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

KAMANURU-2 (4D3A9B2c) MICRO WATERSHED

Irakallagada Hobli, Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

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

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PREFACE

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

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

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

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

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

ICAR-NBSS&LUP, Regional Centre, Bangalore has taken up a project sponsored by the Karnataka Watershed Development Project-II, (Sujala-III), Government of Karnataka funded by the World Bank under Component -1 Land Resource Inventry. This study was taken up to demonstrate the utility of such a database in reviewing, monitoring and evaluating all the land based watershed development programs on a scientific footing. To meet the requirements of various land use planners at grassroots level, the present study on "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of for Kamanuru-2 microwatershed in Koppal Taluk and District, Karnataka" for integrated development was taken up in collaboration with the State Agricutural Universities, IISC, KSRSAC, KSNDMC as Consortia partners. The project provides detailed land resource information at cadastral level (1:7920 scale) for all the plots and socio-economic status of farm households covering thirty per cent farmers randomely selected representing landed and landless class of farmers in the micro-watershed. The project report with the accompanying maps for the microwatershed will provide required detailed database for evolving effective land use plan, alternative land use options and conservation plans for the planners, administrators, agricutural extention personnel, KVK officials, developmental departments and other land users to manage the land resources in a sustainable manner.

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

Nagpur **S.K. SINGH**
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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Kamanuru-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 274 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 88 per cent is covered by soils, 4 per cent water bodies, settlements and others and 7 per cent by rock lands. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 12 soil series and 20 soil phases (management units) and 4 land use classes.*
- *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 250 m grid interval.*
- *Land suitability for growing 28 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area is suitable for agriculture.*
- *About 2 per cent of the soils are moderately shallow (50-75 cm), 22 per cent of the soils are moderately deep (75-100 cm), about 30 per cent are deep soils (100-150 cm) and 34 per cent area has very deep (>150 cm) soils.*
- *About 26 per cent area has clayey soils, 37 per cent loamy soils and 26 per cent sandy soils at the surface.*
- *About 67 per cent of the area has non-gravelly (<15%) soils and 21 per cent gravelly soils (15-35 % gravel) soils.*
- *About 24 per cent are very low (<50 mm/m), 25 per cent low (51-100 mm/m), 1 per cent are medium (101-150 mm/m) and 38 per cent high to very high (151->200 mm/m) in available water capacity.*

- *About 66 per cent area has very gently sloping (1-3%) and 23 per cent area has gently sloping (3-5%) lands.*
- *An area of about 26 per cent has soils that are slightly eroded (e1) and 63 per cent moderately eroded (e2) lands.*
- *An area of about 21 per cent has soils that are slightly to moderately acid (pH 5.5-6.5), 32 per cent soils are neutral (pH 6.5-7.3), 36 per cent are slightly to moderately alkaline (pH 7.3 to 8.4) and 1 per cent are strongly alkaline (pH 8.4-9.0).*
- *The Electrical Conductivity (EC) of the soils is <2 dS m^{-1} and as such the soils are non-saline.*
- *Organic carbon is low (<0.5%) in about 14 per cent, 44 per cent of the soils are medium (0.5-0.75%) and 30 per cent of the soils are high (>0.75%) in organic carbon.*
- *Available phosphorus is medium (23-57 kg/ha) in about 70 per cent and high (>57 kg/ha) in 19 per cent area of the microwatershed.*
- *About 69 per cent of the soils are medium (145-337 kg/ha) and 20 per cent of the soils are high (>337 kg/ha) in available potassium content.*
- *Available sulphur is low (<10 ppm) in about 49 per cent and medium (10-20 ppm) in 40 per cent.*
- *Available boron is low (0.5 ppm) in about 38 per cent area, 46 per cent area is medium (0.5-1.0 ppm) and high (>1.0 ppm) in about 4 per cent.*
- *Available iron is sufficient (>4.5 ppm) in 52 per cent and deficient (<4.5 ppm) in about 36 per cent area.*
- *Available zinc is deficient (<0.6 ppm) in 68 per cent and sufficient (>0.6 ppm) in about 21 per cent area.*
- *Available manganese and copper are sufficient in all the soils.*
- *The land suitability for 28 major agricultural and horticultural crops grown in the microwatershed were assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*82 (30)*	*58 (21)*		*Pomegranate*	*82 (30)*	*96 (35)*
Maize	*38 (14)*	*72 (26)*		*Guava*	*80 (29)*	*72 (27)*
Bajra	*84 (31)*	*69 (25)*		*Jackfruit*	*82 (30)*	*71 (26)*
Red gram	*82 (30)*	*53 (19)*		*Jamun*	*42 (15)*	*135 (49)*
Bengalgram	*25 (9)*	*115 (42)*		*Musambi*	*82 (30)*	*96 (35)*
Groundnut	*80 (29)*	*91 (33)*		*Lime*	*82 (30)*	*96 (35)*
Sunflower	*82 (30)*	*53 (19)*		*Cashew*	*80 (29)*	*88 (32)*
Cotton	*44 (16)*	*95 (35)*		*Custard apple*	*84 (31)*	*158 (58)*
Chilli	*84 (31)*	*26 (9)*		*Amla*	*84 (31)*	*158 (58)*
Tomato	*84 (31)*	*26 (9)*		*Tamarind*	*42 (15)*	*91 (33)*
Drumstick	*82 (30)*	*96 (35)*		*Marigold*	*80 (29)*	*59 (22)*
Mulberry	*82 (30)*	*155 (56)*		*Chrysanthemum*	*80 (29)*	*59 (22)*
Mango	*42 (15)*	*66 (24)*		*Jasmine*	*80 (29)*	*34 (13)*
Sapota	*82 (30)*	*71 (26)*		*Crossandra*	*80 (29)*	*29 (11)*

Apart from the individual crop suitability, a proposed crop plan and drainage line treatment plan has been prepared for the 4 identified LUCs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and other horticulture crops that helps in maintaining productivity and ecological balance in the microwatershed.

- *Maintaining soil-health is vital to crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested for these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation treatment plan has been prepared that would help in identifying the sites to be treated and also the type of structures required.*
- *As part of the greening programme, several tree species have been suggested to be planted in marginal and submarginal lands, field bunds and also in the hillocks, mounds and ridges. 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 Kamanuru-2 microwatershed in Koppal Taluk, Koppal District, KarnatakaState 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 Kamanuru-2 Microwatershed is located in the central part of northern Karnataka in Koppal Taluk, Koppal District, Karnataka State (Fig.2.1). It comprisesofTavarageri, Bheemanuraand Halalli villages. It lies between $15^0$23' – $15^0$25' North latitudes and 76'14 – $76^0$15' East longitudesand covers an area of274ha. It is surrounded byTavarageri village on the northeast and northwest, Halalli on southeast and Bheemanura village on the southern side.

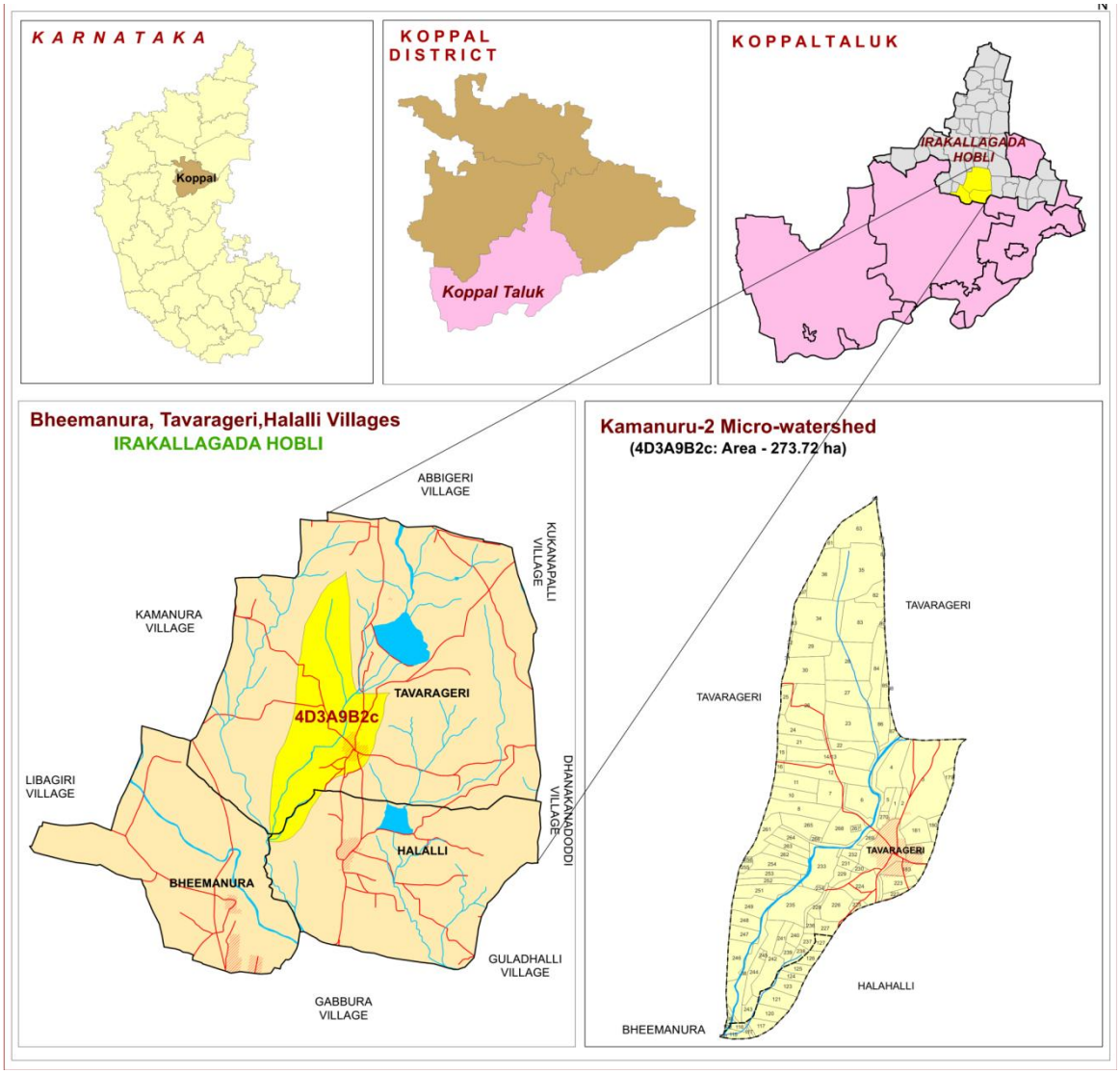


Fig.2.1 Location map of Kamanuru-2 Microwatershed

2.2 Geology

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

10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in thevillage. The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig. 2.2 a Granite and granite gneiss rocks

Fig. 2.2 b 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 summits, very gently sloping uplands and nearly level plains based on slope and its relief features. The elevation ranges from 540 to 563 m in the gently sloping uplands.

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 an average annual rainfall of 662 mm (Table 2.1). Maximum of 424 mm precipitation takes place during the 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 takes place 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 and193 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**	

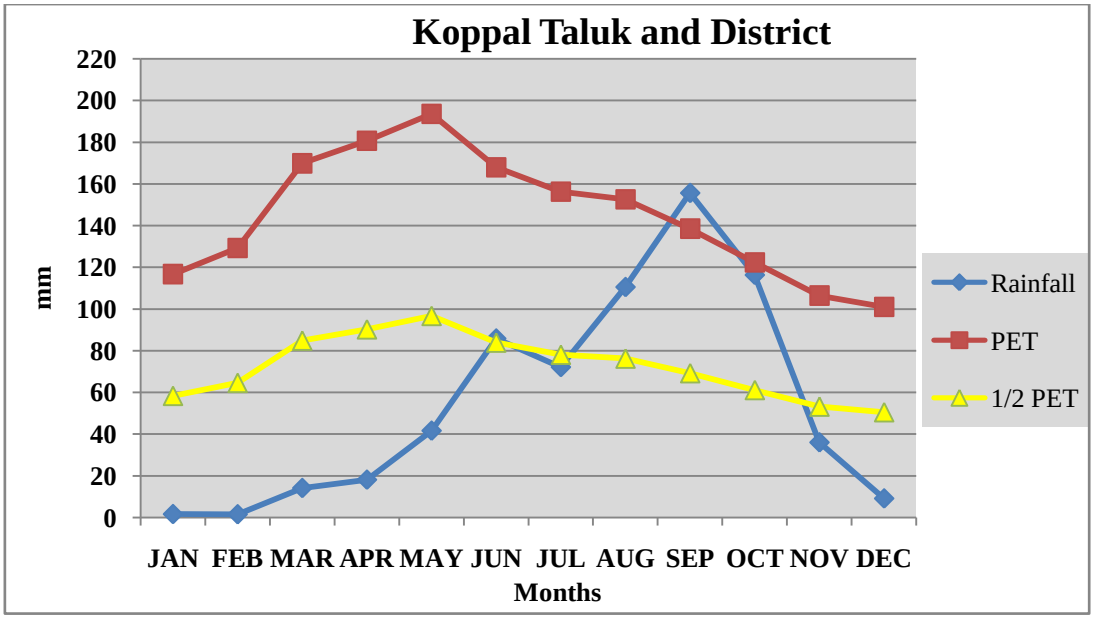


Fig. 2.3 Rainfall distribution in Koppal Taluk and District

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 Kamanuru-2 microwatershed

2.7 Land Utilization

About 91 per cent area (Table 2.2) inKoppal district is cultivated at present and about 16 per cent of the area is sown more than once. The cropping intensity is 118 per cent. 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 bouldery 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 Kamanuru-2 Microwatershedis presented in Fig.2.6. Simultaneously, enumeration of existing wells (bore wells and open wells) and other soil and water conservation structures in the microwatershed is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells and other water bodies in Kamanuru-2 Microwatershed is given Fig.2.7.

Table 2.2 Land Utilization in KoppalDistrict

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 Kamanuru-2 Microwatershed

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

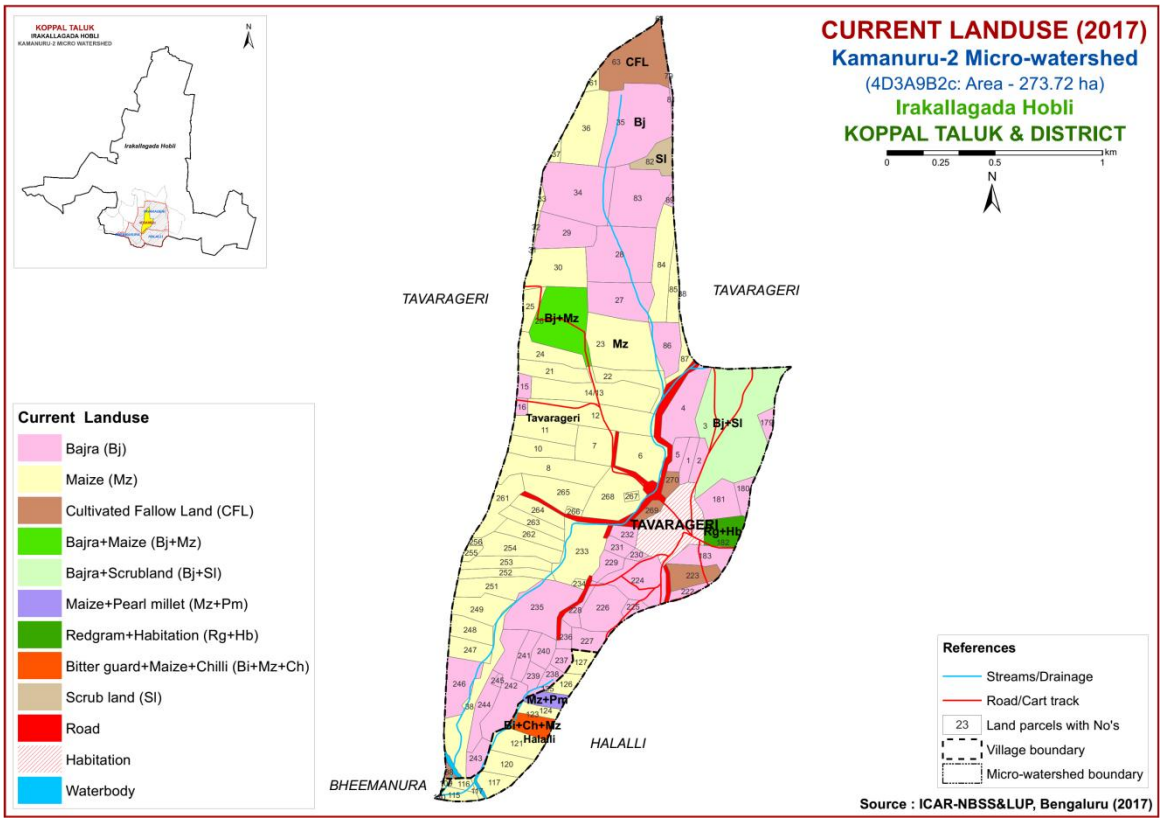


Fig. 2.6 Current Land Use – Kamanuru-2 Microwatershed

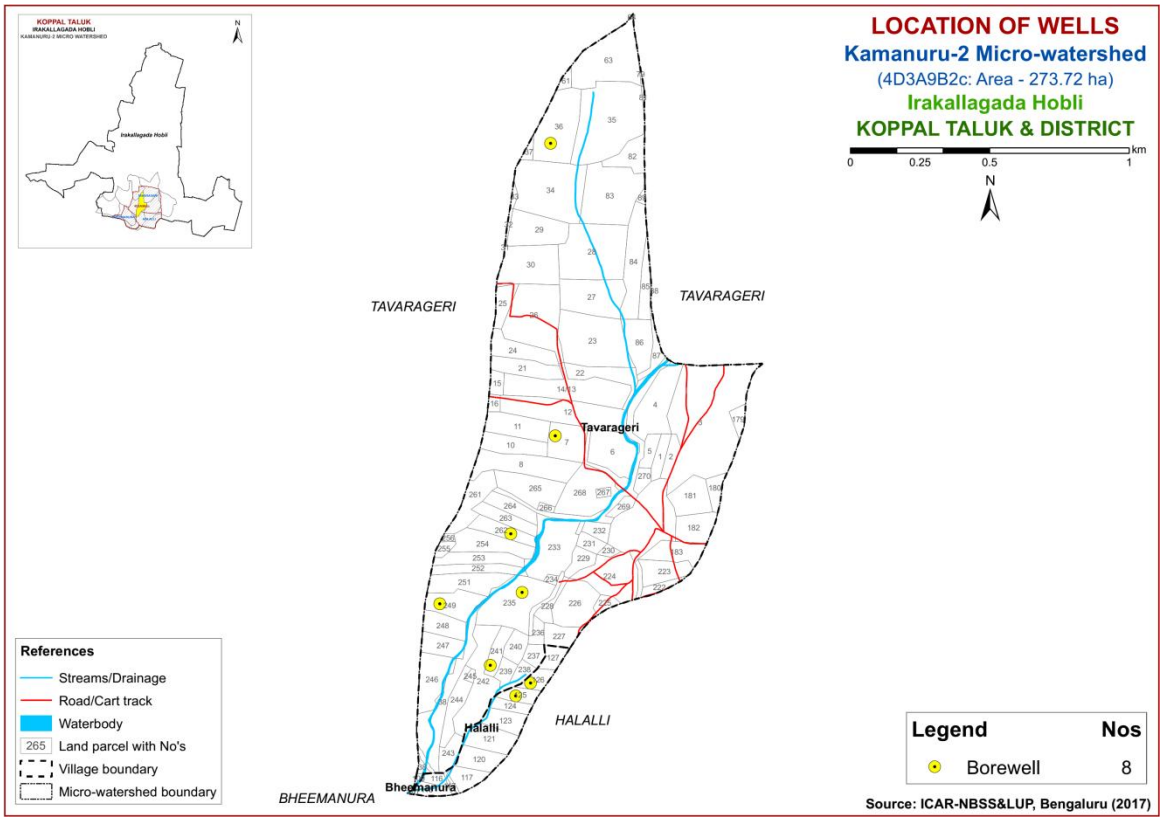


Fig. 2.7 Location of wells-Kamanuru-2 Microwatershed

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 Kamanuru-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 (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 274 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 a 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 asgranite gneiss and alluviallandscapes 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 givenbelow.

ImageInterpretationLegend for Physiography

G- Granite gneiss landscape

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

DSe Alluvial landscape

DSe1 Summit

- DSe11 Nearly level Summit with dark grey tone
- DSe12 Nearly level Summit with medium grey tone
- DSe13 Nearly level Summit with whitish grey tone
- DSe14Nearly level Summit with whitish tone (Calcareousness)
- DSe15 Nearly level Summit with pinkish grey tone
- DSe16 Nearly level Summit with medium pink tone
- DSe17 Nearly level Summit with bluish white tone
- DSe 18 Nearly level Summit with greenish grey tone

DSe2 Very genetly sloping

- DSe21 Very gently sloping, whitish tone
- DSe22Very gently sloping, greyish pink tone
- DSe23Very gently sloping, whitish grey tone
- DSe24Very gently sloping, medium grey tone
- DSe25Very gently sloping, medium pink tone
- DSe26 Very gently sloping, dark grey tone
- DSe27 Very gently sloping, bluish grey tone
- DSe28Very gently sloping, greenish grey tone
- DSe 29 Very gently sloping, Pinkish grey

DSa 3 –Valleys

- DSa31 – Interhill Valley
- DSa32 – Valley/ Lowlands
- DSa 321- Medium gray with pink tone
- DSa 322- Pink tone
- DSa 323- Whitish gray (eroded) tone
- DSa 324- Dark gray tone
- DSa 325- Medium gray tone
- DSa 326- Medium green with pink tone

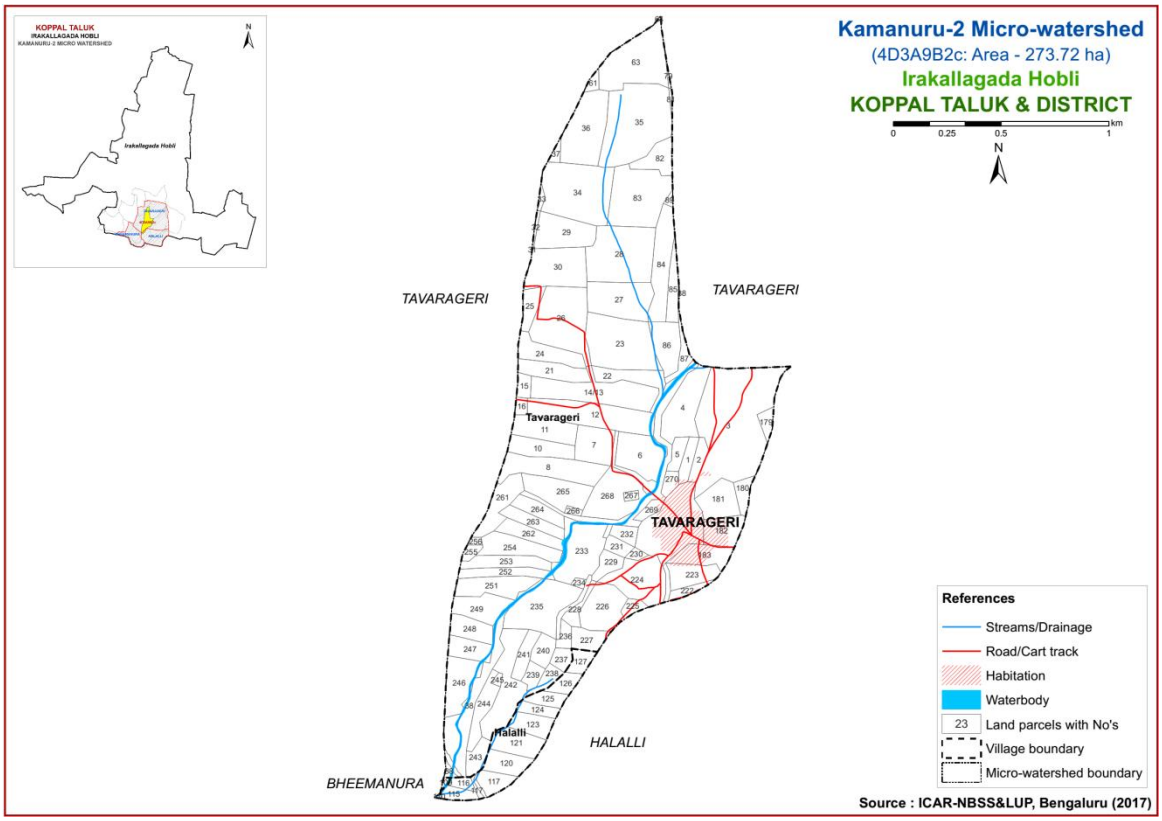


Fig. 3.1 Scanned and Digitized Cadastral map of Kamanuru-2 Microwatershed

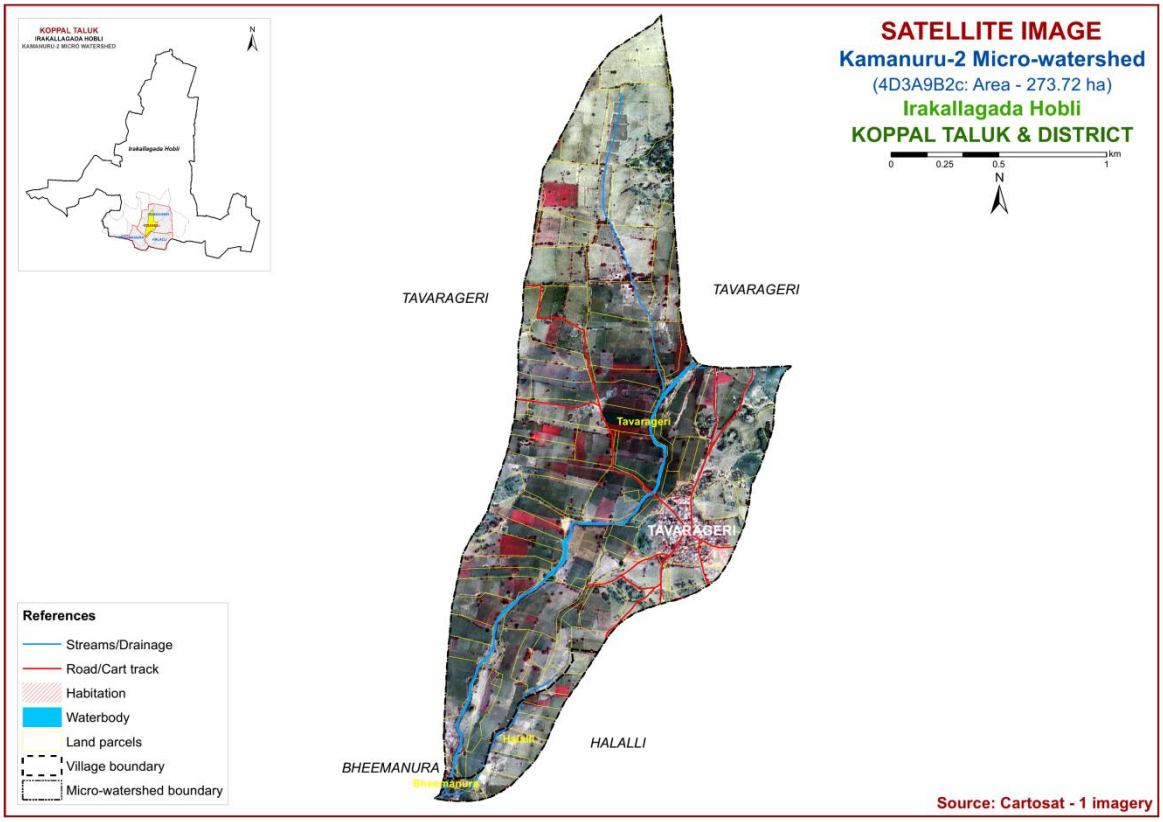


Fig.3.2 Satellite Image of Kamanuru-2 Microwatershed

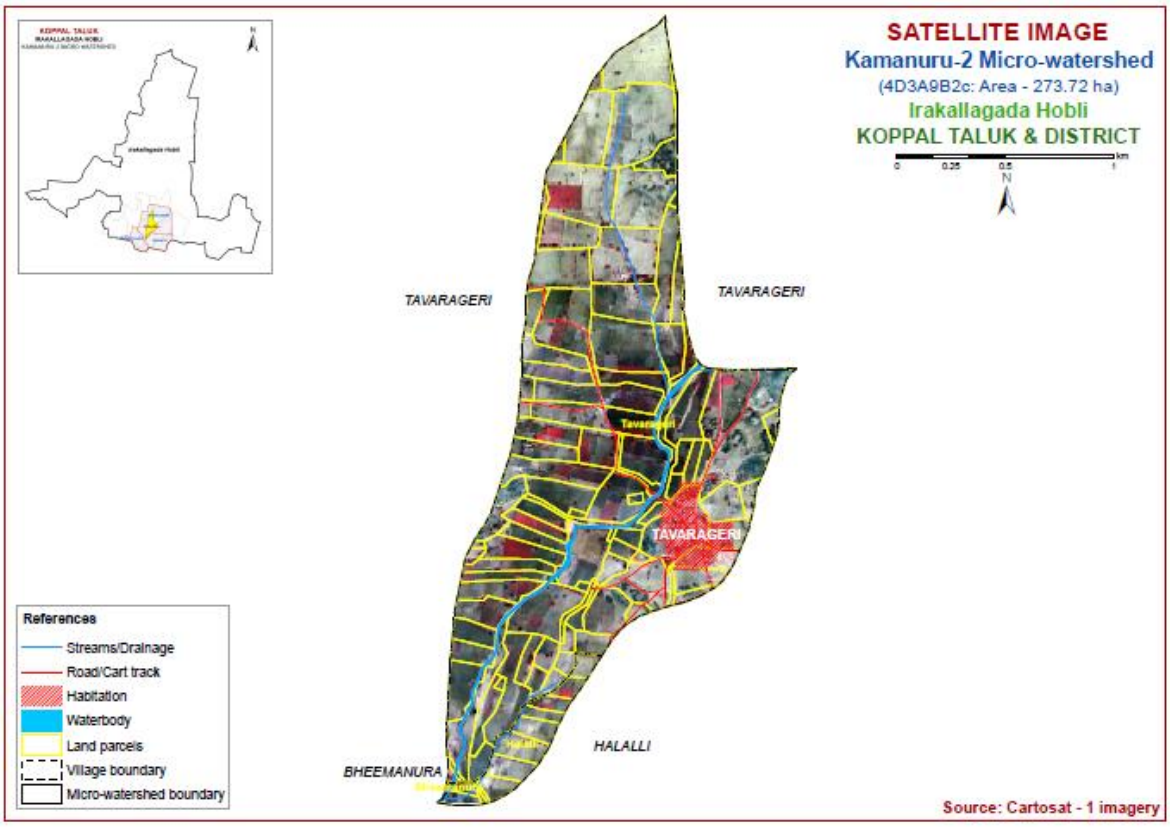


Fig.3.3Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Kamanuru-2 Microwatershed

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).

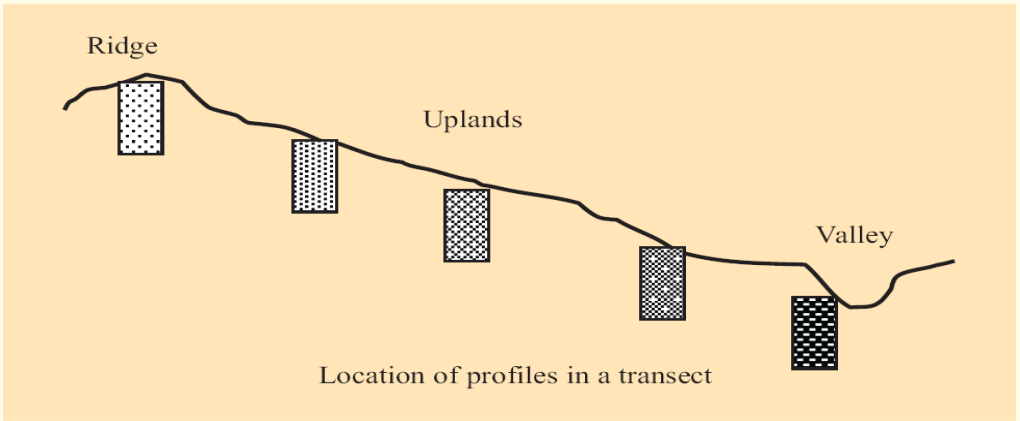


Fig. 3.4Location of profiles in a transect

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, soil profiles (vertical cut showing the soil layers from surface to the rock) were opened upto 200 cm or to the depth limited by rock or hard substratum and studied in detail for all their morphological and physical characteristics. The soil and site characteristics were recorded for all profile sites on a standard proforma as per the guidelines given in USDA Soil Survey Manual (Soil Survey Staff, 2012). Apart from the transect study, profiles were also studied at random, almost like in a grid pattern, outside the transect areas to validate the soil map unit boundariers.

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,12soil series were identified in Kamanuru-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	Hooradhahalli (HDH)	75-100	2.5YR2.5/4,3/4, 3/6	gsc-gc	>35	Ap-Bt-Cr	-
2	Bisarahalli (BSR)	75-100	5 YR 3/3, 3/4	gsc	15-35	Ap-Bt-Cr	-
3	Chikkamegheri (CKM)	75-100	2.5YR2.5/3,3/4,3/6	sc	-	Ap-Bt-Cr	-
4	Bidanagere (BDG)	75-100	5YR3/3,3/4,4/3,5/4 2.5YR3/4	gc	35-60	Ap-Bt-Cr	-
5	Balapur (BPR)	100-150	2.5YR2.5/4,3/4	gsc-gc	>35	Ap-Bt-Cr	-
6	Vaddarahalli (VDH)	100-150	7.5YR3/2,3/3,3/4	sc-c	-	Ap-Bt-Cr	-
7	Nagalapur (NGP)	100-150	5YR2.5/2,3/2, 2.5YR3/6,4/6	gsc-gc	>35	Ap-Bt-Cr	-
8	Ranatur (RTR)	>150	2.5YR2.5/3,2.5/4, 3/3,4/6	c	-	Ap-Bt	-
9	Niduvalalu (NDL)	>150	2.5YR2.5/3,2.5/4, 3/3,4/6	gsc	>35	Ap-Bt	-
10	Jedigere (JDG)	100-150	5YR 4/6, 3/4, 7.5YR 3/4, 4/6	sc-c	<15	Ap-Bt-BC-Cr	-
11	Thimmasandra (TSD)	>150	10YR2/12/2,3/1, 3/2,4/1, 4/2,4/3	c	-	Ap-Bw	-
Soils of Alluvial Landscape							
12	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

3.4 Soil Mapping

The area under each soil series was further separated into 20soil 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 soil map(Fig.3.5) in the form of symbols. During the survey manysoil profile pits, few minipits and a few auger bores representing different landforms occurring in the microwatershed were studied. In addition to the profile study, spot observations in the form of minipits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map.The soil map shows the geographic distribution of 20 mapping units representing 12soil 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 20soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

3.5Laboratory Characterization

Soil samples for each soil series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2017 from Kamanuru-2 farmer's fields (29samples) for fertility status (major and micronutrients) at 250 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 Kamanuru-2 Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite gneiss landscape				
	HDH	Hooradhahalli soils are moderately deep (75-100 cm), well drained, dark red to dark reddish brown, red gravelly sandy clay to sandy clay loam soils occurring on nearly level to moderately sloping uplands under cultivation		**44 (15.89)**
104		HDHbB2	Loamy sand surface, slope 1-3%, moderate erosion	7 (2.59)
105		HDHbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	25 (8.98)
123		HDHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	12 (4.32)

	BSR	Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly red sandy clay soils occurring on very gently sloping uplands under cultivation		**0 (0.07)**
159		BSRcB1	Sandy loam surface, slope 1-3%, slight erosion	0 (0.07)
	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		**1 (0.52)**
178		CKMiB1	Sandy clay surface, slope 1-3%, slight erosion	1 (0.52)
	BDG	Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly red sandy clay soils occurring on nearly level to gently sloping uplands under cultivation		**15 (5.65)**
184		BDGhA1	Sandy clay loam surface, slope 0-1%, slight erosion	0 (0.01)
187		BDGhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	15 (5.64)
	BPR	Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation		**6 (2.33)**
216		BPRbB2	Loamy sand surface, slope 1-3%, moderate erosion	5 (1.9)
217		BPRbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	1 (0.43)
	VDH	Vaddarahalli soils are deep (100-150 cm), moderately well drained, have dark brown sandy clay to clay soils occurring on nearly level to very gently sloping uplands under cultivation		**38 (13.86)**
242		VDHcA2	Sandy loam surface, slope 0-1%, moderate erosion	38 (13.86)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation		**37 (13.47)**
249		NGPbB1	Loamy sand surface, slope 1-3%, slight erosion	32 (11.72)
250		NGPbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	1 (0.37)
251		NGPcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	4 (1.38)
	RTR	Ranatur soils are very deep (>150 cm), well drained, have dark reddish brown to dark red clay soils occurring on nearly level to very gently sloping uplands under cultivation		**42 (15.47)**

288		RTRiB2	Sandy clay surface, slope 1-3%, moderate erosion	42 (15.47)
	NDL	Niduvalalu soils are very deep (>150 cm), well drained, have red to dark reddish brown red gravelly sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation		**25 (9.45)**
290		NDLcB1	Sandy loam surface, slope 1-3%, slight erosion	9 (3.45)
291		NDLcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	0 (0.01)
296		NDLhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	16 (5.99)
	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		**2 (0.71)**
458		JDGiB1	Sandy clay surface, slope 1-3%, slight erosion	2 (0.71)
	TSD	Thimmasandra soils are very deep (>150 cm), moderately well drained, have very dark brown to very dark grayish brown, black clay soils occurring on nearly level to very gently sloping lowlands under cultivation		**25 (9.04)**
446		TSDmA1	Clay surface, slope 0-1%, slight erosion	25 (9.04
Soils of Alluvial Landscape				
	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		**5 (1.99)**
328		RNKhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	5 (1.99)
999		Rock outcrops	Rock lands, both massive and bouoldery	19 (7.08)
1000		Others	Habitaion and waterbody	12(4.46)

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

3.6 Land Use Classes

The 20 soil phases identified and mapped in the microwatershed were regrouped into 4 Land Use Classes (LUC'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 Use Classes (LUC's) based on the management needs. One or more than one soil site characteristic having influence on the management have been choosen for identification and delineation of LUCs. For Kamanuru-2 Microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope, erosion and gravel content have been considered for defining LUCs. The land use classes are expected to behave similarly for a given level of management.

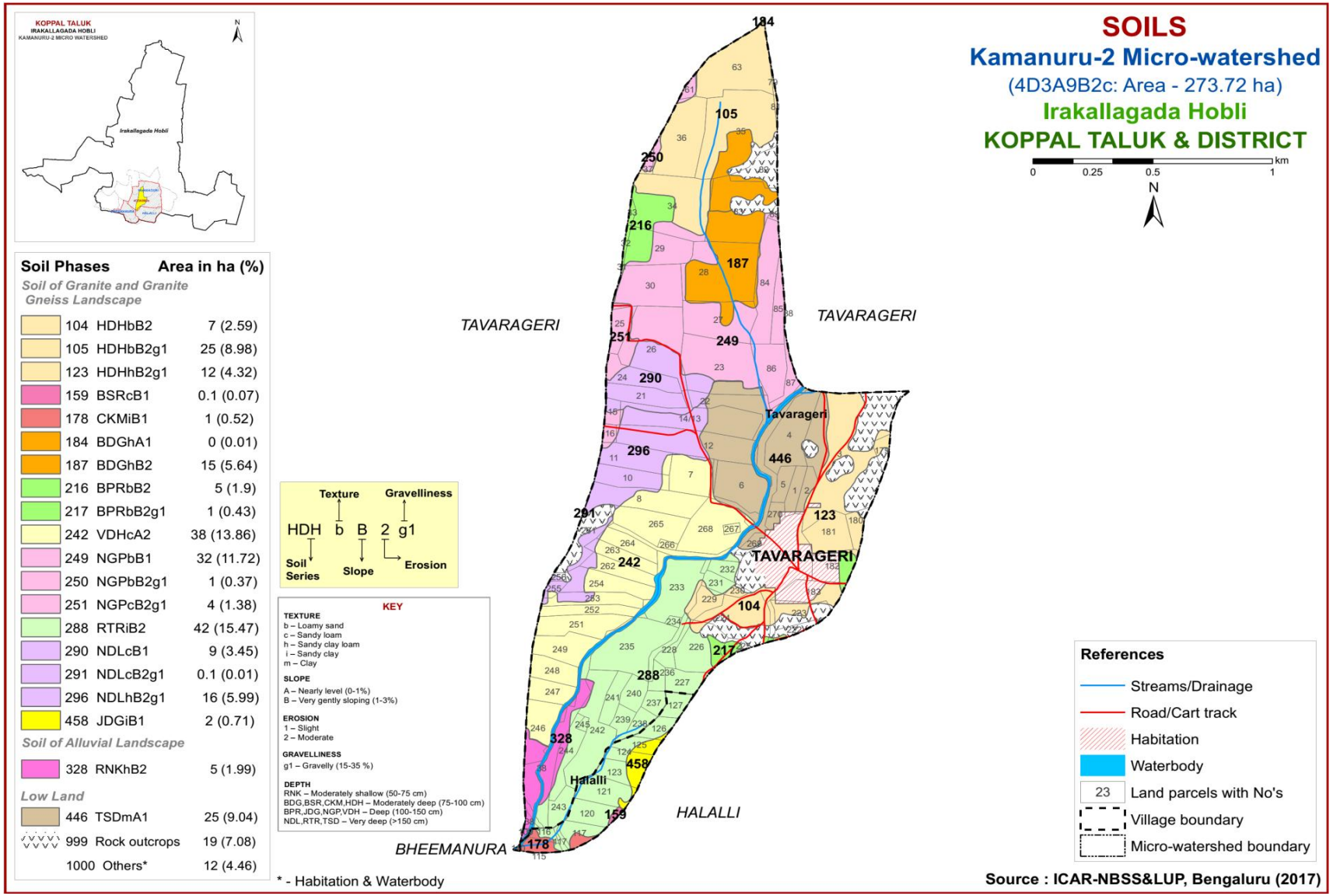


Fig 3.4 Soil Phase or Management Units-Kamanuru-2 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Kamanuru-2 microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluviallandscapesbased on geology. In all,12 soil series are 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 12 soil series identified followed by 20 soil phases (management units) mapped (Fig. 3.4) are furnished below. The physical and chemical characteristics of soil series identified in Kamanuru-2 microwatershed are given in Table 4.1. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of granite gneiss landscape

In this landscape, 11 soil series are identified and mapped. Of these, Hooradhahalli (HDH) series occupies maximum area of 44 ha (16%), Ranatur (RTR) 42 ha (15%), Vaddarahalli (VDH) 38 ha (14%), Nagalapur (NGP) 37 ha (13%), Niduvalalu (NDL) 25 ha (9%), Thimmasandra (TSD)25 ha (9%), Bidanagere (BDG) 15 ha (6%), Balapur (BPR) 6 ha (2%), Ravanaki (RNK) 5 ha (2%) and other series occupy minor area in the microwatershed.The brief description of each soil series along with the soil phases identified and mapped is given below.

4.1.1Hooradhahalli (HDH) Series: Hooradhahalli soils are moderately deep (75-100 cm), well drained, have red to dark red and reddish brown gravelly sandy clay to clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Hooradhahalli series has been classified as a member of the clayey-skeletal, mixed isohyperthermic family of Rhodic Paleustalfs.

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

Landscape and soil profile characteristics of Hooradhahalli (HDH) Series

4.1.2Bisarahalli (BSR) Series: Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly sandy clay red soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 75 to 98 cm. The thickness of A horizon ranges from 17 to 25 cm. Its colour is in 5 YR hue with value 3 to 4 and chroma 3 to 6. The texture ranges from sandy clay loam to sandy clay with 15 to 35 per cent gravel. The thickness of B horizon ranges from 61 to 79 cm. Its colour is in 5 YR hue with value 3 and chroma 3 to 4. Its texture is gravelly sandy clay with gravel content of 15-35 per cent. The available water capacity is low (50-100 mm/m). Only one phase was identified and mapped.

Landscape and soil profile characteristics of Bisarahalli (BSR) Series.

4.1.3Chikkamegheri (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 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 (100-150 mm/m). Only one phase was identified and mapped.

Landscape and soil profile characteristics of Chikkamegheri (CKM) Series

4.1.4Bidanagere (BDG) Series: Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly clay soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.The Bidanagere series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Rhodic Paleustalfs.

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

Landscape Soil Profile Characteristics of Bidanagere (BDG) Series

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

The thickness of the solum ranges from 102 to 147 cm. The thickness of A horizon ranges from 12 to 17cm. Its colour is in 5 YR and 2.5 YR hue with value and chroma 3 to 4. The texture ranges from loamy sand to sandy clay with 15 to 50 per cent gravel. The thickness of B horizon ranges from 90 to 132 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4 to 6. Texture is sandy clay to clay with 35 to 50 per cent gravel. The available water capacity is low (51-100 mm/m). Two phases were identified and mapped.


Landscape Soil Profile Characteristics of Balapur (BPR) Series

4.1.6 Vaddarahalli (VDH) Series: Vaddarahalli soils are deep (100-150 cm), well drained, have dark reddish brown to dark brown sandy clay to clay soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands. The Vaddarahalli series has been tentatively classified as a member of the fine, mixed, isohyperthermic family of Typic Haplustalfs.

The thickness of the solum ranges from 106 to 148 cm. The thickness of A horizon ranges from 13 to 23 cm. Its colour is in 7.5 YR and 10 YR hue with value 3 and chroma 3 to 4. The texture varies from sandy loam to clay. The thickness of B horizon ranges from 95 to 132 cm. Its colour is in 7.5 YR and 5 YR hue with value 3 to 4 and chroma 2 to 4. Its texture is sandy clay to clay. The available water capacity is high (150-200 mm/m). Only one phase was identified and mapped.

Landscape and soil profile characteristics of Vaddarahalli (VDH) Series

4.1.7Nagalapur (NGP) Series: Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands.

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

Landscape Soil Profile Characteristics of Nagalapur (NGP)Series

4.1.8 Ranatur (RTR) Series: Ranatur soils are very deep (> 150 cm), well drained, have dark reddish brown to dark red clayey soils. They have developed from granite gneiss and occur on very gently sloping uplands. The Ranatur series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 8 to 14 cm. Its colour is in 5 YR and 2.5 YR hue with value 2.5 to 4 and chroma 3 to 6. The texture varies from sandy loam to sand clay. The thickness of B horizon is more than 150 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 3 to 6. Its texture is clay. The available water capacity is high (150-200 mm/m). Only one phase was identified and mapped.

Landscape and soil profile characteristics of Ranatur (RTR) Series

4.1.9Niduvalalu (NDL) Series: Niduvalalu soils are very deep (>150 cm), well drained, have dark red and dark reddish brown gravelly sandy clay soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands under cultivation.

The thickness of the solum is more than 150 cm. The thickness of A-horizon ranges from 11 to 15 cm. Its colour is in 5 YR hue with value 3 to 4 and chroma 4 to 6. The texture varies from sandy loam to sandy clay loam with 10 to 30 per cent gravel. The thickness of B-horizon ranges from 150 to 160 cm. Its colour is in 2.5 YR and 5 YR hue with value 2.5 to 4 and chroma 4 to 6. Its texture is sandy clay and ranges from gravelly sandy clay with 20 to 75 per cent gravel. The available water capacity is low (50-100 mm/m). Three phases were identified and mapped.

Landscape Soil Profile Characteristics of Niduvalalu(NDL)Series

4.1.10 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 granite gneiss and occur on nearly level to very gently sloping uplands under cultivation.

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).

Landscape and Soil Profile Characteristics of Jedigere (JDG)Series

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

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

Landscape and soil profile characteristics of Thimmasandra (TSD) Series

4.2 Soils of Alluvial landscape

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

4.2.1Ravanaki (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 uplands. The Ravanaki series has been classified as a member of the very fine, smectitic, isohyperthermic (calc) 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 low (51-100 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile Characteristics of Ravanaki (RNK) Series

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

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

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

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

Contd...

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	4.33
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	6.68
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	10.01
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	10.27
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	11.39
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	12.69

Contd...

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

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

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

Contd...

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

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

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

Contd...

Soil Series: Ranatur (RTR), Pedon: RM-87
Location: $13^0$21'49.0"N, $76^0$38'06"E, (4B3D4L2a), J C Pura village, Chikkanayakanahalli taluk, Tumakuru district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **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							1/3 Bar	15 Bar
		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)				
0-17	Ap	84.16	9.46	6.38	2.22	18.57	26.14	24.32	12.92	-	ls	-	-
17-47	Bt1	51.14	8.30	40.56	1.66	13.49	14.52	13.59	7.88	-	sc	-	-
47-89	Bt2	51.99	11.01	37.00	1.94	13.99	15.32	13.18	7.56	-	sc	-	-
89-123	Bt3	51.58	9.07	39.35	3.47	14.50	14.61	11.64	7.35	-	sc	-	-
123-152	Bt4	47.89	8.88	43.23	2.27	12.36	14.21	11.12	7.93	-	sc	-	-
152-198	Bt5	43.37	13.17	43.45	2.48	9.83	13.25	10.87	6.94	-	c	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-17	5.08	-	-	0.03	0.52	0.00	3.68	0.72	0.06	0.19	4.65	9.21	1.44	50.50	2.06
17-47	6.28	-	-	0.03	0.48	0.00	3.93	0.72	0.08	0.07	4.80	7.92	0.20	60.59	0.94
47-89	6.42	-	-	0.03	0.40	0.00	4.40	0.74	0.08	0.06	5.28	7.52	0.20	70.15	0.79
89-123	6.50	-	-	0.02	0.32	0.00	4.44	0.76	0.09	0.07	5.36	7.82	0.20	68.58	0.93
123-152	6.52	-	-	0.02	0.28	0.00	4.40	0.71	0.09	0.07	5.26	8.22	0.19	64.00	0.81
152-198	7.09	-	-	0.02	0.24	0.00	6.10	0.98	0.10	0.20	7.38	9.60	0.22	76.89	2.09

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, isohyperthermic (calc) Fluventic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-28	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	-	16.94
28-55	8.61	-	-	1.4	0.23	13.68	-	-	0.68	12.27	-	53.20	0.81	-	23.06
55-80	8.35	-	-	4.53	0.91	11.40	-	-	0.75	28.97	-	54.80	0.76	-	52.86

Contd...

Soil Series: Thimmasandra (TSD), Pedon: R-14
Location: 11°55'64.2"N, 76°51'82.9" E, (4B3A5K3b), Somanapura village, Chamarajanagara taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification**: Fine, mixed, isohyperthermic Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-19	Ap	12.27	25.92	61.81	0.98	0.98	1.52	3.91	4.89	-	c	-	-
19-33	Bw1	32.98	26.29	40.72	2.75	4.44	4.97	8.35	12.47	-	c	-	-
33-58	Bw2	10.21	27.99	61.81	0.98	1.30	1.19	2.17	4.56	-	c	-	-
58-83	Bw3	9.83	27.40	62.77	1.09	0.98	0.98	1.86	4.91	-	c	-	-
83-95	Bw4	6.17	26.07	67.76	0.99	0.77	0.55	0.99	2.86	-	c	-	-
95-116	Bw5	7.52	28.87	63.61	0.77	1.00	1.11	1.88	2.77	-	c	-	-

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

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The 20 soil map units identified in the Kamanuru-2 microwatershed are grouped under twoland capability classes and six land capability subclasses(Fig. 5.1).

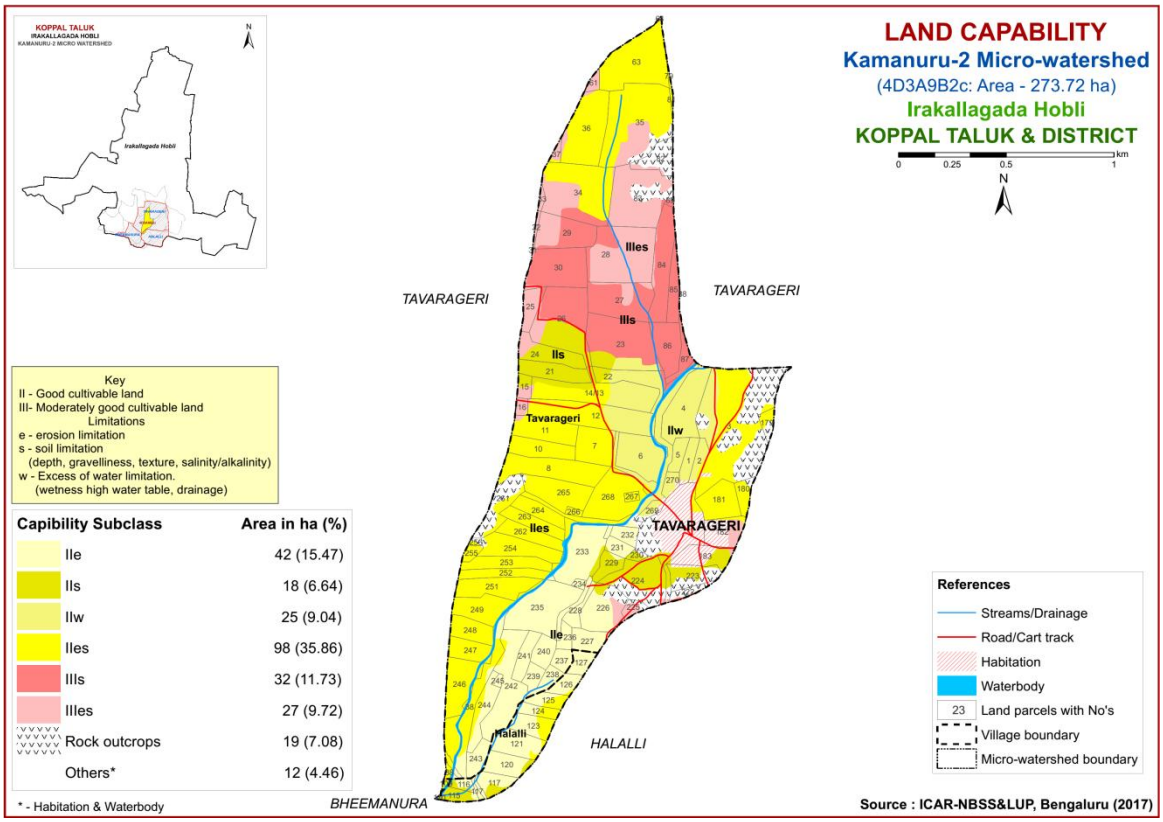


Fig. 5.1 Land Capability map of Kamanuru-2 Microwatershed

Entire are of the microwatershed is suitable for agriculture. An area of 183 ha (67%) is good cultivable lands (Class II) that have minor limitations of soil erosion and drainage and require moderate conservation practices and are distributed in the major part of the microwatershed. Moderately good cultivable lands (Class III) cover an area of 59 ha (21%) and are distributed in the northern, eastern and westernpart of the microwatershed with moderate problems of soiland erosion that require special conservation practices.

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).

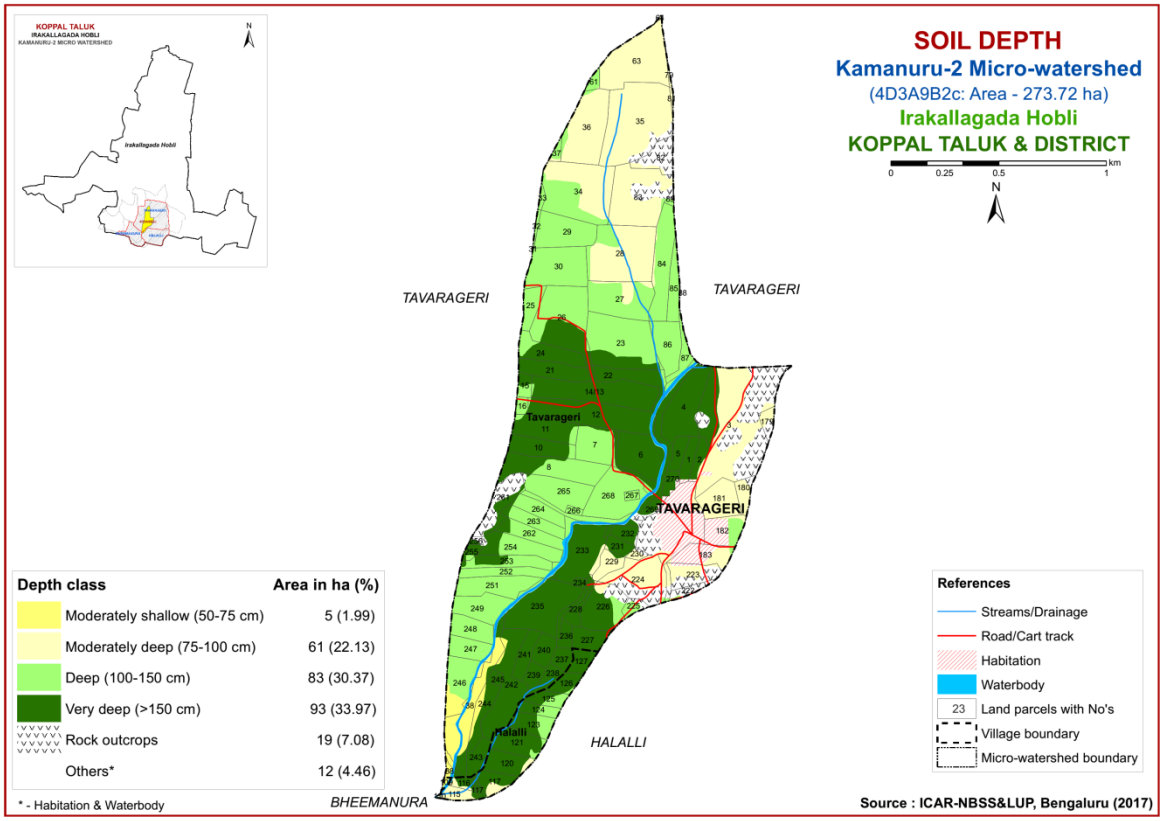


Fig. 5.2Soil Depth map of Kamanuru-2 Microwatershed

Moderately shallow (50-75 cm) soils occupy an area of 5 ha (2%) and are distributed in the southwestern part of the microwatershed. Moderately deep soils (75-100 cm) occupy an area of 61 ha (22%) and occur in the northern, eastern and southern part of

the microwatershed. Deep (100-150 cm) to very deep (>150 cm) soils occupy an area of 176 ha (64%) and are distributed in the western, eastern and southern part of the microwatershed.

The most problem lands with an area of about 5 ha (2%) having moderately shallow (50-75 cm) rooting depth. They are suitable for growing short/medium duration agricultural crops but well suited for pasture, forestry or other recreational purposes. The most productive lands cover about 176 ha (64%) where all climatically adapted long duration crops 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 behaviour, microbial activity and crop suitability. The textural classes used for LRI were used to classify and a surface soil texture map was generated (fig. 5.3). The area extent and their spatial distribution in the microwatershed is shown in figure 5.3.

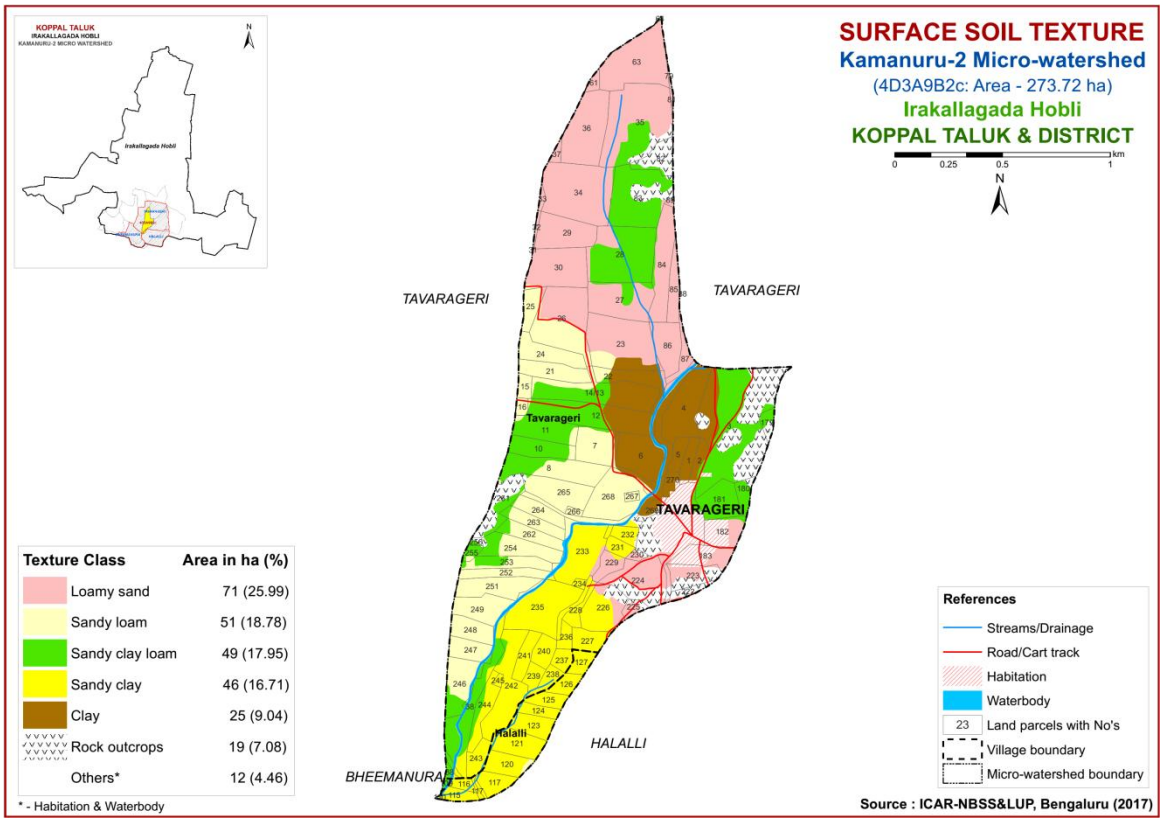


Fig. 5.3 Surface Soil Texture map of Kamanuru-2 Microwatershed

A small area of 71 ha (26%) has sandy soils at the surface and are distributed in the northern and eastern part of the microwatershed. An area of about 100 ha (37%) has

soils that are loamy soils at the surface. They are distributed in the western, southwestern, northern and eastern part of the microwatershed. An area of 71 ha (26%) has clayey soils at the surface and are distributed in the eastern, central and southern part of the microwatershed (Fig. 5.3).

The most productive lands 71 ha (26%) with respect to surface soil texture are the clayey soils that 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 most productive lands 100 ha (37%) are loamy soils which also have high potential for AWC, nutrient availability but have no drainage or other physical problems as compared to loamy soils. The problem soils cover about 71 ha (26%) that have sandy soils at the surface having problems of poor soil water retention and availability and nutrient retention and availability, but have better rain water retention and less run off and soil moisture conservation, less capillary rise and less evaporation losses.

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 spatial distribution in the microwatershed is given in figure 5.4.

The soils that are non-gravelly (<15% gravel) cover an area of about 183 ha (67%) and are distributed in the major part of the microwatershed. An area of59 ha (21%) is covered by gravelly (15-35% gravel) soils and are distributed in the northern, western and easternpart of the microwatershed (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 67%. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem soils that are gravelly (15-35%) cover 59 ha (21%) where only short or medium duration crops can be grown.

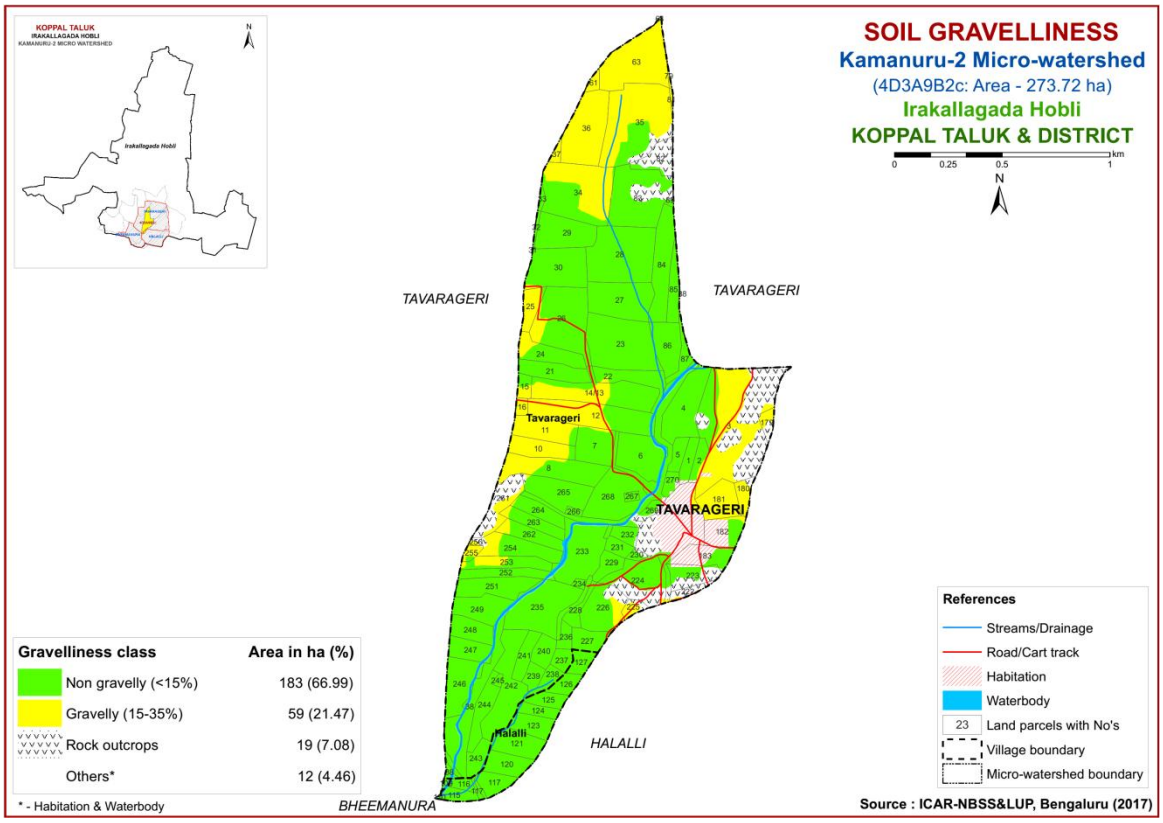


Fig. 5.4 Soil Gravelliness map of Kamanuru-2 Microwatershed

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 (Fig. 5.5), showing the area extent and their spatial distribution in the microwatershed.

Major area of about 64 ha (24%) are very low (<50 mm/m) in available water capacity and are distributed in the northern, southwestern and eastern part of the microwatershed. An area of about 69 ha (25%) has soils that are low (51-100 mm/m) in available water capacity and are distributed in the northern, eastern and western part of the microwatershed.A minorarea of about3ha (1%) is medium (101-150 mm/m) in available water capacity and are distributed in the southern and southeastern part of the microwatershed.High to very high (151->200 mm/m) in available water capacity covers an area of105 ha (38%) and are distributed in the central and southern part of the microwatershed.

An area of about 64ha (23%) 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. The potential soils with respect to AWC cover about 25 ha (9%) that have very high AWC, where all climatically adapted long duration crops can be grown.

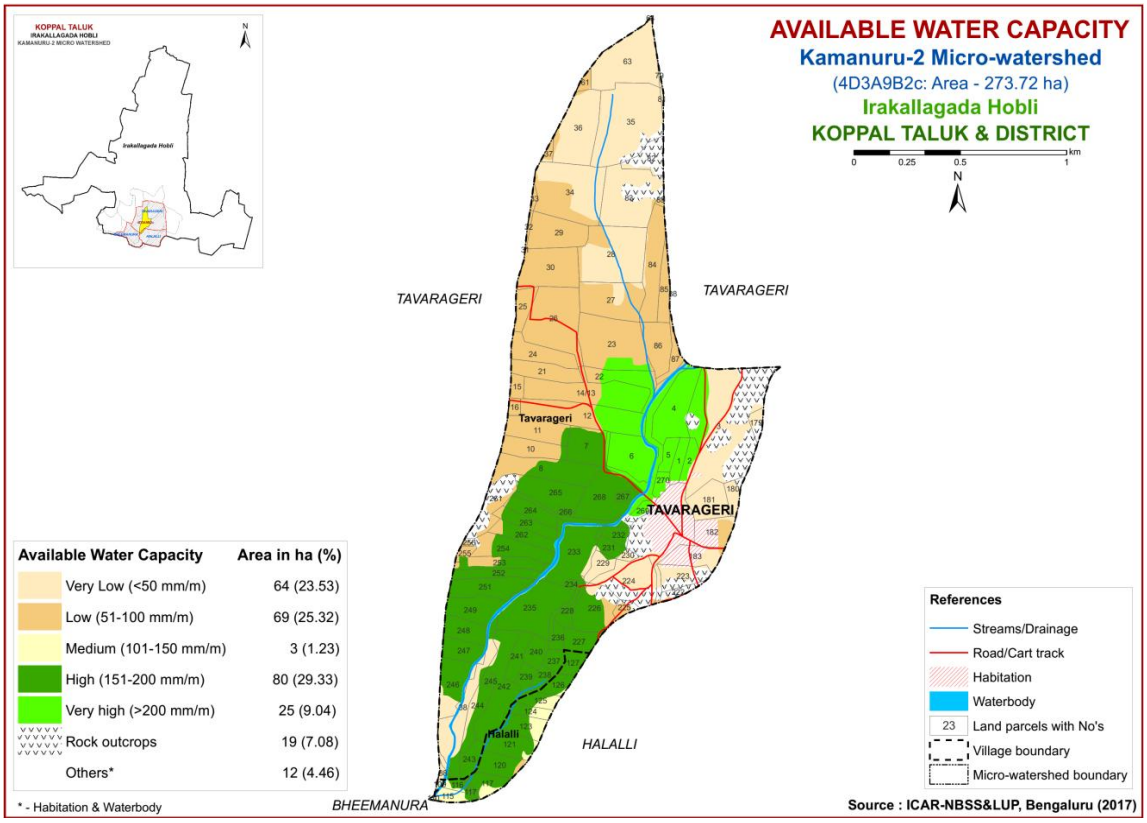


Fig. 5.5 Soil Available Water Capacity map of Kamanuru-2 Microwatershed

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 four 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).

Nearly level (0-1%) soils occupy an area of 63 ha (23%) and are distributed in the central and southwestern part of the microwatershed. Major area of about 179 ha (66%) falls under very gently sloping (1-3% slope) and are distributed in all parts of the microwatershed. In all these lands, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

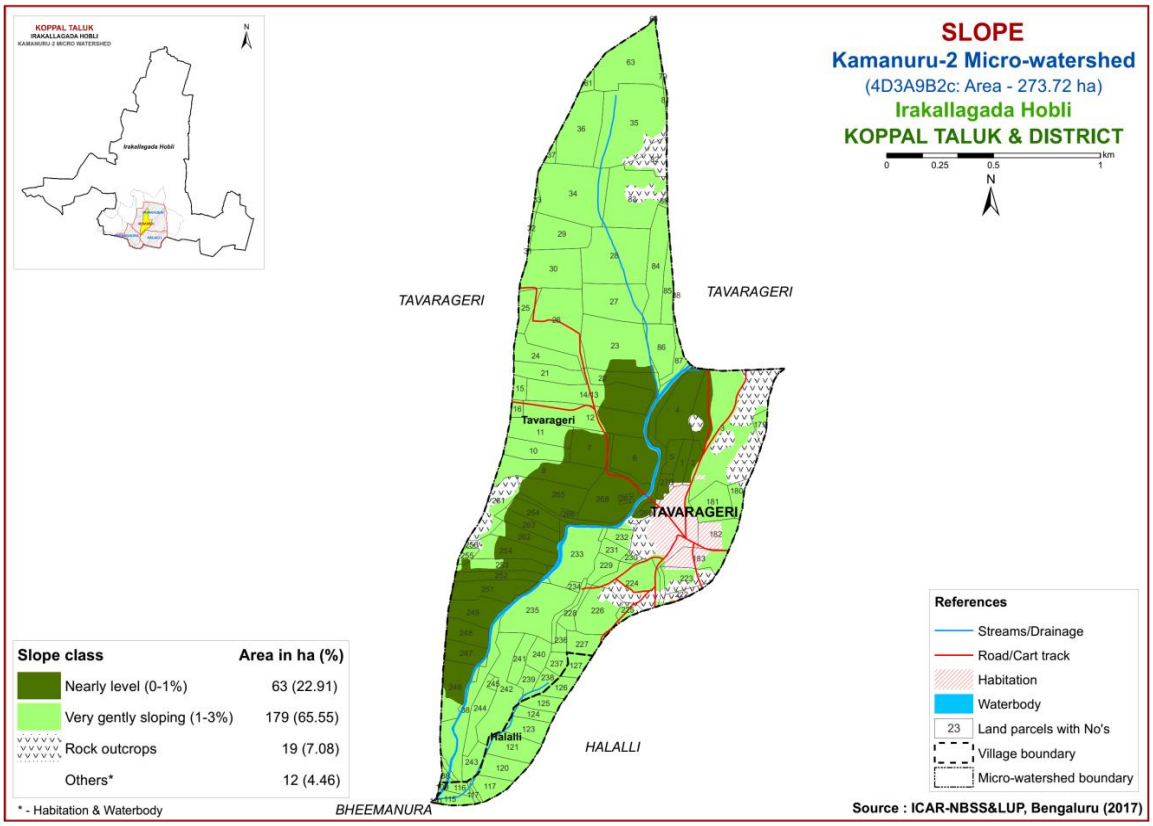


Fig. 5.6 Soil Slope map of Kamanuru-2 Microwatershed

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 microwatershedis given in Figure 5.7.

Soils that are slightly eroded (e1 Class) occupy an area of about 70 ha (26%) and are distributed in the southern, northern and northeastern part of the microwatershed. Moderately eroded (e2 Class) soils cover an area of 172 ha (63%) and are distributed in the major part of the microwatershed.

An area of about 172 ha (63%) in the microwatershed is problematic because of moderate erosion. These areas need soil and water conservation and other land development measures for restoring the soil health.

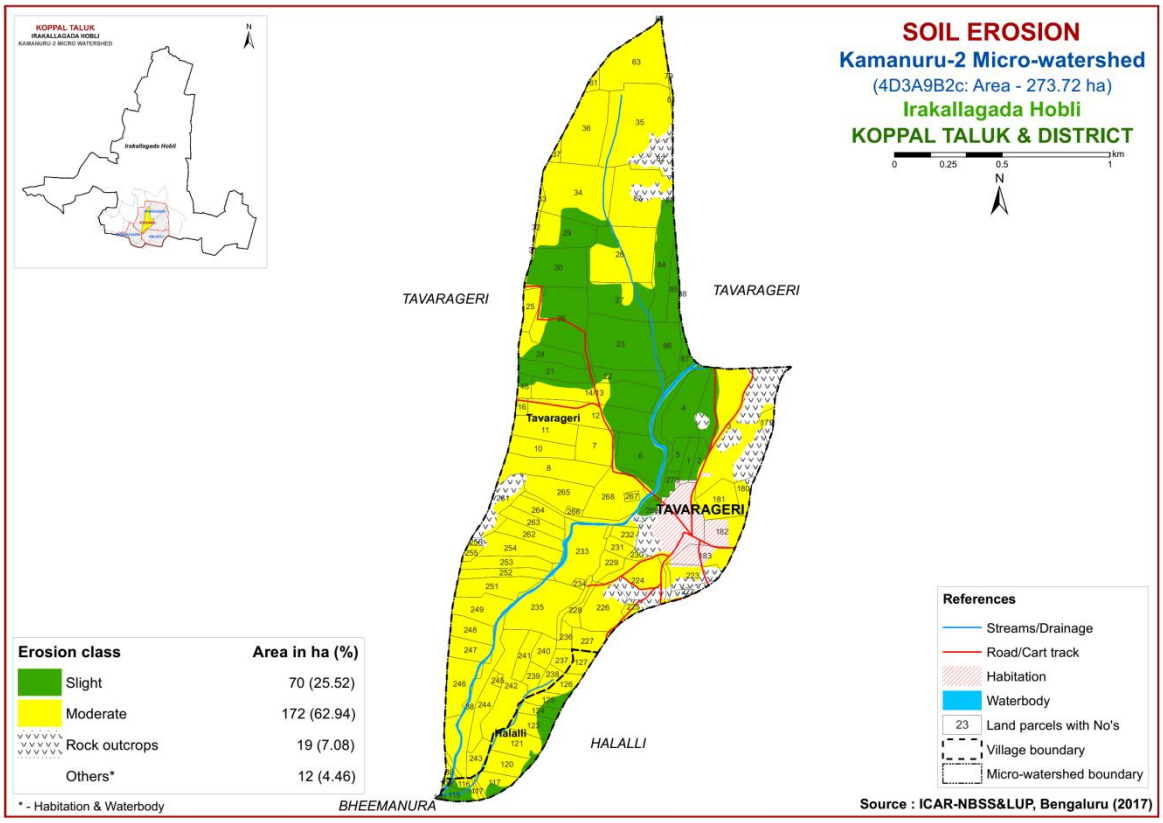


Fig. 5.7 Soil Erosion map of Kamanuru-2 Microwatershed

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 areasare characterised by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 250 m grid interval) all over the microwatershed through land resource inventory in the year 2017 were analysed for pH, EC, organic carbon, available phosphorus and potassium and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

Soil fertility data generated has been assessed and individual maps for all the nutrients for the microwatershed have been generated 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 Kamanuru-2 microwatershedfor soil reaction (pH) showed that an area of 57 ha (21%) is moderately to slightly acid (pH 5.5-6.5) and are distributed in the northern, northwestern and eastern part of the microwatershed. An area of 86ha (32%) is neutral (pH 6.5-7.3) and are distributed in the northern, western, northeastern and easternpart of the microwatershed. Slightly to moderately alkaline (pH 7.3-8.4) soils occupy 97 ha (35%) and are distributed in the southern and central part of the microwatershed. A minor area of 2 ha (1%) is strongly alkaline (pH 8.4-9.0) and are distributed in the southwestern part of the microwatershed(Fig. 6.1).Thus, all the soils in the microwatershed are acidic to alkaline in reaction.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen)in the soils of the microwatershed is low (<0.5%) coveringanarea of40ha (14%) and is distributed in the northern, northeastern, western and central part of the microwatershed.An area of 120 ha (44%) is medium(0.5-0.75%) in organic carbon contentand is distributed in allpartsof the microwatershed. High (>0.75%) organic carbon cover an area of 83 ha (30%) and is distributed in the northern, eastern and southern part of the microwatershed(Fig.6.3).

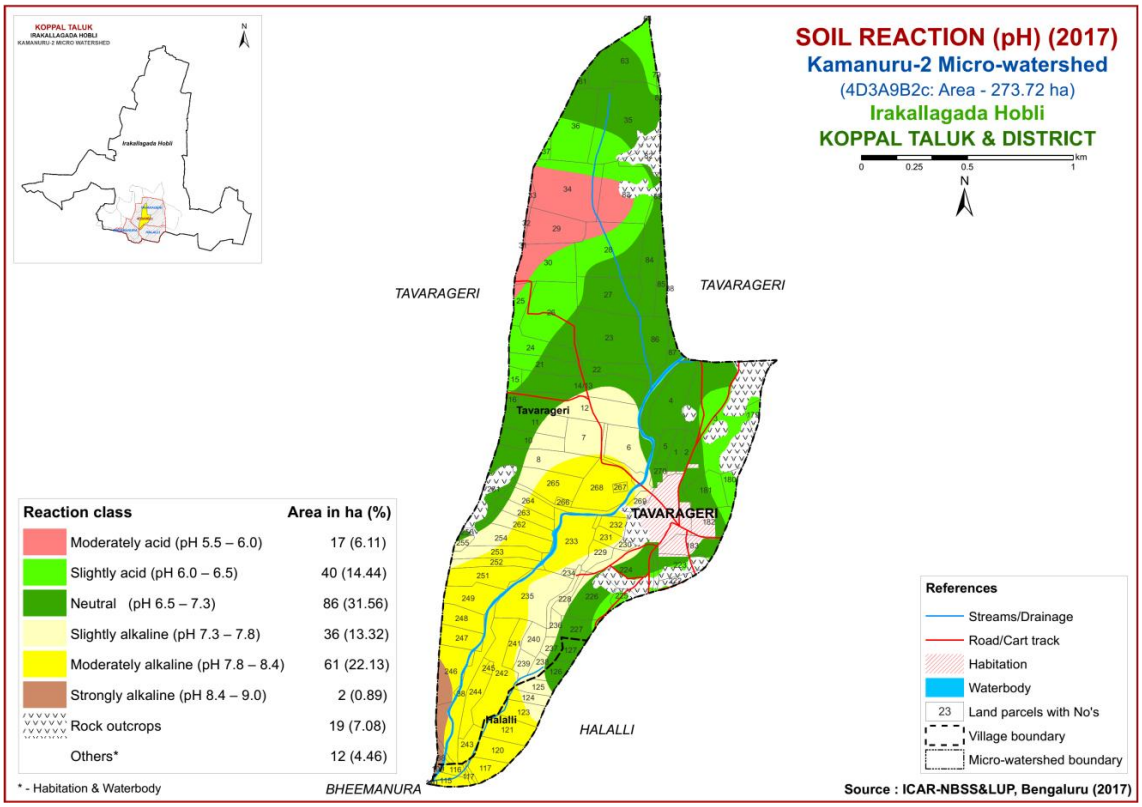


Fig.6.1 Soil Reaction (pH) map of Kamanuru-2 Microwatershed

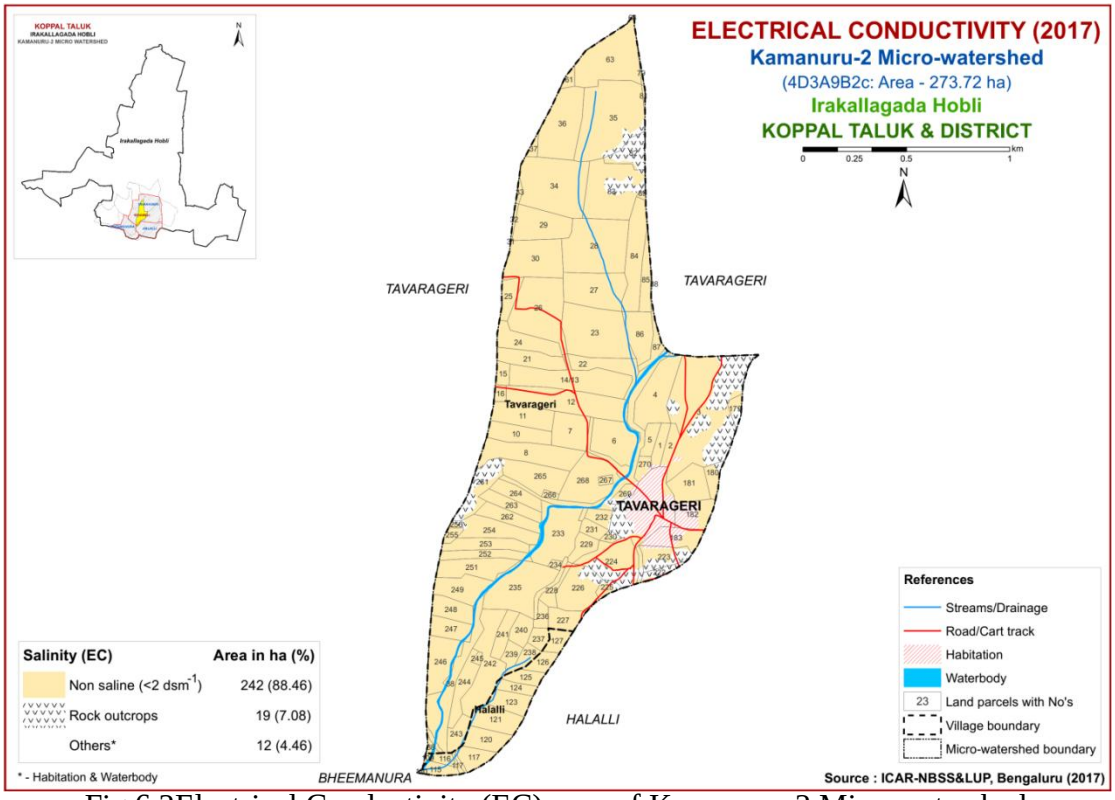


Fig.6.2Electrical Conductivity (EC) map of Kamanuru-2 Microwatershed

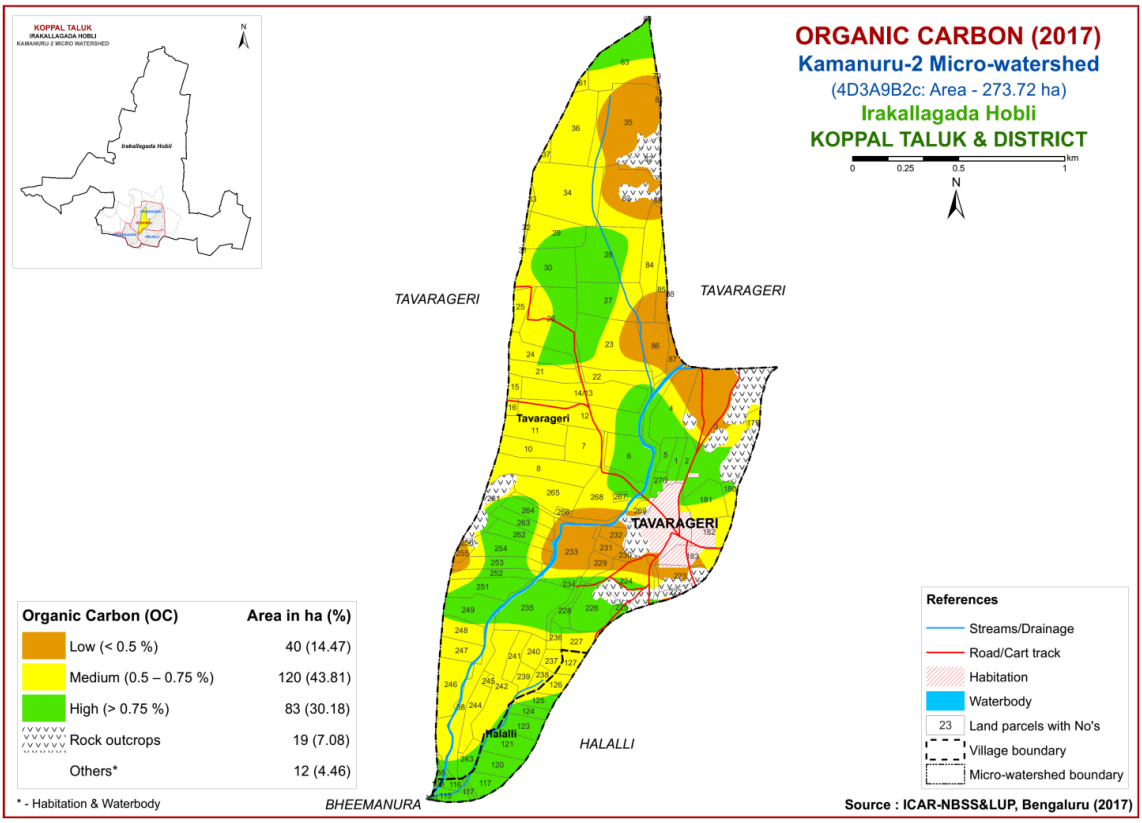


Fig.6.3Soil Organic Carbon map of Kamanuru-2 Microwatershed

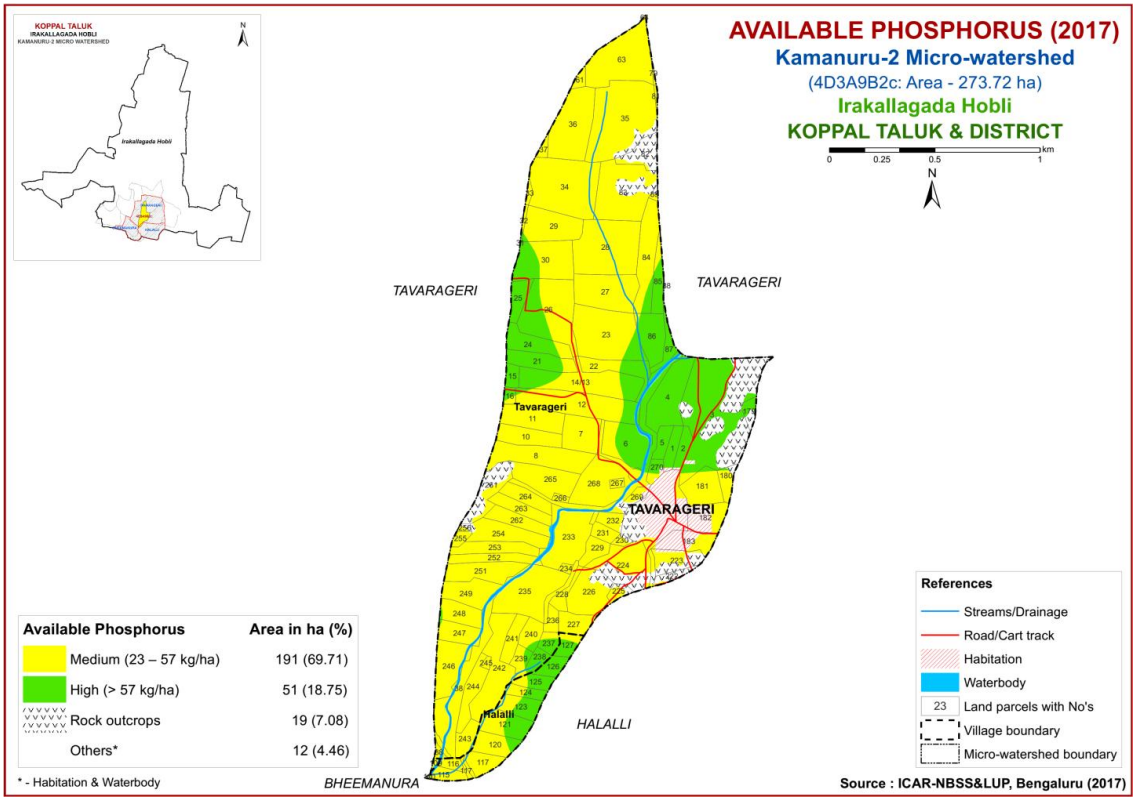


Fig.6.4 Soil Available Phosphorus map of Kamanuru-2 Microwatershed

6.4 Available Phosphorus

An area of about 191 ha (70%) is medium (23-57 kg/ha) in available phosphorus and is distributed in all parts of the microwatershed. An area of 51 ha (19%) is high (>57 kg/ha) in available phosphorus content and are distributed in the northeastern, southeastern and western part of the microwatershed (Fig. 6.4).

6.5 Available Potassium

Major area of about 188 ha (69%) is medium (145-337 kg/ha) and are distributed in all parts of the microwatershed. High (>337 kg/ha) in available potassium content occupy an area of 54 ha (20%) and are distributed in the central, eastern and southernpart of the microwatershed (Fig. 6.5).

6.6 Available Sulphur

Soils that are low in available sulphur content (<10 ppm) cover major area of 134 ha (49%) and are distributed in the northern, eastern and southern part of the microwatershed. An area of 108ha (40%) is medium (10-20 ppm) in available sulphur content and are distributed in the central, western and easternpartofthe microwatershed.(Fig.6.6).The areas that are low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or factomphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Available boron content is low (<0.5ppm) in an area of 104ha (38%) and are distributed in the northern, central, eastern, western and southern part of the microwatershed. An area of about 127ha (46%) is medium (0.5-1.0 ppm) in available boron and are distributedin the northern, central, eastern, western and a small area in southern partof the microwatershed. High (>1.0 ppm) in available boron occupy an area of about 11 ha (4%) in the northern, central and southern part of the microwatershed(Fig.6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) inan area of 143 ha (52%) and occur in the major part of the microwatershed. An area of 99 ha (36%) is deficient (<4.5 ppm) and are distributed in the northern, central and 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 sufficient (>0.6 ppm) in an area of 56 ha (21%) and deficient (<0.6 ppm) in 186 ha (68%) in the microwatershed (Fig. 6.11).

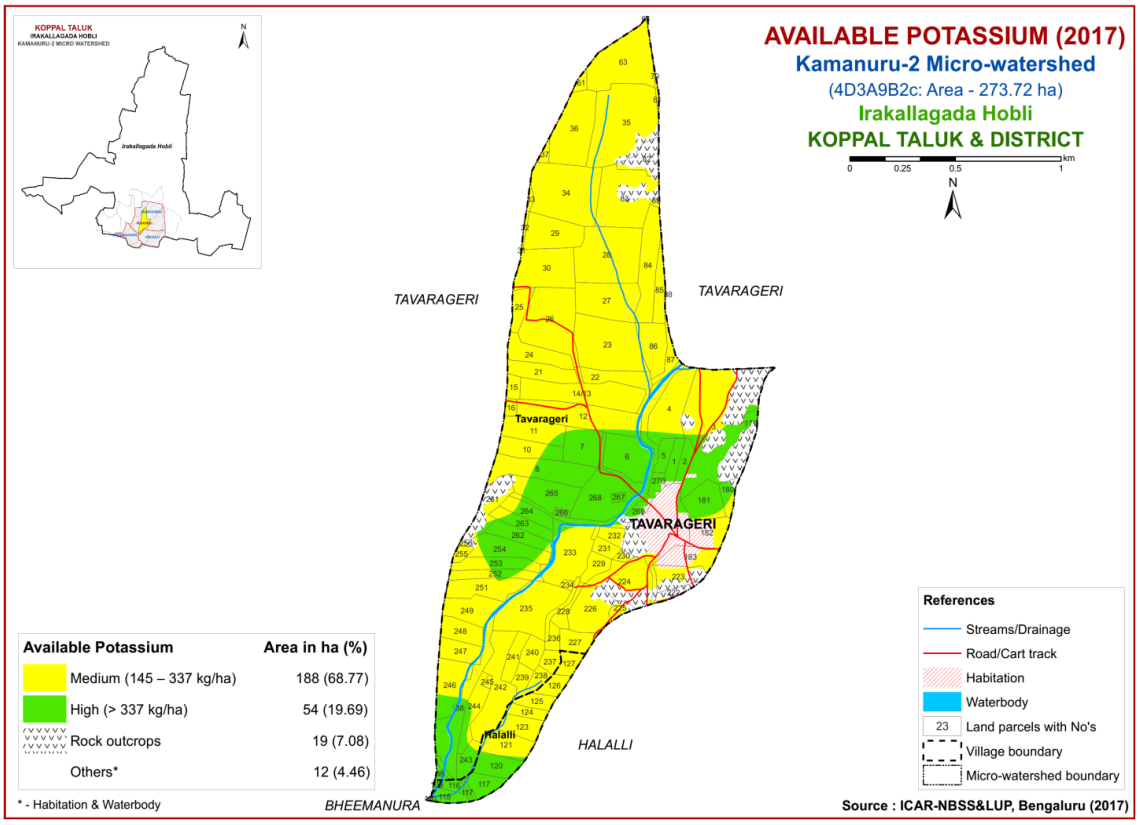


Fig.6.5Soil Available Potassium map of Kamanuru-2 Microwatershed

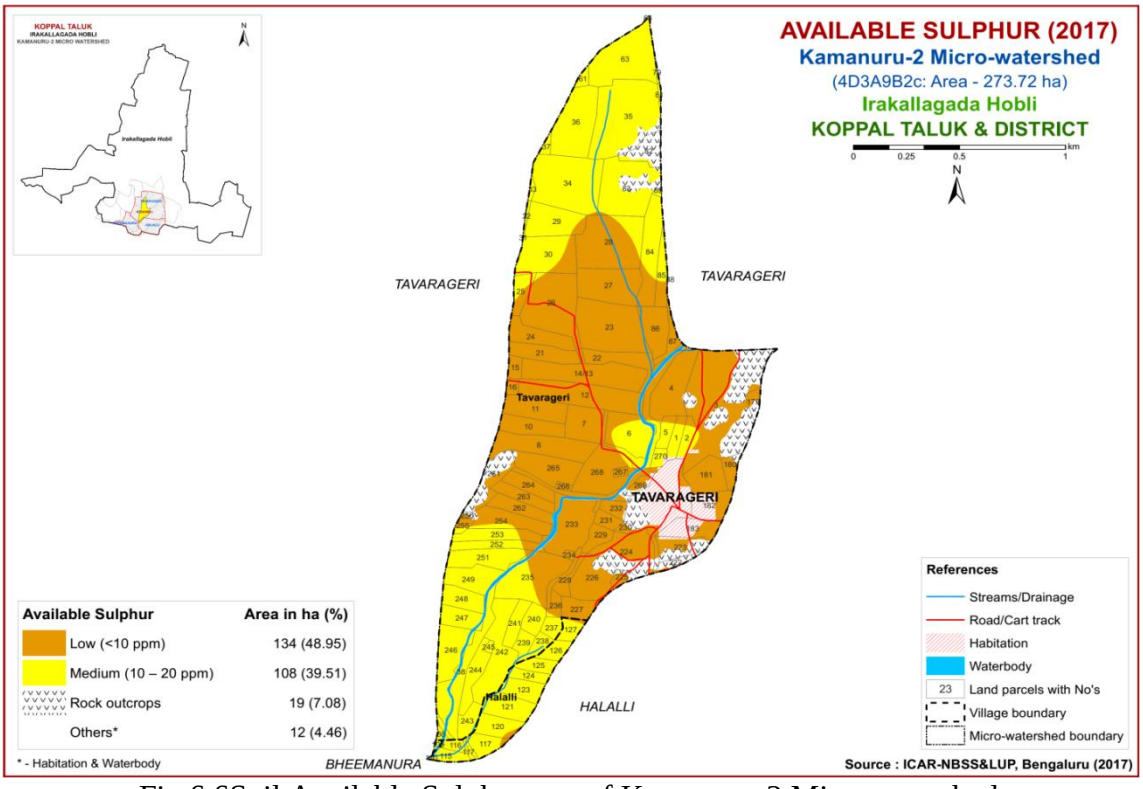


Fig.6.6Soil Available Sulphurmap of Kamanuru-2 Microwatershed

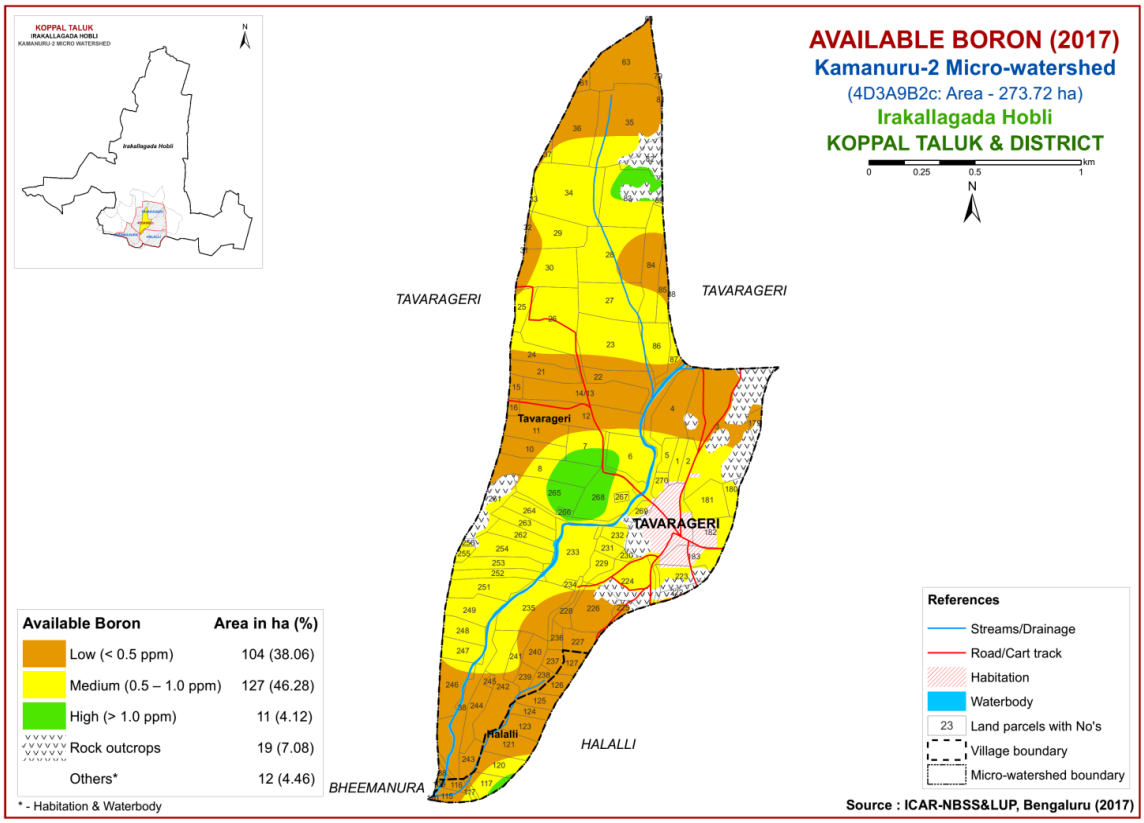


Fig.6.7Soil Available Boronmap of Kamanuru-2 Microwatershed

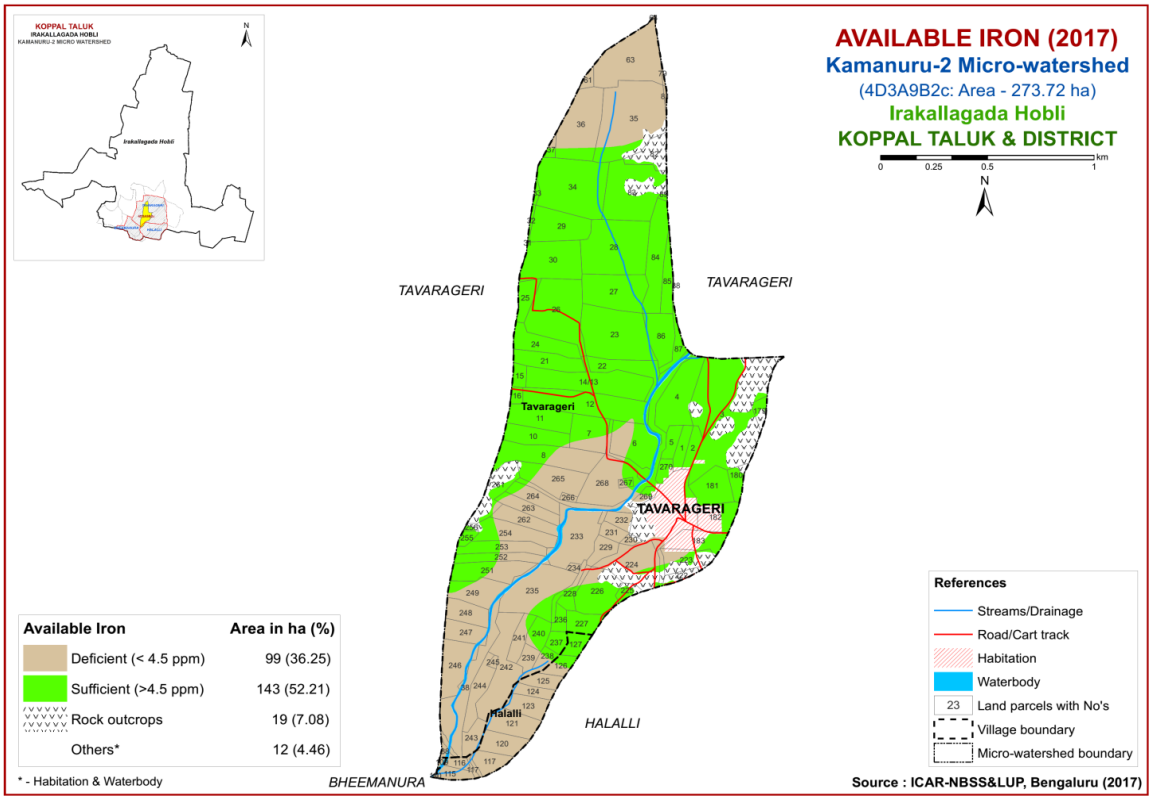


Fig.6.8Soil Available Iron map of Kamanuru-2 Microwatershed

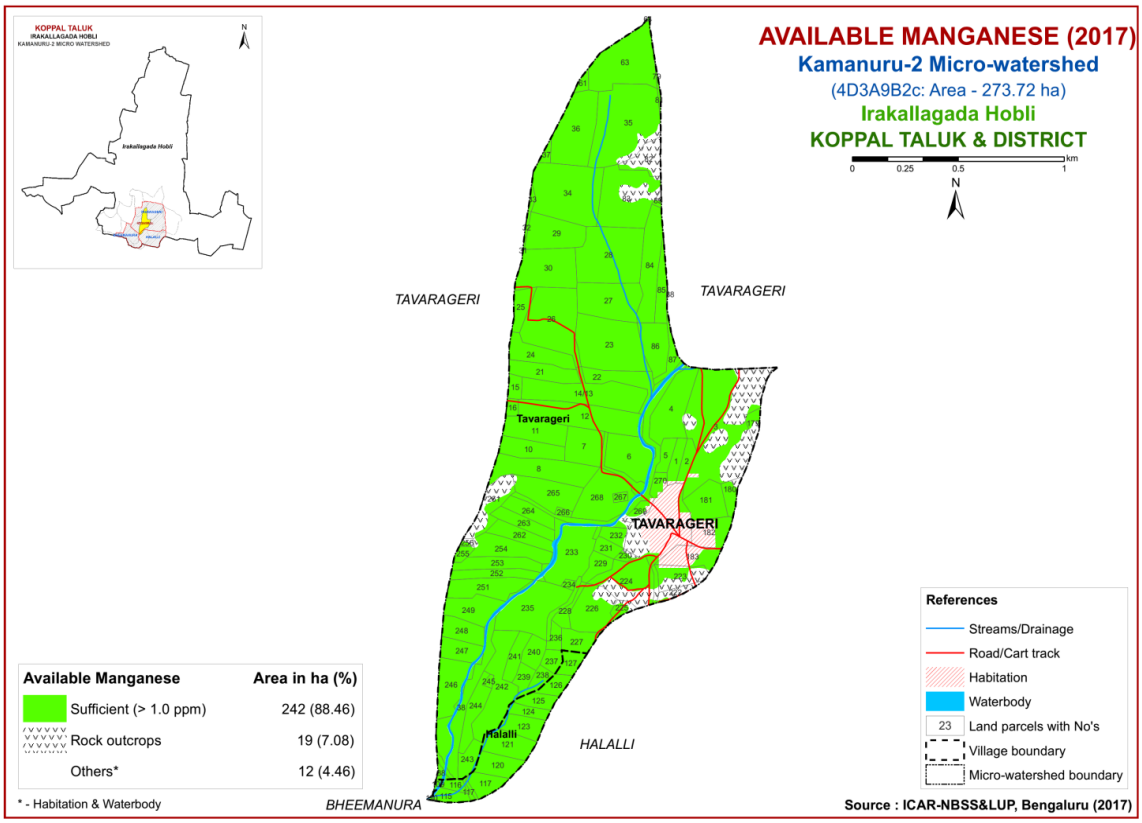


Fig.6.9Soil Available Manganese map of Kamanuru-2 Microwatershed

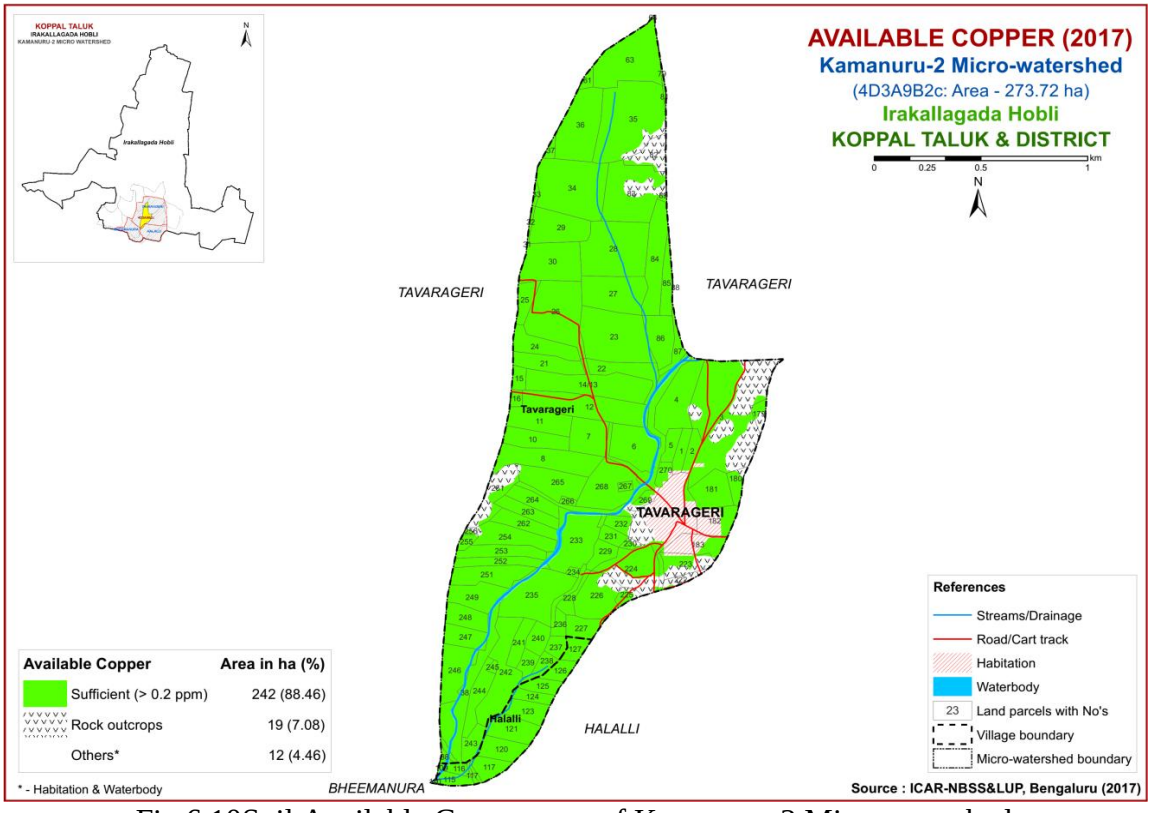


Fig.6.10Soil Available Copper map of Kamanuru-2 Microwatershed

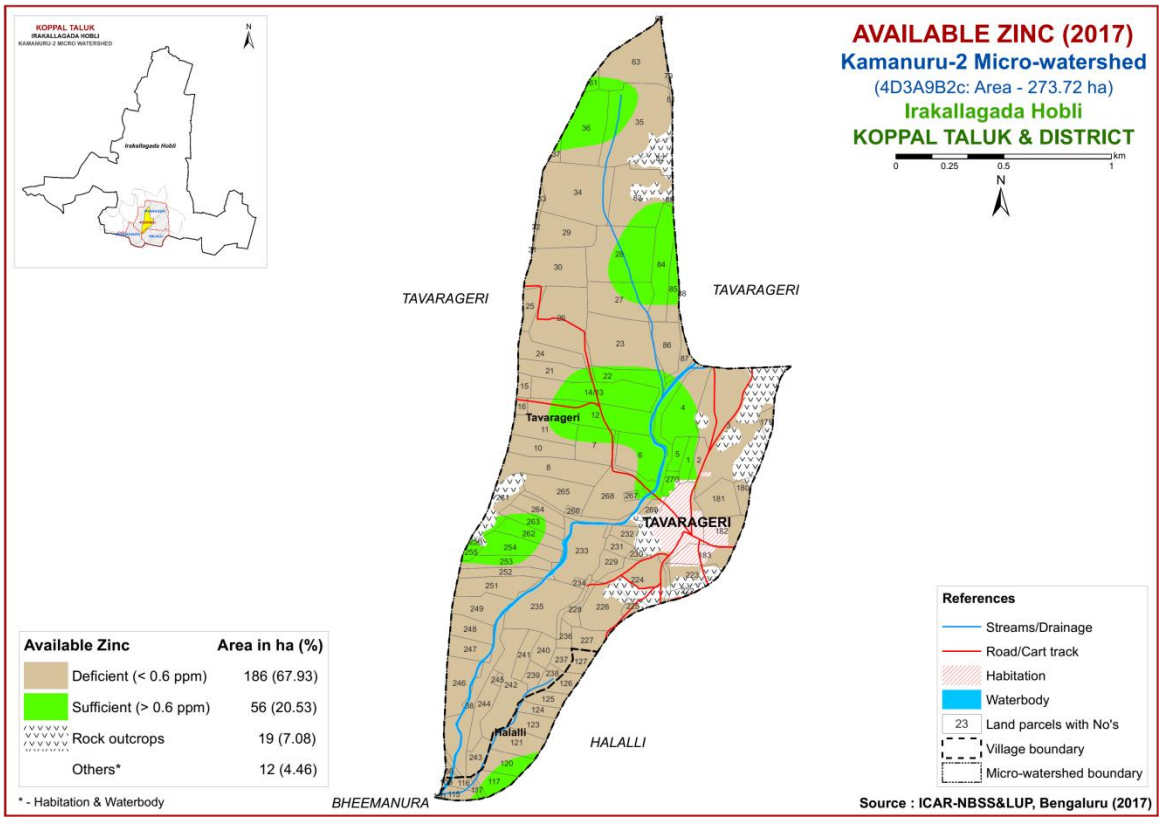


Fig.6.11Soil Available Zinc map of Kamanuru-2 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Kamanuru-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 crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3-Marginally Suitable. Order N has two Classes, N1-Currently not Suitable and N2-Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3, N1 and N2 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'z' for calcareousness's' for sodium 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 28major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

Sorghum is one of the major crop grown in Karnataka in an area of 10.47 lakh ha in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad, Bellary, Chitradurga, Mysore and 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 82 ha (30%) for growing sorghum and are distributed in the southern and central part of the microwatershed. An area of 58 ha (21%) is moderately suitable (ClassS2) for growing sorghum and are distributed inthe central, western and southernpartof the microwatershed. They have minor limitations of gravelliness, texture, drainage, calcareousnessand rooting condition.

Table 7.1 Soil-Site Characteristics of Kamanuru-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	ESP	CEC [Cmol $(p^+)kg^{-1}$]	BS (%)
					Surface	Subsurface	Surface	Subsurface								
HDHbB2	662	90	WD	75-100	ls	gsc-gc	-	>35	50-100	1-3	Moderate	7.55	0.15	0.44	7.59	104
HDHbB2g1	662	90	WD	75-100	ls	gsc-gc	15-35	>35	50-100	1-3	Moderate	7.55	0.15	0.44	7.59	104
HDHhB2g1	662	90	WD	75-100	scl	gsc-gc	15-35	>35	50-100	1-3	Moderate	7.55	0.15	0.44	7.59	104
BSRcB1	662	90	WD	75-100	sl	gsc	-	15-35	50-100	1-3	Slight	-	-	-	-	-
CKMiB1	662	90	WD	75-100	sc	sc	-	-	100-150	1-3	Slight	7.99	0.32	4.33	12.5	119
BDGhA1	662	90	WD	75-100	scl	gc	-	35-60	<50	0-1	Slight	6.24	0.06	0.35	3.76	52.5
BDGhB2	662	90	WD	75-100	scl	gc	-	35-60	<50	1-3	Moderate	6.24	0.06	0.35	3.76	52.5
BPRbB2	662	90	WD	100-150	ls	gsc-gc	-	>35	51-100	1-3	Moderate	6.64	0.03	0.51	5.45	63.4
BPRbB2g1	662	90	WD	100-150	ls	gsc-gc	15-35	>35	51-100	1-3	Moderate	6.64	0.03	0.51	5.45	63.4
VDHcA2	662	90	MWD	100-150	sl	sc-c	-	-	150-200	0-1	Moderate	-	-	-	-	-
NGPbB1	662	90	WD	100-150	ls	gsc-gc	-	>35	51-100	1-3	Slight	-	-	-	-	-
NGPbB2g1	662	90	WD	100-150	ls	gsc-gc	15-35	>35	51-100	1-3	Moderate	-	-	-	-	-
NGPcB2g1	662	90	WD	100-150	sl	gsc-gc	15-35	>35	51-100	1-3	Moderate	-	-	-	-	-
RTRiB2	662	90	WD	>150	sc	c	-	-	150-200	1-3	Moderate	5.08	0.03	2.06	9.21	50.5
NDLcB1	662	90	WD	>150	sl	gsc	-	>35	50-100	1-3	Slight	-	-	-	-	-
NDLcB2g1	662	90	WD	>150	sl	gsc	15-35	>35	50-100	1-3	Moderate	-	-	-	-	-
NDLhB2g1	662	90	WD	>150	scl	gsc	15-35	>35	50-100	1-3	Moderate	-	-	-	-	-
JDGiB1	662	90	WD	100-150	sc	sc-c	-	<15	>200	1-3	Slight					
RNKhB2	662	90	MWD	50-75	scl	c	-	<15	51-100	1-3	Moderate	8.86	0.48	16.9	37.0	-
TSDmA1	662	90	MWD	>150	c	c	-	-	>200	1-3	Slight	8.46	0.17	0.48	36.6	100

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

Maximum area of about 102 ha (37%) is marginally suitable (Class S3) for growing sorghum and are distributed in the northern and eastern part of the microwatershed with moderate limitations of gravelliness and texture.

Table 7.2 Crop suitability criteria for Sorghum

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

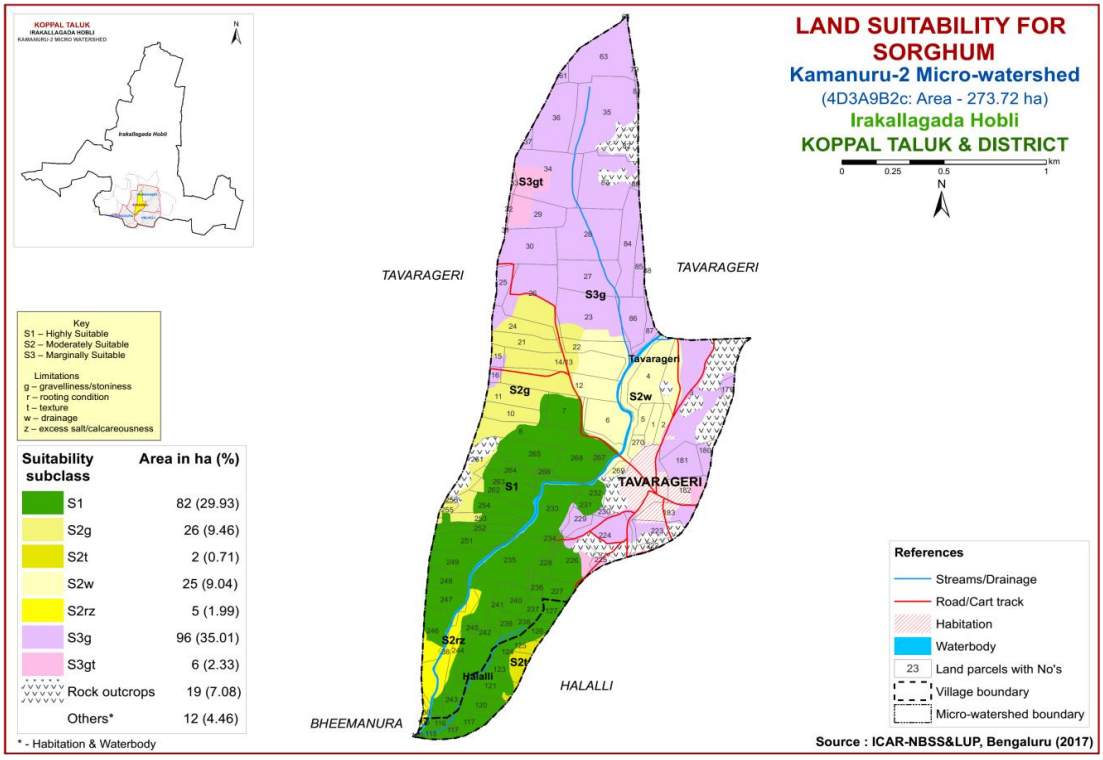


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

Maize is one of the most important food crop grown in an area of 13.37 lakh ha in almost all the districts of the State. The crop requirements forgrowing maize (Table 7.3) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for

growing maize was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.2.

Table 7.3 Crop suitability criteria for Maize

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

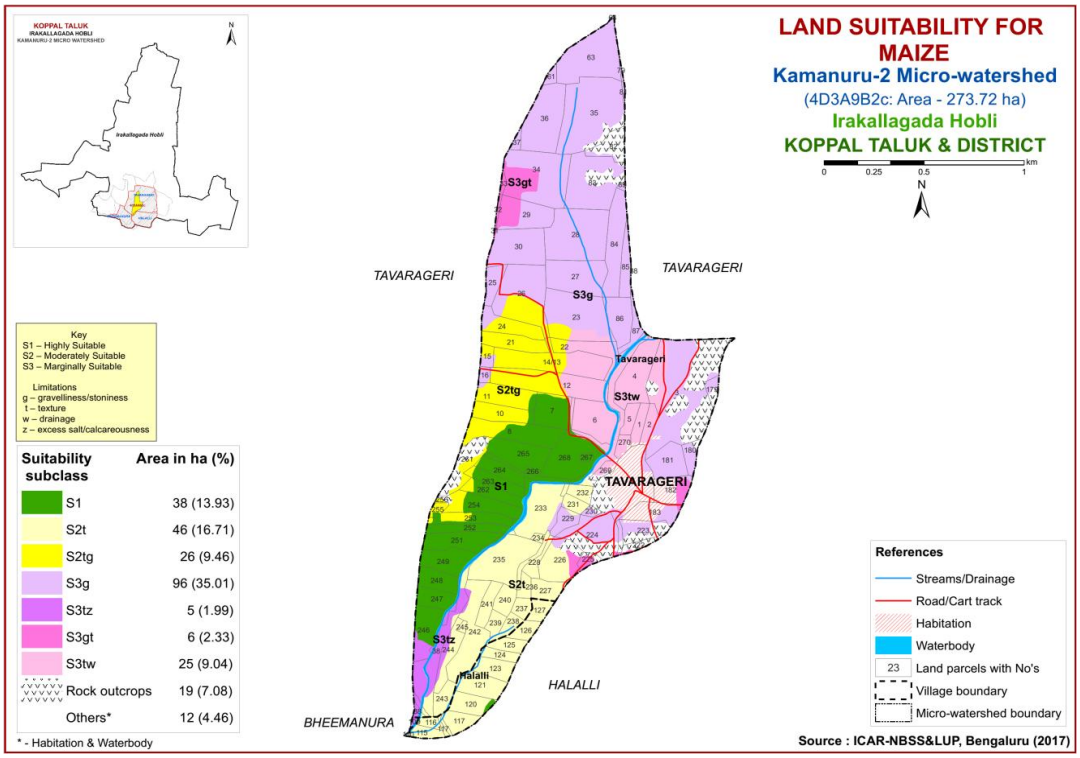


Fig. 7.2 Land Suitability map of Maize

An area of 38 ha (14%) is highly suitable (Class S1) lands for growing maize and are distributed in the central and southern part of the microwatershed. Moderately suitable (Class S2) lands cover an area of 72 ha (26%) for growing maize and are distributed in the southern and western part of the microwatershed with minor limitations of gravelliness and texture. Marginally suitable (Class S3) lands cover a major area of 132 ha (48%) and are distributed in the northern, central and southwestern part of the microwatershed. They have moderate limitations of texture, gravelliness, drainage and calcareousness.

7.3Land Suitability for Bajra (*Pennisetum glaucum)*

Bajra is one of the major food crop grown in an area of 2.34 lakh ha in the northern districts of the Karnataka state. The crop requirements for growing bajra (Table 7.4)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.

Table 7.4 Crop suitability criteria for Bajra

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

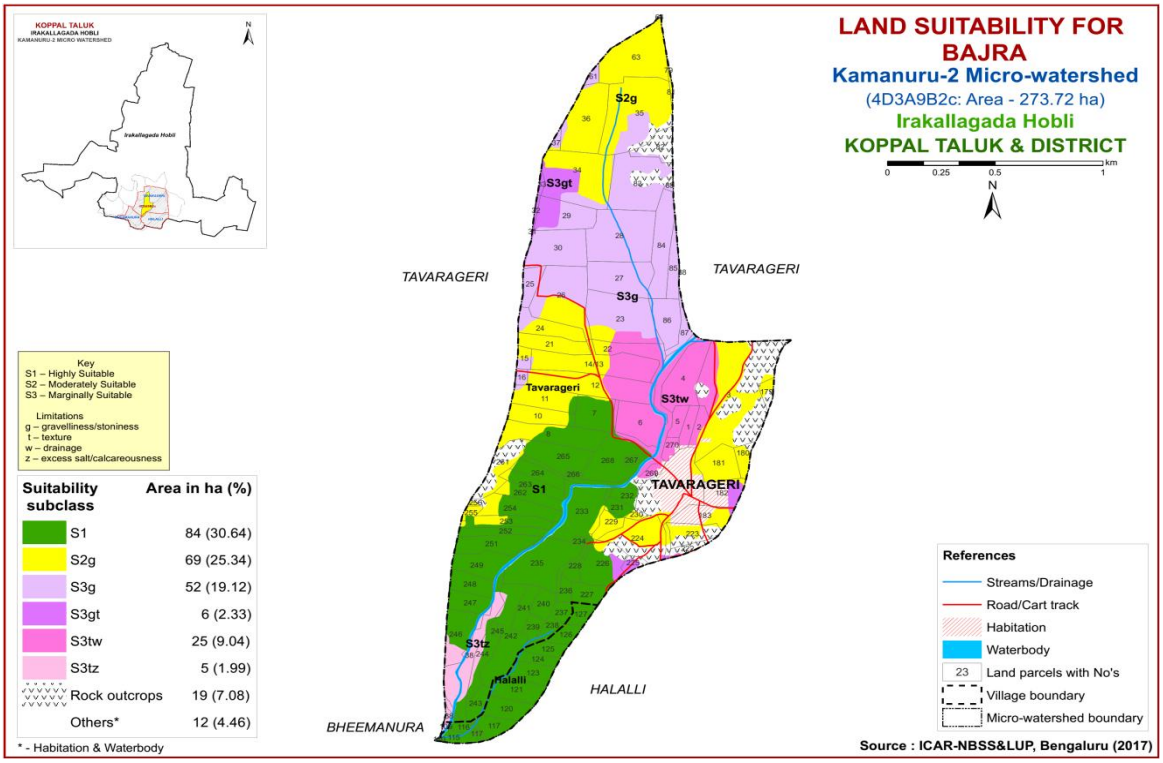


Fig. 7.3 Land Suitability map of Bajra

An area of 84 ha (31%) is highly suitable (Class S1) for growing bajra and are distributed in the central and southern part of the microwatershed. Moderately suitable

lands occupy an area of 69 ha (25%) and are distributed in the northern, western and eastern part of the microwatershed with minor limitation of gravelliness. Marginally suitable (Class S3) lands cover a maximum area of 88 ha (32%) and are distributed in the northern, eastern and southwestern part of the microwatershed. They have moderate limitations of gravelliness, rooting condition and texture.

7.4 Land Suitability for Red gram (*Cajanus cajan)*

Redgram is one of the most important pulse crop grown in an area of 7.28 lakh ha in almost all the districts of the State. The crop requirements for growing redgram (Table 7.5) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing redgram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.4.

Highly suitable (Class S1) lands occupy an area of 82 ha (30%) for growing redgram and are distributed in the central and southern part of the microwatershed. Moderately suitable lands occupy an area of 53 ha (19%) and are distributed in the central and western part of the microwatershed with minor limitations of gravelliness, rooting condition, texture and drainage. Marginally suitable (Class S3) lands cover a maximum area of 107 ha (39%) and are distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, texture, calcareousness and rooting condition.

Table 7.5 Land suitability criteria for Red gram

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

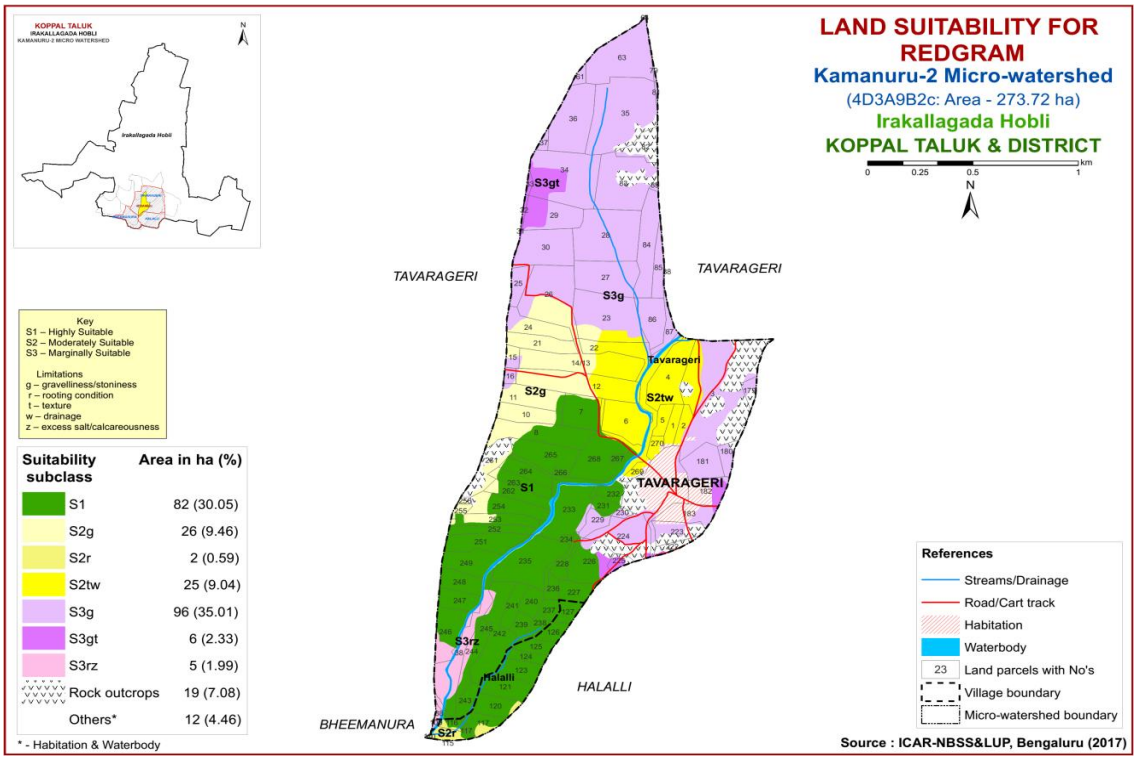


Fig. 7.4 Land Suitability map of Redgram

7.5 Land Suitability for Bengalgram (*Cicer arietinum*)

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

Table 7.6 Crop suitability criteria for Bengalgram

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

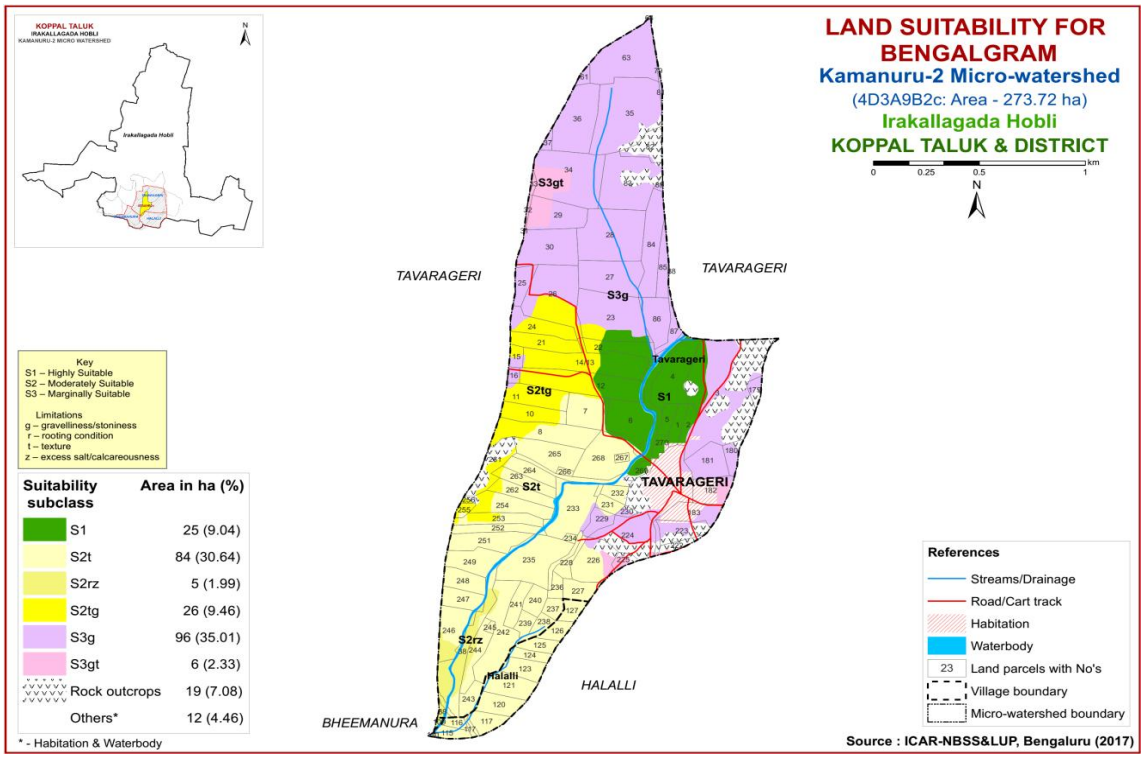


Fig. 7.5 Land Suitability map of Bengalgram

Highly suitable (Class S1) lands cover an area of 25 ha (9%) and are distributed in the eastern part of the microwatershed for growing bengalgram. Moderately suitable lands occupy an area of 115 ha (42%) and are distributed in the central and southern part of the microwatershed with minor limitations of gravelliness, texture, rooting condition and calcareousness. Marginally suitable (Class S3) lands cover an area of 102 ha (37%) and are distributed in the northern, western and eastern part of the microwatershed. They have moderate limitations of gravelliness and texture.

7.6 Land Suitability for Groundnut (*Arachis hypogaea*)

Groundnut is one of the major oilseed crop grown in an area of 6.54 lakh ha in Karnataka in most of the districts either as rainfed or irrigated crop. The crop requirements for growing groundnut (Table 7.7) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing groundnut was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.6.

An area of 80 ha (29%) is highly suitable (Class S1) for growing groundnut and are distributed in the central and southernpart of the microwatershed. Moderately suitable (Class S2) lands cover an area of 91 ha (33%) and are distributed in the northern, eastern and southernpart of the microwatershed. They have minor limitations of texture and gravelliness. Anarea of 71 ha (26%) is marginally suitable (Class S3) for groundnut and are distributed in the northern, western, southwestern and central part of the microwatershed. They have moderate limitations of gravelliness, drainage, calcareousness and texture.

Table 7.7 Crop suitability criteria for Groundnut

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

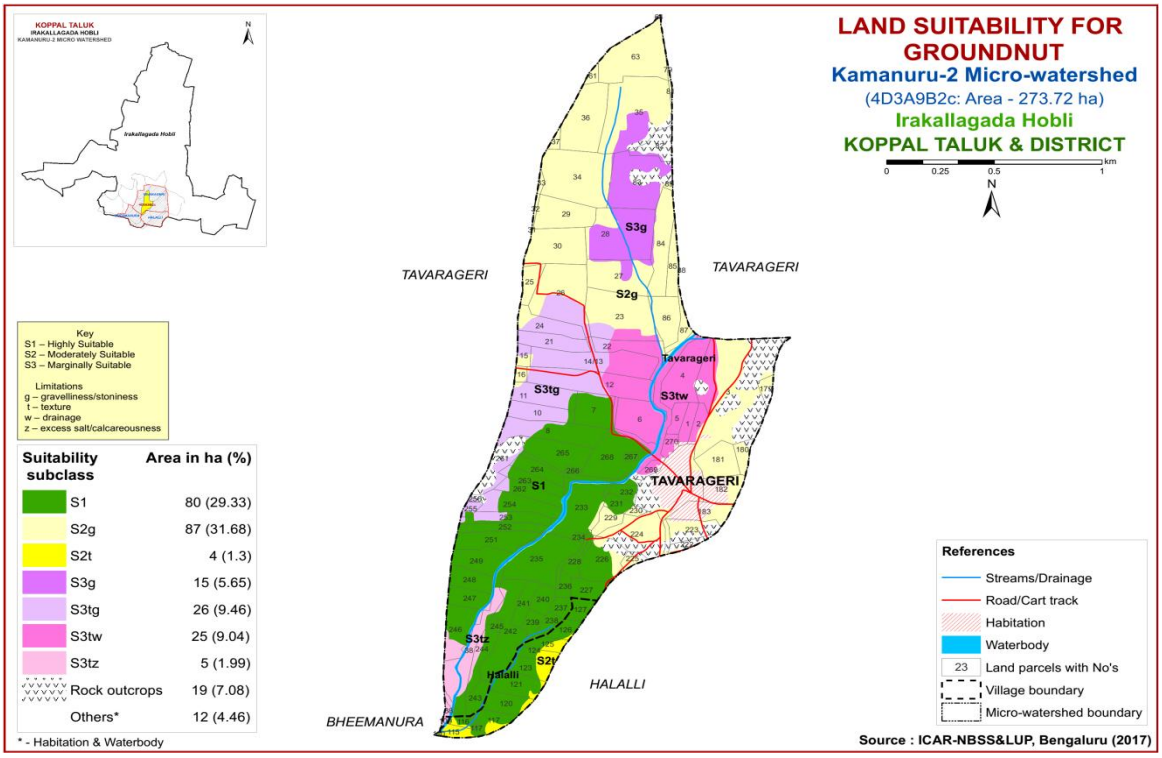


Fig. 7.6 Land Suitability map of Groundnut

7.7 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is one of the most important oilseed crop grown in an area of 3.56 lakh ha in the State in all the districts. The crop requirements for growing sunflower (Table 7.8) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sunflower was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.7.

Highly suitable (Class S1) landsoccupy an area of 82 ha (30%) and are distributed in the central and southern part of the microwatershed. An area of 53 ha (19%) is

moderately suitable (Class S2) and are distributed in the central and westernpart of the microwatershed. They have minor limitations of rooting condition, gravelliness and drainage. Major area of106 ha (39%) is marginally suitable (Class S3) for growing sunflower with moderate limitations of texture, rooting condition, calcareousness and gravelliness.

Table 7.8 Crop suitability criteria for Sunflower

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

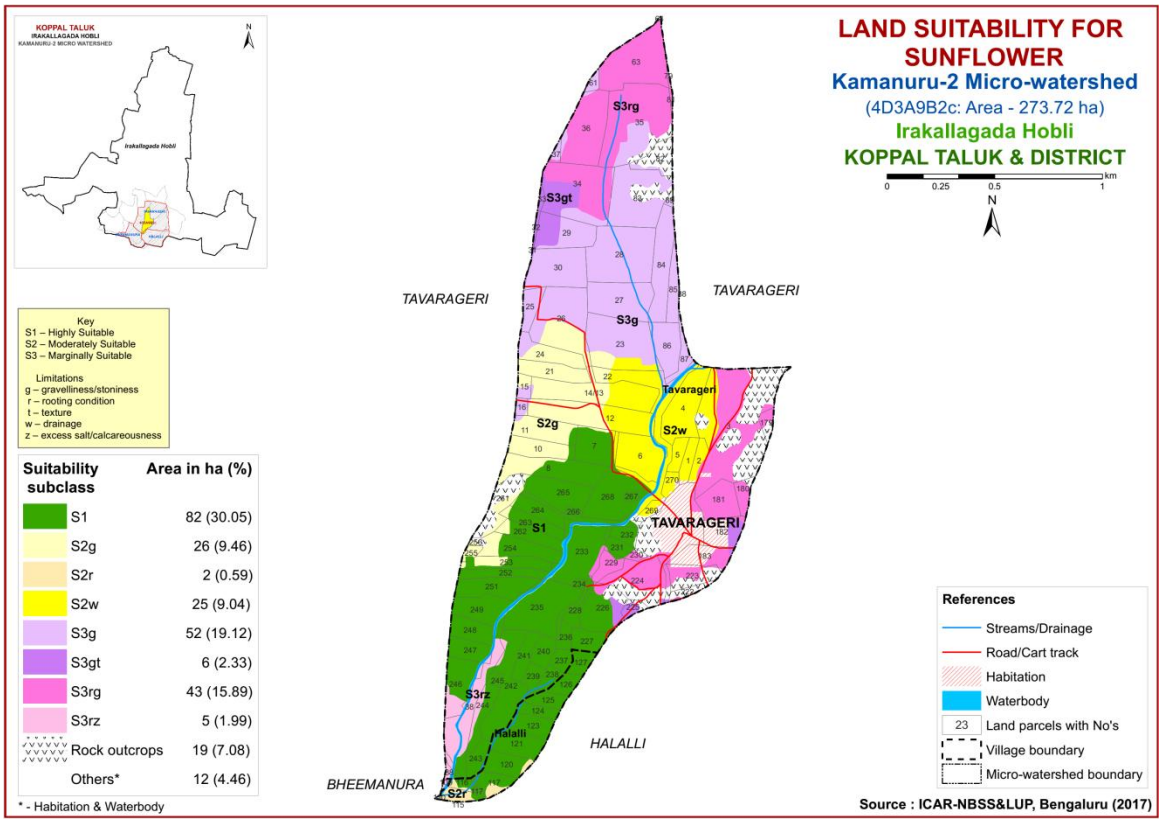


Fig. 7.7 Land Suitability map of Sunflower

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.

Table 7.9 Crop suitability criteria for Cotton

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

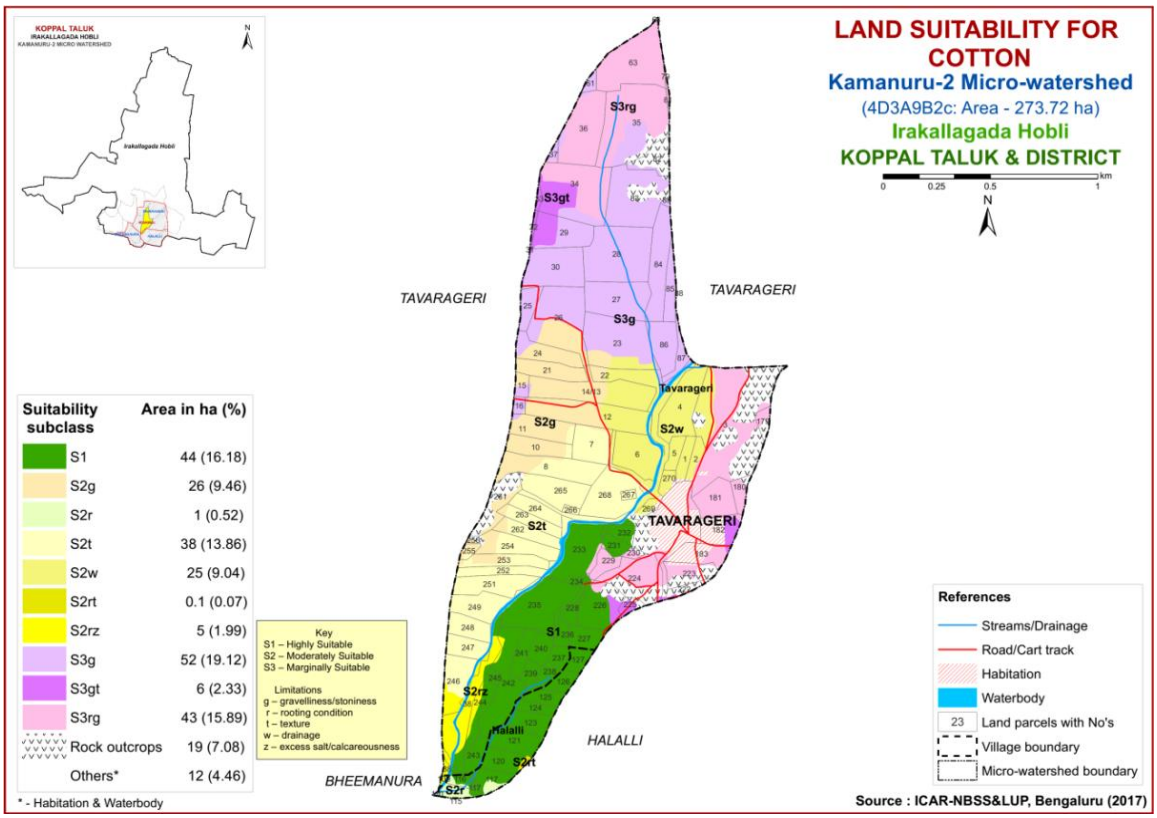


Fig. 7.8 Land Suitability map of Cotton

An area of 44 ha (16%) is highly suitable (Class S1) for growing cotton and are distributed in the southern part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of 95 ha (35%) and are distributed in the central, western and southwestern part of the microwatershed. They have minor limitations of gravelliness, rooting condition, texture, drainage, gravelliness and calcareousness. Marginally suitable (Class S3) lands cover a major area of 101 ha (37%) and are distributed in the northern and eastern part of the microwatershed. They have moderate limitations of gravelliness, texture and rooting condition.

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

Chilli is one of the most important commercialcrop grown in an area of 0.89 lakh ha in all the districts of 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.

Highly suitable (Class S1) landsoccupy an area of 84 ha (31%) and are distributed in the central and western part of the microwatershed. Moderately suitable (Class S2) lands cover an area of 26 ha (9%) and are distributed in the western part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable (Class S3) lands cover a maximum area of about 132 ha (48%) and are distributed in the northern, eastern, central and southwesternpart of the microwatershed. They have moderate limitations of gravelliness, texture, calcareousness and drainage.

Table 7.10Crop suitability criteria for Chilli

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

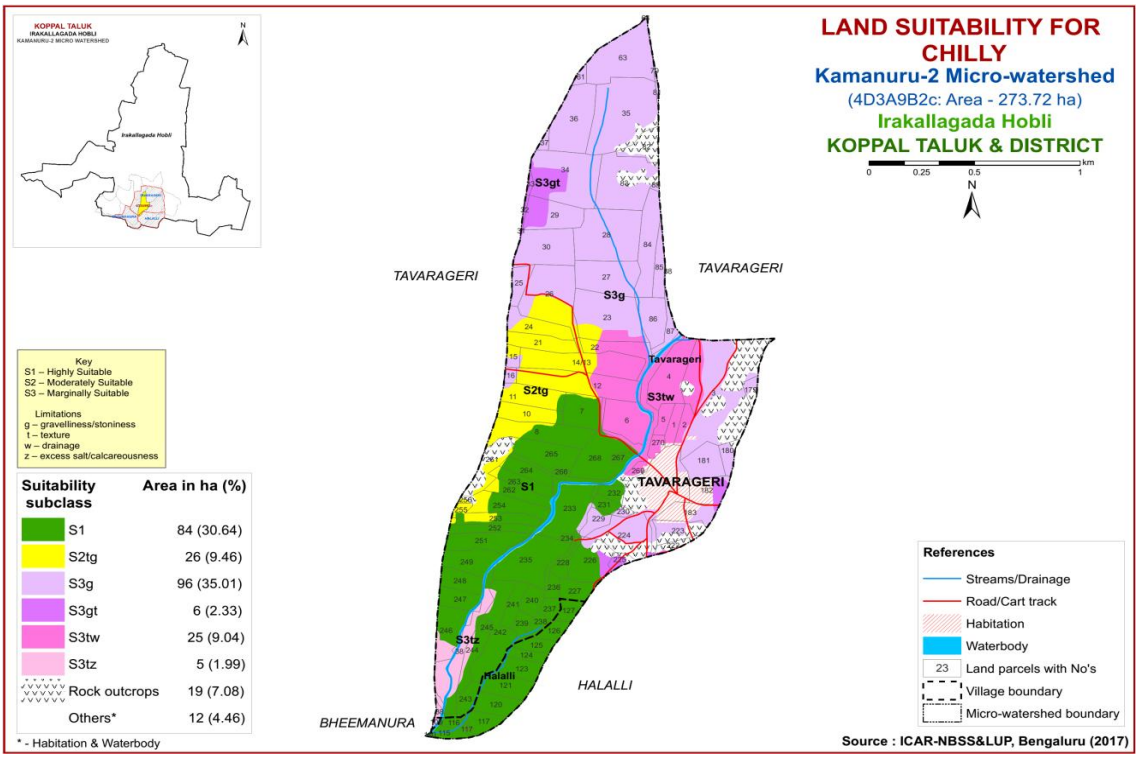


Fig. 7.9 Land Suitability map of Chilli

7.10Land 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.

Table 7.11 Crop suitability criteria for Tomato

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

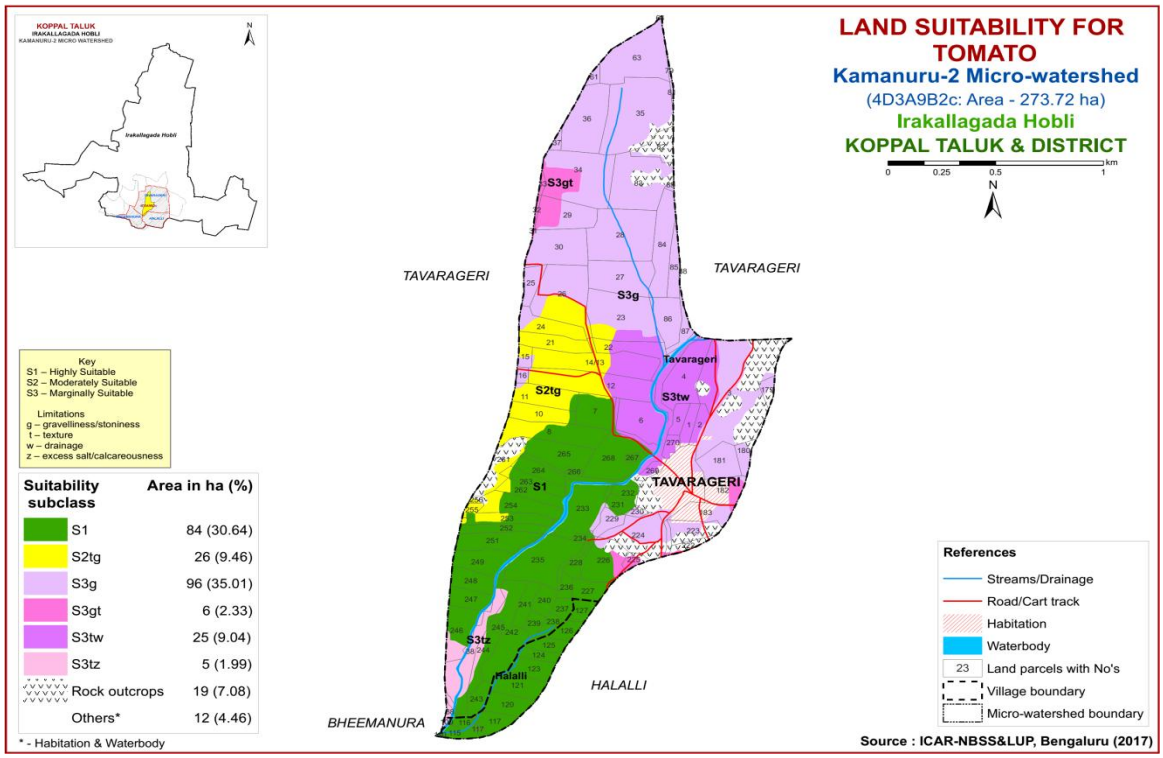


Fig. 7.10 Land Suitability map of Tomato

An area of 84 ha (31%) is highly suitable (Class S1) for growing tomato and are distributed in the central and southern part of the microwatershed. Moderately suitable (Class S2) lands occupy 26 ha (9%) and are distributed in the western part of the microwatershed with minor limitations of gravelliness and texture. Marginally suitable (Class S3) lands cover a maximum area of 132 ha (48%) and occur in the northern, eastern and southwestern part of the microwatershed. They have moderate limitations of gravelliness, texture, drainage and calcareousness.

7.11 Land Suitability for Drumstick (*Moringa oleifera)*

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

An area of 82 ha (30%) is highly suitable (Class S1) for growing drumstick and are distributed in the central and southern part of the microwatershed.Moderately suitable (Class S2) lands occupy an area of 96 ha (35%) and are distributed in thenorthern, central, eastern and westernpart of the microwatershed. They have minor limitations of gravelliness, rooting condition, textureand drainage. Marginally suitable (Class S3)lands coveranarea of 64 ha (24%) and are distributed in thenorthern, eastern and southwesternpart of the microwatershed. They have moderate limitations of gravelliness, calcareousness and rooting condition.

Table 7.12 Land suitability criteria for Drumstick

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

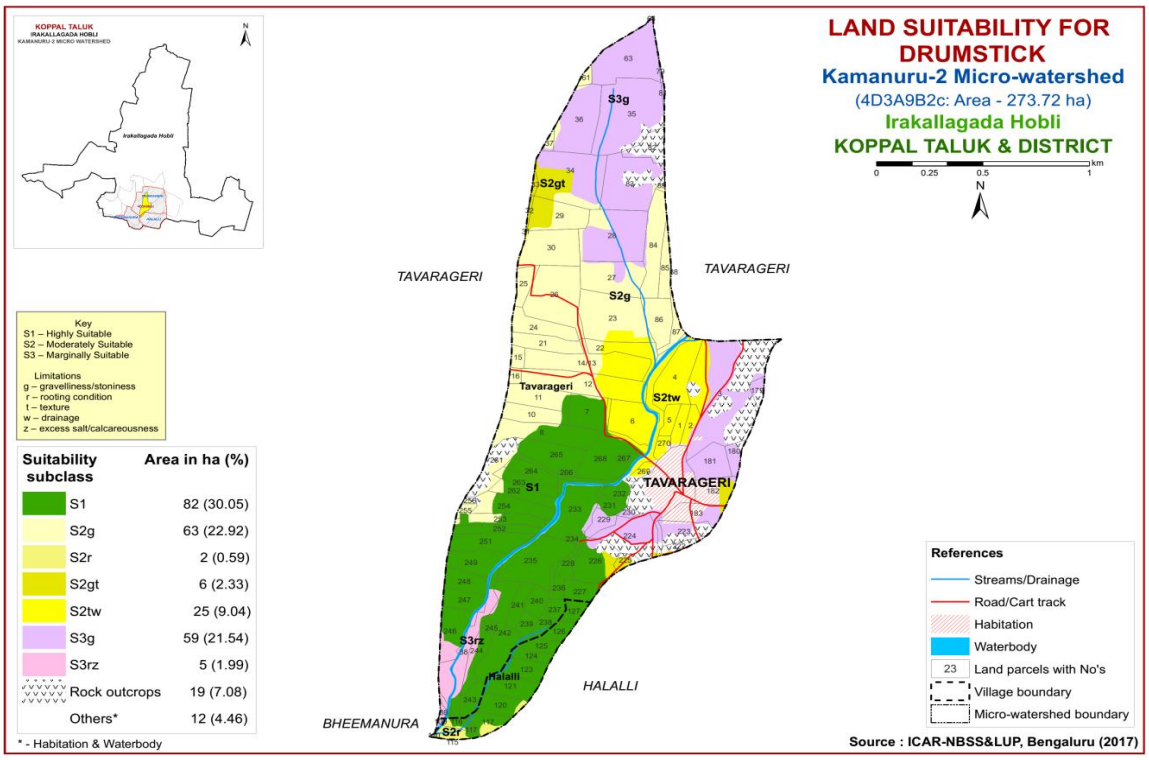


Fig. 7.11 Land Suitability map of Drumstick

7.12Land Suitability for Mulberry (*Morus nigra*)

Mulberry is the most important leaf crop grownfor rearing silkworms inabout 1.66 lakh ha in all the districts of the State. The crop requirements for growing mulberry (Table 7.13) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mulberry was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.12.

Highly suitable (Class S1) landscover an area of 82 ha (30%) for growing mulberry and are distributed in the central and southern part of the microwatershed. Moderately suitable (Class S2) lands occupy a maximum area of 155 ha (56%) and are distributed in the major part of the microwatershed. They have minor limitations of

gravelliness, rooting condition, drainage and texture. Marginally suitable (Class S3) lands cover a minor area of 5ha (2%) and occur in the southwesternpart of the microwatershed. They have moderate limitations of rooting condition and calcareousness.

Table 7.13 Land suitability criteria for Mulberry

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

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

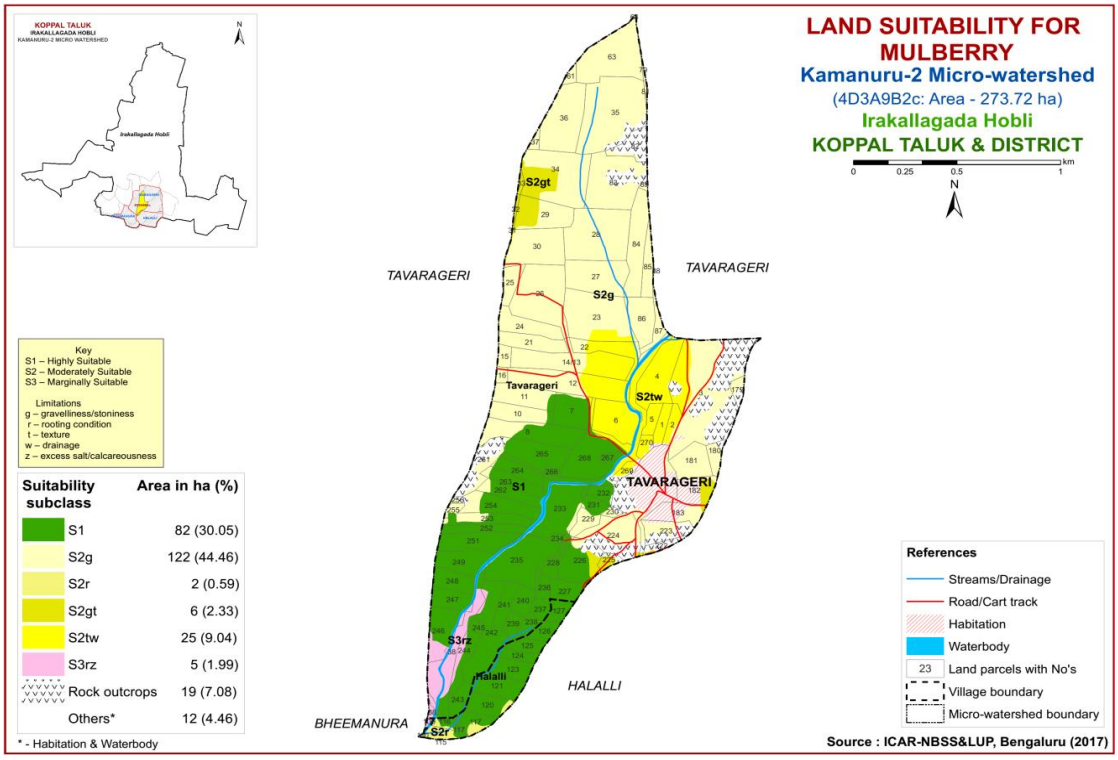


Fig. 7.12 Land Suitability map of Mulberry

7.13 Land Suitability for Mango (*Mangifera indica*)

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

Table 7.14 Crop suitability criteria for Mango

Crop requirement			Rating			
Soil-site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temp. in growing season	^{0}C	28-32	24-27 33-35	36-40	20-24
	Min. temp. before flowering	^{0}C	10-15	15-22	>22	
Soil moisture	Growing period	Days	>180	150-180	120-150	<120
Soil aeration	Soil drainage	Class	Well drained	Mod. To imp.drained	Poor drained	Very poorly drained
	Water table	M	>3	2.50-3.0	2.5-1.5	<1.5
Nutrient availability	Texture	Class	sc, l, sil, cl	sl, sc, sic, l, c	c (<60%)	c (>60%),
	pH	1:2.5	5.5-7.5	7.6-8.55.0-5.4	8.6-9.04.0-4.9	>9.0<4.0
	OC	%	High	medium	low	
	$CaCO_3$ in root zone	%	Non calcareous	<5	5-10	>10
Rooting conditions	Soil depth	cm	>200	125-200	75-125	<75
	Gravel content	%vol	Non-gravelly	<15	15-35	>35
Soil toxicity	Salinity	dS/m	Non saline	<2.0	2.0-3.0	>3.0
	Sodicity	%	Non sodic	<10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

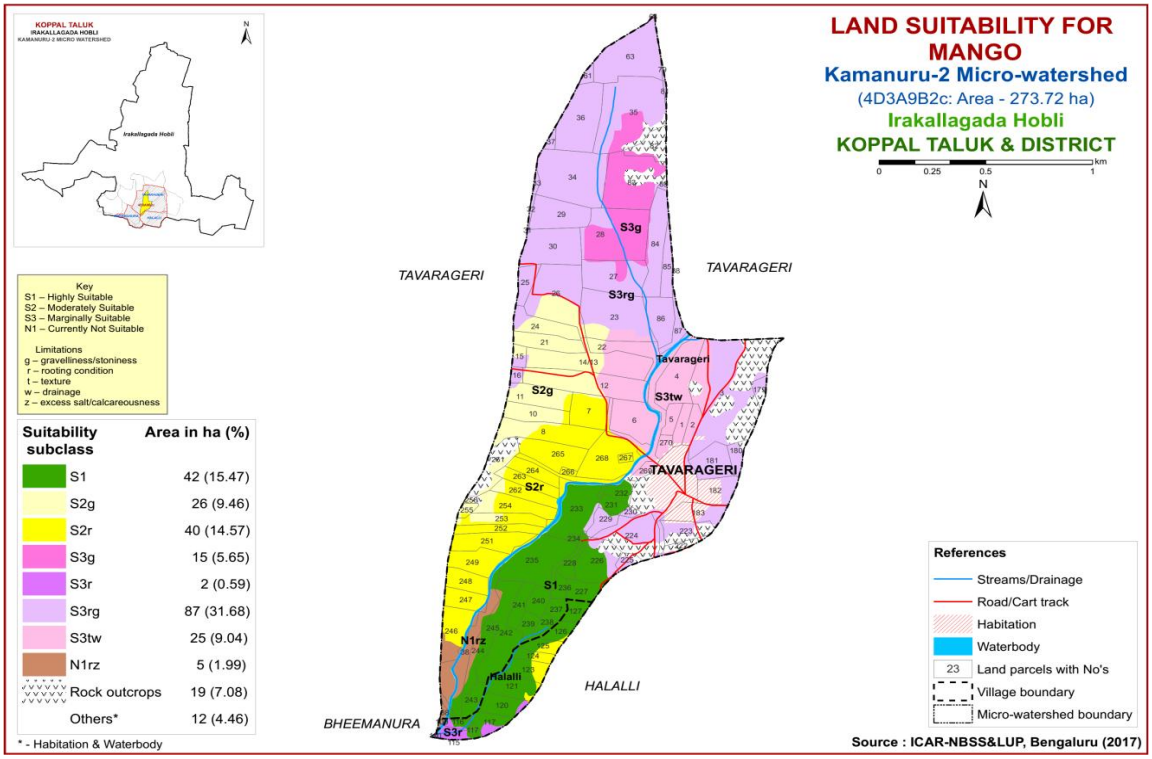


Fig. 7.13 Land Suitability map of Mango

Highly suitable (Class S1) lands cover an area of 42 ha (15%) and are distributed in the southern part of the microwatershed. An area of 66 ha (24%) is moderately suitable (Class S2) and are distributed in the western, southwestern and southeastern part of the

microwatershed. They have minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of 129 ha (47%) and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, texture, drainage and gravelliness. An area of 5 ha (2%) is not suitable (Class N1) for growing mango and occur in the southwestern part of the microwatershed with severe limitations of calcareousness and rooting condition.

7.14 Land Suitability for Sapota (*Manilkara zapota*)

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

Highly suitable (Class S1) landsoccupy an area of 82 ha (30%) for growing sapota and are distributed in the central and southern part of the microwatershed. An area of 71 ha (26%) is moderately suitable (Class S2) and are distributed in the northern, western and eastern part of the microwatershed with minor limitations of gravelliness and rooting condition. Marginally suitable (Class S3) lands cover an area of 89 ha (32%) and occur in the northern, central, eastern and southwestern part of the microwatershed. They have moderate limitations of gravelliness, texture, rooting condition, drainage and calcareousness.

Table 7.15 Crop suitability criteria for Sapota

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

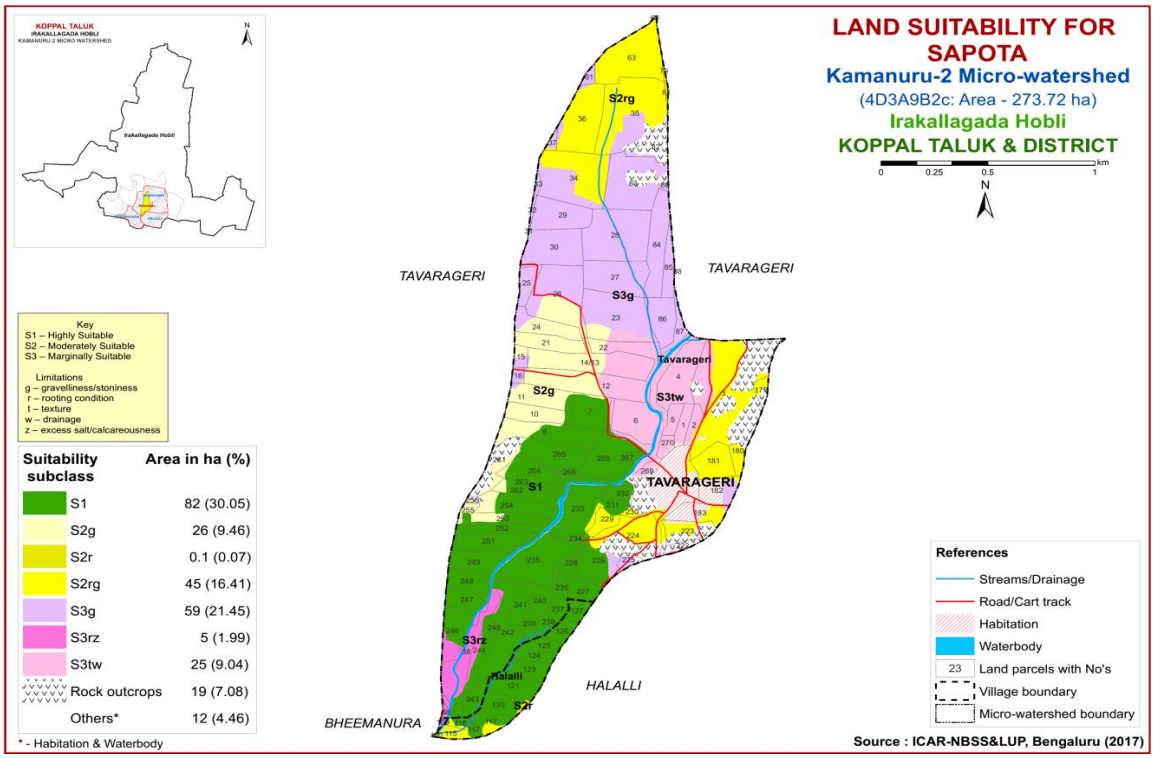


Fig. 7.14 Land Suitability map of Sapota

7.15 Land Suitability for Pomegranate (*Punica granatum*)

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

Table 7.16 Crop suitability criteria for Pomegranate

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

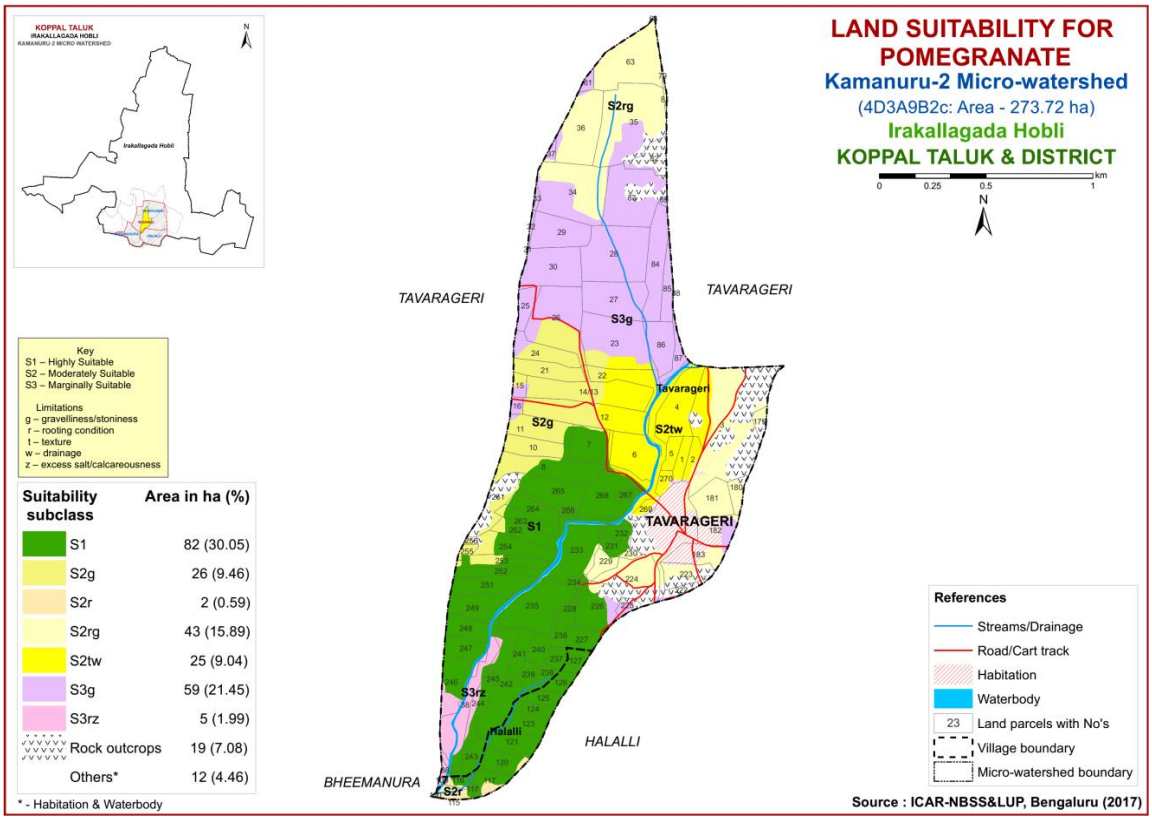


Fig. 7.15 Land Suitability map of Pomegranate

Highly suitable (Class S1) lands occupy an area of 82 ha (30%) for growing pomegranate and are distributed in the central and southern part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of 96 ha (35%) and are distributed in the northern, central, eastern and southern part of the microwatershed. They have minor limitations of rooting condition, texture, gravelliness and drainage. An area of 64 ha (23%) is marginally suitable (Class S3) for growing pomegranate and are distributed in the northern, western, eastern and southwestern part of the microwatershed. They have moderate limitations of rooting condition, calcareousness and gravelliness.

7.16 Land suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in an area of about 0.64 lakh ha in almost all the districts of the State. The crop requirements (Table 7.17) for growing guava were matched with the soil-site characteristics (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 80 ha (29%) is highly suitable (Class S1) for growing guava and are distributed in the central and southern part of the microwatershed. An area of 72 ha (27%) is moderately suitable (Class S2) and are distributed in the northern, western, eastern and southeastern part of the microwatershed. They have minor limitations of rooting condition, gravelliness and texture. Marginally suitable (Class S3) lands cover an area of 89 ha (32%) and are distributed in the northern, central, eastern and southwestern part of

the microwatershed. They have moderate limitations of gravelliness, texture, drainage and calcareousness.

Table 7.17 Crop suitability criteria for Guava

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

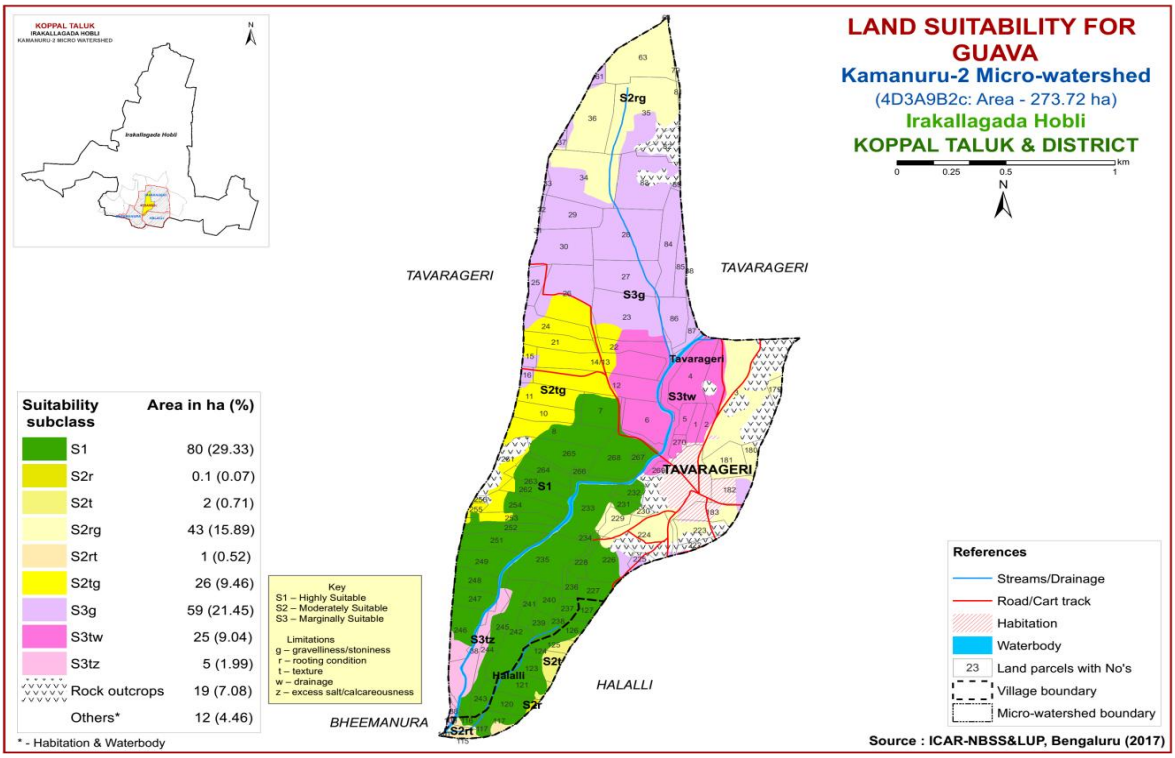


Fig. 7.16 Land Suitability map of Guava

7.17Land 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 for growing jackfruit (Table 7.18) were

matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jackfruit was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in figure 7.17.

Table 7.18 Crop suitability criteria for Jackfruit

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

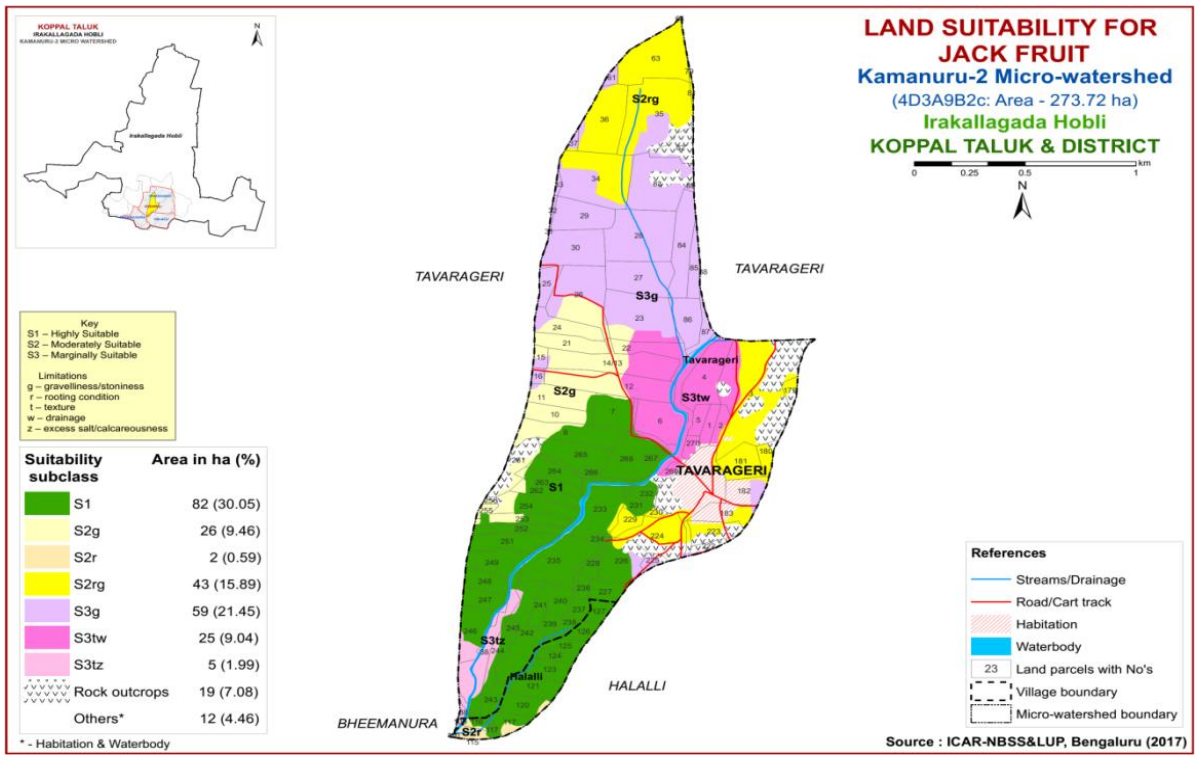


Fig. 7.17 Land Suitability map of Jackfruit

An area of 82 ha (30%) is highly suitable (Class S1) for growing jackfruit and are distributed in the central and southern part of the microwatershed. An area of 71 ha (26%) is moderately suitable (Class S2) and are distributed in the northern, western, eastern and southeastern part of the microwatershed with minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of 89 ha (32%) and are distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, texture, drainage and calcareousness.

7.18Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun (Table 7.19) 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 7.18.

An area of 42 ha (15%) is highly suitable (Class S1) for growing jamun and are distributed in the southern part of the microwatershed. An area of 135 ha (49%) is moderately suitable (Class S2) and occur in themajor part of the microwatershed. They have minor limitations of rooting condition, texture, gravelliness, drainage and calcareousness. Marginally suitable (Class S3) lands cover an area of 64ha (23%) and are distributed in the northern, eastern and southwesternpart of the microwatershed with moderate limitations of rooting condition, textureandgravelliness.

Table 7.19 Crop suitability criteria for Jamun

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

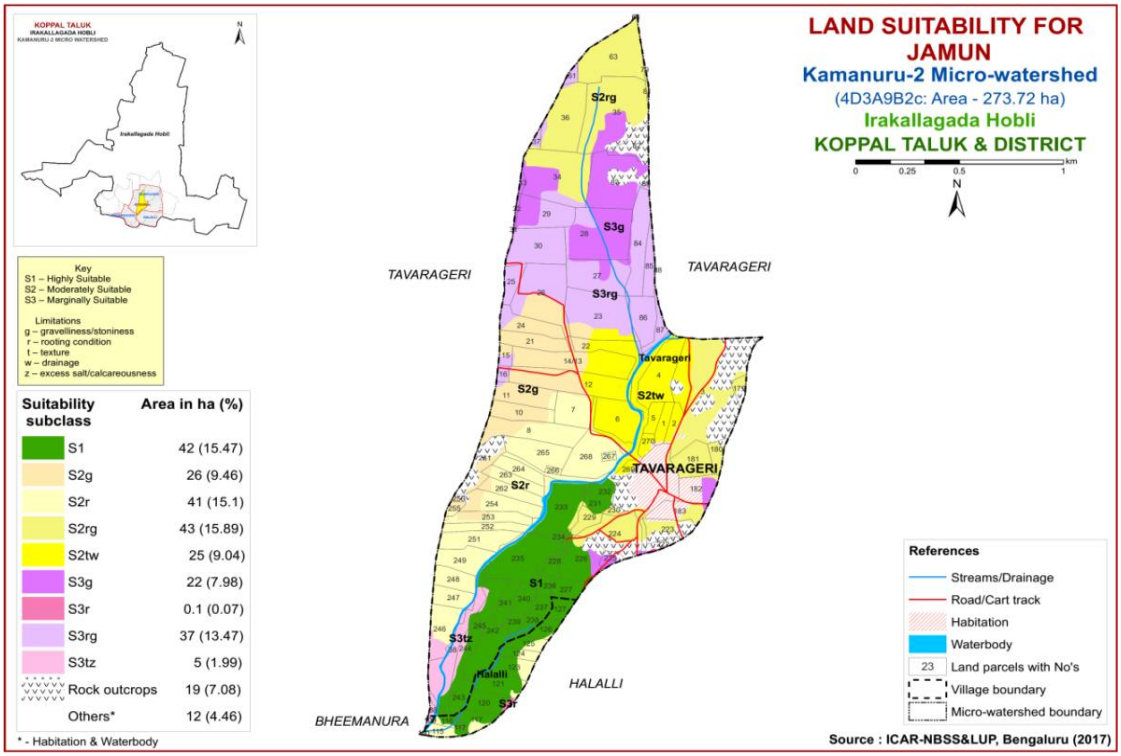


Fig. 7.18Land Suitability map of Jamun

7.19Land Suitability for Musambi (*Citrus limetta*)

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

Highly suitable (Class S1) lands occupy an area of 82 ha (30%) for growing musambi and are distributed in the central and southern part of the microwatershed. An area of 96ha (35%) is moderately suitable (Class S2) and are distributed in the northern, central, eastern and westernpart of the microwatershed. They have minor limitations of rooting condition, drainageand gravelliness.Marginally suitable (Class S3) lands occur in an area of 64 ha (23%) for growing musambi and are distributed in the northern, eastern and southwestern part of the microwatershed with moderate limitations of rooting condition, calcareousness and gravelliness.

Table 7.20 Crop suitability criteria for Musambi

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

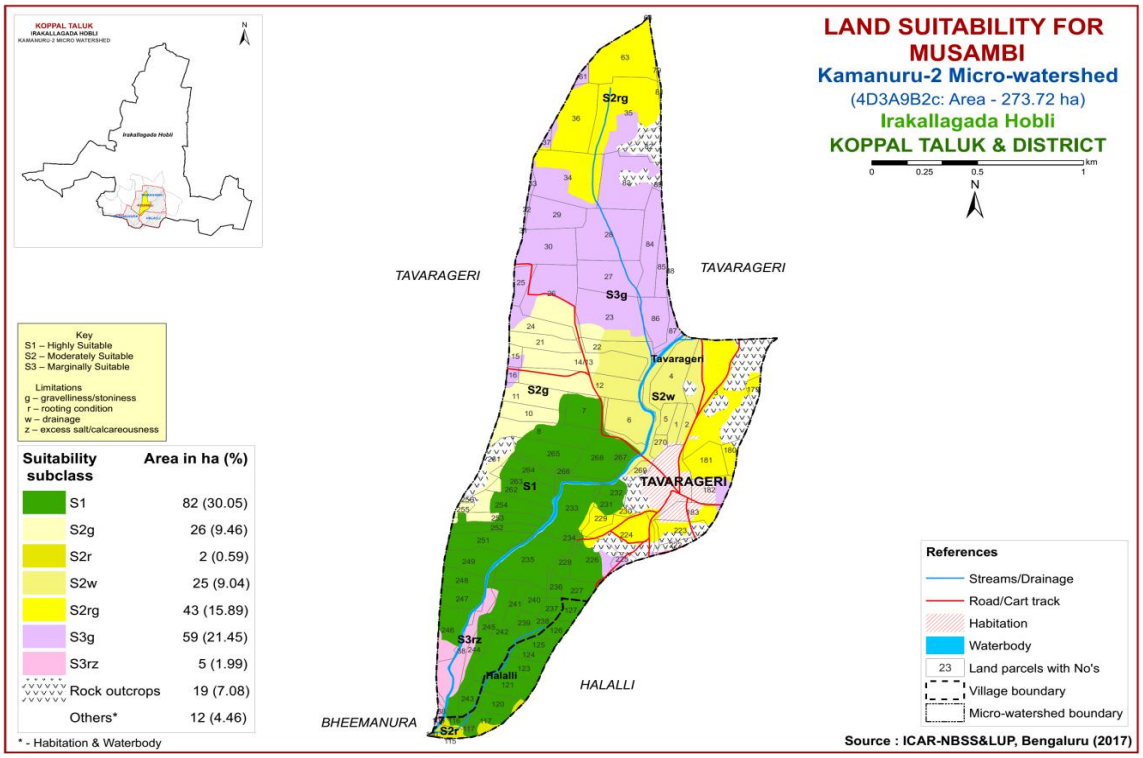


Fig. 7.19Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 0.11 lakh ha in almost all the districts of the State. The crop requirements for growing lime(Table 7.21) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated.The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.20.

Table 7.21Crop suitability criteria for Lime

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

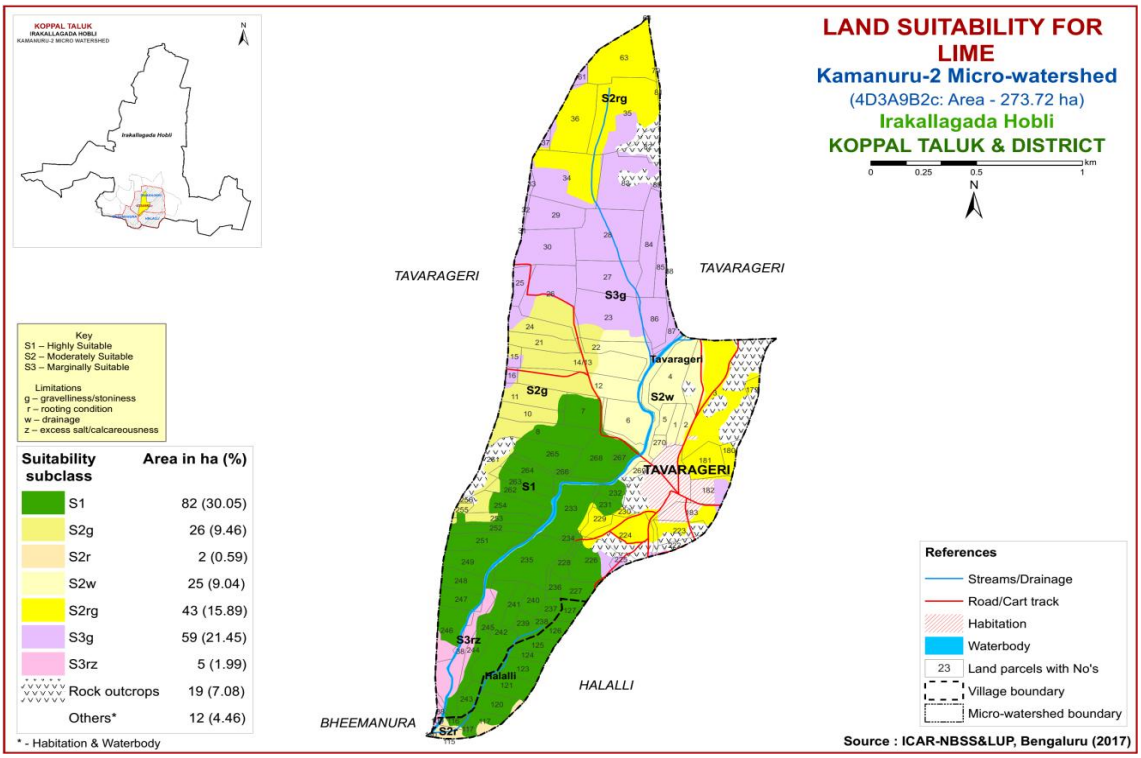


Fig. 7.20 Land Suitability map of Lime

Highly suitable (Class S1) lands occupy an area of 82 ha (30%) for growing lime and are distributed in the central and southern part of the microwatershed. An area of 96 ha (35%) is moderately suitable (Class S2) and are distributed in the northern, central, western and eastern part of the microwatershed. They have minor limitations of rooting condition, drainage and gravelliness. Marginally suitable (Class S3) lands occur in an area of 64 ha (23%) for growing lime and distributed in the northern, eastern and southwestern part of the microwatershed with moderate limitations of rooting condition, calcareousness and gravelliness.

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important nut crop grown in an area of 1.24 lakh ha in almost all the districts of the State. The crop requirements for growing cashew (Table 7.22) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.21.

An area of 80 ha (29%) is highly suitable (Class S1) for growing cashew and are distributed in the central and southern part of the microwatershed. An area of 88 ha (32%) is moderately suitable (Class S2) and occur in the northern, western, eastern and southeastern part of the microwatershed. They have minor limitations of rooting condition, gravelliness and texture. Marginally suitable (Class S3) lands occur in an area of 43 ha (16%) for growing cashew and are distributed in the northern and eastern part of the microwatershed with moderate limitation ofgravelliness. An area of about 30 ha (11%) is not suitable (Class N1) for growing cashew with severe limitations of texture,

calcareousness and drainage. They are distributed in the northeastern and southwestern part of the microwatershed.

Table 7.22 Crop suitability criteria for Cashew

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

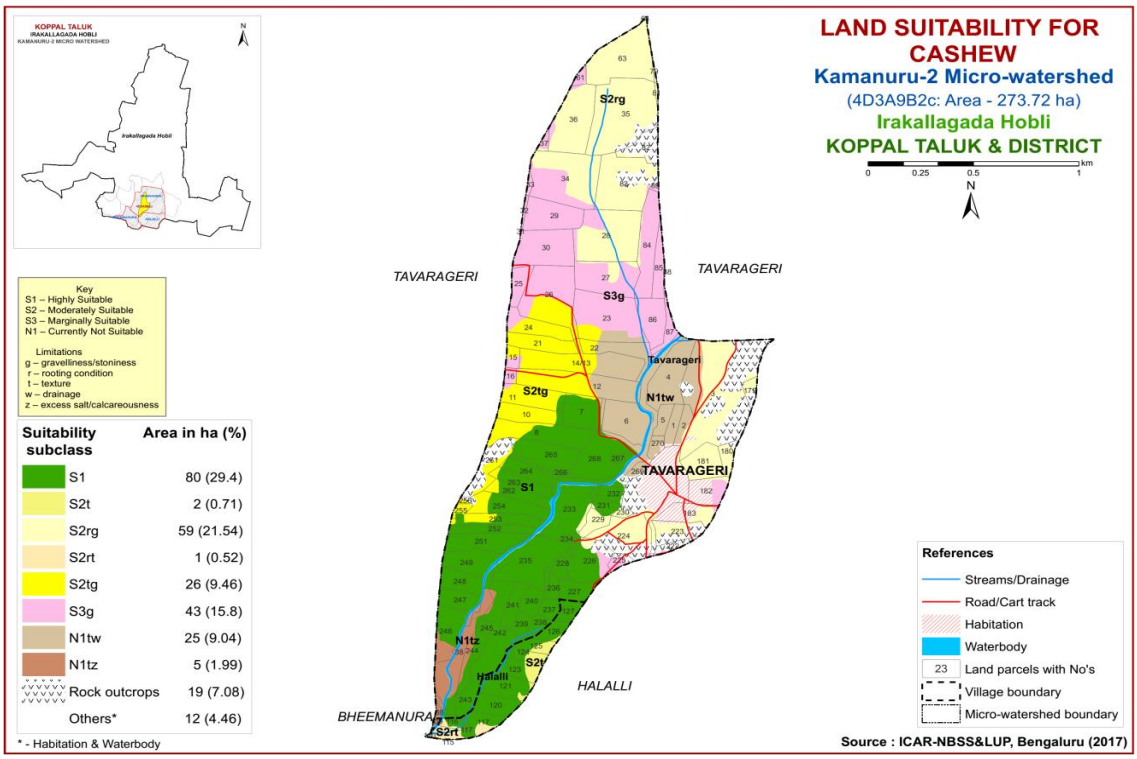


Fig. 7.21 Land Suitability map of Cashew

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

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

An area of 84 ha (31%) is highly suitable (Class S1) lands for growing custard apple and are distributed in the central and southern part of the microwatershed. Major area of 158 ha (58%) is moderately suitable (Class S2) and are distributed in the

majorpartof the microwatershed. They have minor limitations of gravelliness, rooting condition, drainage and calcareousness.

Table 7.23Land suitability criteria for Custard apple

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

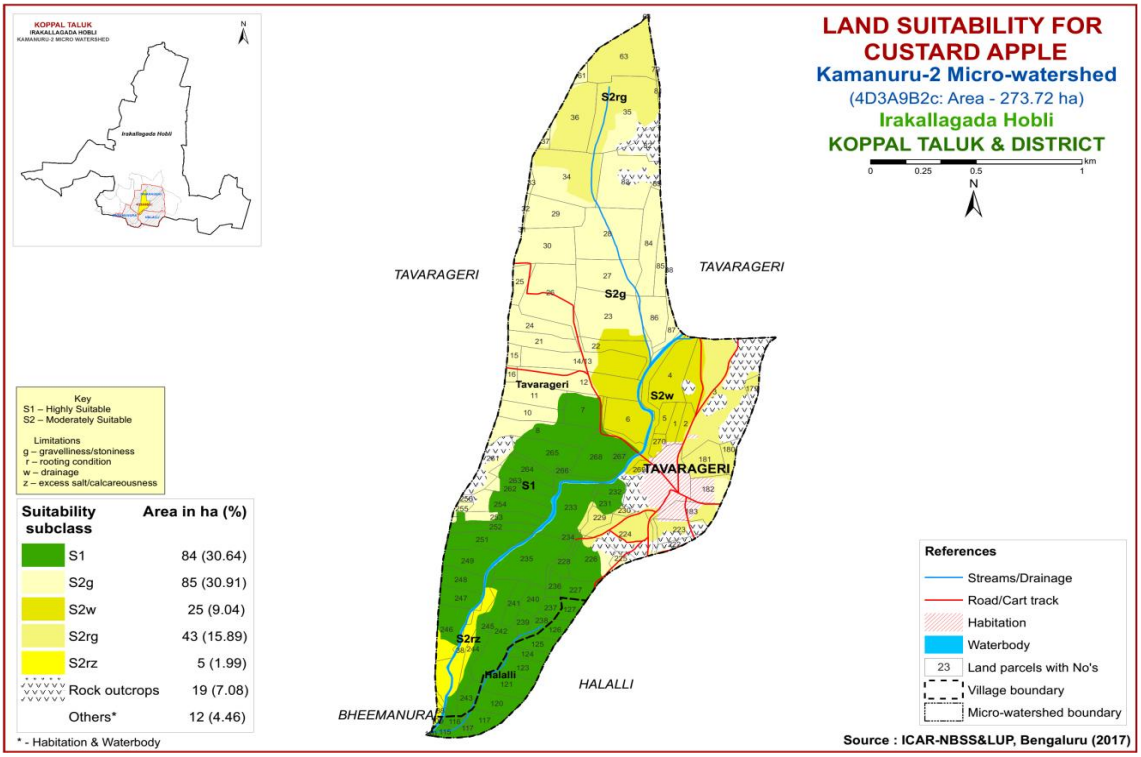


Fig. 7.22 Land Suitability map of Custard Apple

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the most important fruit and medicinal crop grown in 151 ha area and distributed in almost all the districts of the State. The crop requirements for growing amla (Table 7.24) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing amla was generated.The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.23.

Highly suitable (Class S1) lands occupy an area of 84 ha (31%) for growing amla and are distributed in the central and southernpart of the microwatershed. Major area of 158ha (58%) has soils that are moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of rooting condition, gravelliness, textureand calcareousness. There are no marginally suitable lands (Class S3) in the microwatershed.

Table 7.24 Crop suitability criteria for Amla

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

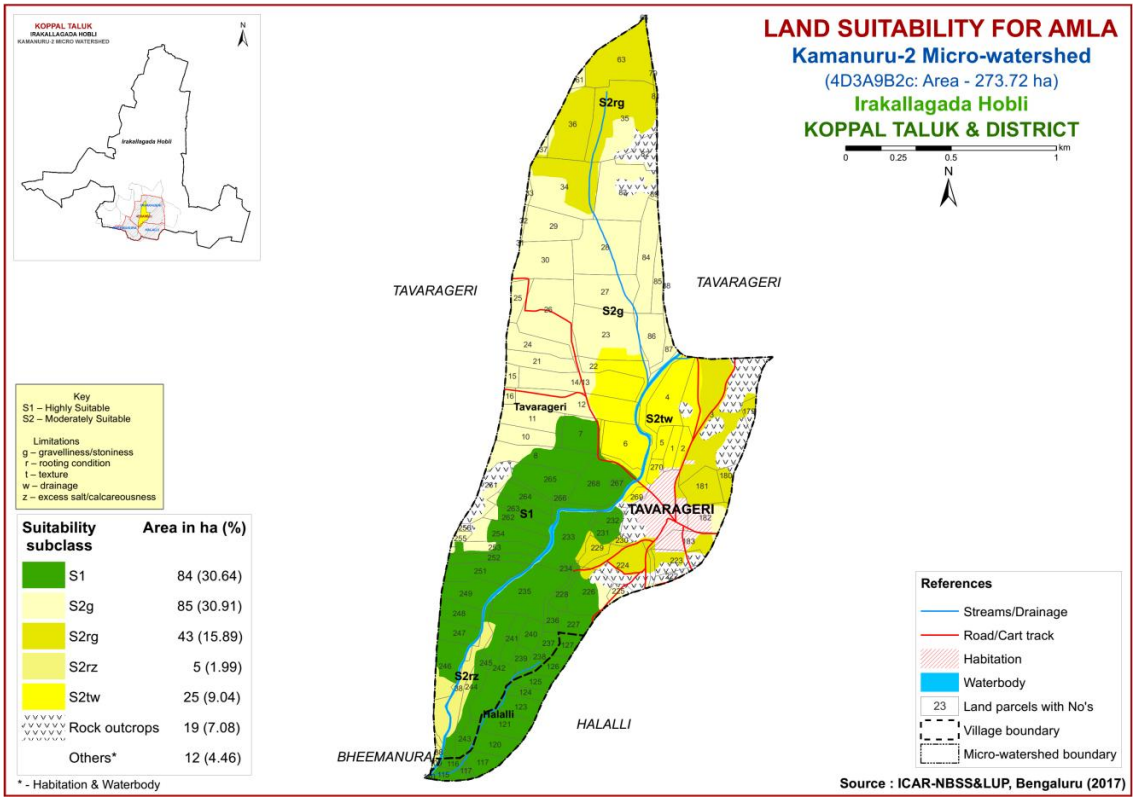


Fig. 7.23Land Suitability map of Amla

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the most important spice crop grown in 14897 ha in all the districts of the State. The crop requirements for growing tamarind (Table 7.25) were

matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tamarind was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.24.

Table 7.25Crop suitability criteria for Tamarind

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

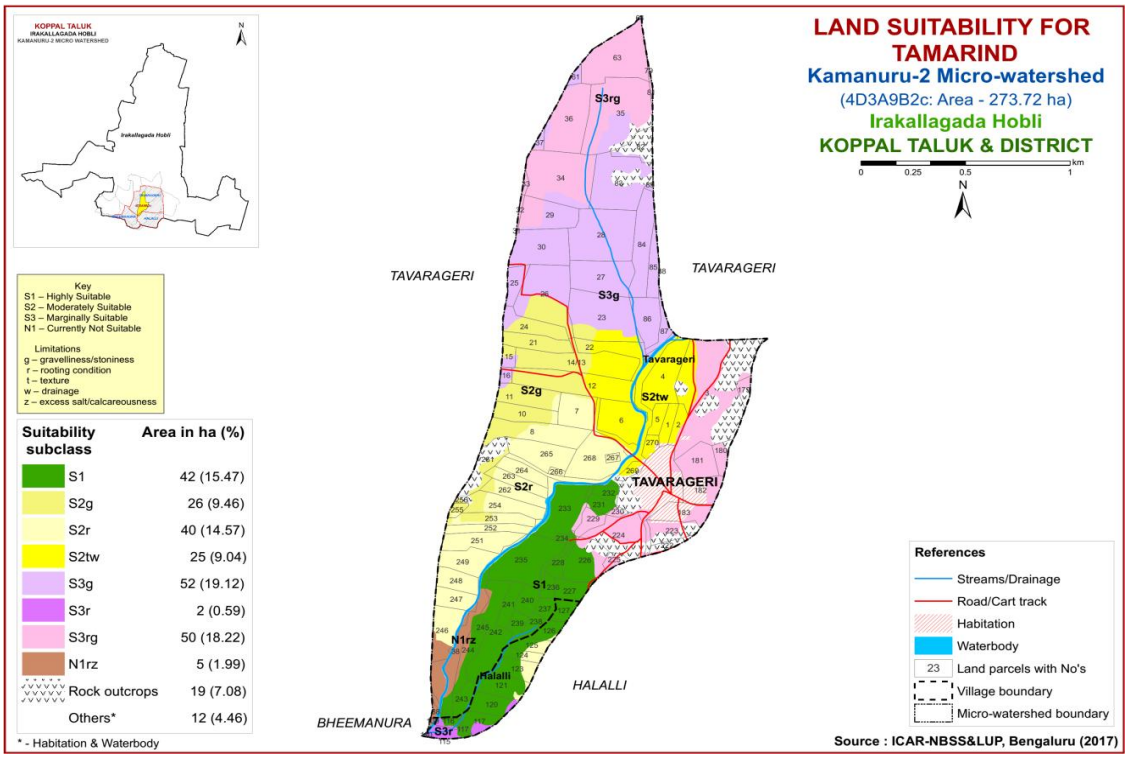


Fig. 7.24Land Suitability map of Tamarind

Highly suitable lands (Class S1) occupy an area of 42 ha (15%) for growing tamarind and are distributed in the southern part of the microwatershed. An area of 91 ha (33%) is moderately suitable (Class S2) and occur in central and western part of the microwatershed. They have minor limitations of rooting condition, texture, gravelliness and drainage. Major area of 104 ha (38%) is marginally suitable (Class S3) and occur in the northern, eastern and southern part of the microwatershed. They have moderate

limitations of rooting condition and gravelliness. An area of 5 ha (2%) is not suitable (Class N1) for growing tamarind and are distributed in the southwestern part of the microwatershed with severe limitations of calcareousness and rooting condition.

7.25 Land Suitability for Marigold (*Tagetes erecta*)

Marigold is one of the most important flower crop grown in an area of 1858 ha in almost all the districts of the State. The crop requirements for growing marigold (Table 7.26) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

An area of 80 ha (29%) is highly suitable (Class S1) for growing marigold and are distributed in the central and southern part of the microwatershed. An area of 59 ha (22%) is moderately suitable (Class S2) and are distributed in the central, southern and westernpart of the microwatershed. They have minor limitations of texture, gravelliness, drainage, rooting conditionand calcareousness. Major area of 102 ha (37%) is marginally suitable (Class S3) for growing marigold and occur in the northern and easternpart of the microwatershed. They have moderate limitations of gravelliness and texture.

Table 7.26 Crop suitability criteria for Marigold

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

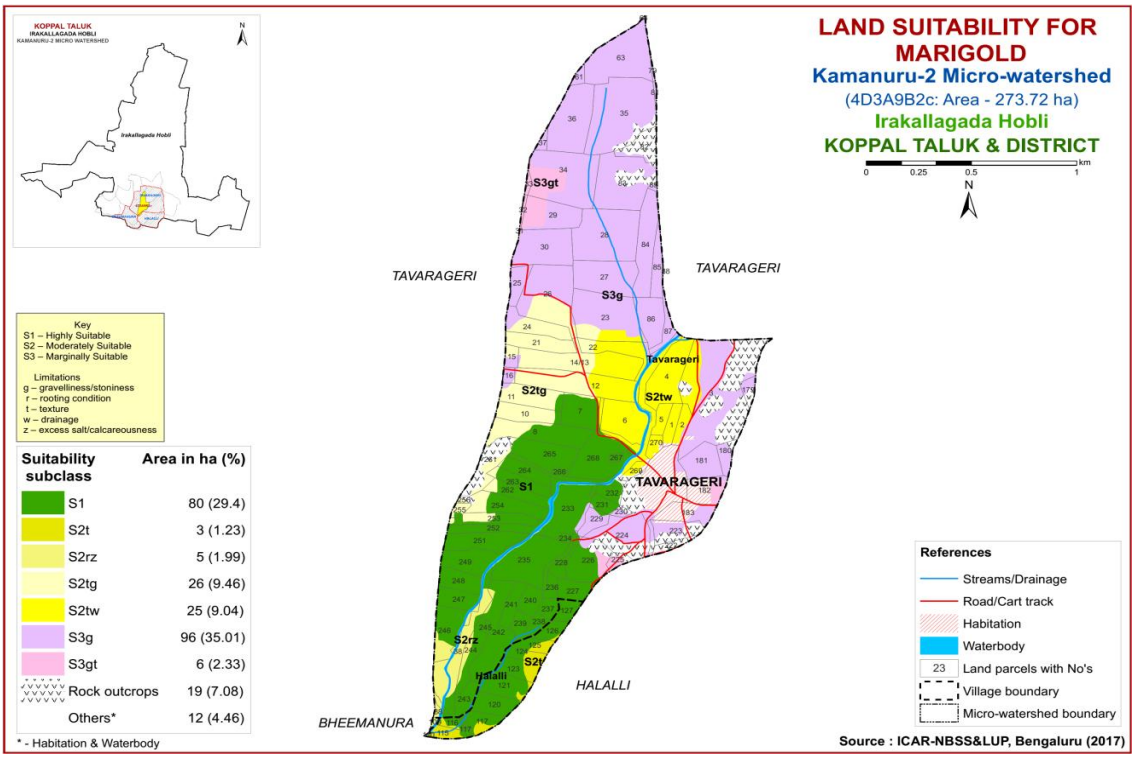


Fig. 7.25 Land Suitability map of Marigold

7.26Land 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 for growing chrysanthemum (Table 7.27) 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 microwatershedis given in Figure 7.26.

Table 7.27 Crop suitability criteria for Chrysanthemum

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

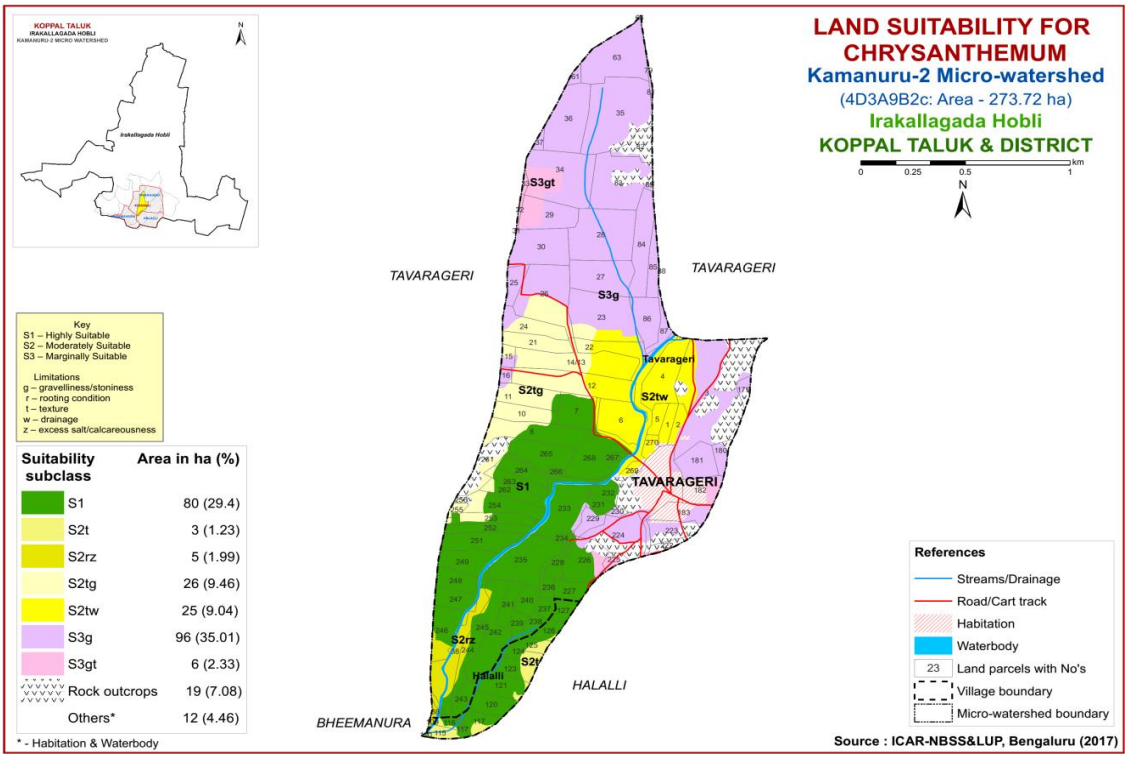


Fig. 7.26 Land Suitability map of Chrysanthemum

Highly suitable lands (Class S1) occupy an area of 80 ha (29%) for growing chrysanthemum and are distributed in the central and southern part of the microwatershed. An area of 59 ha (22%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in the central, western and southern part of the microwatershed. They have minor limitations of calcareousness, gravelliness, rooting condition, drainage and texture. Major area of 102 ha (37%) is marginally suitable (Class S3) for growing chrysanthemum and occur in the northern and eastern part of the microwatershed. They have moderate limitations of gravelliness and texture.

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

Jasmine is one of the most important flower crop grown in an area of 6146 ha in almost all the districts of the State. The crop requirements (Table 7.28) for growing jasmine were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jasmine was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.27.

Highly suitable lands (Class S1) occupy an area of 80 ha (29%) for growing jasmine and are distributed in the central and southernpart of the microwatershed. An area of 34 ha (13%) is moderately suitable (Class S2) and occur in the western and southernpart of the microwatershed. They have minor limitations of rooting condition, calcareousness, texture and gravelliness. Major area of 127ha (46%) is marginally suitable (Class S3) for growing jasmine and are distributed in the northern and easternpart

of the microwatershed. They have moderate limitations of gravelliness, drainage and texture.

Table 7.28 Crop suitability criteria for jasmine (irrigated)

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

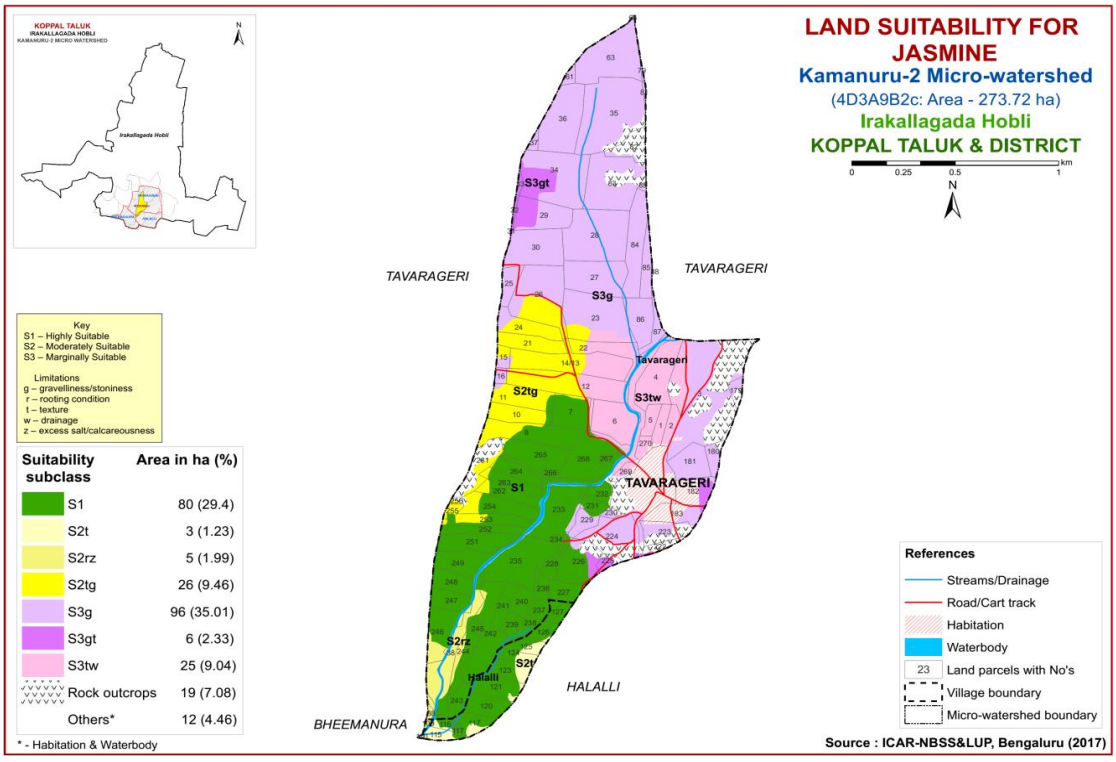


Fig. 7.27 Land Suitability map of Jasmine

7. 28 Land Suitability for Crossandra *(Crossandra in fundibuliformis)*

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

Highly suitable lands (Class S1) occupy an area of 80 ha (29%) for growing crossandra and are distributed in the central and western part of the microwatershed. An area of 29 ha (11%) is moderately suitable (Class S2) for growing jasmine and occur in the major part of the microwatershed. They have minor limitations of texture, rooting condition, calcareousness and gravelliness. An area of 132 ha (48%) is marginally suitable (Class S3) for growing jasmine and are distributed in the northern, eastern and southwestern part of the microwatershed. They have moderate limitations of gravelliness, rooting condition, calcareousness, drainage and texture.

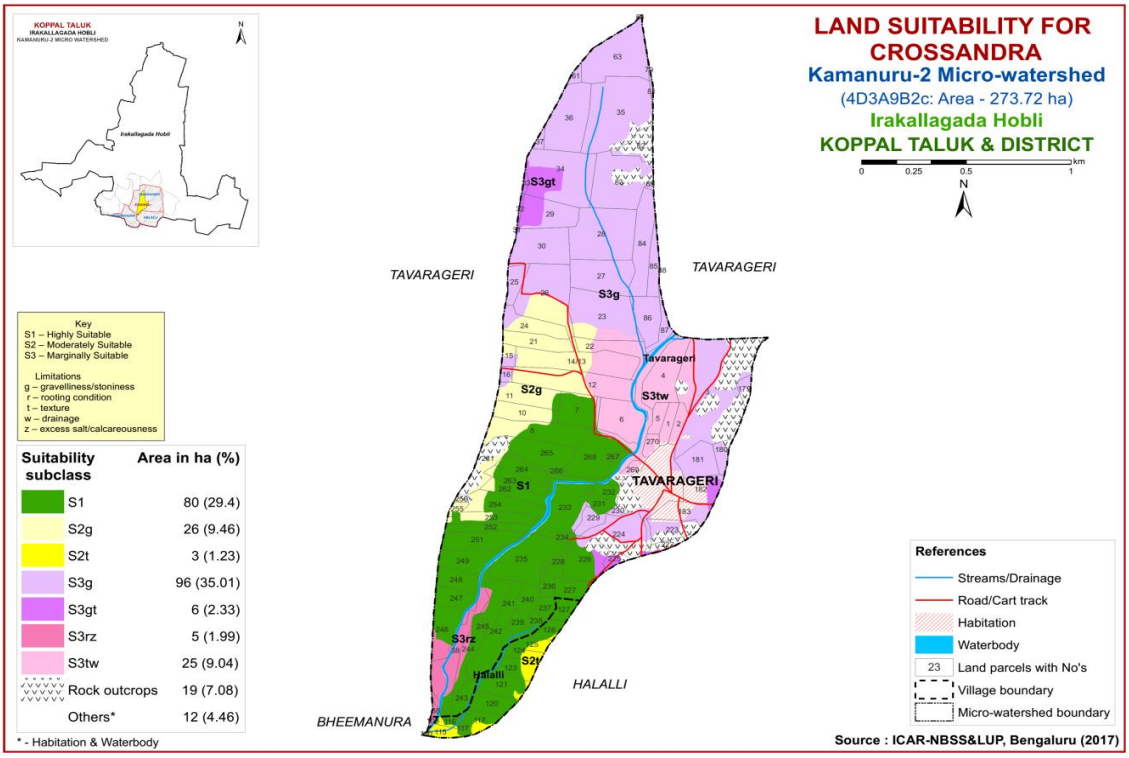


Fig. 7.28 Land Suitability map of Crossandra

7.29 Land Management Units (LMU)

The 20 soil map units identified in Kamanuru-2 microwatershed have been grouped into 4 Land Management Units (LMU) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig.7.29) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

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

LMU No.	Soil map unit number	Mapping unit	Soil and site characteristics
1	446	TSDmA1	Very deep, sandy clay to clay lowland soils
2	290, 291, 296, 249, 250, 251,184, 187, 216, 217, 104, 105, 123	NDLcB1, NDLcB2g1, NDLhB2g1, NGPbB1, NGPbB2g1, NGPcB2g1, BDGhA1, BDGhB2, BPRbB2, BPRbB2g1, HDHbB2, HDHbB2g1, HDHhB2g1	Moderately deep to very deep, red gravelly sandy clay to sandy clay loam soils
3	458, 288, 242, 159, 178	JDGiB1, RTRiB2, VDHcA2, BSRcB1, CKMiB1	Moderately deep to deep, red sandy clay to clay soils
4	328	RNKhB2	Moderately shallow, black calcareous sandy clay to clay soils

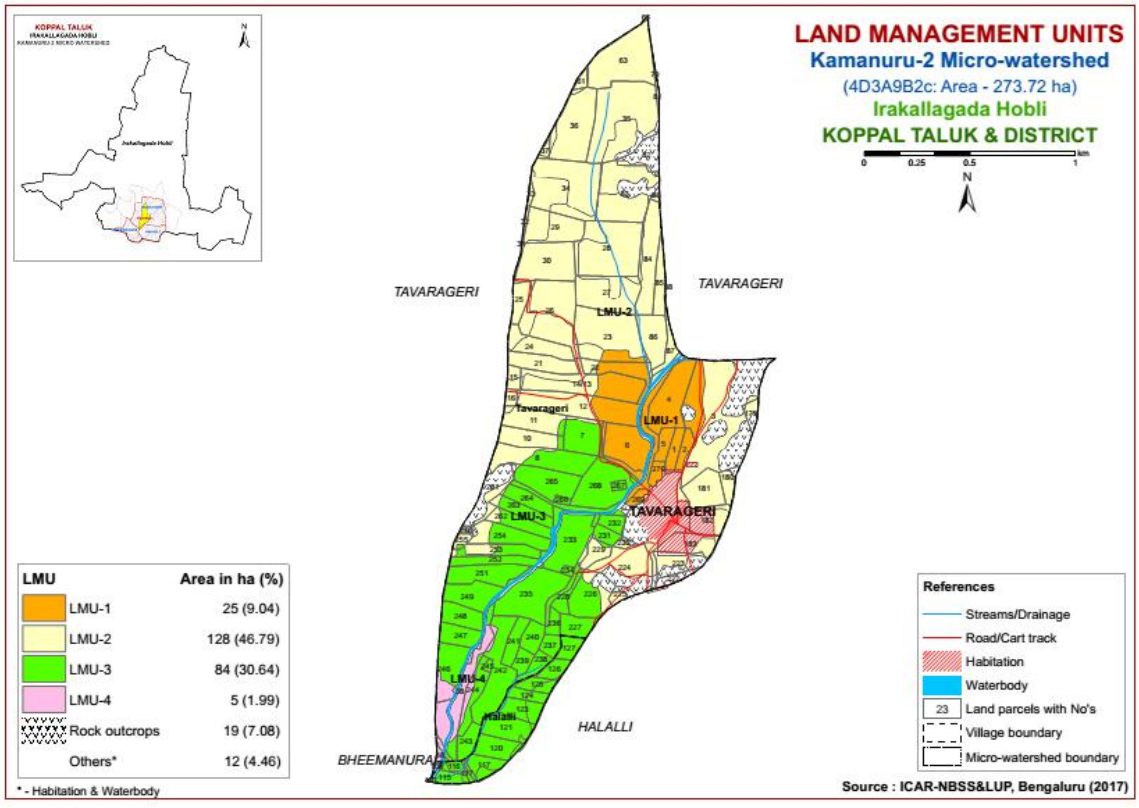


Fig 7.29 Land Management Units map of Kamanuru-2 microwatershed

7.29 Proposed Crop Plan for Kamanuru-2 Microwatershed

After assessing the land suitability for the 28 crops, the proposed crop plan has been prepared for the 4 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 28 crops. The resultant proposed crop plan is presented in Table 7.29.

Table 7.29Proposed Crop Plan for Kamanuru-2 Microwatershed

Proposed LUC	Soil Map Units	Survey Number	Soil characters	Field Crops	Horticulture Crops	Suitable Interventions
LMU 1 25 ha (9%)	446.TSDmA	**Tavarageri:**1,2,4,5,6,14/13,22, 269, 270	Very deep, sandy clay to clay lowland soils	Paddy, Sunflower, Maize	**Fruit crops:** Custard Apple, Amla **Vegetable crops:** Brinjal, Tomato, Carrot, Beetroot **Flower crops:** Marigold, Chrysanthemum, Jasmine	Providing proper drainage, addition of organic manures, green leaf manuring
LMU 2 128 ha (47%)	290.NDLcB1 291.NDLcB2g1 296.NDLhB2g1 249.NGPbB1 250.NGPbB2g1 251.NGPcB2g1 184.BDGhA1 187.BDGhB2 216.BPRbB2 217.BPRbB2g1 104.HDHbB2 105.HDHbB2g1 123.HDHhB2g1	**Tavarageri:**3,10,11,12,15,16,21,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,61,63,64,78,79,81,83,84,85,86,87,88,89,179,180,181,224,225,229,230,255	Moderately deep to very deep, red gravelly sandy clay to sandy clay loam soils	Groundnut, Redgram, Bajra, Horsegram, Castor	**Fruit crops:** Lime, Musambi**,** Jackfruit, Jamun, Amla, Cashew,Custard apple **Vegetable crops:** Drumstick	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
LMU 3 84 ha (31%)	458.JDGiB1 288.RTRiB2 242.VDHcA2 159.BSRcB1 178.CKMiB1	**Bheemanura:**110 **Halalli:**115,116,117,120,121,123,124,125,126,127 **Tavarageri:**7,8,226,227,228,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,251,252,253,254,262,263,264,265, 266,267,268	Moderately deep to deep, red sandy clay to clay soils	Maize, Sorghum, Bajra, Groundnut, Redgram, Castor	**Fruit crops:** Pomegranate, Guava, Sapota, Mango, Jackfruit, Jamun, Tamarind, Lime, Musambi, Amla,Custard apple **Vegetable crops:** Drumstick, Tomato, Chilli, Brinjal **Flower crops:** Marigold, Chrysanthemum, Jasmine	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
LMU 4 5 ha (2%)	328.RNKhB2	**Bheemanura :** 109 **Tavarageri :** 38	Moderately shallow, black calcareous sandy clay to clay soils	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

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 Kamanuru-2 Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of Hooradhahalli (HDH) occupies maximum area of 44 ha (16%), Ranatur (RTR) 42 ha (15%), Vaddarahalli (VDH) 38 ha (14%), Nagalapur (NGP) 37 ha (13%), Niduvalalu (NDL) 25 ha (9%), Thimmasandra (TSD) 25 ha (9%), Bidanagere (BDG) 15 ha (6%), Balapur (BPR) 6 ha (2%), Ravanaki (RNK) 5 ha (2%) and other series occupy minor in the microwatershed.

- As per land capability classification, entire area in the microwatershed falls under arable land category (ClassII&III). The major limitations identified in the arable lands were soil and erosion.
- On the basis of soil reaction, an area of about 57 ha (21%) is moderately to slightly acid (pH 5.5-6.5), 86 ha (32%) is neutral (pH 6.5-7.3), 97 ha (35%) is slightly to moderately alkaline (pH 7.3-8.4) and about 2ha (1%) is under strongly alkaline(pH 8.4-9.0%) in the microwatershed. Entire area in the microwatershed is acidic to alkaline in reaction.

Soil Health Management

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

Acid soils

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

Liming materials:

1. $CaCO_3$ (Calcium Carbonate). More than 90% use in India.
2. Dolomite [Ca Mg $(Co_3)_2$]
3. Quick lime (Cao)
4. Slaked lime [Ca $(OH)_2$]

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

Alkaline soils

(Slightly alkaline to 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).

Neutral 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, Azotobacter, Rhizobium).
3. Application of 100 per cent RDF.
4. Need based micronutrient applications.

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

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. Out of total 274 ha area in the microwatershed, an area of about 70 ha (26%) is suffering from slight and 172 ha (63%) is suffering from 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 (Saturation plan) 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 Kamanuru-2 Microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is low (<0.5%) in an area of 40 ha (14%), medium (0.5-0.75%) in 120 ha (44%) and high (>0.75%) in 83 ha (30%). 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 160 ha area where OC is low and medium.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:**An area of about 191 ha (70%) is medium (23-57 kg/ha)in available phosphorus. Hence for all the crops, 25% additional P-needs to be applied.It is high in 51 ha (19%) area of the microwatershed.
- **Available Potassium:**Available potassium is medium (145-337 kg/ha) in an area of 188 ha (69%) in the microwatershed. For all crops, additional 25 % potassium may be applied in areas where it is low and medium. It is high in 54ha (20%) area of the microwatershed.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. Available sulphur is low (<10 ppm) in 134 ha (49%), medium (10-20 ppm) in 108 ha (40%) in the microwatershed. These areas 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 Boron:**An area of about 104 ha (38%) is low (<0.5 ppm) in available boron. Maximum area of 127 ha (46%) is medium (0.5-1.0 ppm) in available boron content. It is high in 11 ha (4%) area of the microwatershed. The areas that are low and medium need to be applied with sodium borate @ 10kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency
- **Available Iron:** It is sufficient in (>4.5 ppm) 143 ha (52%) and deficient (<4.5 ppm) in 99 ha (36%) of the microwatershed. To manage iron deficiency, iron sulphate@25 kg/ha needs to be applied for 2-3 years.
- **Available Manganese:** Entire area in the microwatershed is sufficient (>1.0 ppm) in available manganese.

- **Available Copper:** Entire area is sufficient (>0.2 ppm) in available copper in the microwatershed.
- **Available Zinc:** It is deficient (<0.6 ppm) in 186 ha (68%) and sufficient (>0.6 ppm) in 56 ha (21%) area inthe microwatershed. Application of zinc sulphate@25kg/ha is to be followed in areas that are deficient in available zinc.
- **Soil Acidity:**The microwatershed has 40 ha (14%) area with soils that are slightly acid and17 ha (6%) is moderately acid. These areas need application of lime (Calcium Carbonate).
- **Soil Alkalinity:**The microwatershed has 99 ha (36%) soils that are slightlytostrongly 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.

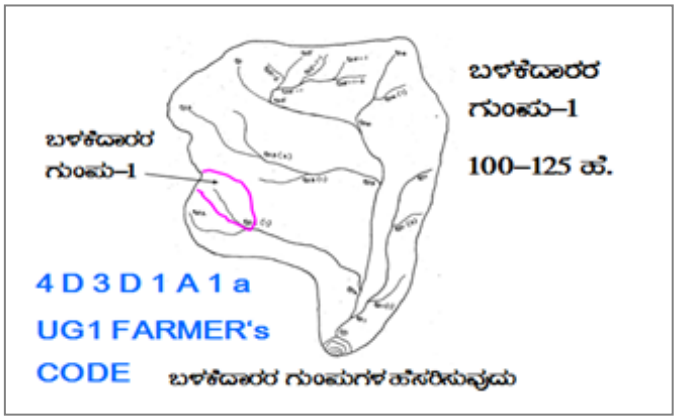
Land suitability for various crops: Areas that are highly, moderately and marginally suitable and not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, 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 Kamanuru-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.

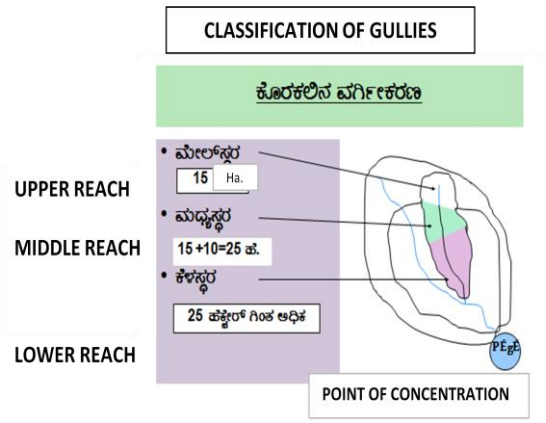
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

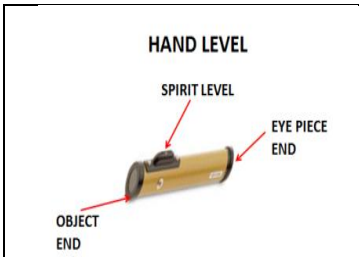
9.1.1 Arable Land Treatment

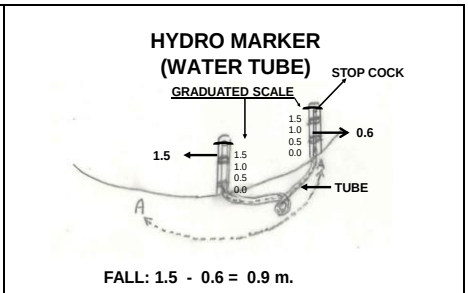
A. BUNDING

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.





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

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

Note: i) The above intervals are maximum.

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

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

Section of the Bund

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

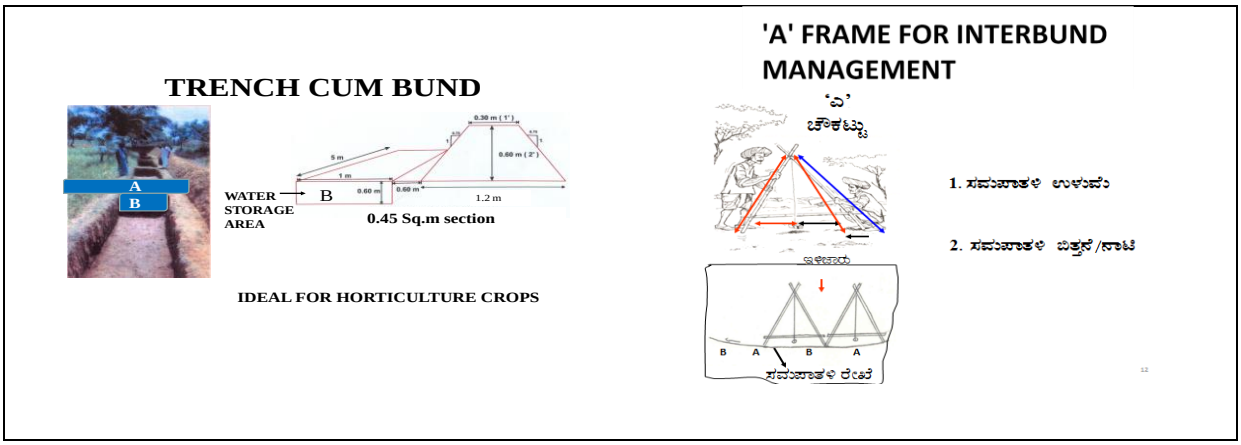
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below



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

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

B. Waterways

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

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

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

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

e) Detailed 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.

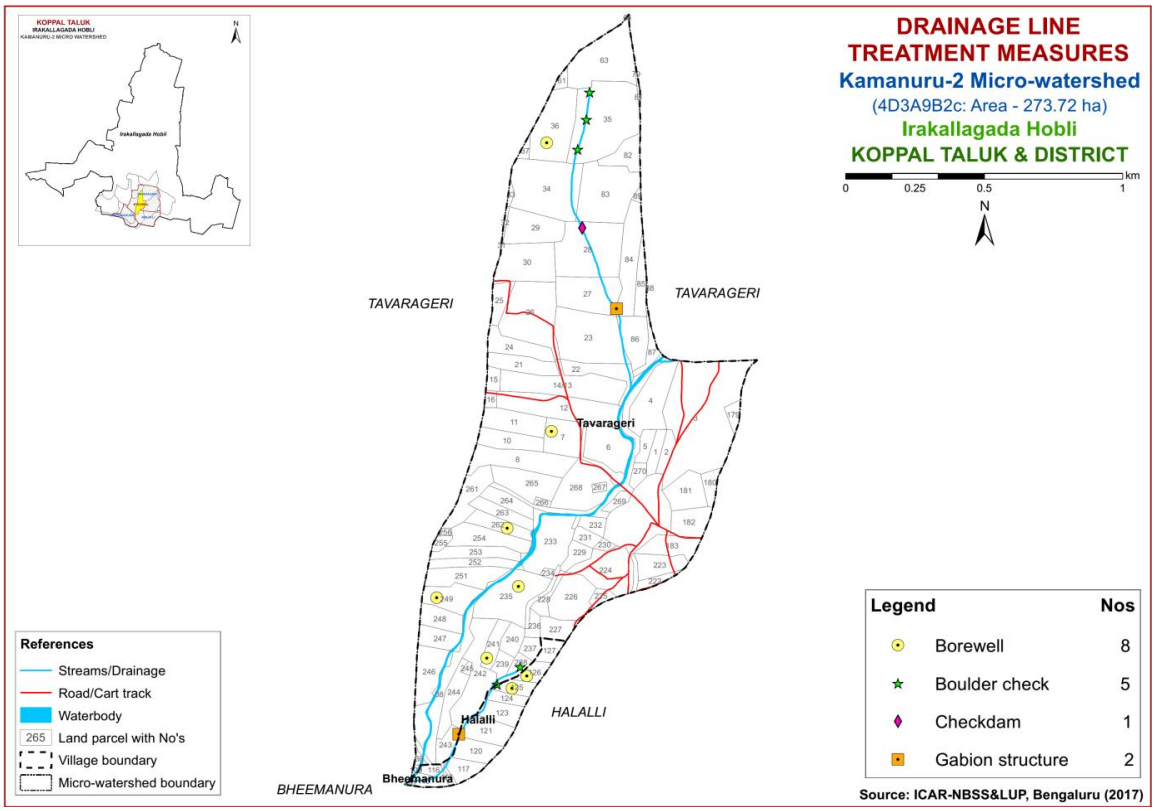


Fig. 9.1 Drainage Line Treatment map of Kamanuru-2 Microwatershed

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. A maximum area of about 217 ha (79%) requires Trench cum Bunding and about 25 ha (9%) requires strengthening of existing Bunds / Bunding in the microwatershed.The conservation plan prepared may be presented to all the stakeholders including farmers and after including their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

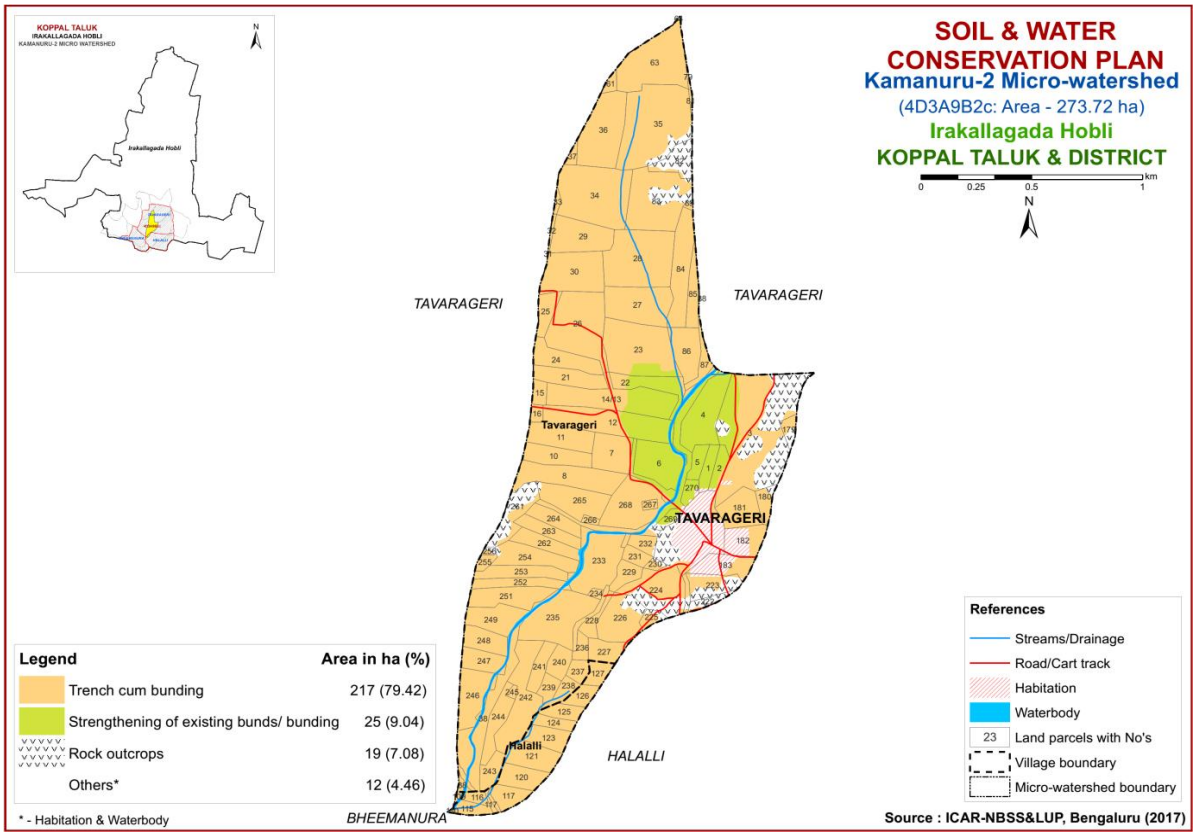


Fig. 9.2 Soil and Water Conservation Plan map of Kamanuru-2 Microwatershed

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

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

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

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Appendix I

Kamanuru-2 Microwatershed

Soil Phase Information

Village	Sy. NO.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Bheemanura	109	0.14	RNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Bheemanura	110	0.03	CKMiB1	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Bajra (Bj)	Not Available	IIs	Trench cum bunding
Halalli	115	0.9	CKMiB1	LMU-3	Moderately deep (75-100 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
Halalli	116	0.58	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Halalli	117	1.6	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Halalli	120	1.94	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Halalli	121	2.53	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Halalli	123	1.77	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bitter guard+ Maize+ Chilli (Bi+Mz+Ch)	Not Available	IIe	Trench cum bunding
Halalli	124	0.96	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Halalli	125	1.11	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Pearl millet (Mz+Pm)	1 Borewell	IIe	Trench cum bunding
Halalli	126	1.04	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIe	Trench cum bunding
Halalli	127	1.04	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Tavarageri	1	1.07	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Bajra (Bj)	Not Available	IIw	Field bunds/ bunding
Tavarageri	2	0.96	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Bajra (Bj)	Not Available	IIw	Field bunds/ bunding
Tavarageri	3	16.33	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra+Scrubland (Bj+Sl)	Not Available	IIes	Trench cum bunding
Tavarageri	4	4.57	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Bajra (Bj)	Not Available	IIw	Field bunds/ bunding
Tavarageri	5	0.95	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Bajra (Bj)	Not Available	IIw	Field bunds/ bunding
Tavarageri	6	3.98	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIw	Field bunds/ bunding
Tavarageri	7	2.9	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	1 Borewell	IIes	Trench cum bunding
Tavarageri	8	4.62	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	10	2.41	NDLhB2g1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	11	2.99	NDLhB2g1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding

Village	Sy. NO.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Tavarageri	12	6.21	NDLhB2g1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	14/13	6.18	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIw	Field bunds/ bunding
Tavarageri	15	0.69	NGPcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Trench cum bunding
Tavarageri	16	0.44	NGPcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Trench cum bunding
Tavarageri	21	2.4	NDLcB1	LMU-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Tavarageri	22	2.44	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIw	Field bunds/ bunding
Tavarageri	23	7.32	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	24	2.55	NDLcB1	LMU-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Trench cum bunding
Tavarageri	25	1.37	NGPcB2g1	LMU-2	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	26	7	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra+Maize (Bj+Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	27	4.86	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra (Bj)	Not Available	IIIs	Trench cum bunding
Tavarageri	28	7.68	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Trench cum bunding
Tavarageri	29	3.75	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra (Bj)	Not Available	IIIs	Trench cum bunding
Tavarageri	30	4.95	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	31	0	BPRbB2	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	32	0.21	BPRbB2	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	33	0.24	BPRbB2	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	34	8.18	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	35	10.06	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	36	5.81	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIes	Trench cum bunding
Tavarageri	37	0.36	NGPbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	38	5.14	RNKhB2	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	61	0.42	NGPbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Tavarageri	63	6.66	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Trench cum bunding

Village	Sy. NO.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Tavarageri	64	0.02	BDGhA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIIs	Field bunds/ bunding
Tavarageri	78	0	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Trench cum bunding
Tavarageri	79	0.1	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	81	0.12	HDHbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	82	1.97	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Scrub land (Sl)	Not Available	Rock outcrops	Rock outcrops
Tavarageri	83	6.85	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Trench cum bunding
Tavarageri	84	4.27	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	85	1.51	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	86	2.78	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra (Bj)	Not Available	IIIs	Trench cum bunding
Tavarageri	87	1.01	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	88	0.04	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Tavarageri	89	0.2	NGPbB1	LMU-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra (Bj)	Not Available	IIIs	Trench cum bunding
Tavarageri	179	0.7	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	180	0.98	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	181	2.73	HDHhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	182	2.29	Habitation	Others	Others	Others	Others	Others	Others	Others	Redgram+Habitation (Rg+Hb)	Not Available	Others	Others
Tavarageri	183	2.36	Habitation	Others	Others	Others	Others	Others	Others	Others	Bajra (Bj)	Not Available	Others	Others
Tavarageri	222	0.71	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	NA	Not Available	Rock outcrops	Rock outcrops
Tavarageri	223	2.19	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	NA	Not Available	Rock outcrops	Rock outcrops
Tavarageri	224	4.58	HDHbB2	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIs	Trench cum bunding
Tavarageri	225	0.65	BPRbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Trench cum bunding
Tavarageri	226	3.72	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	227	1.54	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	228	0.85	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding

Village	Sy. NO.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Tavarageri	229	1.17	HDHbB2	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIs	Trench cum bunding
Tavarageri	230	0.36	HDHbB2	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIs	Trench cum bunding
Tavarageri	231	0.84	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	232	0.89	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	233	5.25	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Tavarageri	234	0.24	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Tavarageri	235	5.84	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	1 Borewell	IIe	Trench cum bunding
Tavarageri	236	0.71	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	237	0.85	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	238	0.94	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	239	0.85	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	240	1.29	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	241	1.41	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	1 Borewell	IIe	Trench cum bunding
Tavarageri	242	5.15	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	243	1.29	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	244	2.1	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	245	0.2	RTRiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIe	Trench cum bunding
Tavarageri	246	3.29	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Bajra (Bj)	Not Available	IIes	Trench cum bunding
Tavarageri	247	1.86	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	248	1.93	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	249	2.72	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	1 Borewell	IIes	Trench cum bunding
Tavarageri	251	3.11	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	252	1.85	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	253	2.22	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding

Village	Sy. NO.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Tavarageri	254	3.08	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	255	0.48	NDLhB2g1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	256	0.21	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	NA	Not Available	Rock outcrops	Rock outcrops
Tavarageri	261	2.78	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	NA	Not Available	Rock outcrops	Rock outcrops
Tavarageri	262	1.88	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	1 Borewell	IIes	Trench cum bunding
Tavarageri	263	1.69	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	264	1.61	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	265	3.53	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	266	0.26	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	267	0.29	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	268	4.57	VDHcA2	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Nearly level (0-1%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Tavarageri	269	0.64	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cultivated Fallow Land (CFL)	Not Available	IIw	Field bunds/ bunding
Tavarageri	270	0.7	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cultivated Fallow Land (CFL)	Not Available	IIw	Field bunds/ bunding

Appendix II

Kamanuru-2 Microwatershed

Soil Fertility Information

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bheemanura	109	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bheemanura	110	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halalli	115	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halalli	116	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halalli	117	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Halalli	120	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Halalli	121	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halalli	123	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halalli	124	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halalli	125	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halalli	126	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halalli	127	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	1	Neutral (pH 6.5 – 7.3)	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)
Tavarageri	2	Neutral (pH 6.5 – 7.3)	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)	Deficient (< 0.6 ppm)
Tavarageri	3	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	4	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	5	Neutral (pH 6.5 – 7.3)	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)
Tavarageri	6	Slightly alkaline (pH 7.3 – 7.8)	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)
Tavarageri	7	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	8	Slightly alkaline (pH 7.3 – 7.8)	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	10	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	11	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Tavarageri	12	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	14/1 3	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	15	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	16	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	21	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	22	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	23	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	24	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	25	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	26	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	27	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	28	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	29	Moderately acid (pH 5.5 – 6.0)	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	30	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	31	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	32	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	33	Moderately acid (pH 5.5 – 6.0)	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	34	Moderately acid (pH 5.5 – 6.0)	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	35	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	36	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	37	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	38	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	61	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	63	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Tavarageri	64	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	78	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	79	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	81	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	82	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	83	Slightly acid (pH 6.0 – 6.5)	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	84	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	85	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	86	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	87	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	88	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	89	Neutral (pH 6.5 – 7.3)	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Rock outcrops
Tavarageri	179	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	180	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	181	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	182	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Tavarageri	183	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Tavarageri	222	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	223	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	224	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Rock outcrops	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)
Tavarageri	225	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	226	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	227	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	228	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	229	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Tavarageri	230	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	231	Moderately alkaline (pH 7.8 – 8.4)	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)
Tavarageri	232	Moderately alkaline (pH 7.8 – 8.4)	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)
Tavarageri	233	Moderately alkaline (pH 7.8 – 8.4)	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)
Tavarageri	234	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	235	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	236	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	237	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	238	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	239	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	240	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	241	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	242	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	243	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	244	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	245	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	246	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	247	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	248	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	249	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Tavarageri	251	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Tavarageri	252	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Tavarageri	253	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Tavarageri	254	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Tavarageri	255	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Tavarageri	256	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	261	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	262	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Tavarageri	263	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Tavarageri	264	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 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)
Tavarageri	265	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	266	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	267	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	268	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	269	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Tavarageri	270	Neutral (pH 6.5 – 7.3)	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)

Appendix III

Kamanuru-2 Microwatershed

Soil Suitability Information

Village	Survey No.	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pome granate	Bajra	Jasmine	Crossandra	Drumstick	Mulberry
Bheemanura	109	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Bheemanura	110	S3r	S2t	S2rg	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Halalli	115	S3r	S2t	S2rg	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Halalli	116	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Halalli	117	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Halalli	120	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Halalli	121	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Halalli	123	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Halalli	124	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Halalli	125	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Halalli	126	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Halalli	127	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	1	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw
Tavarageri	2	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw
Tavarageri	3	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	4	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw
Tavarageri	5	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw
Tavarageri	6	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw
Tavarageri	7	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	8	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	10	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2tg	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g
Tavarageri	11	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2tg	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g
Tavarageri	12	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2tg	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g
Tavarageri	14/13	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw
Tavarageri	15	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	16	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	21	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2tg	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g

Village	Survey No.	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crossandra	Drumstick	Mulberry
Tavarageri	22	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw
Tavarageri	23	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	24	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2tg	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g
Tavarageri	25	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	26	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	27	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	28	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	29	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	30	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	31	S3rg	S3gt	S3g	S3gt	S3g	S3gt	S3rg	S3g	S3gt	S3gt	S3gt	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3gt	S3gt	S3gt	S3gt	S3g	S3gt	S3gt	S3gt	S2gt	S2gt
Tavarageri	32	S3rg	S3gt	S3g	S3gt	S3g	S3gt	S3rg	S3g	S3gt	S3gt	S3gt	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3gt	S3gt	S3gt	S3gt	S3g	S3gt	S3gt	S3gt	S2gt	S2gt
Tavarageri	33	S3rg	S3gt	S3g	S3gt	S3g	S3gt	S3rg	S3g	S3gt	S3gt	S3gt	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3gt	S3gt	S3gt	S3gt	S3g	S3gt	S3gt	S3gt	S2gt	S2gt
Tavarageri	34	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	35	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	36	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	37	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	38	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Tavarageri	61	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	63	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	64	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	78	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	79	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	81	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	82	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	83	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Tavarageri	84	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	85	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	86	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	87	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g

Village	Survey No.	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crossandra	Drumstick	Mulberry
Tavarageri	88	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	89	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Tavarageri	179	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	180	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	181	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	182	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Tavarageri	183	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Tavarageri	223	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	224	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	224	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	225	S3rg	S3gt	S3g	S3gt	S3g	S3gt	S3rg	S3g	S3gt	S3gt	S3gt	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3gt	S3gt	S3gt	S3gt	S3g	S3gt	S3gt	S3gt	S2gt	S2gt
Tavarageri	226	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	227	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	228	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	229	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	230	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Tavarageri	231	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	232	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	233	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	234	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	235	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	236	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	237	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	238	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	239	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	240	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	241	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	242	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1

Village	Survey No.	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crossandra	Drumstick	Mulberry
Tavarageri	243	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	244	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	245	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	246	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	247	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	248	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	249	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	251	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	252	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	253	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	254	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	255	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2tg	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g
Tavarageri	256	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	261	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Tavarageri	262	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	263	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	264	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	265	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	266	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	267	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	268	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Tavarageri	269	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw
Tavarageri	270	S3tw	S3tw	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S3tw	S3tw	S3tw	S2tw	S2tw

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 73 (53.68%) men and 63 (46.32%) women among the sampled households. The average family size of landless farmers' was 4.6, marginal farmers' was 4.33, small farmers' was 4.25, semi medium farmers' was 5.13 and medium farmers' was 4.*
- *The data indicated that, 23 (16.91%) people were in 0-15 years of age, 57 (41.91%) were in 16-35 years of age, 44 (32.35%) were in 36-60 years of age and 12 (8.82 %) were above 61 years of age.*
- *The results indicated that Kamanuru-2 had 31.62 per cent illiterates, 25.74 per cent of them had primary school education, 8.09 per cent of them had middle school education, 22.06 per cent of them had high school education, 7.35 per cent of them had PUC education, 0.74 per cent of them did ITI, and 1.47 per cent of them had degree education.*
- *The results indicate that, 60 per cent of households practicing agriculture, 26.67 per cent of the households were agricultural laborers and 13.33 per cent were general labourers.*
- *The results indicate that agriculture was the major occupation for 38.97 per cent of the household members, 21.32 per cent were agricultural laborers, 9.56 per cent were general labour, 2.21 per cent had household industry, 5.15 per cent were in private, 16.91 per cent were students, 3.68 per cent were housewives and 2.21 per cent were children.*
- *The results show that 100 per cent of the population in the micro watershed has not participated in any local institutions.*
- *The results indicate that 10 per cent of the households possess thatched house, 63.33 per cent of the households possess Katcha house and 26.67 per cent of them possess pucca house.*
- *The results show that 100 per cent of the households possess TV, 80 per cent of the households possess Mixer grinder, 40 per cent of the households possess bicycle, 43.33 per cent of the households possess motor cycle, and 100 per cent of the households possess mobile phones.*
- *The results show that the average value of television was Rs.6333, mixer grinder was Rs.1666, bicycle was Rs. 1916, motor cycle was Rs.34384, auto was Rs.100000 and mobile phone was Rs.1435.*
- *About 3.33 per cent of the households possess bullock cart, 13.33 per cent of them possess plough, 36.67 per cent of them posses sprayer, 93.33 per cent of them possess weeder, and 13.33 per cent of them possess chaff cutter.*
- *The results show that the average value of bullock cart was Rs.20000, plough was Rs.416, the average value of sprayer was Rs.2579, the average value of chaff cutter was Rs.2000, and the average value of weeder was Rs.63.*

- *The results indicate that, 13.33 per cent of the households possess bullocks, 16.67 per cent of the households possess local cow, 3.33 per cent of the households possess crossbred cow, 3.23 per cent of the households possess buffalo and 3.33 per cent of them possess sheep.*
- *The results indicate that, average own labour men available in the micro watershed was 1.84, average own labour (women) available was 1.36, average hired labour (men) available was 7.28 and average hired labour (women) available was 6.60.*
- *The results indicate that, 83.33 per cent of the households opined that the hired labour was adequate.*
- *16. The results indicate that, households of the Kamanuru-2 micro watershed possess 16.54 ha (46.93%) of dry land and 18.70 ha (53.07%) of irrigated land. Marginal farmers possess 3.63 ha (100%) of dry land. Small farmers possess 10.88 ha (92.76%) of dry land and 0.85 ha (7.24%) of irrigated land. Semi medium farmers possess 2.02 ha (15.91%) of dry land and 10.70 ha (84.09%) of irrigated land. Medium farmers possess 7.15 ha (100%) of irrigated land.*
- *The results indicate that, the average value of dry land was Rs. 356656 and average value of irrigated land was Rs. 459783. In case of marginal famers, the average land value was Rs. 633333 for dry land. In case of small famers, the average land value was Rs. 275567 for dry land and Rs. 940952 for irrigated land. In case of semi medium famers, the average land value was Rs. 296400 for dry land and Rs. 504653 for irrigated land. In case of medium famers, the average land value was Rs. 335483 for irrigated land.*
- *The results indicate that, there were 6 functioning and 4 de-functioning bore wells in the micro watershed.*
- *The results indicate that, there was 1 functioning and 1 defunctioning open well in the school.*
- *The results indicate that, bore well was the major irrigation source in the micro water shed for 20 per cent of the farmers, open well and tank each formed the source of irrigation for 3.33 per cent of the farmers.*
- *The results indicate that, the depth of bore well was found to be 29.36 meters and the depth of open well was found to be 3.56 meters.*
- *The results indicate that, small, semi medium and medium farmers had irrigated area of 0.85 ha, 8.86 ha and 5.80 ha respectively.*
- *The results indicate that, farmers have grown bajra (1 ha), bengalgram (1.62 ha), cotton (0.85 ha), groundnut (7.12 ha), maize (11.21 ha), mango (6.11 ha), navane (2.11 ha), paddy (1.82 ha), redgram (1.73 ha) and sugarcane (1.21 ha).*
- *Marginal farmers have grown bajra, groundnut, maize, navane, paddy. Small farmers have grown Bengalgram, cotton, maize, groundnut, navane and redgram.*

Semi medium farmers have grown groundnut, maize, mango and paddy. Medium farmers have grown maize, mango and sugarcane.

- *The results indicate that, the cropping intensity in Kamanuru-2 micro watershed was found to be 85.27 per cent. In case of marginal and small farmers it was 100 per cent, in case of semi medium farmers it was 99.36 per cent, and medium farmers had cropping intensity of 53.73 per cent.*
- *The results indicate that, 86.67 per cent of the households have bank account and 53.33 per cent of the households have savings.*
- *The results indicate that, 46.67 per cent of the households have availed credit from different sources.*
- *The results indicate that, 31.25 per cent of the households availed loan from commercial bank, 12.50 per cent availed loan from friends/relatives, 87.50 per cent availed loan from money lender and 6.25 per cent of the households obtained loan from SHGs/CBOs.*
- *The results indicate that, landless, marginal, small, and semi medium farmers have availed Rs.60000, Rs.87000, Rs.155714, and Rs.243333 respectively.*
- *The results indicate that, 100 per cent of the households have borrowed loan from institutional sources for the purpose of agricultural production.*
- *The results indicate that, the main purpose of borrowing credit from private sources was agricultural production which accounted for 57.14 per cent of those who borrowed credit. Another 28.57 per cent of the households borrowed for social functions and 14.29 per cent of the households borrowed for the purpose of construction of house or cattle shed.*
- *The results indicated that 100 per cent of the households did not repay their loan.*
- *Results indicated that 75 per cent of the households partially paid their loan and 25 per cent of the households did not repay their loan.*
- *The results indicate that, around 31.58 per cent of the households opined that the rate of interest was higher in institutional sources; another 52.63 per cent opined that the loan amount helped to perform timely agricultural operations and 15.79 per cent of the households said that they were forced to sell the produce at low price to repay the loan in time.*
- *The results indicate that, around 12.50 per cent of the households opined that credit was easily accessible, 25 per cent of the households opined that loan amount was adequate to fulfill the requirements, 37.50 per cent of the households opined that the credit helped to perform timely agricultural operations and 12.50 per cent opined that they were forced to sell the produce at low price to repay loan in time.*
- *The results indicate that, the total cost of cultivation for maize was Rs. 22649.48. The gross income realized by the farmers was Rs. 26066.86. The net income from*

Maize cultivation was Rs. 3417.39, thus the benefit cost ratio was found to be 1:1.15.

- *The total cost of cultivation for bajra was Rs. 28310.12. The gross income realized by the farmers was Rs. 28904.72. The net income from bajra cultivation was Rs. 594.59. Thus the benefit cost ratio was found to be 1:1.02.*
- *The total cost of cultivation for mango was Rs. 36079.54. The gross income realized by the farmers was Rs. 35197.50. The net income from mango cultivation was Rs. -882.04. Thus the benefit cost ratio was found to be 1:0.98.*
- *The total cost of cultivation for bengalgram was Rs. 44731.17. The gross income realized by the farmers was Rs. 61379.50. The net income from bengalgram cultivation was Rs. 16648.33. Thus the benefit cost ratio was found to be 1:1.37.*
- *The total cost of cultivation for groundnut was Rs. 41425.25. The gross income realized by the farmers was Rs. 45304.12. The net income from groundnut cultivation was Rs. 8671.21. Thus the benefit cost ratio was found to be 1:1.24.*
- *The total cost of cultivation for cotton was Rs. 32163.01. The gross income realized by the farmers was Rs. 68571.91. The net income from cotton cultivation was Rs. 36408.90. Thus the benefit cost ratio was found to be 1:2.13.*
- *The total cost of cultivation for tomato was Rs. 36338.34. The gross income realized by the farmers was Rs. 111921.87. The net income from tomato cultivation was Rs. 75583.53. Thus the benefit cost ratio was found to be 1:3.08.*
- *The total cost of cultivation for navane was Rs. 17541.23. The gross income realized by the farmers was Rs. 29078.64. The net income from navane cultivation was Rs. 11537.41. Thus the benefit cost ratio was found to be 1:1.66.*
- *The total cost of cultivation for paddy was Rs. 50986.93. The gross income realized by the farmers was Rs. 110091.43. The net income from paddy cultivation was Rs. 59104.50. Thus the benefit cost ratio was found to be 1:2.16.*
- *The total cost of cultivation for sugarcane was Rs. 35639.63. The gross income realized by the farmers was Rs. 177840. The net income from sugarcane cultivation was Rs. 142200.37. Thus the benefit cost ratio was found to be 1:4.99.*
- *The results indicate that, 23.33 per cent of the households opined that dry fodder was adequate and 6.67 per cent of the households opined that green fodder was adequate. Around 6.67 per cent of the households opined that dry fodder was inadequate.*
- *The results indicate that the average annual gross income was Rs.123600 for landless farmers, for marginal farmers it was Rs.69908, for small farmers it was Rs.120494, for semi medium farmers it was Rs.101725, and for medium farmers it was Rs.68833.*
- *The results indicate that the average annual expenditure is Rs. 14,600. For landless households it was Rs. 4,566.67, for marginal farmers it was Rs. 7,427.08,*

for small farmers it was Rs. 9,156.25, for semi medium farmers it was Rs. 12,111.11, and for medium farmers it was Rs. 8,980.

- *The results indicate that, sampled households have grown 48 coconut, 80 custard apple, 1748 mango, 2 lemon and 1 sapota tree in their fields.*
- *The results indicate that, households have planted 1 teak trees, 45 neem trees and 5 tamarind trees in their field.*
- *The results indicate that, the average additional investment capacity with the households for land development was Rs.1733, for irrigation facility Rs.966, for improved crop production Rs.1000 and for improved livestock management Rs.700.*
- *The results indicate that, loan from bank was the source of additional investment capacity for 10 per cent of the households for land development, 3.33 per cent for irrigation facility and 3.33 per cent for improved livestock management. Own funds was the source of investment for 10 per cent for irrigation facility, 6.67 per cent for improved crop production and 3.33 per cent for improved livestock management. Soft loans was the source of funds for 6.67 per cent for land development, 3.33 per cent for irrigation facility, 10 per cent for improved crop production and 6.67 per cent for improved livestock management.*
- *The results indicated that, Bengalgram, cotton, maize, mango, navane and paddy were sold to the extent of 100 per cent. Bajra was sold to the extent of 94.44 per cent, groundnut to the extent of 83.33 per cent and sugarcane to the extent of 44.44 per cent.*
- *The results indicated that, about 50 per cent of the famers have sold their produce in regulated markets and 40 per cent have sold their produce to local/village merchants.*
- *The results indicated that, 70 per cent of the households have used tractor as a mode of transportation for their agricultural produce, 13.33 per cent have used truck and 6.67 per cent have used cart as a mode of transportation.*
- *The results indicated that, 30 per cent of the households have experienced soil and water erosion problems in the farm i.e., 16.67 per cent of marginal farmers, 12.50 per cent of small farmers, 62.50 per cent of semi medium farmers and 66.67 per cent of medium farmers have experienced soil and water erosion problems.*
- *The results indicated that, 90.32 per cent have shown interest in soil test.*
- *The results indicated that, piped supply was the major source of drinking water for 96.67 per cent of the households and bore well was the source of drinking water for 3.33 per cent of the households.*
- *The results indicated that, 87.10 per cent used fire wood and 12.90 per cent of the households used LPG.*
- *Electricity was the major source of light for 100 per cent of the households in micro watershed.*

- *The results indicated that, 70 per cent of the households possess sanitary toilet i.e. 20 per cent of the landless, 16.67 per cent of the marginal, 100 per cent of the small, 100 per cent of the semi medium and 100 per cent of the medium farmers.*
- *The results indicated that, 93.33 per cent of the sampled households possessed BPL card, and 6.67 per cent did not possess PDS card.*
- *The results indicated that, 43.33 per cent of the households participated in NREGA programme.*
- *The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 53.33 per cent, oilseeds were adequate for 13.33 per cent, vegetables were adequate for 56.67 per cent, fruits were adequate for 56.67 per cent, milk was adequate for 86.67 per cent, eggs were adequate for 83.33 per cent and meat was adequate for 56.67 per cent of the households.*
- *The results indicated that, pulses were inadequate for 46.67per cent, oilseeds were inadequate for 86.67 per cent, vegetables were inadequate for 46.67 per cent, fruits were inadequate for 40 per cent, milk was inadequate for 13.33 per cent, eggs were inadequate for 16.67 per cent and meat was inadequate for 43.33 per cent of the households.*
- *The results indicated that, lower fertility status of the soil was the constraint experienced by 83.33 per cent of the households, wild animal menace on farm field (83.33%), frequent incidence of pest and diseases (70%), inadequacy of irrigation water (70%), high cost of fertilizers and plant protection chemicals (80%), high rate of interest on credit (86.67%), low price for the agricultural commodities (86.67%), lack of marketing facilities in the area (80%), lack of transport for safe transport of the agricultural produce to the market (86.67%), less rainfall (13.33%) and inadequate extension services (63.33%).*

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.3 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

Kamanuru-2 micro-watershed (Tavaregere sub-watershed, Koppal Taluk and District) is located at North latitude 15^0 25’ 326.294’’ to 15^0 23’ 26.494’’ and East longitude 76^0 15’ 47.22’’ to 76^0 14’ 50.334’’ covering an area of 273.81 ha and spread across Tavaregere, Bheemanura and Halalli 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 30 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 Kamanuru-2 micro watershed is presented in Table 1 and it indicated that 30 farmers were sampled in Kamanuru-2 micro watershed among them 5 (16.67%) were landless, 6 (20%) were marginal farmers, 8 (26.67%) were small farmers, 8 (26.67%) were semi medium farmers, and 3 (10%) were medium farmers.

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

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	16.67	6	20.00	8	26.67	8	26.67	3	10.00	30	100.00

Population characteristics: The population characteristics of households sampled for socio-economic survey in Kamanuru-2 micro watershed is presented in Table 2. The data indicated that there were 73 (53.68%) men and 63 (46.32%) women among the sampled households. The average family size of landless farmers' was 4.6, marginal farmers' was 4.33, small farmers' was 4.25, semi medium farmers' was 5.13 and medium farmers' was 4.

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

Sl.No.	Particulars	LL (23)		MF (26)		SF (34)		SMF (41)		MDF (12)		All (136)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Male	13	56.52	12	46.15	20	58.82	22	53.66	6	50.00	73	53.68
2	Female	10	43.48	14	53.85	14	41.18	19	46.34	6	50.00	63	46.32
Total		23	100.00	26	100.00	34	100.00	41	100.00	12	100.00	136	100.00
Average		4.6		4.33		4.25		5.13		4		4.53	

Age wise classification of population: The age wise classification of household members in Kamanuru-2 micro watershed is presented in Table 3. The data indicated that, 23 (16.91%) people were in 0-15 years of age, 57 (41.91%) were in 16-35 years of age, 44 (32.35%) were in 36-60 years of age and 12 (8.82 %) were above 61 years of age.

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

Sl.No.	Particulars	LL (23)		MF (26)		SF (34)		SMF (41)		MDF (12)		LF (0)		All (136)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	3	13.04	6	23.08	5	14.71	8	19.51	1	8.33	0	0	23	16.91
2	16-35 years of age	11	47.83	9	34.62	14	41.18	17	41.46	6	50	0	0	57	41.91
3	36-60 years of age	7	30.43	8	30.77	12	35.29	12	29.27	5	41.67	0	0	44	32.35
4	> 61 years	2	8.70	3	11.54	3	8.82	4	9.76	0	0	0	0	12	8.82
Total		23	100	26	100	34	100	41	100	12	100	0	100	136	100

Education level of household members: Education level of household members in Kamanuru-2 micro watershed is presented in Table 4. The results indicated that Kamanuru-2 had 31.62 per cent illiterates, 25.74 per cent of them had primary school education, 8.09 per cent of them had middle school education, 22.06 per cent of them had

high school education, 7.35 per cent of them had PUC education, 0.74 per cent of them did ITI, and 1.47 per cent of them had degree education.

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

Sl.No.	Particulars	LL (23)		MF (26)		SF (34)		SMF (41)		MDF (12)		All (136)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	6	26.09	11	42.31	8	23.53	14	34.15	4	33.33	43	31.62
2	Primary School	12	52.17	5	19.23	8	23.53	9	21.95	1	8.33	35	25.74
3	Middle School	0	0	3	11.54	6	17.65	2	4.88	0	0	11	8.09
4	High School	5	21.74	6	23.08	7	20.59	9	21.95	3	25	30	22.06
5	PUC	0	0	1	3.85	3	8.82	4	9.76	2	16.67	10	7.35
6	ITI	0	0	0	0	1	2.94	0	0	0	0	1	0.74
7	Degree	0	0	0	0	1	2.94	0	0	1	8.33	2	1.47
8	Others	0	0	0	0	0	0	3	7.32	1	8.33	4	2.94
Total		23	100	26	100	34	100	41	100	12	100	136	100

Occupation of household heads: The data regarding the occupation of the household heads in Kamanuru-2 micro watershed is presented in Table 5. The results indicate that, 60 per cent of households practicing agriculture, 26.67 per cent of the households were agricultural laborers and 13.33 per cent were general labourers.

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

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	6	100	7	87.50	4	50	1	33.33	18	60
2	Agricultural Labour	1	20	0	0	1	12.50	4	50	2	66.67	8	26.67
3	General Labour	4	80	0	0	0	0	0	0	0	0	4	13.33
Total		5	100	6	100	8	100	8	100	3	100	30	100

Occupation of the household members: The data regarding the occupation of the household members in Kamanuru-2 micro watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 38.97 per cent of the household members, 21.32 per cent were agricultural laborers, 9.56 per cent were general labour, 2.21 per cent had household industry, 5.15 per cent were in private, 16.91 per cent were students, 3.68 per cent were housewives and 2.21 per cent were children. In case of landless farmers, 13.04 per cent were agricultural labourers, 56.52 per cent were general labourers, 8.7 per cent of them had household industry, 13.04 per cent of them were student and 8.7 per cent of them were housewives. In case of marginal farmers 69.23 per cent of them were practicing agriculture and 30.77 per cent were students. In case of small farmers, 61.76 per cent were agriculturists, 8.82 per cent were agricultural labourers, 2.94 per cent of them had household industry, 8.82 per cent were in private service, 14.71 per cent were students and 2.93 per cent were housewives. In case of semi medium farmers 29.27 per cent were agriculturists, 41.46 per cent were agricultural labourers, 7.32 per cent were in private service and 4.88 per cent were students. In case of medium farmers 16.67 per cent were in agriculture, 50 per cent were agricultural

labourers, 8.33 per cent were in private service, 16.67 per cent were housewives and another 8.33 per cent were children.

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

Sl.No.	Particulars	LL (23)		MF (26)		SF (34)		SMF (41)		MDF (12)		All (136)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	18	69.23	21	61.76	12	29.27	2	16.67	53	38.97
2	Agricultural Labour	3	13.04	0	0	3	8.82	17	41.46	6	50	29	21.32
3	General Labour	13	56.52	0	0	0	0	0	0	0	0	13	9.56
4	Household industry	2	8.70	0	0	1	2.94	0	0	0	0	3	2.21
5	Private Service	0	0	0	0	3	8.82	3	7.32	1	8.33	7	5.15
6	Student	3	13.04	8	30.77	5	14.71	7	17.07	0	0	23	16.91
7	Housewife	2	8.70	0	0	1	2.94	0	0	2	16.67	5	3.68
8	Children	0	0	0	0	0	0	2	4.88	1	8.33	3	2.21
Total		23	100	26	100	34	100	41	100	12	100	136	100

Institutional participation of the household members: The data regarding the institutional participation of the household members in Kamanuru-2 micro watershed is presented in Table 7. The results show that 100 per cent of the population in the micro watershed has not participated in any local institutions.

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

Sl.No.	Particulars	LL (23)		MF (26)		SF (34)		SMF (41)		MDF (12)		All (136)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	23	100.00	26	100.00	34	100.00	41	100.00	12	100.00	136	100.00
Total		23	100.00	26	100.00	34	100.00	41	100.00	12	100.00	136	100.00

Type of house owned: The data regarding the type of house owned by the households in Kamanuru-2 micro watershed is presented in Table 8. The results indicate that 10 per cent of the households possess thatched house, 63.33 per cent of the households possess Katcha house and 26.67 per cent of them possess pucca house. 100 per cent of landless farmers possess katcha house. In case of marginal farmers, 16.67 per cent of the households possess thatched house and 83.33 per cent of the households possess katcha house. In case of small farmers, 75 per cent of the households possess katcha house, and 25 per cent of them possess pucca house. In case of semi medium farmers, 25 per cent of them possess thatched house, 37.50 per cent of the households possess katcha house, and 37.50 per cent of them possess pucca house. 100 per cent of the medium farm households possess pucca house.

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

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	0	0.00	1	16.67	0	0.00	2	25.00	0	0.00	3	10.00
2	Katcha	5	100.00	5	83.33	6	75.00	3	37.50	0	0.00	19	63.33
3	Pucca/RCC	0	0.00	0	0.00	2	25.00	3	37.50	3	100.00	8	26.67
Total		5	100.00	6	100.00	8	100.00	8	100.00	3	100.00	30	100.00

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Kamanuru-2 micro watershed is presented in Table 9. The results show that 100 per cent of the households possess TV, 80 per cent of the households possess Mixer grinder, 40 per cent of the households possess bicycle, 43.33 per cent of the households possess motor cycle, and 100 per cent of the households possess mobile phones.

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

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		LF (0)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Television	5	100	6	100	8	100	8	100	3	100	0	0	30	100
2	Mixer/Grinder	1	20	3	50	9	112.50	8	100	3	100	0	0	24	80
3	Bicycle	2	40	5	83.33	4	50	1	12.50	0	0	0	0	12	40
4	Motor Cycle	1	20	2	33.33	3	37.50	4	50	3	100	0	0	13	43.33
5	Auto	0	0	0	0	0	0	1	12.50	0	0	0	0	1	3.33
6	Mobile Phone	5	100	6	100	8	100	8	100	3	100	0	0	30	100

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Kamanuru-2 micro watershed is presented in Table 10. The results show that the average value of television was Rs.6333, mixer grinder was Rs.1666, bicycle was Rs. 1916, motor cycle was Rs.34384, auto was Rs.100000 and mobile phone was Rs.1435.

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

Average value (Rs.)

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Television	6,200.00	6,166.00	5,750.00	6,500.00	8,000.00	6,333.00
2	Mixer/Grinder	2,000.00	1,666.00	1,611.00	1,625.00	1,833.00	1,666.00
3	Bicycle	4,000.00	1,600.00	1,500.00	1,000.00	0.00	1,916.00
4	Motor Cycle	30,000.00	31,500.00	38,666.00	32,500.00	36,000.00	34,384.00
5	Auto	0.00	0.00	0.00	100,000.00	0.00	100,000.00
6	Mobile Phone	1,142.00	1,671.00	1,353.00	2,630.00	3,500.00	1,943.00

Farm Implements owned: The data regarding the farm implements owned by the households in Kamanuru-2 micro watershed is presented in Table 11. About 3.33 per cent of the households possess bullock cart, 13.33 per cent of them possess plough, 36.67 per cent of them posses sprayer, 93.33 per cent of them possess weeder, and 13.33 per cent of them possess chaff cutter.

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

Sl. No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0.00	0	0.00	1	12.50	0	0.00	0	0.00	1	3.33
2	Plough	0	0.00	1	16.67	2	25.00	1	12.50	0	0.00	4	13.33
3	Sprayer	0	0.00	0	0.00	4	50.00	5	62.50	2	66.67	11	36.67
4	Weeder	5	100.00	6	100.00	7	87.50	8	100.00	2	66.67	28	93.33
5	Chaff Cutter	0	0.00	1	16.67	2	25.00	1	12.50	0	0.00	4	13.33
6	Blank	0	0.00	0	0.00	1	12.50	0	0.00	0	0.00	1	3.33

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Kamanuru-2 micro watershed is presented in Table 12. The results show that the average value of bullock cart was Rs.20000, plough was Rs.416, the average value of sprayer was Rs.2579, the average value of chaff cutter was Rs.2000, and the average value of weeder was Rs.63.

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

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Bullock Cart	0.00	0.00	20,000.00	0.00	0.00	20,000.00
2	Plough	0.00	333.00	500.00	333.00	0.00	416.00
3	Sprayer	0.00	0.00	2,300.00	1,890.00	5,000.00	2,579.00
4	Weeder	81.00	65.00	57.00	58.00	62.00	63.00
5	Chaff Cutter	0.00	1,000.00	2,000.00	3,000.00	0.00	2,000.00

Livestock possession by the households: The data regarding the Livestock possession by the households in Kamanuru-2 micro watershed is presented in Table 13. The results indicate that, 13.33 per cent of the households possess bullocks, 16.67 per cent of the households possess local cow, 3.33 per cent of the households possess crossbred cow, 3.23 per cent of the households possess buffalo and 3.33 per cent of them possess sheep.

In case of marginal households, 16.67 per cent possess bullocks. Among small farmers, 25 per cent of the households possess bullock, 25 per cent possess local cow, 12.5 per cent possess crossbred cow, and 12.50 per cent possess buffalo. In case of semi medium farmers, 12.50 per cent of households possess bullock, 25 per cent of households possess local cow, 37.50 per cent of them possess buffalo and 12.50 per cent possess sheep. Medium farmers possess local cow and buffalo.

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

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0.00	1	16.67	2	25.00	1	12.50	0	0.00	4	13.33
2	Local cow	0	0.00	0	0.00	2	25.00	2	25.00	1	33.33	5	16.67
3	Crossbred cow	0	0.00	0	0.00	1	12.50	0	0.00	0	0.00	1	3.33
4	Buffalo	0	0.00	0	0.00	1	12.50	3	37.50	1	33.33	5	16.67
5	Sheep	0	0.00	0	0.00	0	0.00	1	12.50	0	0.00	1	3.33
6	blank	5	100.00	5	83.33	4	50.00	3	37.50	2	66.67	19	63.33

Average Labour availability: The data regarding the average labour availability in Kamanuru-2 micro watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.84, average own labour (women) available was 1.36, average hired labour (men) available was 7.28 and average hired labour (women) available was 6.60.

In case of marginal farmers, average own labour men available was 1.50, average own labour (women) was 1.50, average hired labour (men) was 3.86 and average hired labour (women) available was 3.29. In case of small farmers, average own labour men

available was 1.88, average own labour (women) was 1.13, average hired labour (men) was 8.57 and average hired labour (women) available was 7.43. In case of semi medium farmers, average own labour men available was 2.13, average own labour (women) was 1.38, average hired labour (men) was 9.38 and average hired labour (women) available was 9.38. In case of medium farmers, average own labour men available was 1.67, average own labour (women) was 1.67, average hired labour (men) was 6.67 and average hired labour (women) available was 5.

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

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
		N	N	N	N	N	N
1	Own labour Male	0.00	1.50	1.88	2.13	1.67	1.84
2	Own Labour Female	0.00	1.50	1.13	1.38	1.67	1.36
3	Hired labour Male	0.00	3.86	8.57	9.38	6.67	7.28
4	Hired labour Female	0.00	3.29	7.43	9.38	5.00	6.60

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Kamanuru-2 micro watershed is presented in Table 15. The results indicate that, 83.33 per cent of the households opined that the hired labour was adequate.

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

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0.00	7	116.67	7	87.50	8	100.00	3	100.00	25	83.33
2	Inadequate	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Distribution of land (ha): The data regarding the distribution of land (ha) in Kamanuru-2 micro watershed is presented in Table 16. The results indicate that, households of the Kamanuru-2 micro watershed possess 16.54 ha (46.93%) of dry land and 18.70 ha (53.07%) of irrigated land. Marginal farmers possess 3.63 ha (100%) of dry land. Small farmers possess 10.88 ha (92.76%) of dry land and 0.85 ha (7.24%) of irrigated land. Semi medium farmers possess 2.02 ha (15.91%) of dry land and 10.70 ha (84.09%) of irrigated land. Medium farmers possess 7.15 ha (100%) of irrigated land.

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

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	0	0	3.63	100	10.88	92.76	2.02	15.91	0	0	16.54	46.93
2	Irrigated	0	0	0	0	0.85	7.24	10.70	84.09	7.15	100	18.70	53.07
Total		0	100	3.63	100	11.73	100	12.72	100	7.15	100	35.23	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Kamanuru-2 micro watershed is presented in Table 17. The results indicate that, the average value of dry land was Rs. 356656 and average value of irrigated land was Rs. 459783. In case of marginal famers, the average land value was Rs. 633333 for dry land. In case of small famers, the average land value was Rs. 275567 for dry land and Rs. 940952 for irrigated land. In case of semi medium famers, the average land value was Rs.

296400 for dry land and Rs. 504653 for irrigated land. In case of medium famers, the average land value was Rs. 335483 for irrigated land.

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

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Dry	0.00	633,333.33	275,567.12	296,400.00	0.00	356,656.87
2	Irrigated	0.00	0.00	940,952.42	504,653.80	335,483.87	459,783.55

Status of bore wells: The data regarding the status of bore wells in Kamanuru-2 micro watershed is presented in Table 18. The results indicate that, there were 6 functioning and 4 de-functioning bore wells in the micro watershed.

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

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
		N	N	N	N	N	N
1	De-functioning	0	0	0	3	1	4
2	Functioning	0	0	1	3	2	6

Status of open wells: The data regarding the status of open wells in Kamanuru-2 micro watershed is presented in Table 19. The results indicate that, there was 1 functioning and 1 defunctioning open well in the micro watershed.

Table 19. Status of open wells in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
		N	N	N	N	N	N
1	De-functioning	0	0	0	1	0	1
2	Functioning	0	0	0	1	0	1

Source of irrigation: The data regarding the source of irrigation in Kamanuru-2 micro watershed is presented in Table 20. The results indicate that, bore well was the major irrigation source in the micro water shed for 20 per cent of the farmers, open well and tank each formed the source of irrigation for 3.33 per cent of the farmers.

Table 20. Source of irrigation in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0.00	0	0.00	1	12.50	3	37.50	2	66.67	6	20.00
2	Open Well	0	0.00	0	0.00	0	0.00	1	12.50	0	0.00	1	3.33
3	Tank	0	0.00	0	0.00	0	0.00	1	12.50	0	0.00	1	3.33

Depth of water (Avg in meters): The data regarding the depth of water in Kamanuru-2 micro watershed is presented in Table 21. The results indicate that, the depth of bore well was found to be 29.36 meters and the depth of open well was found to be 3.56 meters.

Table 21. Depth of water (Avg in meters) in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
		N	N	N	N	N	N
1	Bore Well	0.00	0.00	13.34	56.77	106.68	29.36
2	Open Well	0.00	0.00	0.00	13.34	0.00	3.56

Irrigated Area (ha): The data regarding the irrigated area (ha) in Kamanuru-2 micro watershed is presented in Table 22. The results indicate that, small, semi medium and medium farmers had irrigated area of 0.85 ha, 8.86 ha and 5.80 ha respectively.

Table 22. Irrigated Area (ha) in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Kharif	0.00	0.00	0.85	8.86	5.80	15.51
Total		0.00	0.00	0.85	8.86	5.80	15.51

Cropping pattern: The data regarding the cropping pattern in Kamanuru-2 micro watershed is presented in Table 23. The results indicate that, farmers have grown bajra (1 ha), bengalgram (1.62 ha), cotton (0.85 ha), groundnut (7.12 ha), maize (11.21 ha), mango (6.11 ha), navane (2.11 ha), paddy (1.82 ha), redgram (1.73 ha) and sugarcane (1.21 ha). Marginal farmers have grown bajra, groundnut, maize, navane, paddy. Small farmers have grown Bengalgram, cotton, maize, groundnut, navane and redgram. Semi medium farmers have grown groundnut, maize, mango and paddy. Medium farmers have grown maize, mango and sugarcane.

Table 23. Cropping pattern in Kamanuru-2 micro watershed (Area in ha)

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Kharif - Bajra	0	1	0	0	0	1
2	Kharif - Bengal gram	0	0	1.62	0	0	1.62
3	Kharif - Cotton	0	0	0.85	0	0	0.85
4	Kharif - Groundnut	0	0.85	3.28	2.99	0	7.12
5	Kharif - Maize	0	0.49	3.04	3.64	4.05	11.21
6	Kharif - Mango	0	0	0	4.49	1.62	6.11
7	Kharif - Navane (Fox Millet)	0	0.89	1.21	0	0	2.11
8	Kharif - Paddy	0	0.4	0	1.42	0	1.82
9	Kharif - Red gram (togari)	0	0	1.73	0	0	1.73
10	Kharif - Sugarcane	0	0	0	0	1.21	1.21
Total		0	3.63	11.74	12.54	6.88	34.79

Cropping intensity: The data regarding the cropping intensity in Kamanuru-2 micro watershed is presented in Table 24. The results indicate that, the cropping intensity in Kamanuru-2 micro watershed was found to be 85.27 per cent. In case of marginal and small farmers it was 100 per cent, in case of semi medium farmers it was 99.36 per cent, and medium farmers had cropping intensity of 53.73 per cent.

Table 24. Cropping intensity (%) in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Cropping Intensity	0.00	100.00	100.00	99.36	53.73	85.27

Table 25. Possession of Bank account and savings in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	1	20.00	6	100.00	8	100.00	8	100.00	3	100.00	26	86.67
2	Savings	1	20.00	5	83.33	7	87.50	3	37.50	0	0.00	16	53.33

Possession of Bank account and savings: The data regarding the cropping intensity in Kamanuru-2 micro watershed is presented in Table 25. The results indicate that, 86.67 per cent of the households have bank account and 53.33 per cent of the households have savings.

Borrowing status: The data regarding the cropping intensity in Kamanuru-2 micro watershed is presented in Table 26. The results indicate that, 46.67 per cent of the households have availed credit from different sources.

Table 26. Borrowing status in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	1	20.00	5	83.33	7	87.50	1	12.50	0	0.00	14	46.67

Source of credit availed by households: The data regarding the cropping intensity in Kamanuru-2 micro watershed is presented in Table 27. The results indicate that, 31.25 per cent of the households availed loan from commercial bank, 12.50 per cent availed loan from friends/relatives, 87.50 per cent availed loan from money lender and 6.25 per cent of the households obtained loan from SHGs/CBOs.

Table 27. Source of credit availed by households in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (1)		MF (5)		SF (7)		SMF (3)		MDF (0)		All (16)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Commercial Bank	0	0.00	1	20.00	2	28.57	2	66.67	0	0.00	5	31.25
2	Friends/Relatives	0	0.00	2	40.00	0	0.00	0	0.00	0	0.00	2	12.50
3	Grameena Bank	0	0.00	2	40.00	4	57.14	5	166.67	0	0	11	87.50
4	Money Lender	1	100.00	1	20.00	2	28.57	1	33.33	0	0.00	5	31.25
5	SHGs/CBOs	0	0.00	1	20.00	0	0.00	0	0.00	0	0.00	1	6.25

Average Credit amount: The data regarding the average credit amount availed by households in Kammanuru-2 micro watershed is presented in Table 28. The results indicate that, landless, marginal, small, and semi medium farmers have availed Rs.60000, Rs.87000, Rs.155714, and Rs.243333 respectively.

Table 28. Average Credit amount availed by households in Kammanuru-2 micro watershed

Sl.No.	Particulars	LL (1)	MF (5)	SF (7)	SMF (3)	MDF (0)	All (16)
1	Average Credit	60,000.00	87,000.00	155,714.29	243,333.33	0.00	214,062.50

Table 29. Purpose of credit borrowed (institutional Source) by households in Kammanuru-2 micro watershed

Sl.No.	Particulars	LL (0)		MF (3)		SF (6)		SMF (7)		MDF (3)		All (19)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0.00	3	100.00	6	100.00	7	100.00	3	100.00	19	100.00

Purpose of credit borrowed - Institutional Credit: The data regarding the purpose of credit borrowed from institutional sources by households in Kammanuru-2 micro watershed is presented in Table 29. The results indicate that, 100 per cent of the

households have borrowed loan from institutional sources for the purpose of agricultural production.

Purpose of credit borrowed - Private Credit: The data regarding the purpose of credit borrowed from private sources by households in Kammanuru-2 micro watershed is presented in Table 30. The results indicate that, the main purpose of borrowing credit from private sources was agricultural production which accounted for 57.14 per cent of those who borrowed credit. Another 28.57 per cent of the households borrowed for social functions and 14.29 per cent of the households borrowed for the purpose of construction of house or cattle shed.

Table 30. Purpose of credit borrowed (Private Credit) by households in Kammanuru-2 micro watershed

Sl.No.	Particulars	LL (1)		MF (4)		SF (1)		SMF (1)		MDF (0)		All (7)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0	2	50	1	100	1	100	0	0	4	57.14
2	Construction-house, Construction-cattle shed	0	0	1	25	0	0	0	0	0	0	1	14.29
3	Social functions like marriage	1	100	1	25	0	0	0	0	0	0	2	28.57

Repayment status of households – Institutional: The data regarding the repayment status of credit borrowed from institutional sources by households in Kammanuru-2 micro watershed is presented in Table 31. The results indicated that 100 per cent of the households did not repay their loan.

Table 31. Repayment status of households (institutional sources) in Kammanuru-2 micro watershed

Sl.No.	Particulars	LL (0)		MF (3)		SF (6)		SMF (7)		MDF (3)		All (19)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Partially paid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
2	Un paid	0	0.00	3	100.00	6	100.00	7	100.00	3	100.00	19	100.00

Repayment status of households – Private: The data regarding the repayment status of credit borrowed from private sources by households in Kammanuru-2 micro watershed is presented in Table 32. Results indicated that 75 per cent of the households partially paid their loan and 25 per cent of the households did not repay their loan.

Table 32. Repayment status of households (private sources) in Kammanuru-2 micro watershed

Sl.No.	Particulars	LL (1)		MF (4)		SF (2)		SMF (1)		MDF (0)		All (8)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Partially paid	1	100.00	3	75.00	1	50.00	1	100.00	0	0.00	6	75.00
2	Un paid	0	0.00	1	25.00	1	50.00	0	0.00	0	0.00	2	25.00

Opinion on institutional sources of credit: The data regarding the opinion on institutional sources of credit in Kammanuru-2 micro watershed is presented in Table 33. The results indicate that, around 31.58 per cent of the households opined that the rate of interest was higher in institutional sources; another 52.63 per cent opined that the loan

amount helped to perform timely agricultural operations and 15.79 per cent of the households said that they were forced to sell the produce at low price to repay the loan in time.

Table 33. Opinion on institutional sources of credit in Kammanuru-2 micro watershed

Sl. No.	Particulars	LL (0)		MF (3)		SF (6)		SMF (7)		MDF (3)		All (19)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	0	0	3	100	5	83.33	2	28.57	0	0	10	52.63
2	Higher rate of interest	0	0	0	0	1	16.67	3	42.86	2	66.67	6	31.58
3	Forced to sell the produce at low price to repay loan in time	0	0	0	0	0	0	2	28.57	1	33.33	3	15.79

Opinion on non-institutional sources of credit: The data regarding the opinion on non-institutional sources of credit in Kammanuru-2 micro watershed is presented in Table 34. The results indicate that, around 12.50 per cent of the households opined that credit was easily accessible, 25 per cent of the households opined that loan amount was adequate to fulfill the requirements, 37.50 per cent of the households opined that the credit helped to perform timely agricultural operations and 12.50 per cent opined that they were forced to sell the produce at low price to repay loan in time.

Table 34. Opinion on non-institutional sources of credit in Kammanuru-2 micro watershed

Sl. No.	Particulars	LL (1)		MF (4)		SF (2)		SMF (1)		MDF(0)		All (8)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Easy accessibility of credit	0	0.00	0	0.00	1	50.00	0	0.00	0	0.00	1	12.50
2	Loan amount was adequate to fulfil the requirement	1	100.00	1	25.00	0	0.00	0	0.00	0	0.00	2	25.00
3	Helped to perform timely agricultural operations	0	0.00	2	50.00	0	0.00	1	100.00	0	0.00	3	37.50
4	Forced to sell the produce at low price to repay loan in time	0	0.00	1	25.00	0	0.00	0	0.00	0	0.00	1	12.50

Cost of Cultivation of Maize: The data regarding the cost of cultivation of maize in Kamanuru-2 micro watershed is presented in Table 35. The results indicate that, the total cost of cultivation for maize was Rs. 22649.48. The gross income realized by the farmers was Rs. 26066.86. The net income from Maize cultivation was Rs. 3417.39, thus the benefit cost ratio was found to be 1:1.15.

Table 35. Cost of Cultivation of maize in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	28.76	4764.28	21.03
2	Bullock		Pairs/day	0.72	413.56	1.83
3	Tractor		Hours	2.99	2136.04	9.43
4	Machinery		Hours	0.15	107.99	0.48
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	19.77	2407.27	10.63
6	Seed Inter Crop		Kgs.	0.16	19.69	0.09
7	FYM		Quintal	8.70	1166.28	5.15
8	Fertilizer + micronutrients		Quintal	5.03	4534.86	20.02
9	Pesticides (PPC)		Kgs / ltrs	0.64	644.94	2.85
10	Irrigation		Number	2.47	0.00	0.00
13	Depreciation charges			0.00	22.47	0.10
14	Land revenue and Taxes			0.00	4.12	0.02
II	**Cost B1**					
16	Interest on working capital				1052.83	4.65
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				17274.33	76.27
III	**Cost B2**					
18	Rental Value of Land				733.33	3.24
19	**Cost B2 = (Cost B1 + Rental value)**				18007.66	79.51
IV	**Cost C1**					
20	Family Human Labour			13.19	2582.20	11.40
21	**Cost C1 = (Cost B2 + Family Labour)**				20589.86	90.91
V	**Cost C2**					
22	Risk Premium				0.57	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				20590.43	90.91
VI	**Cost C3**					
24	Managerial Cost				2059.04	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				22649.48	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		20.07	24800.00	
		b) Main Crop Sales Price (Rs.)			1235.71	
	By Product	e) Main Product (q)		6.82	1266.86	
		f) Main Crop Sales Price (Rs.)			185.71	
b.	Gross Income (Rs.)				26066.86	
c.	Net Income (Rs.)				3417.39	
d.	Cost per Quintal (Rs./q.)				1128.56	
e.	Benefit Cost Ratio (BC Ratio)				1:1.15	

Cost of cultivation of Bajra: The data regarding the cost of cultivation of bajra in Kamanuru-2 micro watershed is presented in Table 36. The results indicate that, the total cost of cultivation for bajra was Rs. 28310.12. The gross income realized by the farmers was Rs. 28904.72. The net income from bajra cultivation was Rs. 594.59. Thus the benefit cost ratio was found to be 1:1.02.

Table 36. Cost of Cultivation of bajra in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	44.61	7670.78	27.10
2	Bullock		Pairs/day	1.54	770.12	2.72
3	Tractor		Hours	4.18	2506.95	8.86
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	10.83	1234.35	4.36
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	26.76	3211.00	11.34
8	Fertilizer + micronutrients		Quintal	6.16	4774.74	16.87
9	Pesticides (PPC)		Kgs / liters	0.00	0.00	0.00
10	Irrigation		Number	0.00	0.00	0.00
13	Depreciation charges			0.00	23.66	0.08
14	Land revenue and Taxes			0.00	4.94	0.02
II	**Cost B1**					
16	Interest on working capital				1106.41	3.91
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				21302.95	75.25
III	**Cost B2**					
18	Rental Value of Land				400.00	1.41
19	**Cost B2 = (Cost B1 + Rental value)**				21702.95	76.66
IV	**Cost C1**					
20	Family Human Labour			21.65	4033.52	14.25
21	**Cost C1 = (Cost B2 + Family Labour)**				25736.48	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				25736.48	90.91
VI	**Cost C3**					
24	Managerial Cost				2573.65	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				28310.12	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		14.79	26132.37	
		b) Main Crop Sales Price (Rs.)			1766.67	
	By Product	e) Main Product (q)		14.34	2772.35	
		f) Main Crop Sales Price (Rs.)			193.33	
b.	Gross Income (Rs.)				28904.72	
c.	Net Income (Rs.)				594.59	
d.	Cost per Quintal (Rs./q.)				1913.89	
e.	Benefit Cost Ratio (BC Ratio)				1:1.02	

Cost of cultivation of mango: The data regarding the cost of cultivation of mango in Kamanuru-2 micro watershed is presented in Table 37. The results indicate that, the total cost of cultivation for mango was Rs. 36079.54. The gross income realized by the farmers was Rs. 35197.50. The net income from mango cultivation was Rs. -882.04. Thus the benefit cost ratio was found to be 1:0.98.

Table 37. Cost of Cultivation of mango in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	14.95	3127.00	7.17
2	Bullock		Pairs/day	0.15	92.63	0.21
3	Tractor		Hours	2.36	1662.73	3.81
4	Machinery		Hours	0.15	90.37	0.21
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	166.36	22590.21	51.81
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	9.80	1285.54	2.95
8	Fertilizer + micronutrients		Quintal	4.60	3608.94	8.28
9	Pesticides (PPC)		Kgs / ltrs	0.51	514.58	1.18
10	Irrigation		Number	11.46	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	34.80	0.08
14	Land revenue and Taxes			0.00	6.59	0.02
II	**Cost B1**					
16	Interest on working capital				3359.97	7.71
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				36373.35	83.41
III	**Cost B2**					
18	Rental Value of Land				550.00	1.26
19	**Cost B2 = (Cost B1 + Rental value)**				36923.35	84.68
IV	**Cost C1**					
20	Family Human Labour			12.20	2717.41	6.23
21	**Cost C1 = (Cost B2 + Family Labour)**				39640.77	90.91
V	**Cost C2**					
22	Risk Premium				0.50	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				39641.27	90.91
VI	**Cost C3**					
24	Managerial Cost				3964.13	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				43605.39	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		64.09	149549.91	
		b) Main Crop Sales Price (Rs.)			2333.33	
b.	Gross Income (Rs.)				149549.91	
c.	Net Income (Rs.)				105944.52	
d.	Cost per Quintal (Rs./q.)				680.35	
e.	Benefit Cost Ratio (BC Ratio)				1:3.43	

Cost of Cultivation of Bengal gram: The data regarding the cost of cultivation of bengalgram in Kamanuru-2 micro watershed is presented in Table 38. The results indicate that, the total cost of cultivation for bengalgram was Rs. 44731.17. The gross income realized by the farmers was Rs. 61379.50. The net income from bengalgram cultivation was Rs. 16648.33. Thus the benefit cost ratio was found to be 1:1.37.

Table 38. Cost of Cultivation of Bengal gram in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	40.75	6730.75	15.05
2	Bullock		Pairs/day	0.62	370.50	0.83
3	Tractor		Hours	2.47	1976.00	4.42
4	Machinery		Hours	0.62	494.00	1.10
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	135.85	20377.50	45.56
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	4.94	988.00	2.21
8	Fertilizer + micronutrients		Quintal	5.56	5026.45	11.24
9	Pesticides (PPC)		Kgs / ltrs	0.62	617.50	1.38
10	Irrigation		Number	0.00	0.00	0.00
13	Depreciation charges			0.00	11.12	0.02
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				3241.25	7.25
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				39836.36	89.06
III	**Cost B2**					
18	Rental Value of Land				333.33	0.75
19	**Cost B2 = (Cost B1 + Rental value)**				40169.70	89.80
IV	**Cost C1**					
20	Family Human Labour			2.47	494.00	1.10
21	**Cost C1 = (Cost B2 + Family Labour)**				40663.70	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				40664.70	90.91
VI	**Cost C3**					
24	Managerial Cost				4066.47	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				44731.17	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		14.82	60762.00	
		b) Main Crop Sales Price (Rs.)			4100.00	
	By Product	e) Main Product (q)		6.18	617.50	
		f) Main Crop Sales Price (Rs.)			100.00	
b.	Gross Income (Rs.)				61379.50	
c.	Net Income (Rs.)				16648.33	
d.	Cost per Quintal (Rs./q.)				3018.30	
e.	Benefit Cost Ratio (BC Ratio)				1:1.37	

Cost of Cultivation of groundnut: The data regarding the cost of cultivation of groundnut in Kamanuru-2 micro watershed is presented in Table 39. The results indicate that, the total cost of cultivation for groundnut was Rs. 41425.25. The gross income realized by the farmers was Rs. 45304.12. The net income from groundnut cultivation was Rs. 8671.21. Thus the benefit cost ratio was found to be 1:1.24.

Table 39. Cost of Cultivation of groundnut in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	28.15	4220.72	10.19
2	Bullock		Pairs/day	0.75	436.80	1.05
3	Tractor		Hours	2.41	1798.21	4.34
4	Machinery		Hours	0.48	352.44	0.85
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	116.31	17787.78	42.94
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	8.22	1202.88	2.90
8	Fertilizer + micronutrients		Quintal	4.61	4241.16	10.24
9	Pesticides (PPC)		Kgs / ltrs	0.87	868.78	2.10
10	Irrigation		Number	2.02	0.00	0.00
13	Depreciation charges			0.00	68.02	0.16
14	Land revenue and Taxes			0.00	3.95	0.01
II	**Cost B1**					
16	Interest on working capital				2892.14	6.98
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				33872.88	81.77
III	**Cost B2**					
18	Rental Value of Land				360.00	0.87
19	**Cost B2 = (Cost B1 + Rental value)**				34232.88	82.64
IV	**Cost C1**					
20	Family Human Labour			16.93	3425.84	8.27
21	**Cost C1 = (Cost B2 + Family Labour)**				37658.72	90.91
V	**Cost C2**					
22	Risk Premium				0.60	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				37659.32	90.91
VI	**Cost C3**					
24	Managerial Cost				3765.93	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				41425.25	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		16.77	57368.33	
		b) Main Crop Sales Price (Rs.)			3420.00	
	By Product	e) Main Product (q)		9.27	2038.48	
		f) Main Crop Sales Price (Rs.)			220.00	
b.	Gross Income (Rs.)				59406.81	
c.	Net Income (Rs.)				17981.56	
d.	Cost per Quintal (Rs./q.)				2469.56	
e.	Benefit Cost Ratio (BC Ratio)				1:1.43	

Cost of Cultivation of Cotton: The data regarding the cost of cultivation of cotton in Kamanuru-2 micro watershed is presented in Table 40. The results indicate that, the total cost of cultivation for cotton was Rs. 32163.01. The gross income realized by the farmers was Rs. 68571.91. The net income from cotton cultivation was Rs. 36408.90. Thus the benefit cost ratio was found to be 1:2.13.

Table 40. Cost of Cultivation of Cotton in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	47.05	7468.81	23.22
2	Bullock		Pairs/day	1.18	705.71	2.19
3	Tractor		Hours	2.35	1881.90	5.85
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	2.35	1529.05	4.75
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	5.88	1176.19	3.66
8	Fertilizer + micronutrients		Quintal	8.23	9127.24	28.38
9	Pesticides (PPC)		Kgs / ltrs	1.18	1176.19	3.66
10	Irrigation		Number	7.06	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	197.60	0.61
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				1561.16	4.85
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				24827.15	77.19
III	**Cost B2**					
18	Rental Value of Land				1000.00	3.11
19	**Cost B2 = (Cost B1 + Rental value)**				25827.15	80.30
IV	**Cost C1**					
20	Family Human Labour			18.82	3410.95	10.61
21	**Cost C1 = (Cost B2 + Family Labour)**				29238.10	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				29239.10	90.91
VI	**Cost C3**					
24	Managerial Cost				2923.91	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				32163.01	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		12.94	68571.91	
		b) Main Crop Sales Price (Rs.)			5300.00	
b.	Gross Income (Rs.)				68571.91	
c.	Net Income (Rs.)				36408.90	
d.	Cost per Quintal (Rs./q.)				2485.92	
e.	Benefit Cost Ratio (BC Ratio)				1:2.13	

Cost of cultivation of Tomato: The data regarding the cost of cultivation of tomato in Kamanuru-2 micro watershed is presented in Table 41. The results indicate that, the total cost of cultivation for tomato was Rs. 36338.34. The gross income realized by the farmers was Rs. 111921.87. The net income from tomato cultivation was Rs. 75583.53. Thus the benefit cost ratio was found to be 1:3.08.

Table 41. Cost of Cultivation of tomato in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	38.59	8104.69	22.30
2	Bullock		Pairs/day	1.24	679.25	1.87
3	Tractor		Hours	3.40	2547.19	7.01
4	Machinery		Hours	0.62	370.50	1.02
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	2316.24	3550.62	9.77
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	12.35	2470.00	6.80
8	Fertilizer + micronutrients		Quintal	4.01	5619.25	15.46
9	Pesticides (PPC)		Kgs / liters	927.02	1543.75	4.25
10	Irrigation		Number	1.24	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	108.22	0.30
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				1583.23	4.36
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				26576.70	73.14
III	**Cost B2**					
18	Rental Value of Land				250.00	0.69
19	**Cost B2 = (Cost B1 + Rental value)**				26826.70	73.82
IV	**Cost C1**					
20	Family Human Labour			24.39	6198.16	17.06
21	**Cost C1 = (Cost B2 + Family Labour)**				33024.86	90.88
V	**Cost C2**					
22	Risk Premium				10.00	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**				33034.86	90.91
VI	**Cost C3**					
24	Managerial Cost				3303.49	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				36338.34	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		111.92	111921.87	
		b) Main Crop Sales Price (Rs.)			1000.00	
b.	Gross Income (Rs.)				111921.87	
c.	Net Income (Rs.)				75583.53	
d.	Cost per Quintal (Rs./q.)				324.68	
e.	Benefit Cost Ratio (BC Ratio)				1:3.08	

Cost of cultivation of navane: The data regarding the cost of cultivation of navane in Kamanuru-2 micro watershed is presented in Table 42. The results indicate that, the total cost of cultivation for navane was Rs. 17541.23. The gross income realized by the farmers was Rs. 29078.64. The net income from navane cultivation was Rs. 11537.41. Thus the benefit cost ratio was found to be 1:1.66.

Table 42. Cost of Cultivation of navane in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	17.63	2930.32	16.71
2	Bullock		Pairs/day	0.97	527.68	3.01
3	Tractor		Hours	2.92	1751.45	9.98
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	5.28	734.26	4.19
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	22.45	3143.64	17.92
8	Fertilizer + micronutrients		Quintal	3.07	2378.31	13.56
9	Pesticides (PPC)		Kgs / liters	0.00	0.00	0.00
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	24.40	0.14
14	Land revenue and Taxes			0.00	4.94	0.03
II	**Cost B1**					
16	Interest on working capital				750.75	4.28
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				12245.75	69.81
III	**Cost B2**					
18	Rental Value of Land				400.00	2.28
19	**Cost B2 = (Cost B1 + Rental value)**				12645.75	72.09
IV	**Cost C1**					
20	Family Human Labour			16.32	3300.82	18.82
21	**Cost C1 = (Cost B2 + Family Labour)**				15946.57	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				15946.57	90.91
VI	**Cost C3**					
24	Managerial Cost				1594.66	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				17541.23	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		15.72	29078.64	
		b) Main Crop Sales Price (Rs.)			1850.00	
b.	Gross Income (Rs.)				29078.64	
c.	Net Income (Rs.)				11537.41	
d.	Cost per Quintal (Rs./q.)				1115.98	
e.	Benefit Cost Ratio (BC Ratio)				1:1.66	

Cost of cultivation of paddy: The data regarding the cost of cultivation of paddy in Kamanuru-2 micro watershed is presented in Table 43. The results indicate that, the total cost of cultivation for paddy was Rs. 50986.93. The gross income realized by the farmers was Rs. 110091.43. The net income from paddy cultivation was Rs. 59104.50. Thus the benefit cost ratio was found to be 1:2.16.

Table 43. Cost of Cultivation of paddy in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	31.23	5045.86	9.90
2	Bullock		Pairs/day	0.00	0.00	0.00
3	Tractor		Hours	2.29	1834.86	3.60
4	Machinery		Hours	0.35	282.29	0.55
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	78.51	19627.68	38.50
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.82	564.57	1.11
8	Fertilizer + micronutrients		Quintal	8.47	8052.20	15.79
9	Pesticides (PPC)		Kgs / ltrs	1.59	1587.86	3.11
10	Irrigation		Number	6.35	0.00	0.00
13	Depreciation charges			0.00	12.70	0.02
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				3580.00	7.02
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				40591.30	79.61
III	**Cost B2**					
18	Rental Value of Land				166.67	0.33
19	**Cost B2 = (Cost B1 + Rental value)**				40757.97	79.94
IV	**Cost C1**					
20	Family Human Labour			30.35	5592.79	10.97
21	**Cost C1 = (Cost B2 + Family Labour)**				46350.75	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				46351.75	90.91
VI	**Cost C3**					
24	Managerial Cost				4635.18	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				50986.93	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		79.39	107180.36	
		b) Main Crop Sales Price (Rs.)			1350.00	
	By Product	e) Main Product (q)		19.41	2911.07	
		f) Main Crop Sales Price (Rs.)			150.00	
b.	Gross Income (Rs.)				110091.43	
c.	Net Income (Rs.)				59104.50	
d.	Cost per Quintal (Rs./q.)				642.21	
e.	Benefit Cost Ratio (BC Ratio)				1:2.16	

Cost of cultivation of sugarcane: The data regarding the cost of cultivation of sugarcane in Kamanuru-2 micro watershed is presented in Table 44. The results indicate that, the total cost of cultivation for sugarcane was Rs. 35639.63. The gross income realized by the farmers was Rs. 177840. The net income from sugarcane cultivation was Rs. 142200.37. Thus the benefit cost ratio was found to be 1:4.99.

Table 44. Cost of Cultivation of sugarcane in Kamanuru-2 micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	35.40	6175.00	17.33
2	Bullock		Pairs/day	0.00	0.00	0.00
3	Tractor		Hours	3.29	2634.67	7.39
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	4116.67	8233.33	23.10
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	4.12	823.33	2.31
8	Fertilizer + micronutrients		Quintal	7.41	7228.87	20.28
9	Pesticides (PPC)		Kgs / ltrs	0.82	823.33	2.31
10	Irrigation		Number	4.12	0.00	0.00
13	Depreciation charges			0.00	88.92	0.25
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				2053.18	5.76
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				28063.93	78.74
III	**Cost B2**					
18	Rental Value of Land				333.33	0.94
19	**Cost B2 = (Cost B1 + Rental value)**				28397.26	79.68
IV	**Cost C1**					
20	Family Human Labour			17.29	4001.40	11.23
21	**Cost C1 = (Cost B2 + Family Labour)**				32398.66	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				32399.66	90.91
VI	**Cost C3**					
24	Managerial Cost				3239.97	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				35639.63	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		741.00	177840.00	
		b) Main Crop Sales Price (Rs.)			240.00	
b.	Gross Income (Rs.)				177840.00	
c.	Net Income (Rs.)				142200.37	
d.	Cost per Quintal (Rs./q.)				48.10	
e.	Benefit Cost Ratio (BC Ratio)				1:4.99	

Adequacy of fodder: The data regarding the adequacy of fodder in Kamanuru-2 micro watershed is presented in Table 45. The results indicate that, 23.33 per cent of the households opined that dry fodder was adequate and 6.67 per cent of the households opined that green fodder was adequate. Around 6.67 per cent of the households opined that dry fodder was inadequate.

Table 45. Adequacy of fodder in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0.00	1	16.67	1	12.50	4	50.00	1	33.33	7	23.33
2	Inadequate-Dry Fodder	0	0.00	0	0.00	2	25.00	0	0.00	0	0.00	2	6.67
3	Adequate-Green Fodder	0	0.00	0	0.00	0	0.00	2	25.00	0	0.00	2	6.67
4	Inadequate-Green Fodder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Average annual gross income: The data regarding the average annual gross income in Kamanuru-2 micro watershed is presented in Table 46. The results indicate that the average annual gross income was Rs.123600 for landless farmers, for marginal farmers it was Rs.69908, for small farmers it was Rs.120494, for semi medium farmers it was Rs.101725, and for medium farmers it was Rs.68833.

Table 46. Average annual gross income in Kamanuru-2 micro watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Service/salary	32,000.00	0.00	27,875.00	25,000.00	0.00	19,433.33
2	Business	0.00	0.00	0.00	0.00	0.00	0.00
3	Wage	91,600.00	40,666.67	13,250.00	6,125.00	5,000.00	29,066.67
4	Agriculture	0.00	29,241.67	70,218.75	63,287.50	61,166.67	47,566.67
5	Farm income	0.00	0.00	0.00	0.00	0.00	0.00
6	Non Farm income	0.00	0.00	0.00	0.00	0.00	0.00
7	Dairy Farm	0.00	0.00	9,150.63	7,312.50	2,666.67	4,656.83
8	Goat Farming	0.00	0.00	0.00	0.00	0.00	0.00
Income(Rs.)		123,600.00	69,908.33	120,494.38	101,725.00	68,833.33	100,723.50

Table 47. Average annual expenditure in Kamanuru-2 micro watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Service/salary	50,000.00	0.00	8,333.33	35,000.00	0.00	4,833.33
2	Business	0.00	0.00	0.00	0.00	0.00	0.00
3	Wage	23,000.00	10,600.00	5,333.33	2,500.00	6,000.00	6,666.67
4	Agriculture	0.00	16,800.00	30,750.00	30,000.00	28,333.33	21,833.33
5	Farm income	0.00	0.00	0.00	0.00	0.00	0.00
6	Non Farm income	0.00	0.00	0.00	0.00	0.00	0.00
7	Dairy Farm	0.00	0.00	15,000.00	5,750.00	2,000.00	1,833.33
8	Goat Farming	0.00	0.00	0.00	0.00	0.00	0.00
Total		73,000.00	27,400.00	59,416.67	73,250.00	36,333.33	269,400.00
Average		14,600.00	4,566.67	7,427.08	9,156.25	12,111.11	8,980.00

Average annual expenditure: The data regarding the average annual expenditure in Kamanuru-2 micro watershed is presented in Table 47. The results indicate that the average annual expenditure is Rs. 14,600. For landless households it was Rs. 4,566.67, for marginal farmers it was Rs. 7,427.08, for small farmers it was Rs. 9,156.25, for semi medium farmers it was Rs. 12,111.11, and for medium farmers it was Rs. 8,980.

Horticulture species grown: The data regarding horticulture species grown in Kamanuru-2 micro watershed is presented in Table 48. The results indicate that, sampled households have grown 48 coconut, 80 custard apple, 1748 mango, 2 lemon and 1 sapota tree in their fields.

Table 48. Horticulture species grown in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	0	0	0	0	43	0	5	0	48	0
2	Custard apple	0	0	0	0	0	0	80	0	0	0	80	0
3	Mango	0	0	0	0	0	0	1,108	0	640	0	1,748	0
4	Lemon	0	0	0	0	0	0	2	0	0	0	2	0
5	Sapota	0	0	0	0	0	0	1	0	0	0	1	0

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

Forest species grown: The data regarding forest species grown in Kamanuru-2 micro watershed is presented in Table 49. The results indicate that, households have planted 1 teak trees, 45 neem trees and 5 tamarind trees in their field.

Table 49: Forest species grown in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		LF (0)		All (30)	
		F	B	F	B	F	B	F	B	F	B	F	B	F	B
1	Teak	0	0	0	0	1	0	0	0	0	0	0	0	1	0
2	Neem	0	0	10	0	24	0	7	0	4	0	0	0	45	0
3	Tamarind	0	0	0	0	5	0	0	0	0	0	0	0	5	0

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

Average Additional investment capacity: The data regarding average additional investment capacity in Kamanuru-2 micro watershed is presented in Table 50. The results indicate that, the average additional investment capacity with the households for land development was Rs.1733, for irrigation facility Rs.966, for improved crop production Rs.1000 and for improved livestock management Rs.700.

Table 50. Average Additional investment capacity in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)	MF (6)	SF (8)	SMF (8)	MDF (3)	All (30)
1	Land development	0.00	0.00	0.00	4,000.00	6,666.67	1,733.33
2	Irrigation facility	0.00	0.00	0.00	2,250.00	3,666.67	966.67
3	Improved crop production	0.00	0.00	0.00	2,250.00	4,000.00	1,000.00
4	Improved livestock management	0.00	0.00	0.00	2,000.00	1,666.67	700.00

Source of additional investment: The data regarding Source of additional investment in Kamanuru-2 micro watershed is presented in Table 51. The results indicate that, loan from bank was the source of additional investment capacity for 10 per cent of the

households for land development, 3.33 per cent for irrigation facility and 3.33 per cent for improved livestock management. Own funds was the source of investment for 10 per cent for irrigation facility, 6.67 per cent for improved crop production and 3.33 per cent for improved livestock management. Soft loans was the source of funds for 6.67 per cent for land development, 3.33 per cent for irrigation facility, 10 per cent for improved crop production and 6.67 per cent for improved livestock management.

Table 51: Source of additional investment in Kamanuru-2 micro watershed

Sl. No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Loan from bank	3	10.0	1	3.33	0	0.0	1	3.33
2	Own funds	0	0.0	3	10.0	2	6.67	1	3.33
3	Soft loan	2	6.67	1	3.33	3	10.0	2	6.67

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Kamanuru-2 micro watershed is presented in Table 52. The results indicated that, Bengalgram, cotton, maize, mango, navane and paddy were sold to the extent of 100 per cent. Bajra was sold to the extent of 94.44 per cent, groundnut to the extent of 83.33 per cent and sugarcane to the extent of 44.44 per cent.

Table 52. Marketing of the agricultural produce in Kamanuru-2 micro watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	36.0	2.0	34.0	94.44	1766.67
2	Bengalgram	24.0	0.0	24.0	100.0	4100.0
3	Cotton	11.0	0.0	11.0	100.0	5300.0
4	Groundnut	120.0	20.0	100.0	83.33	2850.0
5	Maize	223.0	0.0	223.0	100.0	1218.75
6	Mango	280.0	0.0	280.0	100.0	2333.33
7	Navane	32.0	0.0	32.0	100.0	1850.0
8	Paddy	150.0	0.0	150.0	100.0	1350.0
9	Sugarcane	900.0	500.0	400.0	44.44	240.0

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Kamanuru-2 micro watershed is presented in Table 53. The results indicated that, about 50 per cent of the famers have sold their produce in regulated markets and 40 per cent have sold their produce to local/village merchants.

Table 53. Marketing Channels used for sale of agricultural produce in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0.00	1	16.67	1	12.50	6	75.00	4	133.33	12	40.00
2	Regulated Market	0	0.00	5	83.33	8	100.00	2	25.00	0	0.00	15	50.00

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Kamanuru-2 micro watershed is presented in Table 54. The results indicated that, 70 per cent of the households have used tractor as a mode of transportation for their agricultural produce, 13.33 per cent have used truck and 6.67 per cent have used cart as a mode of transportation.

Table 54. Mode of transport of agricultural produce in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Head Load	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
2	Cart	0	0.00	2	33.33	0	0.00	0	0.00	0	0.00	2	6.67
3	Tractor	0	0.00	4	66.67	8	100.00	6	75.00	3	100.00	21	70.00
4	Bus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5	Truck	0	0.00	0	0.00	1	12.50	2	25.00	1	33.33	4	13.33

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Kamanuru-2 micro watershed is presented in Table 55. The results indicated that, 30 per cent of the households have experienced soil and water erosion problems in the farm i.e., 16.67 per cent of marginal farmers, 12.50 per cent of small farmers, 62.50 per cent of semi medium farmers and 66.67 per cent of medium farmers have experienced soil and water erosion problems.

Table 55. Incidence of soil and water erosion problems in Kamanuru-2 micro watershed

Sl. No.	Particulars	LL (5)		MF(6)		SF (8)		SMF (8)		MDF(3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0.00	1	16.67	1	12.50	5	62.50	2	66.67	9	30.00

Interest shown towards soil testing: The data regarding incidence of soil and water erosion problems in Kamanuru-2 micro watershed is presented in Table 56. The results indicated that, 90.32 per cent have shown interest in soil test.

Table 56. Interest shown towards soil testing in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		LF (0)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	5	83.33	8	100	8	100	3	100	0	0	24	80

Source of drinking water: The data regarding source of drinking water in Kamanuru-2 micro watershed is presented in Table 57. The results indicated that, piped supply was the major source of drinking water for 96.67 per cent of the households and bore well was the source of drinking water for 3.33 per cent of the households.

Table 57. Source of drinking water in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		LF (0)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	5	100	6	100	8	100	7	87.50	3	100	0	0	29	96.67
2	Bore Well	0	0	0	0	0	0	1	12.50	0	0	0	0	1	3.33

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Kamanuru-2 micro watershed is presented in Table 58. The results indicated that, 87.10 per cent used fire wood and 12.90 per cent of the households used LPG.

Table 58. Usage pattern of fuel for domestic use in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	5	100	6	100	7	87.50	8	100	3	100	29	96.67
2	LPG	0	0	0	0	1	12.50	0	0	0	0	1	3.33

Source of light: The data regarding source of light in Kamanuru-2 micro watershed is presented in Table 59. The results indicated that, Electricity was the major source of light for 100 per cent of the households in micro watershed.

Table 59. Source of light in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100.00	6	100.00	8	100.00	8	100.00	3	100.00	30	100.00

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facility in Kamanuru-2 micro watershed is presented in Table 60. The results indicated that, 70 per cent of the households possess sanitary toilet i.e. 20 per cent of the landless, 16.67 per cent of the marginal, 100 per cent of the small, 100 per cent of the semi medium and 100 per cent of the medium farmers.

Table 60. Existence of Sanitary toilet facility in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	1	20.00	1	16.67	8	100.00	8	100.00	3	100.00	21	70.00

Possession of PDS card: The data regarding possession of PDS card in Kamanuru-2 micro watershed is presented in Table 61. The results indicated that, 93.33 per cent of the sampled households possessed BPL card, and 6.67 per cent did not possess PDS card.

Table 61. Possession of PDS card in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100.00	6	100.00	7	87.50	7	87.50	3	100.00	28	93.33
2	Not Possessed	0	0.00	0	0.00	1	12.50	1	12.50	0	0.00	2	6.67

Participation in NREGA program: The data regarding participation in NREGA programme in Kamanuru-2 micro watershed is presented in Table 62. The results indicated that, 43.33 per cent of the households participated in NREGA programme.

Table 62. Participation in NREGA programme in Kamanuru-2 micro watershed

Sl. No.	Particulars	LL(5)		MF(6)		SF(8)		SMF(8)		MDF(3)		All(30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	5	100.00	1	16.67	2	25.00	2	25.00	3	100.00	13	43.33

Adequacy of food items: The data regarding adequacy of food items in Kamanuru-2 micro watershed is presented in Table 63. The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 53.33 per cent, oilseeds were adequate for 13.33 per cent, vegetables were adequate for 56.67 per cent, fruits were adequate for 56.67 per cent, milk was adequate for 86.67 per cent, eggs were adequate for 83.33 per cent and meat was adequate for 56.67 per cent of the households.

Table 63. Adequacy of food items in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	5	100	6	100	8	100	8	100	3	100	30	100
2	Pulses	2	40	5	83.33	4	50	4	50	1	33.33	16	53.33
3	Oilseed	0	0	2	33.33	0	0	2	25	0	0	4	13.33
4	Vegetables	3	60	2	33.33	5	62.50	4	50	3	100	17	56.67
5	Fruits	4	80	2	33.33	4	50	5	62.50	2	66.67	17	56.67
6	Milk	4	80	5	83.33	7	87.50	7	87.50	3	100	26	86.67
7	Egg	5	100	5	83.33	7	87.50	6	75	2	66.67	25	83.33
8	Meat	4	80	3	50	4	50	4	50	2	66.67	17	56.67

Response on Inadequacy of food items: The data regarding inadequacy of food items in Kamanuru-2 micro watershed is presented in Table 64. The results indicated that, pulses were inadequate for 46.67per cent, oilseeds were inadequate for 86.67 per cent, vegetables were inadequate for 46.67 per cent, fruits were inadequate for 40 per cent, milk was inadequate for 13.33 per cent, eggs were inadequate for 16.67 per cent and meat was inadequate for 43.33 per cent of the households.

Table 64. Response on Inadequacy of food items in Kamanuru-2 micro watershed

Sl.No.	Particulars	LL (5)		MF (6)		SF (8)		SMF (8)		MDF (3)		All (30)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
2	Pulses	3	60.00	1	16.67	4	50.00	4	50.00	2	66.67	14	46.67
3	Oilseed	5	100.00	5	83.33	8	100.00	5	62.50	3	100.00	26	86.67
4	Vegetables	2	40.00	5	83.33	3	37.50	4	50.00	0	0.00	14	46.67
5	Fruits	1	20.00	4	66.67	4	50.00	3	37.50	0	0.00	12	40.00
6	Milk	1	20.00	1	16.67	1	12.50	1	12.50	0	0.00	4	13.33
7	Egg	0	0.00	1	16.67	1	12.50	2	25.00	1	33.33	5	16.67
8	Meat	1	20.00	3	50.00	4	50.00	4	50.00	1	33.33	13	43.33

Farming constraints: The data regarding farming constraints experienced by households in Kamanuru-2 micro watershed is presented in Table 65. The results indicated that, lower fertility status of the soil was the constraint experienced by 83.33 per cent of the households, wild animal menace on farm field (83.33%), frequent incidence of pest and diseases (70%), inadequacy of irrigation water (70%), high cost of fertilizers and plant protection chemicals (80%), high rate of interest on credit (86.67%), low price for the agricultural commodities (86.67%), lack of marketing facilities in the area (80%), lack of transport for safe transport of the agricultural produce to the market (86.67%), less rainfall (13.33%) and inadequate extension services (63.33%).

Table 65. Farming constraints Experienced in Kamanuru-2 micro watershed

Sl. No.	Particulars	MF (6)		SF (8)		SMF(8)		MDF(3)		All (30)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	6	100	8	100	8	100	3	100	25	83.33
2	Wild animal menace on farm field	6	100	8	100	8	100	3	100	25	83.33
3	Frequent incidence of pest and diseases	5	83.33	8	100	6	75	2	66.67	21	70
4	Inadequacy of irrigation water	5	83.33	7	87.50	7	87.50	2	66.67	21	70
5	High cost of Fertilizers and plant protection chemicals	6	100	8	100	8	100	2	66.67	24	80
6	High rate of interest on credit	6	100	9	112.50	8	100	3	100	26	86.67
7	Low price for the agricultural commodities	7	116.67	8	100	8	100	3	100	26	86.67
8	Lack of marketing facilities in the area	6	100	8	100	7	87.50	3	100	24	80
9	Inadequate extension services	6	100	6	75	6	75	1	33.33	19	63.33
10	Lack of transport for safe transport of the Agril produce to the market.	7	116.67	8	100	8	100	3	100	26	86.67
11	Less rainfall	0	0	3	37.50	1	12.50	0	0	4	13.33

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 30 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 73 (53.68%) men and 63 (46.32%) women among the sampled households. The average family size of landless farmers' was 4.6, marginal farmers' was 4.33, small farmers' was 4.25, semi medium farmers' was 5.13 and medium farmers' was 4.

The data indicated that, 23 (16.91%) people were in 0-15 years of age, 57 (41.91%) were in 16-35 years of age, 44 (32.35%) were in 36-60 years of age and 12 (8.82 %) were above 61 years of age.

The results indicated that Kamanuru-2 had 31.62 per cent illiterates, 25.74 per cent of them had primary school education, 8.09 per cent of them had middle school education, 22.06 per cent of them had high school education, 7.35 per cent of them had PUC education, 0.74 per cent of them did ITI, and 1.47 per cent of them had degree education.

The results indicate that, 60 per cent of households practicing agriculture, 26.67 per cent of the households were agricultural laborers and 13.33 per cent were general labourers. The results indicate that agriculture was the major occupation for 38.97 per cent of the household members, 21.32 per cent were agricultural laborers, 9.56 per cent were general labour, 2.21 per cent had household industry, 5.15 per cent were in private, 16.91 per cent were students, 3.68 per cent were housewives and 2.21 per cent were children.

The results show that 100 per cent of the population in the micro watershed has not participated in any local institutions. The results indicate that 10 per cent of the households possess thatched house, 63.33 per cent of the households possess Katcha house and 26.67 per cent of them possess pucca house.

The results show that 100 per cent of the households possess TV, 80 per cent of the households possess Mixer grinder, 40 per cent of the households possess bicycle, 43.33 per cent of the households possess motor cycle, and 100 per cent of the households possess mobile phones. The results show that the average value of television was Rs.6333, mixer grinder was Rs.1666, bicycle was Rs. 1916, motor cycle was Rs.34384, auto was Rs.100000 and mobile phone was Rs.1435.

About 3.33 per cent of the households possess bullock cart, 13.33 per cent of them possess plough, 36.67 per cent of them posses sprayer, 93.33 per cent of them possess weeder, and 13.33 per cent of them possess chaff cutter. The results show that the average value of bullock cart was Rs.20000, plough was Rs.416, the average value of sprayer was Rs.2579, the average value of chaff cutter was Rs.2000, and the average value of weeder was Rs.63.

The results indicate that, 13.33 per cent of the households possess bullocks, 16.67 per cent of the households possess local cow, 3.33 per cent of the households possess crossbred cow, 3.23 per cent of the households possess buffalo and 3.33 per cent of them possess sheep.

The results indicate that, average own labour men available in the micro watershed was 1.84, average own labour (women) available was 1.36, average hired labour (men) available was 7.28 and average hired labour (women) available was 6.60. The results indicate that, 83.33 per cent of the households opined that the hired labour was adequate.

The results indicate that, households of the Kamanuru-2 micro watershed possess 16.54 ha (46.93%) of dry land and 18.70 ha (53.07%) of irrigated land. Marginal farmers possess 3.63 ha (100%) of dry land. Small farmers possess 10.88 ha (92.76%) of dry land and 0.85 ha (7.24%) of irrigated land. Semi medium farmers possess 2.02 ha (15.91%) of dry land and 10.70 ha (84.09%) of irrigated land. Medium farmers possess 7.15 ha (100%) of irrigated land.

The results indicate that, the average value of dry land was Rs. 356656 and average value of irrigated land was Rs. 459783. In case of marginal famers, the average land value was Rs. 633333 for dry land. In case of small famers, the average land value was Rs. 275567 for dry land and Rs. 940952 for irrigated land. In case of semi medium famers, the average land value was Rs. 296400 for dry land and Rs. 504653 for irrigated land. In case of medium famers, the average land value was Rs. 335483 for irrigated land.

The results indicate that, there were 6 functioning and 4 de-functioning bore wells in the micro watershed. There was 1 functioning and 1 defunctioning open well in the school. The results indicate that, bore well was the major irrigation source in the micro water shed for 20 per cent of the farmers, open well and tank each formed the source of irrigation for 3.33 per cent of the farmers. The results indicate that, the depth of bore well was found to be 29.36 meters and the depth of open well was found to be 3.56 meters. The results indicate that, small, semi medium and medium farmers had irrigated area of 0.85 ha, 8.86 ha and 5.80 ha respectively.

The results indicate that, farmers have grown bajra (1 ha), bengalgram (1.62 ha), cotton (0.85 ha), groundnut (7.12 ha), maize (11.21 ha), mango (6.11 ha), navane (2.11 ha), paddy (1.82 ha), redgram (1.73 ha) and sugarcane (1.21 ha).

Marginal farmers have grown bajra, groundnut, maize, navane, paddy. Small farmers have grown Bengalgram, cotton, maize, groundnut, navane and redgram. Semi medium farmers have grown groundnut, maize, mango and paddy. Medium farmers have grown maize, mango and sugarcane.

The results indicate that, the cropping intensity in Kamanuru-2 micro watershed was found to be 85.27 per cent. In case of marginal and small farmers it was 100 per cent, in case of semi medium farmers it was 99.36 per cent, and medium farmers had cropping intensity of 53.73 per cent.

The results indicate that, 86.67 per cent of the households have bank account and 53.33 per cent of the households have savings. The results indicate that, 46.67 per cent of the households have availed credit from different sources.

The results indicate that, 31.25 per cent of the households availed loan from commercial bank, 12.50 per cent availed loan from friends/relatives, 87.50 per cent availed loan from money lender and 6.25 per cent of the households obtained loan from SHGs/CBOs.

The results indicate that, landless, marginal, small, and semi medium farmers have availed Rs.60000, Rs.87000, Rs.155714, and Rs.243333 respectively. The results indicate that, 100 per cent of the households have borrowed loan from institutional sources for the purpose of agricultural production.

The results indicate that, the main purpose of borrowing credit from private sources was agricultural production which accounted for 57.14 per cent of those who borrowed credit. Another 28.57 per cent of the households borrowed for social functions and 14.29 per cent of the households borrowed for the purpose of construction of house or cattle shed. The results indicated that 100 per cent of the households did not repay their loan. Results indicated that 75 per cent of the households partially paid their loan and 25 per cent of the households did not repay their loan.

The results indicate that, around 31.58 per cent of the households opined that the rate of interest was higher in institutional sources; another 52.63 per cent opined that the loan amount helped to perform timely agricultural operations and 15.79 per cent of the households said that they were forced to sell the produce at low price to repay the loan in time.

The results indicate that, around 12.50 per cent of the households opined that credit was easily accessible, 25 per cent of the households opined that loan amount was adequate to fulfill the requirements, 37.50 per cent of the households opined that the credit helped to perform timely agricultural operations and 12.50 per cent opined that they were forced to sell the produce at low price to repay loan in time.

The results indicate that, the total cost of cultivation for maize was Rs. 22649.48. The gross income realized by the farmers was Rs. 26066.86. The net income from Maize cultivation was Rs. 3417.39, thus the benefit cost ratio was found to be 1:1.15. The total cost of cultivation for bajra was Rs. 28310.12. The gross income realized by the farmers was Rs. 28904.72. The net income from bajra cultivation was Rs. 594.59. Thus the benefit cost ratio was found to be 1:1.02. The total cost of cultivation for mango was Rs. 36079.54. The gross income realized by the farmers was Rs. 35197.50. The net income from mango cultivation was Rs. -882.04. Thus the benefit cost ratio was found to be 1:0.98. The total cost of cultivation for bengalgram was Rs. 44731.17. The gross income realized by the farmers was Rs. 61379.50. The net income from bengalgram cultivation was Rs. 16648.33. Thus the benefit cost ratio was found to be 1:1.37. The total cost of cultivation for groundnut was Rs. 41425.25. The gross income realized by the farmers was Rs. 45304.12. The net income from groundnut cultivation was Rs. 8671.21. Thus the benefit cost ratio was found to be 1:1.24. The total cost of cultivation for cotton was Rs. 32163.01. The gross income realized by the farmers was Rs. 68571.91. The net income from cotton cultivation was Rs. 36408.90. Thus the benefit cost ratio was found to be 1:2.13. The total cost of cultivation for tomato was Rs. 36338.34. The gross income realized by the farmers was Rs. 111921.87. The net income from tomato cultivation was Rs. 75583.53. Thus the benefit cost ratio was found to be 1:3.08. The total cost of cultivation for navane was Rs. 17541.23. The gross income realized by the farmers was Rs. 29078.64. The net income from navane cultivation was Rs. 11537.41. Thus the benefit cost ratio was found to be 1:1.66. The total cost of cultivation for paddy was Rs. 50986.93. The gross income realized by the farmers was Rs. 110091.43. The net income from paddy cultivation was Rs. 59104.50. Thus the benefit cost ratio was found to be 1:2.16. The total cost of cultivation for sugarcane was Rs. 35639.63. The gross income realized by the farmers was Rs. 177840. The net income from sugarcane cultivation was Rs. 142200.37. Thus the benefit cost ratio was found to be 1:4.99.

The results indicate that, 23.33 per cent of the households opined that dry fodder was adequate and 6.67 per cent of the households opined that green fodder was adequate. Around 6.67 per cent of the households opined that dry fodder was inadequate.

The results indicate that the average annual gross income was Rs.123600 for landless farmers, for marginal farmers it was Rs.69908, for small farmers it was Rs.120494, for semi medium farmers it was Rs.101725, and for medium farmers it was Rs.68833.

The results indicate that the average annual expenditure is Rs. 14,600. For landless households it was Rs. 4,566.67, for marginal farmers it was Rs. 7,427.08, for small farmers it was Rs. 9,156.25, for semi medium farmers it was Rs. 12,111.11, and for medium farmers it was Rs. 8,980.

The results indicate that, sampled households have grown 48 coconut, 80 custard apple, 1748 mango, 2 lemon and 1 sapota tree in their fields. The results indicate that, households have planted 1 teak trees, 45 neem trees and 5 tamarind trees in their field.

The results indicate that, the average additional investment capacity with the households for land development was Rs.1733, for irrigation facility Rs.966, for improved crop production Rs.1000 and for improved livestock management Rs.700.

The results indicate that, loan from bank was the source of additional investment capacity for 10 per cent of the households for land development, 3.33 per cent for irrigation facility and 3.33 per cent for improved livestock management. Own funds was the source of investment for 10 per cent for irrigation facility, 6.67 per cent for improved crop production and 3.33 per cent for improved livestock management. Soft loans was the source of funds for 6.67 per cent for land development, 3.33 per cent for irrigation facility, 10 per cent for improved crop production and 6.67 per cent for improved livestock management.

The results indicated that, Bengalgram, cotton, maize, mango, navane and paddy were sold to the extent of 100 per cent. Bajra was sold to the extent of 94.44 per cent, groundnut to the extent of 83.33 per cent and sugarcane to the extent of 44.44 per cent. The results indicated that, about 50 per cent of the famers have sold their produce in regulated markets and 40 per cent have sold their produce to local/village merchants.

The results indicated that, 70 per cent of the households have used tractor as a mode of transportation for their agricultural produce, 13.33 per cent have used truck and 6.67 per cent have used cart as a mode of transportation. The results indicated that, 30 per cent of the households have experienced soil and water erosion problems in the farm i.e., 16.67 per cent of marginal farmers, 12.50 per cent of small farmers, 62.50 per cent of semi medium farmers and 66.67 per cent of medium farmers have experienced soil and water erosion problems. The results indicated that, 90.32 per cent have shown interest in soil test.

The results indicated that, piped supply was the major source of drinking water for 96.67 per cent of the households and bore well was the source of drinking water for 3.33 per cent of the households.

The results indicated that, 87.10 per cent used fire wood and 12.90 per cent of the households used LPG. Electricity was the major source of light for 100 per cent of the households in micro watershed. The results indicated that, 70 per cent of the households possess sanitary toilet i.e. 20 per cent of the landless, 16.67 per cent of the marginal, 100 per cent of the small, 100 per cent of the semi medium and 100 per cent of the medium farmers.

The results indicated that, 93.33 per cent of the sampled households possessed BPL card, and 6.67 per cent did not possess PDS card. The results indicated that, 43.33 per cent of the households participated in NREGA programme.

The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 53.33 per cent, oilseeds were adequate for 13.33 per cent, vegetables were adequate for 56.67 per cent, fruits were adequate for 56.67 per cent, milk was adequate for 86.67 per cent, eggs were adequate for 83.33 per cent and meat was adequate for 56.67 per cent of the households.

The results indicated that, pulses were inadequate for 46.67per cent, oilseeds were inadequate for 86.67 per cent, vegetables were inadequate for 46.67 per cent, fruits were inadequate for 40 per cent, milk was inadequate for 13.33 per cent, eggs were inadequate for 16.67 per cent and meat was inadequate for 43.33 per cent of the households.

The results indicated that, lower fertility status of the soil was the constraint experienced by 83.33 per cent of the households, wild animal menace on farm field (83.33%), frequent incidence of pest and diseases (70%), inadequacy of irrigation water (70%), high cost of fertilizers and plant protection chemicals (80%), high rate of interest on credit (86.67%), low price for the agricultural commodities (86.67%), lack of marketing facilities in the area (80%), lack of transport for safe transport of the agricultural produce to the market (86.67%), less rainfall (13.33%) and inadequate extension services (63.33%).