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

CHIKKASHINDHAG-2 (4D3A1X2d) MICRO WATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

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

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PREFACE

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

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

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

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

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

ICAR-NBSS&LUP, Regional Centre, Bangalore has taken up a project sponsored by the Karnataka Watershed Development Project-II, (Sujala-III), Government of Karnataka funded by the World Bank under Component -1 Land Resource Inventry. This study was taken up to demonstrate the utility of such a database in reviewing, monitoring and evaluating all the land based watershed development programs on a scientific footing. To meet the requirements of various land use planners at grassroots level, the present study on "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of for Chikkashindhag-2 microwatershed in Koppal Taluk, Koppal 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 Chikkashindhag-2 microwatershed was conducted using village cadastral maps and IRS satellite imagery on 1:7920 scale. The false colour composites of IRS imagery were interpreted for physiography and these physiographic delineations were used as base for mapping soils. The soils were studied in several transects and a soil map was prepared with phases of soil series as mapping units. Random checks were made all over the area outside the transects to confirm and validate the soil map unit boundaries. The soil map shows the geographic distribution and extent, characteristics, classification, behavior and use potentials of the soils in the Microwatershed.

The present study covers an area of 637 ha in Koppal taluk and district, Karnataka. The climate is semiarid and categorized as drought - prone with an average annual rainfall of 662 mm, of which about 424 mm is received during south –west monsoon, 161 mm during north-east and the remaining 77 mm during the rest of the year. An area of about 95 per cent is covered by soil and 5 per cent by habitation and water body. The salient findings from the land resource inventory are summarized briefly below

- *The soils belong to 10 soil series and 23 soil phases (management units) and 5 land management units.*
- *The length of crop growing period is <90 days and starts from 2nd week of August to 2nd week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 31 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area is suitable for agriculture.*
- *About 27 per cent of the soils are shallow (25-50 cm), 28 per cent of the soils are moderately shallow (50-75 cm), 6 per cent of the soils are moderately deep (75- 100 cm) and 34 per cent is deep to very deep (100 to >150 cm) soils.*
- *About 5 per cent loamy (sandy loam and sandy clay loam) and 90 per cent has clayey (sandy clay and clay) soils at the surface.*
- *About 64 per cent of the area has non-gravelly (<15%) soils and 30 per cent has gravelly (15-35 %) soils.*
- *With respect to available water capacity 4 per cent of the area has very low (<50mm/m), 51 per cent of the area has low (51-100 mm/m), 18 per cent medium (101-150 mm/m), 15 per cent high (151-200 mm/m) and 7 per cent very high (>200 mm/m) in available water capacity.*

- *An area of about 21 per cent is nearly level (0-1%) and 73 per cent is very gently sloping (1-3%) lands.*
- *An area of about 54 per cent is slightly eroded (e1) and 41 per cent is moderately eroded (e2) lands.*
- *An area of about 2 per cent is moderately alkaline (pH 7.8-8.4), 38 per cent is strongly alkaline (pH 8.4-9.0) and 55 per cent is very strongly alkaline (pH >9.0) in reaction.*
- *The Electrical Conductivity (EC) of the soils are dominantly <2 dSm^{-1} indicating that the soils are non saline.*
- *Organic carbon is low (<0.5%) in 38 per cent, medium (0.5-0.75%) in 54 per cent and high (>0.75%) in 3 per cent area of the soils.*
- *Available phosphorus is low (<23 kg/ha) in 31 per cent, medium (23-57 kg/ha) in 57 per cent and high (>57 kg/ha) in 6 per cent area of the microwatershed.*
- *Available potassium is medium (145-337 kg/ha) in 64 per cent and high (>337 kg/ha) in 30 per cent area of the soils.*
- *Available sulphur is low (<10 ppm) in 38 per cent, medium (10-20 ppm) in 54 per cent and high (>20 ppm) in 3 per cent area of the soils.*
- *Available boron is low (<0.5 ppm) in 8 per cent, medium (0.5-1.0) in 82 per cent and high (>1.0) in 4 per cent area of the microwatershed.*
- *Available iron is deficient (<4.5 ppm) in 92 per cent and sufficient (>4.5 ppm) in 2 per cent area of the microwatershed.*
- *Available zinc is deficient (<0.6 ppm) in 66 per cent and sufficient (>0.6 ppm) in 28 per cent area of the microwatershed.*
- *Available manganese and copper are sufficient in the entire area of the microwatershed.*
- *The land suitability for 31 major agricultural and horticultural crops grown in the microwatershed was assessed and the areas that are highly suitable (class S1) and moderately suitable (class S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price, and finally the demand and supply position.*

Land suitability for various crops in the microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*44(7)*	*387(61)*		*Sapota*	*19(3)*	*72(11)*
Maize	*19(3)*	*412(65)*		*Pomegranate*	*19(3)*	*230(36)*
Bajra	*91(14)*	*328(51)*		*Musambi*	*30(5)*	*218(34)*
Groundnut	*32(5)*	*59(9)*		*Lime*	*30(5)*	*218(34)*
Sunflower	*30(5)*	*218(34)*		*Amla*	*91(14)*	*340(54)*
Redgram	*19(3)*	*209(33)*		*Cashew*	-	*59(9)*
Bengal gram	*12(2)*	*419(66)*		*Jackfruit*	*19(3)*	*72(11)*
Cotton	*12(2)*	*419(66)*		*Jamun*	-	*229(36)*
Chilli	*32(5)*	*59(9)*		*Custard apple*	*103(16)*	*328(52)*
Tomato	*32(5)*	*59(9)*		*Tamarind*	-	*214(34)*
Brinjal	*59(9)*	*372(59)*		*Mulberry*	*76(12)*	*161(25)*
Onion	-	*91(14)*		*Marigold*	*19(3)*	*412(65)*
Bhendi	-	*431(68)*		*Chrysanthemum*	*19(3)*	*412(65)*
Drumstick	*63(10)*	*186(29)*		*Jasmine*	*19(3)*	*254(40)*
Mango	-	*108(17)*		*Crossandra*	*19(3)*	*105(17)*
Guava	*19(3)*	*72(11)*				

- *Apart from the individual crop suitability, a proposed crop plan has been prepared for the 5 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 to these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation and drainage line 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. That would help in supplementing the farm income, provide fodder and fuel, and generate lot of biomass which in turn would help in maintaining the ecological balance and contribute to mitigating the climate change.*

Chapter 1

INTRODUCTION

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

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

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

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

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

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

The land resource inventory aims to provide site-specific database for Chikkashindhag-2 microwatershed in Koppal Taluk, Koppal District, Karnataka State for the Karnataka Watershed Development Department. The database was generated by using cadastral map of the village as a base along with high resolution IRS LISS IV and Cartosat-1 merged satellite imagery. Later, an attempt will be made to uplink this LRI data generated at 1:7920 scale under Sujala-III Project to the proposed Landscape Ecological Units (LEUs) map.

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

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Chikkashindhag-2 micro-watershed is located in the central part of Karnataka in Koppal taluk and district (Fig 2.1). It lies between $15^0$15' and $15^0$18' North latitudes and $76^0$06' and $76^0$07' East longitudes and covers an area of about 637 ha. It is about 13 km from Koppal town. It comprises and bounded by Koppal on the north, Chikkashindhogi on the west, Muddhaballi on the east and central, Gondabala on the south, Hireshindhogi, Budhinala on the west and Muddhaballi on the eastern side of the microwatershed.

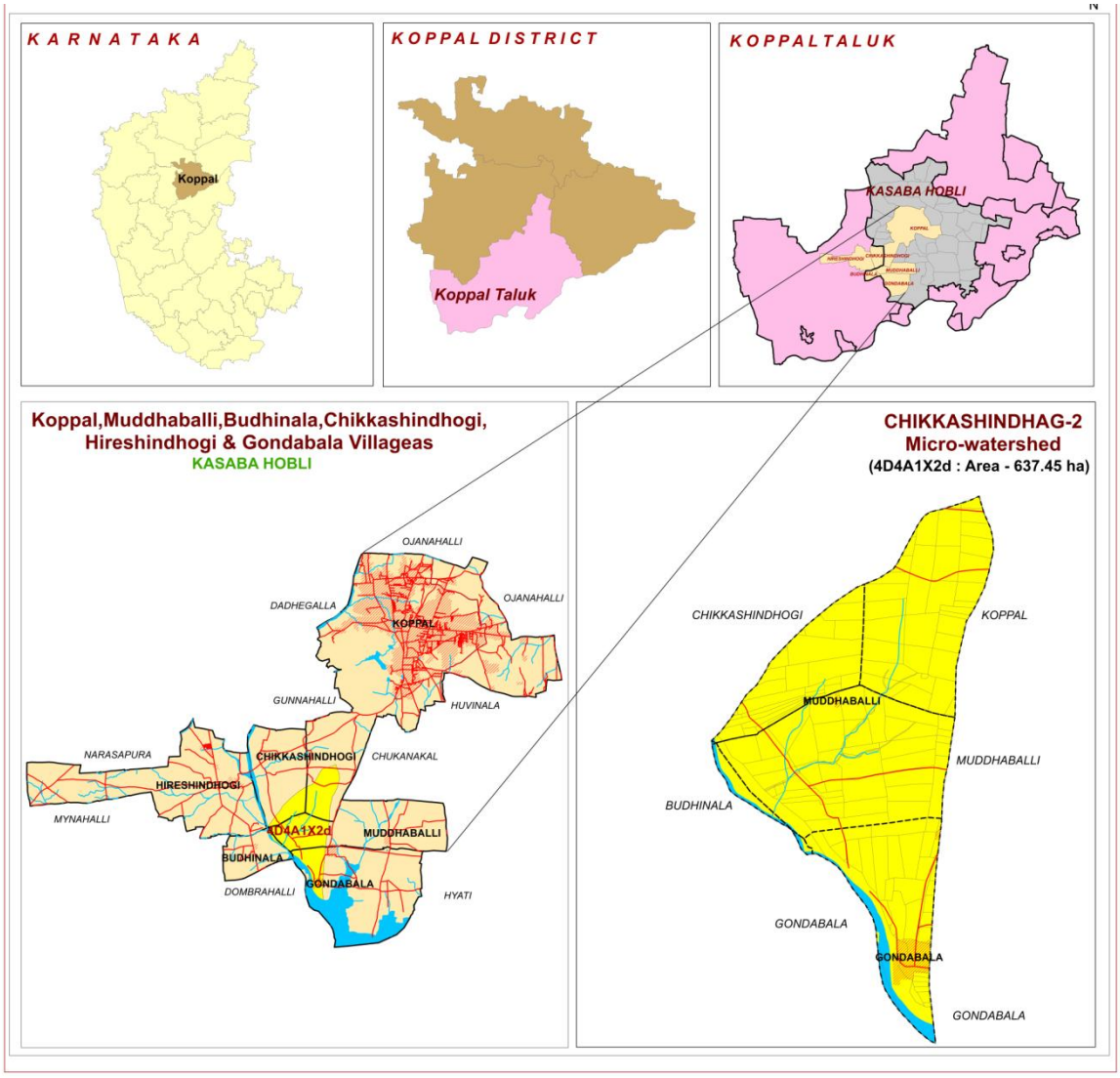


Fig.2.1 Location map of Chikkashindhag-2 Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are granite gneiss and alluvium (Fig.2.2 a and b). Granite gneisses are essentially pink to gray and are coarse to medium grained. They consist primarily of quartz, feldspar, biotite and hornblende. The

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

Fig.2.2a Granite and granite gneiss rocks

Fig.2.2b Alluvium

2.3 Physiography

Physiographically, the area has been identified as Granite gneiss and Alluvial landscapes based on geology. The microwatershed area has been further divided into mounds/ridges, summits, side slopes and very gently sloping uplands and nearly level

plains based on slope and its relief features. The elevation ranges from 500 to 530 m in the gently sloping uplands. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

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

2.5 Climate

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

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

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

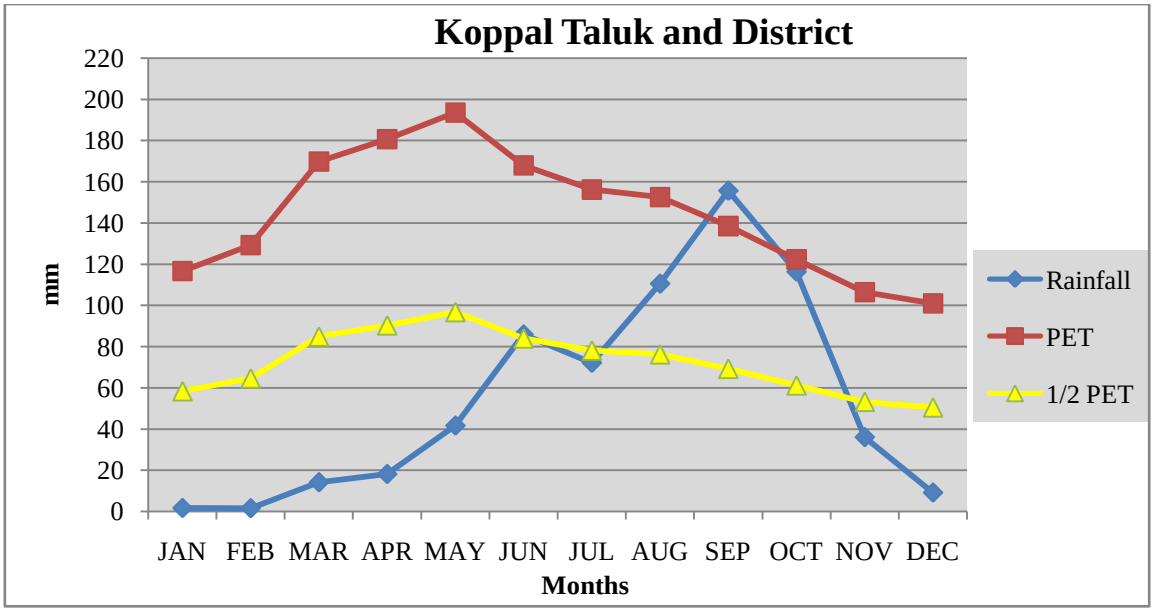


Fig. 2.3 Rainfall distribution in Koppal Taluk and District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Chikkashindhag-2 microwatershed

2.7 Land Utilization

About 91 per cent area (Table 2.2) in Koppal district is cultivated at present and about 17 per cent of the area is sown more than once. An area of about 3 per cent is currently barren. Forests occupy a small area of about 5 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and boulder areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, bajra, cotton, safflower, sunflower, red gram, horse gram, onion, mulberry, pomegranate, sugarcane, bengalgram and groundnut (Fig 2.5). While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Chikkashindhag-2 microwatershed is presented in Fig.2.6. Simultaneously, enumeration of existing wells (bore wells) and conservation structures is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells in Chikkashindhag-2 microwatershed is given in Fig 2.7.

Table 2.2 Land Utilization in Koppal District

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

Fig.2.5 (a) Different crops and cropping systems in Chikkashindhag-2 Microwatershed

Fig.2.5 (b) Different crops and cropping systems in Chikkashindhag-2 Microwatershed

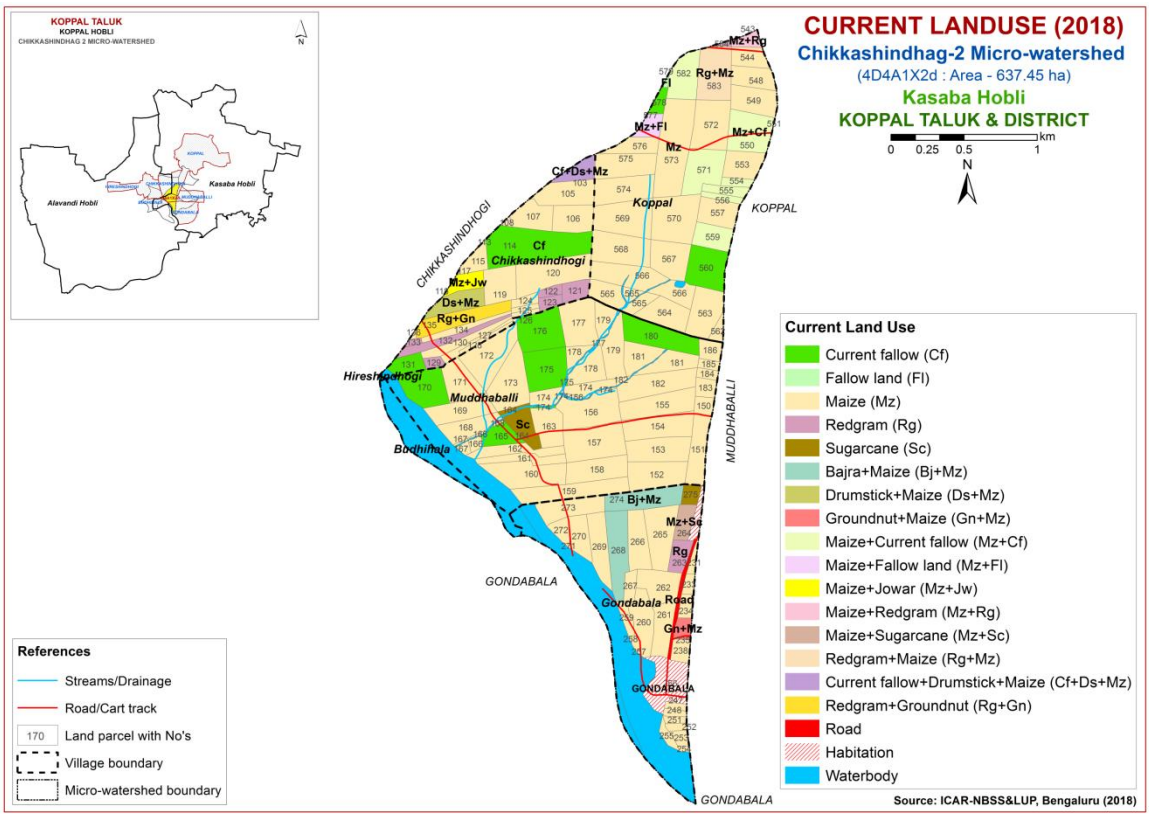


Fig.2.6 Current Land Use map of Chikkashindhag-2 Microwatershed

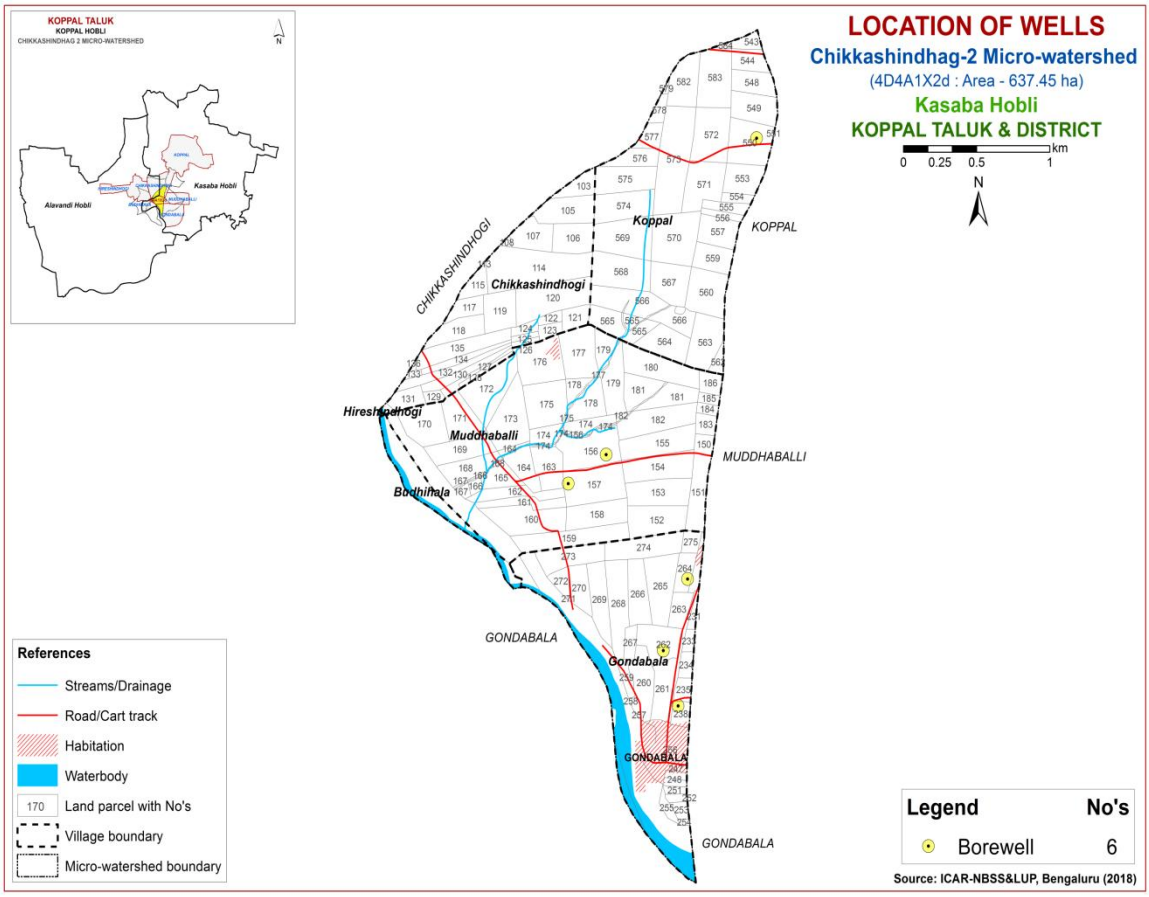


Fig.2.7 Location of wells map of Chikkashindhag-2 Microwatershed

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 Chikkashindhag-2 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, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units and showing their extent and geographic distribution on the microwatershed cadastral map. The detailed soil survey at 1:7920 scale was carried out in 637 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

Image Interpretation Legend for Physiography

G- Granite gneiss landscape

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

DSe -Alluvial landscape

DSe 1 Summit

DSe 11	Nearly level Summit with dark grey tone
DSe 12	Nearly level Summit with medium grey tone
DSe 13	Nearly level Summit with whitish grey tone
DSe 14	Nearly level Summit with whitish tone (Calcareousness)
DSe 15	Nearly level Summit with pinkish grey tone
DSe 16	Nearly level Summit with medium pink tone
DSe 17	Nearly level Summit with bluish white tone
DSe 18	Nearly level Summit with greenish grey tone

DSe 2 Very genetly sloping

DSe 21	Very gently sloping, whitish tone
DSe 22	Very gently sloping, greyish pink tone
DSe 23	Very gently sloping, whitish grey tone
DSe 24	Very gently sloping, medium grey tone
DSe 25	Very gently sloping, medium pink tone
DSe 26	Very gently sloping, dark grey tone
DSe 27	Very gently sloping, bluish grey tone
DSe 28	Very gently sloping, greenish grey tone
DSe 29	Very gently sloping, Pinkish grey

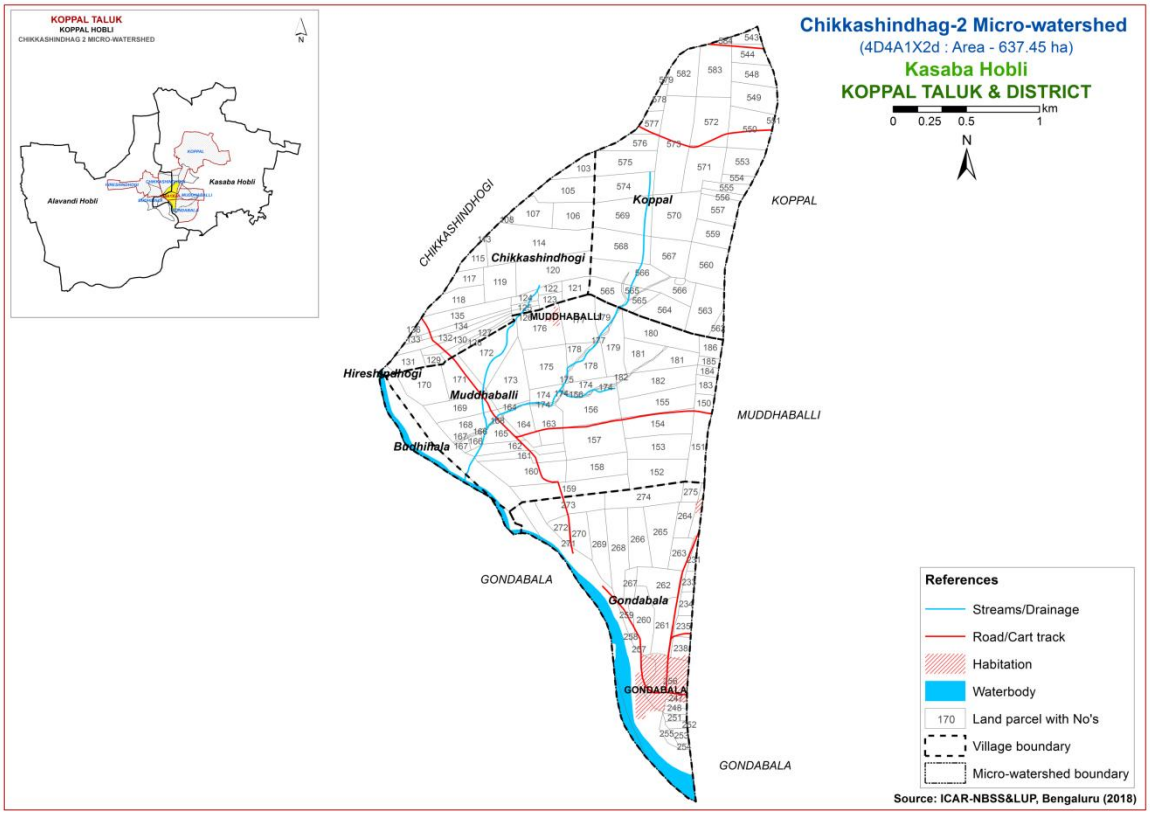


Fig 3.1 Scanned and Digitized Cadastral map of Chikkashindhag-2 Microwatershed

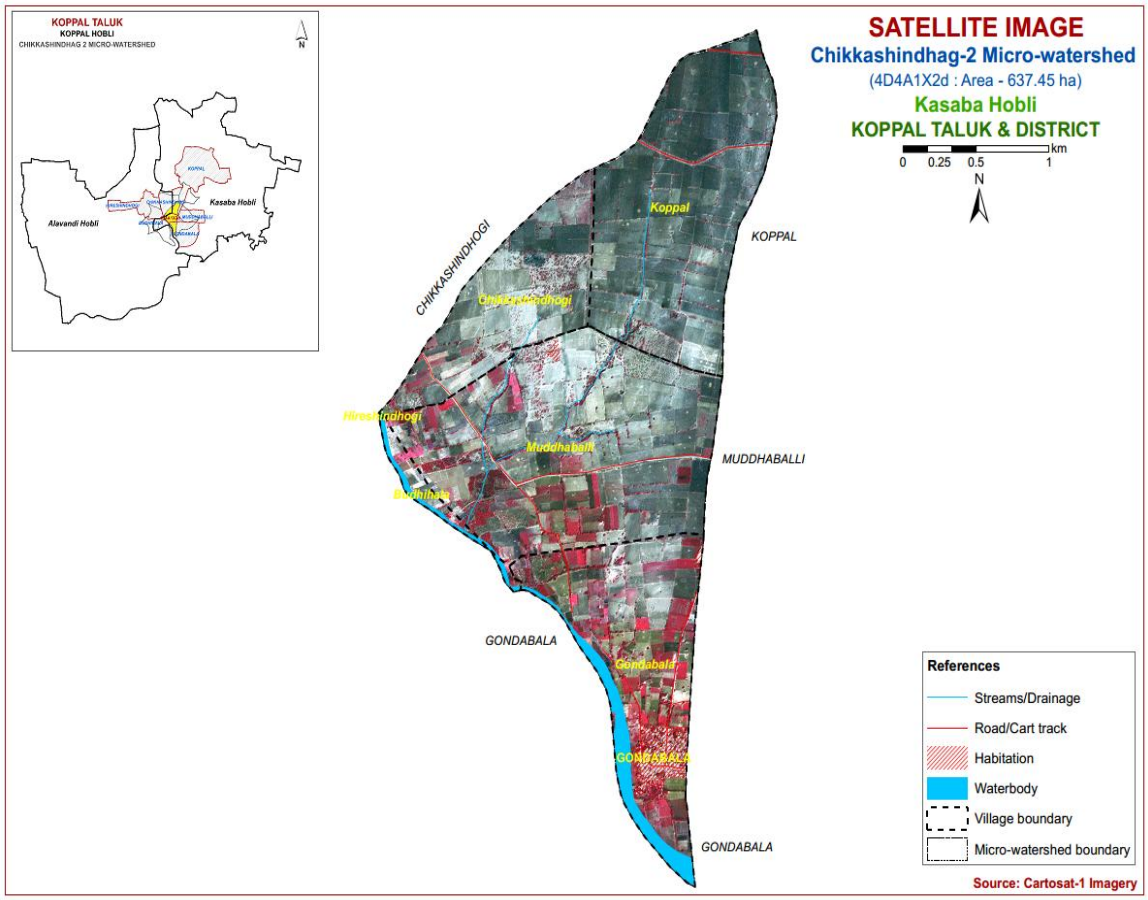


Fig.3.2 Satellite Image of Chikkashindhag-2 Microwatershed

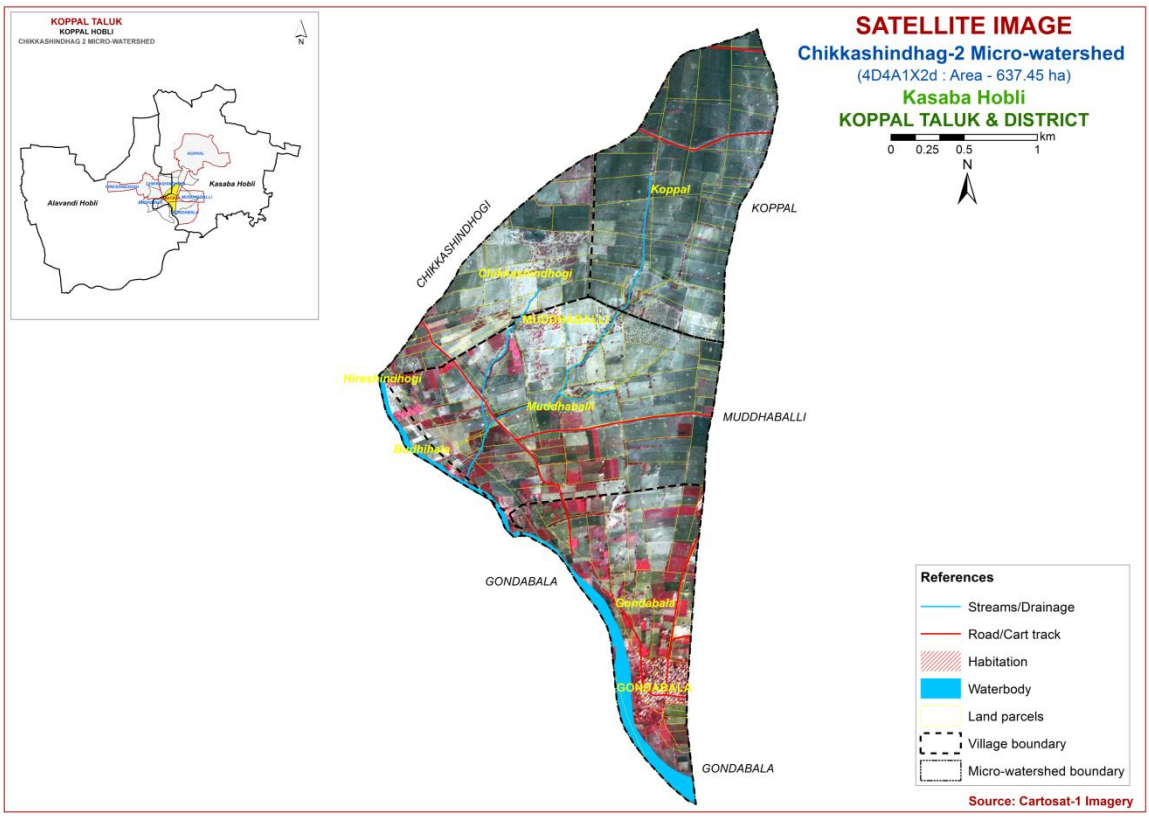


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Chikkashindhag-2 Microwatershed

3.3 Field Investigation

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

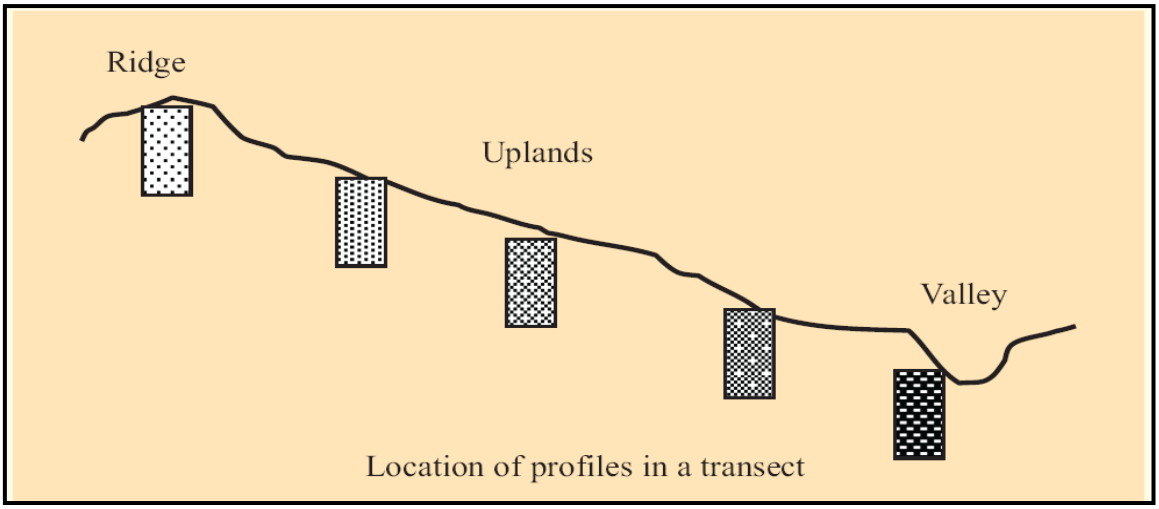


Fig: 3.4. Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, calcareousness, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 10 soil series were identified in Chikkashindhag-2 microwatershed.

Table 3.1 Differentiating Characteristics used for identifying Soil Series (Characteristics are of Series Control Section)

Soils of Granite Gneiss Landscape							
Sl. No	**Soil Series**	**Depth (cm)**	**Colour (moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcareo-usness**
1	Chikkasavanur (CSR)	25-50	7.5YR3/2,3/3,3/4	scl	<15	Ap-Bw-Cr	-
2	Chikkamegheri (CKM)	75-100	2.5YR2.5/3,3/4, 3/6	sc	-	Ap-Bt-Cr	-
3	Mornal (MNL)	100-150	5YR 3/4 2.5 YR 3/4, 4/6	gsc	15-35	Ap-Bt-Cr	-
4	Jedigere (JDG)	100-150	5YR 4/6, 3/4 7.5YR3/4,4/6	sc-c	<15	Ap-Bt- BC-Cr	
Soils of Alluvial landscape							
5	Muttal (MTL)	25-50	10YR 3/2, 3/3, 4/2 7.5YR3/2,3/3,6/4	gc	15-35	Ap-Bw-Ck	e-ev
6	Ravanaki (RNK)	50-75	7.5YR3/2,3/3,5/2,5/3 10YR3/1,3/2,4/1, 4/2, 5/1,6/1	c	<15	Ap-Bw-Cr	e-ev
7	Dambarahalli (DRL)	75-100	10YR 2/1, 3/1, 4/3	c	<15	Ap-Bss-Ck	e-es
8	Kavalur (KVR)	100-150	10 YR 2/2, 3/1, 3/2, 3/3, 4/4	c	<15	Ap-Bss-Bck-Cr	es-ev
9	Budagumpa (BGP)	>150	7.5YR3/2,5/1 10YR4/1,4/4	c	<15	Ap-Bw	es
10	Bardur (BDR)	>150	10YR 2/1, 3/1, 3/2	c	<15	Ap-Bss	es

3.4 Soil Mapping

The area under each soil series was further separated into soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management. The soil mapping units are shown on the map (Fig.3.5) in the form of symbols. During the survey many soil profile pits, few mini pits 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 mini pits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map.

The soil map shows the geographic distribution of 23 mapping units representing 10 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2. The soil phase map (management units) shows the distribution of 23 phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one soil phase will have similar management needs and have to be treated accordingly.

3.5 Land Management Units

The 23 soil phases identified and mapped in the microwatershed were regrouped into 5 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been chosen for identification and delineation of LMU's. For Chikkashindhag-2 microwatershed, five soil and site characteristics, namely the soil depth, soil texture, slope, erosion and gravel content have been considered for defining LMUs. The land use classes are expected to behave similarly for a given level of management.

3.6 Laboratory Characterization

Soil samples for each series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2018 from farmer's fields in Chikkashindhag-2 microwatershed (63 samples) for fertility status (major and micronutrients) at 320 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Chikkashindhag-2 Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite gneiss Landscape				
	CSR	Chikkasavanur soils are shallow (25-50 cm), well drained, have dark brown to light yellowish brown, red sandy clay loam soils occurring on nearly level to very gently sloping uplands under cultivation.		**29 (4.49)**
36		CSRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	8(1.2)
37		CSRhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	21(3.29)
	CKM	Chikkamegheri soils are moderately deep (75-100 cm), well drained, have dark brown to dark reddish brown red sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation.		**15 (2.39)**
174		CKMhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	2(0.32)
177		CKMiA1	Sandy clay surface, slope 0-1%, slight erosion	13(2.07)
	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation.		**32(5.01)**

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
206		MNLiB1	Sandy clay surface, slope 1-3%, slight erosion	19(2.94)
207		MNLiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	13(2.07)
	JDG	Jedigere soils are deep (100-150 cm), well drained, have dark brown to dark reddish brown, red sandy clay to clay soils occurring on nearly level to very gently sloping uplands under cultivation		**44(6.88)**
213		JDGiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	44(6.88)
Soils of Alluvial Landscape				
	MTL	Muttal soils are shallow (25-50 cm), well drained, have very dark grayish brown to dark brown, calcareous black gravelly clay soils occurring on nearly level to gently sloping plains under cultivation.		**143(22.51)**
303		MTLiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	62(9.75)
304		MTLiB2	Sandy clay surface, slope 1-3%, moderate erosion	46(7.27)
307		MTLmB1	Clay surface, slope 1-3%, slight erosion	35(5.49)
	RNK	Ravanaki soils are moderately shallow (50-75 cm), moderately well drained, have dark brown to very dark grayish brown and dark gray, calcareous clay black soils occurring on nearly level to very gently sloping plains under cultivation.		**182(28.51)**
329		RNKiA1	Sandy clay surface, slope 0-1%, slight erosion	14(2.15)
332		RNKmA1g1	Clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	17(2.64)
333		RNKmB1	Clay surface, slope 1-3%, slight erosion	47(7.36)
336		RNKmB2	Clay surface, slope 1-3%, moderate erosion	91(14.35)
337		RNKmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	13(2.01)
	DRL	Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have dark brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation.		**21(3.29)**
350		DRLmB2	Clay surface, slope 1-3%, moderate erosion	21(3.29)
	KVR	Kavalur soils are deep (100-150 cm), moderately well drained, have dark yellowish brown to very dark grayish brown, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation.		**31(4.96)**
384		KVRiB2	Sandy clay surface, slope 1-3%, moderate erosion	3(0.5)
386		KVRmA1	Clay surface, slope 0-1%, slight erosion	12(1.92)

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
387		KVRmA1g1	Clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	14(2.25)
388		KVRmB1	Clay surface, slope 1-3%, slight erosion	2(0.29)
	BGP	Budagumpa soils are very deep (>150 cm), moderately well drained, have dark yellowish brown to dark brown and dark gray, calcareous, sodic black clay soils occurring on nearly level to very gently sloping plains under cultivation.		**94(14.72)**
395		BGPmA1	Clay surface, slope 0-1%, slight erosion	65(10.15)
396		BGPmB1	Clay surface, slope 1-3%, slight erosion	29(4.57)
	BDR	Bardur soils are very deep (>150 cm), moderately well drained, have very dark grayish brown to very dark gray, black calcareous cracking clay soils occurring on nearly level to very gently sloping plains under cultivation.		**12(1.82)**
433		BDRmB2	Clay surface, slope 1-3%, moderate erosion	12(1.82)
1000	Others	Habitation and water body		**34(5.41)**

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

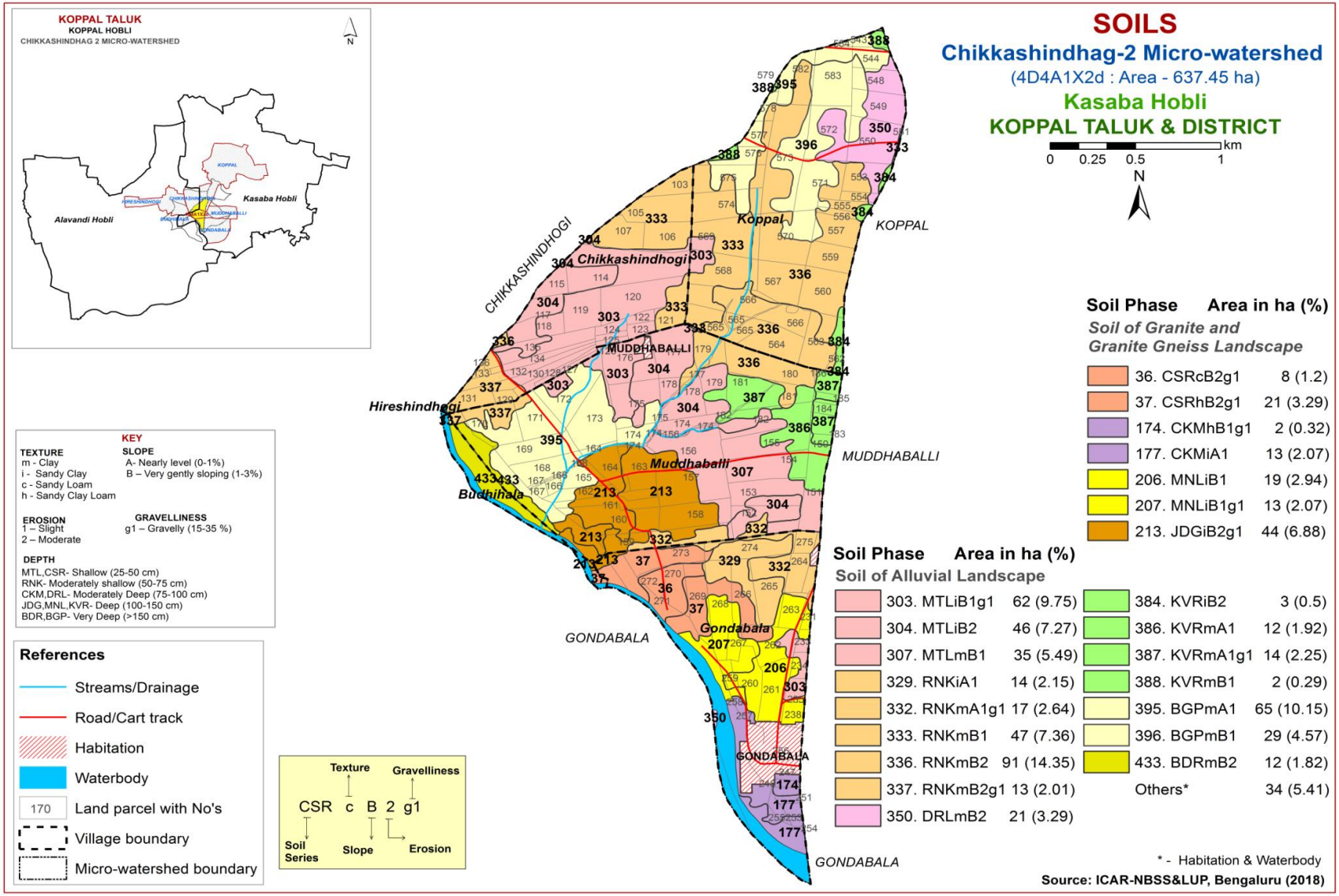


Fig 3.5 Soil Phase or Management Units of Chikkashindhag-2 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Chikkashindhag-2 microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluvial landscape based on geology. In all, 10 soil series were identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by the parent material, climate, time and relief.

A brief description of each of the 10 soil series identified followed by 23 soil phases (management units) mapped (Fig. 3.5) are furnished below. The physical and chemical characteristics of soil series identified in Chikkashindhag-2 microwatershed are given in Table 4.1 along with soil classification. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Granite and Granite gneiss Landscape

In this landscape, 4 soil series were identified and mapped. Of these series, JDG series occupies maximum area of 44 ha (7%) followed by MNL 32 ha (5%), CSR 29 ha (4%) and CKM 15 ha (2%). The brief description of the soil series along with the soil phases identified and mapped is given below.

4.1.1 Chikkasavanur (CSR) Series: Chikkasavanur soils are shallow (25-50 cm), well drained, have dark brown to light yellowish brown sandy clay loam soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands. The Chikkasavanur series has been classified as a member of the loamy, mixed, isohyperthermic family of (Paralithic) Haplustepts.

The thickness of the solum ranges from 32 to 49 cm. The thickness of A horizon ranges from 12 to 23 cm. Its colour is in 7.5 YR and 10 YR hue with value 2.5 to 4 and chroma 3 to 6. The texture varies from sandy loam to clay with 10 to 20 per cent gravel. The thickness of B horizon ranges from 16 to 32 cm. Its colour is in 7.5 YR and 5 YR hue with value 3 and chroma 2 to 4. Its texture is sandy clay loam with gravel content of < 15 per cent. The available water capacity is low (51-100 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Chikkasavanur (CSR) Series

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

The thickness of the solum ranges from 76 to 100 cm. The thickness of A horizon ranges from 11 to 24 cm. Its colour is in 7.5 YR, 5YR and 2.5 YR hue with value 2 to 4 and chroma 3 to 6. The texture varies from sandy clay loam to sandy clay with 10 to 15 per cent gravel. The thickness of B horizon ranges from 65 to 86 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 3 to 6. Its texture is dominantly sandy clay to clay. The available water capacity is medium (101-150 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Chikkamegheri (CKM) Series

4.1.3 Mornal (MNL) Series: Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Mornal series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 112 to 149 cm. The thickness of A-horizon ranges from 15 to 25 cm. Its colour is in 5 YR, 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture is sandy clay loam, sandy clay and clay with 15 to 30 per cent gravel. The thickness of B-horizon ranges from 103 to 131 cm. Its colour is in 2.5 YR and 5 YR hue with value 2.5 to 4 and chroma 3 to 6. Texture is sandy clay loam to sandy clay with 15 to 35 per cent gravel. The available water capacity is medium (101-150 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Mornal (MNL) Series

4.1.4 Jedigere (JDG) Series: Jedigere soils are deep (100-150 cm) well drained, have yellowish red to strong brown sandy clay to clay soils. They have developed from weathered granite gneiss and occur on nearly level to very gently sloping uplands under cultivation. The Jedigere series has been classified as a member of the fine, mixed, isohyperthermic family of typic Haplustalfs.

The thickness of the solum ranges from 117 to 145 cm. The thickness of A horizon ranges from 13 to 21 cm. Its colour is in hue 5 YR and 7.5 YR with value 2 to 4 and chroma 2 to 6. Its texture is dominantly sandy clay and sand clay loam. The thickness of B horizon ranges from 104 to 124 cm. Its colour is in hue 10 YR and 7.5 YR with value 2 to 4 and chroma 3 to 6. Its texture is dominantly clay. The available water capacity is very high (>200mm/m). Only one soil phase was identified and mapped.

Landscape and Soil Profile Characteristics of Jedigere (JDG) Series

4.2 Soils of Alluvial Landscape

In this landscape, 6 soil series were identified and mapped. Of these series, RNK series occupies maximum area of 182 ha (29%) followed by MTL 143 ha (23%), BGP 94 ha (15%), KVR 31 ha (5%), DRL 21 ha (3%) and BDR 12 ha (2%).The brief description of the soil series along with the soil phases identified and mapped is given below.

4.2.1 Muttal (MTL) Series: Muttal soils are shallow (25-50 cm), well drained, have dark brown to very dark grayish brown, calcareous gravelly clay soils. They have developed from alluvium and occur on nearly level to very gently sloping plains. The Muttal series has been classified as a member of the clayey, mixed, (calc), isohyperthermic family of (Paralithic) Haplustepts.

The thickness of the solum ranges from 30 to 50 cm. The thickness of A horizon ranges from 15 to 18 cm. Its colour is in 7.5 YR and 10 YR hue with value 2 to 3 and chroma 2.5 to 4. The texture varies from sandy clay to clay with 10 to 15 per cent gravel. The thickness of B horizon ranges from 18 to 32 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 6 and chroma 2 to 4. Its texture is sandy clay to clay. The available water capacity is low (51-100 mm/m). Three soil phases were identified and mapped.

Landscape and soil profile characteristics of Muttal (MTL) Series

4.2.2 Ravanaki (RNK) Series: Ravanaki soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark grayish brown, calcareous clay soils. They have developed from alluvium and occur on nearly level to very gently sloping plains. The Ravanaki soil series has been classified as a member of the very fine, smectitic, (calc), isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 50 to 75 cm. The thickness of A horizon ranges from 15 to 20 cm. Its colour is in 7.5 YR and 10 YR hue with value 2 to 3 and chroma 2.5 to 4. The texture varies from sandy clay to clay with 10 to 15 per cent gravel. The thickness of B horizon ranges from 35 to 60 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 6 and chroma 2 to 4. Its texture is sandy clay to clay with gravel content of 10 to 20 per cent. The available water capacity is medium (51-100 mm/m). Five soil phases were identified and mapped.

Landscape and Soil Profile Characteristics of Ravanaki (RNK) Series

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

The thickness of the solum ranges from 75 to 99 cm. The thickness of A horizon ranges from 13 to 24 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 2. The texture is clay. The thickness of B horizon ranges from 54 to 85 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 3. Its texture is clay and is calcareous. The available water capacity is high (151-200 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Dambarahalli (DRL) Series

4.2.4 Kavalur (KVR) Series: Kavalur soils are deep (100-150 cm), moderately well drained, have dark yellowish brown to very dark brown and very dark gray, calcareous black cracking clay soils. They have developed from alluvium and occur on very gently sloping uplands. The Kavalur series has been classified as a member of the fine, smectitic, (calc), isohyperthermic family of Typic Haplusterts.

The thickness of the solum is 113 to 143 cm. The thickness of A horizon ranges from 9 to 24 cm. Its colour is in 10 YR hue with value 3 and chroma 1. The texture is clay with no gravel. The thickness of B horizon ranges from 89 to 134 cm. Its colour is in 10 YR hue with value 3 and chroma 1. Its texture is clay. The available water capacity is very high (>200 mm/m). Four soil phases were identified and mapped.

Landscape and soil profile characteristics of Kavalur (KVR) series

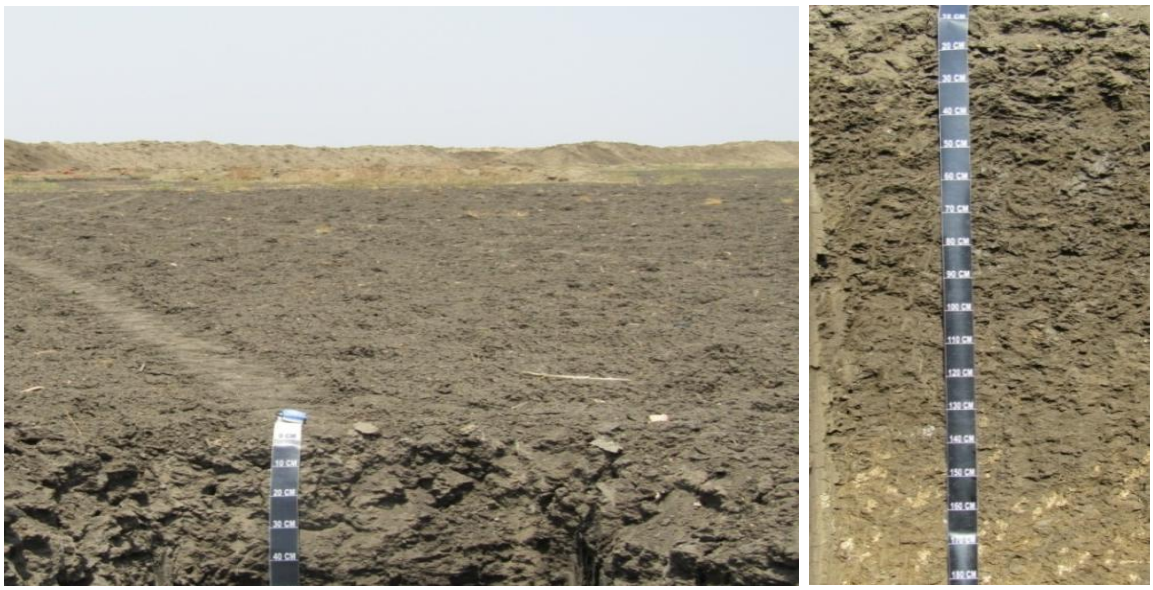
4.2.5 Budagumpa (BGP) Series: Budagumpa soils are very deep (>150 cm), well drained, black calcareous sodic clay soils. They have developed from alluvium and occur on very gently sloping plains under cultivation. The Budagumpa series has been classified as a member of the fine, mixed, (calc), isohyperthermic family of Typic Haplustepts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 16 to 26 cm. Its colour is in 7.5 YR and 10 YR hue with value 2 to 3 and chroma 2 to 4. The texture varies from sandy clay to clay with 5 to 10 per cent gravel. The thickness of B horizon ranges from 130 to 160 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 5 and chroma 1 to 4. Its texture is clay with gravel content of <15 per cent. These soils are calcareous that increase with depth. The available water capacity is very high (>200 mm/m). Two soil phases were identified and mapped.

Landscape and soil Profile Characteristics of Budagumpa (BGP) Series

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

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 15 to 19 cm. Its colour is in 10 YR hue with value 2 and chroma 1 with clay texture. The thickness of B horizon ranges from 146 to 180 cm. Its colour is in 10 YR hue with value 2 to 3 and chroma 1 to 2. Its texture is clay and is calcareous with less than 15 per cent gravel. The available water capacity is very high (>200 mm/m). Only one soil phase was identified and mapped.



Landscape and soil profile characteristics of Bardur (BDR) Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Chikkashindhag-2 microwatershed

Series Name: Chikkamegheri (CKM), **Pedon:** RM-2

Location: $15^0$21'40"N, $76^0$16'43"E, Gudanahalli village, Koppal Taluk and District

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic Rhodic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-10	Ap	66.80	5.51	27.69	10.14	10.04	20.29	14.75	11.58	-	scl	20.59	7.15
10-25	Bt1	39.52	7.17	53.32	8.75	9.59	7.27	8.43	5.48	-	c	26.96	13.99
25-38	Bt2	42.00	7.16	50.84	13.16	8.74	6.42	8.53	5.16	-	c	26.51	13.42
38-55	Bt3	41.77	10.31	47.92	15.19	8.54	6.33	7.38	4.32	10	c	25.28	14.10
55-70	Bt4	44.03	8.96	47.01	15.72	9.22	6.92	6.81	5.35	20	c	24.30	14.35
70-90	Bt5	56.02	8.46	35.52	11.41	17.07	12.36	10.26	4.92	25	sc	20.59	13.06

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-10	7.99	-	-	0.326	0.83	4.44	9.35	4.76	0.28	0.54	14.93	12.50	0.45	119	1.73
10-25	7.36	-	-	0.345	0.99	2.40	10.37	4.84	0.10	1.18	16.48	17.60	0.33	94	2.67
25-38	6.69	-	-	0.477	0.79	0.00	10.25	4.20	0.09	1.61	16.15	16.10	0.32	100	4.00
38-55	6.45	-	-	0.548	0.63	0.00	9.43	2.86	0.10	1.52	13.91	14.80	0.31	94	4.11
55-70	6.35	-	-	0.532	0.71	0.00	9.59	2.79	0.11	1.66	14.16	14.60	0.31	97	4.56
70-90	6.44	-	-	0.613	0.27	0.00	9.58	3.10	0.19	1.87	14.74	14.70	0.41	100	5.08

Contd…

Series Name: Mornal (MNL), **Pedon:** R-12
Location: $15^0$22'75"N, $76^0$05'16.1" Halageri village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic Rhodic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-17	Ap	81.48	5.14	13.39	14.07	12.15	17.00	27.53	10.73	70	sl	9.64	4.93
17-31	Bt1	51.43	10.24	38.33	6.67	7.72	9.52	19.26	8.25	30	sc	23.97	11.70
31-56	Bt2	45.62	8.77	45.62	17.85	7.31	8.14	8.87	3.44	30	sc	25.94	12.45
56-104	Bt3	53.10	10.62	36.28	21.87	10.30	8.10	7.99	4.84	<30	sc	20.95	10.16
104-126	Bc	54.21	12.88	32.91	12.28	8.84	15.92	10.20	6.97	<30	scl	19.96	10.21

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}							%	%
0-17	7.89	-	-	0.137	0.33	0.00	4.92	3.35	0.35	0.45	9.07	9.01	0.67	100	5.04
17-31	8.19	-	-	0.31	0.45	0.00	7.24	5.16	0.16	0.15	12.70	13.57	0.35	94	1.12
31-56	8.2	-	-	0.414	0.53	0.00	6.49	5.32	0.11	0.13	12.05	18.55	0.41	65	0.71
56-104	8.64	-	-	0.422	0.37	0.00	6.21	4.64	0.16	0.14	11.15	15.16	0.42	74	0.95
104-126	8.71	-	-	0.436	0.2	0.00	7.06	6.31	0.09	0.33	13.79	14.52	0.44	95	2.31

Contd…

Series Name: Jedigere (JDG), **Pedon:** R5
Location: $15^0$29'06"N, $76^0$10'38" E Chennahalu village, Yelburga Taluk and Koppal District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic Typic Haplustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-14	Ap	70.63	8.33	21.04	16.26	23.58	13.41	11.59	5.79	-	scl	13.46	6.17
14-39	Bt1	49.95	11.56	38.49	10.61	17.40	10.30	7.42	4.22	-	sc	23.07	13.70
39-62	Bt2	45.88	11.44	42.68	10.72	16.70	9.28	6.80	2.37	-	sc	25.24	15.20
62-94	Bt3	42.89	8.51	48.61	9.48	14.54	8.35	6.80	3.71	-	c	25.30	14.07
94-118	Bt4	45.24	11.90	42.86	10.66	15.53	8.59	6.63	3.83	-	sc	23.52	13.58

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-14	6.11	-	-	0.078	0.83	-	5.58	2.49	0.18	0.19	8.45	9.41	0.45	90	2.06
14-39	6.87	-	-	0.123	0.67	-	12.01	5.62	0.32	0.29	18.24	18.22	0.47	100	1.59
39-62	7.65	-	-	0.121	0.50	-	-	-	0.42	0.43	-	21.68	0.51	-	1.99
62-94	8.21	-	-	0.188	0.28	-	-	-	0.34	0.41	-	21.09	0.43	-	1.93
94-118	8.23	-	-	0.189	0.24	-	-	-	0.33	0.36	-	17.62	0.41	-	2.02

Contd…

Series Name: Muttal (MTL), **Pedon:** RM-13
Location: $15^0$14'30.8"N, $75^0$56'50.6"E, Gatareddihalla village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey, mixed, (calc), isohyperthermic (Paralithic) 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
0-20	Ap	39.05	13.74	47.21	3.05	5.05	8.21	14.63	8.11	15-30	c	29.95	17.94
20-34	Bwk	28.77	19.57	51.66	4.81	4.71	4.92	9.09	5.24	10	c	33.44	21.56

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-20	8.27	-	-	0.202	0.79	6.10	-	-	0.62	0.25	-	36.64	0.78	-	0.69
20-34	8.36	-	-	0.177	0.99	23.04	-	-	0.29	0.38	-	39.60	0.77	-	0.96

Contd…

Series Name: Ravanaki (RNK), **Pedon:** RM-20
Location: $15^0$14'22.7"N, $75^0$57'45.8"E, Gatareddihalla village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, (calc), isohyperthermic Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-28	Ap	24.43	17.76	57.81	5.30	3.89	3.78	7.14	4.32	20	c	41.40	29.60
28-55	Bw	18.77	15.59	65.64	2.74	3.73	2.85	4.83	4.61	10	c	46.71	35.18
55-80	Bc	12.53	15.43	72.04	2.60	1.92	1.47	3.16	3.39	10	c	56.82	43.73

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}							%	%
0-28	8.86	-	-	0.483	0.63	15.48	-	-	0.86	6.27	-	37.00	0.64	-	6.78
28-55	8.61	-	-	1.4	0.23	13.68	-	-	0.68	12.27	-	53.20	0.81	-	9.22
55-80	8.35	-	-	4.53	0.91	11.40	-	-	0.75	28.97	-	54.80	0.76	-	21.14

Contd…

Series Name: Dombarahalli (DRL), **Pedon:** R-8
Location: $15^0$13'96.2"N, $75^0$57'48.6" E Ragunathanahalli village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, (calc), 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
0-15	Ap	28.25	19.48	52.27	4.76	4.44	4.87	8.23	5.95	-	c	39.86	27.20
15-27	BA1	21.55	20.00	58.45	3.76	2.76	3.43	6.30	5.30	-	c	46.35	34.84
27-45	Bss1	14.86	20.89	64.25	2.46	2.23	2.23	3.91	4.02	-	c	57.99	41.06
45-80	Bss2	10.42	19.04	70.54	1.74	1.97	1.27	2.78	2.66	-	c	66.36	36.24

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-15	8.78	-	-	0.42	0.32	12.35	-	-	0.59	4.25	-	49.70	0.95	100.00	5.62
15-27	9.03	-	-	0.61	0.30	12.48	-	-	0.30	8.96	-	57.23	0.98	100.00	10.07
27-45	9.10	-	-	0.67	0.34	11.70	-	-	0.25	11.85	-	60.71	0.95	100.00	14.05
45-80	9.18	-	-	0.86	0.32	13.39	-	-	0.27	15.40	-	63.33	0.90	100.00	18.45

Contd…

Series Name: Kavalura (KVR), **Pedon:** A2/RM-9
Location: $15^0$18'86.8"N, $75^0$56'56.3"E, Kavalura village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, smectitic, (calc), 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
0-24	Ap	36.18	17.80	46.02	7.04	7.47	6.62	9.28	5.76	10	c	28.20	18.75
24-50	Bss1	38.79	15.36	45.85	6.25	6.25	9.70	10.67	5.93	05	c	27.16	18.81
50-85	Bss2	36.80	14.66	48.54	9.63	8.23	7.03	7.58	4.33	<5	c	30.16	22.17
85-124	Bss3	22.66	17.24	60.09	4.18	3.85	5.28	5.06	4.29	<5	c	40.34	31.42

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}							%	%
0-24	8.4	-	-	0.265	0.2	8.04	-	-	0.97	0.65		43.25	0.94		0.60
24-50	9.27	-	-	0.23	0.37	8.04	-	-	0.31	3.21		41.66	0.91		3.08
50-85	9.44	-	-	0.297	0.41	8.64	-	-	0.35	6.43		43.99	0.91		5.85
85-124	9.37	-	-	0.46	0.41	11.40	-	-	0.42	7.99		51.09	0.85		6.26

Contd…

Series Name: Budagumpa (BGP),**Pedon:** R-21
Location: $15^0$23'45"N, $76^0$08'52"E Neregalla village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-16	Ap	58.30	18.10	23.60	6.34	11.75	11.66	17.44	11.10	-	scl	18.24	10.29
16-38	Bw1	44.26	18.39	37.36	4.71	9.79	9.32	12.24	8.19	-	cl	32.99	18.12
38-68	Bw2	37.84	24.91	37.25	3.66	7.51	8.45	10.89	7.32	-	cl	39.50	22.32
68-83	Bw3	19.17	19.89	60.93	0.87	3.47	3.85	6.07	4.91	-	c	47.27	28.52
83-107	Bw4	14.76	23.22	62.02	0.63	2.41	3.25	4.61	3.87	-	c	46.10	29.36
107-131	Bw5	11.86	17.75	70.39	0.85	2.73	2.45	3.20	2.64	-	c	50.52	28.09
131-160	Bw6	14.48	18.21	67.31	2.23	2.50	2.59	3.84	3.31	-	c	59.14	28.35

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-16	9.20	-	-	0.27	0.51	6.24	-	-	0.42	3.11	-	19.60	0.83	100.00	3.84
16-38	9.29	-	-	0.88	0.35	5.98	-	-	0.17	9.36	-	28.40	0.76	100.00	15.38
38-68	8.95	-	-	2.37	0.31	4.81	-	-	0.31	24.10	-	34.90	0.94	100.00	42.65
68-83	8.65	-	-	4.28	0.33	4.42	-	-	0.39	27.95	-	45.10	0.74	100.00	25.94
83-107	8.10	-	-	9.50	0.30	3.38	-	-	0.44	31.29	-	44.10	0.71	100.00	12.82
107-131	8.16	-	-	9.32	0.22	2.73	-	-	0.63	37.86	-	47.20	0.67	100.00	20.37
131-160	8.49	-	-	5.29	0.19	3.51	-	-	0.60	34.82	-	43.70	0.65	100.00	48.66

Contd…

Series Name: Bardur (BDR), **Pedon:** R-4
Location: $15^0$14'31.7"N, $76^0$01'19.1"E, Moranali village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, (calc), 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
0-25	Ap	21.78	22.78	55.44	2.17	3.68	4.44	6.61	4.88	-	c	36.78	26.95
25-53	BA	18.62	18.56	62.82	2.23	4.24	3.46	5.24	3.46	-	c	41.25	29.87
53-90	Bss1	15.87	18.60	65.53	2.23	1.34	4.25	3.91	4.13	-	c	44.73	33.64
90-126	Bss2	13.66	20.02	66.32	1.68	2.80	2.35	3.70	3.14	-	c	49.24	38.37
126-152	Bss3	11.64	20.79	67.57	1.69	1.81	1.81	3.50	2.82	-	c	53.50	41.90
152-210	Bss4	11.38	22.78	65.42	2.16	2.16	1.93	3.07	2.05	-	c	51.53	39.64

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}							%	%
0-25	8.73	-	22.78	0.203	0.24	5.76	-	-	0.65	4.43	-	40.56	0.73	-	4.37
25-53	9.17	-	18.56	0.295	0.45	4.92	-	-	0.32	10.47	-	74.70	1.19	-	5.61
53-90	9.27	-	18.60	0.388	0.66	6.00	-	-	0.24	10.49	-	76.20	1.16	-	5.51
90-126	9.22	-	20.02	0.608	0.57	5.88	-	-	0.21	15.93	-	77.20	1.16	-	8.25
126-152	9.21	-	20.79	0.936	0.33	6.60	-	-	0.37	20.88	-	80.90	1.20	-	10.32
152-210	9.03	-	23.21	1.47	0.33	8.16	-	-	0.24	15.34	-	73.10	1.12	-	8.39

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The 23 soil map units identified in the Chikkashindhag-2 microwatershed are grouped under 2 land capability classes and 5 land capability subclasses (Fig. 5.1).

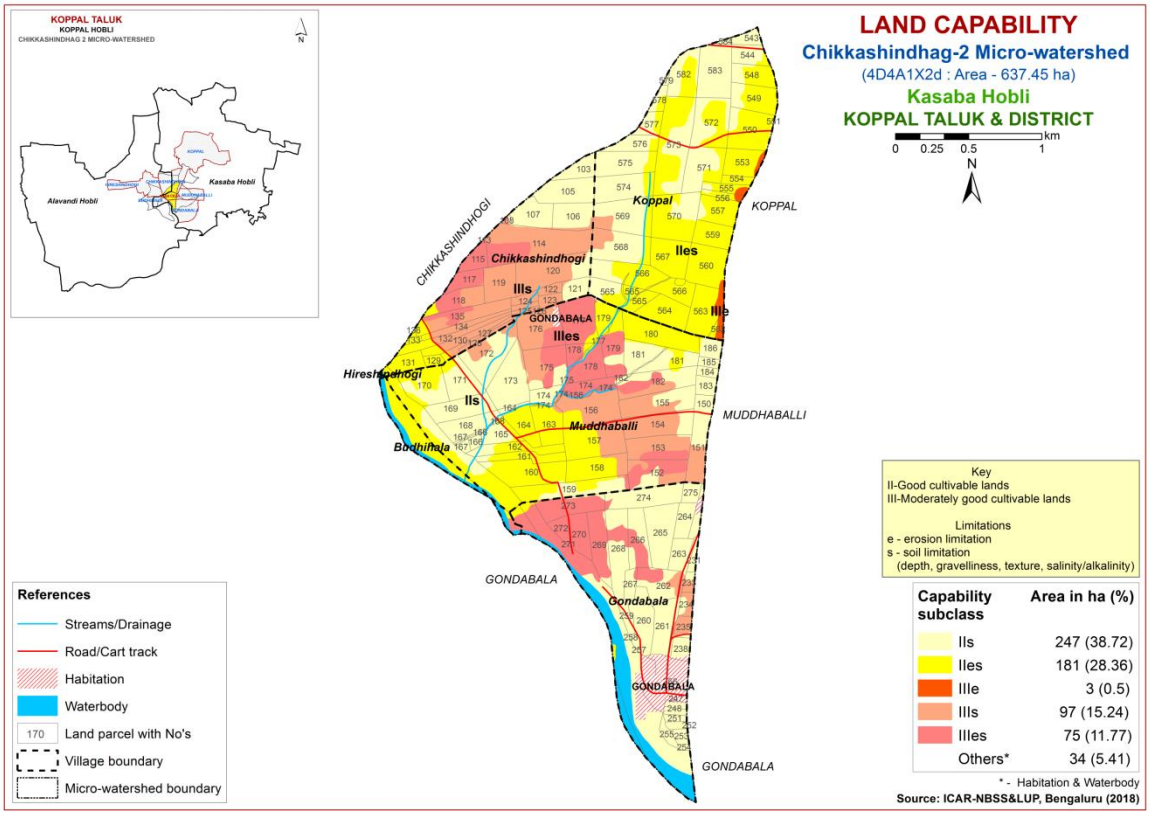


Fig. 5.1 Land Capability classification map of Chikkashindhag-2 Microwatershed

Entire cultivated area in the microwatershed is suitable for agriculture. Good lands (Class II) cover a maximum area of about 428 ha (67%) and are distributed in all parts of the microwatershed with minor problems of soil and erosion. Moderately good (Class III) lands cover an area of about 175 ha (28%) and are distributed in the central, western, eastern and southern part of the microwatershed with major problems of soil and erosion. An area of about 34 ha (5%) is covered by others (habitation and water body).

5.2 Soil Depth

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

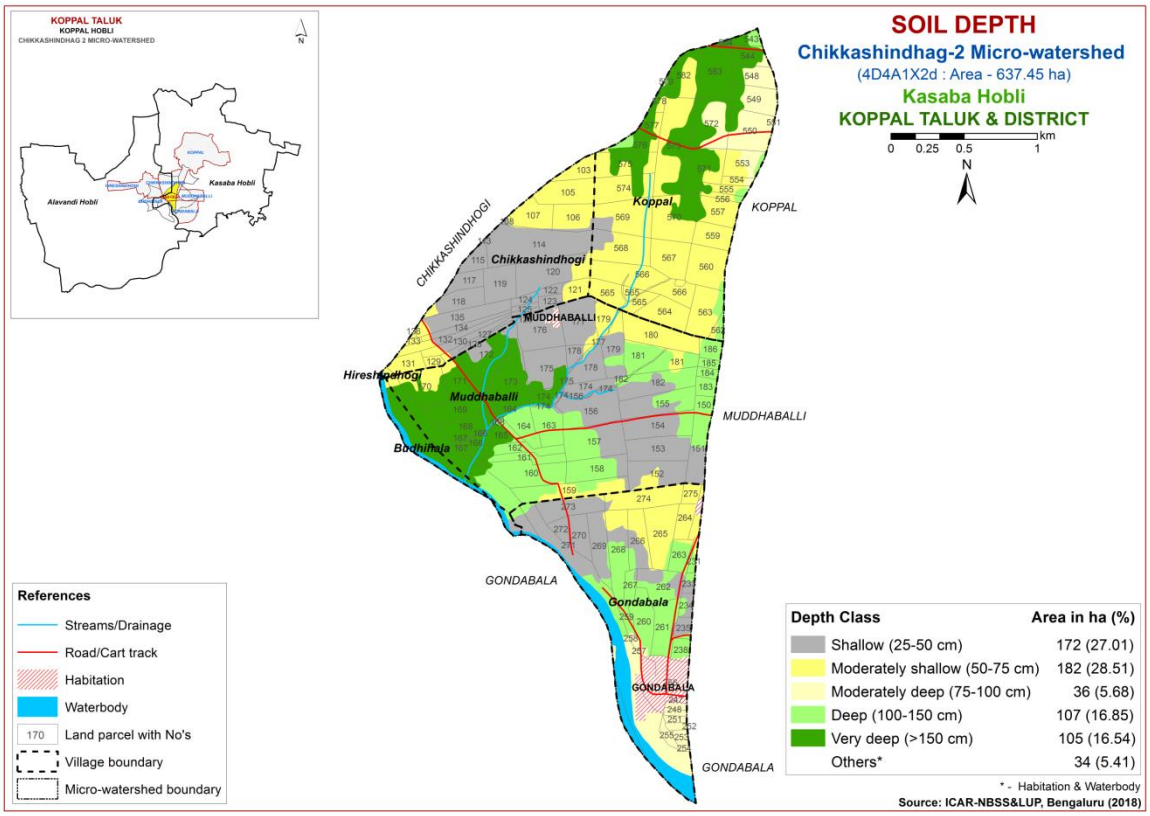


Fig. 5.2 Soil Depth map of Chikkashindhag-2 Microwatershed

Shallow (25-50 cm) soils cover an area of about 172 ha (27%) and are distributed in the western, central, eastern and southern part of the microwatershed. An area of about 182 ha (28%) is moderately shallow (50-75 cm) and distributed in the northern, western,

eastern and southern part of the microwatershed. Moderately deep soils (75-100 cm) cover an area of 36 ha (6%) and are distributed in the northern and southern part of the microwatershed. Deep to very deep (100 to >150 cm) soils occupy a maximum area of about 212 ha (34%) and are distributed in all parts of the microwatershed.

The most productive lands cover about 212 ha (34%) where all climatically adopted long duration crops can be grown. Problem soils cover about 172 ha (27%) where only short duration crops can be grown.

5.3 Surface Soil Texture

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

An area of about 31 ha (5%) is loamy at the surface and are distributed in the southern part of the microwatershed. Maximum area of about 572 ha (90%) is 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 soils that (95%) have high potential for soil-water retention and availability and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other productive lands are loamy (5%) soils which also have high potential for soil- water retention and nutrient availability but have no drainage or other physical problems.

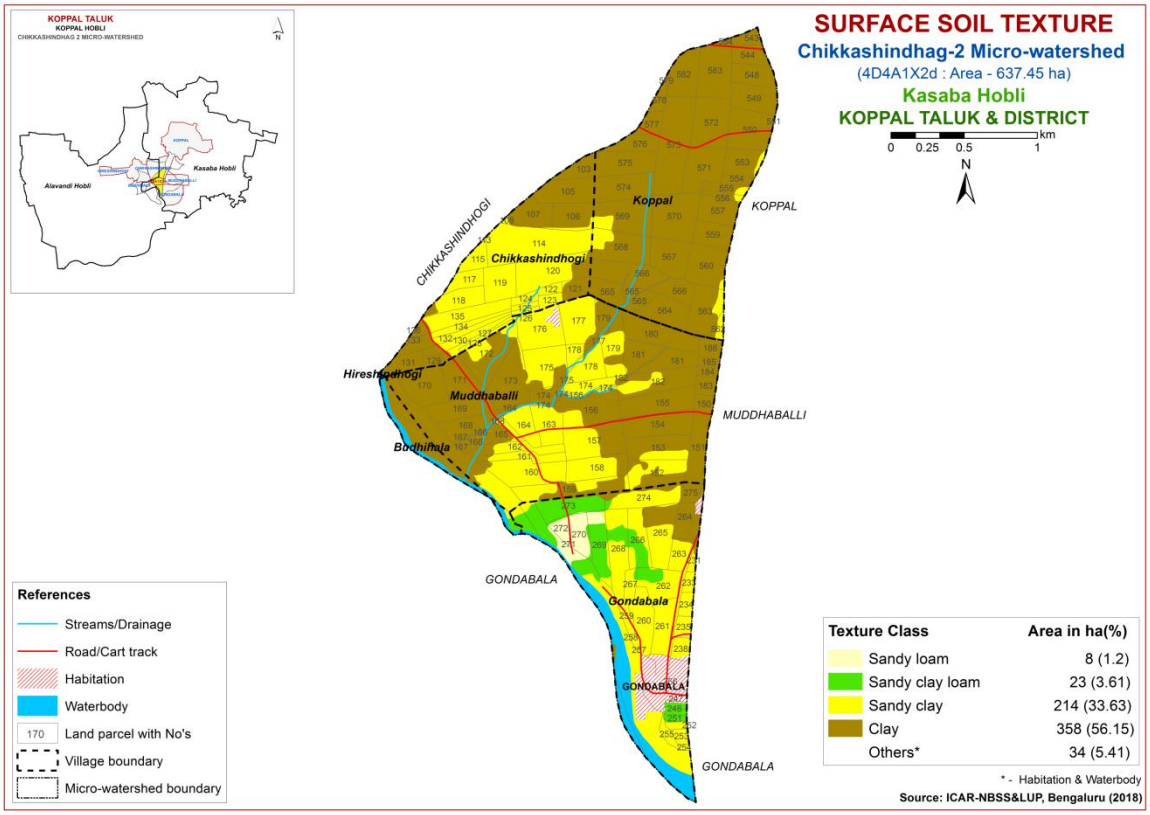


Fig. 5.3 Surface Soil Texture map of Chikkashindhag-2 Microwatershed

5.4 Soil Gravelliness

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

The soils that are non-gravelly (<15% gravel) cover a maximum area of about 409 ha (64%) and distributed in all parts of the microwatershed. An area of about 194 ha (30%) is covered by gravelly (15-35% gravel) soils and are distributed in the eastern, central, western and southern part of the microwatershed (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 64 per cent that are non gravelly (<15%) soils. These are most productive soils and have potential for growing both annual and perennial crops. The problem soils that are gravelly (15-35%) cover an area of about 30 per cent where only short duration crops can be grown.

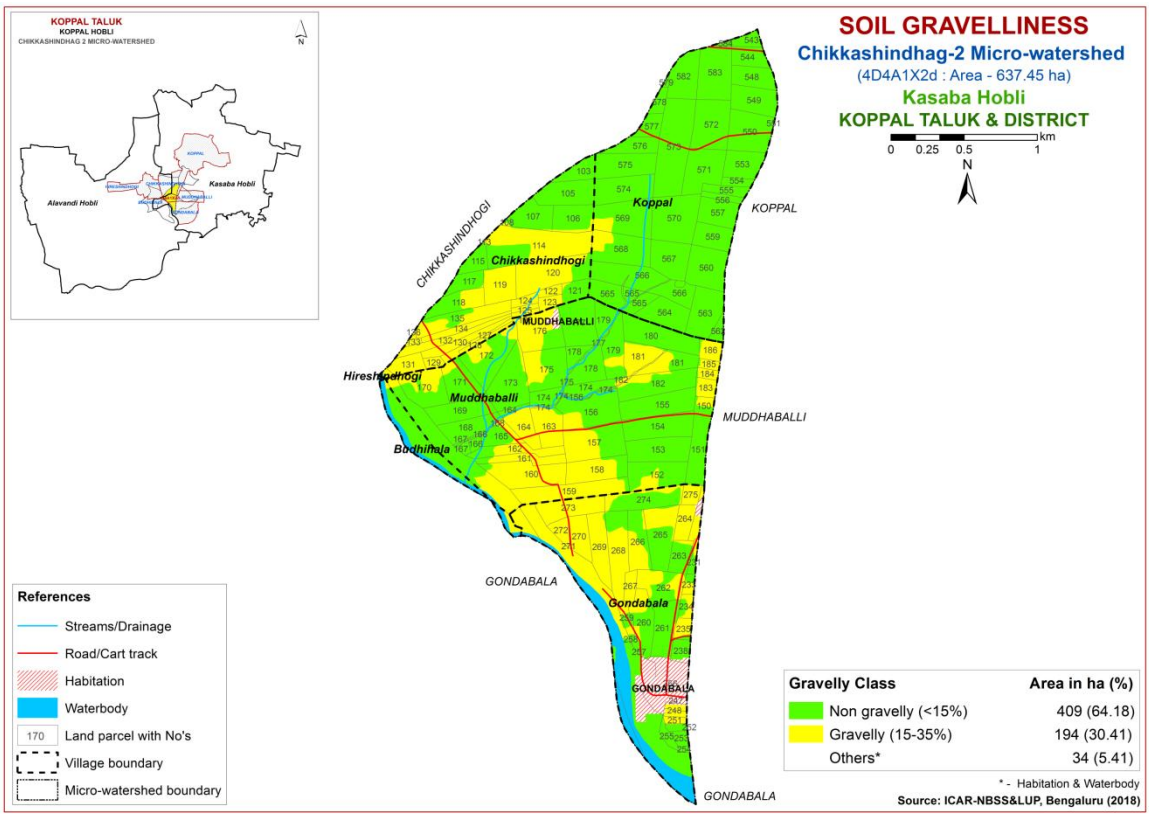


Fig. 5.4 Soil Gravelliness map of Chikkashindhag-2 Microwatershed

5.5 Available Water Capacity

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

An area of about 29 ha (4%) in the microwatershed has soils that are very low (<50 mm/m) in available water capacity and are distributed in the southern part of the microwatershed. Maximum area of about 325 ha (51%) has soils that are low (51 to 100 mm/m) in available water capacity and are distributed in all parts of the microwatershed. An area of about 112 ha (18%) has soils that are medium (101-150 mm/m) in available water capacity and are distributed in the northern and southern part of the microwatershed. High (151-200 mm/m) in an area of about 94 ha (15%) and distributed in the northern and western part of the microwatershed. An area of about 43 ha (7%) is very high (>200 mm/m) in available water capacity and are distributed in the northern and eastern part of the microwatershed.

An area of about 354 ha (55%) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. An area of about 137 ha (22%) has soils that have high potential with regard to available water capacity where all climatically adapted long duration crops can be grown successfully.

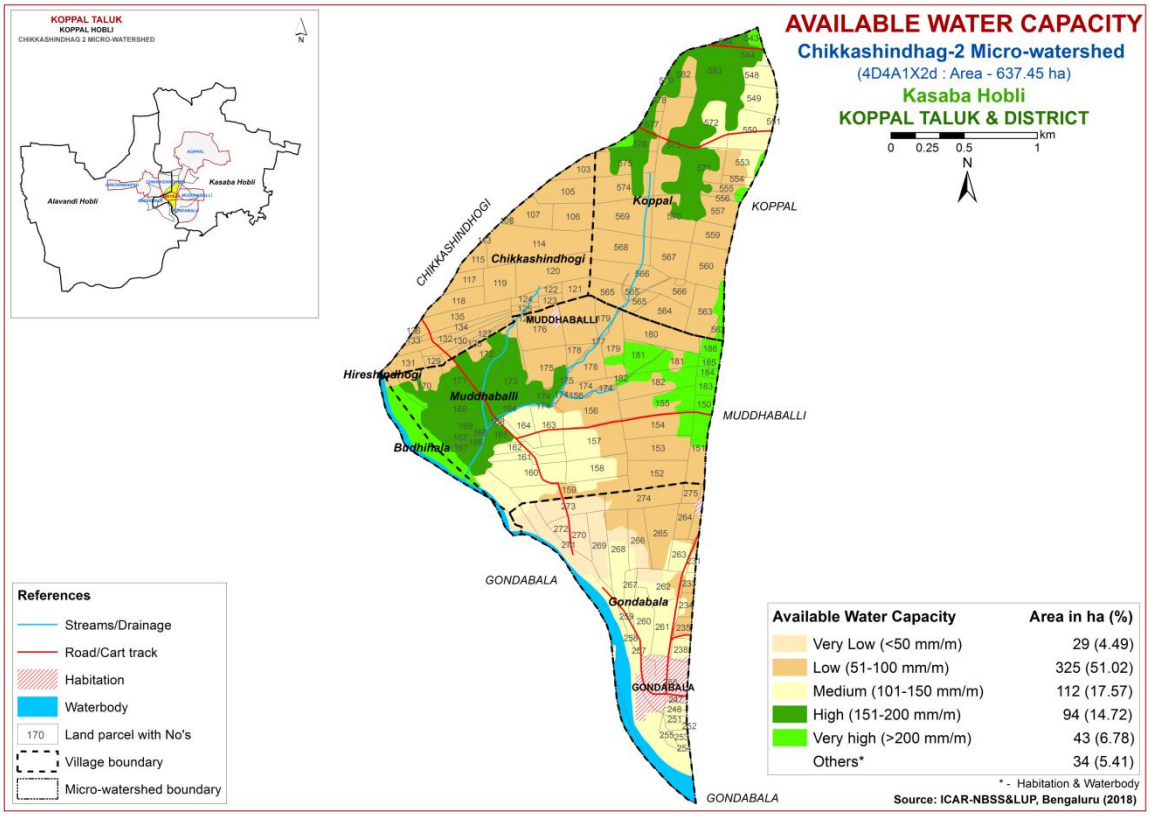


Fig. 5.5 Soil Available Water Capacity map of Chikkashindhag-2 Microwatershed

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

An area of about 135 ha (21%) is nearly level (0-1%) lands and are distributed in the northern, eastern, western and southern part of the microwatershed. Maximum area of 468 ha (73%) in the microwatershed has very gently sloping (1-3%) lands and are distributed in all parts of the microwatershed. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

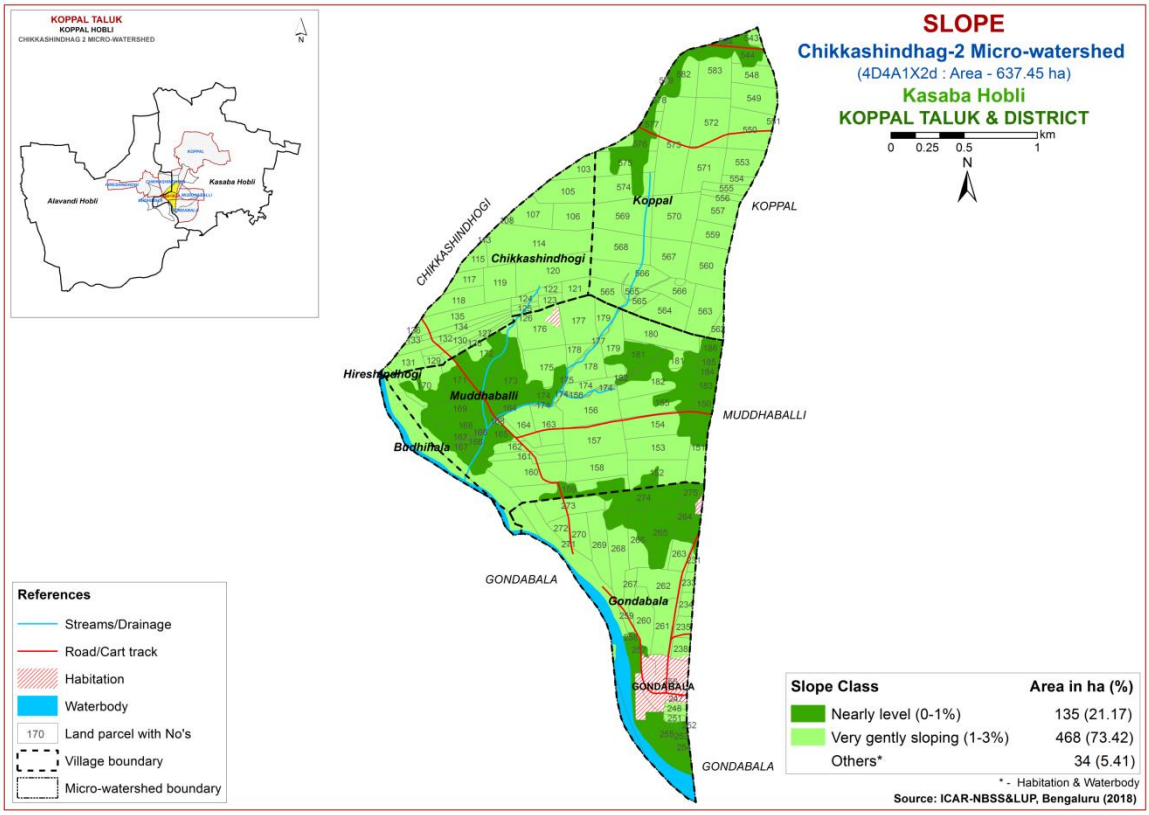


Fig. 5.6 Soil Slope map of Chikkashindhag-2 Microwatershed

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 class) lands cover a maximum area of about 344 ha (54%) and are distributed in all parts of the microwatershed. An area of about 259 ha (41%) is moderately eroded (e2 class) and distributed in the northern, eastern, western and southern part of the microwatershed. Moderately eroded lands are problematic and need appropriate soil and water conservation and other land development measures.

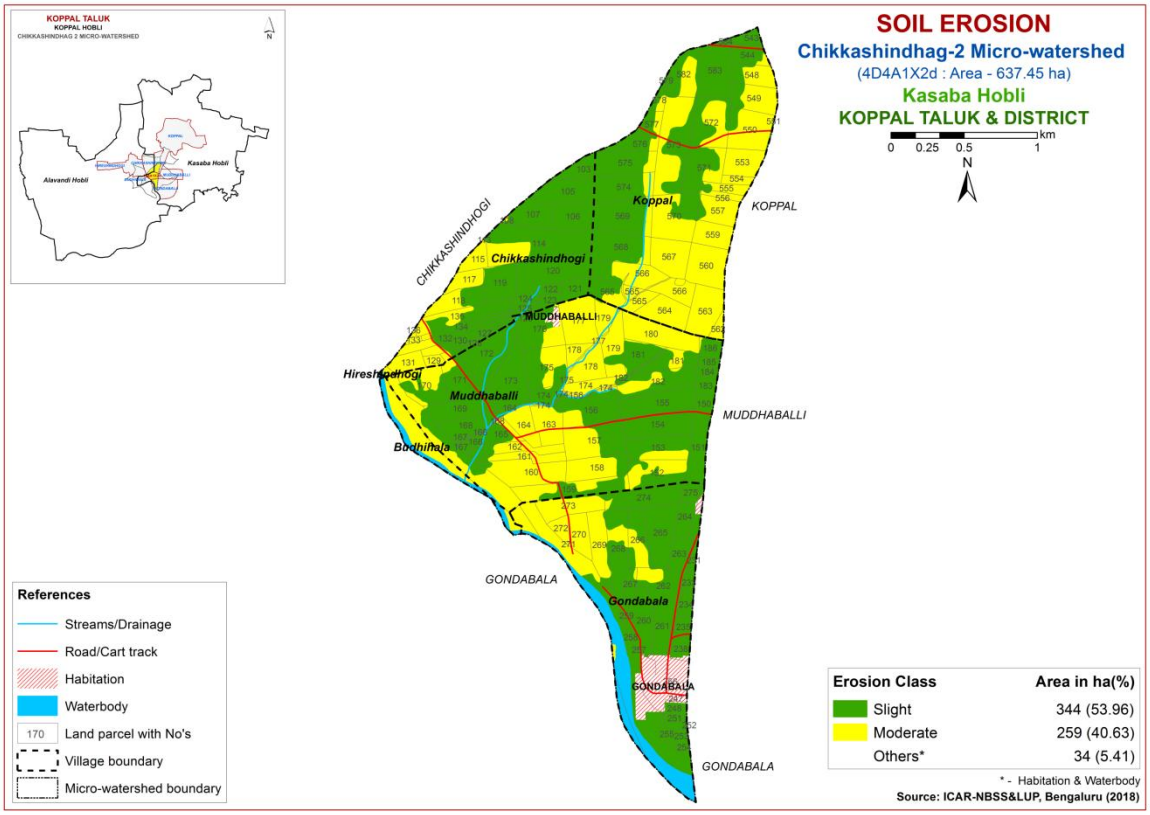


Fig. 5.7 Soil Erosion map of Chikkashindhag-2 Microwatershed

Chapter 6

FERTILITY STATUS

Soil fertility plays an important role in increasing crop yield. The adoption of high yielding varieties that require high amounts of nutrients has resulted in deficiency symptoms in crops and plants due to imbalanced fertilization and poor inherent fertility status, as these areas are characterized by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 320 m grid interval) all over the microwatershed through land resource inventory in the year 2018 were analyzed for pH, EC, organic carbon, available phosphorus and potassium, and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

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

6.1 Soil Reaction (pH)

The soil analysis of the Chikkashindhag-2 microwatershed for soil reaction (pH) showed that an area of about 14 ha (2%) is moderately alkaline (pH 7.8-8.4) and are distributed in the southern part of the microwatershed. An area of about 240 ha (38%) is strongly alkaline (pH 8.4-9.0) and are distributed in the western, southern and eastern part of the microwatershed. Maximum area of 349 ha (55%) is very strongly alkaline (pH >9.0) and distributed in all parts of the microwatershed. Thus, all the soils in the microwatershed are alkaline in reaction (Fig.6.1).

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

An area of about 245 ha (38%) is low (<0.5%) and distributed in the northern part of the microwatershed. Maximum area of about 341 ha (54%) is medium (0.5-0.75%) in organic carbon content and distributed in all parts of the microwatershed (Fig.6.3). An area of about 17 ha (3%) is high (>0.75%) in organic carbon and distributed in the western and southern part of the microwatershed.

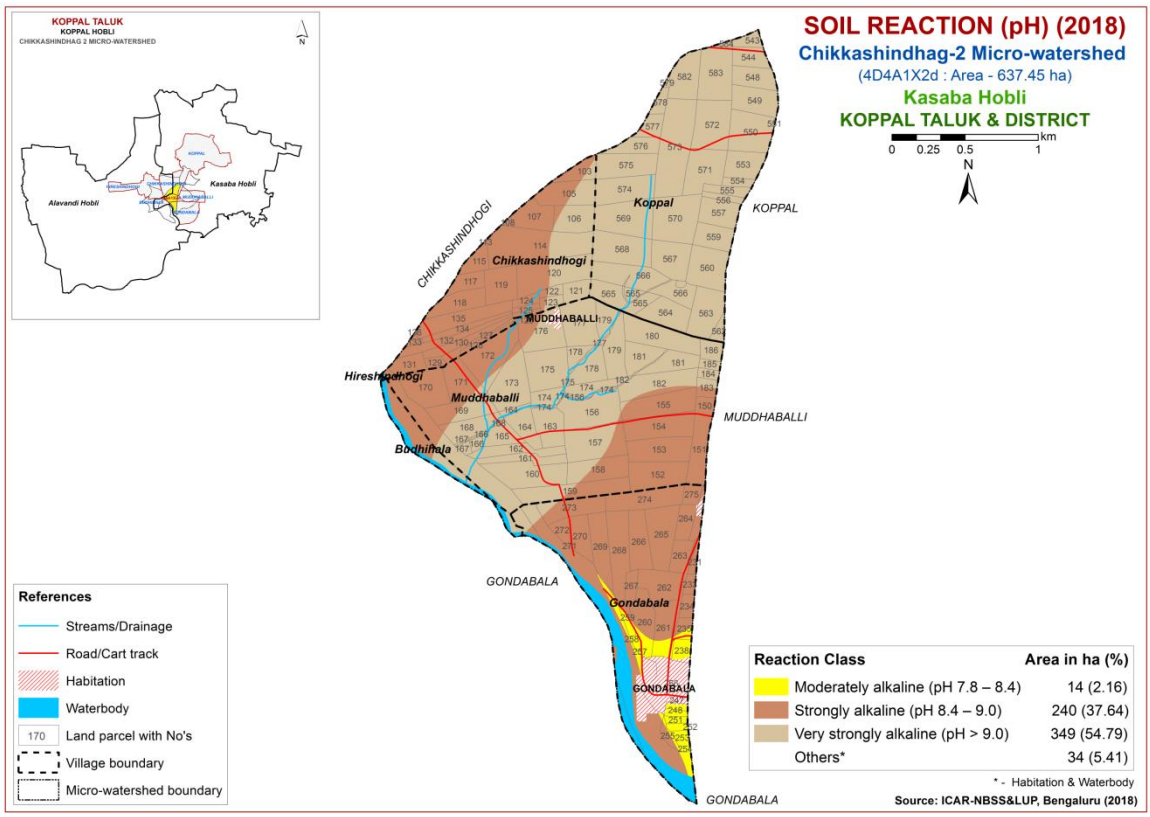


Fig.6.1 Soil Reaction (pH) map of Chikkashindhag-2 Microwatershed

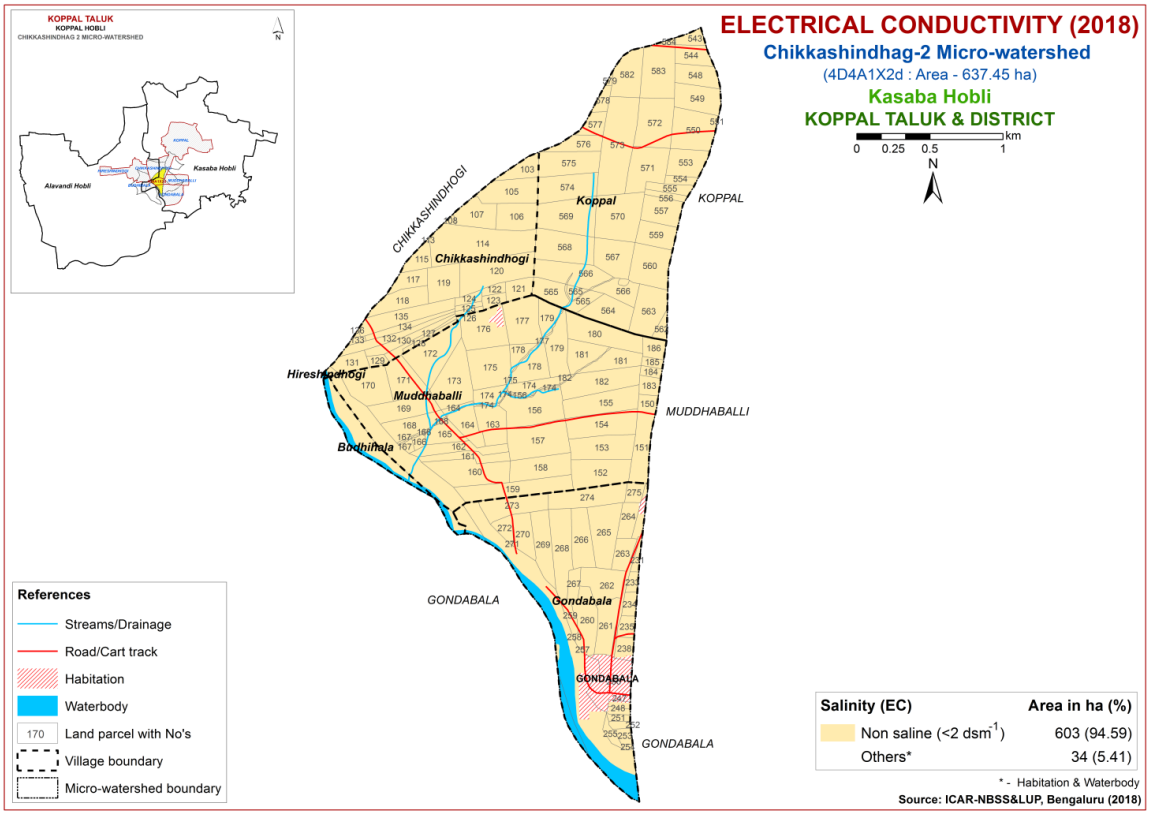


Fig.6.2 Electrical Conductivity (EC) map of Chikkashindhag-2 Microwatershed

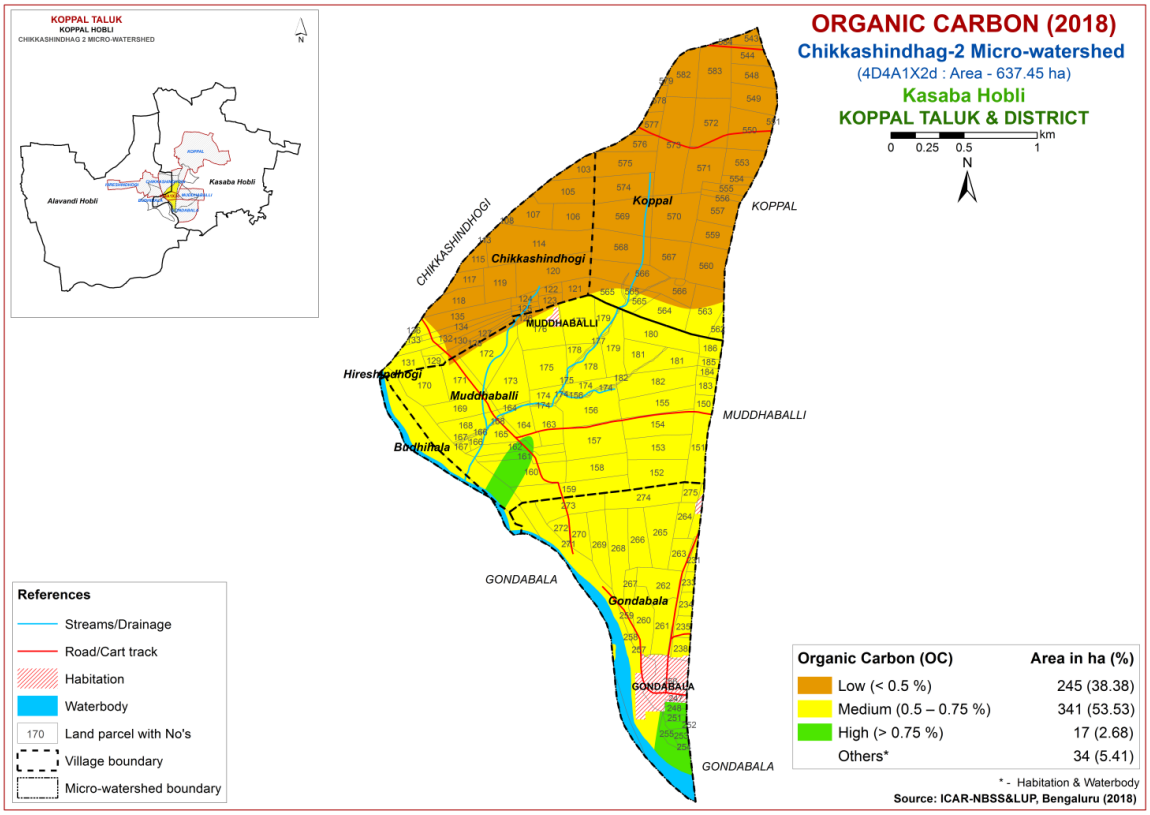


Fig.6.3 Soil Organic Carbon map of Chikkashindhag-2 Microwatershed

6.4 Available Phosphorus

Available phosphorus content is low (<23 kg/ha) in an area of 197 ha (31%) and are distributed in the northern part of the microwatershed. Medium (23-57 kg/ha) in a maximum area of about 365 ha (57%) and are distributed in all parts of the microwatershed. An area of about 41 ha (6%) is high (>57 kg/ha) and are distributed in the southern part of the microwatershed. Apply additional 25% phosphorous in areas where it is low and medium in available phosphorous (Fig 6.4).

6.5 Available Potassium

Medium (145-337 kg/ha) in a maximum area of about 409 ha (64%) and are distributed in all parts of the microwatershed. An area of about 194 ha (30%) is high (>337 kg/ha) in available potassium and are distributed in the western and southern part of the microwatershed (Fig. 6.5). Apply additional 25% potassium in areas where it is low and medium in available potassium.

6.6 Available Sulphur

Available sulphur content is low (<10 ppm) in an area of about 243 ha (38%) and are distributed in the northern, western and southern part of the microwatershed. Maximum area of about 341 ha (54%) is medium (10-20 ppm) in available sulphur and are distributed in all parts of the microwatershed. High (>20 ppm) in an area of 19 ha (3%) and distributed in the western part of the microwatershed. The areas that are low and

medium in available sulphur need to be applied with magnesium sulphate or gypsum or factomphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Available boron content in Chikkashindhag-2 microwatershed is low (< 0.5ppm) in an area of about 54 ha (8%) and distributed in the northwestern and western part of the microwatershed. Maximum area of about 525 ha (82%) is medium (0.5-1.0 ppm) and distributed in all parts of the microwatershed (Fig.6.7). High (>1.0 ppm) in an area of 24 ha (4%) and distributed in the southern part of the microwatershed.

6.8 Available Iron

Available iron content is deficient (<4.5 ppm) in a maximum area of about 589 ha (92%) and are distributed in all parts of the microwatershed. Sufficient (>4.5 ppm) in an area of about 14 ha (2%) and are distributed in the southern part of the microwatershed (Fig 6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in a maximum area of about 423 ha (66%) and are distributed in all parts of the microwatershed (Fig 6.11). An area of about 180 ha (28%) is sufficient (>0.6 ppm) and are distributed in the western and southern part of the microwatershed.

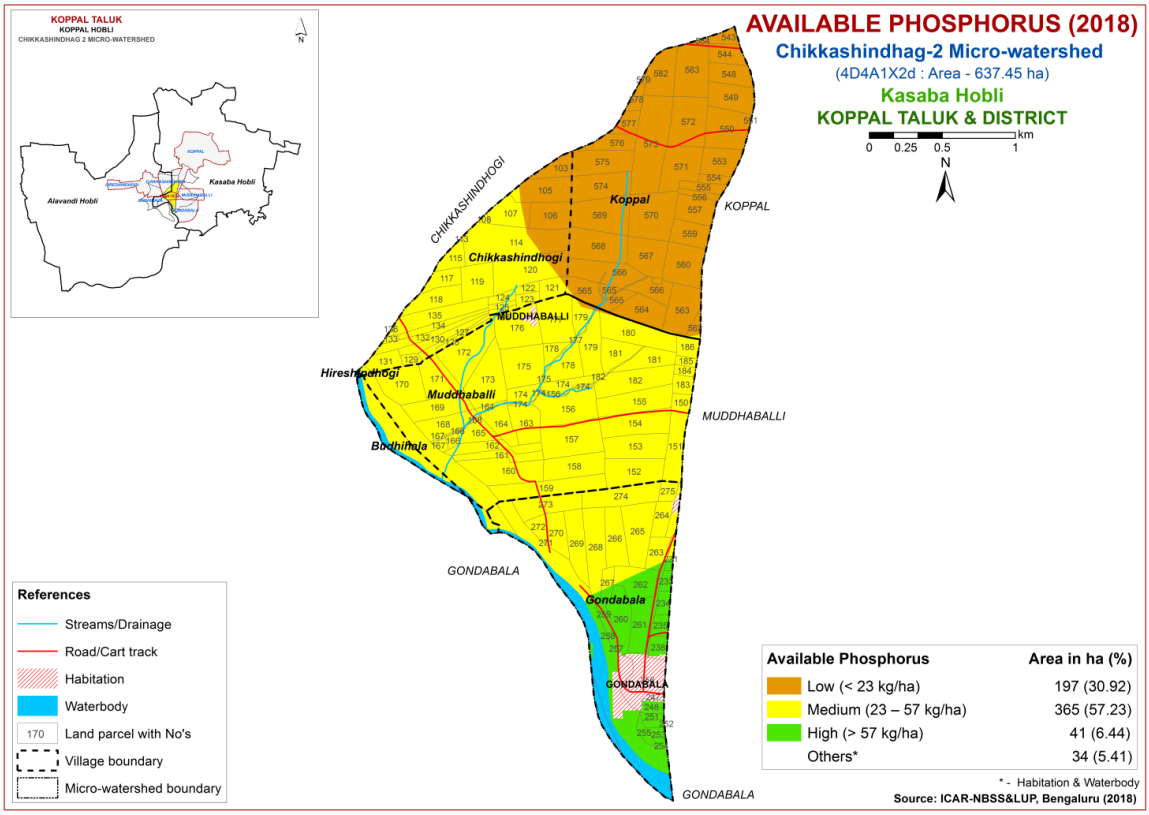


Fig.6.4 Soil Available Phosphorus map of Chikkashindhag-2 Microwatershed

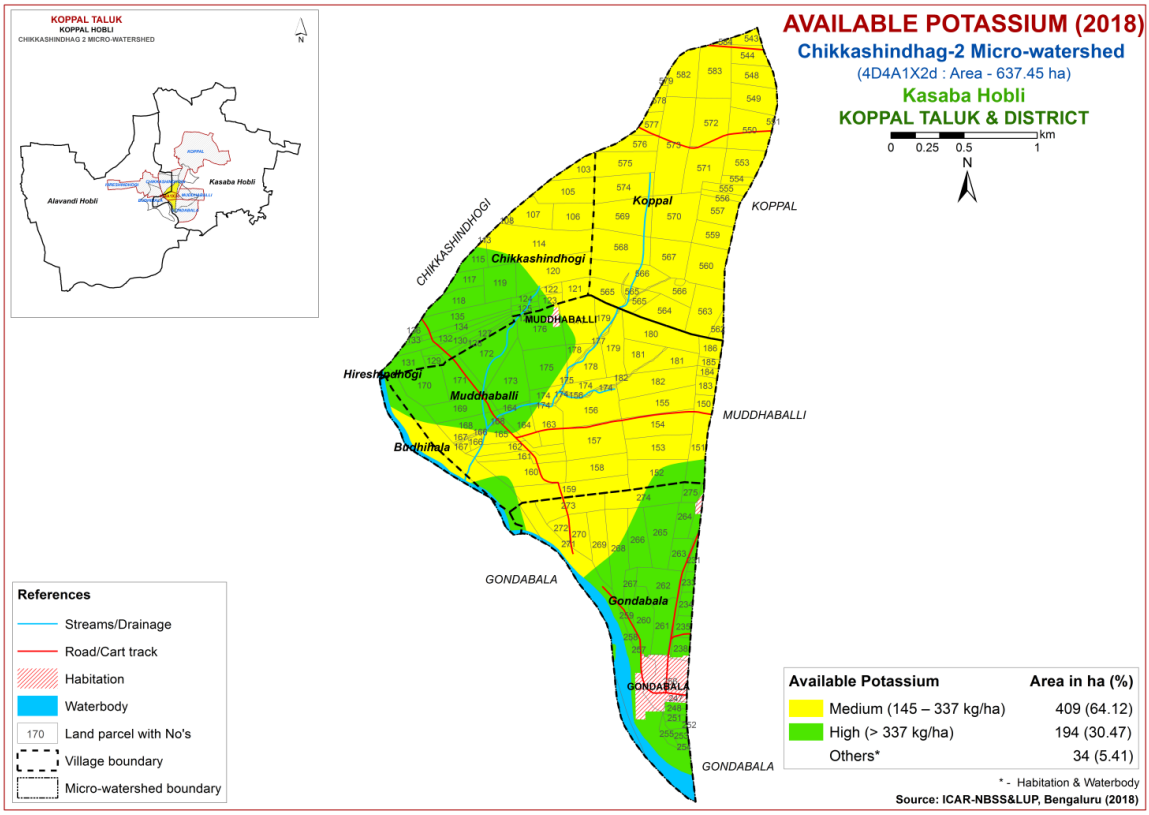


Fig.6.5 Soil Available Potassium map of Chikkashindhag-2 Microwatershed

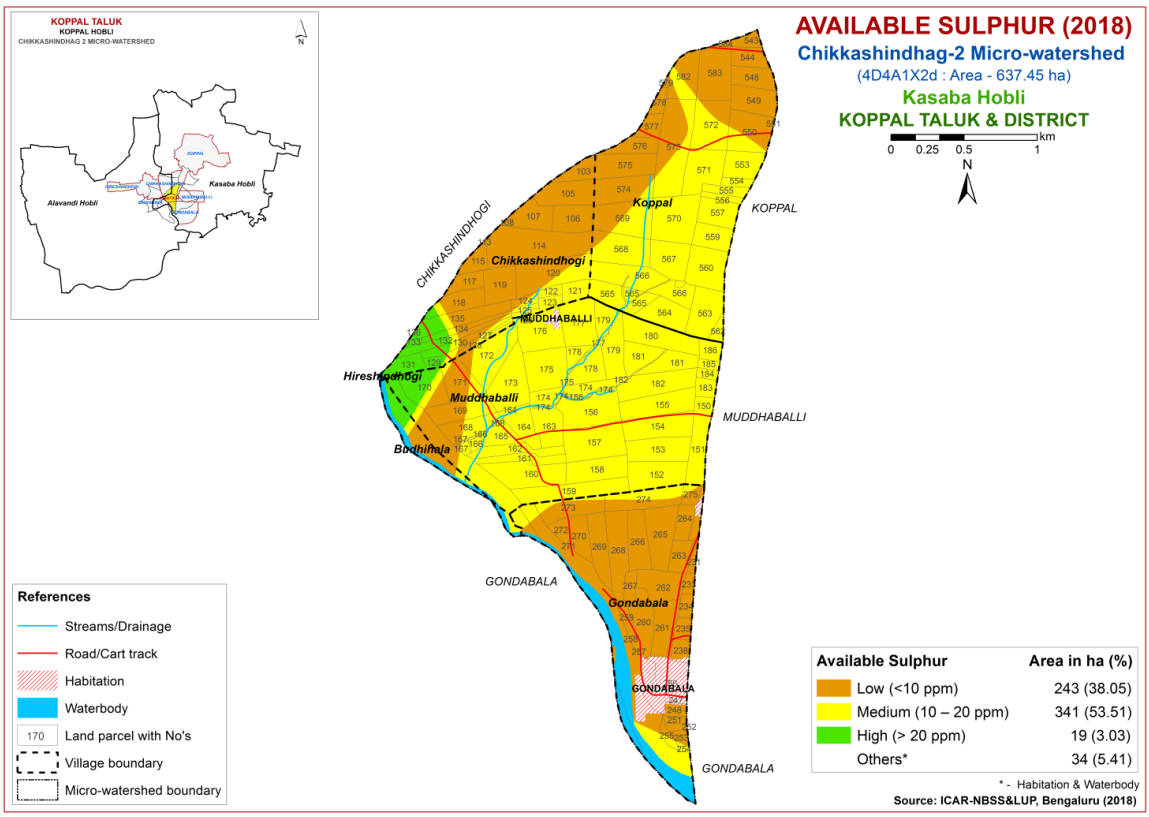


Fig.6.6 Soil Available Sulphur map of Chikkashindhag-2 Microwatershed

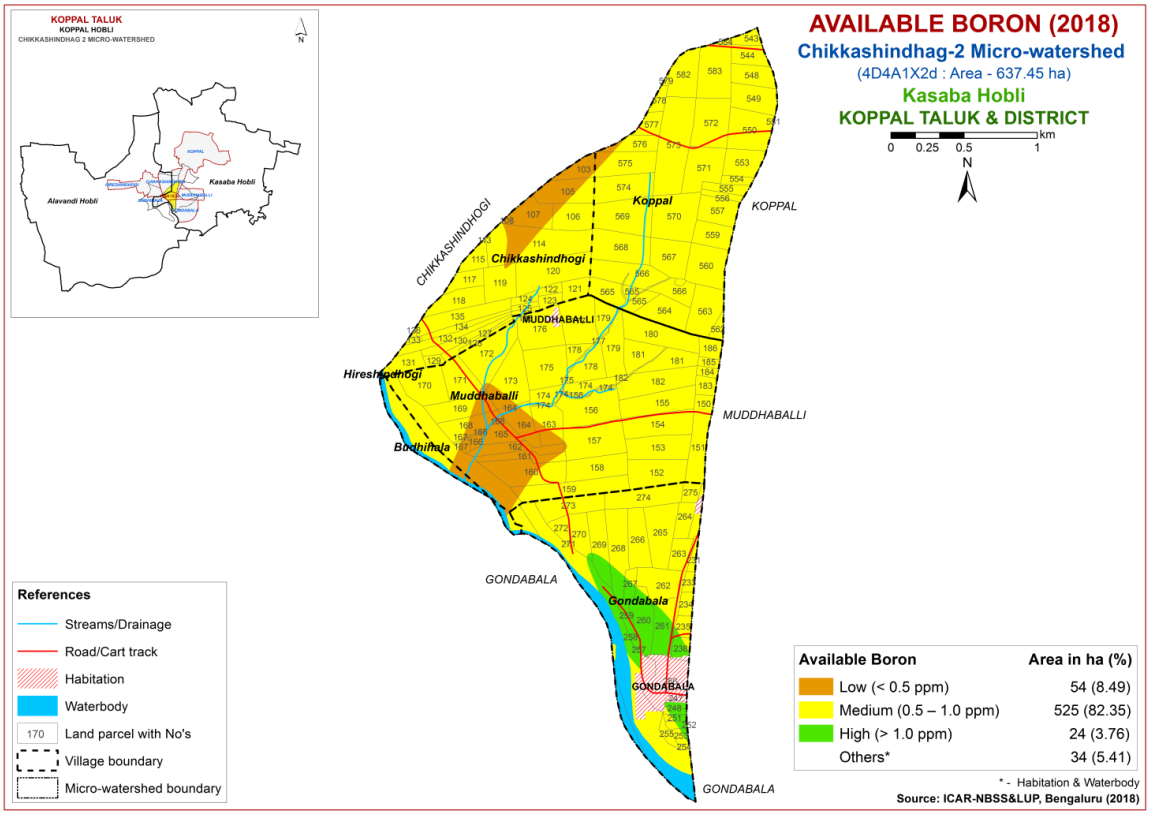


Fig.6.7 Soil Available Boron map of Chikkashindhag-2 Microwatershed

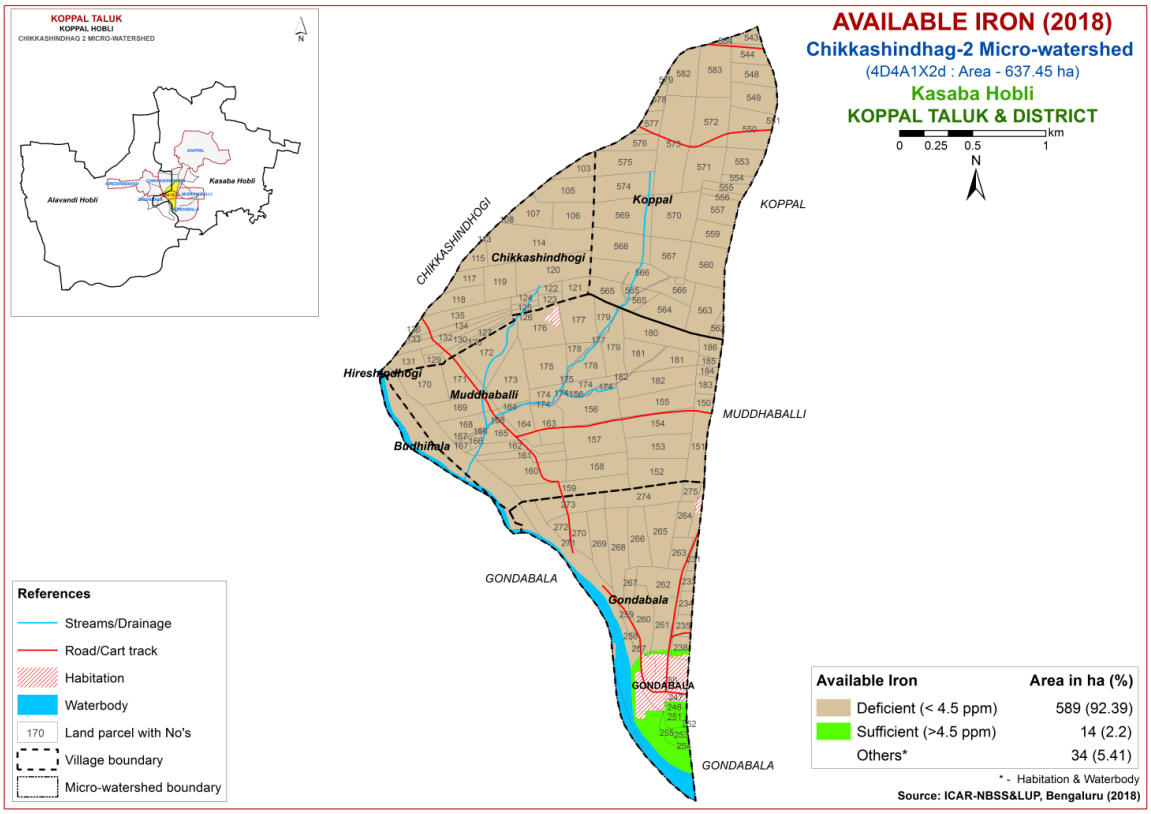


Fig.6.8 Soil Available Iron map of Chikkashindhag-2 Microwatershed

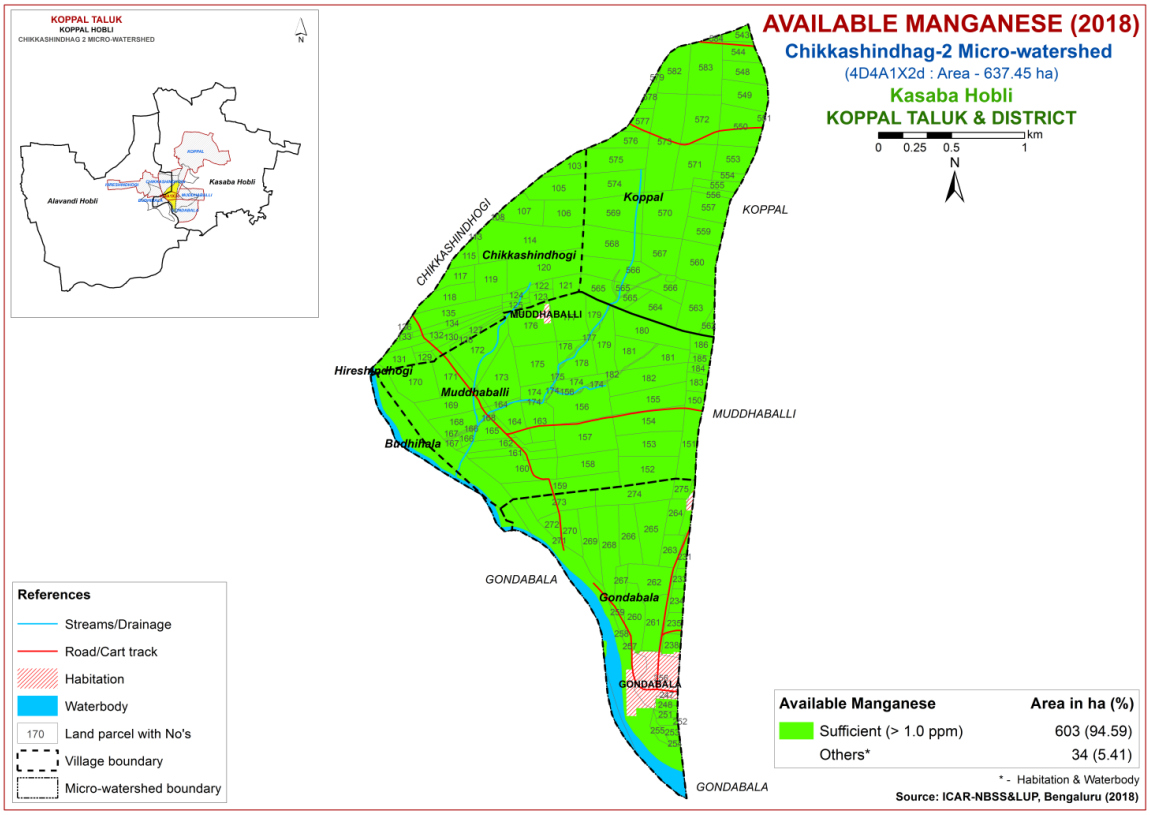


Fig.6.9 Soil Available Manganese map of Chikkashindhag-2 Microwatershed

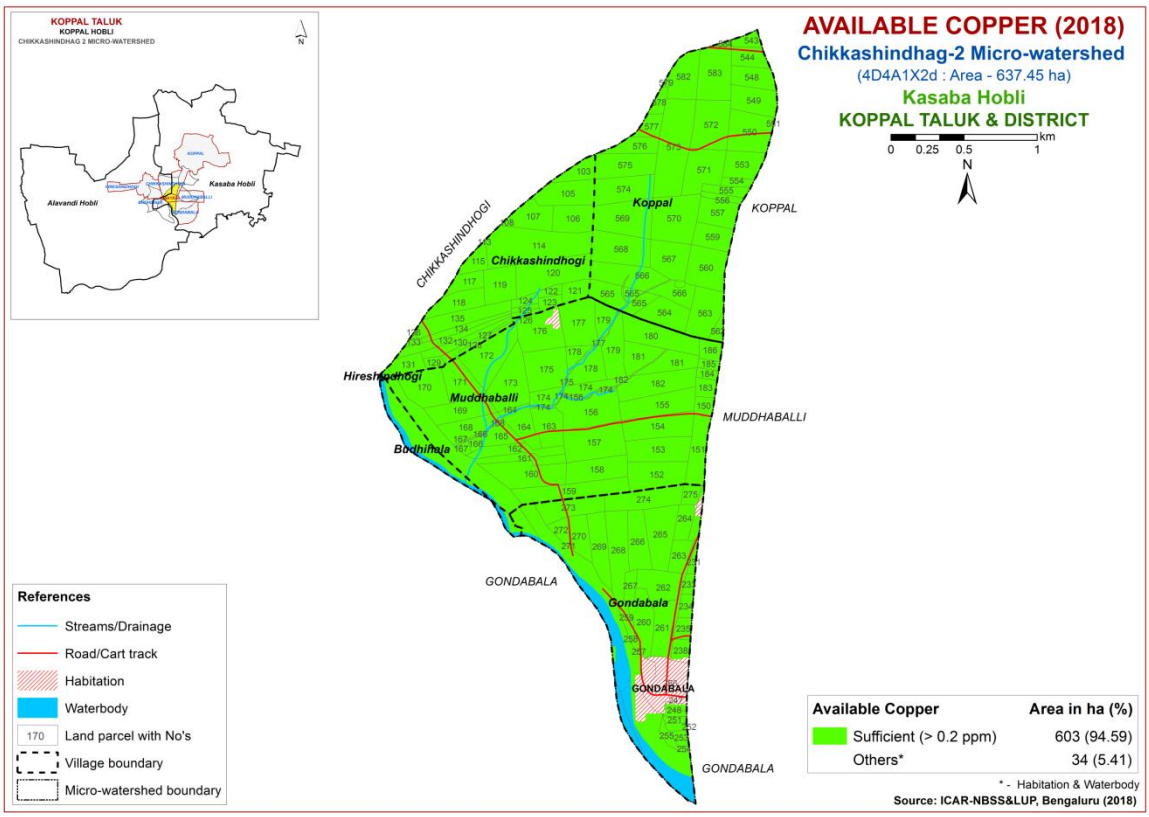


Fig.6.10 Soil Available Copper map of Chikkashindhag-2 Microwatershed

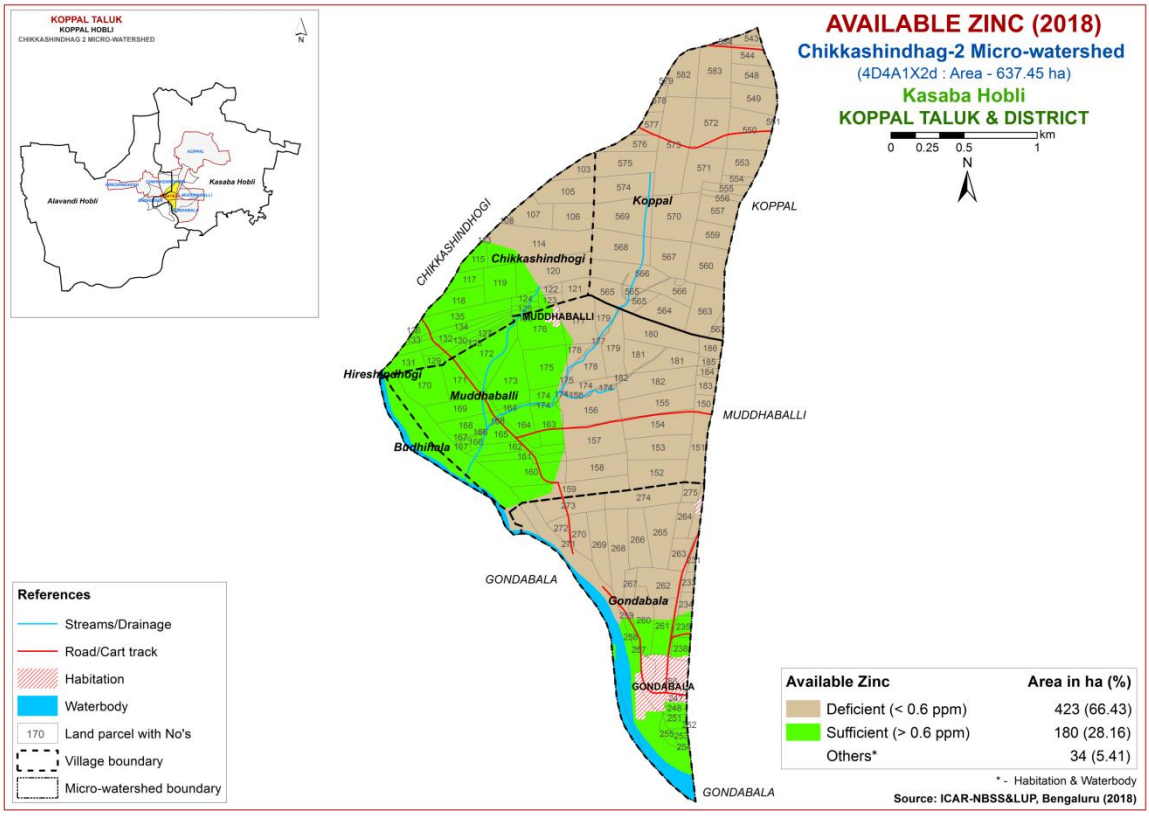


Fig.6.11 Soil Available Zinc map of Chikkashindhag-2 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Chikkashindhag-2 microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The soil and land characteristics were matched with the crop requirements to arrive at the crop suitability. The soil and land characteristics table (Table 7.1) were matched with the crop requirements (Tables 7.2-7.32) to arrive at the crop suitability and the criteria tables are given at the end of the chapter. In FAO land suitability classification, two orders are recognized. Order S- Suitable and Order N- Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1- Highly Suitable, Class S2- Moderately Suitable and Class S3- Marginally Suitable. Order N has two Classes, N1- Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 's' for sodium 'z' for calcareousness and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 31 major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

Highly suitable (Class S1) lands occupy an area of about 44 ha (7%) for growing sorghum and occur in the western and southern part of the microwatershed. Maximum

area of about 387 ha (61%) is moderately suitable (Class S2) for growing sorghum and distributed in all parts of the microwatershed with minor limitations of nutrient availability, calcareousness, rooting depth, texture and gravelliness. An area of about 173 ha (27%) is marginally suitable (Class S3) for growing sorghum and distributed in the western, eastern and southern part of the microwatershed. They have moderate limitations of calcareousness and rooting depth.

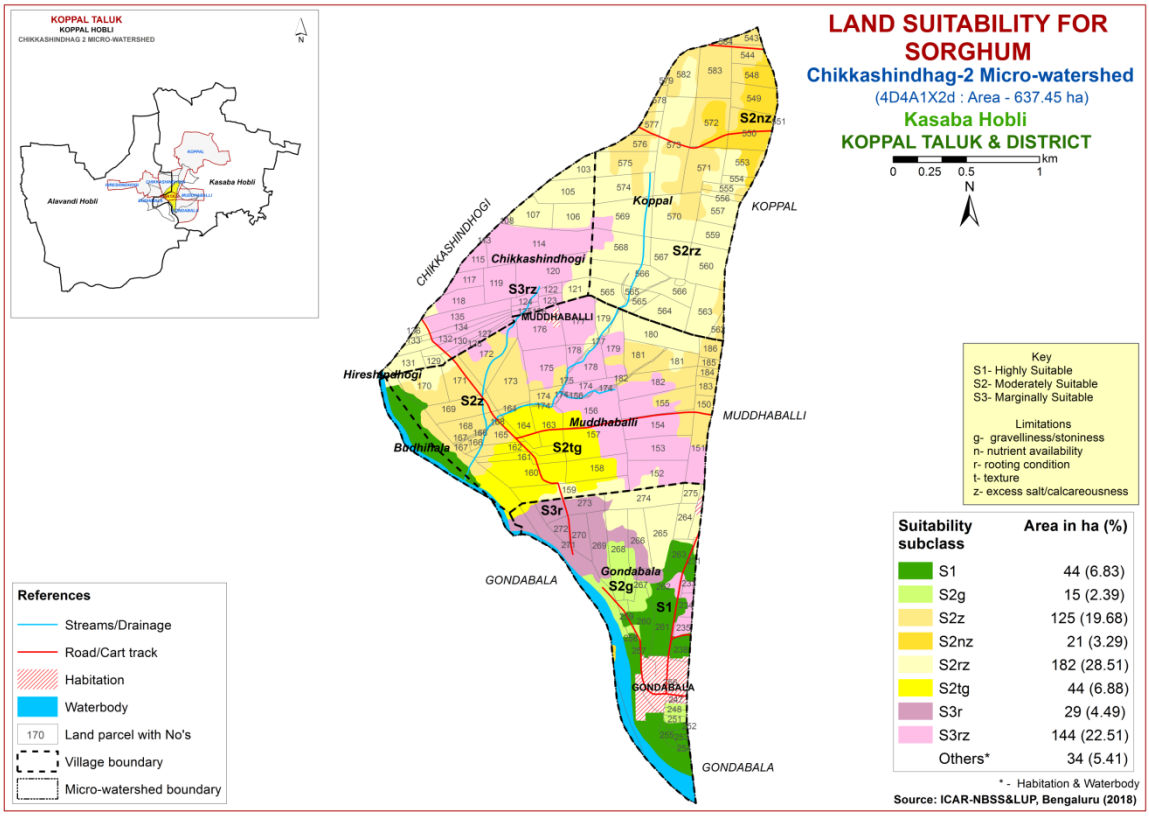


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

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

Highly suitable (Class S1) lands occupy an area of about 19 ha (3%) for growing Maize and occur in the southern part of the microwatershed. Maximum area of about 412 ha (65%) is moderately suitable (Class S2) for growing Maize and distributed in all parts of the microwatershed with minor limitations gravelliness, calcareousness and texture. An area of about 173 ha (27%) is marginally suitable (Class S3) for growing Maize and distributed in the western, central and southern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and texture.

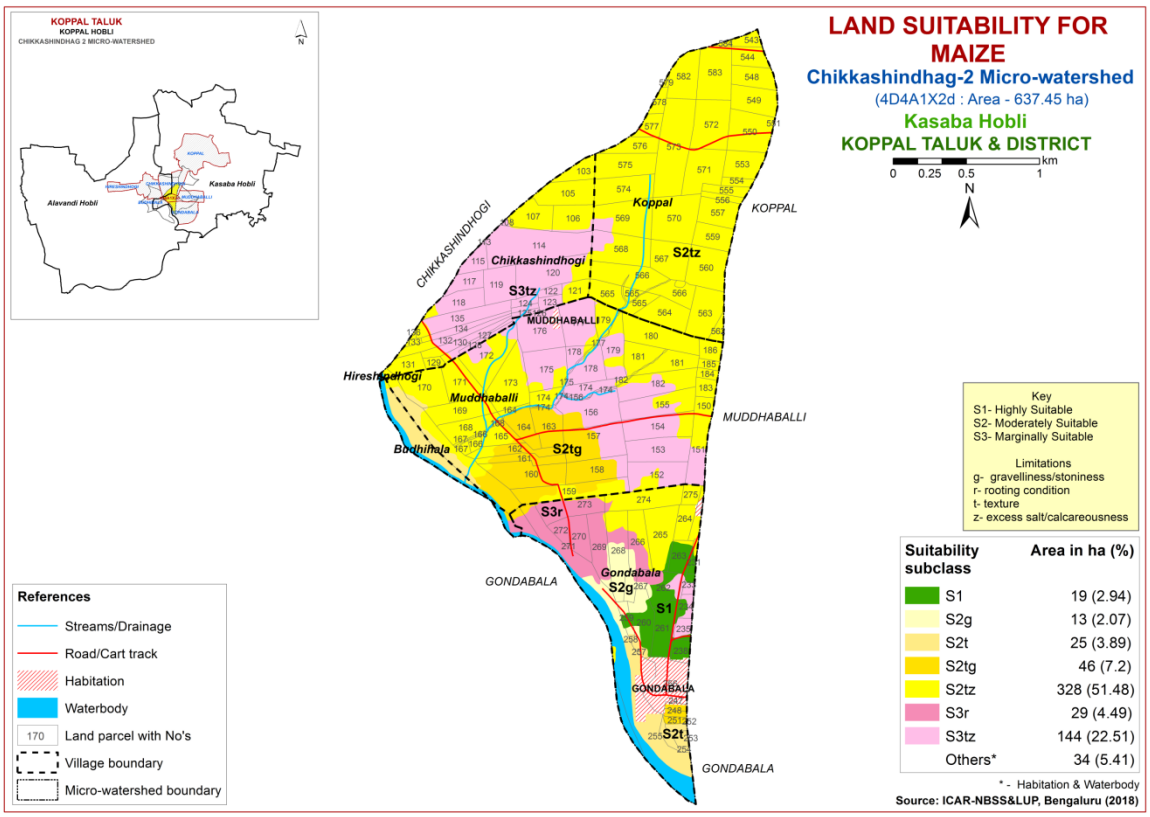


Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

An area of about 91 ha (14%) is highly suitable (Class S1) lands for growing Bajra and distributed in the southwestern and southern part of the microwatershed. Maximum area of about 328 ha (51%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of texture and calcareousness. Marginally suitable (Class S3) lands cover an area of about 185 ha (29%) and distributed in the western, central, eastern and southern part of the microwatershed. They have moderate limitations of texture, calcareousness and rooting depth.

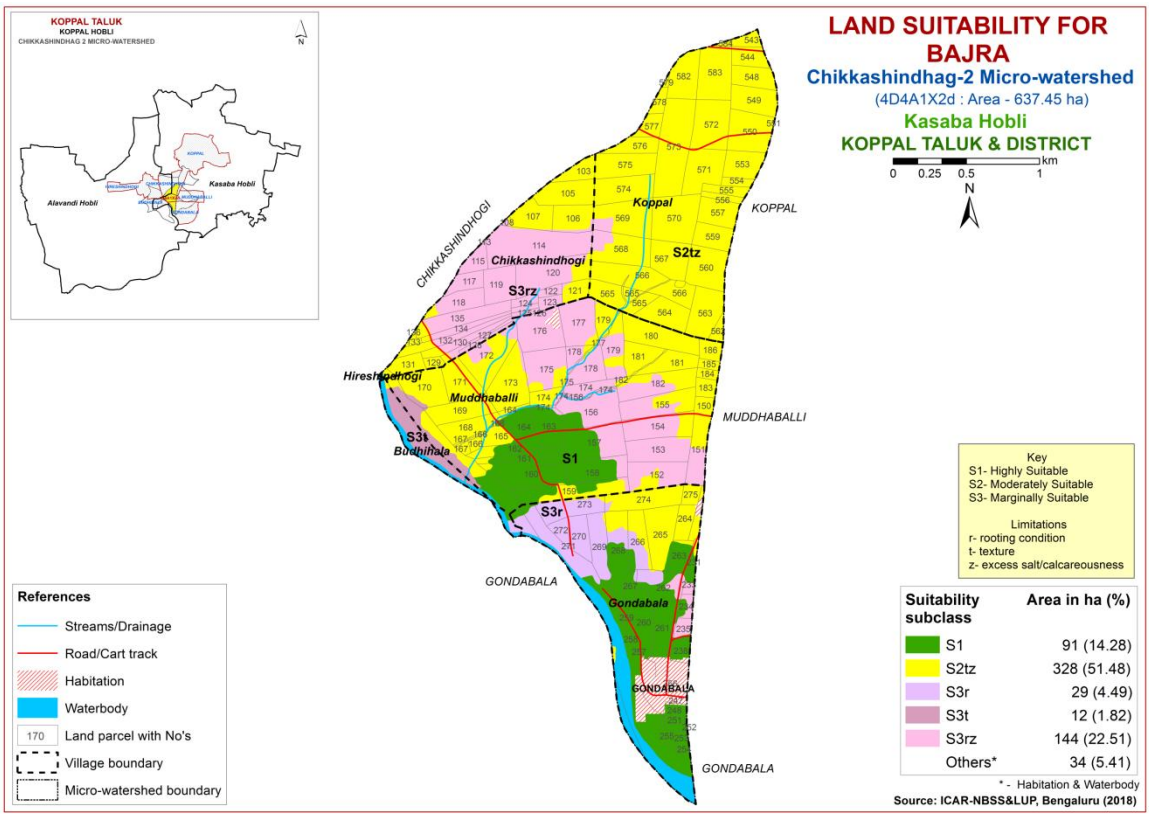


Fig. 7.3 Land Suitability map of Bajra

7.4 Land Suitability for Groundnut (*Arachis hypogaea*)

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

An area of about 32 ha (5%) is highly suitable (Class S1) for growing Groundnut and distributed in the southern part of the microwatershed. An area of about 59 ha (9%) is moderately suitable (Class S2) for growing Groundnut and distributed in the southwestern and southern part of the microwatershed with minor limitation of texture. Marginally suitable (Class S3) lands cover a maximum area of about 513 ha (81%) and occur in all parts of the microwatershed with major limitations of rooting depth, texture and calcareousness.

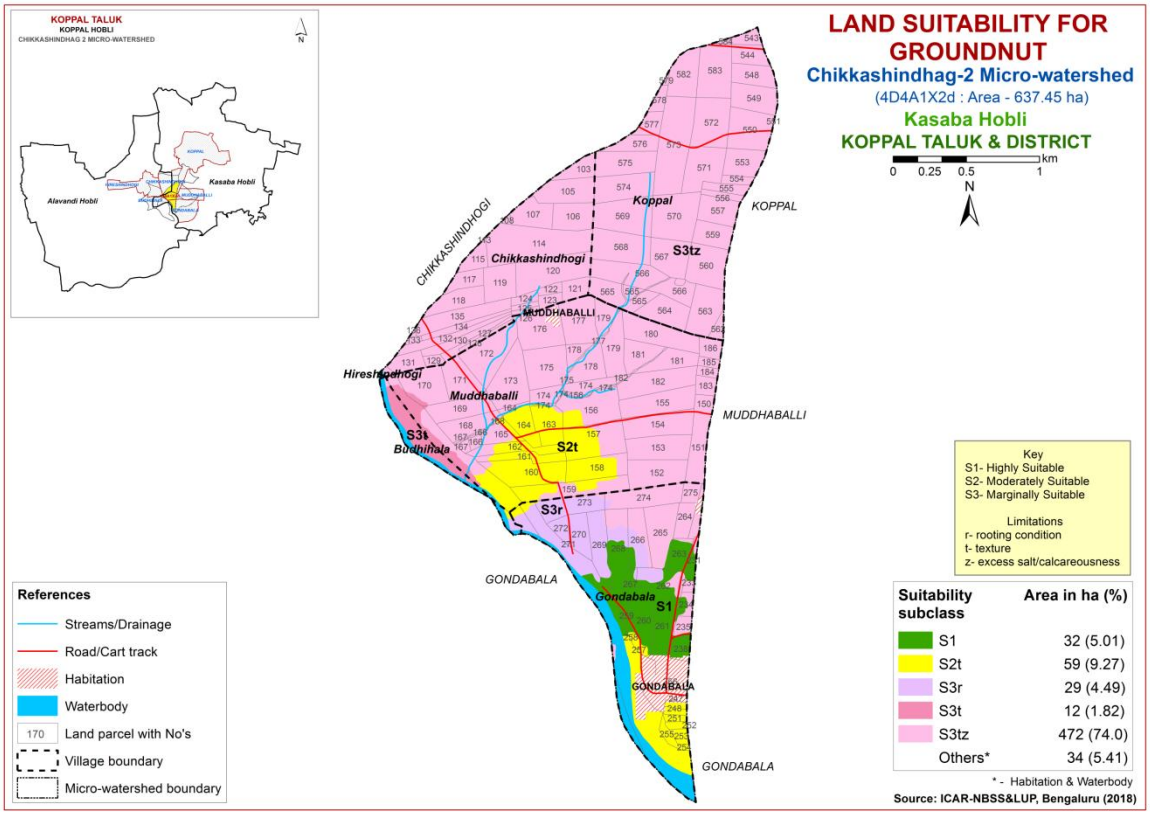


Fig. 7.4 Land Suitability map of Groundnut

7.5 Land Suitability for Sunflower (*Helianthus annus*)

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

An area of about 30 ha (5%) is highly suitable (Class S1) lands for growing Sunflower and distributed in the western and southern part of the microwatershed. Maximum area of about 218 ha (34%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, calcareousness and gravelliness. Marginally suitable (Class S3) lands cover an area of about 182 ha (29%) and distributed in the northern, western, eastern and southern part of the microwatershed. They have moderate limitations of rooting depth and calcareousness. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Sunflower and are distributed in the western, central, eastern and southern part of the microwatershed with severe limitations of calcareousness and rooting depth.

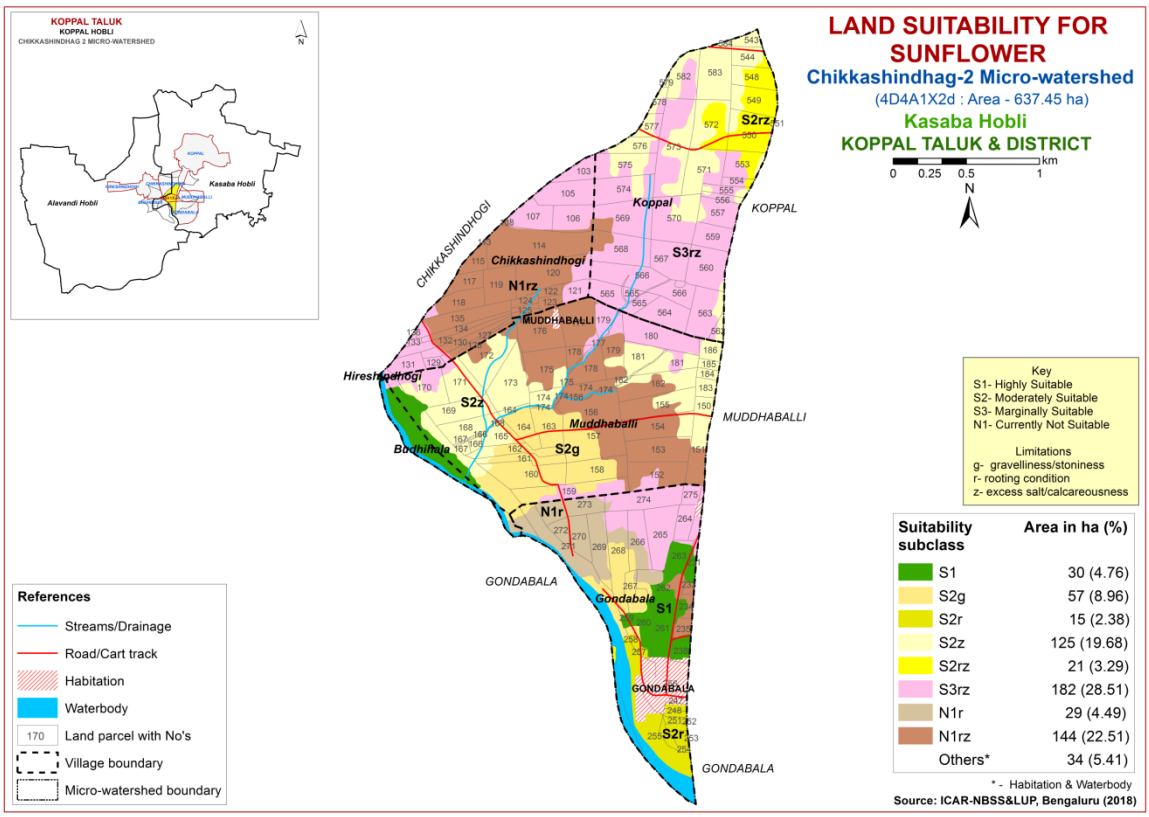


Fig. 7.5 Land Suitability map of Sunflower

7.6 Land Suitability for Redgram (*Cajanus cajan*)

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

An area of about 19 ha (3%) is highly suitable (Class S1) lands for growing Redgram and distributed in the southern part of the microwatershed. Maximum area of about 209 ha (33%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of texture, calcareousness, rooting depth and gravelliness. Marginally suitable (Class S3) lands cover an area of about 203 ha (32%) and distributed in the northern, eastern, western and southern part of the microwatershed. They have moderate limitations of calcareousness and rooting depth. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Redgram and are distributed in the western, central, eastern and southern part of the microwatershed with severe limitations of rooting depth and calcareousness.

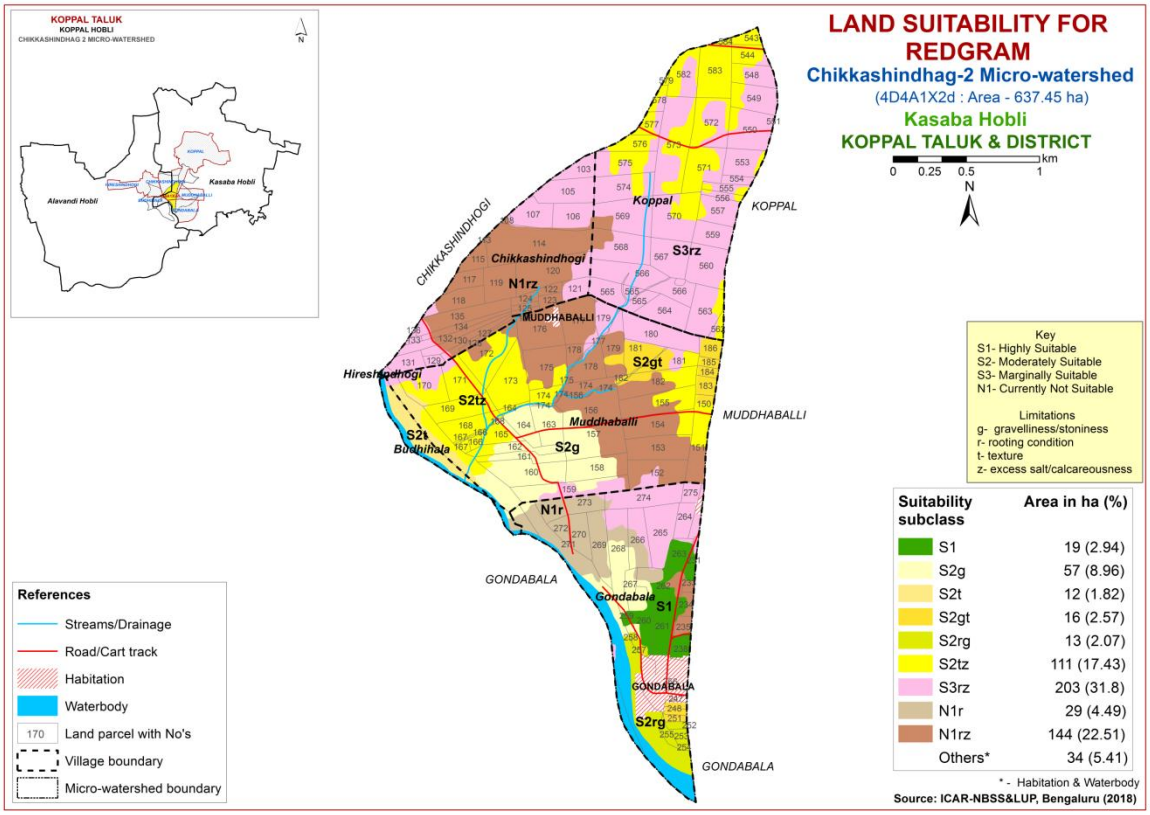


Fig. 7.6 Land Suitability map of Redgram

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

Bengal gram is one of the major pulse crop grown in an area of 9.39 lakh ha in northern Karnataka in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad and Bell ary districts. The crop requirements for growing Bengal gram (Table 7.8) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing Bengal gram was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.7.

Highly suitable (Class S1) lands occupy an area of about 12 ha (2%) for growing Bengal gram and occur in the western part of the microwatershed. Maximum area of about 419 ha (66%) is moderately suitable (Class S2) for growing Bengal gram and distributed in all parts of the microwatershed with minor limitations of rooting depth, calcareousness, texture and gravelliness. An area of about 173 ha (27%) is marginally suitable (Class S3) for growing Bengal gram and distributed in the western, eastern, central and southern part of the microwatershed. They have moderate limitations of calcareousness and rooting depth.

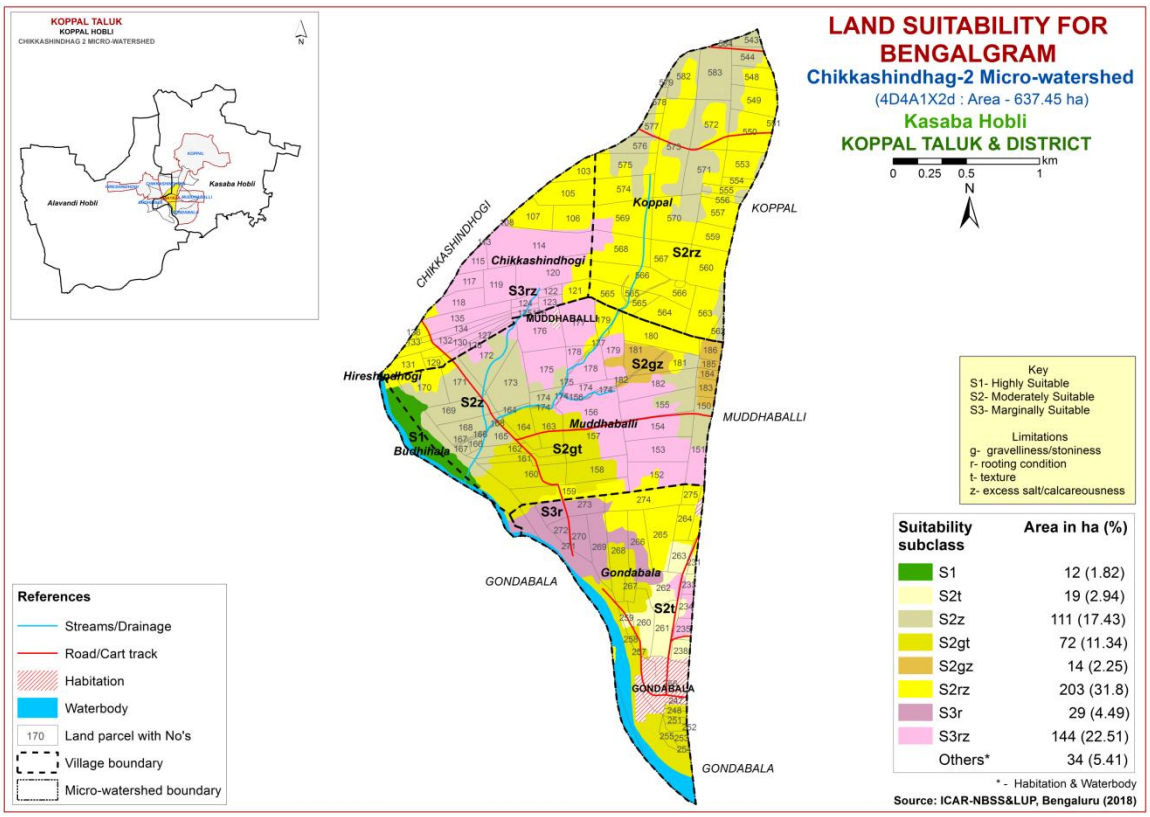


Fig. 7.7 Land Suitability map of Bengal gram

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

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

Highly suitable (Class S1) lands occupy an area of about 12 ha (2%) for growing Cotton and occur in the western part of the microwatershed. Maximum area of about 419 ha (66%) is moderately suitable (Class S2) for growing Cotton and distributed in all parts of the microwatershed with minor limitations of rooting depth, calcareousness, texture and gravelliness. An area of about 173 ha (27%) is marginally suitable (Class S3) for growing Cotton and distributed in the western, eastern, central and southern part of the microwatershed. They have moderate limitations of calcareousness and rooting depth.

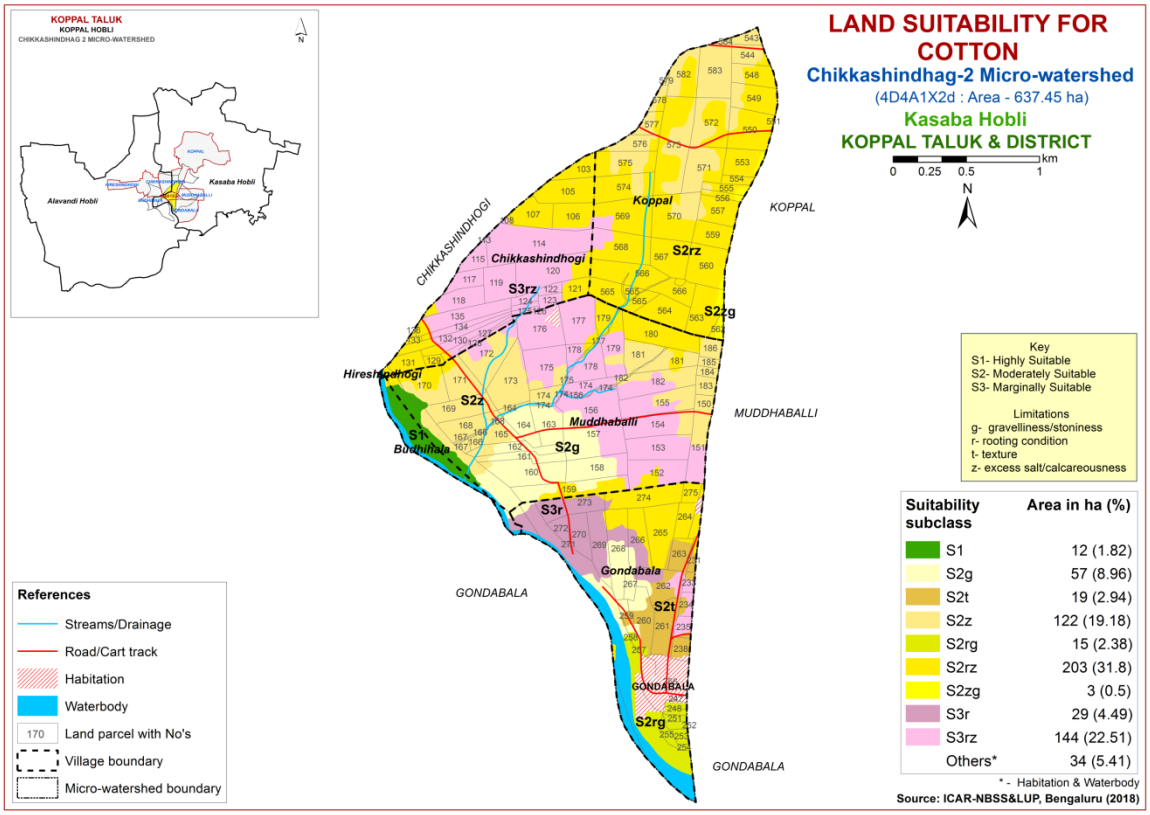


Fig. 7.8 Land Suitability map of Cotton

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

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

An area of about 32 ha (5%) is highly suitable (Class S1) for growing Chilli and distributed in the southern part of the microwatershed. An area of about 59 ha (9%) is moderately suitable (Class S2) for growing Chilli and distributed in the southwestern and southern part of the microwatershed with minor limitation of gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 513 ha (81%) and occur in all parts of the microwatershed with major limitations of rooting depth, texture and calcareousness.

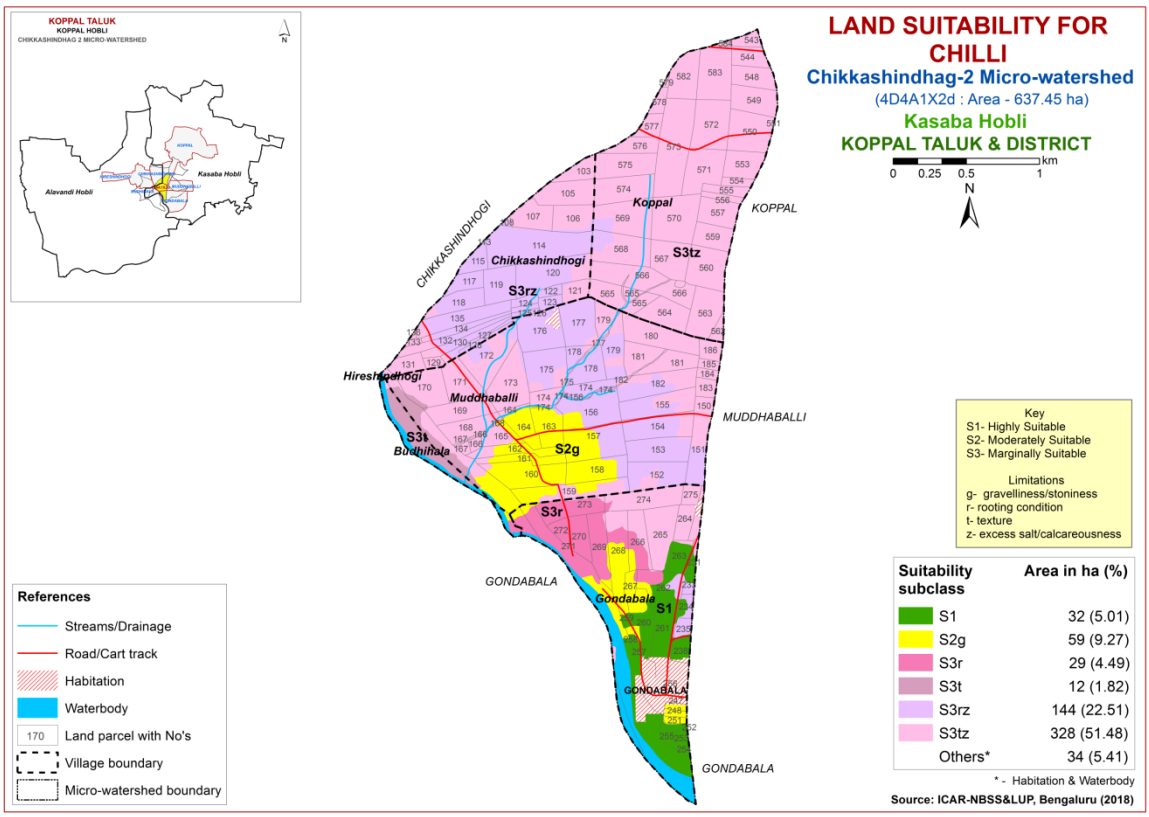


Fig. 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato (*Solanum lycopersicum*)

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

An area of about 32 ha (5%) is highly suitable (Class S1) for growing Tomato and distributed in the southern part of the microwatershed. An area of about 59 ha (9%) is moderately suitable (Class S2) for growing Tomato and distributed in the southwestern and southern part of the microwatershed with minor limitation of gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 513 ha (81%) and occur in all parts of the microwatershed with major limitations of rooting depth, texture and calcareousness.

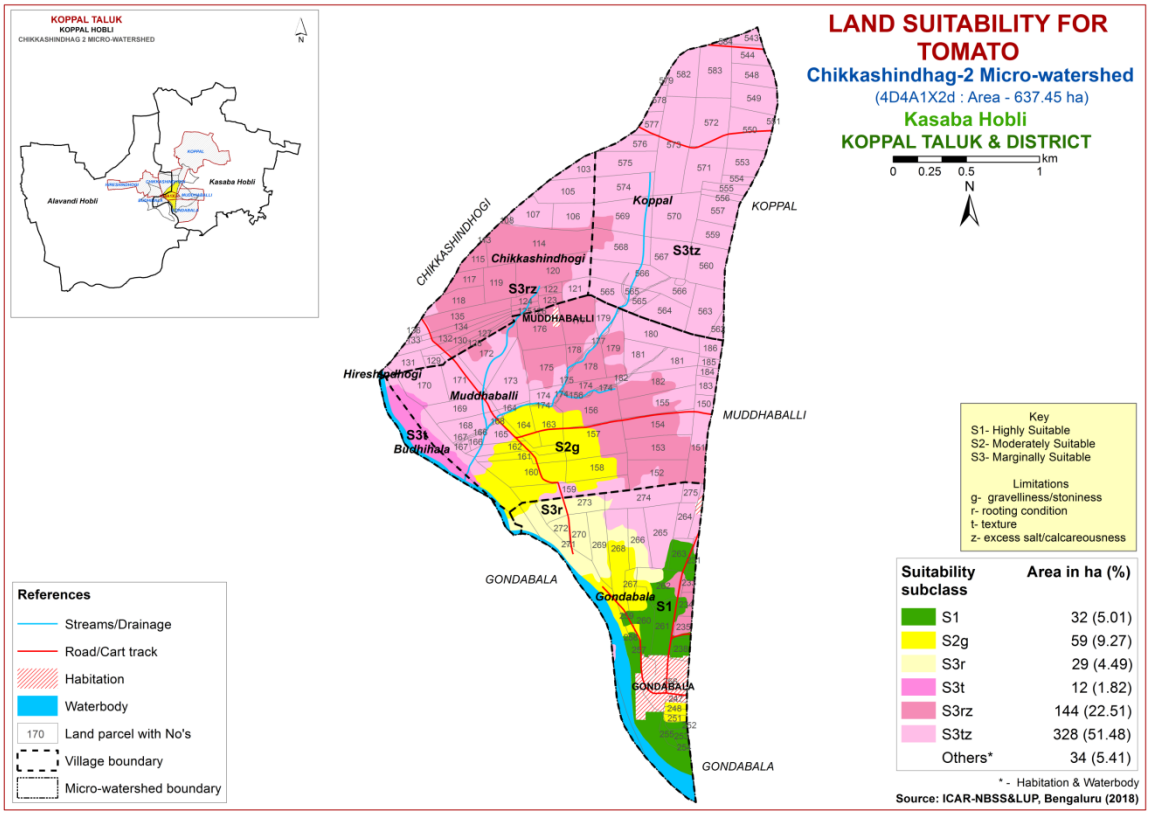


Fig. 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Brinjal (*Solanum melongena*)

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

Highly suitable (Class S1) lands for growing Brinjal in an area of 59 ha (9%) and distributed in the southwestern and southern part of the microwatershed. Maximum area of about 372 ha (59%) is moderately suitable (Class S2) for growing Brinjal and distributed in all parts of the microwatershed with minor limitations of texture, calcareousness and rooting depth. Marginally suitable (Class S3) lands cover an area of about 172 ha (27%) and occur in the western, eastern, central and southern part of the microwatershed with major limitation of rooting depth.

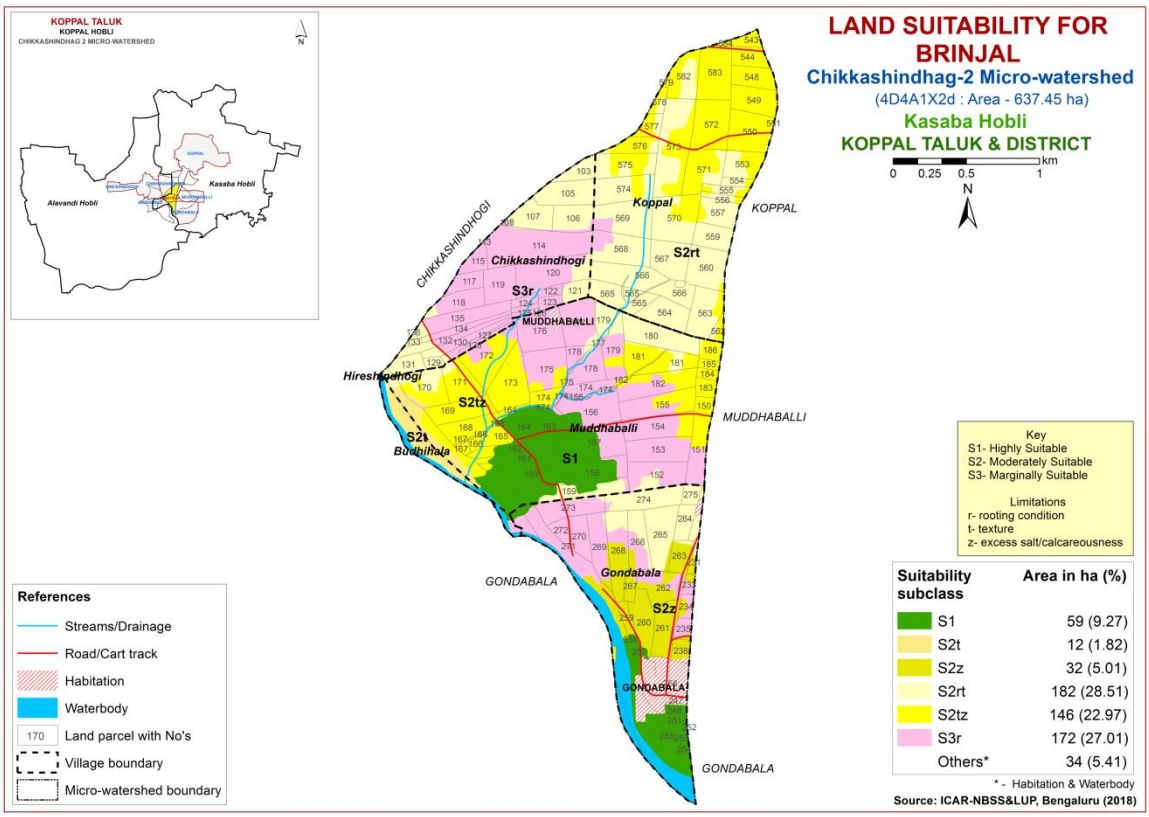


Fig 7.11 Land Suitability map of Brinjal

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

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

No highly suitable (Class S1) lands for growing Onion in the microwatershed. An area of about 91 ha (14%) is moderately suitable (Class S2) for growing Onion and distributed in the southwestern and southern part of the microwatershed with minor limitations of texture and rooting depth. Marginally suitable (Class S3) lands cover a maximum area of about 513 ha (81%) and occur in all parts of the microwatershed with major limitations of texture, calcareousness and rooting depth.

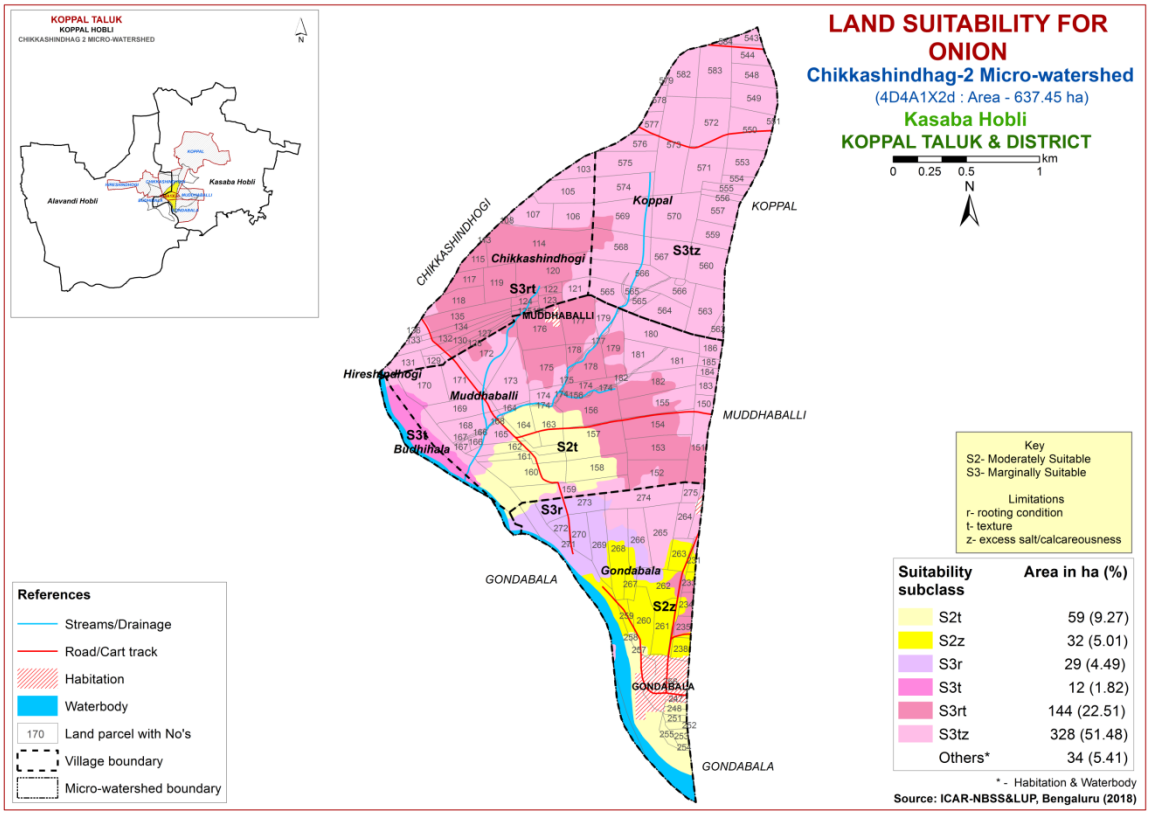


Fig 7.12 Land Suitability map of Onion

7.13 Land Suitability for Bhendi (*Abelmoschus esculentus*)

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

No highly suitable (Class S1) lands for growing Bhendi in the microwatershed. Maximum area of about 431 ha (68%) is moderately suitable (Class S2) for growing Bhendi and distributed in all parts of the microwatershed with minor limitations of texture, rooting depth and calcareousness. Marginally suitable (Class S3) lands cover an area of about 172 ha (27%) and occur in the western, eastern, central and southern part of the microwatershed with major limitation of rooting depth.

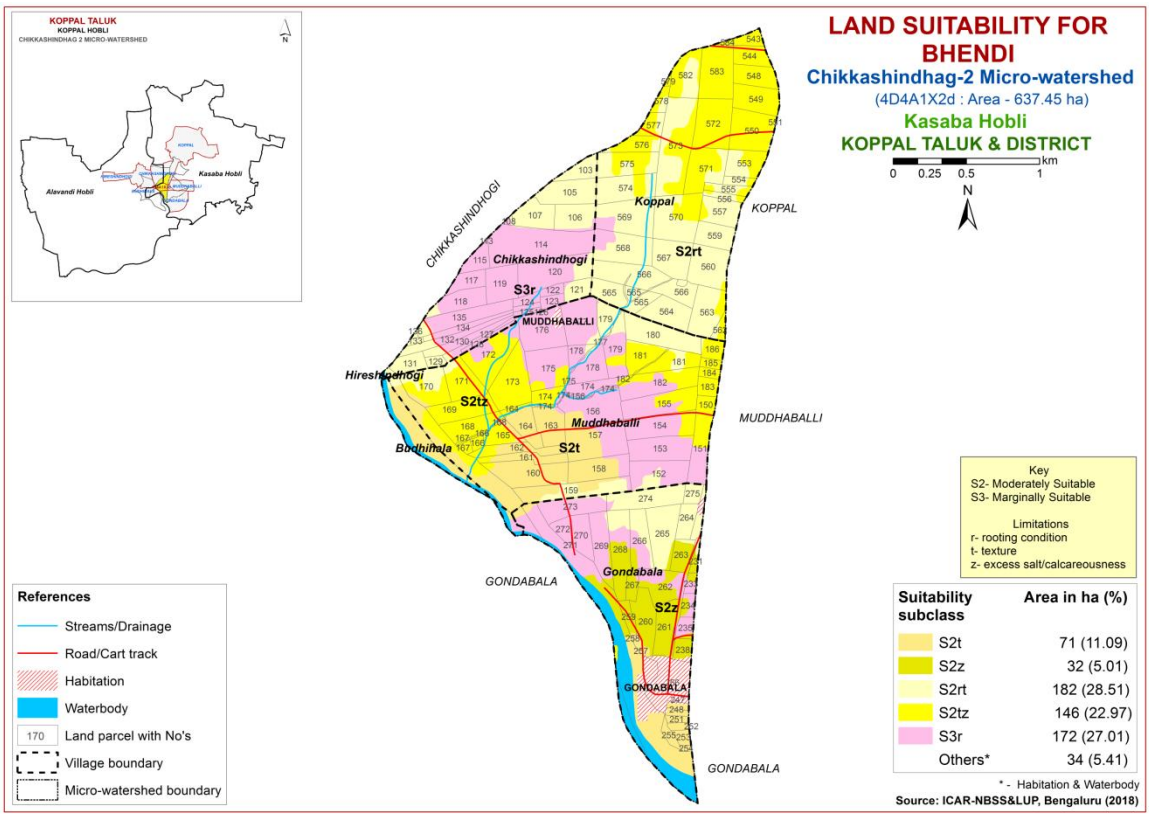


Fig 7.13 Land Suitability map of Bhendi

7.14 Land Suitability for Drumstick (*Moringa oleifera)*

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

An area of about 63 ha (10%) is highly suitable (Class S1) lands for growing Drumstick and distributed in the southwestern and southern part of the microwatershed. Maximum area of about 186 ha (29%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, texture, calcareousness and gravelliness. Marginally suitable (Class S3) lands cover an area of about 182 ha (29%) and distributed in the northern, western, eastern and southern part of the microwatershed. They have moderate limitations of rooting depth and calcareousness. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Drumstick and are distributed in the western, central, eastern and southern part of the microwatershed with severe limitations of calcareousness and rooting depth.

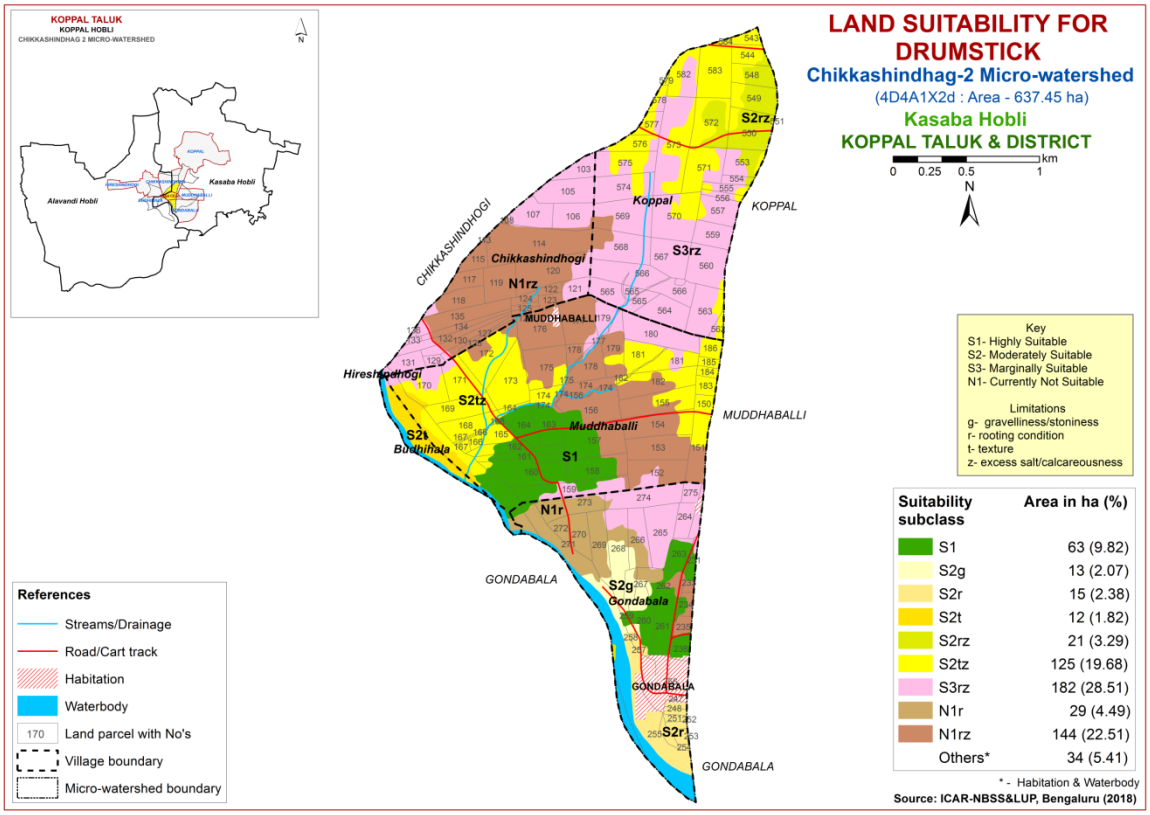


Fig. 7.14 Land Suitability map of Drumstick

7.15 Land Suitability for Mango (*Mangifera indica*)

Mango is one of the most important fruit crop grown in about 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 are given in Figure 7.15.

No highly suitable (Class S1) lands for growing Mango in the microwatershed. An area of about 108 ha (17%) is moderately suitable (Class S2) and distributed in the eastern, western and southern part of the microwatershed with minor limitations of rooting depth, gravelliness and calcareousness. Marginally suitable (Class S3) lands cover an area of about 142 ha (22%) and distributed in the northern, western and southern part of the microwatershed. They have moderate limitations of texture, rooting depth, calcareousness and gravelliness. Maximum area of about 355 ha (56%) is currently not suitable (Class N1) for growing Mango and are distributed in all parts of the microwatershed with severe limitations of rooting depth, texture and calcareousness.

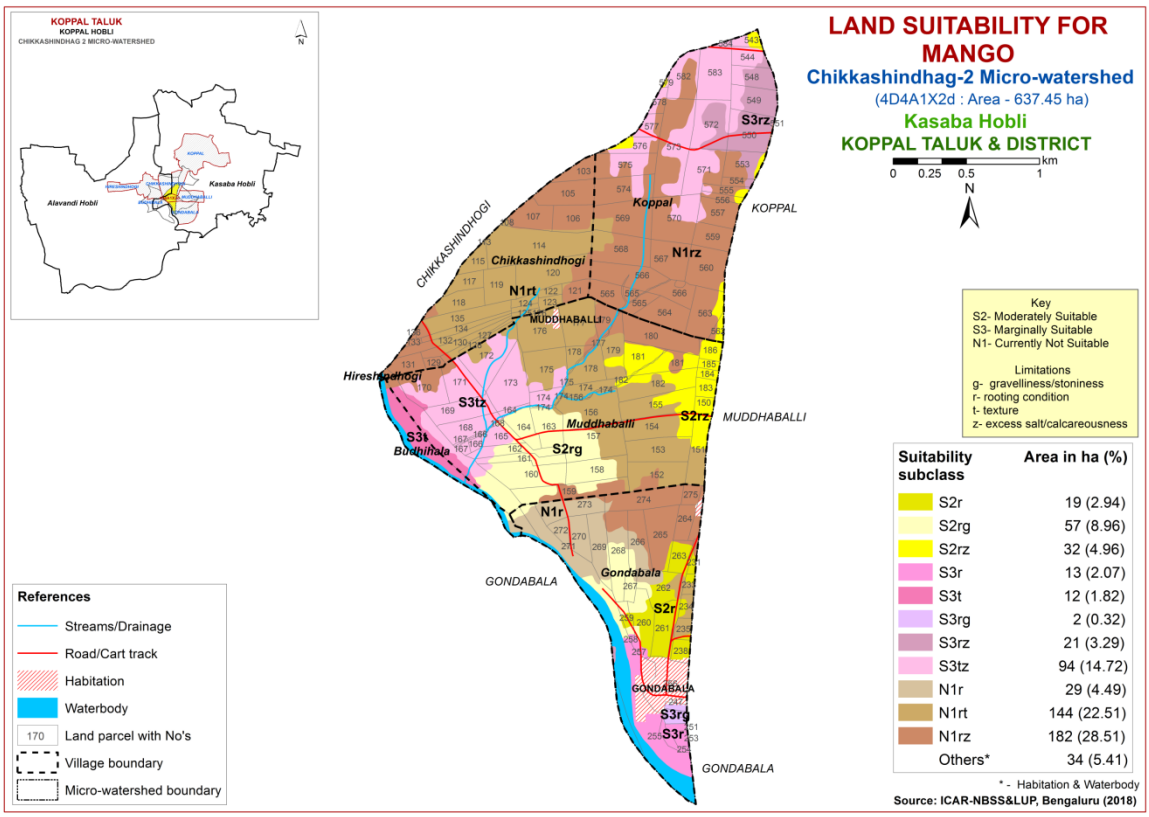


Fig. 7.15 Land Suitability map of Mango

7.16 Land Suitability for Guava (*Psidium guajava*)

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

An area of about 19 ha (3%) is highly suitable (Class S1) lands for growing Guava and distributed in the southern part of the microwatershed. An area of about 72 ha (11%) is moderately suitable (Class S2) and distributed in the southwestern and southern part of the microwatershed with minor limitations of texture, rooting depth and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 340 ha (53%) and distributed in all parts of the microwatershed. They have moderate limitations of calcareousness and texture. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Guava and are distributed in the western, central, eastern and southern part of the microwatershed with severe limitations of rooting depth and texture.

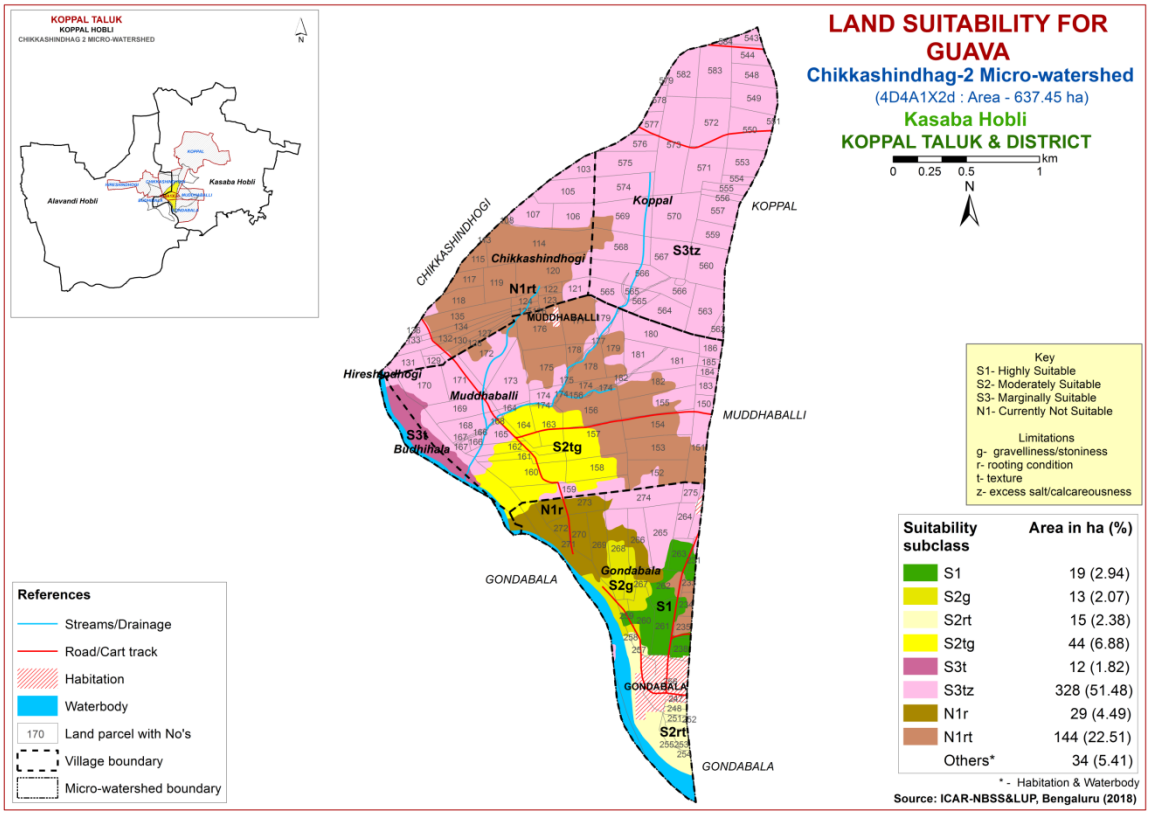


Fig. 7.16 Land Suitability map of Guava

7.17 Land Suitability for Sapota (*Manilkara zapota*)

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

An area of about 19 ha (3%) is highly suitable (Class S1) lands for growing Sapota and distributed in the southern part of the microwatershed. An area of about 72 ha (11%) is moderately suitable (Class S2) and distributed in the southwestern and southern part of the microwatershed with minor limitations of rooting depth and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 340 ha (54%) and distributed in all parts of the microwatershed. They have moderate limitations of rooting depth, calcareousness and texture. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Sapota and are distributed in the western, central, eastern and southern part of the microwatershed with severe limitations of rooting depth and calcareousness.

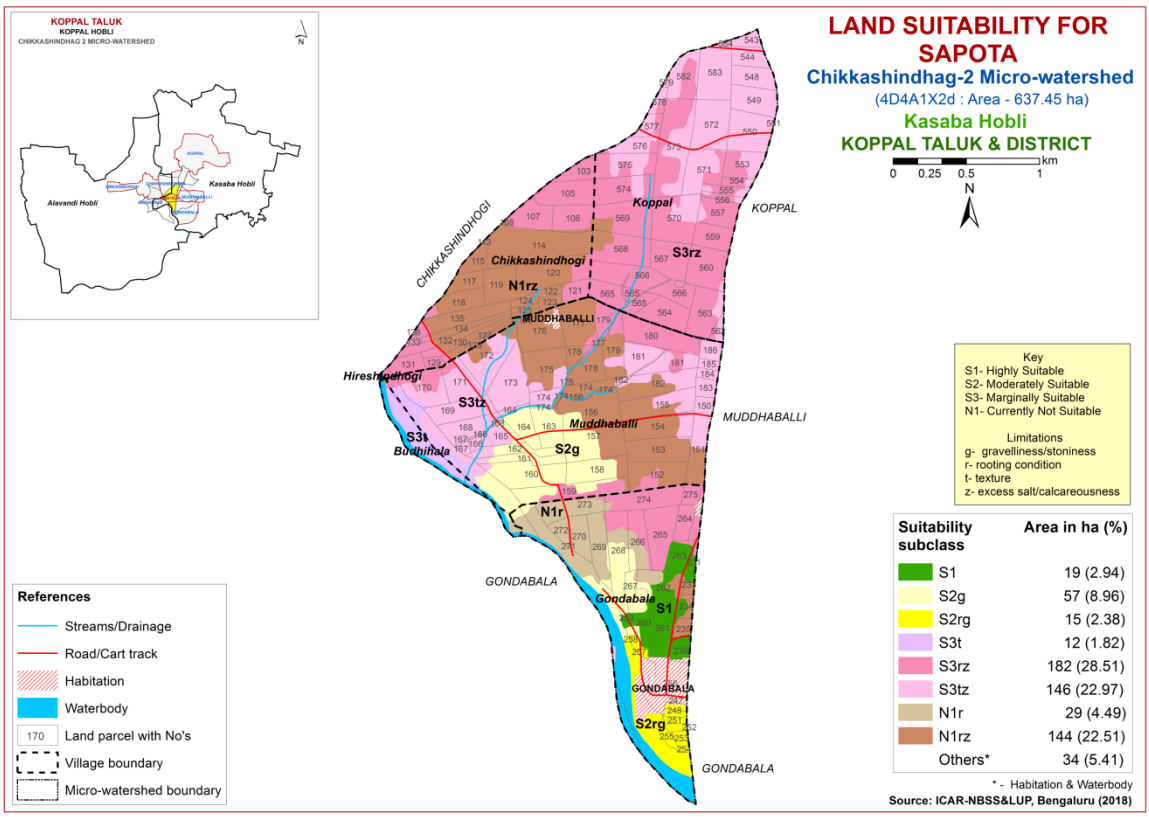


Fig. 7.17 Land Suitability map of Sapota

7.18 Land Suitability for Pomegranate (*Punica granatum*)

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

An area of about 19 ha (3%) is highly suitable (Class S1) lands for growing Pomegranate and distributed in the southern part of the microwatershed. Maximum area of about 230 ha (36%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of texture, calcareousness, rooting depth and gravelliness. Marginally suitable (Class S3) lands cover an area of about 182 ha (29%) and distributed in the northern, eastern, western and southern part of the microwatershed. They have moderate limitations of calcareousness and rooting depth. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Pomegranate and are distributed in the western, central, eastern and southern part of the microwatershed with severe limitations of rooting depth and calcareousness.

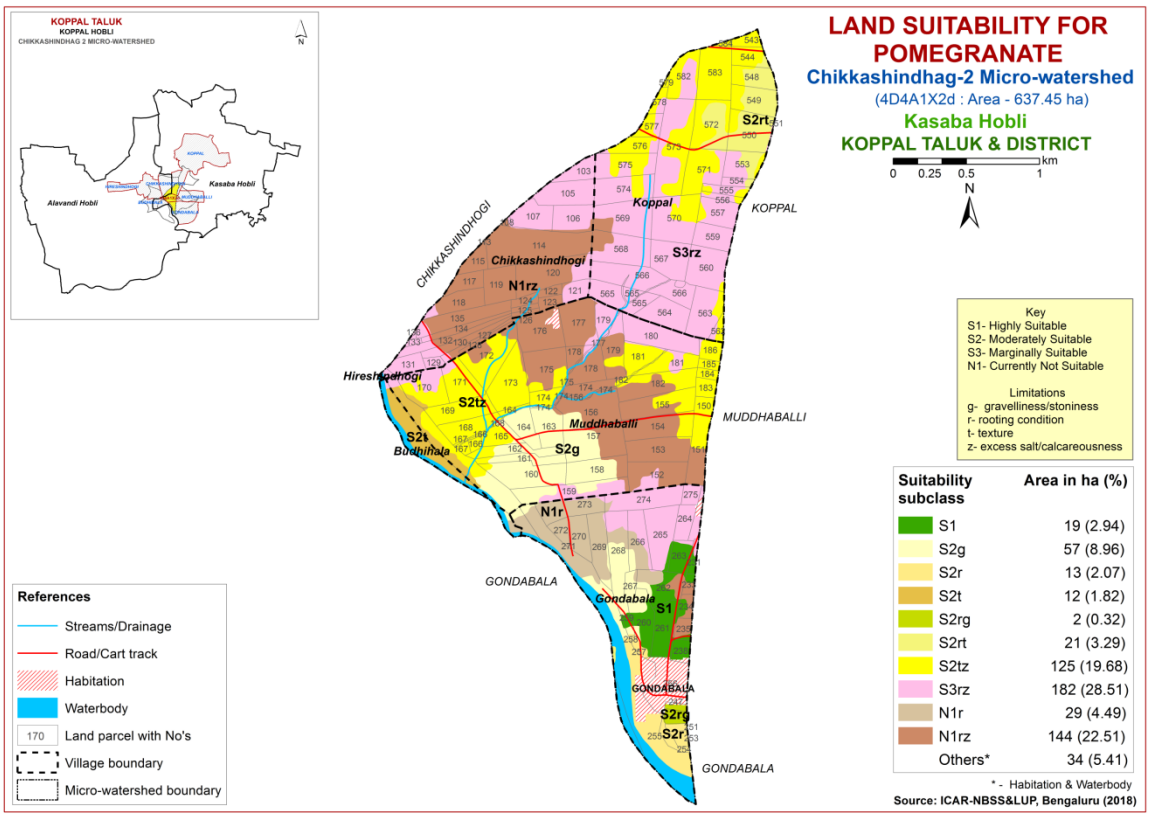


Fig. 7.18 Land Suitability map of Pomegranate

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the most important fruit crop grown in an area of 5446 ha in almost all the districts of the state. The crop requirements (Table 7.20) for growing musambi were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Musambi was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.19.

An area of about 30 ha (5%) is highly suitable (Class S1) lands for growing Musambi and distributed in the western and southern part of the microwatershed. Maximum area of about 218 ha (34%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, calcareousness and gravelliness. Marginally suitable (Class S3) lands cover an area of about 182 ha (29%) and distributed in the northern, western, eastern and southern part of the microwatershed. They have moderate limitations of rooting depth and calcareousness. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Musambi and are distributed in the western, eastern, central and southern part of the microwatershed with severe limitations of rooting depth and calcareousness.

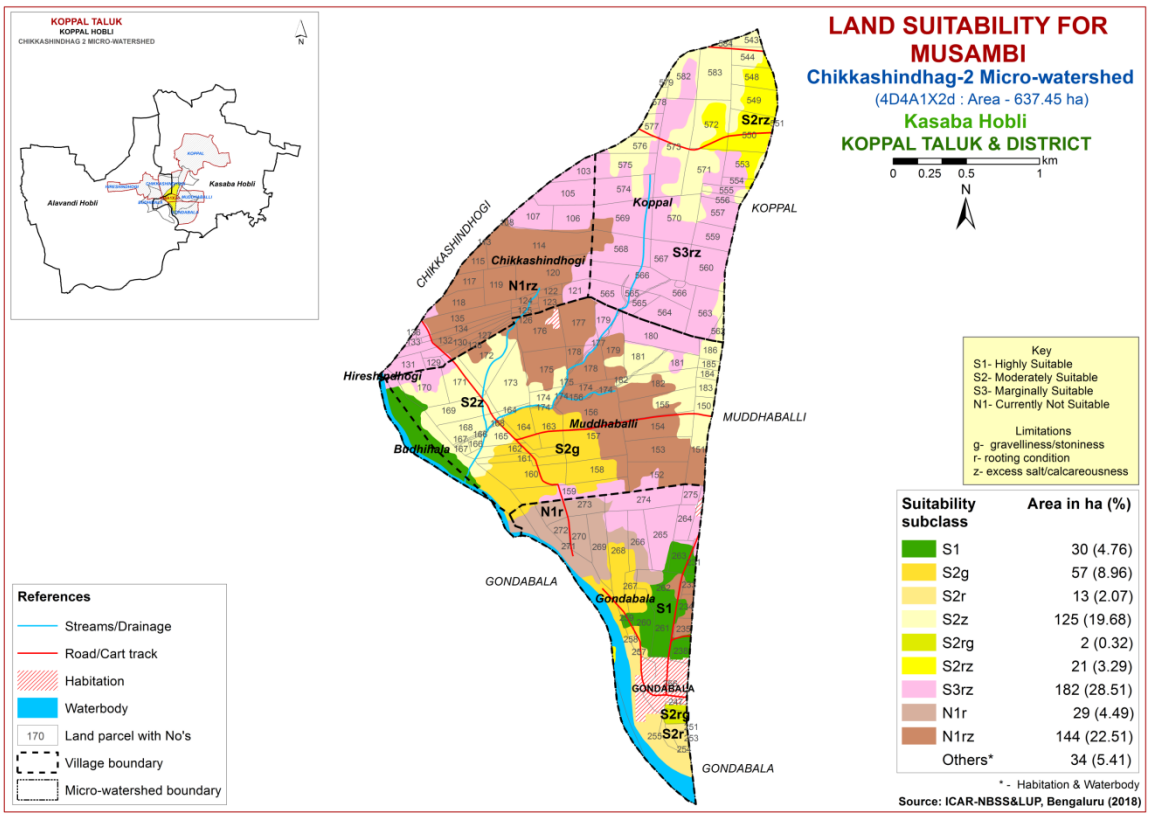


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

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

An area of about 30 ha (5%) is highly suitable (Class S1) lands for growing Lime and distributed in the western and southern part of the microwatershed. Maximum area of about 218 ha (34%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, calcareousness and gravelliness. Marginally suitable (Class S3) lands cover an area of about 182 ha (29%) and distributed in the northern, western, eastern and southern part of the microwatershed. They have moderate limitations of rooting depth and calcareousness. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Lime and are distributed in the western, eastern, central and southern part of the microwatershed with severe limitations of rooting depth and calcareousness.

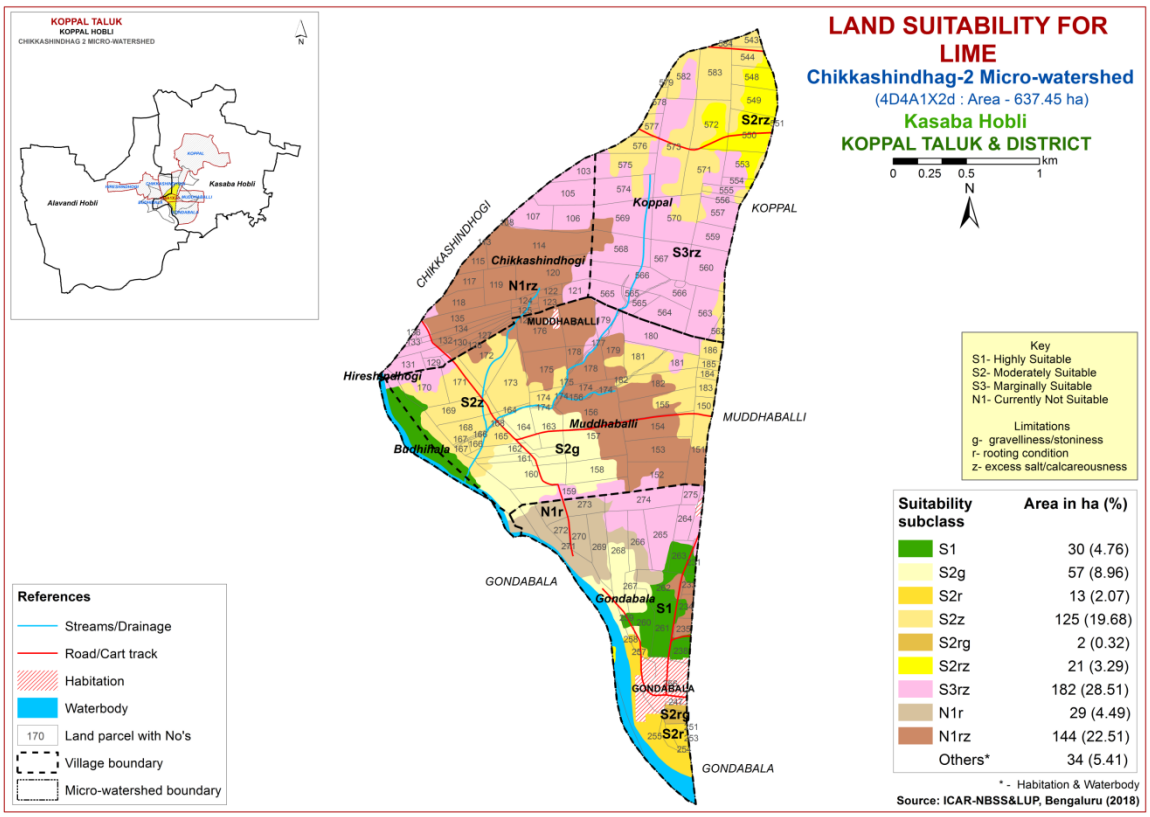


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the most important fruit and medicinal crop grown in an area of 151 ha and distributed in almost all the districts of the state. The crop requirements (Table 7.22) for growing amla were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing amla was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.21.

An area of about 91 ha (14%) is highly suitable (Class S1) for growing Amla and are distributed in the southwestern and southern part of the microwatershed. Maximum area of about 340 ha (54%) is moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands occupy an area of about 173 ha (27%) and are distributed in the western, eastern, central and southern part of the microwatershed with moderate limitations of texture, rooting depth and calcareousness.

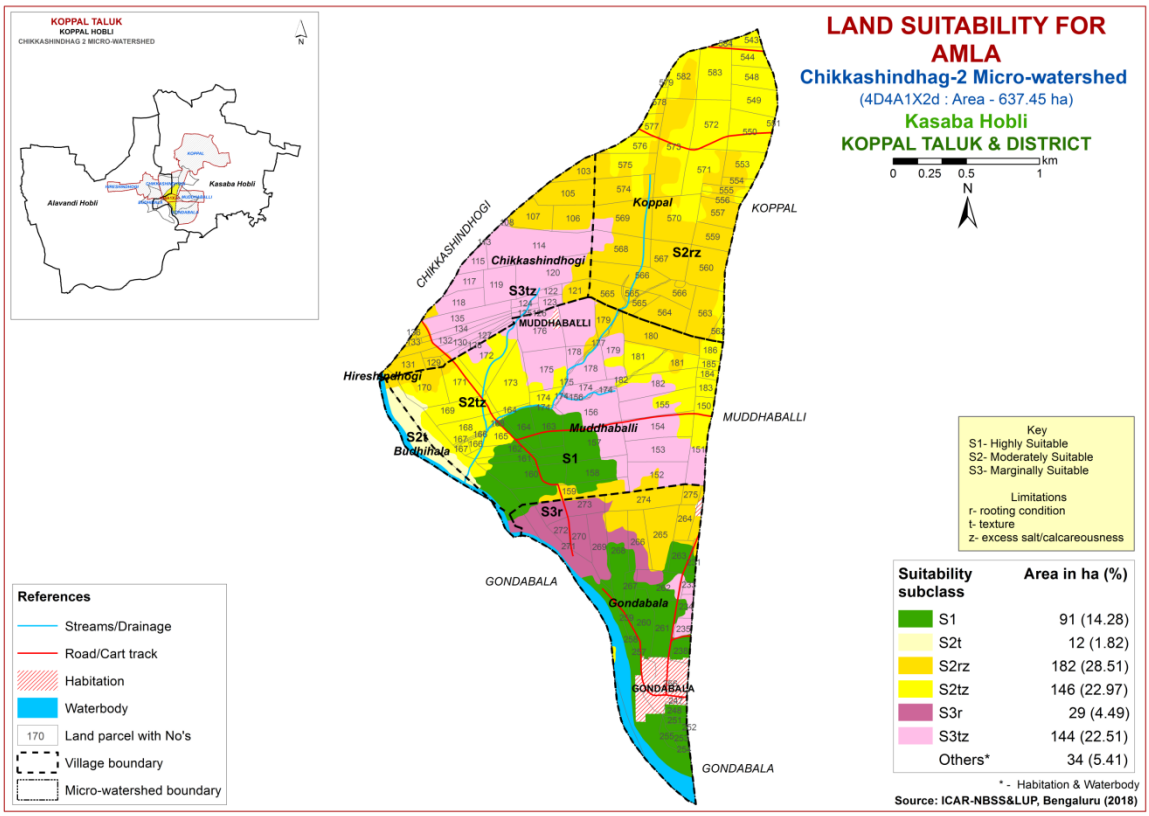


Fig. 7.21 Land Suitability map of Amla

7.22 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important nut crop grown in an area of 7052 ha in almost all the districts of the State. The crop requirements for growing cashew (Table 7.23) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.22.

No highly suitable (Class S1) lands for growing Cashew in the microwatershed. An area of about 59 ha (9%) is moderately suitable (Class S2) and distributed in the southwestern and southern part of the microwatershed with minor limitations of texture and rooting depth. Maximum area of about 545 ha (86%) is currently not suitable (Class N1) for growing Cashew and are distributed in all parts of the microwatershed with severe limitations of rooting depth, texture and calcareousness.

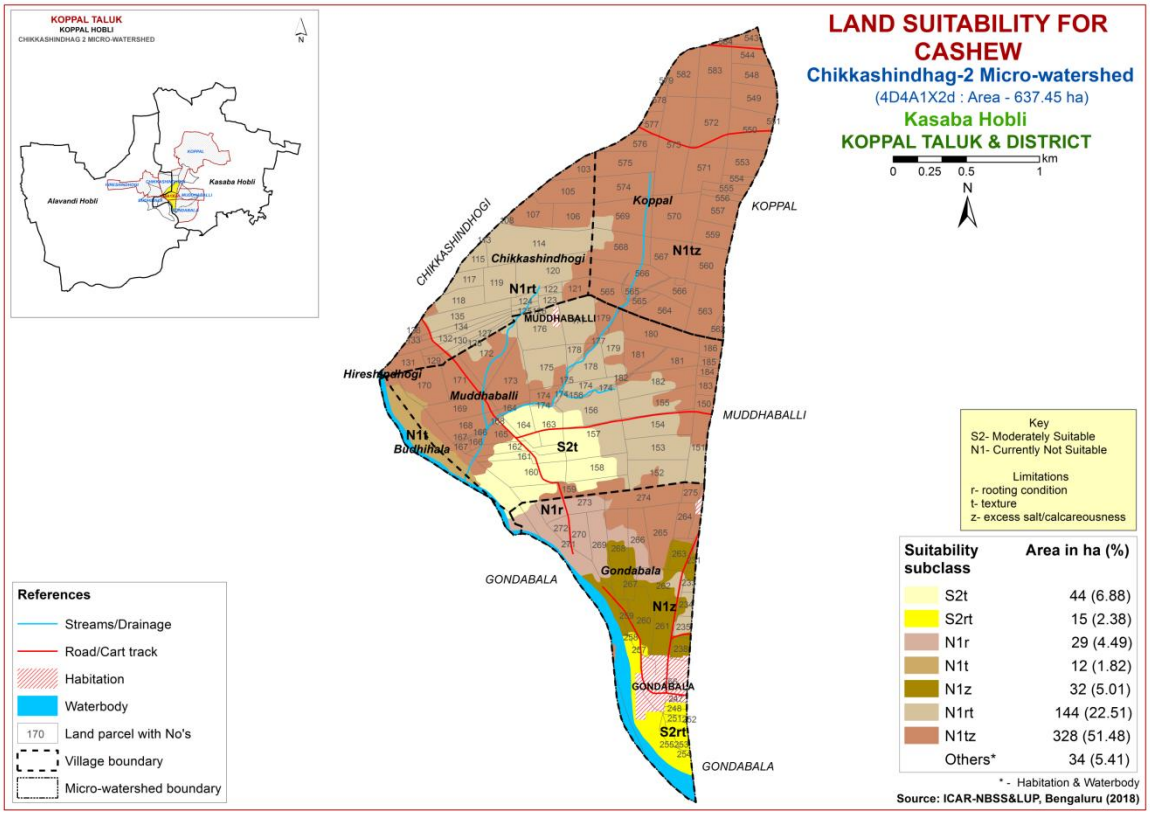


Fig. 7.22 Land Suitability map of Cashew

7.23 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

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

An area of about 19 ha (3%) is highly suitable (Class S1) lands for growing Jackfruit and distributed in the southern part of the microwatershed. An area of about 72 ha (11%) is moderately suitable (Class S2) and distributed in the southwestern and southern part of the microwatershed with minor limitations of rooting depth and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 340 ha (53%) and distributed in all parts of the microwatershed. They have moderate limitations of calcareousness and texture. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Jackfruit and are distributed in the western, central, eastern and southern part of the microwatershed with severe limitations of rooting depth and texture.

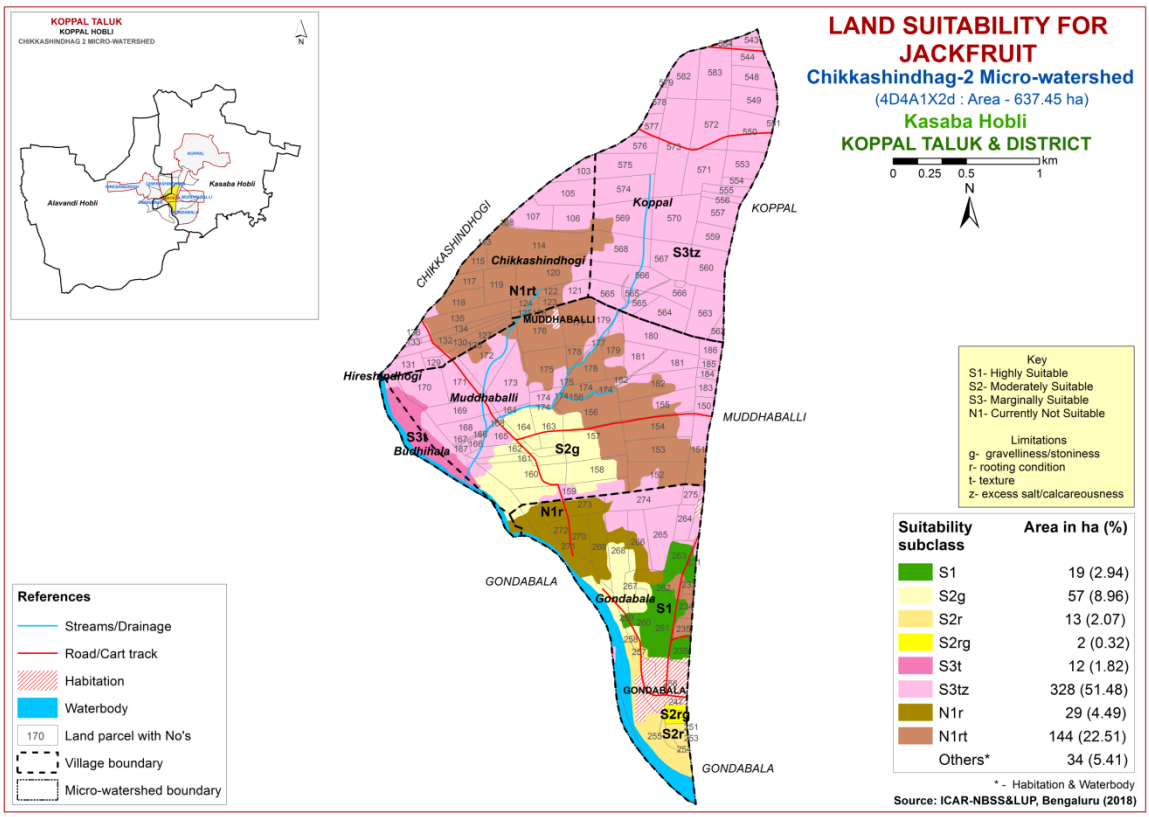


Fig. 7.23 Land Suitability map of Jackfruit

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 (Table 7.25) for growing Jamun 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 geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.24.

No highly suitable (Class S1) lands for growing Jamun in the microwatershed. Maximum area of about 229 ha (36%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, texture, calcareousness and gravelliness. Marginally suitable (Class S3) lands cover an area of about 203 ha (32%) and distributed in the northern, western and southern part of the microwatershed. They have moderate limitations of texture, rooting depth and calcareousness. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Jamun and are distributed in the western, central, eastern and southern part of the microwatershed with severe limitations of rooting depth and texture.

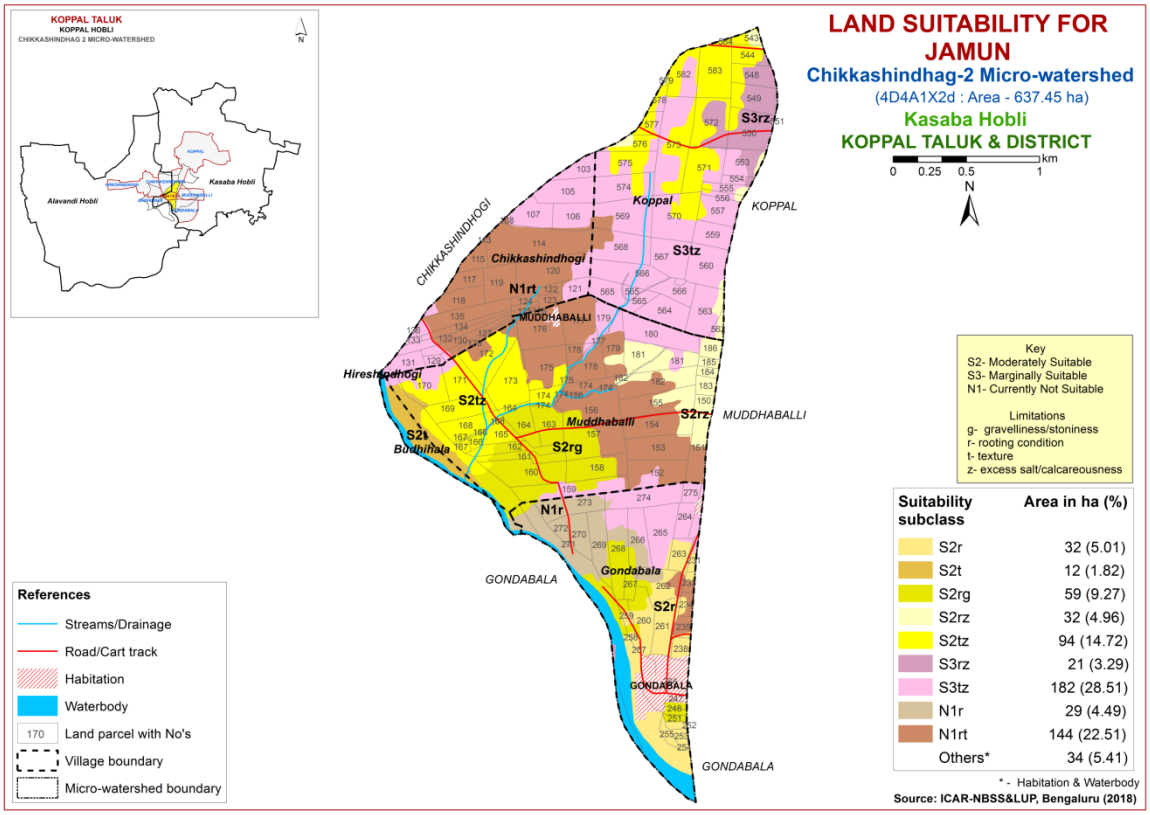


Fig. 7.24 Land Suitability map of Jamun

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

Custard apple is one of the most important fruit crop grown in 1426 ha in almost all the districts of the State. The crop requirements (Table 7.26) for growing custard apple were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated .The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.25.

An area of about 103 ha (16%) is highly suitable (Class S1) for growing Custard Apple and are distributed in the western and southern part of the microwatershed. Maximum area of about 328 ha (52%) is moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of rooting depth and calcareousness. Marginally suitable (Class S3) lands occupy an area of about 173 ha (27%) and are distributed in western, eastern, central and southern part of the microwatershed with moderate limitations of gravelliness, rooting depth and calcareousness.

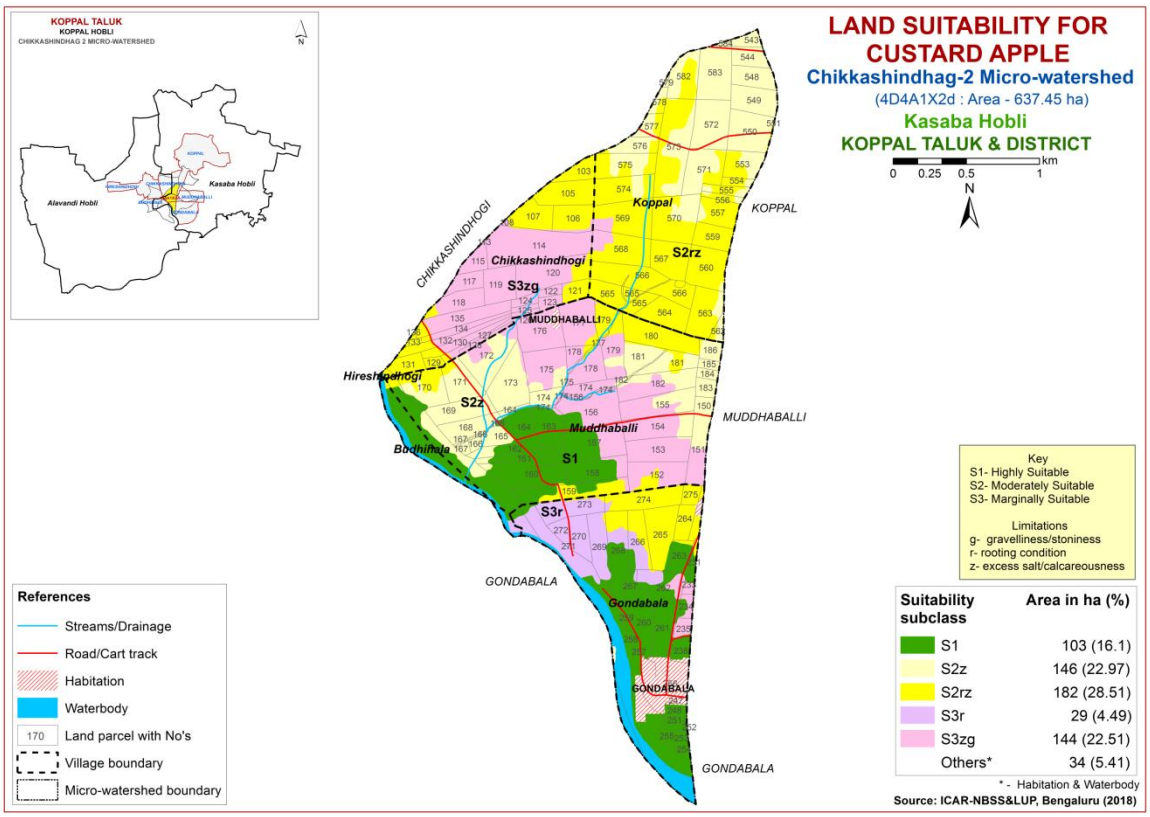


Fig. 7.25 Land Suitability map of Custard Apple

7.26 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the most important spice crop grown in 14897 ha in all the districts of the state. The crop requirements (Table 7.27) for growing tamarind were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tamarind was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.26.

No highly suitable (Class S1) lands for growing Tamarind in the microwatershed. An area of about 214 ha (34%) is moderately suitable (Class S2) and distributed in the northern, western, eastern and southern part of the microwatershed with minor limitations of rooting depth, texture, calcareousness and gravelliness. Marginally suitable (Class S3) lands cover an area of about 36 ha (6%) and distributed in the northern and southern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and gravelliness. Maximum area of about 354 ha (55%) is currently not suitable (Class N1) for growing Tamarind and are distributed in all parts of the microwatershed with severe limitations of rooting depth and calcareousness.

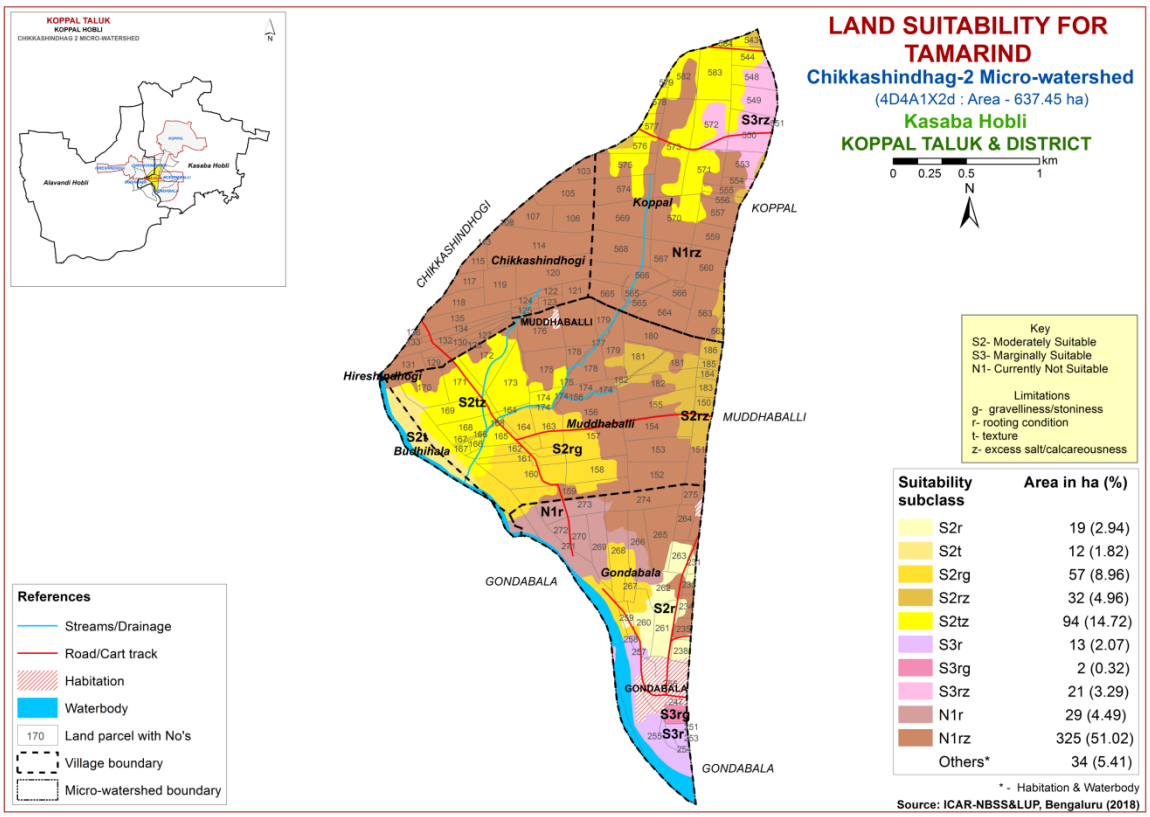


Fig. 7.26 Land Suitability map of Tamarind

7.27 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is the most important leaf crop grown for rearing silkworms in about 1.66 lakh ha in all the districts of the state. The crop requirements for growing mulberry (Table 7.28) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mulberry was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.27.

An area of about 76 ha (12%) is highly suitable (Class S1) lands for growing Mulberry and distributed in the southwestern and southern part of the microwatershed. An area of about 161 ha (25%) is moderately suitable (Class S2) and distributed in the northern, western, eastern and southern parts of the microwatershed with minor limitations of texture, calcareousness and rooting depth. Marginally suitable (Class S3) lands cover a maximum area of about 194 ha (31%) and distributed in all parts of the microwatershed. They have moderate limitations of rooting depth, calcareousness and texture. An area of about 173 ha (27%) is currently not suitable (Class N1) for growing Mulberry and are distributed in the western, eastern, central and southern part of the microwatershed with severe limitations of rooting depth and calcareousness.

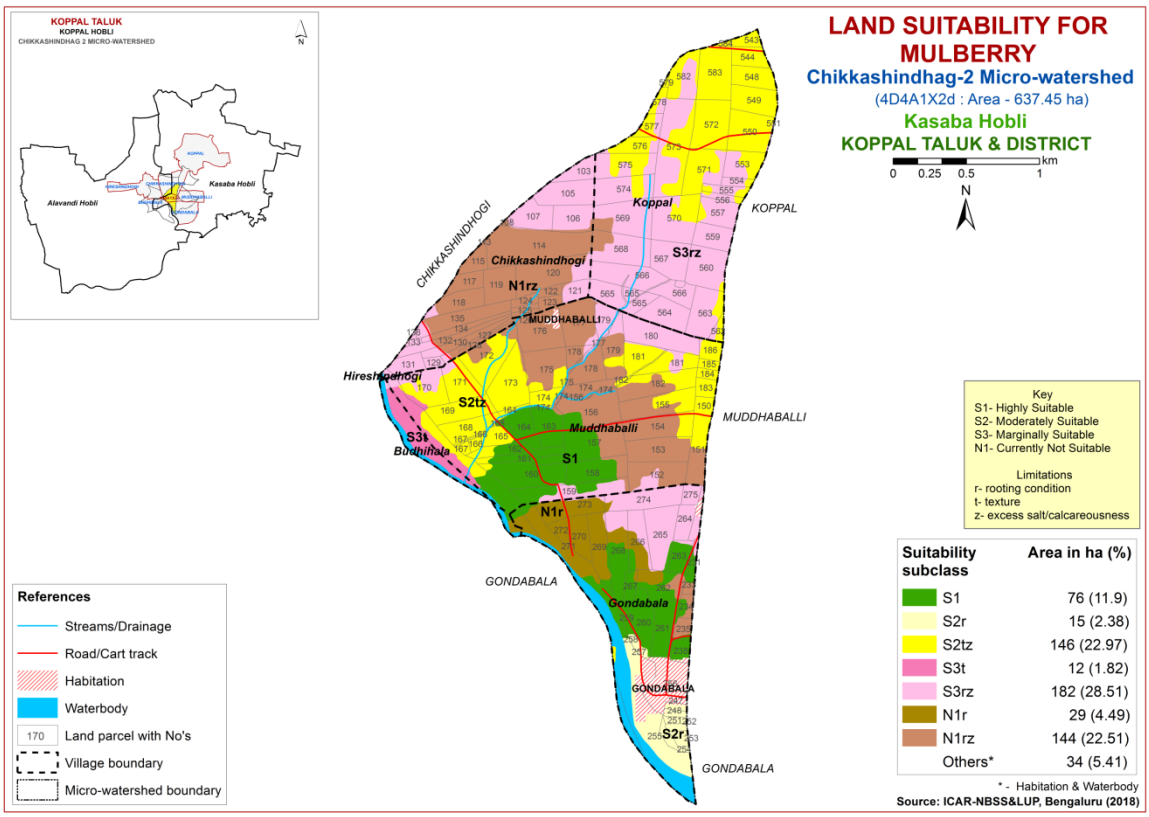


Fig. 7.27 Land Suitability map of Mulberry

7.28 Land Suitability for Marigold (*Tagetes erecta*)

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

An area of about 19 ha (3%) is highly suitable (Class S1) for growing Marigold and distributed in the southern part of the microwatershed. Maximum area of about 412 ha (65%) is moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture and calcareousness. Marginally suitable (Class S3) lands occupy an area of about 173 ha (27%) and are distributed in the western, eastern, central and southern part of the microwatershed with moderate limitations of rooting depth and calcareousness.

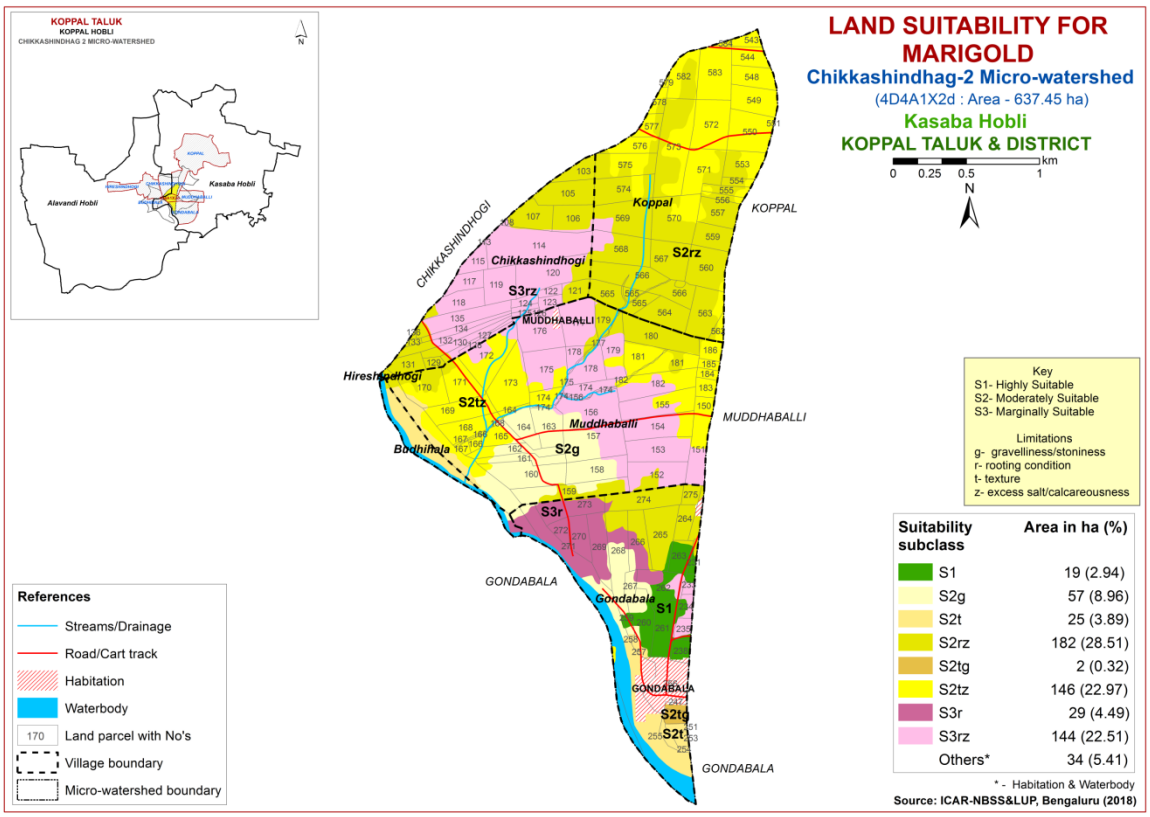


Fig. 7.28 Land Suitability map of Marigold

7.29 Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

Chrysanthemum is one of the most important flower crop grown in an area of 4978 ha in almost all the districts of the State. The crop requirements (Table 7.30) 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 geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.29.

An area of about 19 ha (3%) is highly suitable (Class S1) for growing Chrysanthemum and distributed in the southern part of the microwatershed. Maximum area of about 412 ha (65%) is moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of gravelliness, rooting, texture and calcareousness. Marginally suitable (Class S3) lands occupy an area of about 173 ha (27%) and are distributed in the western, eastern, central and southern part of the microwatershed with moderate limitations of rooting depth and calcareousness.

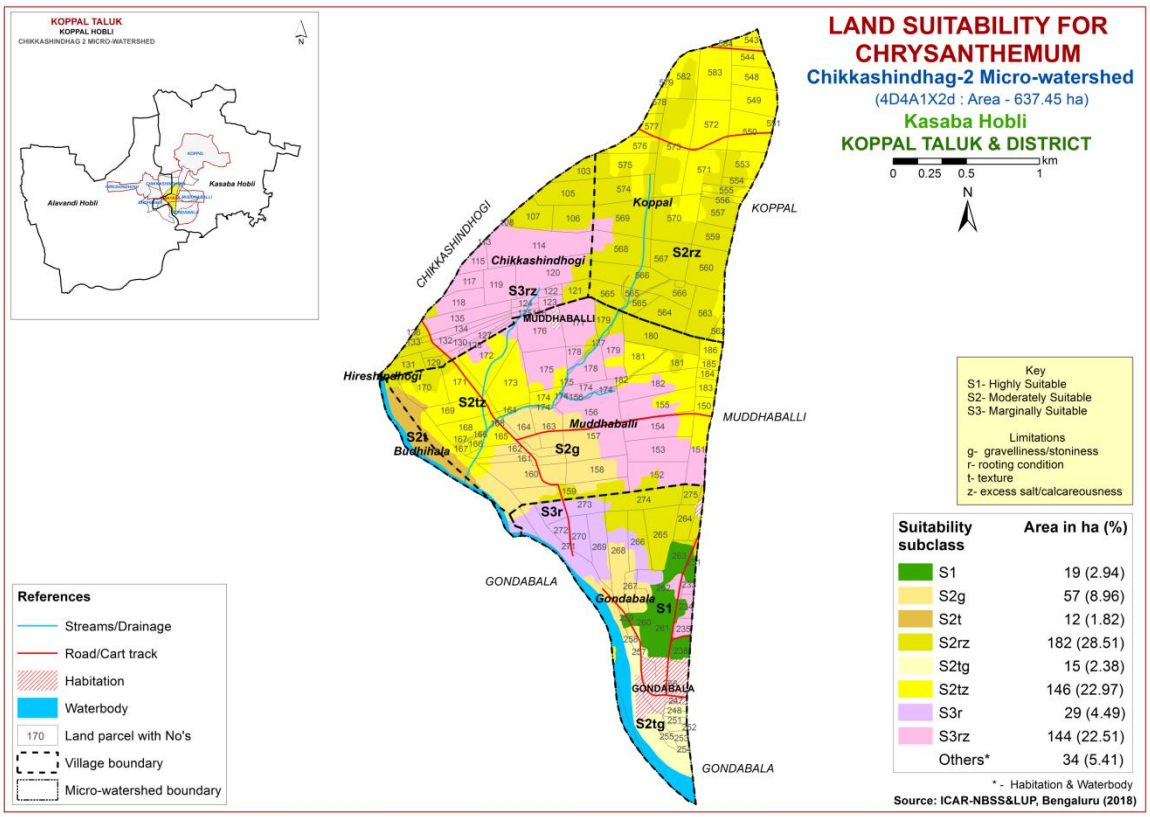


Fig. 7.29 Land Suitability map of Chrysanthemum

7. 30 Land Suitability for Jasmine *(Jasminum sp.)*

Jasmine is one of the most important flower crop grown in an area of 803 ha in almost all the districts of the State. The crop requirements (Table 7.31) for growing jasmine were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jasmine was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.30.

An area of about 19 ha (3%) is highly suitable (Class S1) lands for growing Jasmine and distributed in the southern part of the microwatershed. Moderately suitable (Class S2) lands occupy in an area of 254 ha (40%) and distributed in the northern, western, eastern and southern part of the microwatershed with minor limitations of graveliness, rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands occupy a maximum area of about 331 ha (52%) and are distributed in all parts of the microwatershed with moderate limitations of rooting depth, texture and calcareousness.

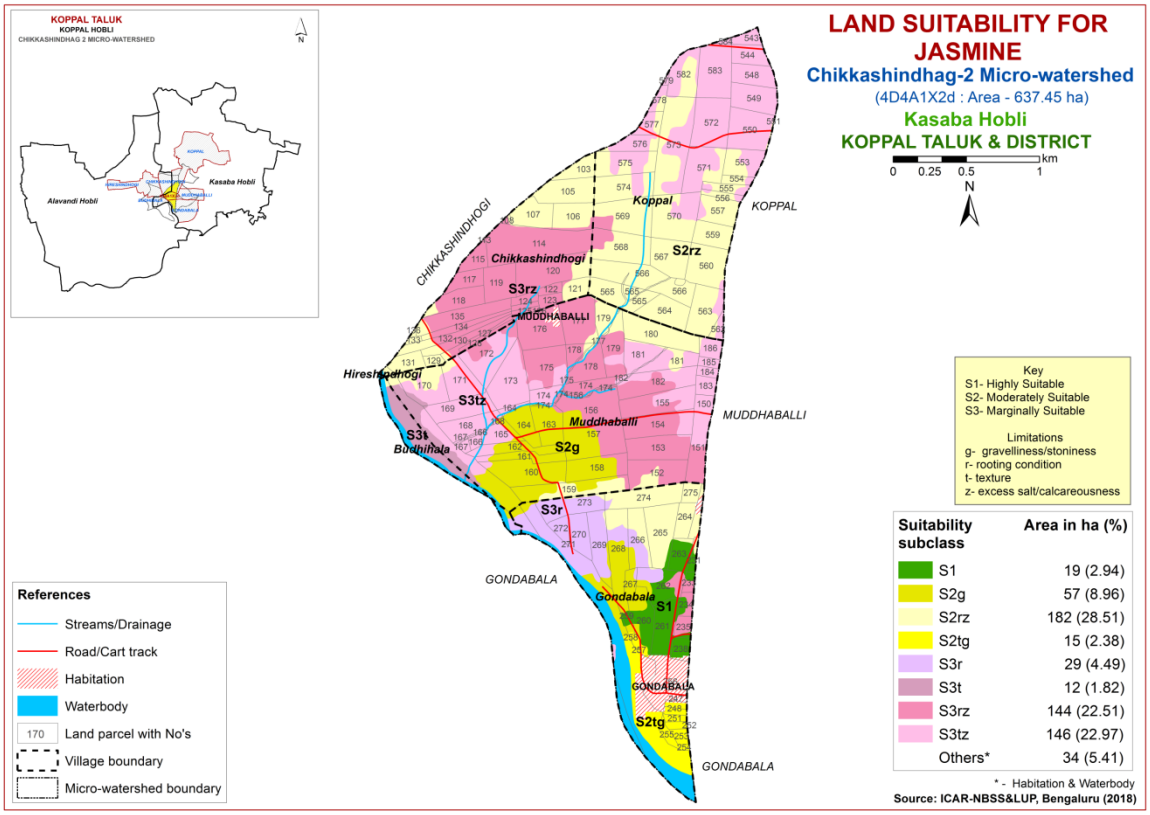


Fig. 7.30 Land Suitability map of Jasmine

7. 31 Land Suitability for Crossandra *(Crossandra infundibuliformis)*

Crossandra is one of the most important flower crop grown in almost all the districts of the State (Table 7.32). Land suitability map for growing crossandra was generated (Table 7.1). The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.31.

An area of about 19 ha (3%) is highly suitable (Class S1) lands for growing Crossandra and distributed in the southern part of the microwatershed. Moderately suitable (Class S2) lands occupy in an area of 105 ha (17%) and distributed in the northern, western and southern part of the microwatershed with minor limitations of graveliness, texture and calcareousness. Marginally suitable (Class S3) lands occupy a maximum area of about 479 ha (75%) and are distributed in all parts of the microwatershed with moderate limitations of rooting depth, texture and calcareousness.

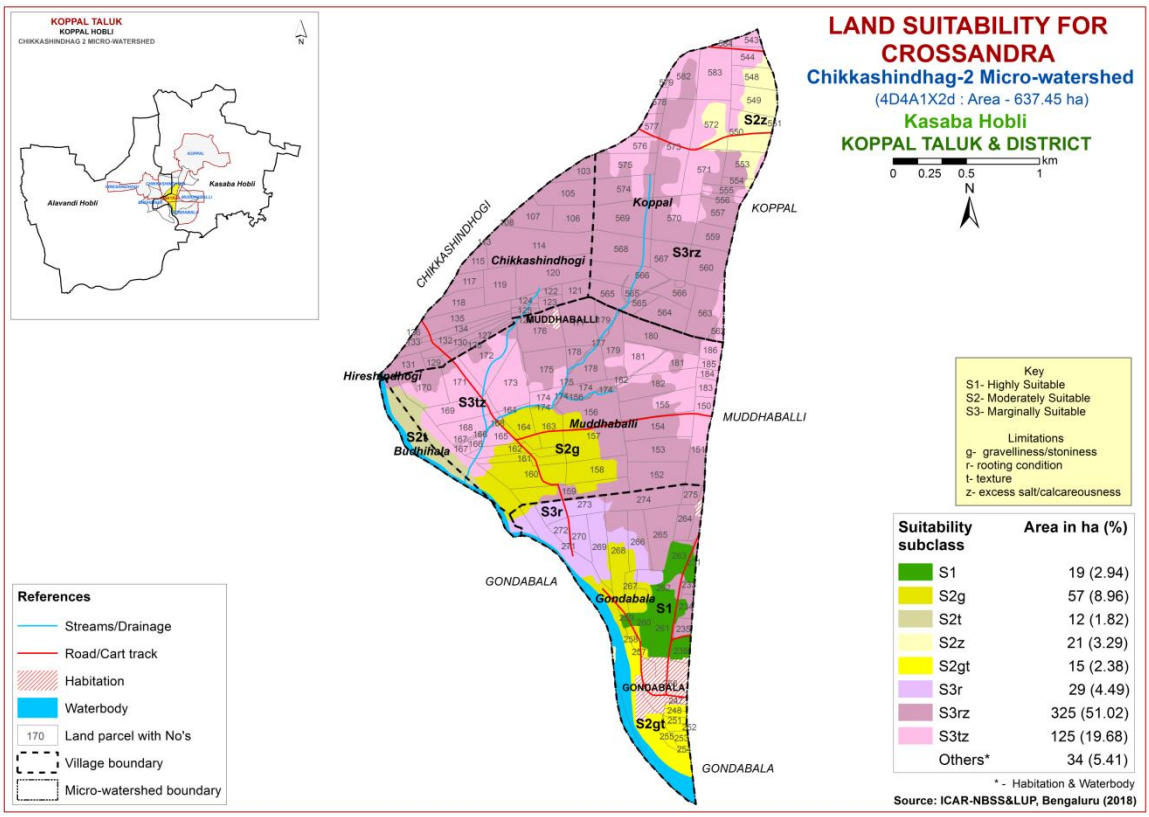


Fig. 7.31 Land Suitability map of Crossandra

Table 7.1 Soil-Site Characteristics of Chikkashindhag-2 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 (%)
					Surface	Sub-surface	Surface	Sub-surface								
CSRcB2g1	662	<90	WD	25-50	sl	scl	15-35	<15	51-100	1-3	moderate	-	-	-	-	-
CSRhB2g1	662	<90	WD	25-50	scl	scl	15-35	<15	51-100	1-3	moderate	-	-	-	-	-
CKMhB1g1	662	<90	WD	75-100	scl	sc	15-35	<15	101-150	1-3	slight	7.99	0.32	1.73	12.5	100
CKMiA1	662	<90	WD	75-100	sc	sc	<15	<15	101-150	0-1	slight	7.99	0.32	1.73	12.5	100
MNLiB1	662	<90	WD	100-150	sc	gsc	<15	15-35	101-150	1-3	slight	7.89	0.13	5.04	9.01	100
MNLiB1g1	662	<90	WD	100-150	sc	gsc	15-35	15-35	101-150	1-3	slight	7.89	0.13	5.04	9.01	100
JDGiB2g1	662	<90	WD	100-150	sc	sc-c	15-35	<15	>200	1-3	moderate	6.11	0.08	2.06	9.41	90
MTLiB1g1	662	<90	WD	25-50	sc	gc	15-35	15-35	51-100	1-3	slight	8.27	0.20	0.69	37.00	-
MTLiB2	662	<90	WD	25-50	sc	gc	<15	15-35	51-100	1-3	moderate	8.27	0.20	0.69	37.00	-
MTLmB1	662	<90	WD	25-50	c	gc	<15	15-35	51-100	1-3	slight	8.27	0.20	0.69	37.00	-
RNKiA1	662	<90	MWD	50-75	sc	c	<15	<15	51-100	0-1	slight	8.86	0.48	7.00	37.00	-
RNKmA1g1	662	<90	MWD	50-75	c	c	15-35	<15	51-100	0-1	slight	8.86	0.48	7.00	37.00	-
RNKmB1	662	<90	MWD	50-75	c	c	<15	<15	51-100	1-3	slight	8.86	0.48	7.00	37.00	-
RNKmB2	662	<90	MWD	50-75	c	c	<15	<15	51-100	1-3	moderate	8.86	0.48	7.00	37.00	-
RNKmB2g1	662	<90	MWD	50-75	c	c	15-35	<15	51-100	1-3	moderate	8.86	0.48	7.00	37.00	-
DRLmB2	662	<90	MWD	75-100	c	c	<15	<15	151-200	1-3	moderate	8.78	0.42	5.62	49.70	100
KVRiB2	662	<90	MWD	100-150	sc	c	<15	<15	>200	1-3	moderate	8.40	0.26	0.60	43.25	-
KVRmA1	662	<90	MWD	100-150	c	c	<15	<15	>200	0-1	slight	8.40	0.26	0.60	43.25	-
KVRmA1g1	662	<90	MWD	100-150	c	c	15-35	<15	>200	0-1	slight	8.40	0.26	0.60	43.25	-
KVRmB1	662	<90	MWD	100-150	c	c	<15	<15	>200	1-3	slight	8.40	0.26	0.60	43.25	-
BGPmA1	662	<90	MWD	>150	c	c	<15	<15	>200	0-1	slight	9.20	0.27	4.00	20.00	100
BGPmB1	662	<90	MWD	>150	c	c	<15	<15	>200	1-3	slight	9.20	0.27	4.00	20.00	100
BDRmB2	662	<90	MWD	>150	c	c	<15	<15	>200	1-3	moderate	8.73	0.20	4.37	40.56	-

Table 7.2 Land suitability criteria for Sorghum

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

Table 7.3 Land suitability criteria for Maize

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

Table 7.4 Land suitability criteria for Bajra

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

Table 7.5 Land suitability criteria for Groundnut

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

Table 7.6 Land suitability criteria for Sunflower

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

Table 7.7 Land suitability criteria for Redgram

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

Table 7.8 Land suitability criteria for Bengal gram

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

Table 7.9 Land suitability criteria for Cotton

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

Table 7.10 Land suitability criteria for Chilli

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

Table 7.11 Land suitability criteria for Tomato

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

Table 7.12 Land suitability criteria for Brinjal

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

Table 7.13 Land suitability criteria for Onion

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

Table 7.14 Land suitability criteria for Bhendi

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

Table 7.15 Land suitability criteria for Drumstick

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

Table 7.16 Land suitability criteria for Mango

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

Table 7.17 Land suitability criteria for Guava

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

Table 7.18 Land suitability criteria for Sapota

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

Table 7.19 Land suitability criteria for Pomegranate

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

Table 7.20 Land suitability criteria for Musambi

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

Table 7.21 Land suitability criteria for Lime

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

Table 7.22 Land suitability criteria for Amla

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

Table 7.23 Land suitability criteria for Cashew

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

Table 7.24 Land suitability criteria for Jackfruit

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

Table 7.25 Land suitability criteria for Jamun

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

Table 7.26 Land suitability criteria for Custard apple

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

Table 7.27 Land suitability criteria for Tamarind

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

Table 7.28 Land suitability criteria for Mulberry

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

Table 7.29 Land suitability criteria for Marigold

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

Table 7.30 Land suitability criteria for Chrysanthemum

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

Table 7.31 Land suitability criteria for Jasmine (irrigated)

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

7.32 Land suitability criteria for Crossandra

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

7.32 Land Management Units (LMUs)

The 23 soil map units identified in Chikkashindhag-2 microwatershed have been grouped into 5 Land Management Units (LMUs) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig.7.31) 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 5 Land Management Units along with brief description of soil and site characteristics are given below.

LMU	Mapping unit	Soil and site characteristics
1	421.AWDmA1 424.AWDmB2 428.BDRmA1 433.BDRmB2 434.BDRmB2g1 373.GRHmB2 388.KVRmB1 390.KVRmB2g1 350.DRLmB2 358.NSPiB2g1 362.NSPmB2	Moderately deep to very deep (75 to >150 cm), black calcareous clay soils, slope (0-3%), slight to moderate erosion, gravelly (15-35%)
2	231.BPRhB2g1 239.BPRiB2	Moderately deep to deep (75-150 cm), red sandy clay to sandy clay loam soils, slope (1-3%), moderate erosion, gravelly (15-35%)
3	269.GDPiB2 123.HDHhB2g1	Moderately shallow (50-75 cm), black calcareous sandy clay to sandy clay loam soils, slope (1-3%), moderate erosion, gravelly (15-35%)
4	304.MTLiB2	Shallow (25-50 cm), black calcareous clay soils, slope (1-3%), moderate erosion
5	6.BGTiB2g1	Shallow (25-50 cm), red sandy caly soils, slope (1-3%), moderate erosion, gravelly (15-35%)

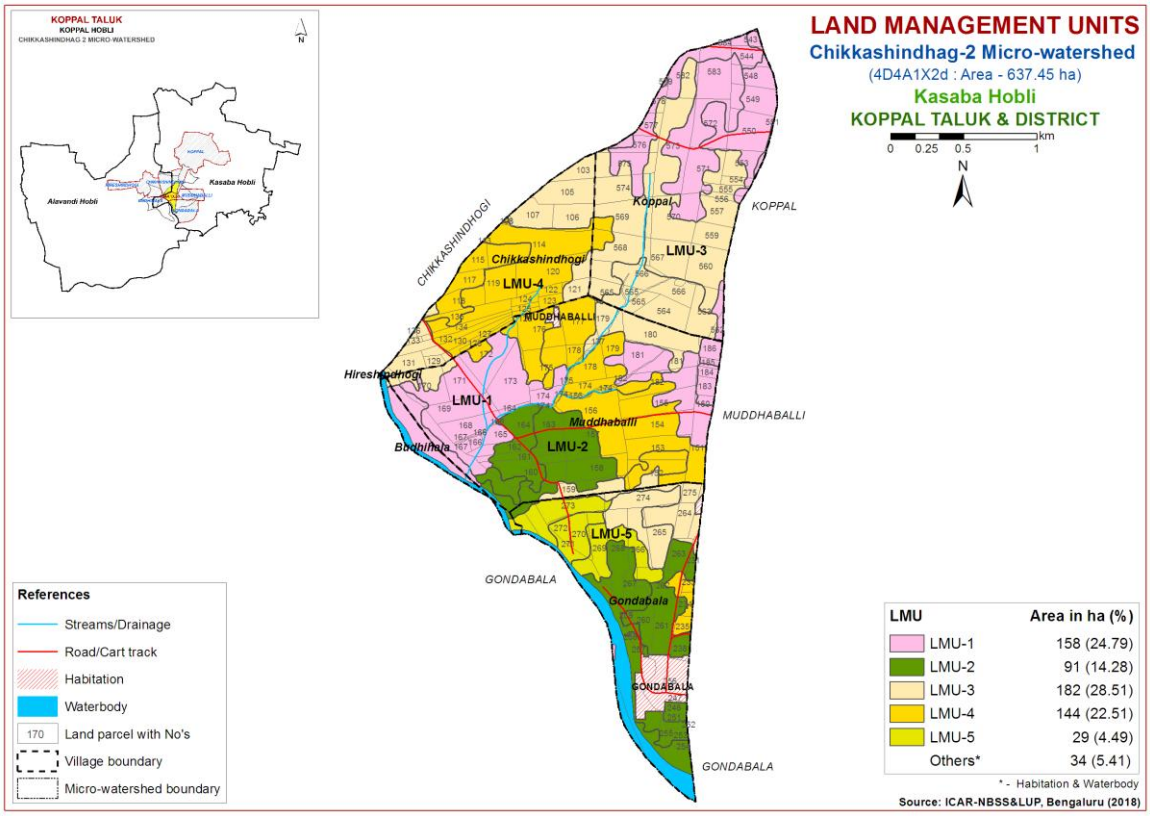


Fig 7.32 Land Management Units map of Chikkashindhag-2 microwatershed

7.33 Proposed Crop Plan for Chikkashindhag-2 Microwatershed

After assessing the land suitability for the 31 crops, the proposed crop plan has been prepared for the 5 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 31 crops. The resultant proposed crop plan is presented in Table 7.33.

Table 7.33 Proposed Crop Plan for Chikkashindhag-2 Microwatershed

LMU	Soil Map Units	Survey Number	Field Crops	Horticulture Crops	Suitable Interventions
1	433.BDRmB2 395.BGPmA1 396.BGPmB1 384.KVRiB2 386.KVRmA1 387.KVRmA1g1 388.KVRmB1 350.DRLmB2	**Koppal:**543,544,548,549,550,562,571,572,575,576,577,578,579,582,583,584 **Muddhaballi:**150,165,166,167,168,169,170,171,172,173,181,182,183,184,185,186	Maize, Sorghum, Sunflower, Cotton, Bengal gram, Safflower, Linseed, Bajra , Soybean	**Fruit crops:** Sapota, Pomegranate, Jamun, Lime, Musambi, Tamarind, Amla, Custard apple **Vegetables:** Drumstick, Chilli, Coriander, Tomato, Bhendi **Flowers:** Marigold, Chrysanthemum, Crossandra, Jasmine	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
2	213.JDGiB2g1 206.MNLiB1 207.MNLiB1g1 174.CKMhB1g1 177.CKMiA1	**Gondabala:**231,238,247,248,251,252,253,254,255,257,258,259,260,261,262,263,267,268 **Muddhaballi:**157,158,160,161,162,163, 164	Maize, Sorghum, Sunflower, Bajra, Finger millet, Groundnut, Red gram, Cowpea, Field bean, Castor, Mulberry	**Fruit crops:** Mango, Pomegranate, Guava, Sapota, Jackfruit, Jamun, Tamarind, Lime, Musambi, Amla, Custard apple, Cashew **Vegetable crops:** Drumstick, Tomato, Bhendi, Chilli, Brinjal, Onion, Curry leaves **Flower crops:** Marigold, Chrysanthemum, Jasmine, Crossandra	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
3	329.RNKiA1 332.RNKmA1g1 333.RNKmB1 336.RNKmB2 337.RNKmB2g1	**Chikkashindhogi:**103,105,106,107,108,121,129,131,133,136 **Gondabala:**264,265,266,274,275 **Koppal:**551,553,554,555,556,557,559,560,563,564,565,566,567,568,569,570,573,574 **Muddhaballi :**159,179,180	Sorghum, Bajra, Bengal gram, Linseed, Safflower, Coriander	**Fruit crops:** Amla, Custard apple **Flower crops:** Marigold, Jasmine, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
4	303.MTLiB1g1	**Chikkashindhogi:**113,114,115,1	Bengal gram	**Agri-Silvi-Pasture:** Hybrid	Use of short duration

LMU	Soil Map Units	Survey Number	Field Crops	Horticulture Crops	Suitable Interventions
	304.MTLiB2 307.MTLmB1	17,118,119,120,122,123,124,125,126,127,128,130,132,134,135 **Gondabala :**233,234,235 **Muddhaballi:**151,152,153,154,155,156,174,175,176,177,178		Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	varieties, sowing across the slope
5	36.CSRcB2g1 37.CSRhB2g1	**Gondabala:**269,270,271,272,273	Green gram, Black gram, Horse gram	**Agri-Silvi-Pasture:** Custard apple, Amla, Hybrid Napier, *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Chikkashindhag-2 Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of RNK 182 (29%), MTL 143 ha (23%), BGP 94 ha (15%), JDG 44 ha (7%), MNL 32 ha (5%), KVR 31 ha (5%), CSR 29 ha (4%), DRL 21 ha (3%), CKM 15 ha (2%) and BDR 12 ha (2%).
- As per land capability classification, entire area in the microwatershed falls under arable land category (Class II and III). The major limitations identified in the arable lands were soil and erosion.

- On the basis of soil reaction, an area of about 14 ha (2%) is moderately alkaline (pH 7.8-8.4), 240 ha (38%) is strongly alkaline (pH 8.4-9.0) and 349 ha (55%) 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

About 603 ha (95%) is under alkaline soils (moderately to very strongly 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. An area of about 344 ha (54%) is under slight erosion and 259 ha (41%) is under moderate erosion. The areas with moderate erosion need immediate soil and water conservation and other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning in IWMP is focusing on preparation of

1. Soil and Water Conservation Treatment Plans for each plot or farm.

2. Productivity enhancement measures/ interventions for existing crops/livestock/other farm enterprises.
3. Diversification of farming mainly with perennial horticultural crops and livestock.
4. Improving livelihood opportunities and income generating activities.

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

- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.
- **Surface Soil Texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.
- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Chikkashindhag-2 Microwatershed.
- **Organic Carbon:** An area of about 245 ha (38%) is low (<0.5%), 341 ha (54%) is medium (0.5-0.75%) and 17 ha (3%) is high (>0.75%) in OC content. The areas that are low and medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops costs Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be supplemented by 25% in addition to the recommended level in 586 ha area where OC is less than 0.75 per cent. For example, for rainfed maize,

recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.

- **Available Phosphorus**: Available phosphorus is low (<23 kg/ha) in 197 ha (31%), medium (23-57 kg/ha) in 365 ha (57%) and high (>57 kg/ha) in 41 ha (6%) area of the microwatershed. The areas with low and medium in phosphorus content, additional 25% phosphorus from the RDF to be applied.
- **Available Potassium:** Available potassium is medium (145-337 kg/ha) in 409 ha (64%) and high (>337 kg/ha) in 194 ha (30%) area of the microwatershed. The areas with high potassium content reduce 25% from the RDF to avoid the excess application of fertilizer and apply additional 25% potassium in areas where it is low and medium.
- **Available Sulphur:** Available sulphur is low (<10 ppm) in 243 ha (38%), medium (10-20 ppm) in 341 ha (54%) and high (>20 ppm) in 19 ha (3%) area of the microwatershed. Areas with low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Iron:** Available iron is deficient (<4.5 ppm) in 589 ha (92%) and sufficient (>4.5 ppm) in 14 ha (2%) area of the microwatershed. Application of iron sulphate @ 25 kg/ha for 2-3 years to correct the deficiency.
- **Available Zinc:** Available zinc is deficient (<0.6 ppm) in 423 ha (66%) and sufficient (>0.6 ppm) in 180 ha (28%) area of the microwatershed. Application of zinc sulphate @ 25 kg/ha is to be followed in areas that are deficient in available zinc.
- **Available Boron:** Available boron is low in (<0.5ppm) 54 ha (8%), medium (0.5-1.0 ppm) in 525 ha (82%) and high (>1.0 ppm) in 24 ha (4%) area in the microwatershed. The areas with low and medium in boron content need to be applied with sodium borate @ 10 kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency.
- **Available Manganese**: It is sufficient (>1.0 ppm) in the entire area of the microwatershed.
- **Available Copper:** Available copper is sufficient (>0.2 ppm) in the entire area of the microwatershed.
- **Soil Alkalinity:** An area of 603 ha in the microwatershed has soils that are moderately 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.

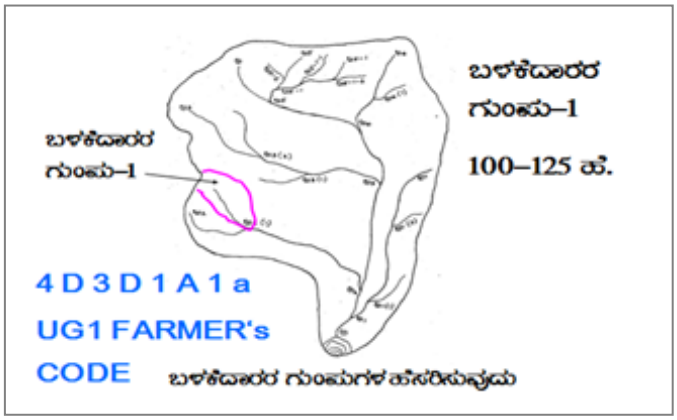
- **Land Suitability for various crops:** Areas that are highly, moderately and marginally suitable and not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, 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 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 Chikkashindhag-2 microwatershed, the land resource inventory database generated under Sujala-III project has been transformed as information through series of interpretative (thematic) maps using soil phase map as a base. The various thematic maps (1:7920 scale) generated were

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



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

Steps for Survey and Preparation of Treatment Plan

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

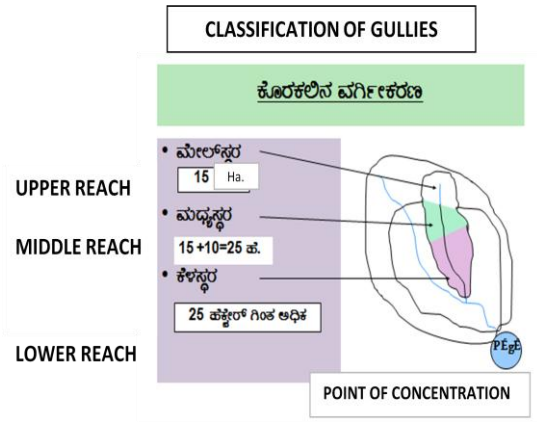
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

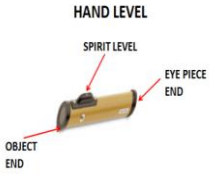
9.1.1 Arable Land Treatment

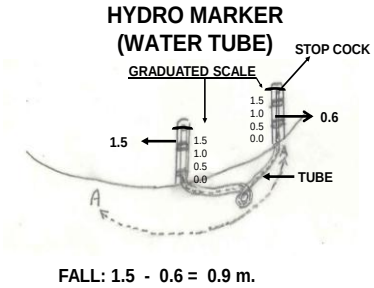
A. BUNDING

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

Measurement of Land Slope

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





FALL: 1.5 - 0.6 = 0.9 m.

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

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

Note: i) The above intervals are maximum.

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

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

Section of the Bund

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

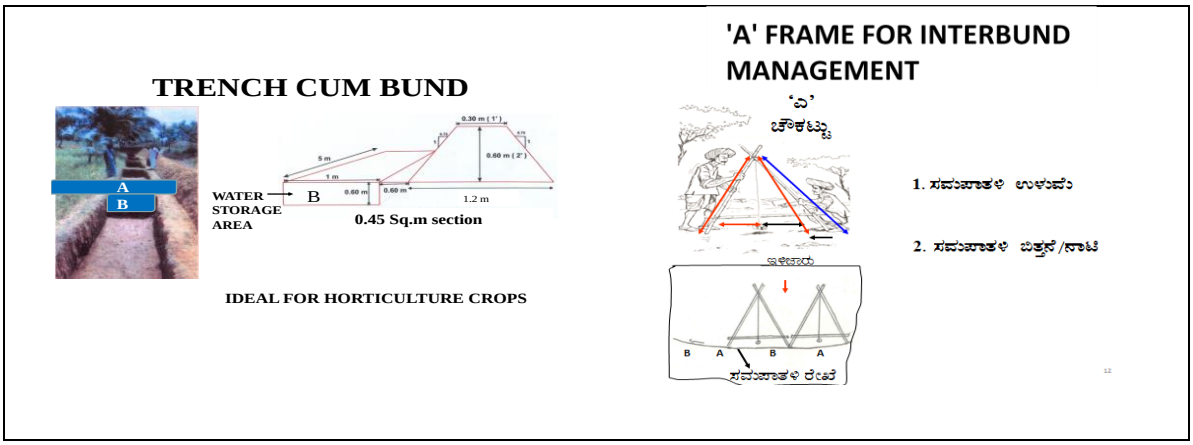
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below



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

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

B. Waterways

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. An area of about 106 ha (17%) needs trench cum bunding. Maximum area of about 362 ha (57%) needs graded bunding. Strengthening of existing bunds/bunding occur in an area of about 135 ha (21%).The conservation plan prepared may be presented to all the stakeholders including farmers and after considering their suggestions, the conservation plan for the microwatershed may be finalized in a participatory approach.

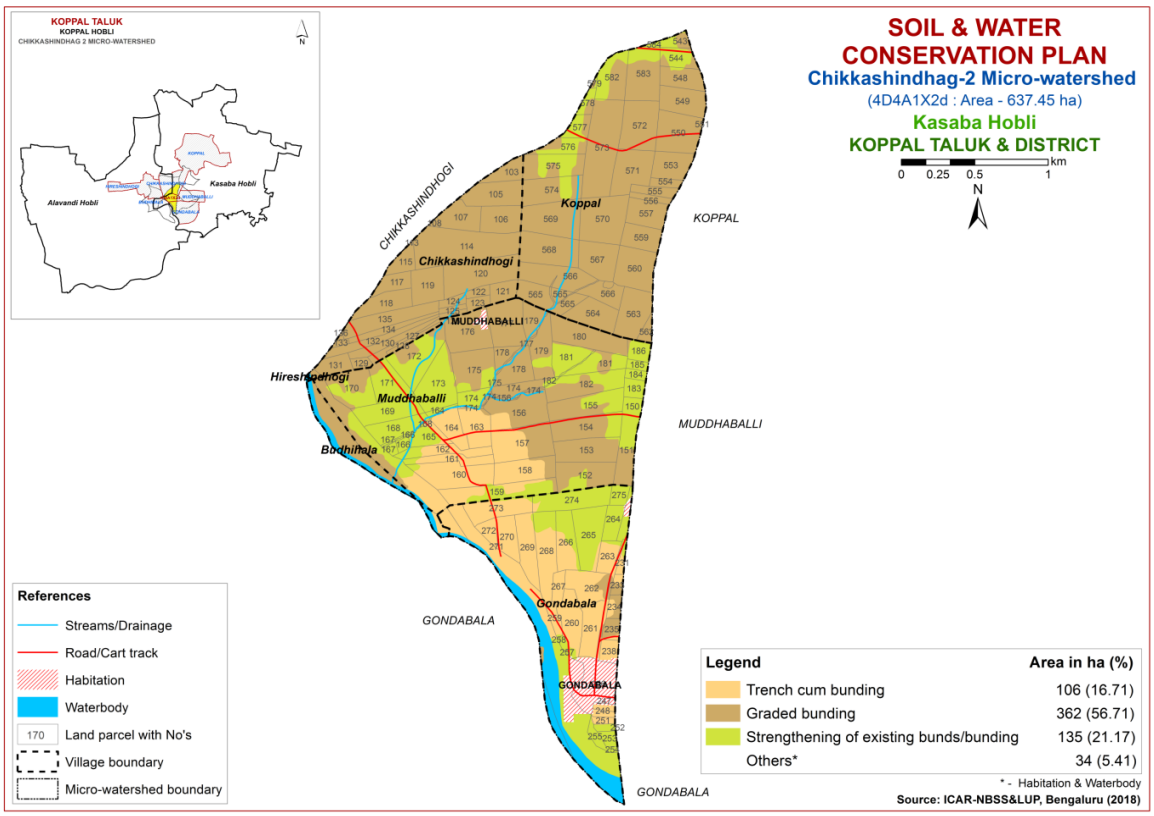


Fig. 9.1 Soil and Water Conservation Plan map of Chikkashindhag-2 Microwatershed

9.3 Greening of Microwatershed

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

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

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

Chikkashindhag-2 (1X2d) Microwatershed

Soil Phase Information

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Gondabala	231	0.83	MNLiB1	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Gondabala	233	1	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Gondabala	234	1.46	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Gondabala	235	1.64	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut+Maize (Gn+Mz)	Not Available	IIIs	Graded bunding
Gondabala	238	1.9	MNLiB1	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Borewell	IIs	Trench cum bunding
Gondabala	247	0.72	CKMhB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Gondabala	248	0.73	CKMhB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Gondabala	251	0.74	CKMhB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Gondabala	252	0.72	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Gondabala	253	1.07	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Gondabala	254	0.28	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Gondabala	255	1.11	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Gondabala	256	8.24	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Gondabala	257	0.09	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Gondabala	258	0.06	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Gondabala	259	1.52	MNLiB1g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Gondabala	260	5.94	MNLiB1	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Gondabala	261	4.83	MNLiB1	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Gondabala	262	5.84	MNLiB1	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Borewell	IIs	Trench cum bunding
Gondabala	263	2.77	MNLiB1	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	Trench cum bunding
Gondabala	264	2.74	RNKmA1g1	LMU-3	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Maize+Sugarcane (Mz+Sc)	Borewell	IIs	Graded bunding
Gondabala	265	7.64	RNKiA1	LMU-3	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Gondabala	266	5.51	RNKiA1	LMU-3	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Gondabala	267	1.64	MNLiB1g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Gondabala	268	7.58	MNLiB1g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Bajra+Maize (Bj+Mz)	Not Available	IIs	Trench cum bunding
Gondabala	269	5.59	CSRhB2g1	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Gondabala	270	3.79	CSRcB2g1	LMU-5	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Gondabala	271	0.07	CSRcB2g1	LMU-5	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Gondabala	272	1.71	CSRcB2g1	LMU-5	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Gondabala	273	5.74	CSRhB2g1	LMU-5	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Gondabala	274	6.8	RNKiA1	LMU-3	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Bajra+Maize (Bj+Mz)	Not Available	IIs	Graded bunding
Gondabala	275	1.6	RNKmA1g1	LMU-3	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Sugarcane (Sc)	Not Available	IIs	Graded bunding
Chikkashindhogi	103	2.95	RNKmB1	LMU-3	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Drumstick+Maize (Cf+Ds+Mz)	Not Available	IIs	Graded bunding
Chikkashindhogi	105	6.28	RNKmB1	LMU-3	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Chikkashindhogi	106	5.12	RNKmB1	LMU-3	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Chikkashindhogi	107	4.75	RNKmB1	LMU-3	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Chikkashindhogi	108	0.31	RNKmB1	LMU-3	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Maize (Rg+Mz)	Not Available	IIs	Graded bunding
Chikkashindhogi	113	0.05	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	114	15.22	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow (Cf)	Not Available	IIIs	Graded bunding
Chikkashindhogi	115	2.52	MTLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Chikkashindhogi	117	2.72	MTLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Jw (Mz+Jw)	Not Available	IIIes	Graded bunding
Chikkashindhogi	118	4.72	MTLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Drumstick+Maize (Ds+Mz)	Not Available	IIIes	Graded bunding
Chikkashindhogi	119	5.24	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	120	9.88	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	121	2.45	RNKmB1	LMU-3	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Chikkashindhogi	122	1.03	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIIs	Graded bunding
Chikkashindhogi	123	1.34	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIIs	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Chikkashindhogi	124	1.19	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	125	0.66	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	126	0.64	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	127	1.07	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	128	1.51	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	129	0.97	RNKmB2g1	LMU-3	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Chikkashindhogi	130	2.94	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	131	2.71	RNKmB2g1	LMU-3	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Chikkashindhogi	132	3.41	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIIs	Graded bunding
Chikkashindhogi	133	0.42	RNKmB2g1	LMU-3	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Chikkashindhogi	134	2.24	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Chikkashindhogi	135	6.37	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Groundnut (Rg+Gn)	Not Available	IIIs	Graded bunding
Chikkashindhogi	136	0.16	RNKmB2g1	LMU-3	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Budhihala	RIVER	11.34	BDRmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Waterbody	Not Available	IIes	Graded bunding
Muddhaballi	150	1.59	KVRmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhaballi	151	5.62	MTLmB1	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Muddhaballi	152	7.19	MTLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Muddhaballi	153	6.98	MTLmB1	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Muddhaballi	154	7.42	MTLmB1	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Muddhaballi	155	7.46	MTLmB1	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Graded bunding
Muddhaballi	156	8.91	MTLmB1	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Borewell	IIIs	Graded bunding
Muddhaballi	157	9.32	JDGiB2g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Borewell	IIes	Trench cum bunding
Muddhaballi	158	6.29	JDGiB2g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Muddhaballi	159	8.22	RNKmA1g1	LMU-3	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Muddhabalii	160	8.34	JDGiB2g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Muddhabalii	161	3.26	JDGiB2g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Muddhabalii	162	4.02	JDGiB2g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Muddhabalii	163	4.97	JDGiB2g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Muddhabalii	164	4.41	JDGiB2g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Sugarcane (Sc)	Not Available	IIes	Trench cum bunding
Muddhabalii	165	3.13	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Current fallow (Cf)	Not Available	IIs	Graded bunding
Muddhabalii	166	0.85	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	167	0.69	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	168	4.65	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	169	5.85	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	170	6.97	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Current fallow (Cf)	Not Available	IIs	Graded bunding
Muddhabalii	171	5.57	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	172	8.7	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	173	8.45	BGPmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	174	5.04	MTLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Muddhabalii	175	7.64	MTLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIIes	Graded bunding
Muddhabalii	176	7.92	MTLiB1g1	LMU-4	Shallow (25-50 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow (Cf)	Not Available	IIIs	Graded bunding
Muddhabalii	177	7.27	MTLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Muddhabalii	178	6.17	MTLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Muddhabalii	179	7.97	RNKmB2	LMU-3	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Muddhabalii	180	7.92	RNKmB2	LMU-3	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Muddhabalii	181	8.11	KVRmA1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	182	8.01	KVRmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	183	1.76	KVRmA1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding

Village	Survey Number	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Muddhabalii	184	0.97	KVRmA1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	185	0.93	KVRmA1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Muddhabalii	186	2.09	KVRmA1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding

Appendix II

Chikkashindhag-2 (1X2d) Microwatershed

Soil Fertility Information

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Koppal	543	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	544	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	548	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	549	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	550	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	551	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	553	Very strongly alkaline (pH > 9.0)	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)
Koppal	554	Very strongly alkaline (pH > 9.0)	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)
Koppal	555	Very strongly alkaline (pH > 9.0)	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)
Koppal	556	Very strongly alkaline (pH > 9.0)	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)
Koppal	557	Very strongly alkaline (pH > 9.0)	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)
Koppal	559	Very strongly alkaline (pH > 9.0)	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)
Koppal	560	Very strongly alkaline (pH > 9.0)	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)
Koppal	562	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	563	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	564	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	565	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	566	Very strongly alkaline (pH > 9.0)	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)
Koppal	567	Very strongly alkaline (pH > 9.0)	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)
Koppal	568	Very strongly alkaline (pH > 9.0)	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)
Koppal	569	Very strongly alkaline (pH > 9.0)	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)
Koppal	570	Very strongly alkaline (pH > 9.0)	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)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Koppal	571	Very strongly alkaline (pH > 9.0)	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)
Koppal	572	Very strongly alkaline (pH > 9.0)	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)
Koppal	573	Very strongly alkaline (pH > 9.0)	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)
Koppal	574	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	575	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	576	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	577	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	578	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	579	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	582	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	583	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Koppal	584	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Chikkash indhogi	103	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)
Chikkash indhogi	105	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)
Chikkash indhogi	106	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Chikkash indhogi	107	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Chikkash indhogi	108	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Chikkash indhogi	113	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Chikkash indhogi	114	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Chikkash indhogi	115	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkash indhogi	117	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkash indhogi	118	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkash indhogi	119	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkash indhogi	120	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Chikkashindhogi	121	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 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)
Chikkashindhogi	122	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 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)
Chikkashindhogi	123	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 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)
Chikkashindhogi	124	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	125	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	126	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	127	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	128	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	129	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	130	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	131	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	132	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	133	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	134	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	135	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chikkashindhogi	136	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	231	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	233	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	234	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	235	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	238	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	247	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	248	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	251	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Gondabala	252	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	253	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	254	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	255	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	256	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Gondabala	257	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	258	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Gondabala	259	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	260	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 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)	Sufficient (> 0.6 ppm)
Gondabala	261	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 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)	Sufficient (> 0.6 ppm)
Gondabala	262	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	263	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)
Gondabala	264	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)
Gondabala	265	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)
Gondabala	266	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)
Gondabala	267	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)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	268	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)
Gondabala	269	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	270	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	271	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	272	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	273	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gondabala	274	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)
Gondabala	275	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)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Muddhaballi	150	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	151	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	152	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	153	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	154	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	155	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	156	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	157	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	158	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	159	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	160	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	161	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	162	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	163	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	164	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	165	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	166	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	167	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	168	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	169	Very strongly alkaline (pH > 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)	Sufficient (> 0.6 ppm)
Muddhaballi	170	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Muddhaballi	171	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)	Sufficient (> 0.6 ppm)
Muddhaballi	172	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)	Sufficient (> 0.6 ppm)
Muddhaballi	173	Very strongly alkaline (pH > 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)	Sufficient (> 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Muddhaballi	174	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	175	Very strongly alkaline (pH > 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)	Sufficient (> 0.6 ppm)
Muddhaballi	176	Very strongly alkaline (pH > 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)	Sufficient (> 0.6 ppm)
Muddhaballi	177	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	178	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	179	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	180	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	181	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	182	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	183	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	184	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	185	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Muddhaballi	186	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Appendix III

Chikkashindhag-2 (1X2d) Microwatershed

Soil Suitability Information

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Koppal	543	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	544	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	548	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Koppal	549	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Koppal	550	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Koppal	551	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	553	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	554	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	555	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	556	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	557	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	559	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	560	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	562	S2rz	S2tz	S3tz	S2z	S3tz	S2zg	S2rz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	563	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	564	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	565	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	566	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	567	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	568	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	569	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	570	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	571	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	572	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Koppal	573	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	574	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Koppal	575	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	576	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	577	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	578	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	579	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	582	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	583	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Koppal	584	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Chikkashindhogi	103	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Chikkashindhogi	105	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Chikkashindhogi	106	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Chikkashindhogi	107	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Chikkashindhogi	108	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Chikkashindhogi	113	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	114	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	115	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	117	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	118	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	119	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	120	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	121	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Chikkashindhogi	122	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	123	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	124	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	125	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	126	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	127	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	128	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	129	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Chikkashindhogi	130	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	131	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Chikkashindhogi	132	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	133	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Chikkashindhogi	134	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	135	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Chikkashindhogi	136	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gondabala	231	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Gondabala	233	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Gondabala	234	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Gondabala	235	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Gondabala	238	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Gondabala	247	S3rg	S2tg	S2rg	S2g	S2rt	S2rg	S3rg	S2rg	S2gt	S2r	S2gt	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S2g	S2g	S2tg	S2tg	S2rg	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Gondabala	248	S3rg	S2tg	S2rg	S2g	S2rt	S2rg	S3rg	S2rg	S2gt	S2r	S2gt	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S2g	S2g	S2tg	S2tg	S2rg	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Gondabala	251	S3rg	S2tg	S2rg	S2g	S2rt	S2rg	S3rg	S2rg	S2gt	S2r	S2gt	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S2g	S2g	S2tg	S2tg	S2rg	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Gondabala	252	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2gt	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Gondabala	253	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2gt	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Gondabala	254	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2gt	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Gondabala	255	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2gt	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Gondabala	256	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	Others
Gondabala	257	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2gt	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Gondabala	258	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2gt	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Gondabala	259	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Gondabala	260	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Gondabala	261	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Gondabala	262	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Gondabala	263	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Gondabala	264	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gondabala	265	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gondabala	266	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gondabala	267	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Gondabala	268	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Gondabala	269	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	N1r	S3r
Gondabala	270	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	N1r	S3r
Gondabala	271	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	N1r	S3r
Gondabala	272	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	N1r	S3r
Gondabala	273	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	N1r	S3r
Gondabala	274	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gondabala	275	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Muddhaballi	150	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	151	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Muddhaballi	152	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	153	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	154	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	155	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	156	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	157	S2rg	S2tg	S2g	S2tg	S2tg	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	S2t	S2rg	S2g	S2t	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2t	S1	S2g	S1	S1	S2t
Muddhaballi	158	S2rg	S2tg	S2g	S2tg	S2tg	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	S2t	S2rg	S2g	S2t	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2t	S1	S2g	S1	S1	S2t
Muddhaballi	159	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Muddhaballi	160	S2rg	S2tg	S2g	S2tg	S2tg	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	S2t	S2rg	S2g	S2t	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2t	S1	S2g	S1	S1	S2t
Muddhaballi	161	S2rg	S2tg	S2g	S2tg	S2tg	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	S2t	S2rg	S2g	S2t	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2t	S1	S2g	S1	S1	S2t
Muddhaballi	162	S2rg	S2tg	S2g	S2tg	S2tg	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	S2t	S2rg	S2g	S2t	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2t	S1	S2g	S1	S1	S2t
Muddhaballi	163	S2rg	S2tg	S2g	S2tg	S2tg	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	S2t	S2rg	S2g	S2t	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2t	S1	S2g	S1	S1	S2t
Muddhaballi	164	S2rg	S2tg	S2g	S2tg	S2tg	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	S2t	S2rg	S2g	S2t	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2t	S1	S2g	S1	S1	S2t
Muddhaballi	165	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	166	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	167	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	168	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	169	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	170	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	171	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	172	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	173	S3tz	S2tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	174	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	175	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	176	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	177	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Muddhaballi	178	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Muddhaballi	179	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Muddhaballi	180	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Muddhaballi	181	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2gz	S2z	S2gt	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	182	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	183	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2gz	S2z	S2gt	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	184	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2gz	S2z	S2gt	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	185	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2gz	S2z	S2gt	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Muddhaballi	186	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2gz	S2z	S2gt	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

SALIENT FINDINGS OF THE SURVEY

- *The data indicated that there were 105 (57.69%) men and 77 (42.31%) women among the sampled households.*
- *The average family size of landless farmers' was 4.2, marginal farmers' was 5.06, small farmers' was 4.8, semi medium farmers' was 6 and medium farmers' was 4.*
- *The data indicated that, 22 (12.09%) people were in 0-15 years of age, 95 (52.2%) were in 16-35 years of age, 56 (30.77%) were in 36-60 years of age and 9 (4.95%) were above 61 years of age.*
- *The results indicated that Chikkashindhag-2 had 25.82 per cent illiterates, 16.48 per cent of them had primary school education, 6.04 per cent of them had middle school education, 28.57 per cent of them had high school education, 10.99 per cent of them had PUC education, 0.55 per cent had ITI education, 6.59 per cent of them ha degree education and 1.10 per cent of them had degree level education.*
- *The results indicate that, 55.56 per cent of household heads were practicing agriculture and 41.67 per cent of the household heads were agricultural labour.*
- *The results indicate that agriculture was the major occupation for 39.56 per cent of the household members, 36.26 per cent were agricultural labourers, 2.20 per cent were private service, 15.38 per cent were students, 3.85 per cent were housewives and 2.75 per cent were children.*
- *The results show that, 3.30 per cent of the population in the micro watershed has participated in user group and 96.70 per cent of the population in the micro watershed has not participated in any local institutions.*
- *The results indicate that 83.33 per cent of the households possess katcha, 11.11 per cent of the households pucca/RCC and5.56 per cent of the households possess semi pacca house. The results show that 75 per cent of the households possess TV, 2.78 per cent of them possess DVD/VCD player, 58.33 per cent of them possess mixer/grinder, 44.44 per cent of them possess motor cycle and 91.67 per cent of them possess mobile phones.*
- *The results show that the average value of television was Rs. 8,333, DVD/VCD player was Rs. 2,000, mixer grinder was Rs. 1,952, motor cycle was Rs. 42,687 and mobile phones was Rs. 1,980.*
- *About 5.56 per cent of the households possess bullock cart, 30.56 per cent of them possess plough, 19.44 per cent of them possess sprayer and 52.78 per cent of them possess weeder.*
- *The results show that the average value of bullock cart was Rs. 18,000, plough was Rs. 1,636, sprayer was Rs. 4,428 and weeder was Rs.75.*
- *The results indicate that, 8.33 per cent of the households possess bullocks, 22.22 per cent of the households possess local cow, 2.78 per cent possess crossbreed cow and goat and 5.56 per cent of them possess buffalo.*

- *The results indicate that, average own labour men available in the micro watershed was 2.13, average own labour (women) available was 1.29, average hired labour (men) available was 13.29 and average hired labour (women) available was 13.74.*
- *The results indicate that 86.11 per cent of the households opined that the hired labour was adequate.*
- *The results indicate that, households of the Chikkashindhag-2 micro-watershed possess 26.67 ha (67.76 %) of dry land and 12.69 ha (12.69 %) of irrigated land. Marginal farmers possess 4.71 ha (75.19%) of dry land and 1.55 ha (24.81%) of irrigated land. Small farmers possess 3.22 ha (52.17%) of dry land and 2.95 ha (47.83%) of irrigated land. Semi medium farmers possess 12.26 ha (69.80%) of dry land and 5.31 (30.20%) for irrigated land. Medium farmers possess 6.48 ha (69.23%) for dry land and 2.88 ha (30.77 %) for irrigated land.*
- *The results indicate that, the average value of dry land was Rs. 401,107.91 and the average value of irrigated land was Rs. 653,939.39. In case of marginal famers, the average land value was Rs. 1,379,295.53 for dry land and Rs. 1,801,041.66 for irrigated land. In case of small famers, the average land value was Rs. 341,761.01 for dry land and Rs. 677,640.61 for irrigated land. In case of semi medium famers, the average land value was Rs. 220,099.01 for dry land and Rs. 546,376.81 for irrigated land. In case of medium farmers, the average land value was Rs. 61,750 for dry land and Rs. 208,438.81 for irrigated land.*
- *The results indicate that, there were 15 functioning and 4 de-functioning bore wells in the micro watershed.*
- *The results indicate that, bore well was the major irrigation source in the micro water shed for 41.67 per cent of the farmers.*
- *The results indicate that, the depth of bore well was found to be 44.87 meters.*
- *The results indicate that marginal, small, semi medium and medium farmers had an irrigated area of 1.96 ha, 5 ha, 3.36 ha, 6.93 ha and 2.88 ha respectively.*
- *The results indicate that, farmers have grown maize (23.72 ha), sunflower (3.24 ha), Bengal gram (2.83 ha), sorghum (2.43 ha), sugarcane (1.7 ha), jowar (0.81 ha), cotton (0.41 ha), bajra, cluster bean and onion (0.4 ha). Marginal farmers had grown maize, Bengal gram, cotton, bajra, cluster bean and onion. Small farmers had grown maize,. Semi medium farmers had grown maize, Bengal gram, sorghum, sugarcane, and jowar. Medium farmers had grown maize and sunflower.*
- *The results indicate that, the cropping intensity in Chikkashindhag-2 micro-watershed was found to be 84.92 per cent.*
- *The results indicate that, 11.11 per cent of the households have bank account. The results indicate that, 2.78 per cent of the households have availed credit from different sources.*
- *The results indicate that, 100 per cent of the households have borrowed from cooperative and grameena bank.*

- *The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 205,000.*
- *The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production.*
- *The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources.*
- *The results indicate that, around 40 per cent opined that the loan amount borrowed from high rate of interest.*
- *The results indicate that, the total cost of cultivation for bajra was Rs. 36799.97. The gross income realized by the farmers was Rs. 31616. The net income from bajra cultivation was Rs. -5183.97. Thus the benefit cost ratio was found to be 1:0.86.*
- *The total cost of cultivation for Cotton was Rs. 162755.71. The gross income realized by the farmers was Rs. 262007.31. The net income from Cotton cultivation was Rs. 99251.60. Thus the benefit cost ratio was found to be 1:1.61.*
- *The total cost of cultivation for Beans was Rs. 40614.69. The gross income realized by the farmers was Rs. 88920. The net income from Beans cultivation was Rs. 48305.31. Thus the benefit cost ratio was found to be 1:2.19.*
- *The total cost of cultivation for Maize was Rs. 62559.11. The gross income realized by the farmers was Rs. 47681.83. The net income from Maize cultivation was Rs. -14877.27. Thus the benefit cost ratio was found to be 1:0.76.*
- *The total cost of cultivation for Sorghum was Rs. 24327.11. The gross income realized by the farmers was Rs. 33962.50. The net income from Sorghum cultivation was Rs. 9635.39. Thus the benefit cost ratio was found to be 1:1.4.*
- *The total cost of cultivation for Bengal gram was Rs. 43641.12. The gross income realized by the farmers was Rs. 61186.67. The net income from Bengal gram cultivation was Rs. 17545.55. Thus the benefit cost ratio was found to be 1:1.4.*
- *The total cost of cultivation for onion was Rs. 95996.88. The gross income realized by the farmers was Rs. 197600. The net income from onion cultivation was Rs. 101603.12. Thus the benefit cost ratio was found to be 1:2.06.*
- *The total cost of cultivation for sunflower was Rs. 27307.87. The gross income realized by the farmers was Rs. 46312.50. The net income from sunflower cultivation was Rs. 19004.63. Thus the benefit cost ratio was found to be 1:1.7.*
- *The total cost of cultivation for sugarcane was Rs. 22141.16. The gross income realized by the farmers was Rs. 27052.38. The net income from sugarcane cultivation was Rs. 4911.22. Thus the benefit cost ratio was found to be 1:1.22.*
- *The results indicate that, 25 per cent of the households opined that dry fodder was adequate, 22.22 green fodders was adequate, 5.56 per cent of the households opine dry fodder was in adequate and 2.78 per cent of the households opined that green fodder was inadequate.*

- *The results indicate that the annual gross income was Rs. 39,533.33 for for marginal farmers, for small farmers it was Rs. 36,666.67, for semi medium farmers it was Rs. 104,375 and for medium farmers it was Rs. 110,000.*
- *The results indicate that the average annual expenditure is Rs. 6,373.84. For marginal farmers it was Rs. 4,708.89, for small farmers it was Rs. 6,366.67, for semi medium farmers it was Rs. 7,578.13 and for medium farmers it was Rs. 30,000.*
- *The results indicate that, households have planted 48 coconut and 2 mango trees in their field.*
- *The results indicate that, households have planted 34 teak, 49 neem and 4 tamarind tree in their field.*
- *The results indicated that, households have an average investment capacity of Rs. The results indicated that, households have an average investment capacity of Rs. 1,750.22 for land development, Rs. 361.11for improved crop production and Rs. 277.78 for improved crop production.*
- *The results indicated that loan from bank was the source of additional investment for 13.51 per cent for land development and improved crop production and 8.11 per cent for irrigation facility. Own funds was the source of additional investment for 2.7 per cent for land development and improved crop production and 5.41 per cent for improved livestock management.*
- *The results indicated that, bajra and sorghum was sold to the extent of 60 per cent, beans and Bengal gram was sold to the extent of 83.33 per cent, cotton, sugarcane and sunflower was sold to the extent of 100 per cent, maize was sold to the extent of 97.62 per cent and onion was sold to the extent of 98 per cent.*
- *The results indicated that, about 8.33 per cent of the farmers sold their produce to agent/traders, 47.22 per cent of the farmers sold their produce to local/village merchants, 19.44 per cent of the farmers sold their produce to regulated market and 13.89 per cent of the farmers sold their produce to cooperative marketing society.*
- *The results indicated that, 75 per cent of the households used tractor and 13.89 per cent of the households use truck as a mode of transportation for their agricultural produce.*
- *The results indicated that, 36.11 per cent of the households have experienced soil and water erosion problems in the farm.*
- *The results indicated that, 72.22 per cent have shown interest in soil test.*
- *The results indicated that, 97.22 per cent of the households used firewood and 2.78 per cent of the households used LPG as a source of fuel.*
- *The results indicated that, piped supply was the major source of drinking water for 77.78 per cent of the households bore well and canal/nala was the source of drinking water for 11.11 per cent of the households in micro watershed.*
- *Electricity was the major source of light for 97.22 per cent and 2.78 per cent of the households used kerosene lamp in micro watershed.*

- *The results indicated that, 33.33 per cent of the households possess sanitary toilet facility.*
- *The results indicated that, 100 per cent of the sampled households possessed BPL card.*
- *The results indicated that, 27.78 per cent of the households participated in NREGA programme.*
- *The results indicated that, cereals and milk were adequate for 100 per cent of the households, pulses were adequate for 91.67 per cent, oilseeds were adequate for 25 per cent, vegetables were adequate for 47.22 per cent, fruits were adequate for 16.67 per cent, egg were adequate for 80.56 per cent and meat were adequate for 77.78 per cent.*
- *The results indicated that, pulses were inadequate for 8.33 per cent, oilseeds were inadequate for 66.67 per cent, vegetables were inadequate for 52.78 per cent, fruits were inadequate for 75 per cent, egg and meat were inadequate were 5.56 per cent of the households.*
- *The results indicated that, oilseeds were market surplus for 8.33 per cent and fruits were market surplus for 2.78 per cent and meat were market surplus for 11.11 per cent of the households.*
- *The results indicated that, lower fertility status of the soil water and inadequacy of irrigation water was the constraint experienced by 72.22 per cent of the households, wild animal menace on farm field (86.11%), frequent incidence of pest and diseases (69.44%), high cost of fertilizers and plant protection chemicals and high rate of interest on credit (75%), low price for the agricultural commodities(8.33%), less rainfall (22.22%) and Source of Agri-technology information (8.33%).*

Chapter 2

INTRODUCTION

Soil and water are the two precious natural resources which are essential for crop production and existence of life on earth. Rainfed agriculture is under severe stress due to various constraints related to agriculture like uneven and erratic distribution of rainfall, indiscriminate use of fertilizers, chemicals and pesticides, adoption of improper land management practices, soil erosion, decline in soil fertility, decline in ground water resources leading to low crop productivity. The area under rainfed agriculture has to be managed effectively using the best available practices to enhance the production of food, fodder and fuel. This is possible if the land resources are characterized at each parcel of land through detailed land resource inventory using the best available techniques of remote sensing, GPS and GIS. The watershed development programs are aimed at the sustainable distribution of its resources and the process of creating and implementing plans, programs, and projects to sustain and enhance watershed functions that affect the plant, animal and human communities within a watershed boundary.

World Bank funded KWDP II, SUJALA III project was implemented in with Broad objective of demonstrating more effective watershed management through greater integration of programmes related to rain-fed agriculture, innovative and science based approaches and strengthen institutional capacities and If successful, it is expected that the systems and tools could be mainstreamed into the overall IWMP in the State of Karnataka and in time, throughout other IWMP operations in India. With this background the socio-economic survey has been carried out with following specific objectives:

1. To understand the demographic features of the households in the micro-watershed
2. To understand the extent of family labour available and additional employment opportunities available within the village.
3. To know the status of assets of households in the micro-watershed for suggesting possible improvements.
4. To study the cropping pattern, cropped area and productivity levels of different households in micro-watershed.
5. To determine the type and extent of livestock owned by different categories of HHs
6. Availability of fodder and level of livestock management.

Scope and importance of survey

Survey helps in identification of different socio-economic and resource use-patterns of farmers at the Micro watershed. Household survey provides demographic features, labour force, and levels of education; land ownership and asset position (including livestock and other household assets) of surveyed households; and cropping patterns, input intensities, and average crop yields from farmers' fields. It also discusses crop utilization and the degree of commercialization of production in the areas; farmers' access to and utilization of credit from formal and informal sources; and the level of adoption and use of soil, water,and pest management technologies.

Chapter 3

METHODOLOGY

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

Description of the study area

Koppal district is an administrative district in the state of Karnataka in India. In the past Koppal was referred to as 'Kopana Nagara'. Koppal, now a district headquarters is ancient Kopana a major holy place of the Jainas. The district occupies an area of 7,190 km² and has a population of 1,196,089, which 16.58% were urban as of 2001. The Koppal district was formed after split of Raichur district.

Geographers are very particular about the physiography or relief of a region. It plays a very important role in the spatial analysis of agricultural situation of the study area. The undulating topography with black cotton soil shrips, cut across by numerous nalas or streams is the major characteristic feature of the study region. Three physiographic divisions have made considering the local conditions of landforms and crops grown in the district. On the basis of physiography, Koppal district can be divided into three major divisions. They are (a) Koppal & Yelburga plateau, (b) Maidan division, (c) Tungabhadra valley. The district is part of Krishna basin the main streams draining the area are Maskinala, Ilkal-nadi and Hirenala. These are Ephemaral in nature, these come under Tungabhadra sub-basin. The drainage exhibit dentritic to subdentric with drainage density varies from 1.4 to7.0kms/sq.km.

According to the 2011 census Koppal district has a population of 1,391,292, roughly equal to the nation of Swaziland or the US state of Hawaii. This gives it a ranking of 350th in India (out of a total of 640). The district has a population density of 250 inhabitants per square kilometre (650/sq mi). Its population growth rate over the decade 2001-2011 was 16.32%.Koppal has a sex ratio of 983 females for every 1000 males, and a literacy rate of 67.28%.

Description of the micro watershed

Chikkashindhag-2 micro-watershed in Bhagyanagar sub-watershed (Koppal taluk and district) is located in between $15^0$18’11.372’’ to 15^0 15’19.136’’ North latitudes 76^0 7’59.582’’ to $76^0$6’20.511” East longitudes, covering an area of about 637.71 ha, bounded by Chikkashindhag, Budhihala, Koppala ,Muddhaballi and Gondabala villages.

Methodology followed in assessing socio-economic status of households

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 36 households located in the micro-watershed were interviewed for the survey.

Chapter 4

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Chikkashindhag-2 micro-watershed is presented in Table 1 and it indicated that 36 farmers were sampled in Chikkashindhag-2 micro-watershed among them 5 (13.89%) were landless, 15 (41.67%) were marginal farmers, 6 (16.67%) were small farmers, 8 (22.22%) were semi medium farmers and 2 (5.56%) were medium farmers.

Table 1: Households sampled for socio economic survey in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	13.89	15	41.67	6	16.67	8	22.22	2	5.56	36	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Chikkashindhag-2 micro-watershed is presented in Table 2. The data indicated that there were 105 (57.69%) men and 77 (42.31%) women among the sampled households. The average family size of landless farmers' was 4.2, marginal farmers' was 5.06, small farmers' was 4.8, semi medium farmers' was 6 and medium farmers' was 4.

Table 2: Population characteristics of Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (21)		MF (76)		SF (29)		SMF (48)		MDF (8)		All (182)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	10	47.62	41	53.95	18	62.07	31	64.58	5	62.50	105	57.69
2	Women	11	52.38	35	46.05	11	37.93	17	35.42	3	37.50	77	42.31
Total		21	100	76	100	29	100	48	100	8	100	182	100
Average		4.2		5.06		4.8		6		4		5.05	

Age wise classification of family members: The age wise classification of household members in Chikkashindhag-2 micro-watershed is presented in Table 3. The data indicated that, 22 (12.09%) people were in 0-15 years of age, 95 (52.2%) were in 16-35 years of age, 56 (30.77%) were in 36-60 years of age and 9 (4.95%) were above 61 years of age.

Table 3: Age wise classification of household members in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (21)		MF (76)		SF (29)		SMF (48)		MDF (8)		All (182)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	4	19.05	9	11.84	4	13.79	5	10.42	0	0	22	12.09
2	16-35 years of age	14	66.67	38	50	13	44.83	26	54.17	4	50	95	52.20
3	36-60 years of age	3	14.29	23	30.26	11	37.93	15	31.25	4	50	56	30.77
4	> 61 years	0	0	6	7.89	1	3.45	2	4.17	0	0	9	4.95
Total		21	100	76	100	29	100	48	100	8	100	182	100

Education level of household members: Education level of household members in Chikkashindhag-2 micro-watershed is presented in Table 4. The results indicated that Chikkashindhag-2 had 25.82 per cent illiterates, 16.48 per cent of them had primary school education, 6.04 per cent of them had middle school education, 28.57 per cent of them had high school education, 10.99 per cent of them had PUC education, 0.55 per cent had ITI education, 6.59 per cent of them ha degree education and 1.10 per cent of them had degree level education.

Table 4. Education level of household members in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (21)		MF (76)		SF (29)		SMF (48)		MDF (8)		All (182)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	8	38.10	18	23.68	6	20.69	11	22.92	4	50	47	25.82
2	Primary School	4	19.05	10	13.16	4	13.79	12	25	0	0	30	16.48
3	Middle School	2	9.52	3	3.95	4	13.79	2	4.17	0	0	11	6.04
4	High School	4	19.05	25	32.89	5	17.24	15	31.25	3	37.50	52	28.57
5	PUC	1	4.76	9	11.84	4	13.79	6	12.50	0	0	20	10.99
6	ITI	0	0	1	1.32	0	0	0	0	0	0	1	0.55
7	Degree	1	4.76	5	6.58	5	17.24	0	0	1	12.50	12	6.59
8	Masters	0	0	1	1.32	1	3.45	0	0	0	0	2	1.10
9	Others	1	4.76	4	5.26	0	0	2	4.17	0	0	7	3.85
Total		21	100	76	100	29	100	48	100	8	100	182	100

Occupation of household heads: The data regarding the occupation of the household heads in Chikkashindhag-2 micro-watershed is presented in Table 5. The results indicate that, 55.56 per cent of household heads were practicing agriculture and 41.67 per cent of the household heads were agricultural labour.

Table 5: Occupation of household heads in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	9	60	4	66.67	6	75	1	50	20	55.56
2	Agricultural Labour	5	100	5	33.33	2	33.33	2	25	1	50	15	41.67
Total		5	100	14	100	6	100	8	100	2	100	35	100

Table 6: Occupation of family members in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (21)		MF (76)		SF (29)		SMF (48)		MDF (8)		All (182)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	32	42.11	13	44.83	24	50	3	37.50	72	39.56
2	Agricultural Labour	19	90.48	21	27.63	7	24.14	16	33.33	3	37.50	66	36.26
3	Private Service	0	0	2	2.63	2	6.90	0	0	0	0	4	2.20
4	Student	2	9.52	12	15.79	6	20.69	6	12.50	2	25	28	15.38
5	Housewife	0	0	5	6.58	1	3.45	1	2.08	0	0	7	3.85
6	Children	0	0	4	5.26	0	0	1	2.08	0	0	5	2.75
Total		21	100	76	100	29	100	48	100	8	100	182	100

Occupation of the household members: The data regarding the occupation of the household members in Chikkashindhag-2 micro-watershed is presented in Table 6. The

results indicate that agriculture was the major occupation for 39.56 per cent of the household members, 36.26 per cent were agricultural labourers, 2.20 per cent were private service, 15.38 per cent were students, 3.85 per cent were housewives and 2.75 per cent were children.

Institutional participation of the household members: The data regarding the institutional participation of the household members in Chikkashindhag-2 micro-watershed is presented in Table 7. The results show that, 3.30 per cent of the population in the micro watershed has participated in user group and 96.70 per cent of the population in the micro watershed has not participated in any local institutions.

Table 7. Institutional Participation of household members in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (21)		MF (76)		SF (29)		SMF (48)		MDF (8)		All (182)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	User Group	0	0	4	5.26	1	3.45	1	2.08	0	0	6	3.30
2	No Participation	21	100	72	94.74	28	96.55	47	97.92	8	100	176	96.70
Total		21	100	76	100	29	100	48	100	8	100	182	100

Type of house owned: The data regarding the type of house owned by the households in Chikkashindhag-2 micro-watershed is presented in Table 8. The results indicate that 83.33 per cent of the households possess katcha, 11.11 per cent of the households pucca/RCC and5.56 per cent of the households possess semi pacca house.

Table 8. Type of house owned by households in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Katcha	5	100	13	86.67	5	83.33	5	62.50	2	100	30	83.33
2	Pucca/RCC	0	0	1	6.67	1	16.67	2	25	0	0	4	11.11
3	Semi pacca	0	0	1	6.67	0	0	1	12.50	0	0	2	5.56
Total		5	100	15	100	6	100	8	100	2	100	36	100

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Chikkashindhag-2 micro-watershed is presented in Table 9. The results show that 75 per cent of the households possess TV, 2.78 per cent of them possess DVD/VCD player, 58.33 per cent of them possess mixer/grinder, 44.44 per cent of them possess motor cycle and 91.67 per cent of them possess mobile phones.

Table 9. Durable Assets owned by households in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	4	80	11	73.33	4	66.67	6	75	2	100	27	75
2	DVD/VCD Player	0	0	0	0	0	0	1	12.50	0	0	1	2.78
3	Mixer/Grinder	0	0	11	73.33	5	83.33	4	50	1	50	21	58.33
4	Motor Cycle	2	40	6	40	4	66.67	4	50	0	0	16	44.44
5	Mobile Phone	4	80	15	100	6	100	6	75	2	100	33	91.67
6	Blank	1	20	0	0	0	0	1	12.50	0	0	2	5.56

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Chikkashindhag-2 micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 8,333, DVD/VCD player was Rs. 2,000, mixer grinder was Rs. 1,952, motor cycle was Rs. 42,687 and mobile phones was Rs. 1,980.

Table 10. Average value of durable assets owned by households in Chikkashindhag-2 micro-watershed

Average value (Rs.)

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Television	9,000	8,272	8,250	7,833	9,000	8,333
2	DVD/VCD Player	0	0	0	2,000	0	2,000
3	Mixer/Grinder	0	2,090	1,900	1,625	42,687	1,952
4	Motor Cycle	45,000	43,333	51,250	32,000	0	42,687
5	Mobile Phone	2,000	1,521	2,600	2,333	2,000	1,980

Farm Implements owned: The data regarding the farm implements owned by the households in Chikkashindhag-2 micro-watershed is presented in Table 11. About 5.56 per cent of the households possess bullock cart, 30.56 per cent of them possess plough, 19.44 per cent of them possess sprayer and 52.78 per cent of them possess weeder.

Table 11. Farm Implements owned by households in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	0	0	0	0	2	25	0	0	2	5.56
2	Plough	0	0	4	26.67	5	83.33	1	12.50	1	50	11	30.56
3	Sprayer	0	0	3	20	1	16.67	2	25	1	50	7	19.44
4	Weeder	0	0	7	46.67	8	133.33	3	37.50	1	50	19	52.78
5	Blank	5	100	8	53.33	0	0	4	50	1	50	18	50

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Chikkashindhag-2 micro-watershed is presented in Table 12. The results show that the average value of bullock cart was Rs. 18,000, plough was Rs. 1,636, sprayer was Rs. 4,428 and weeder was Rs.75.

Table 12. Average value of farm implements owned by households in Chikkashindhag-2 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Bullock Cart	0	0	0	18,000	0	18,000
2	Plough	0	1,625	1,600	1,500	2,000	1,636
3	Sprayer	0	5,000	5,000	4,500	2,000	4,428
4	Weeder	0	88	62	84	50	75

Livestock possession by the households: The data regarding the Livestock possession by the households in Chikkashindhag-2 micro-watershed is presented in Table 13. The results indicate that, 8.33 per cent of the households possess bullocks, 22.22 per cent of the households possess local cow, 2.78 per cent possess crossbreed cow and goat and 5.56 per cent of them possess buffalo.

Table 13. Livestock possession by households in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	0	0	1	16.67	1	12.50	1	50	3	8.33
2	Local cow	0	0	4	26.67	2	33.33	1	12.50	1	50	8	22.22
3	Crossbred cow	0	0	0	0	0	0	1	12.50	0	0	1	2.78
4	Buffalo	0	0	2	13.33	0	0	0	0	0	0	2	5.56
5	Goat	0	0	0	0	1	16.67	0	0	0	0	1	2.78
6	blank	5	100	10	66.67	3	50	6	75	1	50	25	69.44

Average Labour availability: The data regarding the average labour availability in Chikkashindhag-2 micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 2.13, average own labour (women) available was 1.29, average hired labour (men) available was 13.29 and average hired labour (women) available was 13.74.

Table 14. Average Labour availability in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Hired labour Female	0	13.20	14.67	9.38	32.50	13.74
2	Own Labour Female	0	1.13	1.33	1.63	1	1.29
3	Own labour Male	0	2	2	2.50	2	2.13
4	Hired labour Male	0	12.80	13.67	9.13	32.50	13.29

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Chikkashindhag-2 micro-watershed is presented in Table 15. The results indicate that 86.11 per cent of the households opined that the hired labour was adequate.

Table 15. Adequacy of Hired Labour in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0	15	100	6	100	8	100	2	100	31	86.11

Distribution of land (ha): The data regarding the distribution of land (ha) in Chikkashindhag-2 micro-watershed is presented in Table 16. The results indicate that, households of the Chikkashindhag-2 micro-watershed possess 26.67 ha (67.76 %) of dry land and 12.69 ha (12.69 %) of irrigated land. Marginal farmers possess 4.71 ha (75.19%) of dry land and 1.55 ha (24.81%) of irrigated land. Small farmers possess 3.22 ha (52.17%) of dry land and 2.95 ha (47.83%) of irrigated land. Semi medium farmers possess 12.26 ha (69.80%) of dry land and 5.31 (30.20%) for irrigated land. Medium farmers possess 6.48 ha (69.23%) for dry land and 2.88 ha (30.77 %) for irrigated land.

Table 16. Distribution of land (Ha) in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	4.71	75.19	3.22	52.17	12.26	69.80	6.48	69.23	26.67	67.76
2	Irrigated	1.55	24.81	2.95	47.83	5.31	30.20	2.88	30.77	12.69	32.24
Total		6.26	100	6.17	100	17.57	100	9.35	100	39.35	100

Average land value (Rs./ha): The results (Table 17) indicate that, the average value of dry land was Rs. 401,107.91 and the average value of irrigated land was Rs. 653,939.39. In case of marginal famers, the average land value was Rs. 1,379,295.53 for dry land and Rs. 1,801,041.66 for irrigated land. In case of small famers, the average land value was Rs. 341,761.01 for dry land and Rs. 677,640.61 for irrigated land. In case of semi medium famers, the average land value was Rs. 220,099.01 for dry land and Rs. 546,376.81 for irrigated land. In case of medium farmers, the average land value was Rs. 61,750 for dry land and Rs. 208,438.81 for irrigated land.

Table 17. Average land value (Rs./ha) in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Dry	1,379,295.53	341,761.01	220,099.01	61,750	401,107.91
2	Irrigated	1,801,041.66	677,640.61	546,376.81	208,438.81	653,939.39

Status of bore wells: The data regarding the status of bore wells in Chikkashindhag-2 micro-watershed is presented in Table 18. The results indicate that, there were 15 functioning and 4 de-functioning bore wells in the micro watershed.

Table 18. Status of bore wells in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	De-functioning	0	1	1	2	0	4
2	Functioning	0	6	4	4	1	15

Source of irrigation: The data regarding the source of irrigation in Chikkashindhag-2 micro-watershed is presented in Table 19. The results indicate that, bore well was the major irrigation source in the micro water shed for 41.67 per cent of the farmers.

Table 19. Source of irrigation in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	6	40	4	66.67	4	50	1	50	15	41.67

Depth of water (Avg in meters): The data regarding the depth of water in Chikkashindhag-2 micro-watershed is presented in Table 20. The results indicate that, the depth of bore well was found to be 44.87 meters.

Table 20. Depth of water (Avg in meters) in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Bore Well	0	42.67	71.12	55.25	53.34	44.87

Table 21. Irrigated Area (ha) in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Kharif	0	1.55	2.95	5.31	2.88	12.69
2	Perennial Crops	0	0.40	0.40	0.40	0	1.21
3	Rabi	0	0	0	1.21	0	1.21
Total		0	1.96	3.36	6.93	2.88	15.12

Irrigated Area (ha): The results (Table 2)1indicate that marginal, small, semi medium and medium farmers had an irrigated area of 1.96 ha, 5 ha, 3.36 ha, 6.93 ha and 2.88 ha respectively.

Cropping pattern: The data regarding the cropping pattern in Chikkashindhag-2 micro-watershed is presented in Table 22. The results indicate that, farmers have grown maize (23.72 ha), sunflower (3.24 ha), Bengal gram (2.83 ha), sorghum (2.43 ha), sugarcane (1.7 ha), jowar (0.81 ha), cotton (0.41 ha), bajra, cluster bean and onion (0.4 ha). Marginal farmers had grown maize, Bengal gram, cotton, bajra, cluster bean and onion. Small farmers had grown maize,. Semi medium farmers had grown maize, Bengal gram, sorghum, sugarcane, and jowar. Medium farmers had grown maize and sunflower.

Table 22. Cropping pattern in Chikkashindhag-2 micro-watershed (Area in ha)

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Kharif - Maize	0	3.72	4.17	9.72	6.12	23.72
2	Kharif - Sunflower	0	0	0	0	3.24	3.24
3	Rabi - Bengal gram	0	0.92	0	2.83	0	3.75
4	Kharif - Sorghum	0	0	0	2.43	0	2.43
5	Kharif - Sugarcane	0	0	0	1.7	0	1.7
6	Kharif - Jowar	0	0	0	0.81	0	0.81
7	Kharif - Cotton	0	0.41	0	0	0	0.41
8	Kharif - Bajra	0	0.4	0	0	0	0.4
9	Kharif - Cluster bean	0	0.4	0	0	0	0.4
10	Kharif - Onion	0	0.4	0	0	0	0.4
Total		0	6.27	4.17	17.49	9.36	37.28

Cropping intensity: The data regarding the cropping intensity in Chikkashindhag-2 micro-watershed is presented in Table 23. The results indicate that, the cropping intensity in Chikkashindhag-2 micro-watershed was found to be 84.92 per cent.

Table 23. Cropping intensity (%) in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Cropping Intensity	0	100	96.71	100	59.09	84.92

Possession of Bank account and savings: The data regarding the possession of bank account and saving in Chikkashindhag-2 micro-watershed is presented in Table 24. The results indicate that, 11.11 per cent of the households have bank account.

Table 24. Possession of Bank account and savings in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	0	0	1	6.67	1	16.67	2	25	0	0	4	11.11

Table 25. Borrowing status in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	0	0	1	6.67	0	0	0	0	0	0	1	2.78

Borrowing status: The data regarding the borrowing status in Chikkashindhag-2 micro-watershed is presented in Table 25. The results indicate that, 2.78 per cent of the households have availed credit from different sources.

Source of credit availed by households: The data regarding the borrowing status in Chikkashindhag-2 micro-watershed is presented in Table 26. The results indicate that, 100 per cent of the households have borrowed from cooperative and grameena bank.

Table 26. Source of credit availed by households in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	MF (1)		All (1)	
		N	%	N	%
1	Cooperative Bank	1	100	1	100
2	Grameena Bank	1	100	1	100

Avg. Credit amount: The data regarding the avg. Credit amount in Chikkashindhag-2 micro-watershed is presented in Table 27. The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 205,000.

Table 27. Avg. credit amount by household in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	MF (1)	All (1)
1	Average Credit	30,000	205,000

Purpose of credit borrowed - Institutional Credit: The data regarding the purpose of credit borrowed - Institutional Credit in Chikkashindhag-2 micro-watershed is presented in Table 28. The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production.

Table 28. Purpose of credit borrowed - Institutional Credit by household in Chikkashindhag-2 micro-watershed

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

Repayment status of households – Institutional: The data regarding the repayment status of credit borrowed from institutional sources by households in Chikkashindhag-2 micro watershed is presented in Table 29. The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources.

Table 29. Repayment status of households – Institutional Credit in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	MF (2)		SF (1)		SMF (2)		All (5)	
		N	%	N	%	N	%	N	%
1	Un paid	2	100	1	100	2	100	5	100

Opinion on institutional sources of credit: The results (Table 30) indicate that, around 40 per cent opined that the loan amount borrowed from high rate of interest.

Table 30. Opinion on institutional sources of credit in Chikkashindhag-2 micro watershed

Sl.No.	Particulars	MF (2)		SF (1)		SMF (2)		All (5)	
		N	%	N	%	N	%	N	%
1	Higher rate of interest	2	100	0	0	0	0	2	40

Cost of cultivation of Bajra: The data regarding the cost of cultivation of bajra in Chikkashindhag-2 micro-watershed is presented in Table 31. The results indicate that, the total cost of cultivation for bajra was Rs. 36799.97. The gross income realized by the farmers was Rs. 31616. The net income from bajra cultivation was Rs. -5183.97. Thus the benefit cost ratio was found to be 1:0.86.

Table 31. Cost of Cultivation of bajra in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	24.70	3952	10.74
2	Bullock		Pairs/day	4.94	2964	8.05
3	Tractor		Hours	2.47	1976	5.37
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	12.35	1482	4.03
7	FYM		Quintal	7.41	1482	4.03
8	Fertilizer + micronutrients		Quintal	9.88	9089.60	24.70
9	Pesticides (PPC)		Kgs / liters	0	0	0
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	103.74	0.28
14	Land revenue and Taxes			0	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				1446.55	3.93
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				22499.19	61.14
III	**Cost B2**					
18	Rental Value of Land				333.33	0.91
19	**Cost B2 = (Cost B1 + Rental value)**				22832.52	62.04
IV	**Cost C1**					
20	Family Human Labour			49.40	10621	28.86
21	**Cost C1 = (Cost B2 + Family Labour)**				33453.52	90.91
V	**Cost C2**					
22	Risk Premium				1	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				33454.52	90.91
VI	**Cost C3**					
24	Managerial Cost				3345.45	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				36799.97	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		24.70	29640	
		b) Main Crop Sales Price (Rs.)			1200	
	By Product	e) Main Product (q)		4.94	1976	
		f) Main Crop Sales Price (Rs.)			400	
b.	Gross Income (Rs.)				31616	
c.	Net Income (Rs.)				-5183.97	
d.	Cost per Quintal (Rs./q.)				1489.88	
e.	Benefit Cost Ratio (BC Ratio)				1:0.86	

Cultivation of Cotton: The data regarding the cost of cultivation of Cotton in Chikkashindhag-2 micro-watershed is presented in Table 32. The results indicate that, the total cost of cultivation for Cotton was Rs. 162755.71. The gross income realized by the farmers was Rs. 262007.31. The net income from Cotton cultivation was Rs. 99251.60. Thus the benefit cost ratio was found to be 1:1.61.

Table 32. Cost of Cultivation of Cotton in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	147.09	24115.17	14.82
2	Bullock		Pairs/day	5.03	3018.89	1.85
3	Tractor		Hours	12.09	8259.47	5.07
4	Machinery		Hours	15.55	12441.48	7.64
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	14.77	14029.34	8.62
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	15.78	3156.11	1.94
8	Fertilizer + micronutrients		Quintal	36.72	33117.60	20.35
9	Pesticides (PPC)		Kgs / liters	7.38	7854.34	4.83
10	Irrigation		Number	28.23	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	327.30	0.20
14	Land revenue and Taxes			0	15.92	0.01
II	**Cost B1**					
16	Interest on working capital				6978.97	4.29
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				113314.58	69.62
III	**Cost B2**					
18	Rental Value of Land				1888.89	1.16
19	**Cost B2 = (Cost B1 + Rental value)**				115203.47	70.78
IV	**Cost C1**					
20	Family Human Labour			151.99	32755.60	20.13
21	**Cost C1 = (Cost B2 + Family Labour)**				147959.07	90.91
V	**Cost C2**					
22	Risk Premium				0.67	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				147959.74	90.91
VI	**Cost C3**					
24	Managerial Cost				14795.97	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				162755.71	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		68.35	262007.31	
		b) Main Crop Sales Price (Rs.)			3833.33	
		h) Intercrop Sales Price (Rs.)			2.67	
b.	Gross Income (Rs.)				262007.31	
c.	Net Income (Rs.)				99251.60	
d.	Cost per Quintal (Rs./q.)				2381.22	
e.	Benefit Cost Ratio (BC Ratio)				1:1.61	

Cost of cultivation of Beans: The data regarding the cost of cultivation of Beans in Chikkashindhag-2 micro-watershed is presented in Table 33. The results indicate that, the total cost of cultivation for Beans was Rs. 40614.69. The gross income realized by the farmers was Rs. 88920. The net income from Beans cultivation was Rs. 48305.31. Thus the benefit cost ratio was found to be 1:2.19.

Table 33. Cost of Cultivation of Beans in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	27.17	4322.50	10.64
2	Bullock		Pairs/day	2.47	1482	3.65
3	Tractor		Hours	2.47	1976	4.87
4	Machinery		Hours	4.94	3952	9.73
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	12.35	3458	8.51
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	9.88	1976	4.87
8	Fertilizer + micronutrients		Quintal	7.41	6125.60	15.08
9	Pesticides (PPC)		Kgs / liters	2.47	2470	6.08
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	0.05	0
14	Land revenue and Taxes			0	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				1683.67	4.15
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				27449.11	67.58
III	**Cost B2**					
18	Rental Value of Land				333.33	0.82
19	**Cost B2 = (Cost B1 + Rental value)**				27782.45	68.40
IV	**Cost C1**					
20	Family Human Labour			44.46	9139	22.50
21	**Cost C1 = (Cost B2 + Family Labour)**				36921.45	90.91
V	**Cost C2**					
22	Risk Premium				1	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				36922.45	90.91
VI	**Cost C3**					
24	Managerial Cost				3692.24	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				40614.69	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		29.64	88920	
		b) Main Crop Sales Price (Rs.)			3000	
b.	Gross Income (Rs.)				88920	
c.	Net Income (Rs.)				48305.31	
d.	Cost per Quintal (Rs./q.)				1370.27	
e.	Benefit Cost Ratio (BC Ratio)				1:2.19	

Cost of Cultivation of Maize: The data regarding the cost of cultivation of Maize in Chikkashindhag-2 micro-watershed is presented in Table 34. The results indicate that, the total cost of cultivation for Maize was Rs. 62559.11. The gross income realized by the farmers was Rs. 47681.83. The net income from Maize cultivation was Rs. -14877.27. Thus the benefit cost ratio was found to be 1:0.76.

Table 34. Cost of Cultivation of Maize in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	60.20	18846.04	30.13
2	Bullock		Pairs/day	6.91	4153.08	6.64
3	Tractor		Hours	1.61	1174.54	1.88
4	Machinery		Hours	0.22	138.14	0.22
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	26.30	3162.61	5.06
7	FYM		Quintal	1.72	2072.49	3.31
8	Fertilizer + micronutrients		Quintal	12.98	10675.62	17.06
9	Pesticides (PPC)		Kgs / liters	2.15	2153.36	3.44
10	Irrigation		Number	2.47	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	51.36	0.08
14	Land revenue and Taxes			0	5.11	0.01
II	**Cost B1**					
16	Interest on working capital				2169.06	3.47
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				44611.80	71.31
III	**Cost B2**					
18	Rental Value of Land				508.77	0.81
19	**Cost B2 = (Cost B1 + Rental value)**				45120.57	72.12
IV	**Cost C1**					
20	Family Human Labour			40.14	11750.34	18.78
21	**Cost C1 = (Cost B2 + Family Labour)**				56870.91	90.91
V	**Cost C2**					
22	Risk Premium				1	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				56871.91	90.91
VI	**Cost C3**					
24	Managerial Cost				5687.19	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				62559.11	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		36.87	45797.56	
		b) Main Crop Sales Price (Rs.)			1242.11	
	By Product	e) Main Product (q)		2.78	1884.27	
		f) Main Crop Sales Price (Rs.)			678.95	
b.	Gross Income (Rs.)				47681.83	
c.	Net Income (Rs.)				-14877.27	
d.	Cost per Quintal (Rs./q.)				1696.71	
e.	Benefit Cost Ratio (BC Ratio)				1:0.76	

Cultivation of Sorghum: The data regarding the cost of cultivation of Sorghum in Chikkashindhag-2 micro-watershed is presented in Table 35. The results indicate that, the total cost of cultivation for Sorghum was Rs. 24327.11. The gross income realized by the farmers was Rs. 33962.50. The net income from Sorghum cultivation was Rs. 9635.39. Thus the benefit cost ratio was found to be 1:1.4.

Table 35. Cost of Cultivation of Sorghum in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	50.64	7224.75	29.70
2	Bullock		Pairs/day	1.03	617.50	2.54
3	Tractor		Hours	3.09	2099.50	8.63
4	Machinery		Hours	1.24	617.50	2.54
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	7.41	1099.15	4.52
7	FYM		Quintal	0	0	0
8	Fertilizer + micronutrients		Quintal	7.82	5650.13	23.23
9	Pesticides (PPC)		Kgs / liters	0	0	0
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	4.33	0.02
14	Land revenue and Taxes			0	22.23	0.09
II	**Cost B1**					
16	Interest on working capital				809.97	3.33
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				18145.05	74.59
III	**Cost B2**					
18	Rental Value of Land				1500	6.17
19	**Cost B2 = (Cost B1 + Rental value)**				19645.05	80.75
IV	**Cost C1**					
20	Family Human Labour			10.09	2470	10.15
21	**Cost C1 = (Cost B2 + Family Labour)**				22115.05	90.91
V	**Cost C2**					
22	Risk Premium				0.50	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				22115.55	90.91
VI	**Cost C3**					
24	Managerial Cost				2211.56	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				24327.11	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		18.53	32418.75	
		b) Main Crop Sales Price (Rs.)			1750	
	By Product	e) Main Product (q)		6.18	1543.75	
		f) Main Crop Sales Price (Rs.)			250	
b.	Gross Income (Rs.)				33962.50	
c.	Net Income (Rs.)				9635.39	
d.	Cost per Quintal (Rs./q.)				1313.20	
e.	Benefit Cost Ratio (BC Ratio)				1:1.4	

Cultivation of Bengal gram: The data regarding the cost of cultivation of Bengal gram in Chikkashindhag-2 micro-watershed is presented in Table 36. The results indicate that, the total cost of cultivation for Bengal gram was Rs. 43641.12. The gross income realized by the farmers was Rs. 61186.67. The net income from Bengal gram cultivation was Rs. 17545.55. Thus the benefit cost ratio was found to be 1:1.4.

Table 36. Cost of Cultivation of Bengal gram in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	46.91	7659.21	17.55
2	Bullock		Pairs/day	0.79	473.20	1.08
3	Tractor		Hours	3.40	2041	4.68
4	Machinery		Hours	0.49	250.95	0.58
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	103.57	11791	27.02
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	1.08	1625	3.72
8	Fertilizer + micronutrients		Quintal	8.92	8219.68	18.83
9	Pesticides (PPC)		Kgs / liters	0.79	667.98	1.53
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	60.23	0.14
14	Land revenue and Taxes			0	21.82	0.05
II	**Cost B1**					
16	Interest on working capital				2676.50	6.13
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				35486.58	81.31
III	**Cost B2**					
18	Rental Value of Land				1500	3.44
19	**Cost B2 = (Cost B1 + Rental value)**				36986.58	84.75
IV	**Cost C1**					
20	Family Human Labour			11.83	2686.67	6.16
21	**Cost C1 = (Cost B2 + Family Labour)**				39673.24	90.91
V	**Cost C2**					
22	Risk Premium				0.50	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				39673.74	90.91
VI	**Cost C3**					
24	Managerial Cost				3967.37	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				43641.12	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		15.30	61186.67	
		b) Main Crop Sales Price (Rs.)			4000	
b.	Gross Income (Rs.)				61186.67	
c.	Net Income (Rs.)				17545.55	
d.	Cost per Quintal (Rs./q.)				2852.98	
e.	Benefit Cost Ratio (BC Ratio)				1:1.4	

Cultivation of Onion: The data regarding the cost of cultivation of onion in Chikkashindhag-2 micro-watershed is presented in Table 37. The results indicate that, the total cost of cultivation for onion was Rs. 95996.88. The gross income realized by the farmers was Rs. 197600. The net income from onion cultivation was Rs. 101603.12. Thus the benefit cost ratio was found to be 1:2.06.

Table 37. Cost of Cultivation of onion in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	111.15	36679.50	38.21
2	Bullock		Pairs/day	9.88	5928	6.18
3	Tractor		Hours	0	0	0
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	988	4940	5.15
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	4.94	988	1.03
8	Fertilizer + micronutrients		Quintal	14.82	12251.20	12.76
9	Pesticides (PPC)		Kgs / liters	2.47	2470	2.57
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	79.04	0.08
14	Land revenue and Taxes			0	3.29	0
II	**Cost B1**					
16	Interest on working capital				2478.02	2.58
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				65817.06	68.56
III	**Cost B2**					
18	Rental Value of Land				333.33	0.35
19	**Cost B2 = (Cost B1 + Rental value)**				66150.39	68.91
IV	**Cost C1**					
20	Family Human Labour			66.69	21118.50	22
21	**Cost C1 = (Cost B2 + Family Labour)**				87268.89	90.91
V	**Cost C2**					
22	Risk Premium				1	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				87269.89	90.91
VI	**Cost C3**					
24	Managerial Cost				8726.99	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				95996.88	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		247	197600	
		b) Main Crop Sales Price (Rs.)			800	
b.	Gross Income (Rs.)				197600	
c.	Net Income (Rs.)				101603.12	
d.	Cost per Quintal (Rs./q.)				388.65	
e.	Benefit Cost Ratio (BC Ratio)				1:2.06	

Cultivation of Sunflower: The data regarding the cost of cultivation of sunflower in Chikkashindhag-2 micro-watershed is presented in Table 38. The results indicate that, the total cost of cultivation for sunflower was Rs. 27307.87. The gross income realized by the farmers was Rs. 46312.50. The net income from sunflower cultivation was Rs. 19004.63. Thus the benefit cost ratio was found to be 1:1.7.

Table 38. Cost of Cultivation of onion in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	36.74	8243.63	30.19
2	Bullock		Pairs/day	0.93	555.75	2.04
3	Tractor		Hours	2.47	1976	7.24
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	8.03	5217.88	19.11
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	0	0	0
8	Fertilizer + micronutrients		Quintal	7.41	5619.25	20.58
9	Pesticides (PPC)		Kgs / liters	0	0	0
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	0.01	0
14	Land revenue and Taxes			0	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				1300.58	4.76
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				22916.37	83.92
III	**Cost B2**					
18	Rental Value of Land				333.33	1.22
19	**Cost B2 = (Cost B1 + Rental value)**				23249.71	85.14
IV	**Cost C1**					
20	Family Human Labour			5.87	1574.63	5.77
21	**Cost C1 = (Cost B2 + Family Labour)**				24824.33	90.91
V	**Cost C2**					
22	Risk Premium				1	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				24825.33	90.91
VI	**Cost C3**					
24	Managerial Cost				2482.53	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				27307.87	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		15.44	46312.50	
		b) Main Crop Sales Price (Rs.)			3000	
b.	Gross Income (Rs.)				46312.50	
c.	Net Income (Rs.)				19004.63	
d.	Cost per Quintal (Rs./q.)				1768.93	
e.	Benefit Cost Ratio (BC Ratio)				1:1.7	

Cultivation of Sugarcane: The data regarding the cost of cultivation of sugarcane in Chikkashindhag-2 micro-watershed is presented in Table 39. The results indicate that, the total cost of cultivation for sugarcane was Rs. 22141.16. The gross income realized by the farmers was Rs. 27052.38. The net income from sugarcane cultivation was Rs. 4911.22. Thus the benefit cost ratio was found to be 1:1.22.

Table 39. Cost of Cultivation of onion in Chikkashindhag-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	37.64	5316.38	24.01
2	Bullock		Pairs/day	0	0	0
3	Tractor		Hours	2.35	1881.90	8.50
4	Machinery		Hours	0.59	411.67	1.86
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	1764.29	3528.57	15.94
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	0.59	882.14	3.98
8	Fertilizer + micronutrients		Quintal	3.53	3263.93	14.74
9	Pesticides (PPC)		Kgs / liters	0.59	470.48	2.12
10	Irrigation		Number	3.53	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	211.71	0.96
14	Land revenue and Taxes			0	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				977.53	4.42
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				16947.61	76.54
III	**Cost B2**					
18	Rental Value of Land				333.33	1.51
19	**Cost B2 = (Cost B1 + Rental value)**				17280.95	78.05
IV	**Cost C1**					
20	Family Human Labour			17.05	2846.38	12.86
21	**Cost C1 = (Cost B2 + Family Labour)**				20127.33	90.90
V	**Cost C2**					
22	Risk Premium				1	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				20128.33	90.91
VI	**Cost C3**					
24	Managerial Cost				2012.83	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				22141.16	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		117.62	27052.38	
		b) Main Crop Sales Price (Rs.)			230	
b.	Gross Income (Rs.)				27052.38	
c.	Net Income (Rs.)				4911.22	
d.	Cost per Quintal (Rs./q.)				188.24	
e.	Benefit Cost Ratio (BC Ratio)				1:1.22	

Adequacy of fodder: The data regarding the adequacy of fodder in Chikkashindhag-2 micro-watershed is presented in Table 40. The results indicate that, 25 per cent of the households opined that dry fodder was adequate, 22.22 green fodders was adequate, 5.56 per cent of the households opine dry fodder was in adequate and 2.78 per cent of the households opined that green fodder was inadequate.

Table 30. Adequacy of fodder in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	4	26.67	2	33.33	2	25	1	50	9	25
2	Inadequate-Dry Fodder	0	0	0	0	0	0	2	25	0	0	2	5.56
3	Adequate-Green Fodder	0	0	3	20	2	33.33	2	25	1	50	8	22.22
4	Inadequate-Green Fodder	0	0	1	6.67	0	0	0	0	0	0	1	2.78

Annual gross income: The data regarding the annual gross income in Chikkashindhag-2 micro-watershed is presented in Table 41. The results indicate that the annual gross income was Rs. 39,533.33 for for marginal farmers, for small farmers it was Rs. 36,666.67, for semi medium farmers it was Rs. 104,375 and for medium farmers it was Rs. 110,000.

Table 31. Annual gross income in Chikkashindhag-2 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Service/salary	0	6,666.67	0	0	0	2,777.78
2	Wage	0	3,666.67	10,000	6,875	0	4,722.22
3	Agriculture	0	27,800	16,666.67	95,125	110,000	41,611.11
4	Dairy Farm	0	1,400	0	2,375	0	1,111.11
5	Goat Farming	0	0	10,000	0	0	1,666.67
Income(Rs.)		0	39,533.33	36,666.67	104,375	110,000	51,888.89

Average annual expenditure: The data regarding the average annual expenditure in Chikkashindhag-2 micro-watershed is presented in Table 42. The results indicate that the average annual expenditure is Rs. 6,373.84. For marginal farmers it was Rs. 4,708.89, for small farmers it was Rs. 6,366.67, for semi medium farmers it was Rs. 7,578.13 and for medium farmers it was Rs. 30,000.

Table 42. Average annual expenditure in Chikkashindhag-2 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Service/salary	0	40,000	0	0	0	2,222.22
2	Wage	0	9,333.33	15,000	9,000	0	2,361.11
3	Agriculture	0	16,800	11,200	46,125	60,000	22,138.89
4	Dairy Farm	0	4,500	0	5,500	0	555.56
5	Goat Farming	0	0	12,000	0	0	333.33
Total		0	70,633.33	38,200	60,625	60,000	229,458.33
Average		0	4,708.89	6,366.67	7,578.13	30,000	6,373.84

Horticulture species grown: The data regarding horticulture species grown in Chikkashindhag-2 micro-watershed is presented in Table 43. The results indicate that, households have planted 48 coconut and 2 mango trees in their field.

Table 43: Horticulture species grown in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	18	0	30	0	0	0	0	0	48	0
2	Mango	0	0	0	0	0	0	2	0	0	0	2	0

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

Forest species grown: The data regarding forest species grown in Chikkashindhag-2 micro-watershed is presented in Table 44. The results indicate that, households have planted 34 teak, 49 neem and 4 tamarind tree in their field.

Table 44: Forest species grown in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Teak	0	0	24	0	10	0	0	0	0	0	34	0
2	Neem	0	0	14	1	16	0	19	0	0	0	49	1
3	Tamarind	0	0	4	0	0	0	0	0	0	0	4	0

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

Average Additional investment capacity: The data regarding average additional investment capacity in Chikkashindhag-2 micro-watershed is presented in Table 45. The results indicated that, households have an average investment capacity of Rs. 1,750.22 for land development, Rs. 361.11for improved crop production and Rs. 277.78 for improved crop production.

Table 45: Source of funds for additional investment capacity in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (15)	SF (6)	SMF (8)	MDF (2)	All (36)
1	Land development	0	666.67	834.67	3,500	10,000	1,750.22
2	Irrigation facility	0	266.67	666.67	625	0	361.11
3	Improved crop production	0	466.67	500	2,250	5,000	1,055.56
4	Improved livestock management	0	533.33	333.33	0	0	277.78

Table 46: Source of funds for additional investment capacity in Chikkashindhag-2 micro-watershed

Sl.No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Loan from bank	5	13.51	3	8.11	5	13.51	0	0.0
2	Own funds	1	2.7	0	0.0	1	2.7	2	5.41

Source of additional investment: The data regarding source of funds for additional investment in Chikkashindhag-2 micro-watershed is presented in Table 46. The results

indicated that loan from bank was the source of additional investment for 13.51 per cent for land development and improved crop production and 8.11 per cent for irrigation facility. Own funds was the source of additional investment for 2.7 per cent for land development and improved crop production and 5.41 per cent for improved livestock management.

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Chikkashindhag-2 micro-watershed is presented in Table 47. The results indicated that, bajra and sorghum was sold to the extent of 60 per cent, beans and Bengal gram was sold to the extent of 83.33 per cent, cotton, sugarcane and sunflower was sold to the extent of 100 per cent, maize was sold to the extent of 97.62 per cent and onion was sold to the extent of 98 per cent.

Table 47. Marketing of the agricultural produce in Chikkashindhag-2 micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	10	4	6	60	1200.0
2	Beans	12	2	10	83.33	3000.0
3	Bengal gram	60	10	50	83.33	4100.5
4	Cotton	28	0	28	100	3833.33
5	Maize	840	20	820	97.62	1230.0
6	Onion	100	2	98	98	800.0
7	Sorghum	50	20	30	60	1750.0
8	Sugarcane	200	0	200	100	230.0
9	Sunflower	50	0	50	100	3000.0

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Chikkashindhag-2 micro-watershed is presented in Table 48. The results indicated that, about 8.33 per cent of the farmers sold their produce to agent/traders, 47.22 per cent of the farmers sold their produce to local/village merchants, 19.44 per cent of the farmers sold their produce to regulated market and 13.89 per cent of the farmers sold their produce to cooperative marketing society.

Table 48. Marketing Channels used for sale of agricultural produce in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agent/Traders	0	0	1	6.67	0	0	2	25	0	0	3	8.33
2	Local/village Merchant	0	0	11	73.33	1	16.67	3	37.50	2	100	17	47.22
3	Regulated Market	0	0	2	13.33	3	50	1	12.50	1	50	7	19.44
4	Cooperative marketing Society	0	0	1	6.67	1	16.67	3	37.50	0	0	5	13.89

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Chikkashindhag-2 micro-watershed is presented in Table 49. The

results indicated that, 75 per cent of the households used tractor and 13.89 per cent of the households use truck as a mode of transportation for their agricultural produce.

Table 49. Mode of transport of agricultural produce in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Tractor	0	0	14	93.33	4	66.67	6	75	3	150	27	75
2	Truck	0	0	1	6.67	1	16.67	3	37.50	0	0	5	13.89

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Chikkashindhag-2 micro-watershed is presented in Table 50. The results indicated that, 36.11 per cent of the households have experienced soil and water erosion problems in the farm.

Table 40. Incidence of soil and water erosion problems in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	4	26.67	2	33.33	5	62.50	2	100	13	36.11

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Chikkashindhag-2 micro-watershed is presented in Table 51. The results indicated that, 72.22 per cent have shown interest in soil test.

Table 51. Interest shown towards soil testing in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	13	86.67	5	83.33	6	75	2	100	26	72.22

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Chikkashindhag-2 micro-watershed is presented in Table 52. The results indicated that, 97.22 per cent of the households used firewood and 2.78 per cent of the households used LPG as a source of fuel.

Table 52. Usage pattern of fuel for domestic use in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	5	100	14	93.33	6	100	8	100	2	100	35	97.22
2	LPG	0	0	1	6.67	0	0	0	0	0	0	1	2.78

Source of drinking water: The data regarding source of drinking water in Chikkashindhag-2 micro-watershed is presented in Table 53. The results indicated that, piped supply was the major source of drinking water for 77.78 per cent of the households, bore well and canal/nala was the source of drinking water for 11.11 per cent of the households in micro watershed.

Table 53. Source of drinking water in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	5	100	12	80	5	83.33	4	50	2	100	28	77.78
2	Bore Well	0	0	2	13.33	0	0	2	25	0	0	4	11.11
3	Canal/Nala	0	0	1	6.67	1	16.67	2	25	0	0	4	11.11

Source of light: The data regarding source of light in Chikkashindhag-2 micro-watershed is presented in Table 54. The results indicated that, Electricity was the major source of light for 97.22 per cent and 2.78 per cent of the households used kerosene lamp in micro watershed.

Table 54. Source of light in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Kerosene Lamp	0	0	0	0	0	0	1	12.50	0	0	1	2.78
2	Electricity	5	100	15	100	6	100	7	87.50	2	100	35	97.22

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facilit**y** in Chikkashindhag-2 micro-watershed is presented in Table 55. The results indicated that, 33.33 per cent of the households possess sanitary toilet facility.

Table 55. Existence of Sanitary toilet facility in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	1	20	5	33.33	3	50	1	12.50	2	100	12	33.33

Possession of PDS card: The data regarding possession of PDS card in Chikkashindhag-2 micro-watershed is presented in Table 56. The results indicated that, 100 per cent of the sampled households possessed BPL card.

Table 56. Possession of PDS card in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		LF (0)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100	15	100	6	100	8	100	2	100	0	0	36	100

Participation in NREGA program: The data regarding participation in NREGA programme in Chikkashindhag-2 micro-watershed is presented in Table 57. The results indicated that, 27.78 per cent of the households participated in NREGA programme.

Table 57. Participation in NREGA programme in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF(8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	2	40	3	20	1	16.67	2	25	2	100	10	27.78

Adequacy of food items: The data regarding adequacy of food items in Chikkashindhag-2 micro-watershed is presented in Table 58. The results indicated that, cereals and milk were adequate for 100 per cent of the households, pulses were adequate for 91.67 per

cent, oilseeds were adequate for 25 per cent, vegetables were adequate for 47.22 per cent, fruits were adequate for 16.67 per cent, egg were adequate for 80.56 per cent and meat were adequate for 77.78 per cent.

Table 58. Adequacy of food items in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	5	100	15	100	6	100	8	100	2	100	36	100
2	Pulses	5	100	13	86.67	6	100	7	87.50	2	100	33	91.67
3	Oilseed	0	0	4	26.67	1	16.67	2	25	2	100	9	25
4	Vegetables	0	0	7	46.67	3	50	6	75	1	50	17	47.22
5	Fruits	0	0	3	20	0	0	2	25	1	50	6	16.67
6	Milk	5	100	15	100	6	100	8	100	2	100	36	100
7	Egg	5	100	12	80	5	83.33	5	62.50	2	100	29	80.56
8	Meat	5	100	12	80	5	83.33	4	50	2	100	28	77.78

Response on Inadequacy of food items: The data regarding inadequacy of food items in Chikkashindhag-2 micro-watershed is presented in Table 59. The results indicated that, pulses were inadequate for 8.33 per cent, oilseeds were inadequate for 66.67 per cent, vegetables were inadequate for 52.78 per cent, fruits were inadequate for 75 per cent, egg and meat were inadequate were 5.56 per cent of the households.

Table 59. Response on Inadequacy of food items in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Pulses	0	0	2	13.33	0	0	1	12.50	0	0	3	8.33
2	Oilseed	5	100	10	66.67	4	66.67	5	62.50	0	0	24	66.67
3	Vegetables	5	100	8	53.33	3	50	2	25	1	50	19	52.78
4	Fruits	5	100	11	73.33	5	83.33	5	62.50	1	50	27	75
5	Egg	0	0	0	0	1	16.67	1	12.50	0	0	2	5.56
6	Meat	0	0	0	0	0	0	2	25	0	0	2	5.56

Response on market surplus of food items: The data regarding market surplus of food items in Chikkashindhag-2 micro watershed is presented in Table 60. The results indicated that, oilseeds were market surplus for 8.33 per cent and fruits were market surplus for 2.78 per cent and meat were market surplus for 11.11 per cent of the households.

Table 60. Response on Market surplus of food items in Chikkashindhag-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (15)		SF (6)		SMF (8)		MDF (2)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Oilseed	0	0	1	6.67	1	16.67	1	12.50	0	0	3	8.33
2	Fruits	0	0	0	0	1	16.67	0	0	0	0	1	2.78

Farming constraints: The data regarding farming constraints experienced by households in Chikkashindhag-2 micro-watershed is presented in Table 61. The results indicated that, lower fertility status of the soil water and inadequacy of irrigation water was the

constraint experienced by 72.22 per cent of the households, wild animal menace on farm field (86.11%), frequent incidence of pest and diseases (69.44%), high cost of fertilizers and plant protection chemicals and high rate of interest on credit (75%), low price for the agricultural commodities(8.33%), less rainfall (22.22%) and Source of Agri-technology information (8.33%).

Table 61. Farming constraints Experienced in Chikkashindhag-2 micro-watershed

Sl.No.	Particulars	MF (15)		SF (6)		SMF(8)		MDF(2)		All (36)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	12	80	6	100	6	75	2	100	26	72.22
2	Wild animal menace on farm field	15	100	6	100	8	100	2	100	31	86.11
3	Frequent incidence of pest and diseases	13	86.67	5	83.33	5	62.50	2	100	25	69.44
4	Inadequacy of irrigation water	13	86.67	6	100	5	62.50	2	100	26	72.22
5	High cost of Fertilizers and plant protection chemicals	13	86.67	6	100	6	75	2	100	27	75
6	High rate of interest on credit	14	93.33	6	100	5	62.50	2	100	27	75
7	Low price for the agricultural commodities	2	13.33	0	0	0	0	1	50	3	8.33
8	Less rainfall	3	20	1	16.67	4	50	0	0	8	22.22
9	Source of Agri-technology information(Newspaper/TV/Mobile)	2	13.33	0	0	1	12.50	0	0	3	8.33

Chapter 5

SUMMARY

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 36 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 105 (57.69%) men and 77 (42.31%) women among the sampled households. The average family size of landless farmers' was 4.2, marginal farmers' was 5.06, small farmers' was 4.8, semi medium farmers' was 6 and medium farmers' was 4. The data indicated that, 22 (12.09%) people were in 0-15 years of age, 95 (52.2%) were in 16-35 years of age, 56 (30.77%) were in 36-60 years of age and 9 (4.95%) were above 61 years of age.

The results indicated that Chikkashindhag-2 had 25.82 per cent illiterates, 16.48 per cent of them had primary school education, 6.04 per cent of them had middle school education, 28.57 per cent of them had high school education, 10.99 per cent of them had PUC education, 0.55 per cent had ITI education, 6.59 per cent of them ha degree education and 1.10 per cent of them had degree level education.

The results indicate that, 55.56 per cent of household heads were practicing agriculture and 41.67 per cent of the household heads were agricultural labour. The results indicate that agriculture was the major occupation for 39.56 per cent of the household members, 36.26 per cent were agricultural labourers, 2.20 per cent were private service, 15.38 per cent were students, 3.85 per cent were housewives and 2.75 per cent were children.

The results show that, 3.30 per cent of the population in the micro watershed has participated in user group and 96.70 per cent of the population in the micro watershed has not participated in any local institutions. The results indicate that 83.33 per cent of the households possess katcha, 11.11 per cent of the households pucca/RCC and5.56 per cent of the households possess semi pacca house.

The results show that 75 per cent of the households possess TV, 2.78 per cent of them possess DVD/VCD player, 58.33 per cent of them possess mixer/grinder, 44.44 per cent of them possess motor cycle and 91.67 per cent of them possess mobile phones. The results show that the average value of television was Rs. 8,333, DVD/VCD player was Rs. 2,000, mixer grinder was Rs. 1,952, motor cycle was Rs. 42,687 and mobile phones was Rs. 1,980.

About 5.56 per cent of the households possess bullock cart, 30.56 per cent of them possess plough, 19.44 per cent of them possess sprayer and 52.78 per cent of them possess weeder. The results show that the average value of bullock cart was Rs. 18,000, plough was Rs. 1,636, sprayer was Rs. 4,428 and weeder was Rs.75.

The results indicate that, 8.33 per cent of the households possess bullocks, 22.22 per cent of the households possess local cow, 2.78 per cent possess crossbreed cow and goat and 5.56 per cent of them possess buffalo.

The results indicate that, average own labour men available in the micro watershed was 2.13, average own labour (women) available was 1.29, average hired labour (men) available was 13.29 and average hired labour (women) available was 13.74. The results indicate that 86.11 per cent of the households opined that the hired labour was adequate.

The results indicate that, households of the Chikkashindhag-2 micro-watershed possess 26.67 ha (67.76 %) of dry land and 12.69 ha (12.69 %) of irrigated land. Marginal farmers possess 4.71 ha (75.19%) of dry land and 1.55 ha (24.81%) of irrigated land. Small farmers possess 3.22 ha (52.17%) of dry land and 2.95 ha (47.83%) of irrigated land. Semi medium farmers possess 12.26 ha (69.80%) of dry land and 5.31 (30.20%) for irrigated land. Medium farmers possess 6.48 ha (69.23%) for dry land and 2.88 ha (30.77 %) for irrigated land.

The results indicate that, the average value of dry land was Rs. 401,107.91 and the average value of irrigated land was Rs. 653,939.39. In case of marginal famers, the average land value was Rs. 1,379,295.53 for dry land and Rs. 1,801,041.66 for irrigated land. In case of small famers, the average land value was Rs. 341,761.01 for dry land and Rs. 677,640.61 for irrigated land. In case of semi medium famers, the average land value was Rs. 220,099.01 for dry land and Rs. 546,376.81 for irrigated land. In case of medium farmers, the average land value was Rs. 61,750 for dry land and Rs. 208,438.81 for irrigated land.

The results indicate that, there were 15 functioning and 4 de-functioning bore wells in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 41.67 per cent of the farmers. The results indicate that, the depth of bore well was found to be 44.87 meters.

The results indicate that marginal, small, semi medium and medium farmers had an irrigated area of 1.96 ha, 5 ha, 3.36 ha, 6.93 ha and 2.88 ha respectively. The results indicate that, farmers have grown maize (23.72 ha), sunflower (3.24 ha), Bengal gram (2.83 ha), sorghum (2.43 ha), sugarcane (1.7 ha), jowar (0.81 ha), cotton (0.41 ha), bajra, cluster bean and onion (0.4 ha). Marginal farmers had grown maize, Bengal gram, cotton, bajra, cluster bean and onion. Small farmers had grown maize,. Semi medium farmers had grown maize, Bengal gram, sorghum, sugarcane, and jowar. Medium farmers had

grown maize and sunflower. The results indicate that, the cropping intensity in Chikkashindhag-2 micro-watershed was found to be 84.92 per cent.

The results indicate that, 11.11 per cent of the households have bank account. The results indicate that, 2.78 per cent of the households have availed credit from different sources. The results indicate that, 100 per cent of the households have borrowed from cooperative and grameena bank. The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 205,000. The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production. The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources. The results indicate that, around 40 per cent opined that the loan amount borrowed from high rate of interest.

The results indicate that, the total cost of cultivation for bajra was Rs. 36799.97. The gross income realized by the farmers was Rs. 31616. The net income from bajra cultivation was Rs. -5183.97. Thus the benefit cost ratio was found to be 1:0.86. The total cost of cultivation for Cotton was Rs. 162755.71. The gross income realized by the farmers was Rs. 262007.31. The net income from Cotton cultivation was Rs. 99251.60. Thus the benefit cost ratio was found to be 1:1.61. The total cost of cultivation for Beans was Rs. 40614.69. The gross income realized by the farmers was Rs. 88920. The net income from Beans cultivation was Rs. 48305.31. Thus the benefit cost ratio was found to be 1:2.19. The total cost of cultivation for Maize was Rs. 62559.11. The gross income realized by the farmers was Rs. 47681.83. The net income from Maize cultivation was Rs. -14877.27. Thus the benefit cost ratio was found to be 1:0.76. The total cost of cultivation for Sorghum was Rs. 24327.11. The gross income realized by the farmers was Rs. 33962.50. The net income from Sorghum cultivation was Rs. 9635.39. Thus the benefit cost ratio was found to be 1:1.4. The total cost of cultivation for Bengal gram was Rs. 43641.12. The gross income realized by the farmers was Rs. 61186.67. The net income from Bengal gram cultivation was Rs. 17545.55. Thus the benefit cost ratio was found to be 1:1.4. The total cost of cultivation for onion was Rs. 95996.88. The gross income realized by the farmers was Rs. 197600. The net income from onion cultivation was Rs. 101603.12. Thus the benefit cost ratio was found to be 1:2.06. The total cost of cultivation for sunflower was Rs. 27307.87. The gross income realized by the farmers was Rs. 46312.50. The net income from sunflower cultivation was Rs. 19004.63. Thus the benefit cost ratio was found to be 1:1.7. The total cost of cultivation for sugarcane was Rs. 22141.16. The gross income realized by the farmers was Rs. 27052.38. The net income from sugarcane cultivation was Rs. 4911.22. Thus the benefit cost ratio was found to be 1:1.22.

The results indicate that, 25 per cent of the households opined that dry fodder was adequate, 22.22 green fodders was adequate, 5.56 per cent of the households opine dry

fodder was in adequate and 2.78 per cent of the households opined that green fodder was inadequate.

The results indicate that the annual gross income was Rs. 39,533.33 for for marginal farmers, for small farmers it was Rs. 36,666.67, for semi medium farmers it was Rs. 104,375 and for medium farmers it was Rs. 110,000. The results indicate that the average annual expenditure is Rs. 6,373.84. For marginal farmers it was Rs. 4,708.89, for small farmers it was Rs. 6,366.67, for semi medium farmers it was Rs. 7,578.13 and for medium farmers it was Rs. 30,000.

The results indicate that, households have planted 48 coconut and 2 mango trees in their field. The results indicate that, households have planted 34 teak, 49 neem and 4 tamarind tree in their field.

The results indicated that, households have an average investment capacity of Rs. 1,750.22 for land development, Rs. 361.11for improved crop production and Rs. 277.78 for improved crop production.

The results indicated that loan from bank was the source of additional investment for 13.51 per cent for land development and improved crop production and 8.11 per cent for irrigation facility. Own funds was the source of additional investment for 2.7 per cent for land development and improved crop production and 5.41 per cent for improved livestock management.

The results indicated that, bajra and sorghum was sold to the extent of 60 per cent, beans and Bengal gram was sold to the extent of 83.33 per cent, cotton, sugarcane and sunflower was sold to the extent of 100 per cent, maize was sold to the extent of 97.62 per cent and onion was sold to the extent of 98 per cent.

The results indicated that, about 8.33 per cent of the farmers sold their produce to agent/traders, 47.22 per cent of the farmers sold their produce to local/village merchants, 19.44 per cent of the farmers sold their produce to regulated market and 13.89 per cent of the farmers sold their produce to cooperative marketing society. The results indicated that, 75 per cent of the households used tractor and 13.89 per cent of the households use truck as a mode of transportation for their agricultural produce.

The results indicated that, 36.11 per cent of the households have experienced soil and water erosion problems in the farm. The results indicated that, 72.22 per cent have shown interest in soil test.

The results indicated that, 97.22 per cent of the households used firewood and 2.78 per cent of the households used LPG as a source of fuel. The results indicated that, piped supply was the major source of drinking water for 77.78 per cent of the households, bore well and canal/nala was the source of drinking water for 11.11 per cent of the households in micro watershed.

Electricity was the major source of light for 97.22 per cent and 2.78 per cent of the households used kerosene lamp in micro watershed. The results indicated that, 33.33 per cent of the households possess sanitary toilet facility. The results indicated that, 100 per cent of the sampled households possessed BPL card. The results indicated that, 27.78 per cent of the households participated in NREGA programme.

The results indicated that, cereals and milk were adequate for 100 per cent of the households, pulses were adequate for 91.67 per cent, oilseeds were adequate for 25 per cent, vegetables were adequate for 47.22 per cent, fruits were adequate for 16.67 per cent, egg were adequate for 80.56 per cent and meat were adequate for 77.78 per cent.

The results indicated that, pulses were inadequate for 8.33 per cent, oilseeds were inadequate for 66.67 per cent, vegetables were inadequate for 52.78 per cent, fruits were inadequate for 75 per cent, egg and meat were inadequate were 5.56 per cent of the households.

The results indicated that, oilseeds were market surplus for 8.33 per cent and fruits were market surplus for 2.78 per cent and meat were market surplus for 11.11 per cent of the households.

The results indicated that, lower fertility status of the soil water and inadequacy of irrigation water was the constraint experienced by 72.22 per cent of the households, wild animal menace on farm field (86.11%), frequent incidence of pest and diseases (69.44%), high cost of fertilizers and plant protection chemicals and high rate of interest on credit (75%), low price for the agricultural commodities(8.33%), less rainfall (22.22%) and Source of Agri-technology information (8.33%).