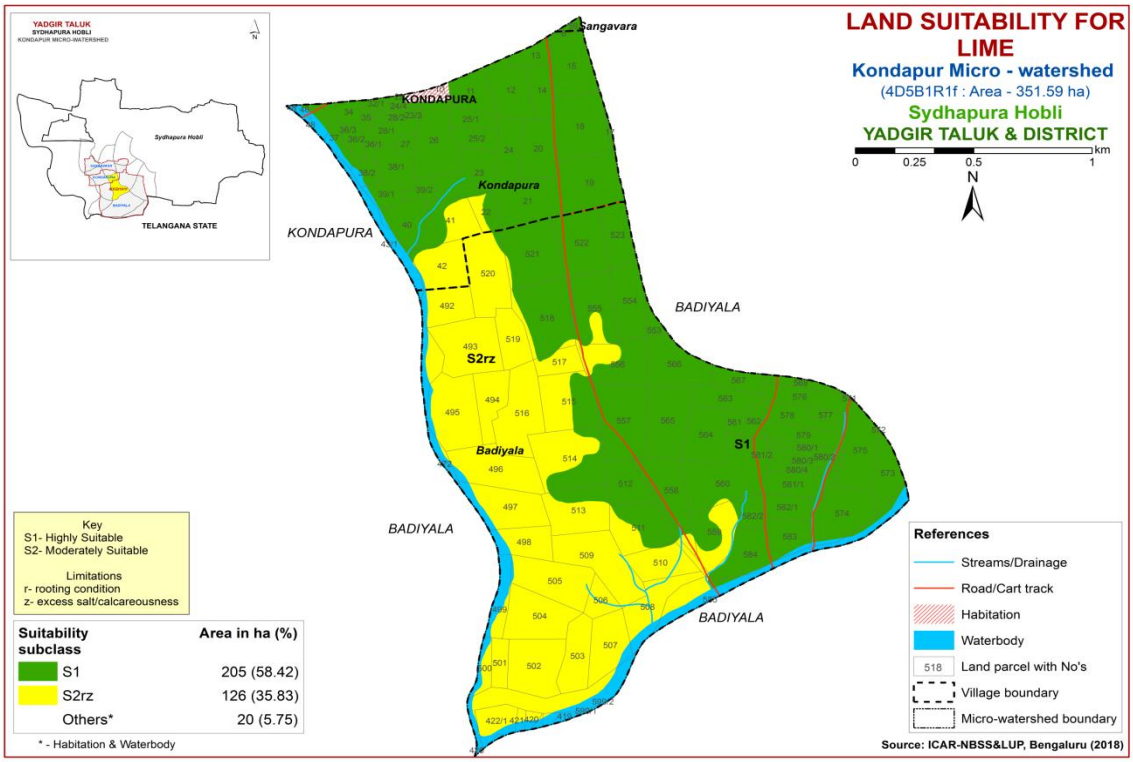


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for 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.

Maximum area of about 205 ha (58%) is highly suitable (S1) for growing amla and are distributed in all parts of the microwatershed. An area of about 126 ha (36%) is moderately suitable (Class S2) for growing amla and are distributed in the western, central and southern part of the microwatershed with minor limitations of calcareousness and rooting depth.

Table 7.22 Land suitability criteria for Amla

Crop requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Soil aeration	Soil drainage	Class	Well drained	Mod.well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	scl,cl,sc,c(red)	c (black)	ls, sl	-
	pH	1:2.5	5.5-7.3	5.0-5.5	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	%vol.	<15-35	35-60	60-80	
Erosion	Slope	%	0-3	3-5	5-10	>10

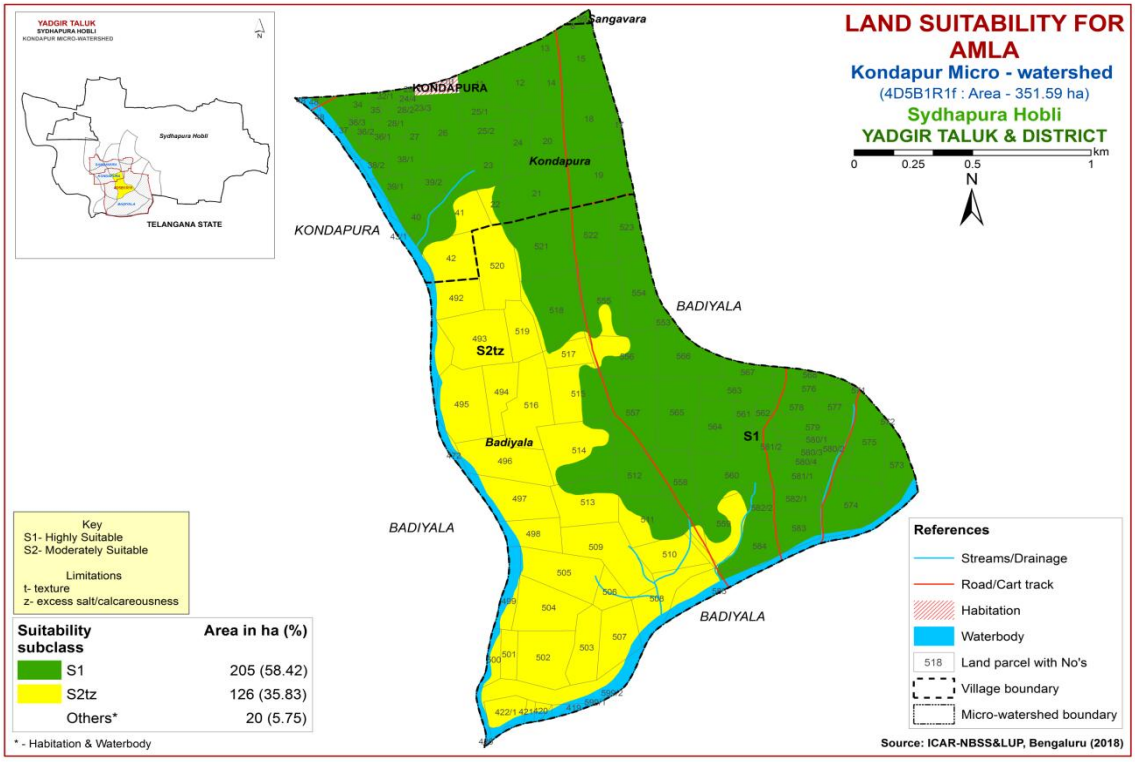


Fig. 7.21 Land Suitability map of Amla

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 7.20) 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 7.19.

Entire area of the microwatershed is currently not suitable (Class N1) for growing cashew and is distributed in all parts of the microwatershed with severe limitations of texture and calcareousness.

Table 7.23 Land suitability criteria for Cashew

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

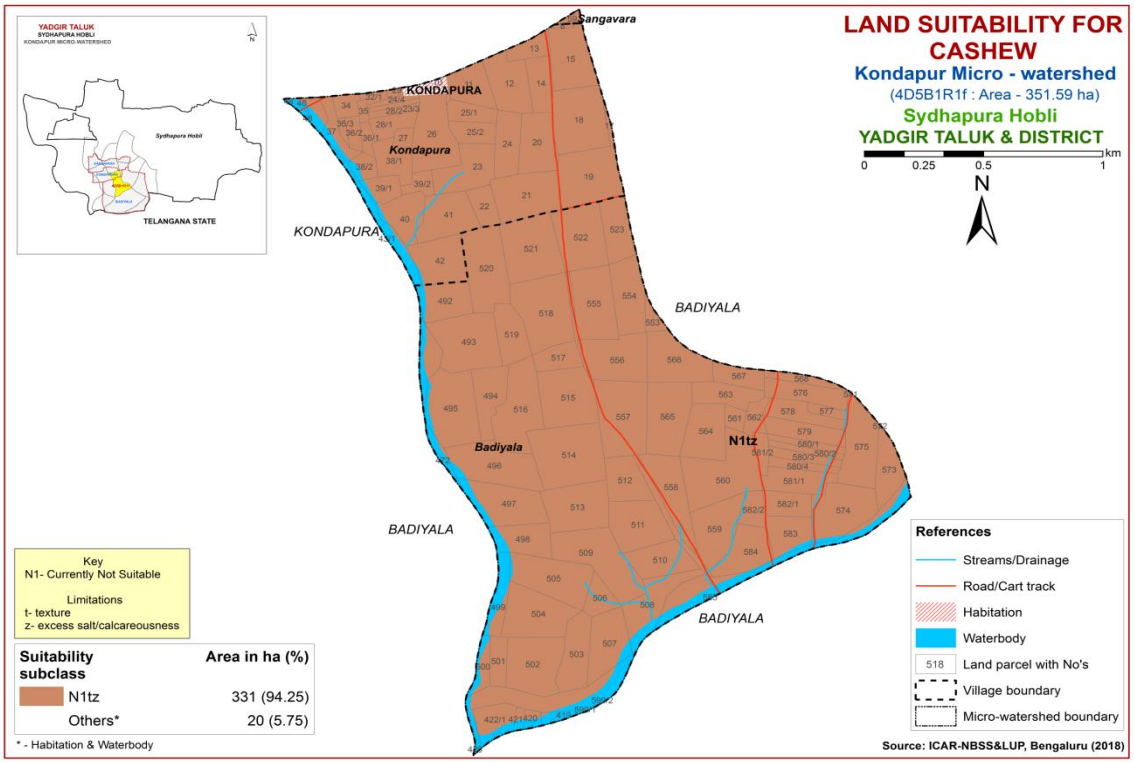


Fig. 7.22 Land Suitability map of Cashew

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.

Entire area of the microwatershed is marginally suitable (Class S3) for growing Jackfruit and is distributed in all parts of the microwatershed with major limitation of texture.

Table 7.24 Land suitability criteria for Jackfruit

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	class	well	Mod. well	Poorly	V. Poorly
Nutrient availability	Texture	Class	scl,cl,sc,c(red)	-	sl, ls, c (black)	-
	pH	1:2.5	5.5-7.3	5.0-5.5,7.3-7.8	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-5	>5	-

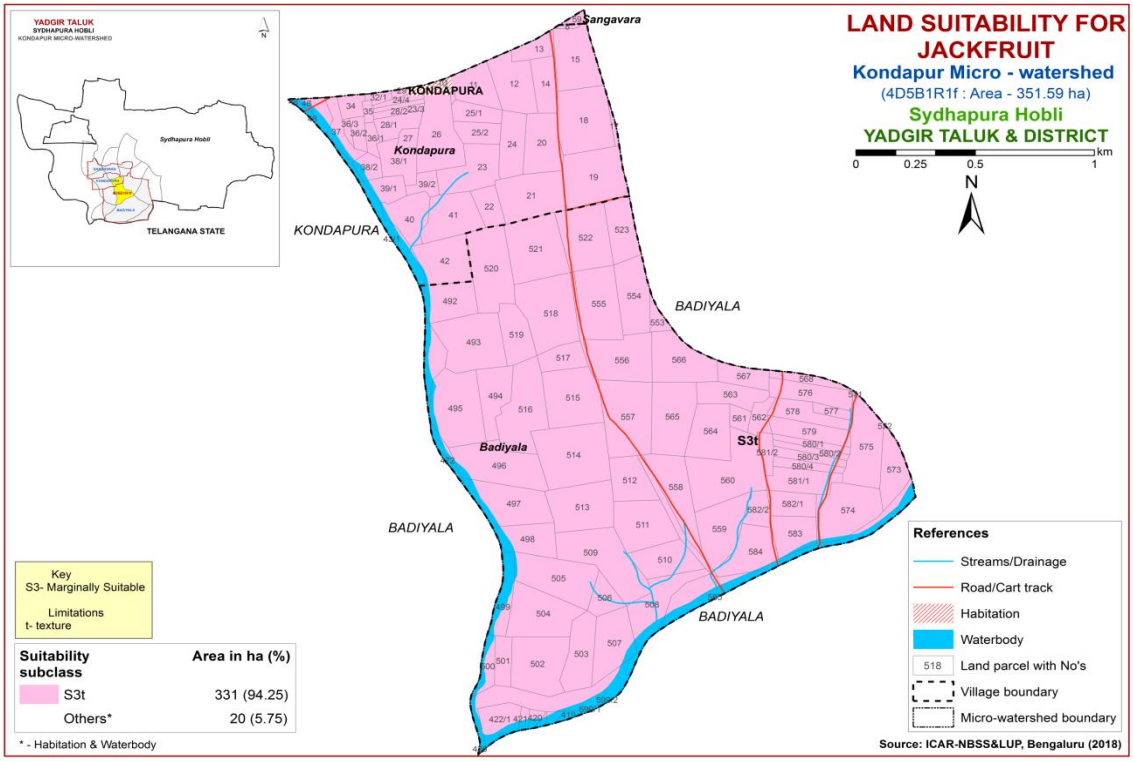


Fig. 7.23 Land Suitability map of Jackfruit

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 are given in Figure 7.24.

Maximum area of about 205 ha (58%) is moderately suitable (Class S2) for growing Jamun and are distributed in all parts of the microwatershed with minor

limitation of texture. An area of about 126 ha (36%) is marginally suitable (Class S3) for growing Jamun and are distributed in the western, central and southern part of the microwatershed with major limitations of texture and rooting depth.

Table 7.25 Land suitability criteria for Jamun

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable (N)
Soil aeration	Soil drainage	Class	Well	Mod. well	Poorly	V. Poorly
Nutrient availability	Texture	Class	scl,cl,sc,c(red)	sl, c (black)	ls	-
	pH	1:2.5	6.0-7.8	5.0-6.0	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-5	5-10	>10

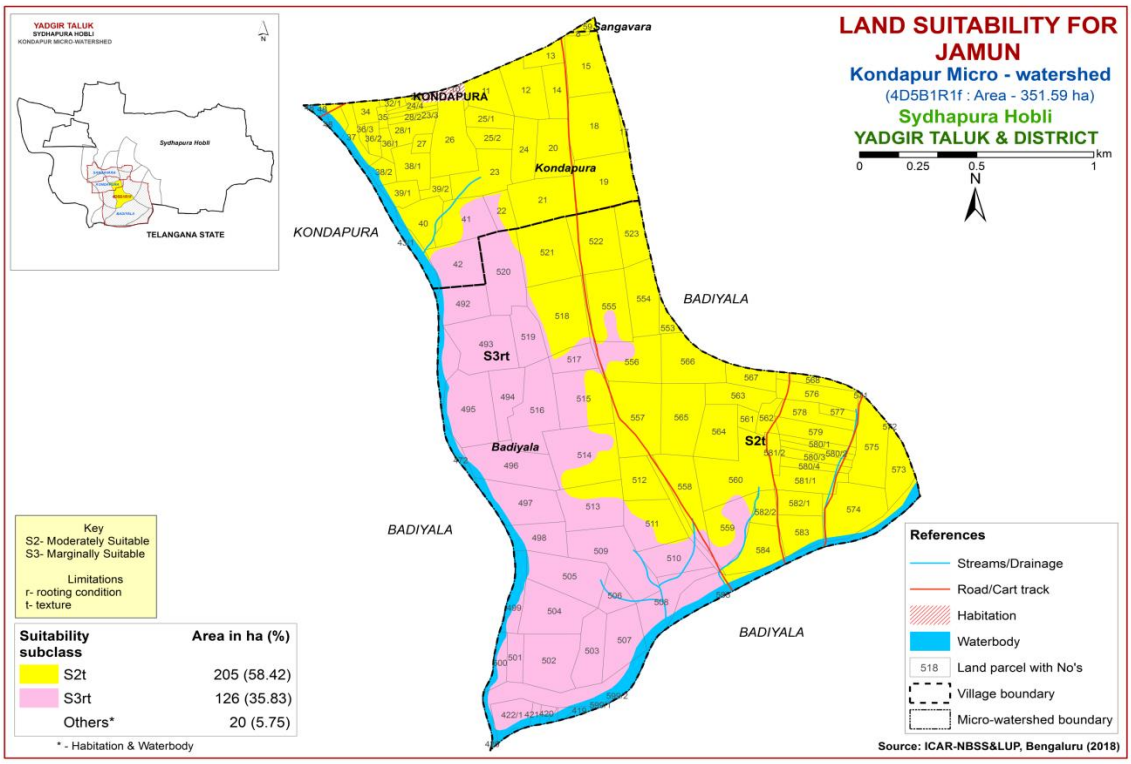


Fig. 7.24 Land Suitability map of Jamun

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 (Table 7.26) 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.

Entire area of the microwatershed is highly suitable (Class S1) for growing Custard apple and is distributed in all parts of the microwatershed.

Table 7.26 Land suitability criteria for Custard apple

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

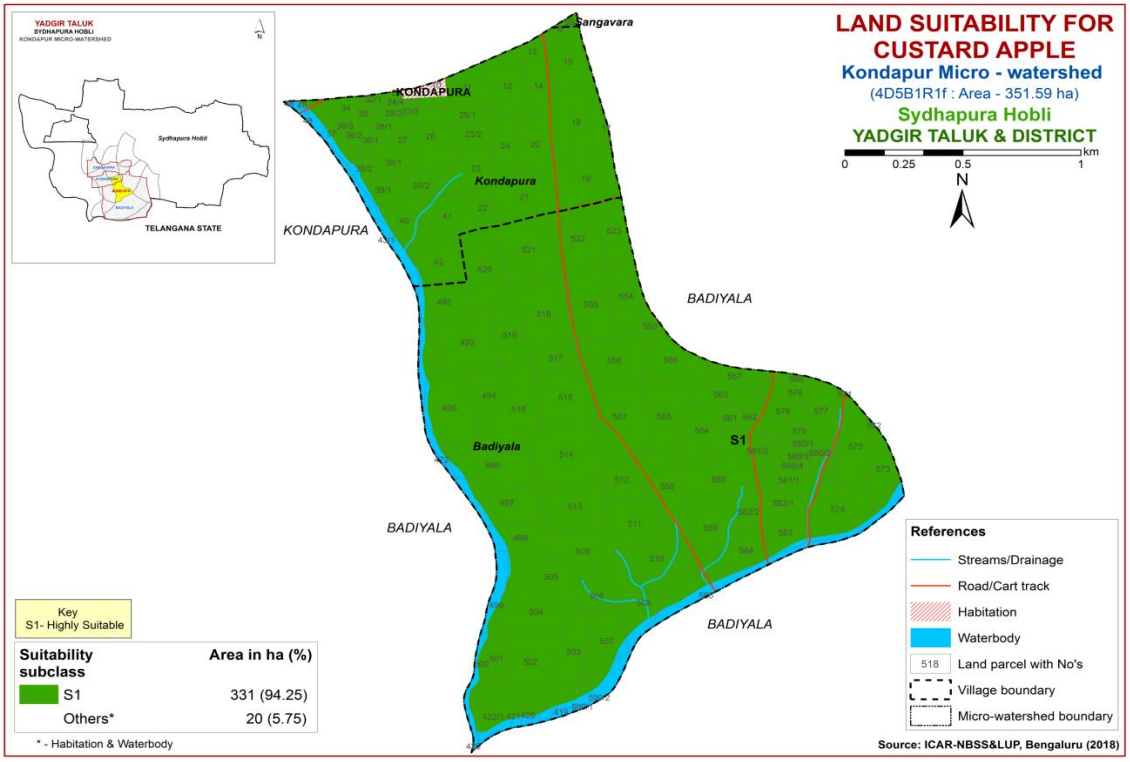


Fig. 7.25 Land Suitability map of Custard Apple

7.26 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is 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.

Maximum area of about 205 ha (58%) is moderately suitable (Class S2) for growing Tamarind and are distributed in all parts of the microwatershed with minor limitation of texture. An area of about 126 ha (36%) is marginally suitable (Class S3) for

growing Tamarind and are distributed in the western, central and southern part of the microwatershed with major limitations of texture and rooting depth.

Table 7.27 Land suitability criteria for Tamarind

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod. well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	scl,cl,sc,c(red)	sl, c (black)	ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0,7.3-7.8	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>150	100-150	75-100	<50
	Gravel content	% vol.	<15	15-35	35-60	60-80
Erosion	Slope	%	0-3	3-5	5-10	>10

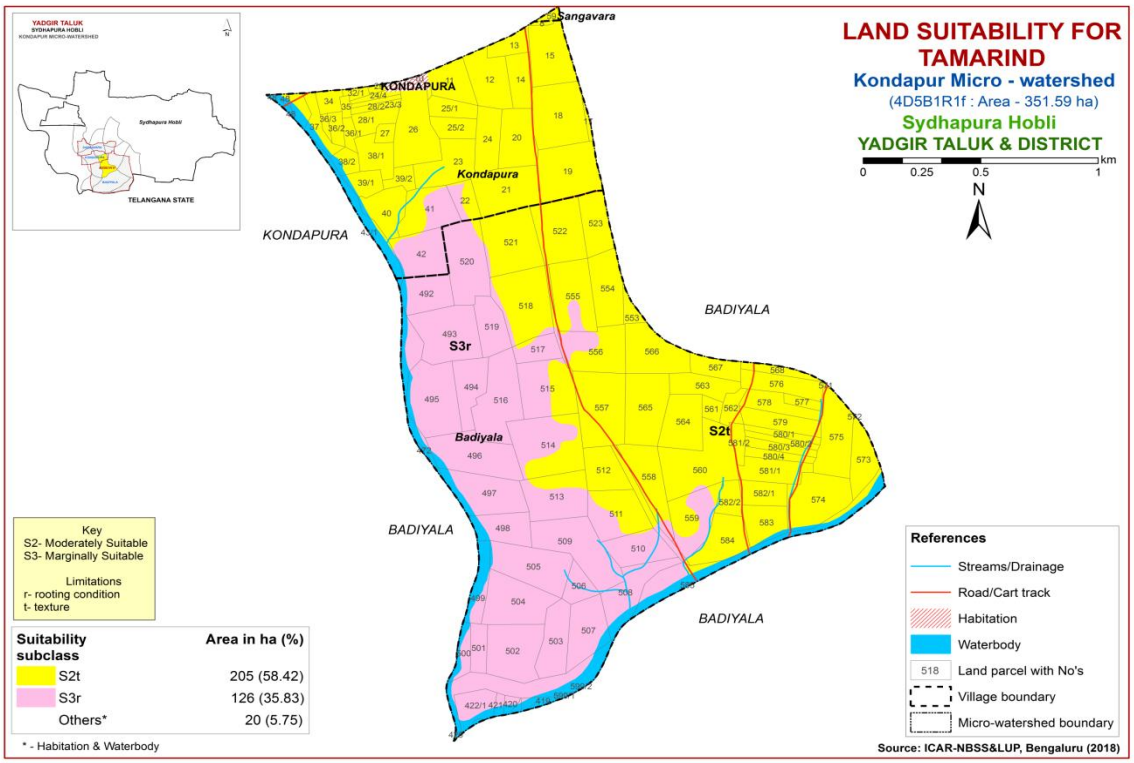


Fig. 7.26 Land Suitability map of Tamarind

7.27 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is an important leaf crop grown for rearing 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.

Entire area of the microwatershed is marginally suitable (Class S3) for growing mulberry and is distributed in all parts of the microwatershed with major limitations of texture and drainage.

Table 7.28 Crop suitability criteria for Mulberry

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

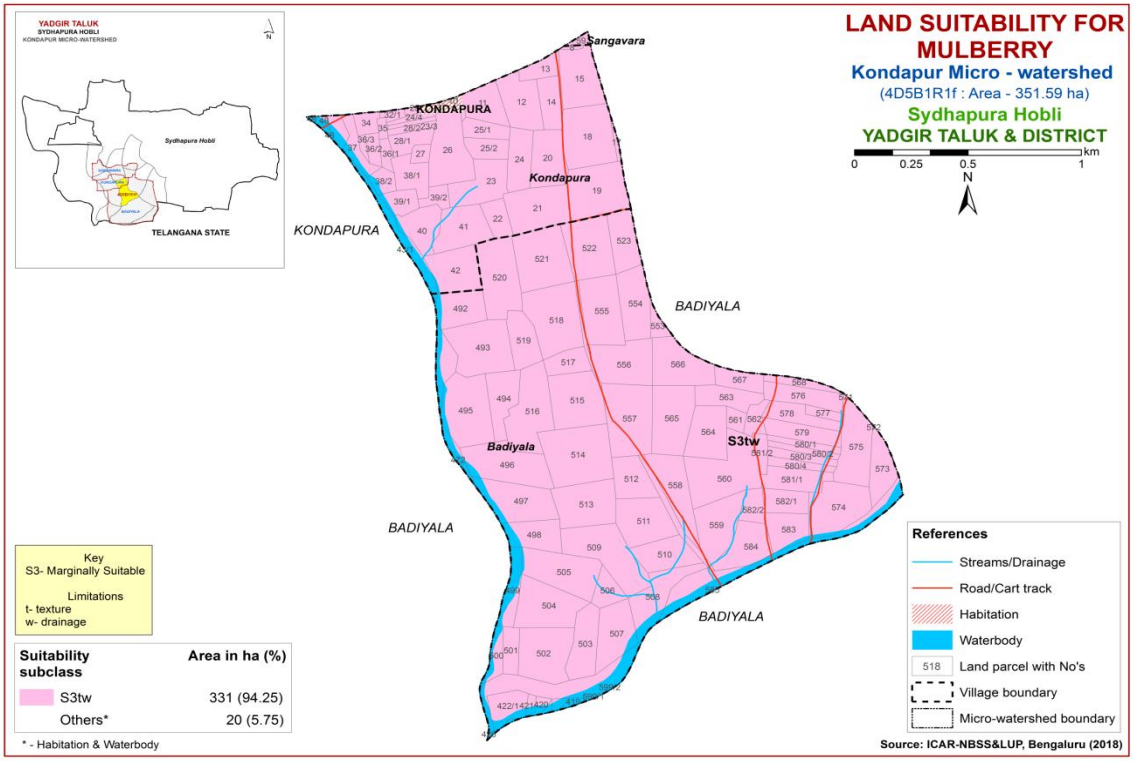


Fig 7.27 Land Suitability map of Mulberry

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.

Entire area of the microwatershed is moderately suitable (Class S2) for growing marigold and is distributed in all parts of the microwatershed with minor limitations of texture and drainage.

Table 7.29 Land suitability criteria for Marigold

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

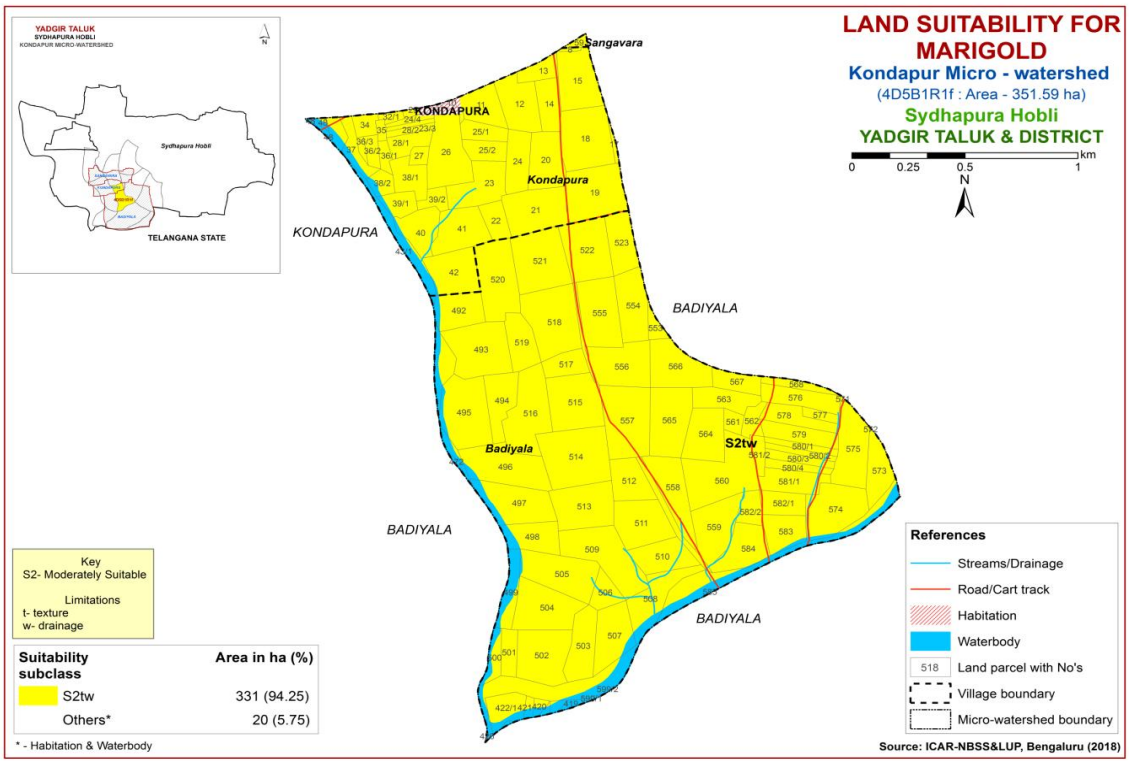


Fig. 7.28 Land Suitability map of Marigold

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.

Entire area of the microwatershed is moderately suitable (Class S2) for growing marigold and are distributed in all parts of the microwatershed with minor limitations of texture and drainage.

Table 7.30 Land suitability criteria for Chrysanthemum

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

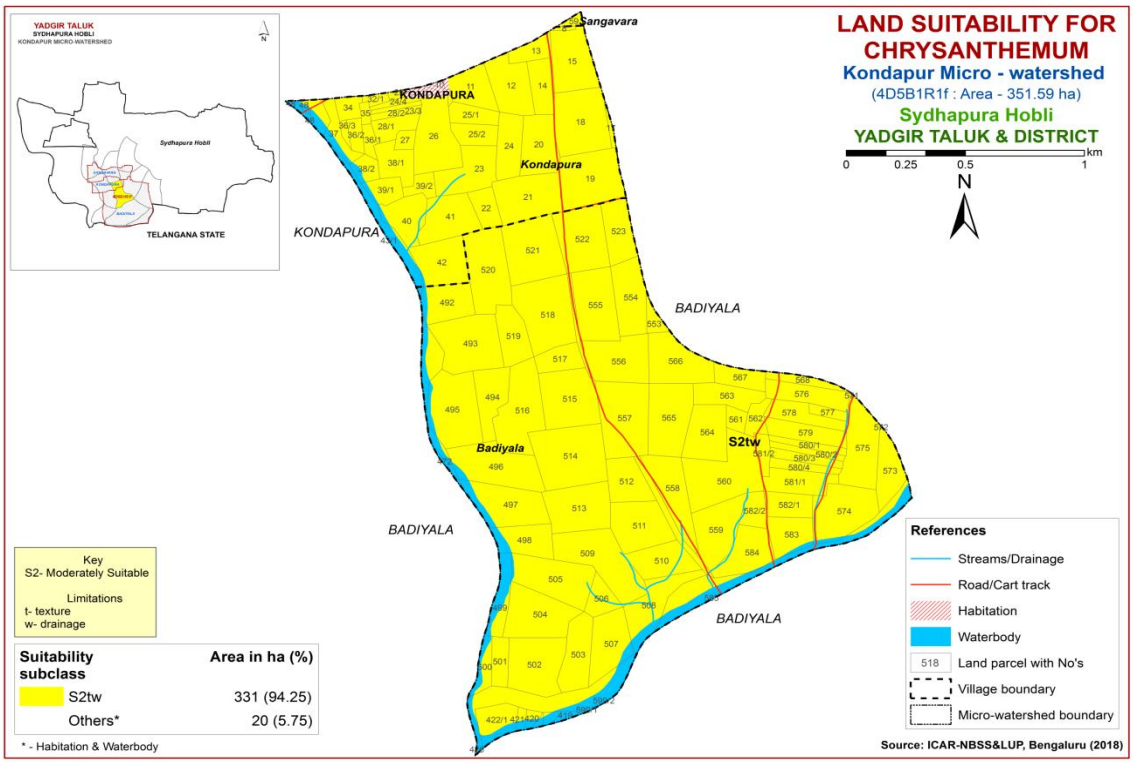


Fig. 7.29Land Suitability map of Chrysanthemum

7.30 Land Management Units (LMUs)

The 5 soil map units identified in Kondapur microwatershed have been grouped into one Land Use Classe (LMU) 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. 7.28) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

The map units that have been grouped into one Land Use Class along with brief description of soil and site characteristics are given below.

LMU NO.	Soil map units	Soil and site characteristics
1	95.HGNmB2 86.KDRhA1 88.KDRiB3 81.MGLcB3 82.MGLmB2	Moderately deep to very deep (75 to >150 cm), black calcareous cracking clay soils, 0-1 % & 1-3% slope, slight and moderate to severe erosion

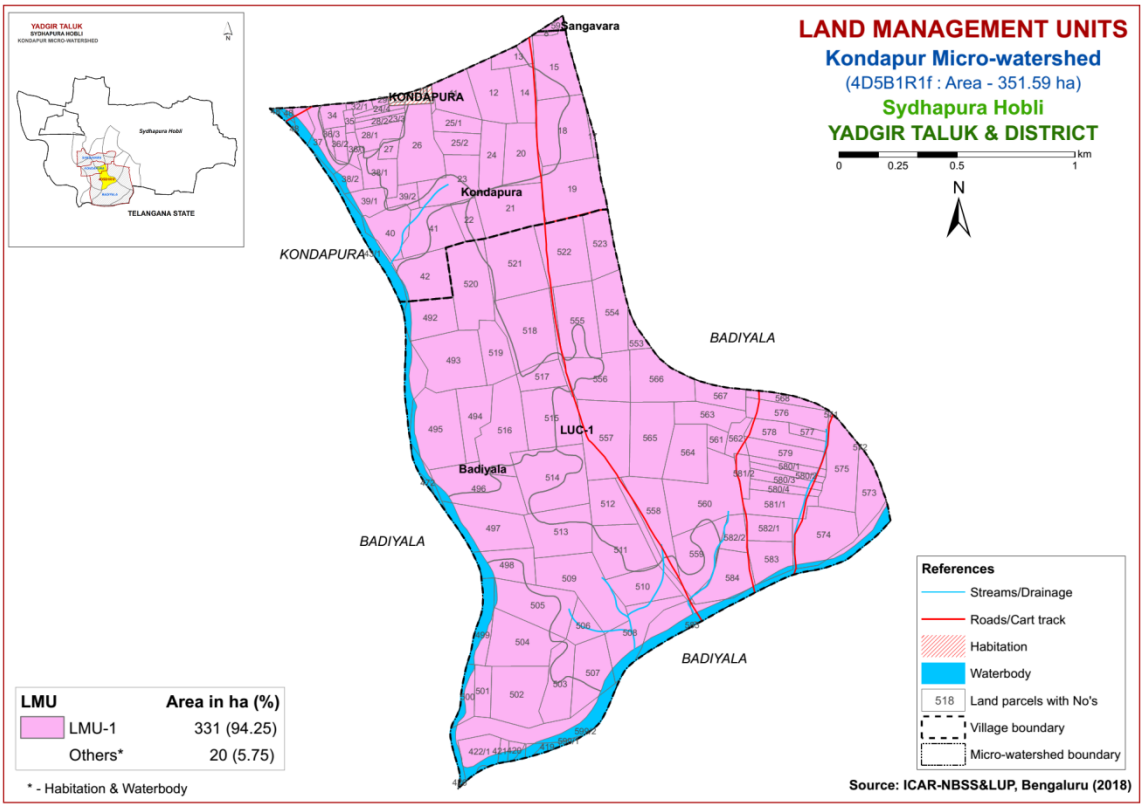


Fig. 7.30 Land Management Units Map of Kondapur Microwatershed

7.31 Proposed Crop Plan for Kondapur Microwatershed

After assessing the land suitability for the 29 crops, the proposed crop plan has been prepared for the one identified LMU 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 7.28.

Table 7.31 Proposed Crop Plan for Kondapur Microwatershed

Proposed Land use Class	Soil Map Units	Survey Number	Soil and site characteristics	Field Crops	Horticulture Crops	Suitable Interventions
1	95.HGNmB2 86.KDRhA1 88.KDRiB3 81.MGLcB3 82.MGLmB2	**Badiyala:** 420,421,422/1,492,493,494,495,496,497,498, 500,501,502,503,504,505,506,507,508,509, 510,511,512,513,514,515,516,517,518,519, 520,521,522,523,553,554,555,556,557,558, 559,560,561,562,563,564,565,566,567,568, 571,572,573,574,575,576,577,578,579,580/1, 580/2,580/3,580/4,581/1,581/2,582/1,582/2 583,584 **Kondapura:** 8,11,12,13,14,15,17,18,19,20,21,22,23,23/3, 24,24/4,25/1,25/2,26,27,28/1,28/2,29,32/1,34, 35,36/1,36/2,36/3,37,38/1,38/2,39/1,39/2,40, 41,42, **Sangavara:** 59	Moderately deep to very deep (75 to >150 cm), black calcareous cracking clay soils, 0-1 % & 1-3% slope, slight and moderate to severe erosion	Sunflower, Sorghum, Soybean, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Pomegranate, Lime, Musambi, Jamun, Amla, Custard apple, Tamarind **Vegetables:** Drumstick, Chilli, Coriander, Bhendi **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices

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 Kondapur Microwatershed

- The soil phases identified in the microwatershed belonged to the soil series of HGN 158 ha (45%), MGL 126 ha (36%) and KDR 47 ha (13%).
- As per land capability classification, entire area of the microwatershed falls under arable land category (Class II & III). The major limitations identified in the arable lands were soil and erosion.
- On the basis of soil reaction, about 44 ha (13%) is moderately alkaline (pH 7.8-8.4), 244 ha (69%) is strongly alkaline (pH 8.4-9.0) and 43 ha (12%) is very strongly alkaline (pH >9.0).

Soil Health Management

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

Alkaline soils

(Slightly alkaline to moderately alkaline soils)

1. Regular addition of organic manure, green manuring, green leaf manuring, crop residue incorporation and mulching needs to be taken up to improve the soil organic matter status.
2. Application of biofertilizers (Azospirullum, Azatobacter, Rhizobium).
3. Application of 25% extra N and P (125 % RDN&P).
4. Application of $ZnSO_4$ – 12.5 kg/ha (once in three years).
5. Application of Boron – 5kg/ha (once in three years).

Besides the above recommendations, the best transfer of technology options are also to be adopted.

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. Maximum area of about 240 ha is suffering from moderate erosion and 57 ha from severe erosion. These areas need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning (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 soil and erosion are the major constraints in Kondapur microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is low (<0.5%) in 82 ha (23%), medium (0.5-0.75%) in about 99 ha (28%) and high (>0.75%) in 150 ha (43%). The areas that are low and medium in OC needs to be further improved by applying farm yard 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 181 ha area where OC is low (<0.5%) and medium (0.5 - 0.75%). For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus**: Available Phosphorus is low (<23 kg/ha) in an area of 304 ha (86%), medium (23-57 kg/ha) in an area of 15 ha (4%) and high (>57 kg/ha) in an area of 13 ha (4%) of the microwatershed. For all the crops, 25% additional P needs to be applied where available P is low and medium.
- **Available Potassium:** Available Potassium is medium (145-337 kg/ha) in an area of 160 ha (45%) of the microwatershed and an area of about 171 ha (49%) is high (>337 kg/ha) in

available potassium. All the plots, where available potassium is low and medium, for all the crops, additional 25 % potassium may be applied.

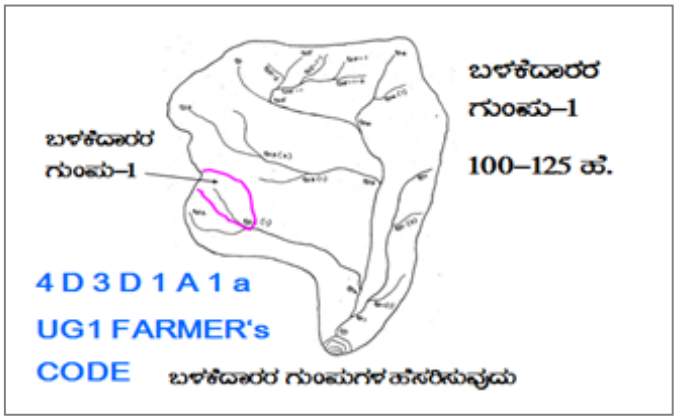
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops, it is low in 183 ha (52%) and medium in 148 ha (42%). Low and medium areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** An area of 55 ha (16%) is low, 146 ha (41%) is medium and 131 ha (37%) is high. For areas that are low and medium, application of sodium borate @ 10 kg/ha as soil application or 0.2 % borax as foliar spray is recommended.
- **Available Iron:** An area of about 297 ha (84%) is deficient and 34 ha (10%) in the microwatershed is sufficient in available iron. To manage iron deficiency, iron sulphate @ 25 kg/ha needs to be applied for 2-3 years.
- **Available Manganese:** An entire area of about 331 ha (94%) in the microwatershed is sufficient in available manganese.
- **Available Copper:** An entire area of about 331 ha (94%) in the microwatershed is sufficient in available copper.
- **Available Zinc:** Major area of about 318 ha (90%) of the microwatershed is deficient and about 13 ha (4%) is sufficient in available zinc content. Application of zinc sulphate @ 25 kg/ha is to be recommended for the deficient areas**.**
- **Soil Alkalinity:** The entire microwatershed area of 331 ha (94%) has soils that are moderately alkaline to very strongly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.
- **Land Suitability for various crops:** Areas that are highly, moderately and marginally suitable and also not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase the water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

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

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



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

Steps for Survey and Preparation of Treatment Plan

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

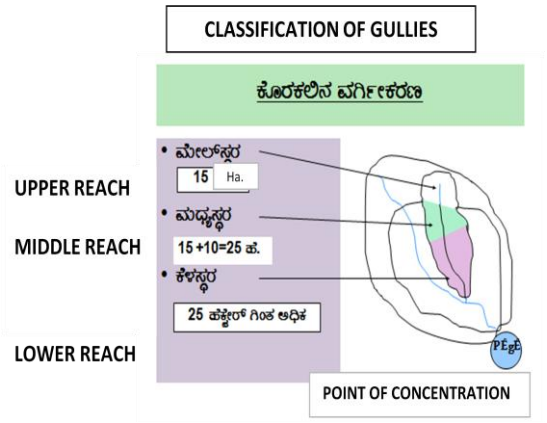
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below

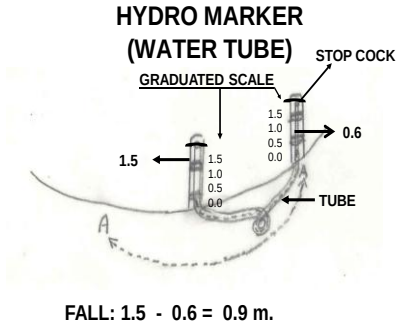
9.1.1 Arable Land Treatment

A. BUNDING

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

Measurement of Land Slope

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



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

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

Note: (i) The above intervals are maximum.

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

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

Section of the Bund

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

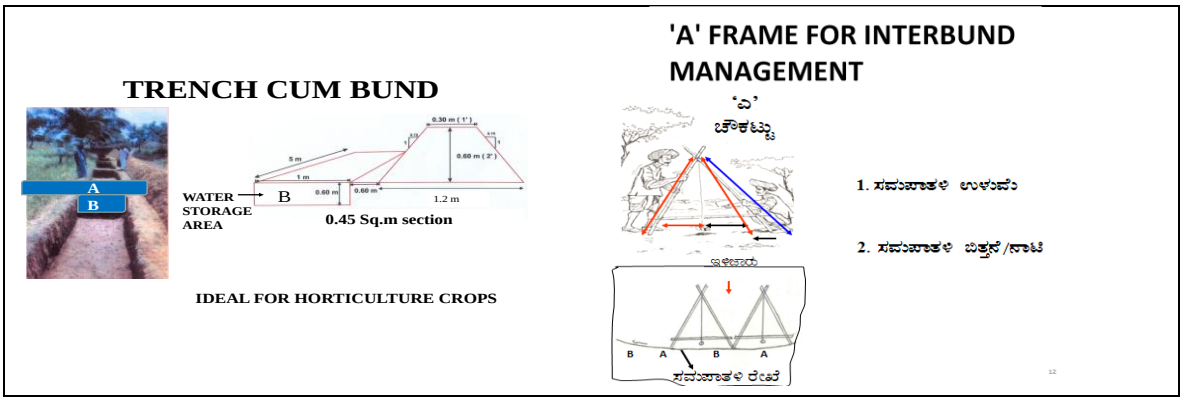
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below:



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

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

B. Water Ways

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

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. An area of about 297 ha (84%) needs Graded Bunding and 35 ha (10%) 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.

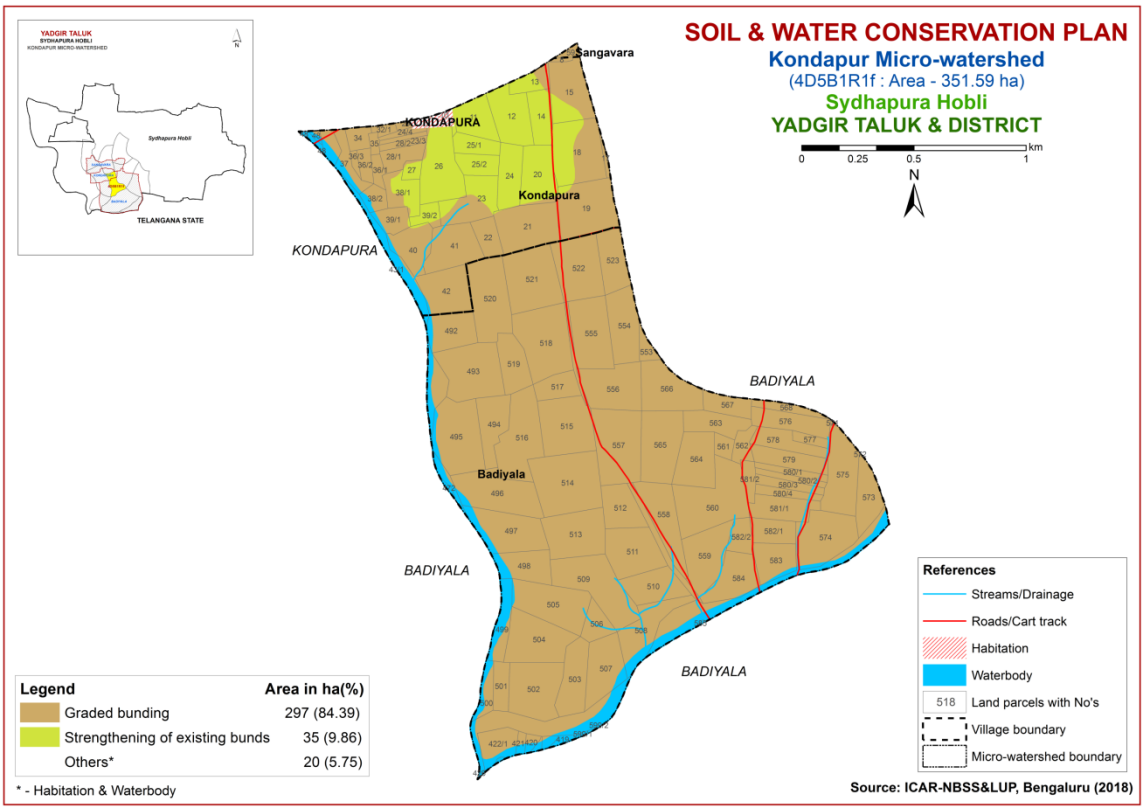


Fig. 9.1 Soil and Water Conservation Plan map of Kondapur Microwatershed

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

Kondapur Microwatershed

Soil Phase Information

Village	Survey No.	Total 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
Kondapura	8	0.17	HGNmB2	LMU-1	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
Kondapura	10	0.12	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Kondapura	11	2.92	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram+Cotton (Rg+Ct)	Not Available	IIs	Strengthening of existing bunds
Kondapura	12	3.99	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram+Jowar (Rg+Jw)	Not Available	IIs	Strengthening of existing bunds
Kondapura	13	1.5	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	1 Bore well	IIs	Strengthening of existing bunds
Kondapura	14	2.35	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram+Cotton (Rg+Ct)	Not Available	IIs	Strengthening of existing bunds
Kondapura	15	4.57	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Jowar (Rg+Jw)	Not Available	IIes	Graded bunding
Kondapura	17	0.3	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding
Kondapura	18	6.08	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Jowar (Rg+Jw)	Not Available	IIes	Graded bunding
Kondapura	19	5.98	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding
Kondapura	20	3.85	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar+Cotton (Jw+Ct)	Not Available	IIs	Strengthening of existing bunds
Kondapura	21	5.19	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding
Kondapura	22	1.7	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Kondapura	23	4.07	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Strengthening of existing bunds
Kondapura	23/3	0.41	HGNmB2	LMU-1	Very deep (>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
Kondapura	24	2.94	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Strengthening of existing bunds
Kondapura	24/4	0.55	HGNmB2	LMU-1	Very deep (>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
Kondapura	25/1	1.62	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Strengthening of existing bunds
Kondapura	25/2	1.72	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Strengthening of existing bunds
Kondapura	26	5.56	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram+Cotton+ Jowar (Rg+Ct+Jr)	Not Available	IIs	Strengthening of existing bunds
Kondapura	27	0.67	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Strengthening of existing bunds
Kondapura	28/1	1.63	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding

Village	Survey No.	Total 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
Kondapura	28/2	0.63	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding
Kondapura	29	0.31	HGNmB2	LMU-1	Very deep (>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
Kondapura	32/1	0.47	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding
Kondapura	34	1.01	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Kondapura	35	0.39	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Kondapura	36/1	0.69	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Kondapura	36/2	0.84	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Kondapura	36/3	0.31	HGNmB2	LMU-1	Very deep (>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
Kondapura	37	1.66	KDRiB3	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Fallow land (Fl)	Not Available	IIIes	Graded bunding
Kondapura	38/1	2.38	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram+Cotton (Rg+Ct)	Not Available	IIs	Strengthening of existing bunds
Kondapura	38/2	1.1	KDRiB3	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Not Available (NA)	Not Available	IIIes	Graded bunding
Kondapura	39/1	1.53	KDRiB3	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Fallow land (Fl)	Not Available	IIIes	Graded bunding
Kondapura	39/2	1.05	KDRhA1	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Strengthening of existing bunds
Kondapura	40	3.02	KDRiB3	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Scrub land (Sl)	Not Available	IIIes	Graded bunding
Kondapura	41	4.14	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Jowar (Rg+Jw)	Not Available	IIes	Graded bunding
Kondapura	42	4.13	MGLmB2	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	IIes	Graded bunding
Kondapura	43/1	0	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Kondapura	48	0.27	Waterbody	Others	Others	Others	Others	Others	Others	Others	Fallow land (Fl)	Not Available	Others	Others
Badiyala	419	0.29	Waterbody	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Badiyala	420	0.39	MGLmB2	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	IIes	Graded bunding
Badiyala	421	0.38	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Badiyala	422/1	2.3	MGLmB2	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	IIes	Graded bunding
Badiyala	426	0.03	Waterbody	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Badiyala	472	0.13	Waterbody	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others

Village	Survey No.	Total 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
Badiyala	492	3.31	MGLmB2	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	IIes	Graded bunding
Badiyala	493	6.16	MGLmB2	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	IIes	Graded bunding
Badiyala	494	3.28	MGLmB2	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	IIes	Graded bunding
Badiyala	495	6.47	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	496	5.92	MGLmB2	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	IIes	Graded bunding
Badiyala	497	5.25	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Cotton (Ct)	Not Available	IIIes	Graded bunding
Badiyala	498	3.17	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Jowar (Jw)	Not Available	IIIes	Graded bunding
Badiyala	499	2.24	Waterbody	Others	Others	Others	Others	Others	Others	Others	Others	1 Farm pond	Others	Others
Badiyala	500	1.37	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Badiyala	501	1.53	MGLmB2	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	IIes	Graded bunding
Badiyala	502	5.53	MGLmB2	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	IIes	Graded bunding
Badiyala	503	3.7	MGLmB2	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	IIes	Graded bunding
Badiyala	504	5.4	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Badiyala	505	5.57	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	1 Bore well	IIes	Graded bunding
Badiyala	506	1.67	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Graded bunding
Badiyala	507	4.22	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Fallow land (Fl)	Not Available	IIIes	Graded bunding
Badiyala	508	4.28	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Fallow land+Scrub land (Fl+Sl)	Not Available	IIIes	Graded bunding
Badiyala	509	6.6	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Graded bunding
Badiyala	510	3.42	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Scrub land (Sl)	Not Available	IIIes	Graded bunding
Badiyala	511	4.77	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	512	3.08	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	513	5.25	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Jowar (Jw)	Not Available	IIIes	Graded bunding
Badiyala	514	7.56	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Jowar (Jw)	Not Available	IIIes	Graded bunding
Badiyala	515	5.73	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding

Village	Survey No.	Total 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
Badiyala	516	6.21	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	1 Bore well	IIes	Graded bunding
Badiyala	517	1.98	MGLmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	518	6.73	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	519	2.98	MGLmB2	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	IIes	Graded bunding
Badiyala	520	5.91	MGLmB2	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	IIes	Graded bunding
Badiyala	521	6.21	HGNmB2	LMU-1	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
Badiyala	522	5.44	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	523	3.15	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding
Badiyala	553	0.8	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	554	4.16	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	555	5.32	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	556	5.03	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	557	6.66	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	558	4.35	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	559	4.61	MGLcB3	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Severe	Jowar+Scrub land (Jw+Sl)	Not Available	IIIes	Graded bunding
Badiyala	560	7.32	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding
Badiyala	561	0.81	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	562	1.19	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	563	2.61	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	564	4.03	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	1 Bore well	IIes	Graded bunding
Badiyala	565	5.48	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Paddy (Jw+Pd)	1 Bore well	IIes	Graded bunding
Badiyala	566	4.75	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Badiyala	567	1.86	HGNmB2	LMU-1	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
Badiyala	568	1.12	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding

Village	Survey No.	Total 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
Badiyala	571	0.04	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	572	0.01	HGNmB2	LMU-1	Very deep (>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
Badiyala	573	2.82	HGNmB2	LMU-1	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
Badiyala	574	5.48	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	575	4.98	HGNmB2	LMU-1	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
Badiyala	576	2.89	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	577	0.68	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	578	2.31	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	579	2.56	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	580/1	0.96	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	580/2	0.85	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	580/3	1.18	HGNmB2	LMU-1	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
Badiyala	580/4	1.09	HGNmB2	LMU-1	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
Badiyala	581/1	2.91	HGNmB2	LMU-1	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
Badiyala	581/2	0.94	HGNmB2	LMU-1	Very deep (>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
Badiyala	582/1	2.12	HGNmB2	LMU-1	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
Badiyala	582/2	1.48	HGNmB2	LMU-1	Very deep (>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
Badiyala	583	2.8	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Badiyala	584	3.67	HGNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Badiyala	585	0.05	Waterbody	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Badiyala	599/1	0.14	Waterbody	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Badiyala	599/2	0.1	Waterbody	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Sangavara	59	0.36	HGNmB2	LMU-1	Very deep (>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

Appendix II

Kondapur 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
Kondapura	8	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	10	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kondapura	11	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	12	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	13	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	14	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	15	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	17	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Kondapura	18	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Kondapura	19	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	20	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	21	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	22	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	23	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	23/3	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	24	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	24/4	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	25/1	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	25/2	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	26	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	27	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	28/1	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	28/2	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 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
Kondapura	29	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	32/1	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Kondapura	34	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	35	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	36/1	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	36/2	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	36/3	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	37	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	38/1	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	38/2	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Kondapura	39/1	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Kondapura	39/2	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	40	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	41	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	42	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kondapura	43/1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kondapura	48	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Badiyala	419	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Badiyala	420	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)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	421	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Others	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Others	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Others
Badiyala	422/1	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)	Sufficient (> 0.6 ppm)
Badiyala	426	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Badiyala	472	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Badiyala	492	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	493	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	494	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	495	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Badiyala	496	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	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)
Badiyala	497	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	498	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	499	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Badiyala	500	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)
Badiyala	501	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)
Badiyala	502	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)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	503	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	504	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)
Badiyala	505	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	506	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	507	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	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)
Badiyala	508	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	509	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	510	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	511	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	512	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	513	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	514	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	515	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	516	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	517	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	518	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	519	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	520	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Badiyala	521	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	522	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	523	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	553	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	554	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	555	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	556	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	557	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	558	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	559	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	560	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	561	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 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)
Badiyala	562	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 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)
Badiyala	563	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	564	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	565	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	566	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	567	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	568	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	571	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	572	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 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)
Badiyala	573	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	574	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	575	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	576	Strongly alkaline	Non saline	Medium (0.5	Low (< 23	High (> 337	Low (<10	High (> 1.0	Sufficient	Sufficient (>	Sufficient	Deficient (<

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		(pH 8.4 – 9.0)	(<2 dsm)	– 0.75 %)	kg/ha)	kg/ha)	ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	(> 0.2 ppm)	0.6 ppm)
Badiyala	577	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	578	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	579	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	580/1	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	580/2	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	580/3	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	580/4	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	581/1	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	581/2	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	582/1	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	582/2	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	583	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Badiyala	584	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Badiyala	585	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Badiyala	599/1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Badiyala	599/2	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Sangavara	59	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Appendix III

Kondapur Microwatershed
Soil Suitability Information

Village	Survey No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulbery
Kondapura	8	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	10	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kondapura	11	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	12	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	13	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	14	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	15	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	17	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	18	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	19	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	20	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	21	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	22	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	23	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	23/3	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	24	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	24/4	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	25/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	25/2	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	26	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	27	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	28/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	28/2	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	29	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	32/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	34	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	35	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	36/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	36/2	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	36/3	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	37	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	38/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	38/2	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	39/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	39/2	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	40	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S2t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Kondapura	41	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Kondapura	42	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw

Village	Survey No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulbery
Kondapura	43/1	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
Kondapura	48	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
Badiyala	419	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
Badiyala	420	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	421	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	422/1	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	426	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
Badiyala	472	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
Badiyala	492	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	493	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	494	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	495	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	496	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	497	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	498	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	499	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
Badiyala	500	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	501	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	502	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	503	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	504	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	505	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	506	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	507	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	508	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	509	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	510	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	511	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	512	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	513	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	514	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	515	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	516	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	517	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	518	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	519	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	520	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	521	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	522	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	523	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	553	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	554	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw

Village	Survey No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulbery
Badiyala	555	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	556	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	557	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	558	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	559	S3rt	S2t	S3t	S1	S3t	S2rw	S3r	S2rz	S1	S2rw	S2rt	S2tz	S3t	S1	N1tz	S3rt	S2rz	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2rt	S2t	S2t	S2t	S2rt	S3tw
Badiyala	560	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	561	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	562	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	563	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	564	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	565	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	566	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	567	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	568	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	571	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	572	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	573	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	574	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	575	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	576	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	577	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	578	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	579	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	580/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	580/2	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	580/3	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	580/4	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	581/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	581/2	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	582/1	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	582/2	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	583	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	584	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Badiyala	585	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
Badiyala	599/1	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
Badiyala	599/2	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
Sangavara	59	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

FINDINGS OF THE SOCIO-ECONOMIC SURVEY

- *The survey was conducted in Kondapur is located at North latitude 16^0 31' 17.129" and 16^0 29' 33.557" and East longitude 77^0 16' 46.336" and 77^0 15' 15.084" covering an area of about 351.42 ha coming under Kondapura and Badiyala villages of Yadagiri taluk.*
- *Socio-economic analysis of Kondapur micro watersheds of Mungal sub-watershed, Yadgir taluk & District indicated that, out of the total sample of 35 total respondents, 5 (14.29 %) were marginal, 12 (34.29%)were small, 11 (31.43 %) were Semi medium and 1 (2.86 %) were medium and 2 (5.71 %) were large farmers and 4 landless farmers were also interviewed for the survey.*
- *The population characteristics of households indicated that, there were 80 (54.05%) men and 68 (45.95 %) were women. The average population of landless was 1.0, marginal farmers were 0.20, small farmers were 0.20, semi medium farmers were 0.21, medium farmers were 1.0 and large farmer were 0.25.*
- *Majority of the respondents (43.24%) were in the age group of 16-35 years.*
- *Education level of the sample households indicated that, there were 52.03 per cent illiterates, 50.68 per cent pre university education and 3.38 per cent attained graduation.*
- *About, 85.71 per cent of household heads practicing agriculture and 8.57 per cent of the household heads were engaged as agricultural labourers.*
- *Agriculture was the major occupation for 56.76 per cent of the household members.*
- *In the study area, 100.00 per cent of the households possess katcha house and 2.86 per cent possess pucca house.*
- *The durable assets owned by the households showed that, 62.86 per cent possess TV, 14.29 per cent possess mixer grinder, 80.00 per cent possess mobile phones and 20.00 per cent possess motor cycles.*
- *Farm implements owned by the households indicated that, 28.57 per cent of the households possess plough, 22.86 per cent possess bullock cart and 20.00 per cent possess sprayer.*
- *Regarding livestock possession by the households, 2.86 per cent possess local cow.*
- *The average labour availability in the study area showed that, own labour men available in the micro watershed was 1.58, women available in the micro watershed was 1.77, hired labour (men) available was 11.94 and hired labour (women) available was 16.97.*
- *Out of the total land holding of the sample respondents 100.00 per cent (88.39 ha) of the area is under dry condition.*

- *The major crops grown by sample farmers are Redgram, Cotton, Greengram, Sorghum and cropping intensity was recorded as 73.42 per cent.*
- *The per hectare cost of cultivation for Redgram, Cotton, Greengram and Sorghum was Rs.25254.34, 41845.18, 27374.25 and 29450.24 with benefit cost ratio of 1:1.10, 1: 1.00, 1: 0.60 and 1: 0.90 respectively.*
- *Further, 82.86 per cent of the households opined that dry fodder was adequate and 5.71 per cent of the households have opined that the green fodder was adequate.*
- *The average annual gross income of the farmers was Rs. 149302.86 in micro-watershed, of which Rs. 96445.71 comes from agriculture.*
- *Sampled households have grown 1 horticulture trees and 151 forestry trees together in the fields and back yards.*
- *Regarding marketing channels, 94.29 per cent of the households have sold agricultural produce to the local/village merchants.*
- *Further, 94.29 per cent of the households have used tractor for the transport of agriculture commodity.*
- *Majority of the farmers (85.71%) have experienced soil and water erosion problems in the watershed and 88.57 per cent of the households were interested towards soil testing.*
- *Fire was the major source of fuel for domestic use for 100.00 per cent of the households.*
- *piped supply of water was the major source for drinking water for 2.86 per cent of the households followed by bore well water (94.29%).*
- *Electricity was the major source of light for 105.71 per cent of the households.*
- *In the study area, 57.14 per cent of the households possess toilet facility.*
- *Regarding possession of PDS card, 105.71 per cent of the households possessed BPL card.*
- *Households opined that, the requirement of cereals (108.57%), pulses (94.29%) and oilseeds (42.86%) are adequate for consumption.*
- *Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (91.43%) wild animal menace on farm field (88.57%), frequent incidence of pest and diseases (88.57%), inadequacy of irrigation water (5.71%), high cost of fertilizers and plant protection chemicals (80.00%), high rate of interest on credit (77.14%), low price for the agricultural commodities (77.14%), lack of marketing facilities in the area (65.71%) and lack of transport for safe transport of the agricultural produce to the market (57.14%).*

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, labor force, and levels of education; land ownership and asset position (including livestock and other household assets) of surveyed households; and cropping patterns, input intensities, and average crop yields from farmers' fields. It also discusses crop utilization and the degree of commercialization of production in the areas; farmers'

access to and utilization of credit from formal and informal sources; and the level of adoption and use of soil, water, and pest management technologies.

Chapter 3

METHODOLOGY

The description of the methods, components selected for the survey and procedures followed in conducting the baseline survey are furnished under the following heads.

1. Description of the study area

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

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

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

2. Locale of the survey and description of the micro-watershed and

The study was conducted in Kondapur micro-watershed (Mungal sub-watershed, Yadgir taluk & District) is located at North latitude 16^0 31’ 17.129” and 16^0 29’ 33.557” and East longitude 77^0 16’ 46.336” and 77^0 15’ 15.084”covering an area of about 351.42 ha bounded by under Kondapura and Badiyala Villages.

3. Selection of the respondents for the study

The micro-watershed is marked with 320 square meters grids. One farmer from every alternate grid in the micro-watershed was selected for the study and interviewed for socio-economic data. Totally 35 households were interviewed for the survey.

4. The parameters considered for socio-economic survey of households

Two forms of data were collected from the micro-watershed which includes primary data from the farm households and secondary data about the villages under the micro-watershed jurisdiction.

The following parameters were considered for the primary data collection about the socio-economic data of the households, (1) Demographic information, (2) Farm and durable assets owned by households, (3) Livestock possession, (4) Labour availability, (5) Level of migration in the village, Land holding, (7) Cropping pattern, (8) Source of irrigation, (9) Borrowing status, (10) Cost of cultivation of major crops, (11) Economics of subsidiary activities, (12) Fodder availability, (13) Family annual income from different sources, (14) Horticulture and forestry species grown, (15) Additional investment capacity, (16) Marketing practices, (17) Status of soil and water conservation structure, (18) Access to basic needs and (19) Constraints and suggestion.

The following parameters were considered for the secondary data regarding the villages under the micro-watershed jurisdiction, (1) Number of villages in each micro-watershed jurisdiction, (2) Village wise number of households, (3) Geographical area of the villages, (4) Cultivable are a including rainfed and irrigated, (5) Number and type of house in each village, (6) Human and livestock population, (7) Facilities in the village such as roads, transport facility for conveyance, drinking water supply, street light and (8) Community based organizations in the villages.

5. Development of interview schedule and data collection

Taking into the consideration the objectives of the survey, an interview schedule was prepared after thorough consultation with the experts in the field of social sciences. A comprehensive interview schedule covering all the major parameters for measuring the socio-economic situation was developed.

6. Tools used to analyze the data

The statistical components such as frequency and percentage were used to analyze the data.

Abbreviations used in the report

LL=Landless
MF=Marginal Farmers
SF=Small farmers
SMF=Semi medium farmers
MDF=Medium farmers
LF=Large Farmers

Chapter 4

FINDINGS OF THE SURVEY

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

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Kondapur Micro watershed is presented in Table 1 and it indicated that 35 farmers were sampled in Kondapur micro-watershed among households surveyed 5 (14.29%) were marginal, 12 (34.29%) were small, 11 (31.43 %) were semi medium, 1 (2.86 %) were medium and 2 (5.71 %) were large farmers. 4 landless farmers were also interviewed for the survey.

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

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	4	11.4	5	14.3	12	34.3	11	31.4	1	2.86	2	6	35	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Kondapur Micro watershed is presented in Table 2. The data indicated that, there were 80 (54.05%) men and 68 (45.95%) were women. The average population of landless was 1.0, marginal farmers were 0.20, small farmers were 0.20, semi medium farmers were 0.21, medium farmers were 1.0 and large farmer were 0.25.

Table 2. Population characteristics in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (25)		SF (59)		SMF (51)		MDF (1)		LF (8)		All (148)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Men	3	75	15	60	32	54	26	51	1	100	3	38	80	54.1
2	Women	1	25	10	40	27	46	25	49	0	0	5	63	68	46
Total		4	100	25	100	59	100	51	100	1	100	8	100	148	100
Average		1.0		0.20		0.20		0.21		1.0		0.25		0.23	

Age wise classification of population: The age wise classification of household members in Kondapur Micro watershed is presented in Table 3. The indicated that, 23 (15.54%) of population were 0-15 years of age, 64 (43.24%) were 16-35 years of age, 50(33.78%) were 36-60 years of age and 11 (7.43 %) were above 61 years of age.

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

Sl. No.	Particulars	LL (4)		MF (25)		SF (59)		SMF (51)		MDF (1)		LF (8)		All (148)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	0	0	1	4	12	20.3	8	15.69	0	0	2	25	23	15.54
2	16-35 years of age	1	25	13	52	25	42.4	23	45.1	0	0	2	25	64	43.24
3	36-60 years of age	3	75	9	36	16	27.1	18	35.29	1	100	3	38	50	33.78
4	> 61 years	0	0	2	8	6	10.2	2	3.92	0	0	1	13	11	7.43
Total		4	100	25	100	59	100	51	100	1	100	8	100	148	100

Education level of household members: Education level of household members in Kondapur Micro watershed is presented in Table 4. The results indicated that, there were 52.03 per cent of illiterates, 12.84 per cent of them had primary school education, 4.73 per cent middle school education, and 11.49 per cent high school education, 10.81 per cent of them had PUC education, 0.68 per cent of them had ITI, 3.38 per cent attained graduation, 0.68 per cent attained post graduation and 3.38 them had other education.

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

Sl.No.	Particulars	LL (4)		MF (25)		SF (59)		SMF (51)		MDF (1)		LF (8)		All (148)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	4	100	15	60	33	55.9	24	47.1	0	0	1	13	77	52
2	Primary School	0	0	2	8	8	13.6	9	17.7	0	0	0	0	19	12.8
3	Middle School	0	0	1	4	4	6.78	2	3.92	0	0	0	0	7	4.73
4	High School	0	0	2	8	6	10.2	8	15.7	0	0	1	13	17	11.5
5	PUC	0	0	3	12	4	6.78	7	13.7	0	0	2	25	16	10.8
6	ITI	0	0	1	4	0	0	0	0	0	0	0	0	1	0.68
7	Degree	0	0	1	4	1	1.69	1	1.96	1	100	1	13	5	3.38
8	Masters	0	0	0	0	0	0	0	0	0	0	1	13	1	0.68
9	Others	0	0	0	0	3	5.08	0	0	0	0	2	25	5	3.38
Total		4	100	25	100	59	100	51	100	1	100	8	100	148	100

Occupation of head of households: The data regarding the occupation of the household heads in Kondapur Micro watershed is presented in Table 5. The results indicate that, 85.71 per cent of households heads were practicing agriculture and 8.57 per cent of the household heads were agricultural Labour.

Table 5: Occupation of heads of households in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	5	100	11	91.67	11	100	1	100	2	100	30	85.71
2	Agricultural Labour	2	50	0	0	1	8.33	0	0	0	0	0	0	3	8.57
3	General Labour	2	50	0	0	0	0	0	0	0	0	0	0	2	5.71
4	Trade & Business	0	0	1	20	0	0	0	0	0	0	0	0	1	2.86
Total		4	100	6	100	12	100	11	100	1	100	2	100	36	100

Occupation of the members of the household: The data regarding the occupation of the household members in Kondapur Micro watershed is presented in Table 6. The results indicate that, agriculture was the major occupation for 56.76 per cent of the household members, 5.41 per cent were agricultural labour, 2.03 per cent were general labour, 16.89 per cent were working in pursuing education, 12.16 per cent were involved as housewife, and 4.05 per cent were childrens.

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

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	11	44	35	59.32	33	64.71	1	100	4	50	84	56.8
2	Agricultural Labour	2	50	2	8	1	1.69	3	5.88	0	0	0	0	8	5.41
3	General Labour	2	50	1	4	0	0	0	0	0	0	0	0	3	2.03
4	Private Service	0	0	1	4	0	0	1	1.96	0	0	1	13	3	2.03
5	Trade & Business	0	0	1	4	0	0	0	0	0	0	0	0	1	0.68
6	Student	0	0	3	12	11	18.64	10	19.61	0	0	1	13	25	16.9
7	Housewife	0	0	6	24	8	13.56	4	7.84	0	0	0	0	18	12.2
8	Children	0	0	0	0	4	6.78	0	0	0	0	2	25	6	4.05
Total		4	100	25	100	59	100	51	100	1	100	8	100	148	100

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

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

Sl.No.	Particulars	LL (4)		MF (25)		SF (59)		SMF (51)		MDF (1)		LF (8)		All (148)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	4	100	25	100	59	100	51	100	1	100	8	100	148	100
Total		4	100	25	100	59	100	51	100	1	100	8	100	148	100

Type of house owned: The data regarding the type of house owned by the households in Kondapur Micro watershed is presented in Table 8. The results indicate that, 100.00 per cent of the households possess katcha house and 2.86 per cent possess pacca house.

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

Sl.No.	Particulars	LL (4)		MF (25)		SF (59)		SMF (51)		MDF (1)		LF (8)		All (148)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Katcha	4	100	5	100	12	100	11	100	1	100	2	100	35	100
2	Pucca/RCC	0	0	0	0	0	0	1	9.09	0	0	0	0	1	2.86
Total		4	100	5	100	12	100	12	100	1	100	2	100	36	100

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

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Television	2	50	1	20	8	66.7	8	73	1	100	2	100	22	62.86
2	Mixer/Grinder	0	0	1	20	1	8.33	1	9.1	0	0	2	100	5	14.29
3	Motor Cycle	0	0	1	20	1	8.33	4	36	0	0	1	50	7	20
4	Mobile Phone	0	0	3	60	12	100	10	91	1	100	2	100	28	80
5	Blank	2	50	2	40	0	0	0	0	0	0	0	0	4	11.43

Durable assets owned by the households: The data regarding the Durable Assets owned by the households in Kondapur Micro watershed is presented in Table 9. The result shows that, 62.86 per cent possess TV, 14.29 per cent possess mixer grinder, 20.00 per cent possess motor cycle, 80.00 per cent possess mobile phones.

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Kondapur Micro watershed is presented in Table 10. The result shows that, the average value of television was Rs.11818.00, mixer grinder was Rs.1900.00, motor cycle was Rs. 47857.00 and mobile phone was Rs.2219.00.

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

Average Value (Rs.)

Sl.No.	Particulars	LL (4)	MF (5)	SF (12)	SMF (11)	MDF (1)	LF (2)	All (35)
1	Television	5000	4000	8375	18625	10000	10000	11818
2	Mixer/Grinder	0	1500	2000	2000	0	2000	1900
3	Motor Cycle	0	50000	50000	50000	0	35000	47857
4	Mobile Phone	0	2250	2900	1921	5000	750	2219

Farm implements owned: The data regarding the farm implements owned by the households in Kondapur Micro watershed is presented in Table 11. About 22.86 per cent of the households possess Bullock Cart, 28.57 per cent possess plough and 20.00 per cent possess Sprayer.

Table 11. Farm implements owned in Kondapur micro-watershed

Sl. No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	0	0	2	16.67	4	36.4	0	0	2	100	8	22.86
2	Plough	0	0	1	20	3	25	4	36.4	0	0	2	100	10	28.57
3	Sprayer	0	0	0	0	3	25	3	27.3	0	0	1	50	7	20
4	Blank	4	100	4	80	7	58.33	5	45.5	1	100	0	0	21	60

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Kondapur Micro watershed is presented in Table 12. The results show that the average value of plough was Rs.3600.00, bullock Cart was Rs.17888.00 and seed/fertilizer drill was Rs.1785.00.

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

Average Value (Rs.)

Sl.No.	Particulars	LL (4)	MF (5)	SF (12)	SMF (11)	MDF (1)	LF (2)	All (35)
1	Bullock Cart	0	0	15000	18200	0	20000	17888
2	Plough	0	4000	4000	3250	0	3500	3600
3	Sprayer	0	0	1666	1833	0	2000	1785

Livestock possession by the households: The data regarding the Livestock possession by the households in Kondapur Micro watershed is presented in Table 13. The results

indicate that, 20.00 per cent of the households possess bullocks and 2.86 per cent possess local cow.

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

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	1	20	2	16.67	2	18	0	0	2	100	7	20
2	Local cow	0	0	0	0	0	0	1	9.1	0	0	0	0	1	2.86
3	blank	4	100	4	80	10	83.33	8	73	1	100	0	0	27	77.14

Average Labour availability: The data regarding the average labour availability in Kondapur Micro watershed is presented in Table 14. The indicated that, own labour men available in the micro watershed was 1.58, women available in the micro watershed was 1.77, hired labour (men) available was 11.94 and hired labour (women) available was 16.97.

Table 14. Average labour availability in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)	MF (5)	SF (12)	SMF (11)	MDF (1)	LF (2)	All (35)
		N	N	N	N	N	N	N
1	Hired labour Female	0	11	10.42	15.45	15	80.5	16.97
2	Own Labour Female	0	1.8	1.83	1.82	2	1	1.77
3	Own labour Male	0	1.4	1.75	1.64	1	1	1.58
4	Hired labour Male	0	10	10	14.55	15	12.5	11.94

Adequacy of hired labour: The data regarding the adequacy of hired labour in Kondapur Micro watershed is presented in Table 15. The results indicate that, 91.43 per cent of the household opined that hired labour was adequate.

Table 15. Adequacy of hired labour in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0	5	100	13	108	11	100	1	100	2	100	32	91.4

Distribution of land (ha): The data regarding the distribution of land (ha) in Kondapur Micro watershed is presented in Table 16. The results indicate that, 88.39 ha (100.00%) of dry land.

Table 16. Distribution of land (ha) in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Dry	0	0	3.37	100	17.6	100	32.22	100	4.86	100	30.4	100	88.39	100
Total		0	100	3.37	100	17.6	100	32.22	100	4.86	100	30.4	100	88.39	100

Average value of land (ha): The data regarding the average land value (Rs./ha) in Kondapur Micro watershed is presented in Table 17. The results show that the average value of dry land was Rs.306460.03.

Table 17. Average value of land (ha) in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)	MF (5)	SF (12)	SMF (11)	MDF (1)	LF (2)	All (35)
		N	N	N	N	N	N	N
1	Dry	0	860937.5	431738.7	452926.4	123500	46106.67	306460

Cropping pattern: The data regarding the cropping pattern in Kondapur Micro watershed is presented in Table 18. The results indicate that, farmers have grown Red gram (togari) (51.87 ha), Cotton (16.26 ha), Greengram (4.99 ha) and Sorghum (4.45 ha).

Table 18. Cropping pattern in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)	MF (5)	SF (12)	SMF (11)	MDF (1)	LF (2)	All (35)
1	Kharif - Red gram	0	0	9.72	23.93	4.05	14.17	51.87
2	Kharif - Cotton	0	1.69	2.83	5.67	0	6.07	16.26
3	Kharif - Greengram	0	1.21	3.77	0	0	0	4.99
4	Kharif - Sorghum	0	0.81	1.21	2.43	0	0	4.45
Total		0	3.71	17.54	32.03	4.05	20.24	77.57

Cropping intensity: The data regarding the cropping intensity in Kondapur Micro watershed is presented in Table 19. The results indicate that, the cropping intensity was 73.42 per cent.

Table 19. Cropping intensity (%) in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)	MF (5)	SF (12)	SMF (11)	MDF (1)	LF (2)	All (35)
1	Cropping Intensity	0	100	100	84.64	100	47.62	73.42

Cost of Cultivation of Redgram: The data regarding the cost of cultivation (Rs/ha) of Redgram in Kondapur micro watershed is presented in Table 20.a. The results indicate that, the total cost of cultivation (Rs/ha) for Redgram was Rs. 25254.34. The gross income realized by the farmers was Rs. 28330.99. The net income from Redgram cultivation was Rs.3076.65, thus the benefit cost ratio was found to be 1:1.10.

Table 20(a). Cost of Cultivation of Redgram in Kondapur micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	45.33	7472.02	29.59
2	Bullock	Pairs/day	1.29	651.23	2.58
3	Tractor	Hours	5	5342.9	21.16
4	Machinery	Hours	0.05	48.03	0.19
5	Seed Main Crop (Establishment and Maintenence)	Kgs (Rs.)	12.9	2064.51	8.17
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	1.21	1584.92	6.28
8	Fertilizer + micronutrients	Quintal	1.45	1577.26	6.25
9	Pesticides (PPC)	Kgs / liters	1.02	1334.03	5.28
10	Irrigation	Number	0	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	46.87	0.19
14	Land revenue and Taxes		0	4.76	0.02
II	**Cost B1**				
16	Interest on working capital			787.29	3.12
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			20913.8	82.81
III	**Cost B2**				
18	Rental Value of Land			462.96	1.83
19	**Cost B2 = (Cost B1 + Rental value)**			21376.76	84.65
IV	**Cost C1**				
20	Family Human Labour		7.64	1581.73	6.26
21	**Cost C1 = (Cost B2 + Family Labour)**			22958.49	90.91
V	**Cost C2**				
22	Risk Premium			0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**			22958.49	90.91
VI	**Cost C3**				
24	Managerial Cost			2295.85	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			25254.34	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	6.46	28330.99	
		b) Main Crop Sales Price (Rs.)		4388.89	
b.	Gross Income (Rs.)			28330.99	
c.	Net Income (Rs.)			3076.65	
d.	Cost per Quintal (Rs./q.)			3912.27	
e.	Benefit Cost Ratio (BC Ratio)			1:1.1	

Cost of Cultivation of Cotton: The data regarding the cost of cultivation (Rs/ha) of Cotton in Kondapur micro watershed is presented in Table 20.b. The results indicate that, the total cost of cultivation (Rs/ha) for Cotton was Rs. 41845.18. The gross income realized by the farmers was Rs. 41818.68. The net income from Cotton cultivation was Rs.-26.50, thus the benefit cost ratio was found to be 1:1.00.

Table 20(b). Cost of Cultivation of Cotton in Kondapur micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	41.1	6421.51	15.35
2	Bullock		Pairs/day	3.88	1939.58	4.64
3	Tractor		Hours	2.93	2929.17	7
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenence)		Kgs (Rs.)	7.45	7479.67	17.87
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	1.65	2305.33	5.51
8	Fertilizer + micronutrients		Quintal	5.64	5244	12.53
9	Pesticides (PPC)		Kgs / liters	2.91	4330.68	10.35
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	43.93	0.1
14	Land revenue and Taxes			0	4.94	0.01
II	**Cost B1**					
16	Interest on working capital				2323.16	5.55
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				33021.97	78.91
III	**Cost B2**					
18	Rental Value of Land				450	1.08
19	**Cost B2 = (Cost B1 + Rental value)**				33471.97	79.99
IV	**Cost C1**					
20	Family Human Labour			23.61	4569.1	10.92
21	**Cost C1 = (Cost B2 + Family Labour)**				38041.07	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				38041.07	90.91
VI	**Cost C3**					
24	Managerial Cost				3804.11	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				41845.18	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		9.49	41818.68	
		b) Main Crop Sales Price (Rs.)			4406.25	
b.	Gross Income (Rs.)				41818.68	
c.	Net Income (Rs.)				-26.5	
d.	Cost per Quintal (Rs./q.)				4409.04	
e.	Benefit Cost Ratio (BC Ratio)				1:1	

Cost of Cultivation of Greengram: The data regarding the cost of cultivation (Rs/ha) of Greengram in Kondapur micro watershed is presented in Table 20.c. The results indicate, the total cost of cultivation (Rs/ha) for Greengram was Rs.27374.25. The gross income realized by the farmers was Rs. 16519.06. The net income from Greengram cultivation was Rs. -10855.19, thus the benefit cost ratio was found to be 1:0.60.

Table 20(c). Cost of Cultivation of Greengram in Kondapur micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	27.94	4368.87	15.96
2	Bullock	Pairs/day	2.43	1215.16	4.44
3	Tractor	Hours	3.38	3380.13	12.35
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenence)	Kgs (Rs.)	12.88	2411.97	8.81
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	1.65	2305.33	8.42
8	Fertilizer + micronutrients	Quintal	4.56	4073.52	14.88
9	Pesticides (PPC)	Kgs / liters	1.81	2100.99	7.68
10	Irrigation	Number	0	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	84.4	0.31
14	Land revenue and Taxes		0	4.94	0.02
II	**Cost B1**				
16	Interest on working capital			1307.02	4.77
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			21252.33	77.64
III	**Cost B2**				
18	Rental Value of Land			450	1.64
19	**Cost B2 = (Cost B1 + Rental value)**			21702.33	79.28
IV	**Cost C1**				
20	Family Human Labour		15.55	3183.35	11.63
21	**Cost C1 = (Cost B2 + Family Labour)**			24885.68	90.91
V	**Cost C2**				
22	Risk Premium			0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**			24885.68	90.91
VI	**Cost C3**				
24	Managerial Cost			2488.57	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			27374.25	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	4.26	16519.06	
		b) Main Crop Sales Price (Rs.)		3875	
b.	Gross Income (Rs.)			16519.06	
c.	Net Income (Rs.)			-10855.19	
d.	Cost per Quintal (Rs./q.)			6421.38	
e.	Benefit Cost Ratio (BC Ratio)			1:0.6	

Cost of Cultivation of Sorghum: The data regarding the cost of cultivation (Rs/ha) of Sorghum in Kondapur micro watershed is presented in Table 20.d. The results indicate that, the total cost of cultivation (Rs/ha) for Sorghum was Rs. 29450.24. The gross income realized by the farmers was Rs.26895.56. The net income from Sorghum cultivation was Rs. -2554.68, thus the benefit cost ratio was found to be 1:0.90.

Table 20(d). Cost of Cultivation of Sorghum in Kondapur micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	24.15	3650.11	12.39
2	Bullock		Pairs/day	3.98	1989.72	6.76
3	Tractor		Hours	0.82	823.33	2.8
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	14.55	2151.64	7.31
7	FYM		Quintal	2.47	4940	16.77
8	Fertilizer + micronutrients		Quintal	4.12	3348.22	11.37
9	Pesticides (PPC)		Kgs / liters	1.65	2085.78	7.08
10	Irrigation		Number	0	0	0
11	Depreciation charges			0	54.89	0.19
12	Land revenue and Taxes			0	4.67	0.02
II	**Cost B1**					
13	Interest on working capital				1503.08	5.1
14	**Cost B1 = (Cost A1 + sum of 15 and 16)**				20551.45	69.78
III	**Cost B2**					
15	Rental Value of Land				444.44	1.51
16	**Cost B2 = (Cost B1 + Rental value)**				20995.89	71.29
IV	**Cost C1**					
17	Family Human Labour			27.72	5777.06	19.62
18	**Cost C1 = (Cost B2 + Family Labour)**				26772.95	90.91
V	**Cost C2**					
19	Risk Premium				0	0
20	**Cost C2 = (Cost C1 + Risk Premium)**				26772.95	90.91
VI	**Cost C3**					
21	Managerial Cost				2677.29	9.09
22	**Cost C3 = (Cost C2 + Managerial Cost)**				29450.24	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		7.68	26895.56	
		b) Main Crop Sales Price (Rs.)			3500	
b.	Gross Income (Rs.)				26895.56	
c.	Net Income (Rs.)				-2554.68	
d.	Cost per Quintal (Rs./q.)				3832.45	
e.	Benefit Cost Ratio (BC Ratio)				1:0.9	

Adequacy of fodder: The data regarding the adequacy of fodder in Kondapur Micro watershed is presented in Table 21. The results indicate that, 82.86 per cent of the households opined that dry fodder was adequate. With respect to green fodder availability, 5.71 percent of them opined it was sufficient.

Table 21. Adequacy of fodder in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	5	100	11	91.67	11	100	1	100	1	50	29	82.86
2	Adequate-Green Fodder	0	0	0	0	1	8.33	0	0	0	0	1	50	2	5.71

Average annual gross income: The data regarding the annual gross income in Kondapur Micro watershed is presented in Table 22. The results indicate that, the farmers have annual gross income of Rs. 149302.86 in micro-watershed, of which Rs. 96445.71 is from agriculture itself.

Table 22. Average annual gross income in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)	MF (5)	SF (12)	SMF (11)	MDF (1)	LF (2)	All (35)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Business	0	15000	10416.7	0	0	0	5714.29
2	Wage	0	102000	46666.7	48181.8	50000	0	47142.9
3	Agriculture	0	40700	42950	86518.2	140000	782500	96445.7
Income(Rs.)		0	157700	100033	134700	190000	782500	149303

Average annual Expenditure: The data regarding the average annual expenditure in Kondapur Micro watershed is presented in Table 23. The results indicate that, the farmers have annual gross expenditure of Rs. 496810.61 in micro-watershed, of which Rs. 44571.43 is from agriculture itself.

Table 23. Average annual Expenditure in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)	MF (5)	SF (12)	SMF (11)	MDF (1)	LF (2)	All (35)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Business	0	0	75000	0	0	0	2142.86
2	Agriculture	0	28000	30583.3	40727.3	40000	282500	44571.4
Total		0	28000	105583	40727.3	40000	282500	496811

Table 24. Horticulture species grown in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B	F	B
1	Mango	0	0	0	0	0	0	1	0	0	0	0	0	1	0

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

Horticulture species grown: The data regarding horticulture species grown in Kondapur Micro watershed is presented in Table 24. The results indicate that, the total number of

horticultural trees grown (both field and backyard) by the sampled households were Mango (1).

Forest species grown: The data regarding forest species grown in Kondapur Micro watershed is presented in Table 25. The results indicate that, households have planted 10 teak trees, 139 neem trees, 1 tamarind tree and 1 banyan trees together in both field and backyard.

Table 25. Forest species grown in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B	F	B
1	Neem	0	0	2	0	28	0	38	1	10	0	60	0	138	1
2	Teak	0	0	0	0	0	0	10	0	0	0	0	0	10	0
3	Banyan	0	0	0	0	1	0	0	0	0	0	0	0	1	0
4	Tamarind	0	0	0	0	1	0	0	0	0	0	0	0	1	0

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

Marketing of agricultural produce: The data regarding marketing of the agricultural produce in Kondapur Micro watershed is presented in Table 26. The results indicated that, 100 percent of output of Cotton was sold in the market with average price of Rs. 4406.25; 100.00 percent of output of Greengram was sold in the market with average price of Rs. 3875.00; 97.00 percent of output of Redgram was sold in the market with average price of Rs. 4388.89 and 100.00 percent of output of Sorghum was sold in the market with average price of Rs. 3500.00..

Table 26. Marketing of agricultural produce in Kondapur micro-watershed

Sl. No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Cotton	93	0	93	100	4406
2	Greengram	21	0	21	100	3875
3	Redgram	333	10	323	97	4389
4	Sorghum	31	0	31	100	3500

Marketing channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Kondapur Micro watershed is presented in Table 27. The results indicated that, 94.29 cent of the households have sold agricultural produce to the local/village merchants.

Table 27. Marketing channels used for sale of agricultural produce in Kondapur micro-watershed

Sl. No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0	5	100	12	100	13	118	1	100	2	100	33	94.29

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Kondapur Micro watershed is presented in Table 28. The results indicated that, 94.29 cent of the households have used tractor for the transport of agriculture commodity.

Table 28. Mode of transport of agricultural produce in Kondapur micro-watershed

Sl. No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Tractor	0	0	5	100	12	100	13	118	1	100	2	100	33	94.29

Incidence of soil and water erosion problems: The data regarding incidence of incidence of soil and water erosion problems in Kondapur Micro watershed is presented in Table 29. The results indicate that, 85.71 per cent of the households have experienced soil and water erosion problems.

Table 29. Incidence of soil and water erosion problems in Kondapur micro-watershed

Sl. No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	5	100	12	100	10	91	1	100	2	100	30	85.71

Interest towards soil testing: The data regarding Interest shown towards soil testing in Kondapur Micro watershed is presented in Table 30. The results indicated that, 88.57 per cent of the households were interested towards soil testing.

Table 30. Interest regarding soil testing in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	5	100	12	100	11	100	1	100	2	100	31	88.57

Usage pattern of fuel for domestic use: The data on usage pattern of fuel for domestic use in Kondapur Micro watershed is presented in Table 31. The results indicated that, firewood was the major source of fuel for domestic use for 100.00 per cent of the households.

Table 31. Usage pattern of fuel for domestic use in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	4	100	5	100	12	100	11	100	1	100	2	100	35	100

Source of drinking water: The data on source of drinking water in Kondapur Micro watershed is presented in Table 32. The results indicated that, piped supply of water was the major source for drinking water for 2.86 per cent of the households followed by bore well water (94.29%).

Table 32. Source of drinking water in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	0	0	0	0	0	0	1	9.09	0	0	0	0	1	2.86
2	Bore Well	4	100	4	80	12	100	10	90.9	1	100	2	100	33	94.29

Source of light: The data on source of light in Kondapur Micro watershed is presented in Table 33. The results indicated that, electricity was the major source of light for 105.71 per cent of the households.

Table 33. Source of light in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	4	100	5	100	14	117	11	100	1	100	2	100	37	106

Existence of sanitary toilet facility: The data on availability of toilet facility in Kondapur Micro watershed is presented in Table 34. The results indicated that, 57.14 per cent of the households possess toilets.

Table 34. Existence of sanitary toilet facility in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	4	100	1	20	1	8.33	11	100	1	100	2	100	20	57.1

Possession of PDS card: The data regarding possession of PDS card in Kondapur Micro watershed is presented in Table 35. The results indicated that, 105.71per cent of the households possessed BPL card.

Table 35. Possession of PDS card in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	4	100	5	100	14	116.7	11	100	1	100	2	100	37	105.7

Table 36. Adequacy of food items in Kondapur micro-watershed

Sl.No.	Particulars	LL (4)		MF (5)		SF (12)		SMF (11)		MDF (1)		LF (2)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	4	100	5	100	15	125	11	100	1	100	2	100	38	108.6
2	Pulses	2	50	5	100	12	100	11	100	1	100	2	100	33	94.29
3	Oilseed	1	25	1	20	7	58.33	5	45.5	0	0	1	50	15	42.86
4	Vegetables	2	50	4	80	4	33.33	4	36.4	0	0	1	50	15	42.86
5	Fruits	0	0	0	0	1	8.33	0	0	0	0	0	0	1	2.86
6	Milk	3	75	3	60	8	66.67	7	63.6	0	0	2	100	23	65.71
7	Egg	0	0	0	0	2	16.67	3	27.3	0	0	0	0	5	14.29

Adequacy of food items: The data regarding adequacy of food items in Kondapur Micro watershed is presented in Table 36. The results indicated that, the extent of adequacy of food items for cereals, pulses, Oilseeds and vegetables were 108.57, 94.29, 42.86, 42.86 per cent respectively, similarly for Fruits (2.86%), milk (65.71%) and Egg (14.29%).

Inadequacy of food items: The data regarding in adequacy of food items in Kondapur Micro watershed is presented in Table 37. The results indicated that, the extent of in adequacy of food items for pulses, Oilseeds and vegetables were 5.71, 54.29, 48.57 and 97.14 per cent respectively, similarly for fruits (91.43%), milk (31.43%), egg (85.71%) and meat (97.14%).

Table 37. Inadequacy of food items in Kondapur micro-watershed

Sl. No.	**Particulars**	**LL** (4)		**MF** (5)		**SF** (12)		**SMF** (11)		**MDF** (1)		**LF** (2)		**All (35)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Pulses	2	50	0	0	0	0	0	0	0	0	0	0	2	5.71
2	Oilseed	2	50	4	80	5	41.67	6	54.6	1	100	1	50	19	54.29
3	Vegetables	1	25	1	20	8	66.67	5	45.5	1	100	1	50	17	48.57
4	Fruits	4	100	5	100	11	91.67	10	90.9	0	0	2	100	32	91.43
5	Milk	1	25	2	40	3	25	4	36.4	1	100	0	0	11	31.43
6	Egg	4	100	5	100	10	83.33	8	72.7	1	100	2	100	30	85.71
7	Meat	4	100	5	100	11	91.67	11	100	1	100	2	100	34	97.14

Response on market surplus of food items: The data regarding adequacy of food items in Kondapur Micro watershed is presented in Table 38. The results indicated that, the extent of adequacy of food items for vegetables were 2.86 per cent respectively.

Table 38. Response on market surplus of food items in Kondapur micro-watershed

Sl. No.	**Particulars**	**LL** (4)		**MF** (5)		**SF** (12)		**SMF** (11)		**MDF** (1)		**LF** (2)		**All (35)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Vegetables	1	25	0	0	0	0	0	0	0	0	0	0	1	2.86

Farming constraints: The data regarding farming constraints experienced by households in Kondapur Micro watershed is presented in Table 40. The results indicated that, lower fertility status of the soil was the constraint experienced by (91.43 %) per cent of the households, wild animal menace on farm field (88.57%), frequent incidence of pest and diseases (88.57%), inadequacy of irrigation water (5.71%), high cost of fertilizers and plant protection chemicals (80.00%), high rate of interest on credit (77.14%), low price for the agricultural commodities (77.14 %), lack of marketing facilities in the area (65.71%) and lack of transport for safe transport of the agricultural produce to the market (57.14%).

Table 40. Farming constraints experienced in Kondapur micro-watershed

SN	Particulars	**MF** (5)		**SF** (12)		**SMF** (11)		**MDF** (1)		**LF** (2)		**All (35)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Lower fertility status of the soil	5	100	12	100	11	100	2	200	2	100	32	91.43
2	Wild animal menace on farm field	5	100	12	100	11	100	1	100	2	100	31	88.57
3	Frequent incidence of pest and diseases	5	100	12	100	11	100	1	100	2	100	31	88.57
4	Inadequacy of irrigation water	0	0	1	8.33	0	0	1	100	0	0	2	5.71
5	High cost of Fertilizers and plant protection chemicals	5	100	12	100	9	81.82	0	0	2	100	28	80
6	High rate of interest on credit	4	80	11	91.67	9	81.82	1	100	2	100	27	77.14
7	Low price for the agricultural commodities	5	100	13	108.33	9	81.82	0	0	0	0	27	77.14
8	Lack of marketing facilities in the area	3	60	10	83.33	7	63.64	1	100	2	100	23	65.71
9	Inadequate extension services	0	0	0	0	0	0	0	0	0	0	0	0
10	Lack of transport for safe transport of the Agril produce to the market.	3	60	8	66.67	7	63.64	1	100	1	50	20	57.14

Chapter 5

SUMMARY AND IMPLICATIONS

In order to assess the socio-economic condition of the farmers in the watershed 35 households located in the micro watershed were interviewed for the survey. The study was conducted in Kondapur micro-watershed (Mungal sub-watershed, Yadgir taluk & District) is located at North latitude 16^0 31' 17.129" and 16^0 29' 33.557" and East longitude 77^0 16' 46.336" and 77^0 15' 15.084"covering an area of about 351.42 ha bounded by under Kondapura and Badiyala Villages.

Socio-economic analysis of Kondapur micro watersheds of Mungal sub-watershed, Yadgir taluk & District indicated that, out of the total sample of 35 total respondents, 5 (14.29 %) were marginal, 12 (34.29%)were small, 11 (31.43 %) were Semi medium and 1 (2.86 %) were medium and 2 (5.71 %) were large farmers and 4 landless farmers were also interviewed for the survey. The population characteristics of households indicated that, there were 80 (54.05%) men and 68 (45.95 %) were women. The average population of landless was 1.0, marginal farmers were 0.20, small farmers were 0.20, semi medium farmers were 0.21, medium farmers were 1.0 and large farmer were 0.25. Majority of the respondents (43.24%) were in the age group of 16-35 years.

Education level of the sample households indicated that, there were 52.03 per cent illiterates, 50.68 per cent pre university education and 3.38 per cent attained graduation. About, 85.71 per cent of household heads practicing agriculture and 8.57 per cent of the household heads were engaged as agricultural labourers. Agriculture was the major occupation for 56.76 per cent of the household members. In the study area, 100.00 per cent of the households possess katcha house and 2.86 per cent possess pucca house. The durable assets owned by the households showed that, 62.86 per cent possess TV, 14.29 per cent possess mixer grinder, 80.00 per cent possess mobile phones and 20.00 per cent possess motor cycles.

Farm implements owned by the households indicated that, 28.57 per cent of the households possess plough, 22.86 per cent possess bullock cart and 20.00 per cent possess sprayer. Regarding livestock possession by the households, 2.86 per cent possess local cow. The average labour availability in the study area showed tha**t,** own labour men available in the micro watershed was 1.58, women available in the micro watershed was 1.77, hired labour (men) available was 11.94 and hired labour (women) available was 16.97.

Out of the total land holding of the sample respondents 100.00 per cent (88.39 ha) of the area is under dry condition. The major crops grown by sample farmers are Redgram, Cotton, Greengram, Sorghum and cropping intensity was recorded as 73.42 per cent. The per hectare cost of cultivation for Redgram, Cotton, Greengram, Sorghum was

Rs.25254.34 , 41845.18, 27374.25 and 29450.24 with benefit cost ratio of 1:1.10, 1: 1.00, 1: 0.60 and 1: 0.90 respectively. Further, 82.86 per cent of the households opined that dry fodder was adequate and 5.71 per cent of the households have opined that the green fodder was adequate.

The average annual gross income of the farmers was Rs. 149302.86 in micro-watershed, of which Rs. 96445.71 comes from agriculture. Sampled households have grown 1 horticulture trees and 151 forestry trees together in the fields and back yards. Regarding marketing channels, 94.29 per cent of the households have sold agricultural produce to the local/village merchants. Further, 94.29 per cent of the households have used tractor for the transport of agriculture commodity. Majority of the farmers (85.71%) have experienced soil and water erosion problems in the watershed and 88.57 per cent of the households were interested towards soil testing.

Fire was the major source of fuel for domestic use for 100.00 per cent of the households. piped supply of water was the major source for drinking water for 2.86 per cent of the households followed by bore well water (94.29%). Electricity was the major source of light for 105.71 per cent of the households. In the study area, 57.14 per cent of the households possess toilet facility. Regarding possession of PDS card, 105.71 per cent of the households possessed BPL card.

Households opined that, the requirement of cereals (108.57%), pulses (94.29%) and oilseeds (42.86%) are adequate for consumption. Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (91.43%) wild animal menace on farm field (88.57%), frequent incidence of pest and diseases (88.57%), inadequacy of irrigation water (5.71%), high cost of fertilizers and plant protection chemicals (80.00%), high rate of interest on credit (77.14%), low price for the agricultural commodities (77.14%), lack of marketing facilities in the area (65.71%) and lack of transport for safe transport of the agricultural produce to the market (57.14%).

Implications of the survey

- ✓ Result indicated that, there were 52.03 per cent were illiterate hence, extension methodologies such as demonstration, street play, drama, video shows will be effective in dissemination of the technologies in the micro watershed.
- ✓ The data indicate that, 100.00 per cent of the households possess katcha house. Hence, the development department while implementing the watershed plan should focus on agriculture to enhance the productivity of major crops in the area to increase the income of the farmers.
- ✓ Results indicated that the local institutional participation of the household members in the micro watershed is minimal hence, activities like membership campaign,

awareness creation about the benefits of membership in local institutions and strengths of organized groups must be conveyed.

- ✓ Majority of the households in the watershed have experience in use of mobile phones, and television hence, these mass media can be effectively utilized for transfer of technology as well as for information dissemination.
- ✓ The farm machinery/implement possession in the micro watershed was found to be minimum the reasons may lack of knowledge or lack of financial ability which can be addressed through training on use of different farm implements, providing information on different sources of finance for purchase of farm implements.
- ✓ The possession of livestock such as crossbred cow found is less hence, farmers must be made aware of the benefits of crossbred cow in increased milk production.
- ✓ The possession of livestock such as sheep, goat and poultry was found to be low hence, farmers may be informed the role of subsidiary enterprises in enhancing the income and information on financial support for subsidiary activities.
- ✓ The data indicate that, job/work was the reason for all the migrants hence, farmers may be trained on profitable agriculture or self employment such has animal husbandry, plate making, sheep rearing, goat rearing, rabbit rearing with suitable information on sources of financial support.
- ✓ The results indicate that there was a change in quality of life due to migration hence, the developmental departments should take actions to arrest migration and to improve the quality of the life in rural areas.
- ✓ Households possess 88.39ha (100.00 %) of dry land and the availability of the dryland agricultural technologies such as short duration crops, high yielding drought resistance crop varieties, drip irrigation technology and subsidy information will be helpful for the farmers to enhance the productivity of land and as well as farmers income.
- ✓ Few of the bore well in micro watershed found non functional hence, farmers may be trained on possibility of bore well rejuvenation.
- ✓ Bore well was major source of irrigation for 94.29 per cent of the households. hence, in order to increase the area under irrigation as well as to increase the water use efficiency farmers may trained on drip irrigation and provide the information on subsidy for drip irrigation equipment's along with the information on different agencies which provides the financial assistance for drip irrigation.
- ✓ The cropping intensity in the micro watershed was found to be (73.42 %) hence, care must be taken by the implementing agency to bring uncultivated land into cultivation through suitable measures.
- ✓ Many of the household members have borrowed loan from cooperative banks which has higher rate of interest hence, farmers may be sensitized on the different sources of credit with lesser interest rate such SHGs etc.

- ✓ The results indicated the non availability of both green and dry fodder throughout the year hence, fodder development activities can be taken up in the micro watershed.
- ✓ The average annual gross income of the households Rs.96445.71 from agriculture, Rs.5714.29 from business and Rs. 47142.86 from wages and. Agriculture was found to be the major source of income for households hence; the development activities should focus on productivity enhancement, marketing arrangements and agricultural technology dissemination to have a direct impact on the farmers.
- ✓ The cultivation of forest species is found minimal hence, information and production technology related to agro-forestry and integrated farming system.
- ✓ The data indicated that, 85.71 per cent of the households have experienced soil and water erosion problems. Hence, those farmers who reported the soil and water erosion problems may be given attention while implementation of the watershed development plan.
- ✓ The data indicated that, 88.57 per cent of the households have interest in soil testing hence, farmers must be provided with the information on various institutions which are involved in soil testing for the benefit of the farmers.
- ✓ Except summer ploughing the adoption of other soil and water conservation structures is minimum hence, the farmers in the micro watershed should be sensitized on the use of different conservation structures for soil water conservation.
- ✓ Cereals and pulses found be adequate for per cent of the households respectively hence, farm households and the farm women must be trained on importance of balanced nutrition and role of vegetable, milk, egg, meat in balanced diet.
- ✓ Lower fertility status of the soil (91.43%), wild animal menace on farm field (88.57%), frequent incidence of pest and diseases (88.57%), high cost of fertilizers and plant protection chemicals (80.00%), high rate of interest on credit (77.14%), low price for the agricultural commodities (77.14%), lack of marketing facilities in the area (65.71%), inadequate extension services (0.00%), lack of transport for safe transport of the agricultural produce to the market (57.14%) were the major farming constraints experienced hence, these constraints must be addressed immediately for the welfare of the farmers. Awareness to be created among the farmers to approach nearest KVKs/RSKs and other developmental departments for technical and for subsidized inputs and utilize the well established regulated markets, approaching the contract firms, direct markets to avoid the involvement of middlemen.