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

KAMANURU-1 (4D3A9B2a) 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 Irakallaguda microwatershed in Koppal Taluk, Koppal District, Karnataka" for integrated development was taken up in collaboration with the State Agricutural Universities, IISC, KSRSAC, KSNDMC as Consortia partners. The project provides detailed land resource information at cadastral level (1:7920 scale) for all the plots and socio-economic status of farm households covering thirty per cent farmers randomely selected representing landed and landless class of farmers in the micro-watershed. The project report with the accompanying maps for the microwatershed will provide required detailed database for evolving effective land use plan, alternative land use options and conservation plans for the planners, administrators, agricutural extention personnel, KVK officials, developmental departments and other land users to manage the land resources in a sustainable manner.

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

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

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Kamanuru-1microwatershed 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 749 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 68 per cent is covered by soil, 28 per cent by rock out crops and four per cent by water bodies, settlements and others. The salient findings from the land resource inventory are summarized briefly below

- *The soils belong to 11 soil series and 33 soil phases (management units) and 5 Land management units.*
- *The length of crop growing period is <90 days and starts from 2nd week of August to 2nd week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 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 5 per cent of the soils are moderately shallow (50-75 cm), 18 per cent moderately deep (75- 100 cm) and 45 per cent is deep to very deep (100->150cm) soils.*
- *About 19 per cent is sandy (loamy sand) at the surface, 34 per cent loamy (sandy loam and sandy clay loam) and 15 per cent has clayey (sandy clay) soils at the surface.*
- *About 36 per cent of the area has non-gravelly (<15%) soils, 28 per cent has gravelly soils (15-35 % gravel) and 4 per cent very gravelly (35-60 %) soils.*
- *With respect to available water capacity 21 per cent of the area has very low (<50mm/m), 36 per cent of the area has low (51-100 mm/m), <1 per cent medium*

(101-150 mm/m) and 11 per cent area has very high (151->200mm/m) available water capacity.

- *An area of about 67 per cent has very gently sloping (1-3%) lands and <1 per cent has very gently sloping (3-5%) lands.*
- *An area of about 25 per cent is slightly eroded (e1), 43 per cent is moderately eroded (e2) and <1 per cent is severely eroded (e3) lands.*
- *An area of about 2 per cent is moderately acid (pH 5.5 to 6.0), 4 per cent is slightly acid (pH 6.0 to 6.5), 59 per cent has neutral (pH 6.5 to 7.3) soils, 3 per cent slightly alkaline (pH 7.3 to 7.8) and <1 per cent moderately alkaline (pH 7.8 to 8.4).*
- *The Electrical Conductivity (EC) of the soils are dominantly <2 dsm^{-1} indicating that soils are non saline.*
- *Organic carbon is medium (0.5-0.75%) in 60 per cent and high (>0.75%) in 9 per cent area of the soils.*
- *Available phosphorus is low (<23 kg/ha) in 11 per cent, medium (23-57 kg/ha) in 28 per cent and high (>57 kg/ha) in 30 per cent of the soils.*
- *Available potassium is low (<145 kg/ha) in 2 per cent and medium (145-337 kg/ha) in 67 per cent of the soils.*
- *Available sulphur is low (<10 ppm) in 63 per cent, medium (10-20 ppm) in 5 per cent and high (>20 ppm) in <1 per cent area of the soils.*
- *Available boron is low (<0.5 ppm) in 57 per cent and medium (0.5-1.0) in 12 per cent area of the microwatershed.*
- *Available iron is deficient in 15 per cent of the area and sufficient (>4.5 ppm) in 54 per cent of the area.*
- *Available zinc is deficient (<0.6 ppm) in 62 per cent and sufficient (>0.6 ppm) in 6 per cent of the microwatershed.*
- *Available manganese and copper are sufficient in the entire area.*
- *The land suitability for 28 major agricultural and horticultural crops grown in the microwatershed was assessed and the areas that are highly suitable (class S1) and moderately suitable (class S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price, and finally the demand and supply position.*

Land suitability for various crops in the microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*94 (13)*	*52 (7)*		*Pomegranate*	*-*	*183(24)*
Maize	*13 (2)*	*134 (18)*		*Guava*	*-*	*100(13)*
Bajra	*13(2)*	*211(28)*		*Jackfruit*	*-*	*100(13)*
Redgram	*-*	*123 (16)*		*Jamun*	*-*	*168(22)*
Bengal gram	*82(11)*	*83(11)*		*Musambi*	*82(11)*	*101(13)*
Groundnut	*-*	*326 (43)*		*Lime*	*82(11)*	*101(13)*
Sunflower	*82 (11)*	*42 (5)*		*Cashew*	*13(2)*	*147(20)*
Cotton	*82(11)*	*65(8)*		*Custard apple*	*94(13)*	*419(56)*
Chilli	*13(2)*	*51(7)*		*Amla*	*13(2)*	*501 (67)*
Tomato	*13(2)*	*51(7)*		*Tamarind*	*-*	*126(17)*
Drumstick	*-*	*353(47)*		*Marigold*	*13(2)*	*134(18)*
Mulbery	*-*	*473(63)*		*Chrysanthemum*	*13(2)*	*134(18)*
Mango	*-*	*27(4)*		*Jasmine*	*13(2)*	*51(7)*
Sapota	*-*	*100(13)*		*Crossandra*	*13(2)*	*52(7)*

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 5 identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and other horticulture crops.

- *Maintaining soil-health is vital for crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested to these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation and drainage line treatment plan has been prepared that would help in identifying the sites to be treated and also the type of structures required.*
- *As part of the greening programme, several tree species have been suggested to be planted in marginal and submarginal lands, field bunds and also in the hillocks, mounds and ridges. That would help in supplementing the farm income, provide fodder and fuel, and generate lot of biomass which in turn would help in maintaining the ecological balance and contribute to mitigating the climate change.*

Chapter 1

INTRODUCTION

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

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

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

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

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

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

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

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

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Kamanuru-1 micro-watershed is located in the central part of Karnataka in Koppal taluk and district (Fig2.1). It lies between $15^0$25' and $15^0$27' North latitudes and $76^0$11' and $76^0$15' East longitudes and covers an area of about 749 ha. It comprises parts of, Yalamageri and Kamanura villages. It is about 14 km from Koppal town and is bounded by Irakallagada on the north, Kenchanadoni and Karadigudda on the east, Kamanura on the south and Thalakanapura on the northwest and Hatti on the western side of the microwatershed.

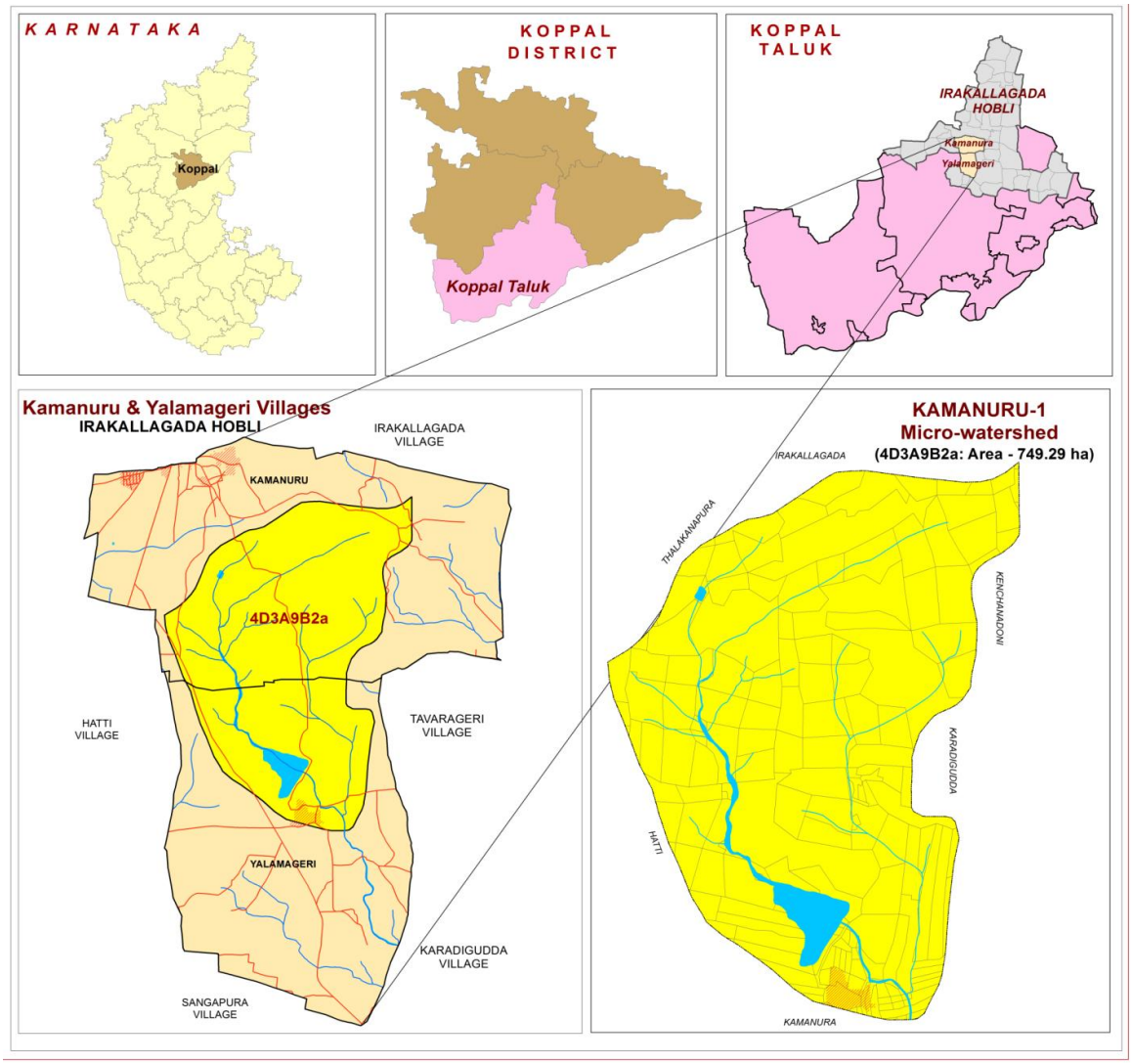

Fig.2.1 Location map of Kamanuru-1 Microwatershed

2.2 Geology

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

gray granite gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in Kamanuru-1 village. The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent paleo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2 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 mounds/ridges, summits, side slopes and very gently sloping uplands and nearly level

plains based on slope and its relief features. The elevation ranges from 533-571 m in the gently sloping uplands. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

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

2.5 Climate

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

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

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

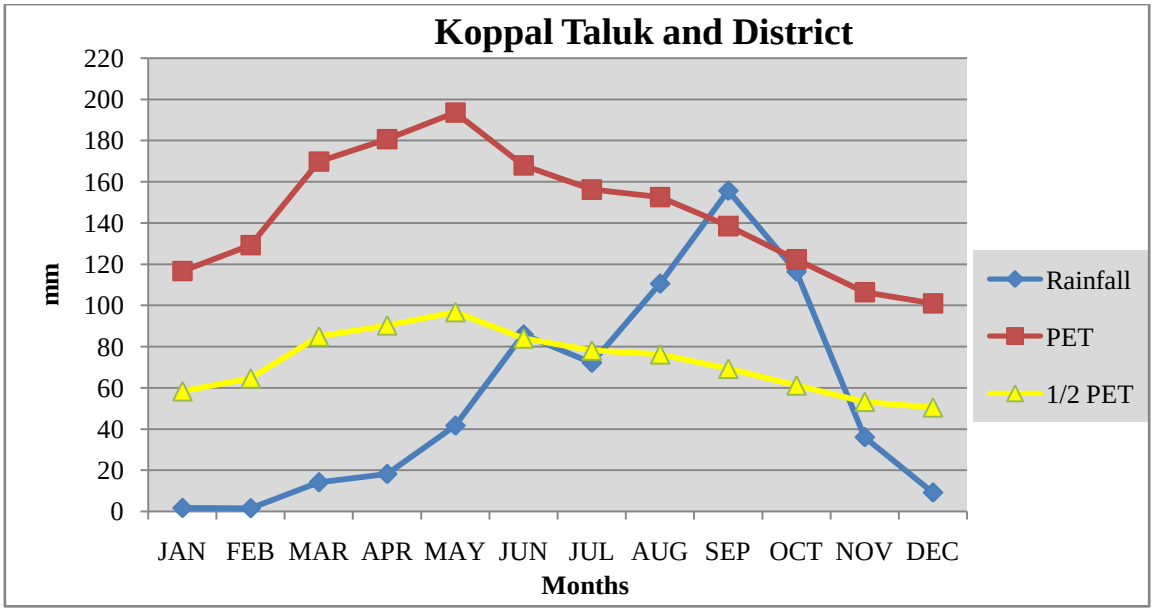

Fig. 2.3 Rainfall distribution in Koppal Taluk and District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Kamanuru-1 microwatershed

2.7 Land Utilization

About 91 per cent area (Table 2.2) in Koppal district is cultivated at present and about 17 per cent of the area is sown more than once. An area of about 3 per cent is currently barren. Forests occupy a small area of about 5 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and boulder areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, bajra, cotton, safflower, sunflower, red gram, horse gram, onion, mulberry, pomegranate, sugarcane, bengalgram and groundnut (Fig 2.5). While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Kamanuru-1 microwatershed is presented in Fig.2.6. Simultaneously, enumeration of existing wells (bore wells) is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells in Kamanuru-1 microwatershed is given in Fig 2.7.

Table 2.2 Land Utilization in Koppal District

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

Fig.2.5 (a) Different crops and cropping systems in Kamanuru-1 Microwatershed

Fig.2.5 (b) Different crops and cropping systems in Kamanuru-1 Microwatershed

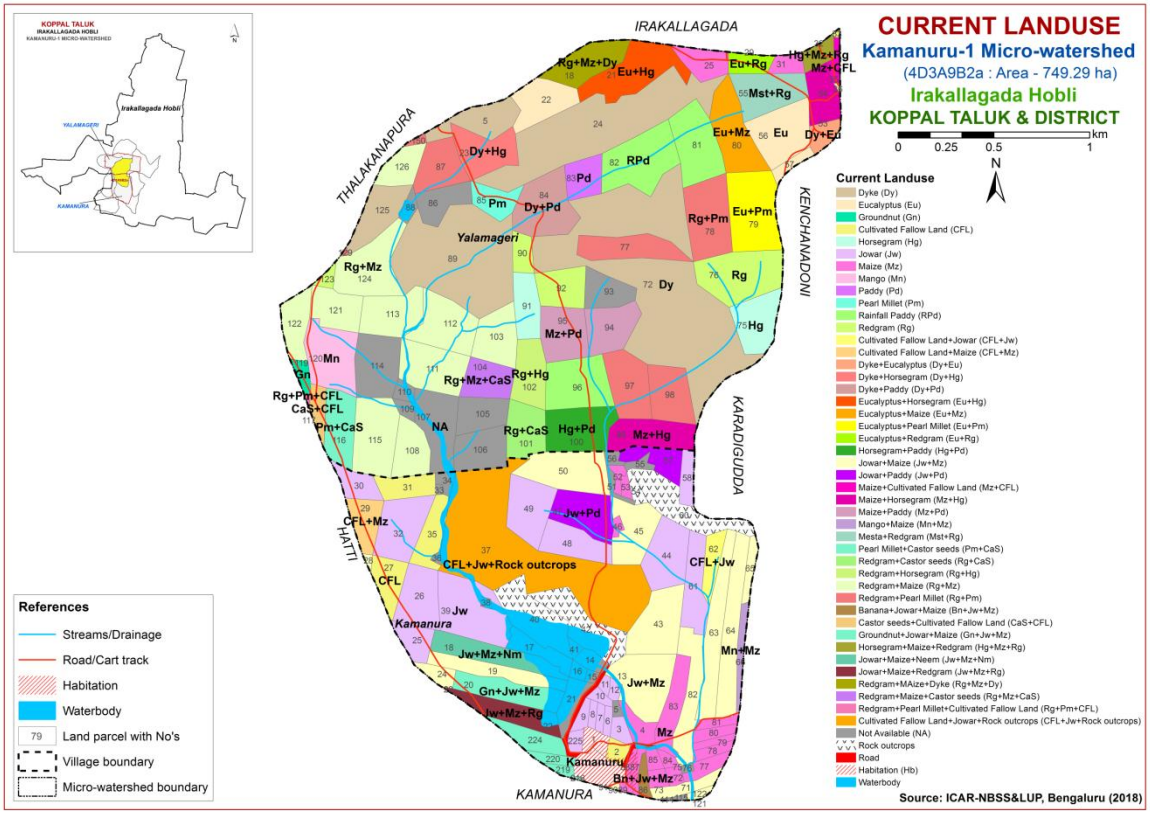

Fig.2.6 Current Land Use – Kamanuru-1 Microwatershed

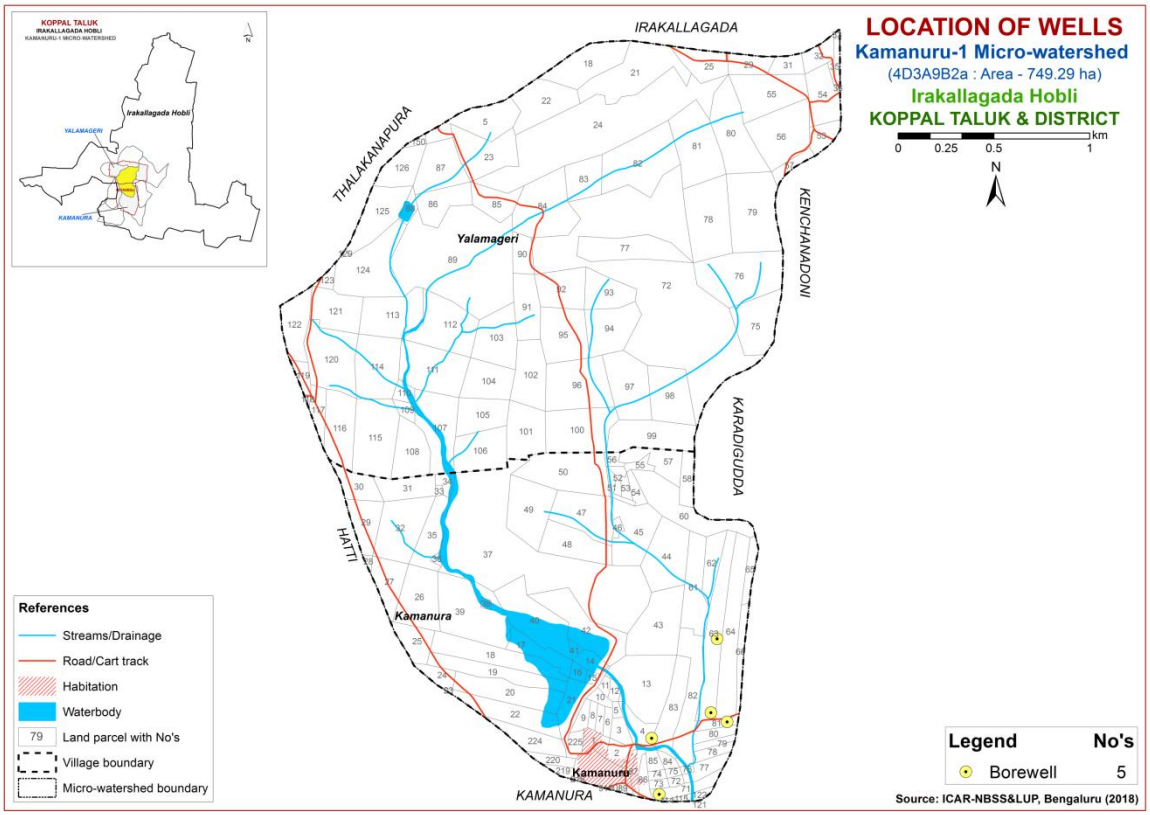

Fig.2.7 Location of wells– Kamanuru-1 Microwatershed

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-1 microwatershed by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site characteristics(slope, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units and showing their extent and geographic distribution on the microwatershed cadastral map. The detailed soil survey at 1:7920 scale was carried out in 749 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

Image Interpretation Legend for Physiography

G- Granite gneiss landscape

G1 Hills/ Ridges/ Mounds

G11 Summits

G12 Side slopes

G121 Side slopes with dark grey tones

G2 Uplands

G21 Summits

G22 Gently sloping uplands

G221 Gently sloping uplands, yellowish green (eroded)

G222 Gently sloping uplands, yellowish white (severely eroded)

G23 Very gently sloping uplands

G231 Very gently sloping uplands, yellowish green

G232 Very gently sloping uplands, medium green and pink

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

G234 Very gently sloping uplands, medium greenish grey

G235 Very gently sloping uplands, yellowish white (eroded)

G236 Very gently sloping uplands, dark green

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

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

DSe -Alluvial landscape

DSe 1 Summit

DSe 11 Nearly level Summit with dark grey tone

DSe 12 Nearly level Summit with medium grey tone

DSe 13 Nearly level Summit with whitish grey tone

DSe 14 Nearly level Summit with whitish tone (Calcareousness)

DSe 15 Nearly level Summit with pinkish grey tone

DSe 16 Nearly level Summit with medium pink tone

DSe 17 Nearly level Summit with bluish white tone

DSe 18 Nearly level Summit with greenish grey tone

DSe 2 Very genetly sloping

DSe 21 Very gently sloping, whitish tone

DSe 22 Very gently sloping, greyish pink tone

DSe 23 Very gently sloping, whitish grey tone

DSe 24 Very gently sloping, medium grey tone

DSe 25 Very gently sloping, medium pink tone

DSe 26 Very gently sloping, dark grey tone

DSe 27 Very gently sloping, bluish grey tone

DSe 28 Very gently sloping, greenish grey tone

DSe 29 Very gently sloping, Pinkish grey

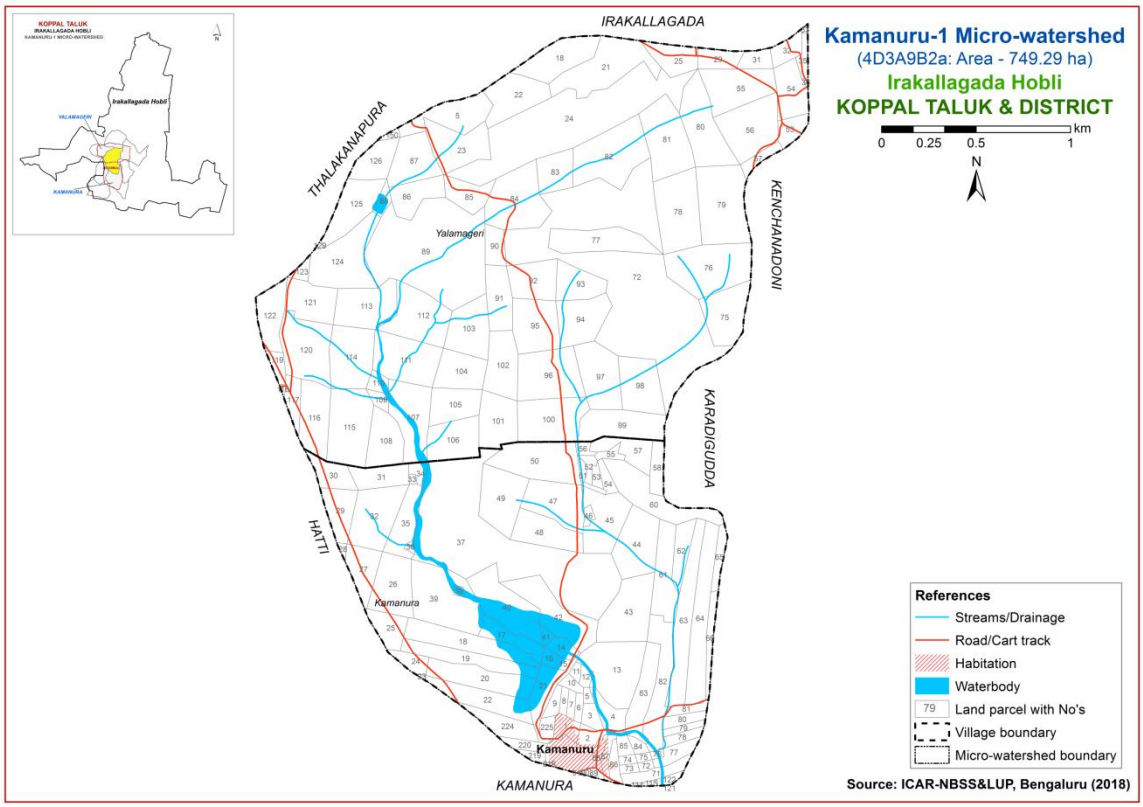

Fig 3.1 Scanned and Digitized Cadastral map of Kamanuru-1 Microwatershed

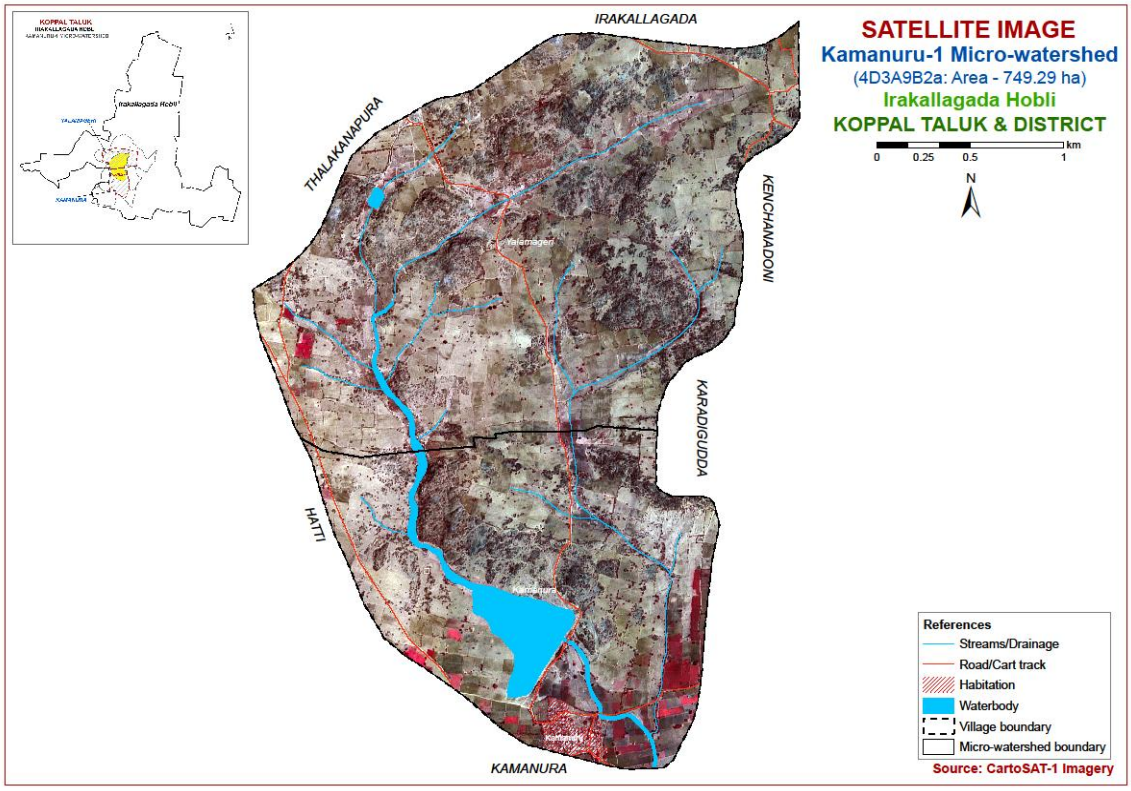

Fig.3.2 Satellite Image of Kamanuru-1 Microwatershed

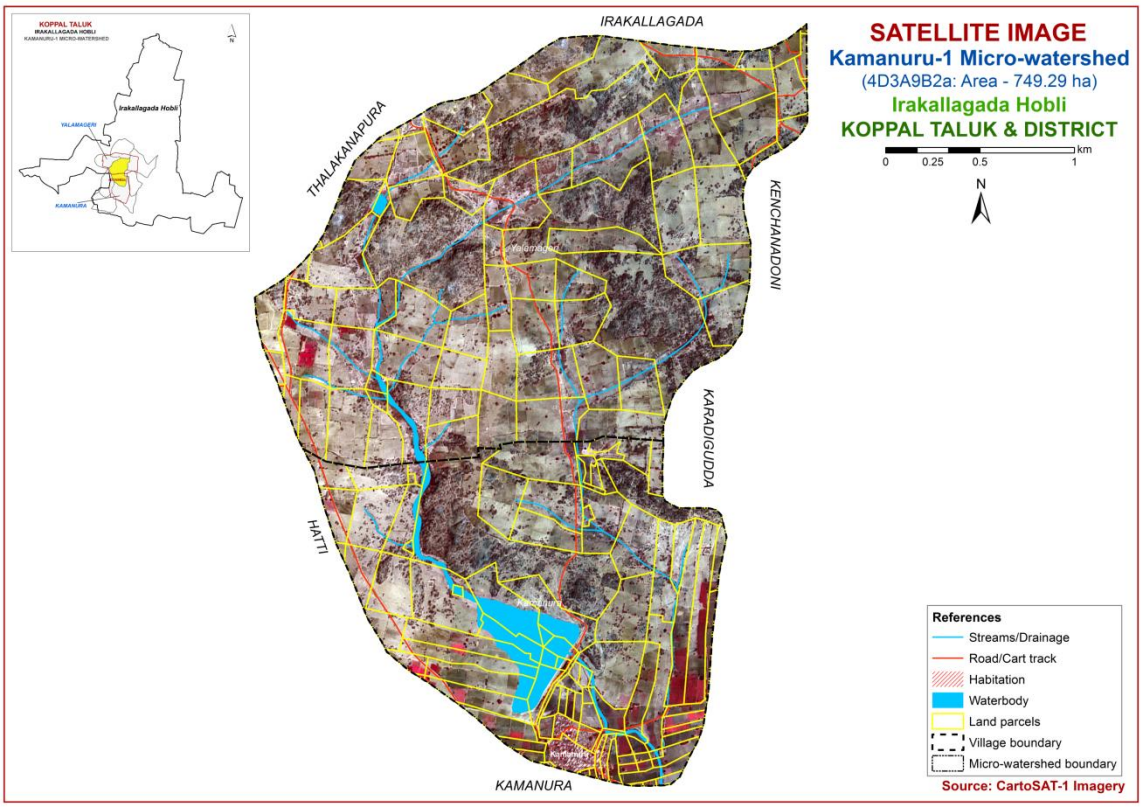

Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Kamanuru-1 Microwatershed

3.3 Field Investigation

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

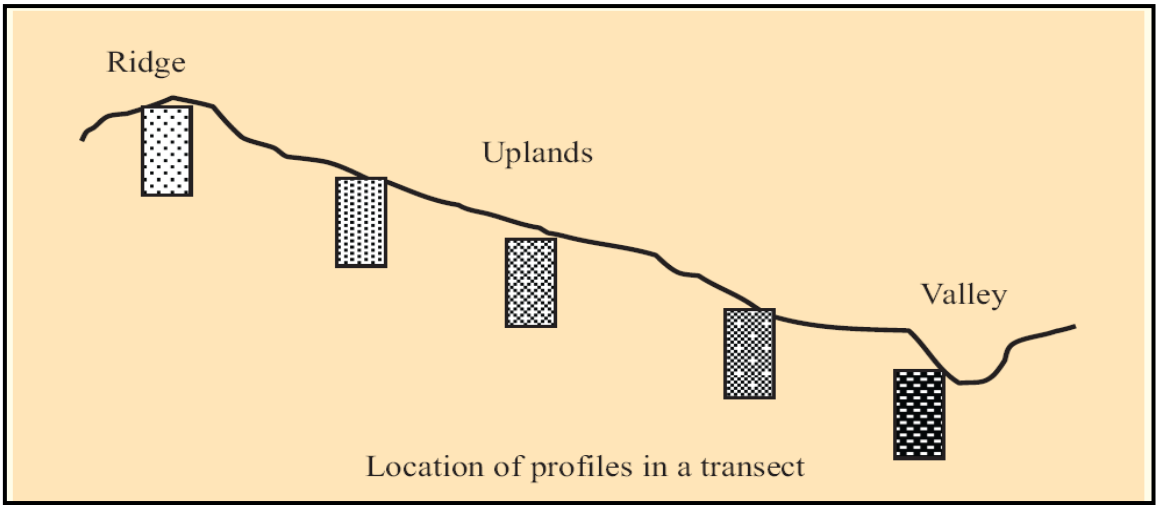

Fig: 3.4. Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, calcareousness, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 11 soil series were identified in Kamanuru-1 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	**Lakkur (LKR)**	50-75	2.5YR 2.5/3, 2.5/4, 3/4, 3/6	gsc	40-60	Ap-Bt-Bc-Cr	
2	**Mukhadahalli (MKH)**	50-75	5YR3/3,3/4,4/3, 5/4,6/6 2.5YR3/4	gscl	>35	Ap-Bt-Cr	

3	**Hooradhahalli (HDH)**	75-100	2.5YR2.5/4,3/4, 3/6	gsc-gc	>35	Ap-Bt-Cr	
4	**Bisarahalli (BSR)**	75-100	5 YR 3/3, 3/4	gsc	15-35	Ap-Bt-Cr	
5	**Bidanagere (BDG)**	75-100	5YR3/3,3/4,4/3,5/4 2.5YR3/4	gc	35-60	Ap-Bt-Cr	-
6	**Balapur (BPR)**	100-150	2.5YR2.5/4,3/4	gsc-gc	>35	Ap-Bt-Cr	
7	**Nagalapur (NGP)**	100-150	5YR2.5/2,3/2, 2.5YR3/6,4/6	gsc	>35	Ap-Bt-Cr	
8	**Niduvalalu (NDL)**	>150	2.5YR2.5/3,2.5/4, 3/3,4/6	gsc	>35	Ap-Bt	-
9	**Huliyapura (HLP)**	75-100	7.5YR3/3,4/6 10YR4/6	scl	-	Ap-Bw-C	-
Soils of Alluvial Landscape							
10	**Dambarahalli (DRL)**	75-100	10YR 2/1, 3/1, 4/3	c	<15	Ap-Bss-Ck	e-es
11	**Gatareddihal (GRH)**	100-150	10YR 2/1, 3/1, 2.5Y 4/3, 5/4	c	<15	Ap-Bss-BC-C	es

3.4 Soil Mapping

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

The soil map shows the geographic distribution of 33 mapping units representing 11 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2. The soil phase map (management units) shows the distribution of 33 phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one soil phase will have similar management needs and have to be treated accordingly.

3.5 Land management units

The 33 soil phases identified and mapped in the microwatershed were regrouped into five Land management units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land management units(LMU's) based on the management needs. One or more than one soil site characteristic having influence

on the management have been chosen for identification and delineation of LMUs. For Kamanuru-1 microwatershed, five soil and site characteristics, namely the soil depth, soil texture, slope, erosion and gravel content have been considered for defining LMUs. The Land management unitsare expected to behave similarly for a given level of management.

3.5 Laboratory Characterization

Soil samples for each series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2017 from farmer's fields in Kamanuru-1 microwatershed (73 samples) for fertility status (major and micronutrients) at 320 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Kamanuru-1 Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite gneiss landscape				
	LKR	Lakkur soils are moderately shallow (50-75 cm), well drained, have dark reddish brown to dark red, red gravelly sandy clay soils occurring on very gently to moderately sloping uplands under cultivation		**18 (2.38**
43		LKRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	18 (2.38)
	MKH	Mukhadahalli soils are moderately shallow (50-75 cm), well drained, have dark brown to reddish brown gravelly red sandy clay loam soils occurring on gently very gently to gently sloping uplands under cultivation		**23(3.04)**
75		MKHcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	4 (0.52)
76		MKHcB2	Sandy loam surface, slope 1-3%, moderate erosion	19 (2.52)
	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		**60(7.9)**
108		HDHcB1	Sandy clay surface, slope 1-3%, slight erosion	1 (0.13)
110		HDHcB2	Sandy loam surface, slope 1-3%, moderate erosion	2 (0.23)
111		HDHcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	7 (0.92)
119		HDHhB1	Sandy clay loam surface, slope 1-3%,	8 (1.08)

			slight erosion	
122		HDHhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	38 (5.03)
123		HDHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	4 (0.51)
	BSR	Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**13 (1.67)**
159		BSRcB1	Sandy loam surface, slope 1-3%, slight erosion	13 (1.67)
	BDG	Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly clay soils occurring on nearly level to gently sloping uplands under cultivation		**61(8.09)**
180		BDGcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	29 (3.87)
181		BDGcB1g2	Sandy loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)	6 (0.79)
187		BDGhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	26 (3.43)
	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		**159(21.32)**
215		BPRbB1g1	Loamy sand surface, slope 1-3%, slight erosion, gravelly (15-35%)	43 (5.75)
217		BPRbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	59 (7.94)
222		BPRcB1	Sandy loam surface, slope 1-3%, slight erosion	10 (1.31)
223		BPRcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	3 (0.41)
224		BPRcB2	Sandy loam surface, slope 1-3%, moderate erosion	1 (0.13)
225		BPRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	3 (0.45)
228		BPRhB1	Sandy clay loam surface, slope 1-3%, slight erosion	7 (0.88)
230		BPRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	5 (0.66)
231		BPRhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	17 (2.33)
233		BPRhC3g2	Sandy clay loam surface, slope 3-5%, severe erosion, very gravelly (35-60%)	7 (0.97)
237		BPRiB1	Sandy clay surface, slope 1-3%, slight erosion	4 (0.49)

	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay soils occurring on nearly level to gently sloping uplands under cultivation		**70(9.44)**
249		NGPbB1	Loamy sand surface, slope 1-3%, slight erosion	43 (5.68)
259		NGPhB1g2	Sandy clay loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)	16 (2.13)
265		NGPiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	11 (1.45)
	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		**27(3.57)**
291		NDLcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	13 (1.67)
300		NDLiB2	Sandy clay surface, slope 1-3%, moderate erosion	14 (1.9)
	HLP	Huliyapura soils are moderately deep (75-100 cm), well drained, have dark yellowish brown to dark brown, black sandy clay loam soils occurring on very gently sloping lowlands under cultivation		**1 (0.09)**
438		HLPiB2	Sandy clay surface, slope 1-3%, moderate erosion	1 (0.09)
Soils of alluvial landscape				
	DRL	Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have dark brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**1 (0.08)**
342		DRLiB2	Sandy clay surface, slope 1-3%, moderate erosion	1 (0.08)
	GRH	Gatareddihal soils are deep (100-150 cm), moderately well drained, have light olive brown to very dark gray, calcareous sodic black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**82 (10.89)**
368		GRHiB2	Sandy clay surface, slope 1-3%, moderate erosion	82 (10.89)
999		Rock outcrops	Rock lands both bouldery and massive with little or no soil	208 (27.71)
1000	Others	Habitation and waterbody		30 (3.97)

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

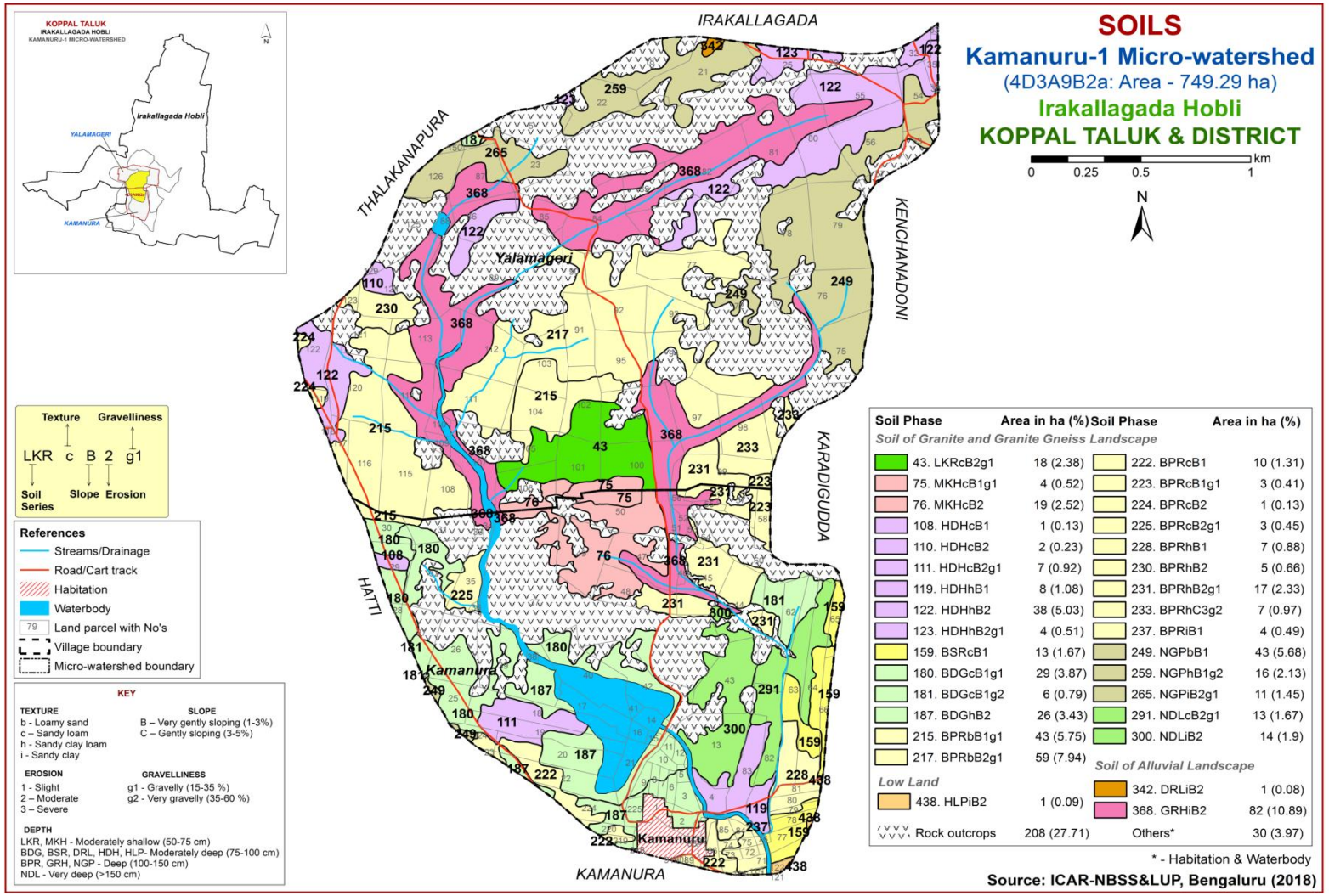

Fig 3.5 Soil Phase or Management Units- Kamanuru-1 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Kamanuru-1 microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluvial landscapes based on geology. In all, 11 soil series were identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by the parent material, climate, time and relief.

A brief description of each of the 11 soil series identified followed by 33 soil phases (management units) mapped (Fig. 3.5) are furnished below. The physical and chemical characteristics of soil series identified in Kamanuru-1 microwatershed are given in Table 4.1 along with soil classification. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Granite and Granite gneiss Landscape

In this landscape, 9 soil series were identified and mapped. Of these series, Balapur (BPR) series occupies maximum area of 159 ha (21 %) followed by Nagalapur (NGP) 70 ha (9 %). The brief description of the soil series along with the soil phases identified and mapped is given below.

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

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

Landscape and soil profile characteristics of Lakkur (LKR) Series

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

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

Landscape and soil profile characteristics of Mukhadahalli (MKH) Series

4.1.3 Hooradhahalli (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 loamy-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 (51-100 mm/m). Six soil phases were identified and mapped.

Landscape and soil profile characteristics of Hooradhahalli (HDH) Series

4.1.4 Bisarahalli (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 Bisarahalli series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Paleustalfs

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 (51-100 mm/m). One soil phase was identified and mapped.

Landscape and soil profile characteristics of Bisarahalli (BSR) Series

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

The thickness of the solum ranges from 78 to 99 cm. The thickness of A-horizon ranges from 12 to 19 cm. Its colour is in 2.5 YR and 5 YR hue with value 2 to 3 and chroma 3 to 4. The texture varies from sandy clay loam to sandy clay with 10 to 20 per cent gravel. The thickness of B-horizon ranges from 68 to 85 cm. Its colour is in 5 YR and 2.5 YR hue with value 3 to 5 and chroma 3 to 4. Its texture is gravelly clay with gravel content of 35-60 per cent. The available water capacity is low (51-100 mm/m). Three soil phases were identified and mapped.

Landscape Soil Profile Characteristics of Bidanagere (BDG) Series

4.1.6 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). Eleven soil phases were identified and mapped.

Landscape Soil Profile Characteristics of Balapur (BPR) Series

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

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). Three soil phases were identified and mapped.

Landscape Soil Profile Characteristics of Nagalapur (NGP) Series

4.1.8 Niduvalalu (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 weathered granite gneiss and occur on nearly level to very gently sloping uplands under cultivation. The Niduvalalu series has been classified as a member of the clayey – skeletal, mixed, isohyperthermic family of Rhodic Paleustalfs.

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 (51-100 mm/m). Two soil phases were identified and mapped.

Landscape Soil Profile Characteristics of Niduvalalu (NDL) Series

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

The thickness of the solum ranges from 75 to 98 cm. The thickness of A-horizon ranges from 18 to 22 cm. Its colour is in 5 YR and 10 YR hue with value 3 to 4 and chroma 4. The texture is sandy clay loam. The thickness of B-horizon ranges from 56 to 75 cm. Its colour is in 5 YR, 7.5 YR and10 YR hue with value 3 to 4 and chroma 2 to 6. Its texture is sandy clay. The available water capacity is low (51-100 mm/m). One soil phase was identified and mapped.

Landscape and soil profile characteristics of Huliyapura (HLP) Series

4.2 Soils of Alluvial Landscape

In this landscape, 2 soil series were identified and mapped. Of these series, Gatareddihal (GRH) series occupies maximum area of 82 ha (11%). The brief description of the soil series along with the soil phases identified and mapped is given below.

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

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

Landscape and soil profile characteristics of Dambarahalli (DRL) Series

4.2.2 Gatareddihal (GRH) Series: Gatareddihal soils are deep (100-150 cm), moderately well drained have black or dark grey to light olive brown calcareous sodic clay soils. They are developed from alluvium and occur on nearly level to very gently sloping uplands under cultivation. The Gatareddihal soil series has been classified as member of the very fine, smectitic, isohyperthermic (calc) family of Sodic Haplustepts.

The thickness of the solum ranges from 102 to 149 cm. The thickness of A-horizon ranges from 12 to 19 cm. Its colour is in 7.5 YR, 10 YR hue with value 3 to 4 and chroma 1 to 6. The texture is sandy clay loam to clay. The thickness of B-horizon ranges from 86 to 117 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 and chroma 2 to 6. Texture is clay with less than 15 per cent gravel and are calcareous. The available water capacity is very high (>200 mm/m). One soil phase was identified and mapped.

Landscape and soil profile characteristics of Gatareddihal (GRH) Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Kamanuru-1 microwatershed

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

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-21	8.18	-	-	0.30	0.56	0.94	-	-	0.31	0.55	0.86	12.19	0.69	100.00	4.51
21-35	8.17	-	-	0.30	0.52	1.29	-	-	0.19	0.84	1.03	22.18	0.63	100.00	3.79
35-56	7.95	-	-	0.46	0.48	1.99	-	-	0.24	0.58	0.82	22.94	0.60	100.00	2.53

Contd…

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

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

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

Contd…

Soil Series: 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: Bisarahalli (BSR) **Pedon:** R-9
Location: $15^0$25'21.0"N, $76^0$11'42.0"E Hatti village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore **Classification:** Fine, mixed isohyperthermic Typic 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
0-14	Ap	70.11	9.29	20.60	22.31	15.97	11.98	9.83	10.03	20	scl	13.22	7.81
14-57	Bt1	47.27	7.52	45.20	27.04	8.28	4.61	2.10	5.24	25	sc	16.39	13.31
57-80	Bt2	41.93	8.67	49.40	21.95	6.83	4.76	4.66	3.73	30	c	21.41	15.41
80-99	Bt3	49.02	9.87	41.11	19.90	10.78	6.84	6.42	5.08	40	sc	21.82	14.24

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-14	6.59	-	-	0.12	0.73	-	4.47	1.77	0.06	0.53	6.82	8.80	0.43	77.55	6.00
14-57	7.02	-	-	0.04	0.48	-	5.85	2.31	0.06	0.20	8.43	14.70	0.33	57.32	1.36
57-80	7.00	-	-	0.05	0.28	-	11.74	2.26	0.08	0.22	14.31	15.60	0.32	91.73	1.44
80-99	6.90	-	-	0.06	0.18	-	13.70	2.16	0.08	0.14	16.08	16.50	0.40	97.44	0.83

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, Tumakuru district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic, Typic Rhodustalfs

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

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

Contd…

Series Name: Nagalapur (NGP) **Pedon :** R-10
Location: $15^0$26'38.0"N, $76^0$10'27.0" E Budashettynala village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey- skeletal, mixed isohyperthermic Typic 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
0-16	Ap	78.43	6.36	15.21	25.23	18.82	14.04	13.22	7.12	30	sl	9.32	5.56
16-38	Bt1	46.97	8.53	44.51	14.33	12.34	7.43	6.80	6.07	30	sc	18.70	13.79
38-58	Bt2	51.92	7.48	40.60	20.98	10.07	7.37	7.48	6.02	40	sc	17.93	13.75
58-81	Bt3	54.05	7.18	38.77	27.07	10.58	5.91	5.81	4.67	50	sc	17.92	11.87
81-104	Bt4	59.03	8.93	32.04	21.88	13.11	8.88	8.05	7.12	50	scl	16.63	10.55
104-126	BC	62.35	9.26	28.40	21.19	14.51	9.88	8.13	8.64	60	scl	15.03	10.06

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}							%	%
0-16	6.77	-	-	0.09	0.82	-	3.52	2.14	0.18	0.03	5.87	7.10	0.47	82.70	0.46
16-38	6.89	-	-	0.06	0.57	-	9.35	3.85	0.10	0.21	13.50	14.70	0.33	91.87	1.40
38-58	6.80	-	-	0.06	0.52	-	8.76	3.42	0.10	0.26	12.55	14.20	0.35	88.35	1.85
58-81	6.84	-	-	0.06	0.32	-	7.67	2.77	0.10	0.58	11.12	12.90	0.33	86.18	4.48
81-104	6.86	-	-	0.05	0.20	-	6.97	2.07	0.09	0.95	10.07	11.90	0.37	84.59	7.95
104-126	6.70	-	-	0.07	0.10	-	5.53	1.77	0.07	0.73	8.09	9.40	0.33	86.09	7.77

Contd…

Series Name: Niduvalalu (NDL) **Pedon:** R-20

Location: $15^0$12'78.8"N, $75^0$57'44.0" E Raghunathanahalli village, Koppal Taluk and District

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **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
0-16	Ap	79.83	7.02	13.15	9.36	11.02	19.54	28.59	11.33	35-40	sl	14.30	5.17
16-31	Bt1	54.75	10.89	34.36	12.81	7.47	12.17	11.95	10.35	55-60	scl	24.67	14.17
31-44	Bt2	44.64	2.31	53.06	17.06	8.48	7.19	8.05	3.86	65-70	c	30.02	17.19
44-79	Bt3	47.28	2.50	50.21	24.17	8.20	6.07	5.96	2.88	65-70	sc	27.19	14.87
79-107	Bt4	47.79	8.17	44.04	13.38	5.72	11.11	11.87	5.72	60-65	sc	25.96	14.23
107-140	Bt5	46.16	3.57	50.27	21.75	7.57	6.40	6.72	3.73	60-65	sc	27.28	15.13
140-180	Bt6	49.47	3.94	46.59	22.49	8.21	6.29	7.78	4.69	65-70	sc	27.56	14.76

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-16	7.46	-	-	0.08	0.76		6.26	4.05	0.12	0.09	10.52	11.45	0.87	91.88	0.32
16-31	7.84	-	-	0.28	1.05	2.86	-	-	0.18	1.41	-	27.36	0.80	100.00	2.06
31-44	7.69	-	-	0.46	0.81	2.99	-	-	0.24	2.63	-	32.59	0.61	100.00	3.23
44-79	7.92	-	-	0.11	0.35	1.69	16.29	3.51	0.14	2.63	22.57	22.56	0.45	100.03	4.66
79-107	7.86	-	-	0.09	0.23	1.43	12.98	2.83	0.10	1.82	17.73	17.88	0.41	99.19	4.07
107-140	8.20	-	-	0.07	0.23	1.17	16.26	3.41	0.13	1.85	21.65	20.82	0.41	104.01	3.56
140-180	8.11	-	-	0.20	0.15	1.82	-	-	0.11	1.29	-	20.71	0.44	100.00	2.49

Contd…

Series Name: Dombarahalli (DRL) **Pedon:** R-8
Location: $15^0$13'96.2"N, $75^0$57'48.6" E Ragunathanahalli village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, isohyperthermic (calc) Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-15	Ap	28.25	19.48	52.27	4.76	4.44	4.87	8.23	5.95	-	c	39.86	27.20
15-27	BA1	21.55	20.00	58.45	3.76	2.76	3.43	6.30	5.30	-	c	46.35	34.84
27-45	Bss1	14.86	20.89	64.25	2.46	2.23	2.23	3.91	4.02	-	c	57.99	41.06
45-80	Bss2	10.42	19.04	70.54	1.74	1.97	1.27	2.78	2.66	-	c	66.36	36.24

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

Contd…

Series Name: Gatareddihal (GRH) Pedon**:** R-7

Location: $15^0$14'20.8"N, $76^0$04'28.4" E Gudlanur village, Koppal Taluk and District

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, isohyperthermic (calc) Sodic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	20.07	19.71	60.23	1.76	3.75	3.64	3.42	7.50	-	c	41.70	29.56
18-51	Bss1	15.11	17.47	67.42	3.16	3.04	2.25	3.38	3.27	-	c	59.43	38.52
51-80	Bss2	13.19	18.74	68.07	1.80	2.93	2.37	3.04	3.04	-	c	60.69	40.91
80-107	Bss3	17.54	19.50	62.96	2.46	4.13	3.24	4.25	3.46	-	c	57.25	37.31
107-131	BC	9.42	17.48	73.10	1.48	1.82	1.36	1.93	2.84	-	c	64.62	43.98

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	9.08	-	-	0.23	0.33	6.89	-	-	0.70	6.36	-	63.21	1.05	100.00	7.11
18-51	9.19	-	-	0.61	0.49	9.10	-	-	0.54	14.20	-	66.05	0.98	100.00	15.98
51-80	9.27	-	-	0.56	0.29	9.36	-	-	0.49	14.75	-	65.63	0.96	100.00	17.07
80-107	9.28	-	-	0.57	0.39	9.62	-	-	0.44	14.64	-	63.95	1.02	100.00	17.49
107-131	9.04	-	-	1.08	0.31	8.32	-	-	0.52	16.40	-	68.36	0.94	100.00	17.30

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The 33 soil map units identified in the Kamanuru-1 microwatershed are grouped under two land capability classes and six land capability subclasses (Fig. 5.1).

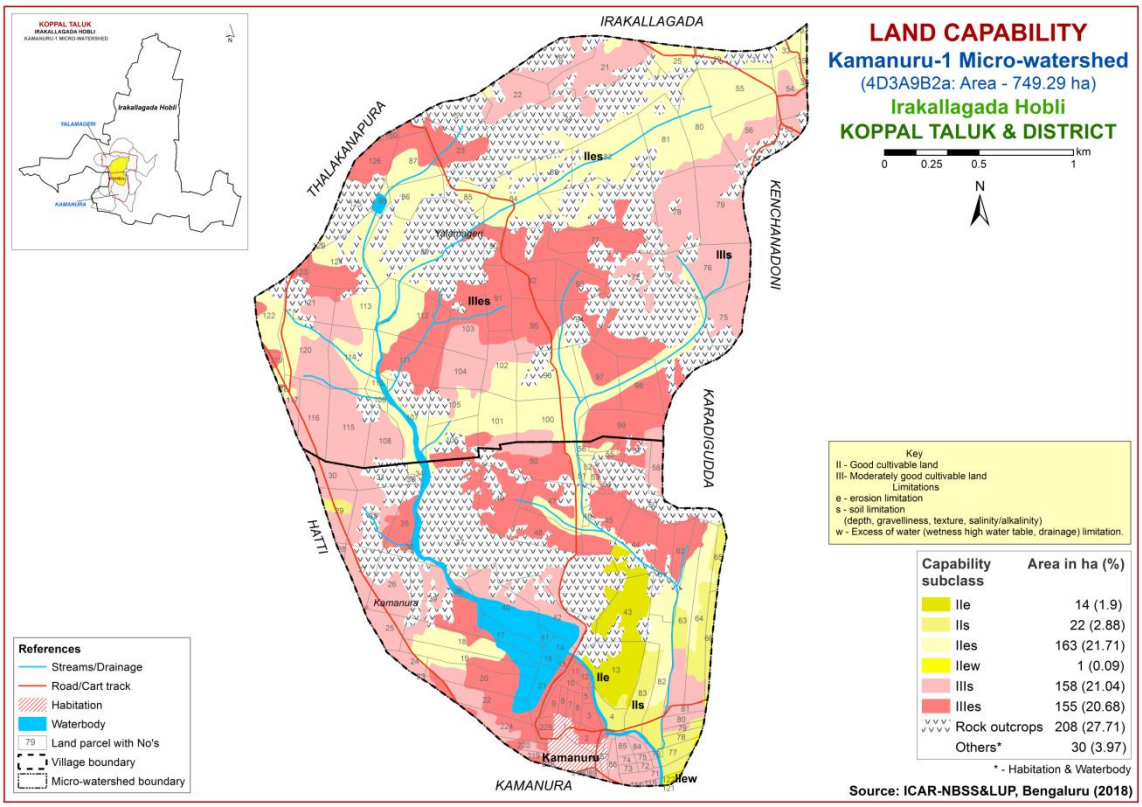

Fig. 5.1 Land Capability map of Kamanuru-1 Microwatershed

Entire area in the microwatershed is suitable for agriculture. Good lands (Class II) cover an area of about 200 ha (27%) and distributed in the major part of the microwatershed with minor problems of soil, drainage and erosion. Moderately good lands (Class III) occupy an area of about 313 ha (42%) and distributed in the northern and eastern part of the microwatershed with severe limitations of soil and erosion. An area of about 208 ha (28 %) is under rock lands and 30 ha (4%) is covered by habitation and water body.

5.2 Soil Depth

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

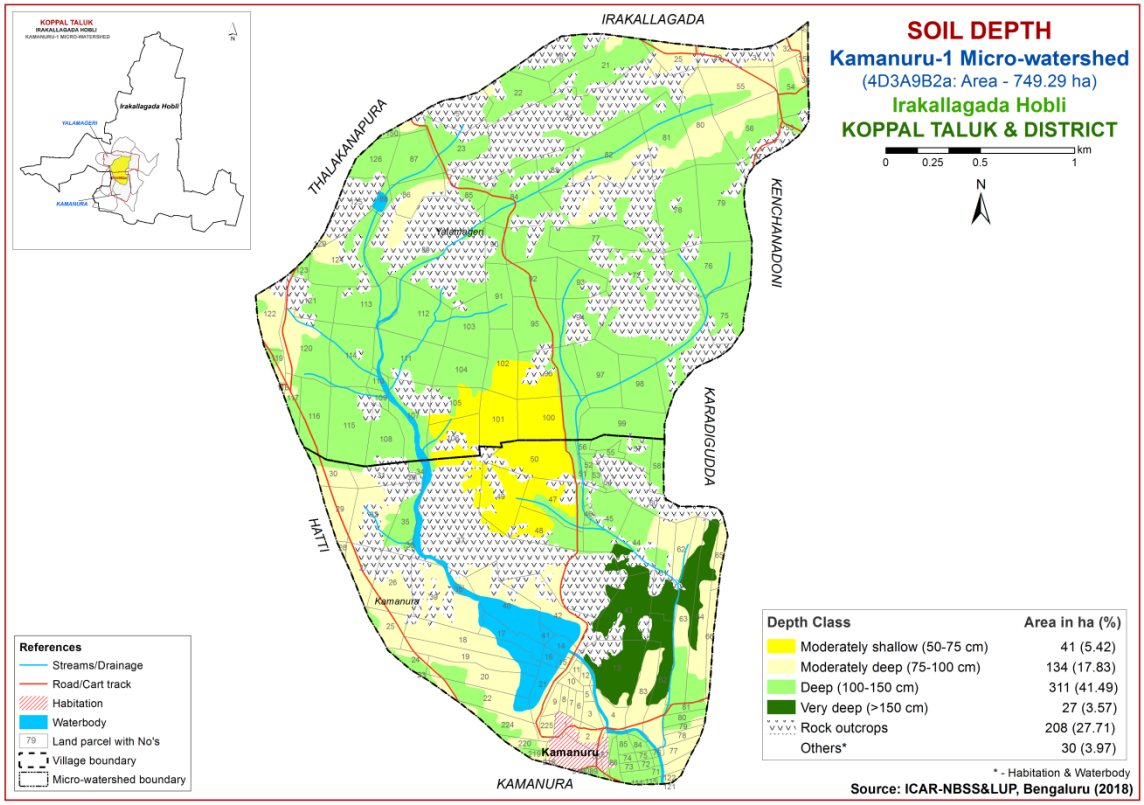

Fig. 5.2 Soil Depth map of Kamanuru-1 Microwatershed

Moderately shallow (50-75 cm) soils cover an area of about 41 ha (5%) and distributed in the central part of the microwatershed. An area of about 134 ha (18%) is

moderately deep soils (75-100 cm) and distributed in the southern, western and northern part of the microwatershed. Deep to very deep (100- >150 cm) soils occupy a maximum area of about 338 ha (45%) distributed in the major part of the microwatershed.

The most productive lands cover about 338 ha (45 %) where all climatically adopted 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 behavior, microbial activity and crop suitability. The textural classes used for LRI were used to classify and a surface soil texture map was generated. The area extent and their geographical distribution in the microwatershed is shown in Fig 5.3.

An area of about 145 ha (19 %) is sandy (loamy sand) at the surface and distributed in the eastern, central and western part of the microwatershed. Maximum area of about 255 ha (34%) is loamy (sandy loam and sandy clay loam) at the surface and distributed in the major part of the microwatershed. Clayey (sandy clay soils) cover an area of about 112 ha (15 %) and are distributed in the central, southern and northern part of the microwatershed.

The most productive lands with respect to surface soil texture are clayey soils that (15 %) have high potential for soil-water retention and availability and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other productive lands are loamy (34%) soils which also have high potential for soil- water retention and nutrient availability but have no drainage or other physical problems. The problem soils are sandy covering 19 per cent area that has moisture and nutrient constraints.

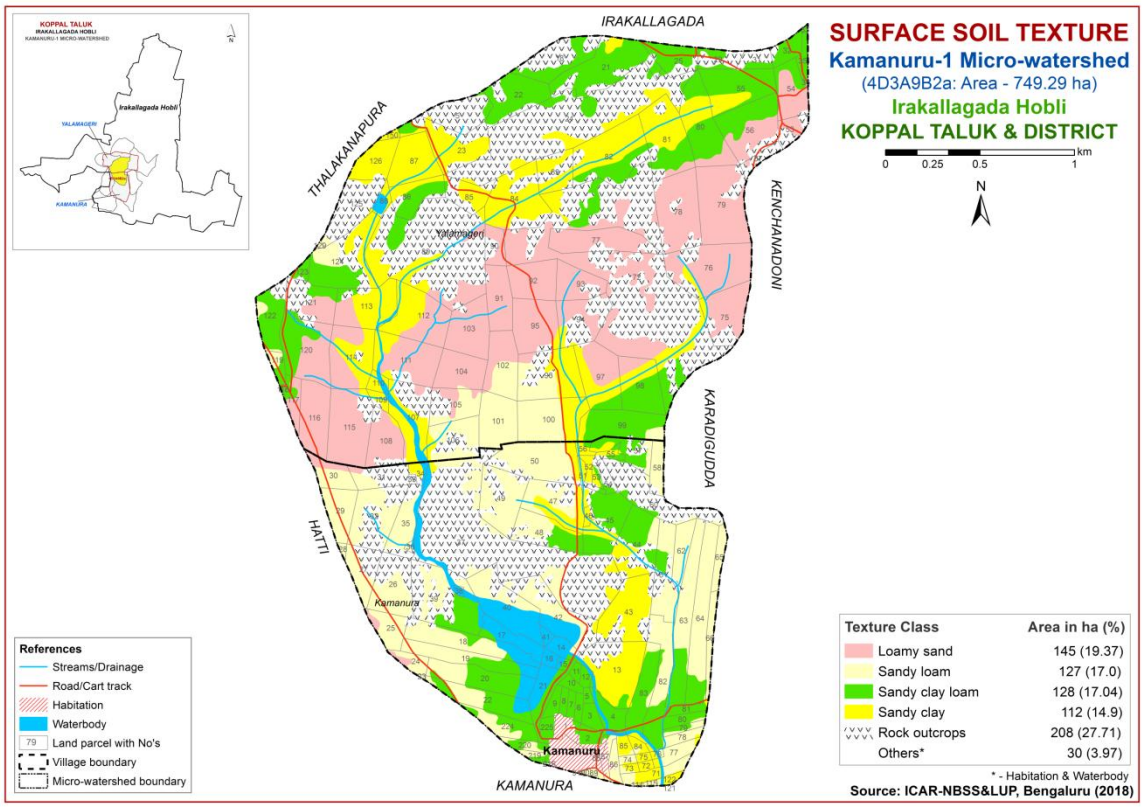

Fig. 5.3 Surface Soil Texture map of Kamanuru-1 Microwatershed

5.4 Soil Gravelliness

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

The soils that are non-gravelly (<15% gravel) covers a maximum area of about 271 ha (36 %) and distributed in the major part of the microwatershed. An area of about 211 ha (28 %) is covered by gravelly (15-35% gravel) soils and are distributed in the central and western part of the microwatershed. Very gravelly (35-60%) soils cover an area of about 29 ha (4%) and distributed in the eastern and northern part of the microwatershed (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 36 per cent. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem soils that are very gravelly (35-60%) cover about 4 per cent where only short duration crops can be grown.

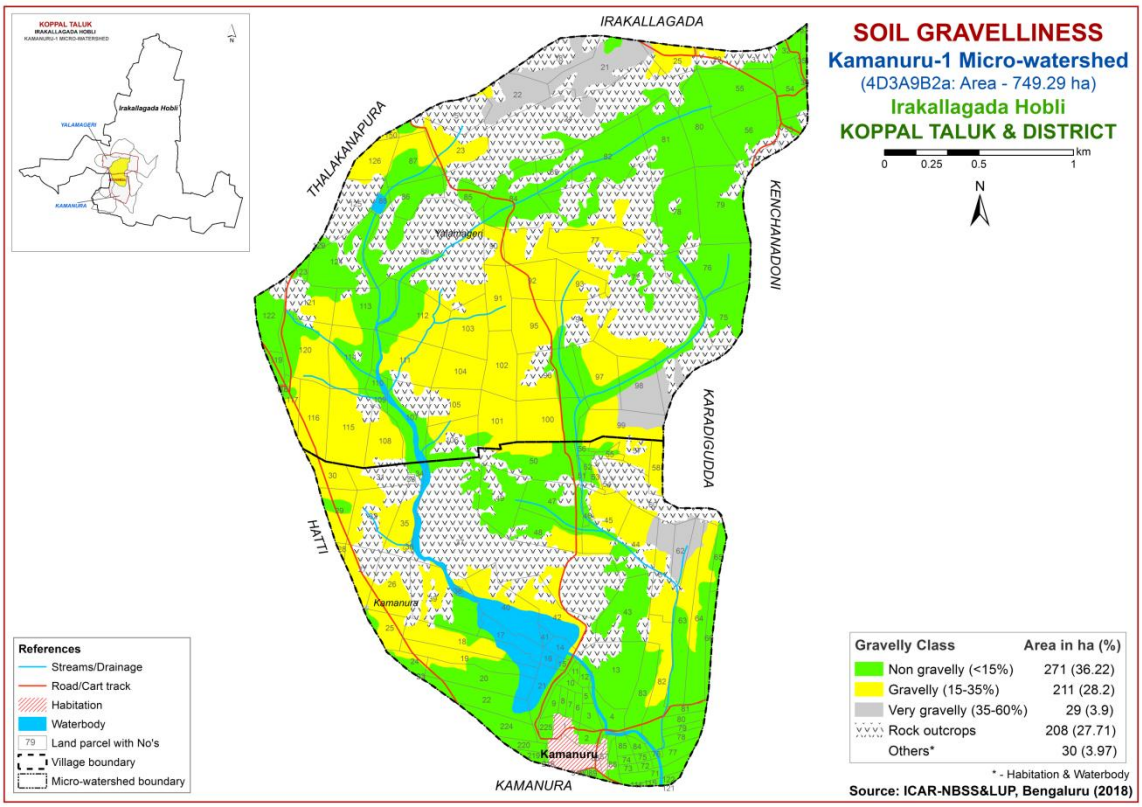

Fig. 5.4 Soil Gravelliness map of Kamanuru-1 Microwatershed

5.5 Available Water Capacity

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

An area of about 160 ha (21 %) in the microwatershed has soils that are very low (<50 mm/m) in available water capacity and are distributed in the southern, central and northern part of the microwatershed. Maximum area of about 269 ha (36 %) has soils that are low (51 to 100 mm/m) in available water capacity and are distributed in the major part of the microwatershed. An area of about 1 ha (<1 %) has soils that are medium (101-150 mm/m) in available water capacity and are distributed in the northern part of the microwatershed. An area of about 82 ha (11%) is very high (>200 mm/min) in available water capacity and distributed in the central part of the microwatershed.

An area of about 429 ha (57 %) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other

alternative uses. An area of about 82 ha (11%) has soils that have high potential (>200 mm/m) with regard to available water capacity where all climatically adapted long duration crops can be grown successfully.

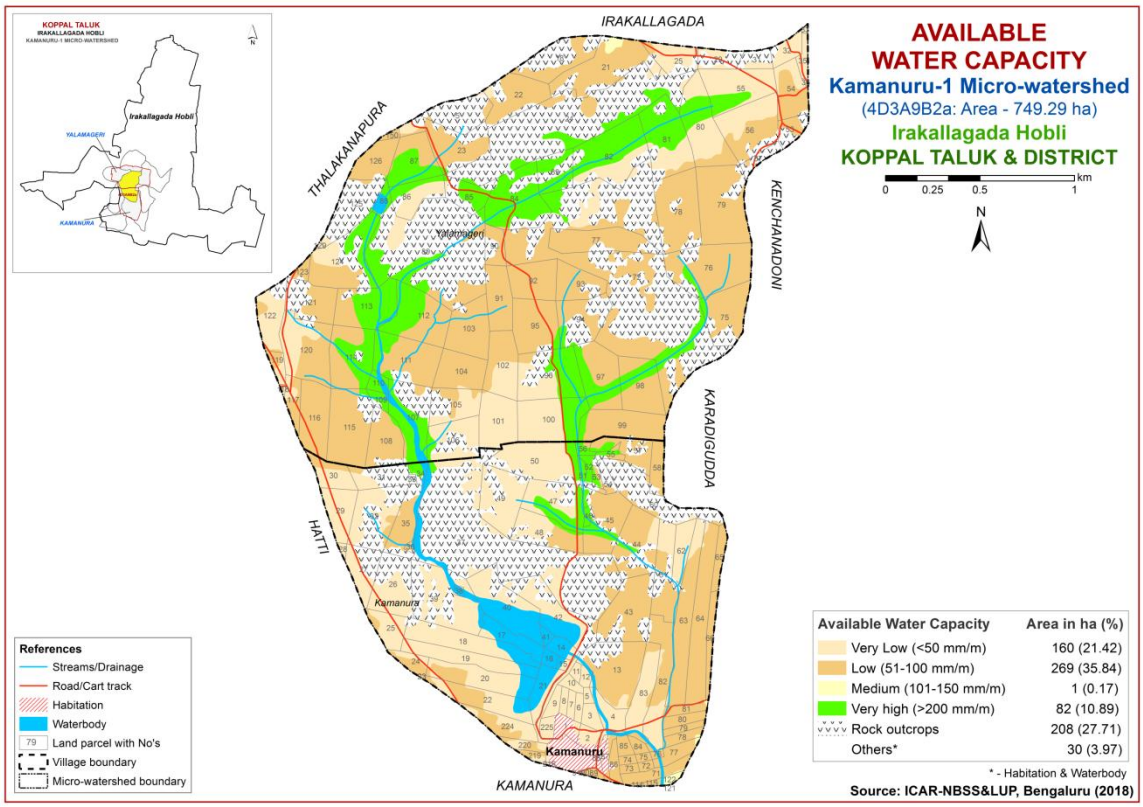

Fig. 5.5 Soil Available Water Capacity map of Kamanuru-1 Microwatershed

5.6 Soil Slope

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

Very gently sloping (1-3%) lands cover a maximum area of about 505 ha (67 %) and distributed in the major part of the microwatershed. Gently sloping (3-5%) lands cover an area of about 7 ha (<1%) and distributed in the eastern part of the microwatershed. In all these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures, except 3-5% sloping lands that require soil and water conservation measures.

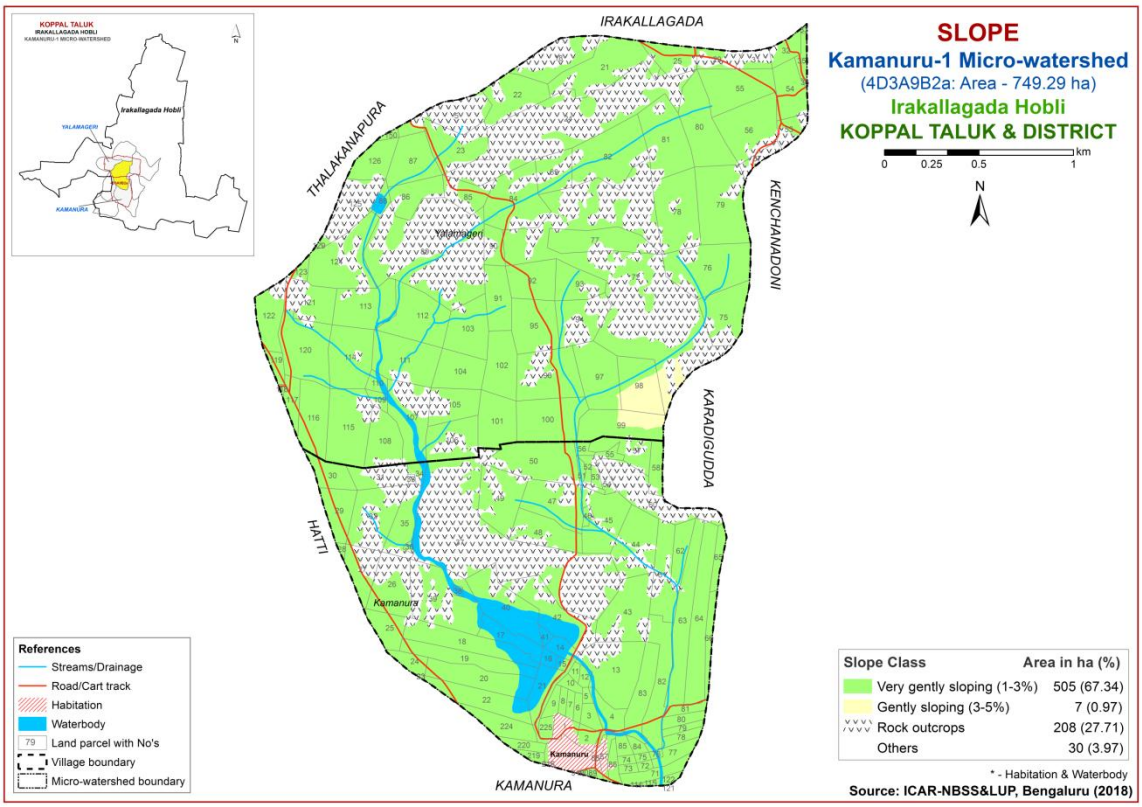

Fig. 5.6 Soil Slope map of Kamanuru-1 Microwatershed

5.7 Soil Erosion

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

Slightly eroded lands cover an area of about 185 ha (25 %) and distributed in the western, southern and eastern part of the microwatershed. Maximum area of about 319 ha (43 %) is moderately eroded (e2 class) and distributed in the major part of the microwatershed. Severely eroded (e3 class) lands cover an area of about 7 ha (<1%) and distributed in the eastern part of the microwatershed. Moderately and severely eroded lands are problematic and need appropriate soil and water conservation and other land development measures.

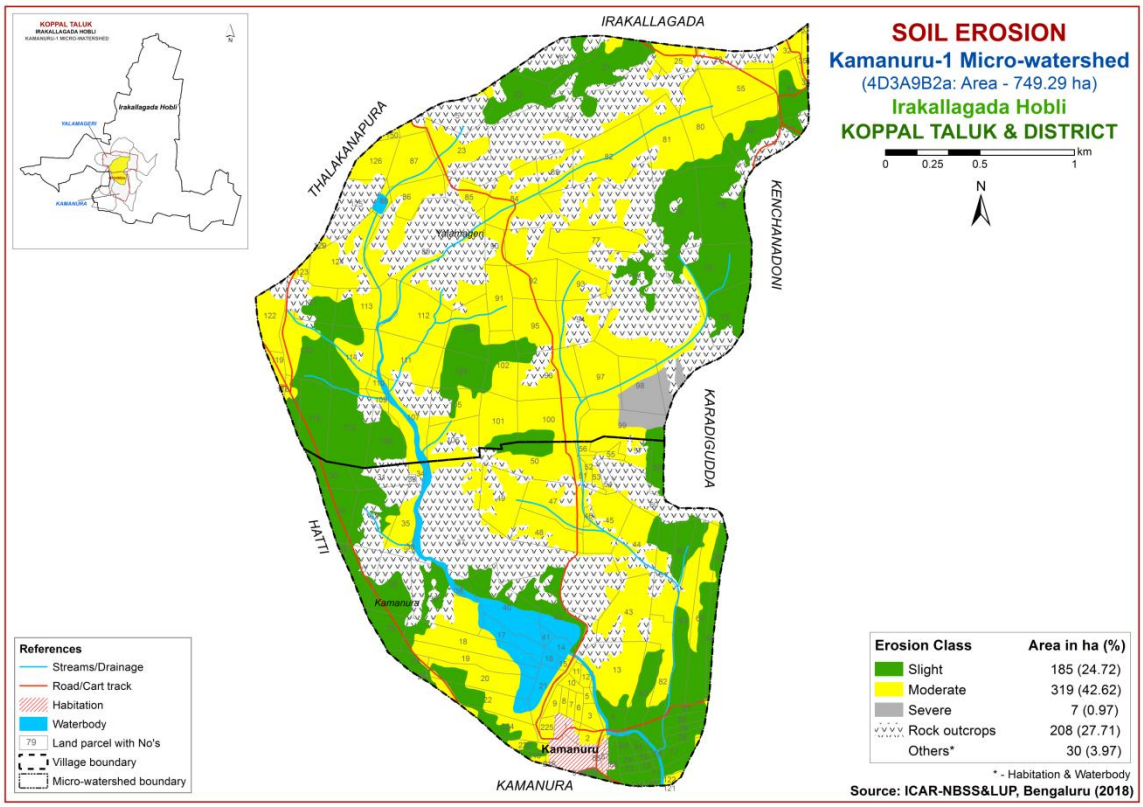

Fig. 5.7 Soil Erosion map of Kamanuru-1 Microwatershed

Chapter 6

FERTILITY STATUS

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

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

6.1 Soil Reaction (pH)

The soil analysis of the Kamanuru-1 microwatershed for soil reaction (pH) showed that moderately acid (pH 5.5-6.0) soils cover an area of about 18 ha (2%) and distributed in the northeastern part of the microwatershed. Slightly acid soils (pH 6.0-6.5) cover an area of about 30 ha (4%) and distributed in the northeastern and northern part of the microwatershed. Neutral soils (pH 6.5-7.3) cover a maximum area of about 443 ha (59 %) and distributed in the major part of the microwatershed. An area of about 21 ha (3%) is slightly to moderately alkaline (pH 7.3-8.4) and is distributed in the southern part of the microwatershed (Fig.6.1). Acid soils cover 48 ha (6%), neutral soils 443 ha (59%) and alkaline soils 21 ha (3%) area in the microwatershed.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

Maximum area of about 447 ha (60 %) is medium (0.5-0.75%) in organic carbon content and distributed in the major part of the microwatershed. An area of about 65 ha (9%) area is high (>0.75%) in OC and distributed in the northern part of the microwatershed (Fig.6.3).

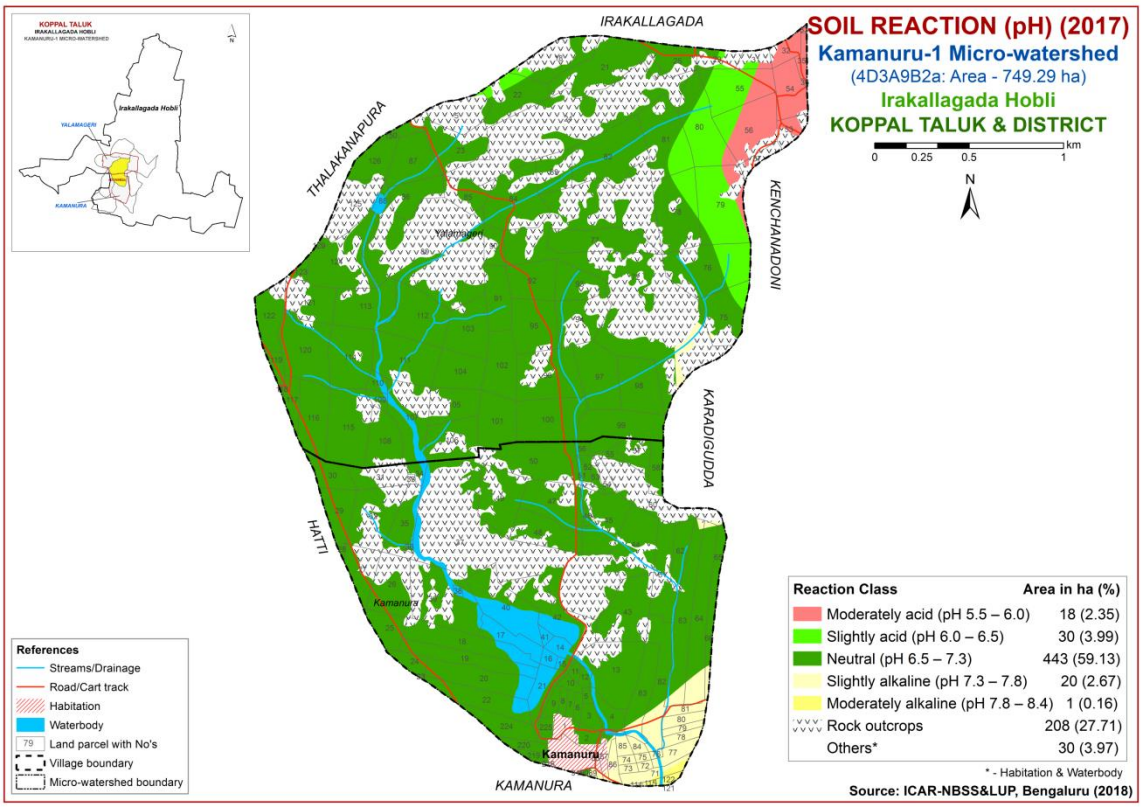

Fig.6.1 Soil Reaction (pH) map of Kamanuru-1 Microwatershed

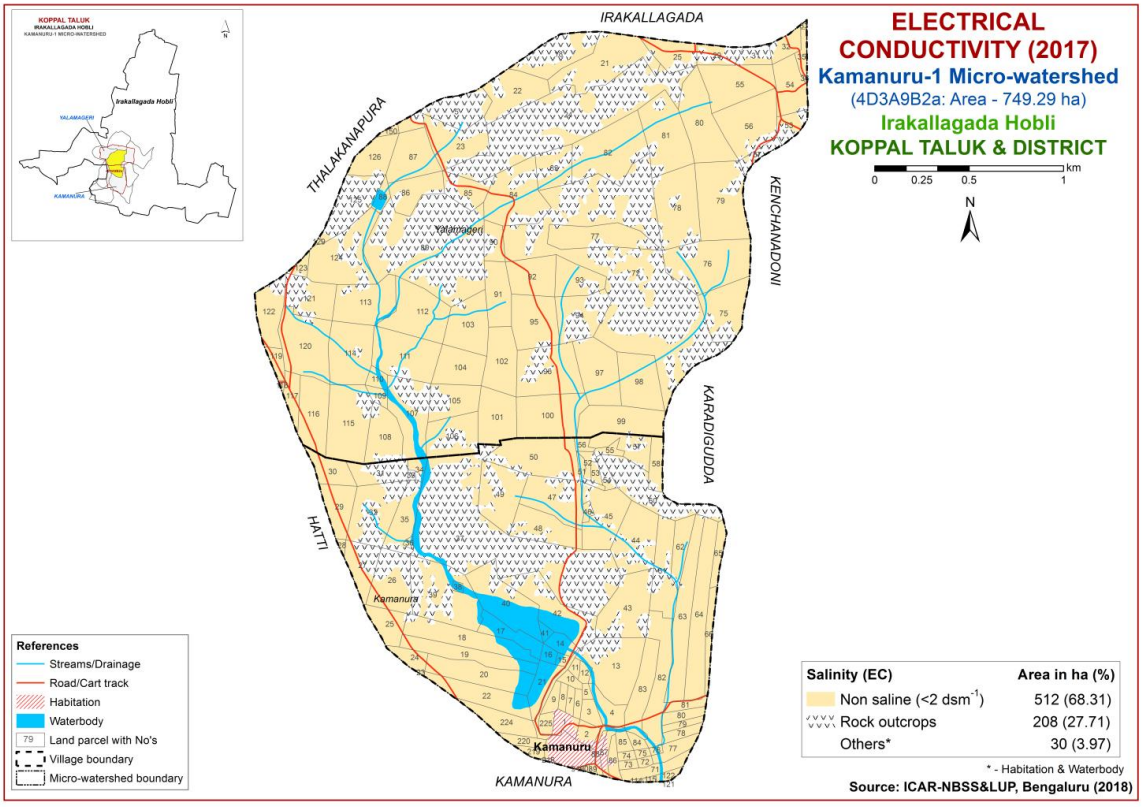

Fig.6.2 Electrical Conductivity (EC) map of Kamanuru-1 Microwatershed

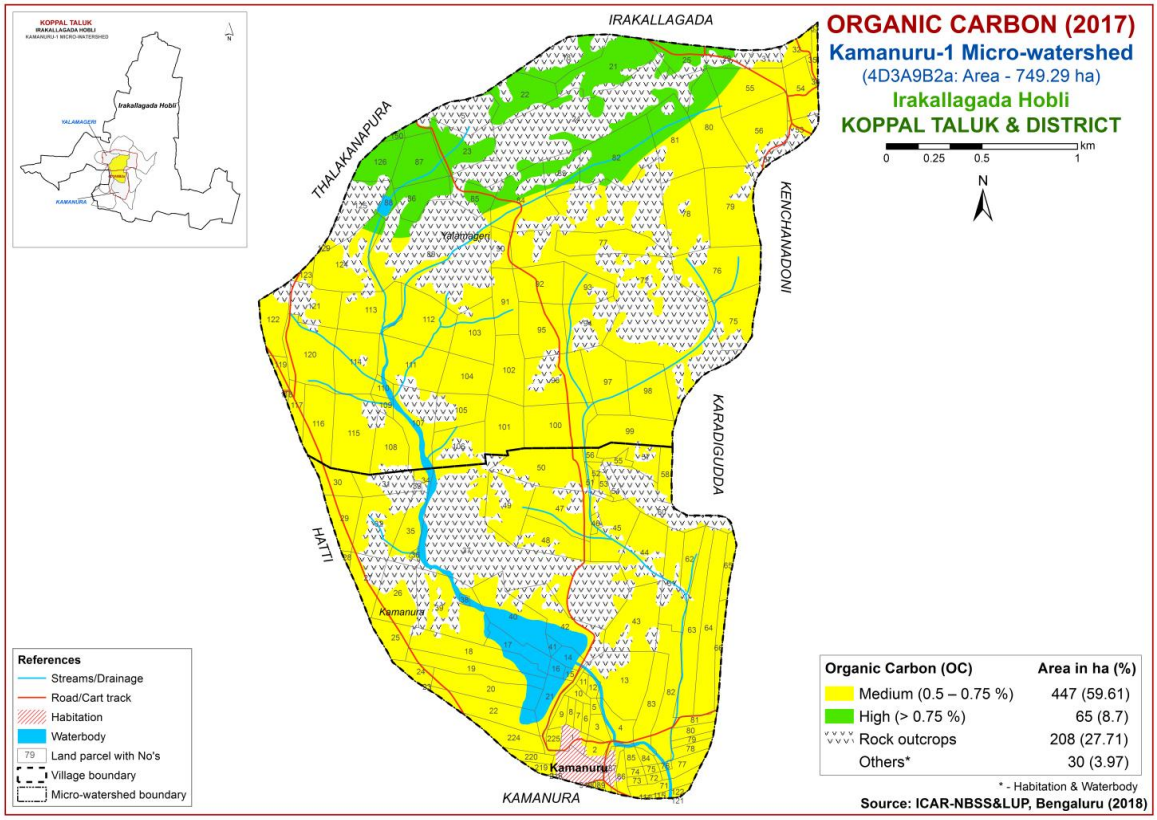

Fig.6.3 Soil Organic Carbon map of Kamanuru-1 Microwatershed

6.4 Available Phosphorus

An area of about 80 ha (11 %) is low in available phosphorus and distributed in the western part of the microwatershed. An area of about 206 ha (28%) is medium (23-57 kg/ha) and distributed in the central, eastern and western part of the microwatershed. Maximum area of about 226 ha (30 %) is high (>57 kg/ha) and distributed in the major part of the microwatershed. The areas with high phosphorus content reduce 25 per cent from the recommended dose to avoid the excess application of fertilizer and apply additional 25% phosphorus in areas where it is low and medium (Fig 6.4).

6.5 Available Potassium

Available potassium is low (<145 kg/ha) in an area of about 14 ha (2 %) and distributed in the northern part of the microwatershed. Maximum area of about 498 ha (67 %) is medium (145-337 kg/ha) and distributed in the major part of the microwatershed. Apply additional 25% potassium in areas where it is low and medium (Fig 6.5).

6.6 Available Sulphur

Soil analysis of available sulphur content in Kamanuru-1 microwatershed showed that a maximum area of about 469 ha (63 %) is low and distributed in the major part of the microwatershed. An area of about 40 ha (5 %) is medium (10-20 ppm) in available sulphur content and distributed in the western and southeastern part of the

microwatershed. A small area of about 3 ha (<1%) is high in available sulphur and distributed in the western part of the microwatershed (Fig.6.6). The areas that are low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or factomphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Available boron content in Kamanuru-1 microwatershed is low (< 0.5ppm) in a maximum area of about 424 ha (57%) and distributed in the major part of the microwatershed. An area of about 88 ha (12 %) is medium (0.5-1.0 ppm) and distributed in the northwestern part of the microwatershed (Fig.6.7).

6.8 Available Iron

Available iron content in the soils of the Kamanuru-1 microwatershed is deficient (<4.5 ppm) in an area of about 111 ha (15 %) and distributed in the southern and northwestern part of the microwatershed. Maximum area of about 401 ha (54%) showed sufficiency (>4.5 ppm) with respect to iron content and distributed in the major part of the microwatershed (Fig 6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in an area of about 464 ha (62 %) and distributed in the major part of the microwatershed (Fig 6.11). An area of about 48 ha (6 %) is sufficient and distributed in the southern part of the microwatershed.

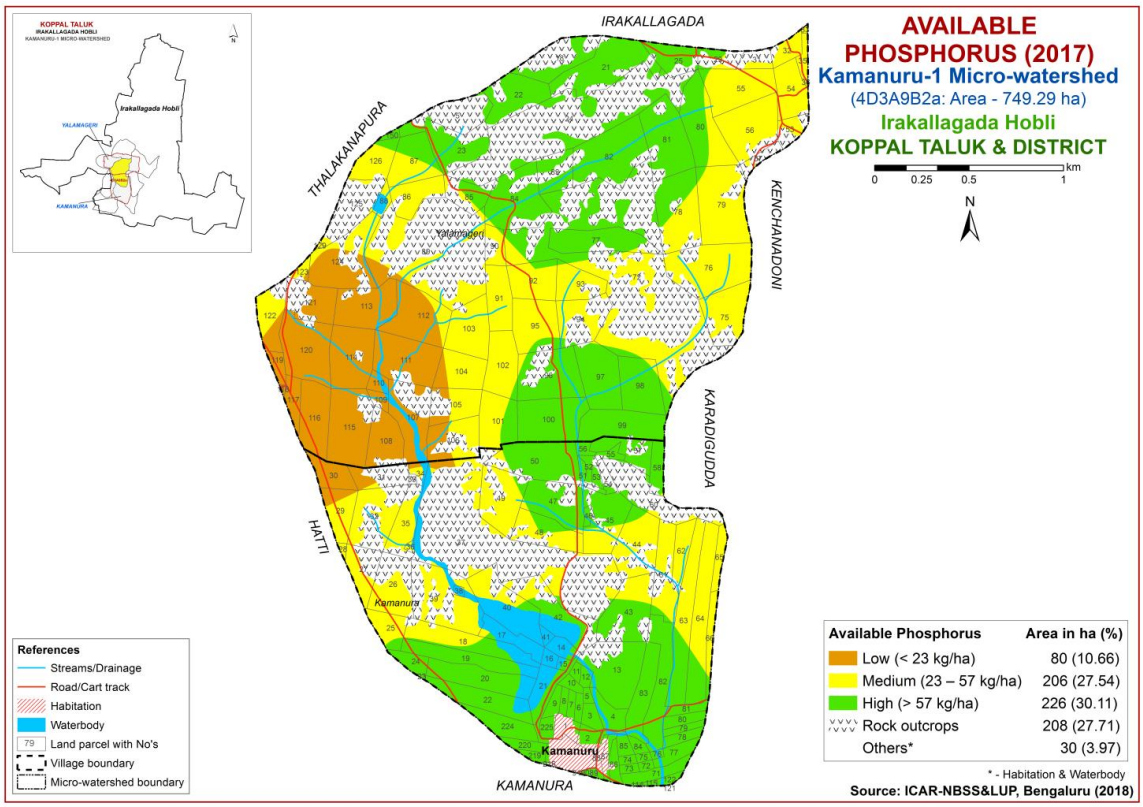

Fig.6.4 Soil Available Phosphorus map of Kamanuru-1 Microwatershed

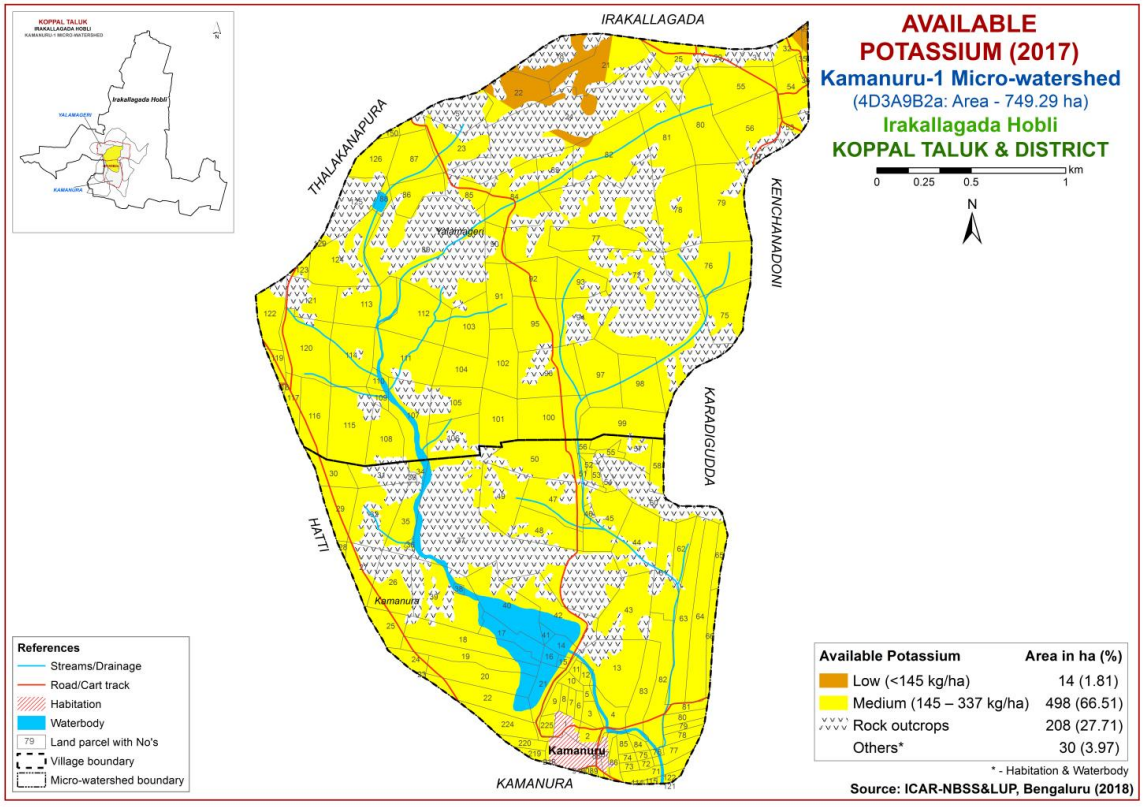

Fig.6.5 Soil Available Potassium map of Kamanuru-1 Microwatershed

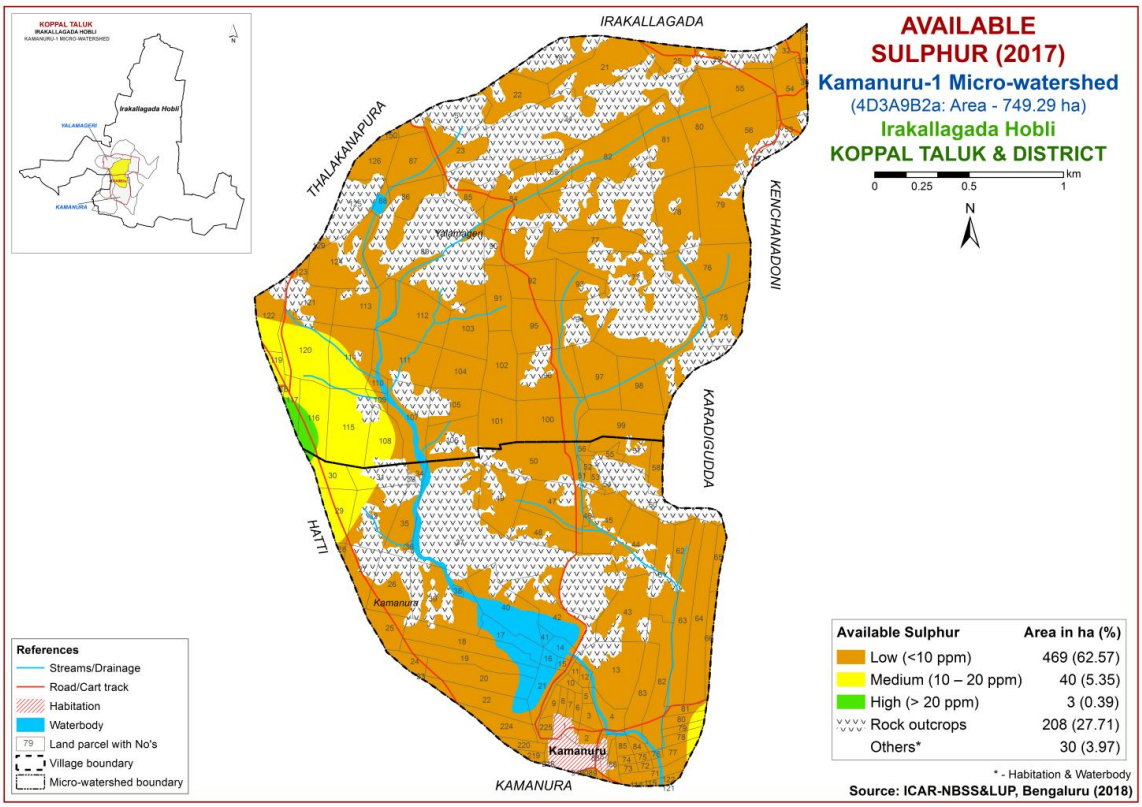

Fig.6.6 Soil Available Sulphur map of Kamanuru-1 Microwatershed

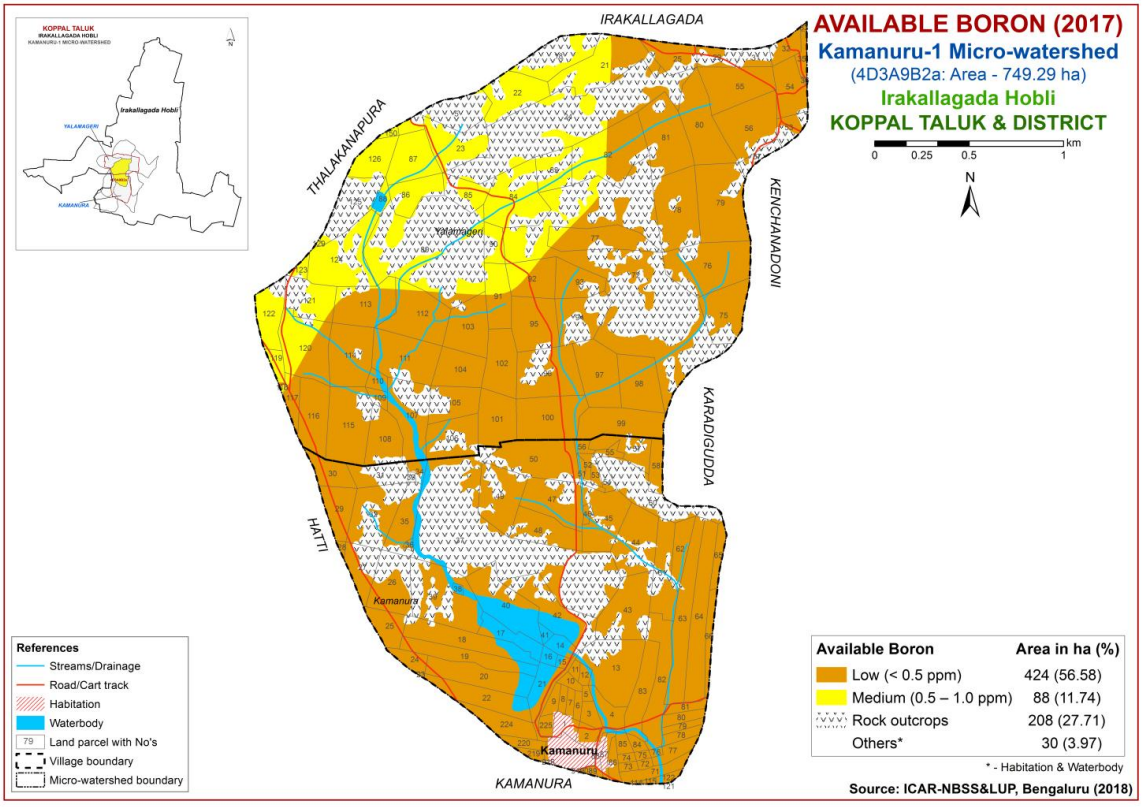

Fig.6.7 Soil Available Boron map of Kamanuru-1 Microwatershed

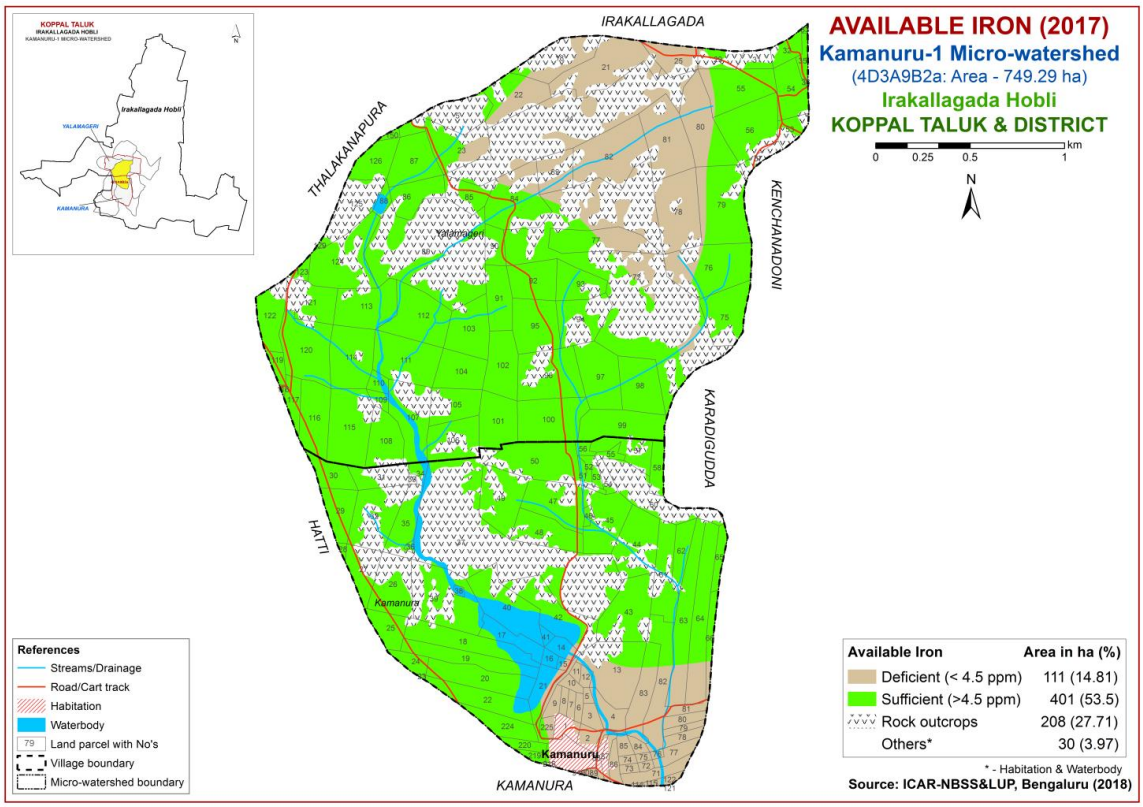

Fig.6.8 Soil Available Iron map of Kamanuru-1 Microwatershed

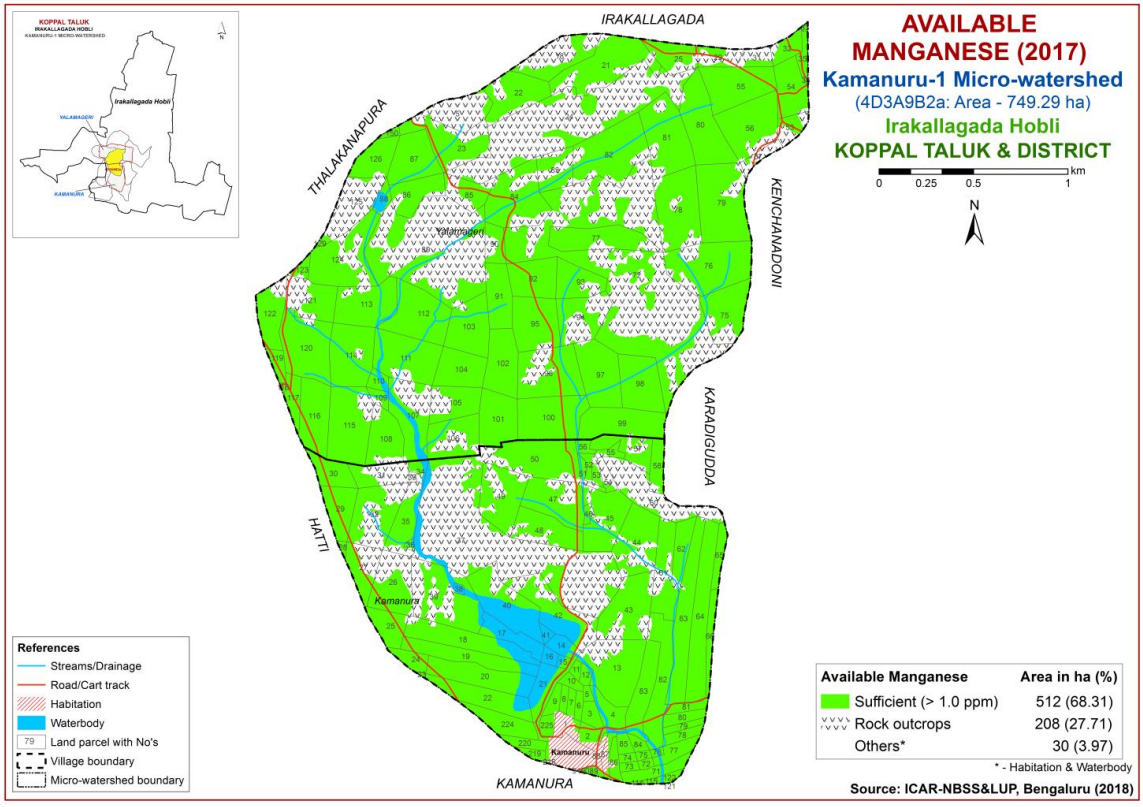

Fig.6.9 Soil Available Manganese map of Kamanuru-1 Microwatershed

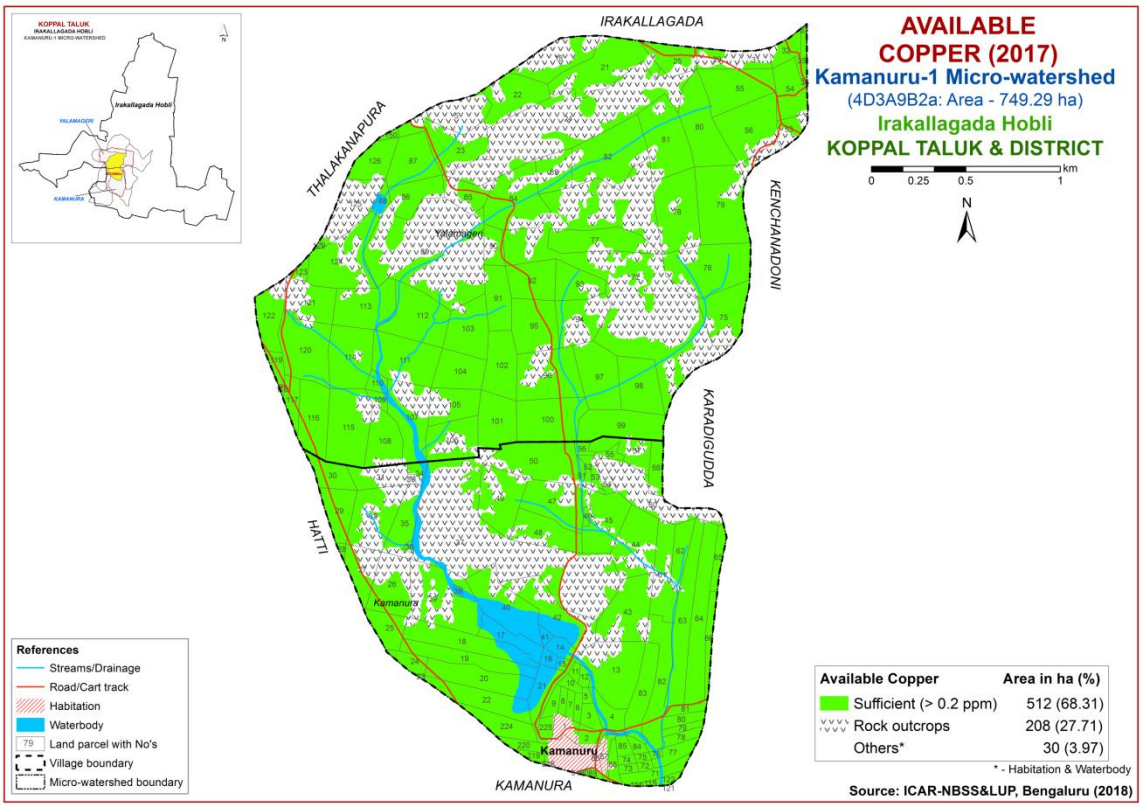

Fig.6.10 Soil Available Copper map of Kamanuru-1 Microwatershed

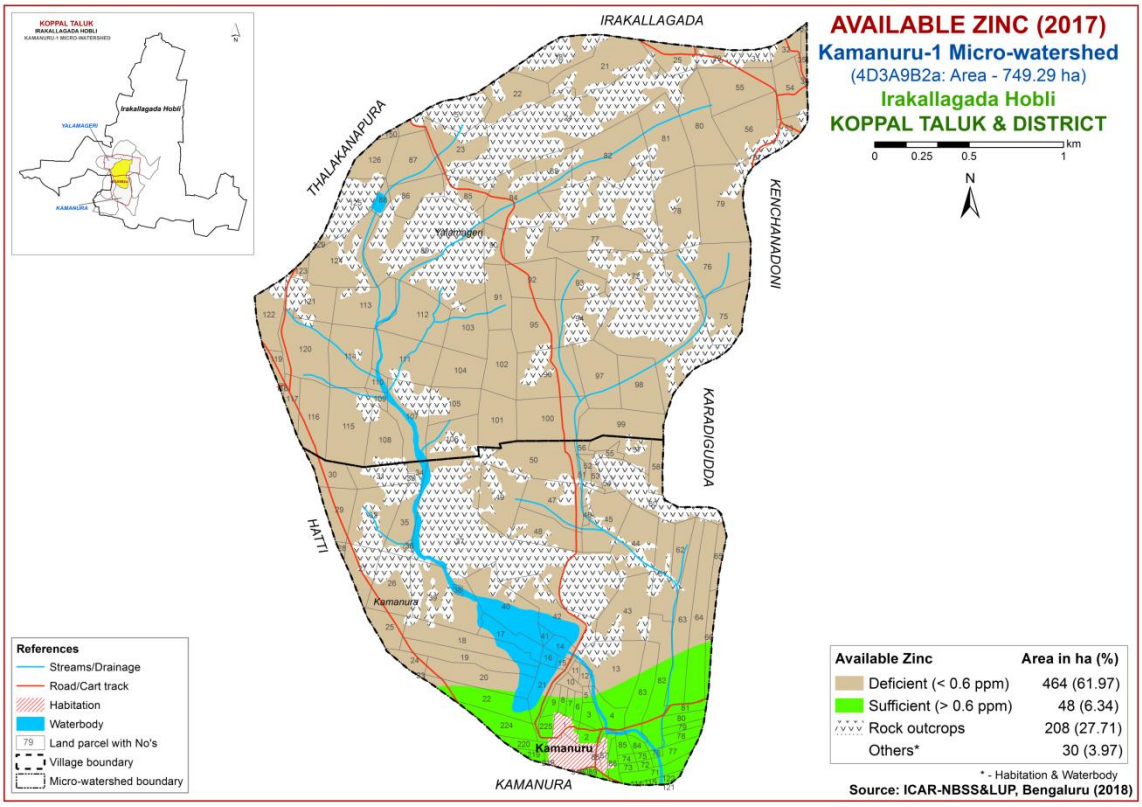

Fig.6.11 Soil Available Zinc map of Kamanuru-1 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Kamanuru-1 microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The soil and land characteristics were matched with the crop requirements to arrive at the crop suitability. The soil and land characteristics table (Table 7.1) were matched with the crop requirements (Tables 7.2-7.29) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S- Suitable and Order N- Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1- Highly Suitable, Class S2- Moderately Suitable and Class S3- Marginally Suitable. Order N has two Classes, N1- Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 's' for sodium 'z' for calcareousness and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 28 major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

Highly suitable (Class S1) lands occupy an area of about 94 ha (13%) for growing sorghum and occur in the southeastern and central part of the microwatershed. An area of about 52 ha (7%) is moderately suitable (Class S2) for growing sorghum and distributed

in the southeastern and central part of the microwatershed with minor limitations of calcareousness, rooting depth, drainage, nutrient availability and gravelliness. Maximum area of about 367 ha (49%) is marginally suitable for growing sorghum and distributed in the major part of the microwatershed. They have moderate limitations of gravelliness and rooting depth.

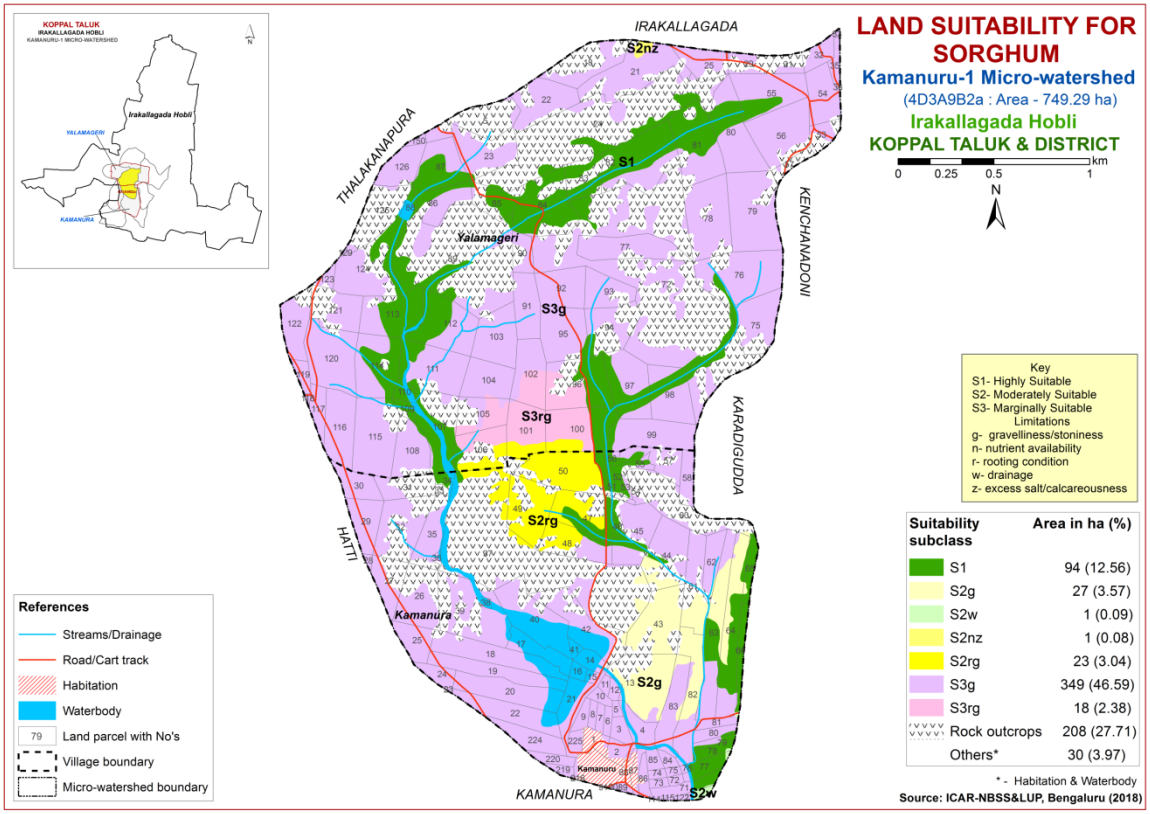

Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

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

Highly suitable (Class S1) lands occupy an area of about 13 ha (2%) for growing maize and distributed in the southeastern part of the microwatershed. An area of about 134 ha (18%) is moderately suitable (Class S2) and distributed in the northern, central and southeastern part of the microwatershed with minor limitations of calcareousness, texture, rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands cover an area of about 367 ha (49%) and occur in the major part of the microwatershed. They have moderate limitations of gravelliness and rooting depth.

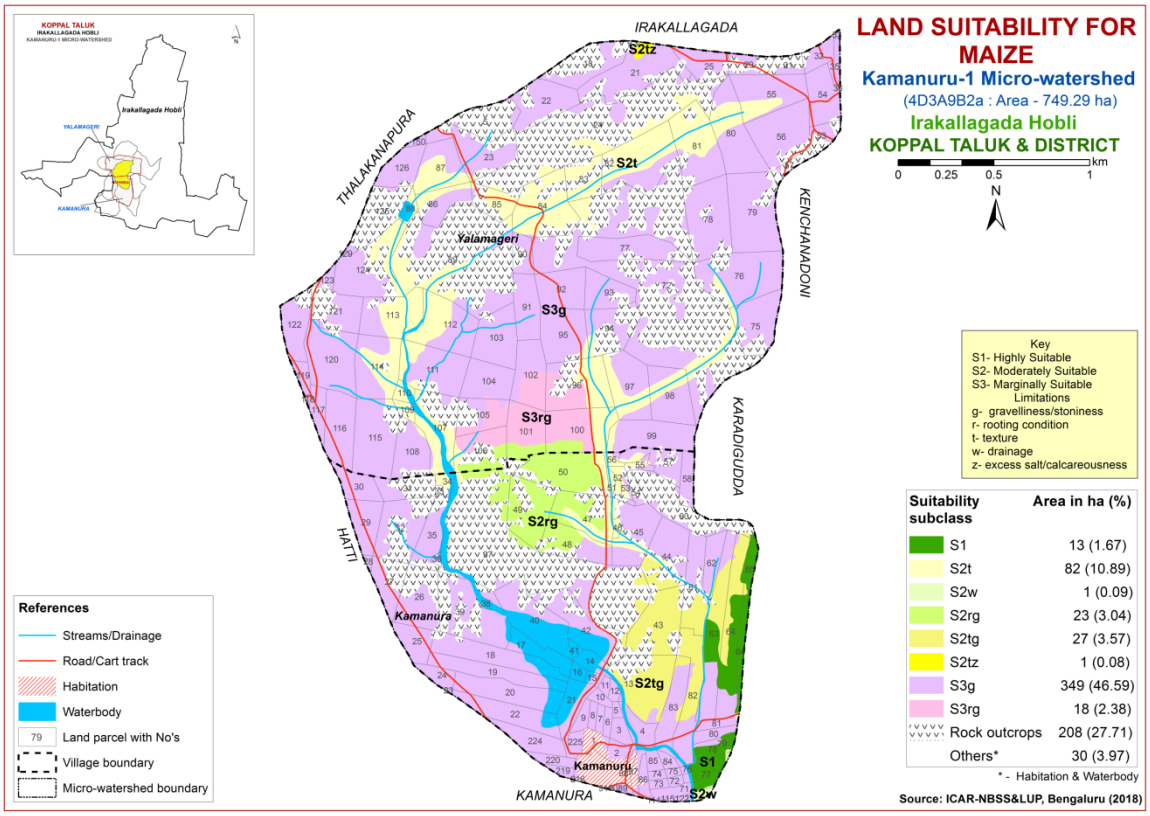

Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

Highly suitable (Class S1) lands occupy an area of about 13 ha (2 %) for growing bajra and occur in the southeastern part of the microwatershed. An area of about 211 ha (28%) is moderately suitable (Class S2) for growing bajra and distributed in the northern, central and southeastern part of the microwatershed with minor limitations of texture, calcareousness, drainage, rooting depth and gravelliness. Marginally suitable (Class S3) lands cover an area of about 290 ha (39 %) and occur in the major part of the microwatershed. They have moderate limitation of gravelliness.

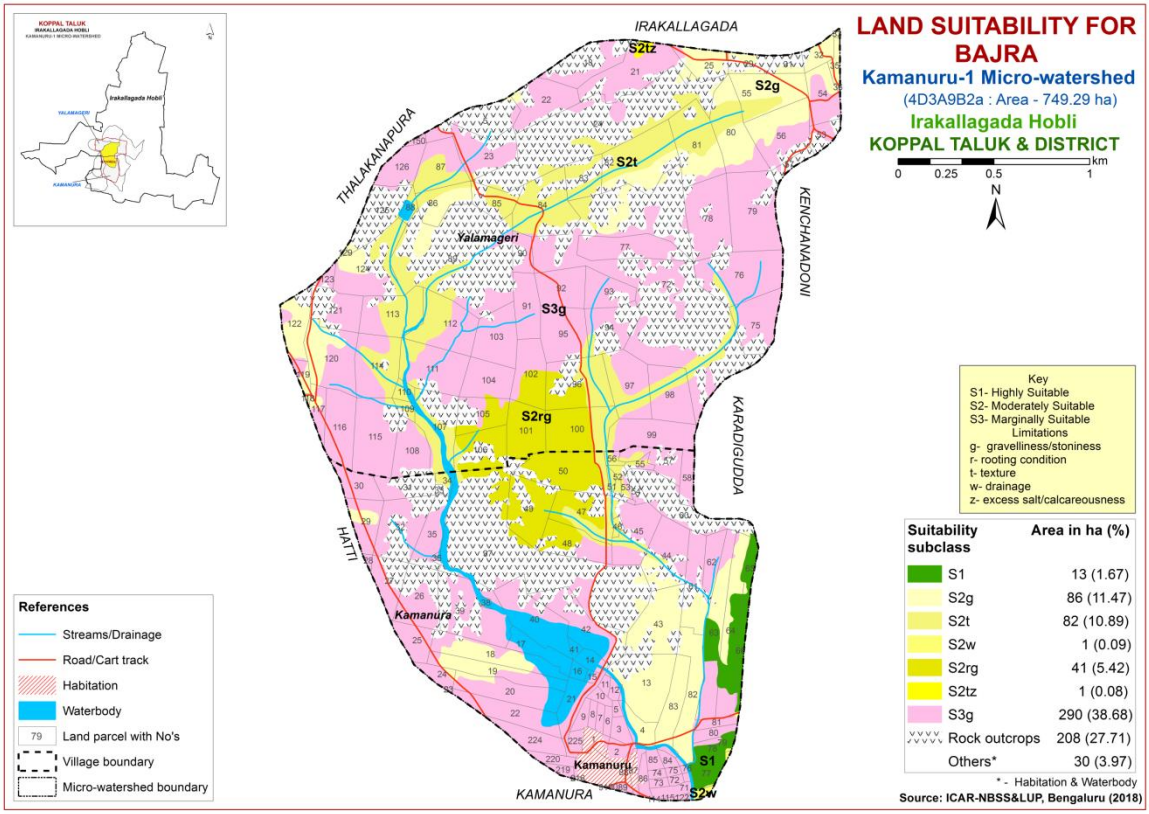

Fig. 7.3 Land Suitability map of Bajra

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

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

An area of about 123 ha (16 %) is moderately suitable (Class S2) for growing red gram and occur in the northern, central and southeastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth, texture and drainage. Marginally suitable lands (Class S3) occupy a maximum area of about 391 ha (52%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and calcareousness.

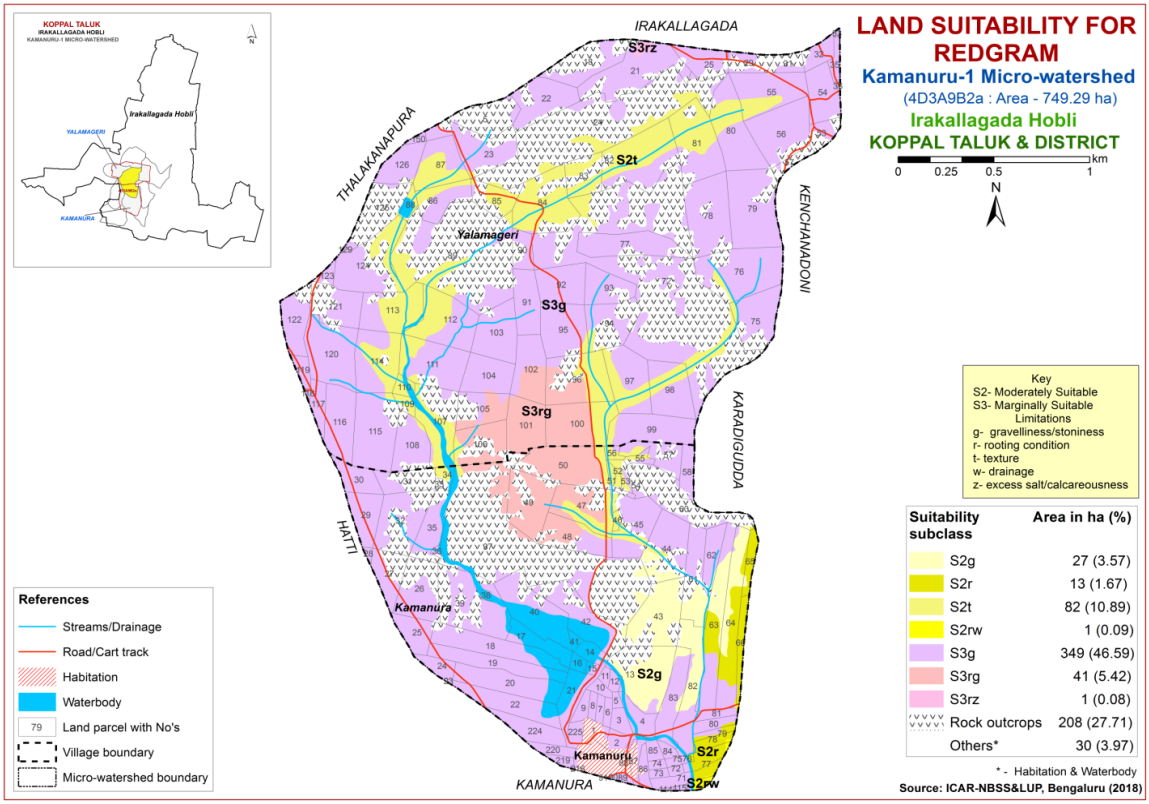

Fig. 7.4 Land Suitability map of Redgram

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

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

An area of about 82 ha (11%) in the microwatershed has soils that are highly suitable (Class S1) for growing Bengal gram and are distributed in the central part of the microwatershed. An area of about 83 ha (11%) is moderately suitable (Class S2) for growing Bengal gram and are distributed in the central and southeastern part of the microwatershed. They have minor limitations of drainage, texture, calcareousness, rooting depth and gravelliness. Marginally suitable (Class S3) lands cover an area of about 349 ha (47%) and are distributed in the major part of the microwatershed. They have moderate limitation of gravelliness.

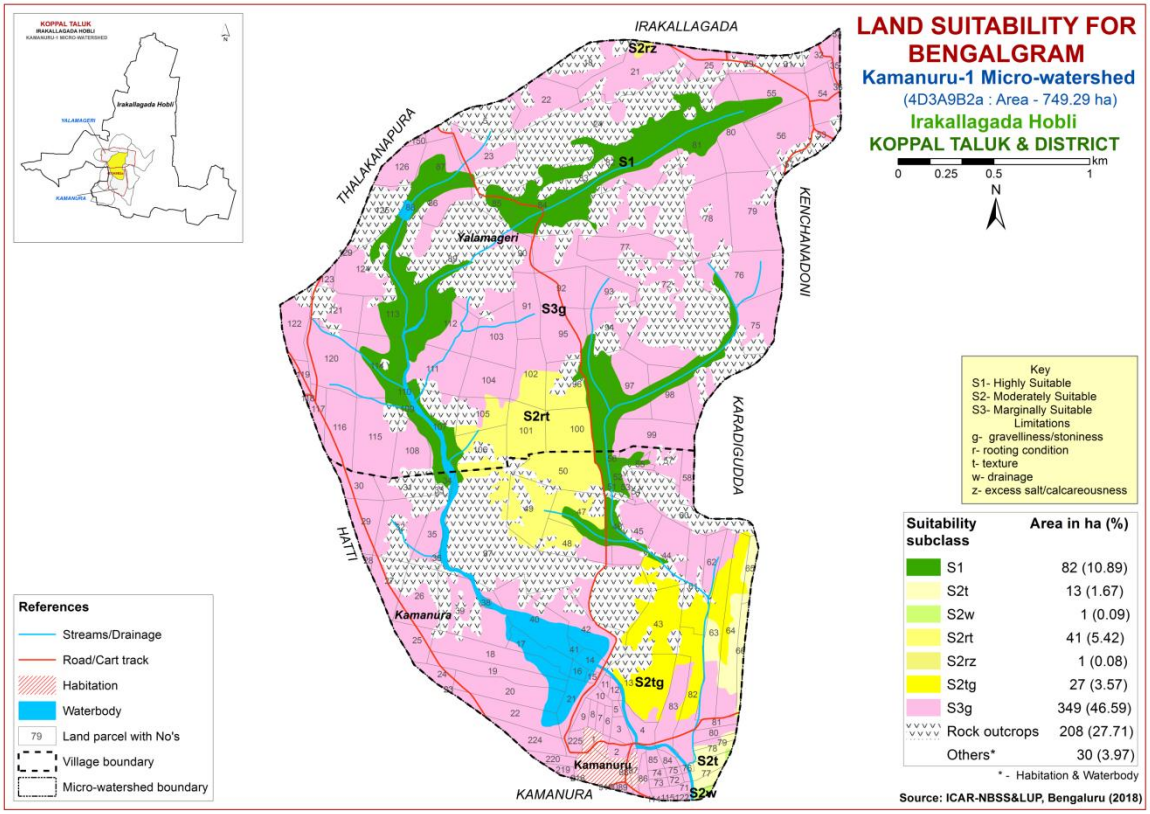

Fig. 7.5 Land Suitability map of Bengal gram

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.

A maximum area of about 326 ha (43%) is moderately suitable (Class S2) for growing groundnut and distributed in the major part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage and texture. An area of about 189 ha (25%) is marginally suitable (Class S3) for growing groundnut and are distributed in the southern, central and western part of the microwatershed with moderate limitations of gravelliness, texture, rooting depth and calcareousness.

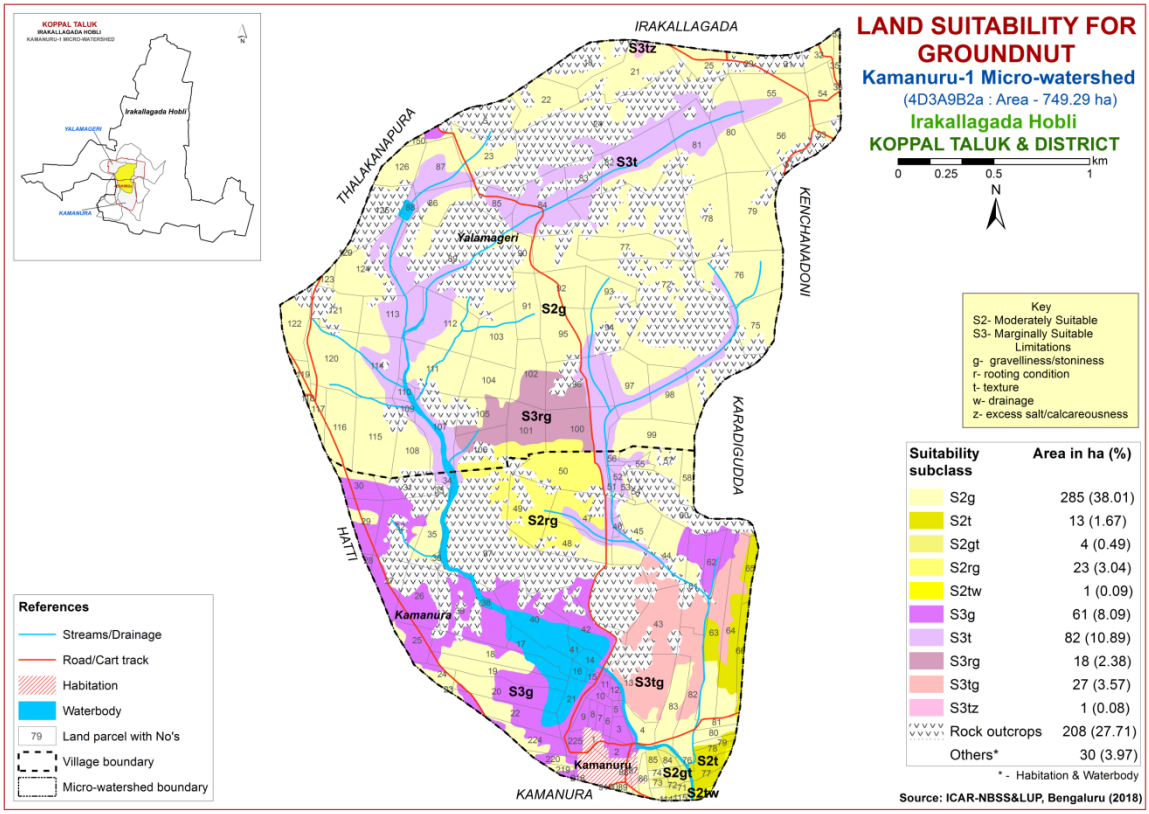

Fig. 7.6 Land Suitability map of Groundnut

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.

An area of about 82 ha (11%) is highly suitable (Class S1) for growing sunflower and are distributed in the northern and central part of the microwatershed. An area of about 42 ha (5%) is moderately suitable (Class S2) and are distributed in the southern and southeastern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, calcareousness and drainage. Marginally suitable (Class S3) lands occupy a maximum area of about 390 ha (52%) and are distributed in the major part of the microwatershed with moderate limitations of rooting depth and gravelliness.

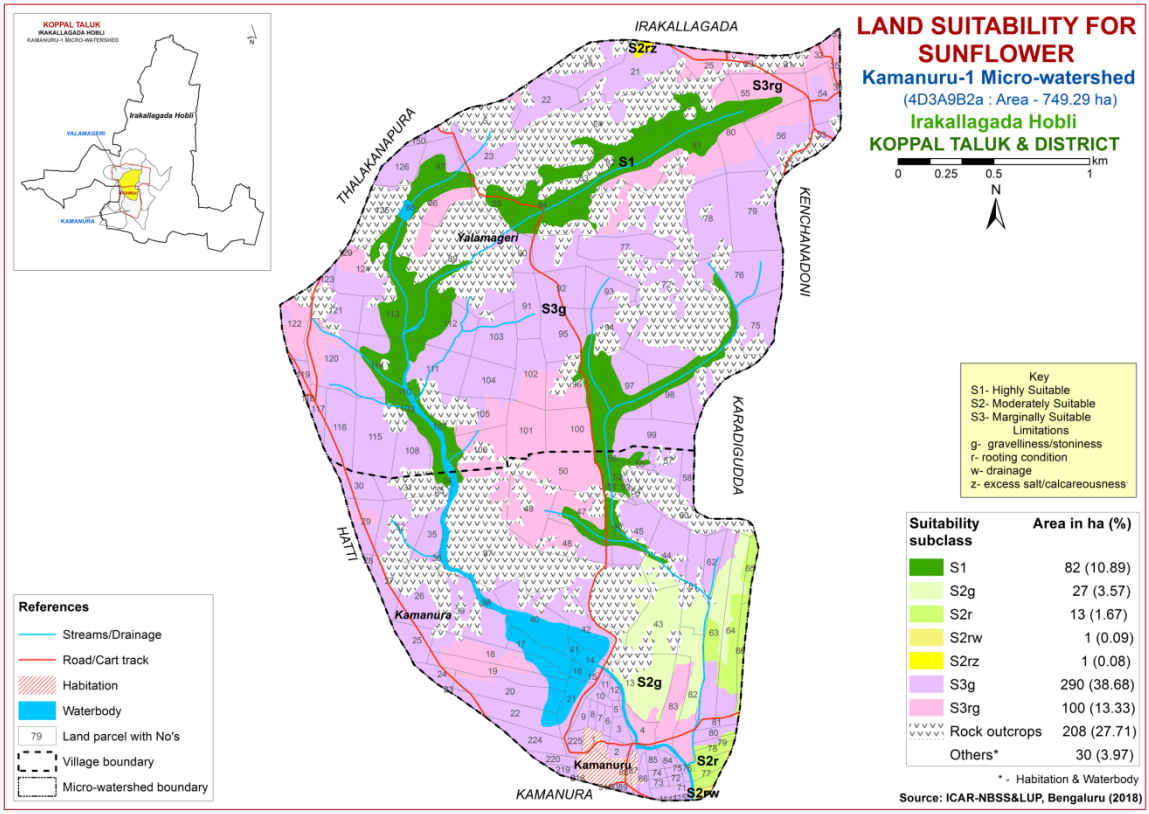

Fig. 7.7 Land Suitability map of Sunflower

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.

An area of about 82 ha (11%) is highly suitable (Class S1) for growing cotton and are distributed in the central and northern part of the microwatershed. An area of about 65 ha (8%) is moderately suitable (Class S2) and are distributed in the southeastern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, calcareousness, texture and drainage. Marginally suitable (Class S3) lands occupy an area of about 367 ha (49%) and are distributed in the major part of the microwatershed with moderate limitations of rooting depth and gravelliness.

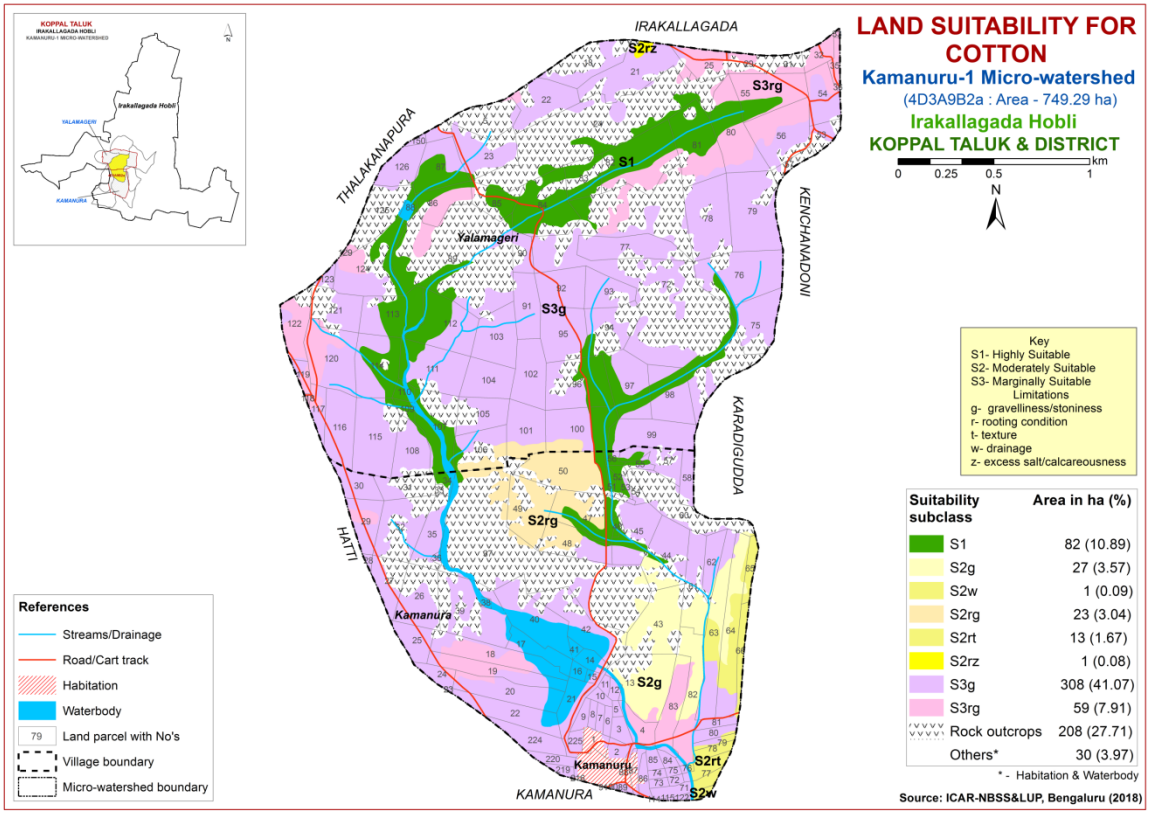

Fig. 7.8 Land Suitability map of Cotton

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

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

An area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing chilli and are distributed in the southeastern part of the microwatershed. An area of about 51 ha (7 %) is moderately suitable (Class S2) for growing chilli and are distributed in the central and southeastern part of the microwatershed. They have minor limitations of gravelliness, drainage, texture and rooting depth. Marginally suitable (Class S3) lands cover a maximum area of about 450 ha (60%) and distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, texture and calcareousness.

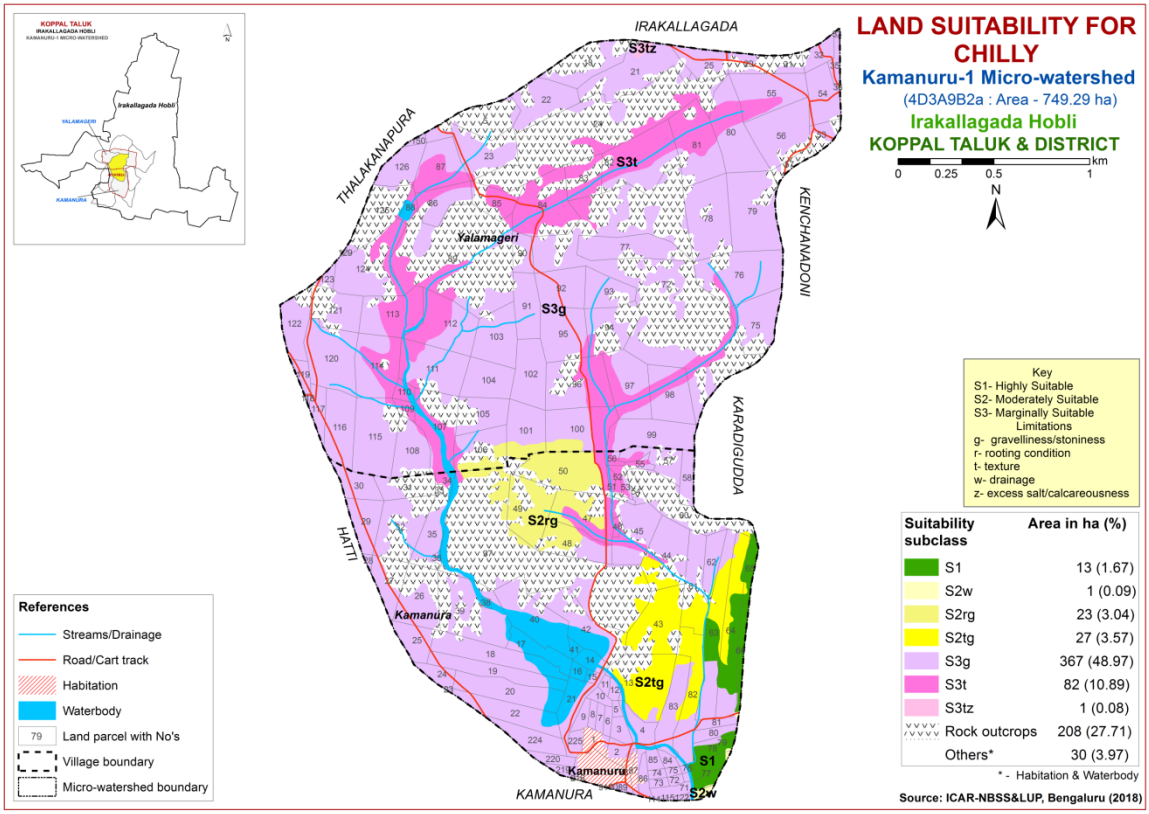

Fig. 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato (*Solanum lycopersicum*)

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

An area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing tomato and are distributed in the southeastern part of the microwatershed. An area of about 51 ha (7 %) is moderately suitable (Class S2) for growing tomato and are distributed in the central and southeastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth, texture and drainage. Marginally suitable (Class S3) lands cover a maximum area of about 450 ha (60%) and distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, texture and calcareousness.

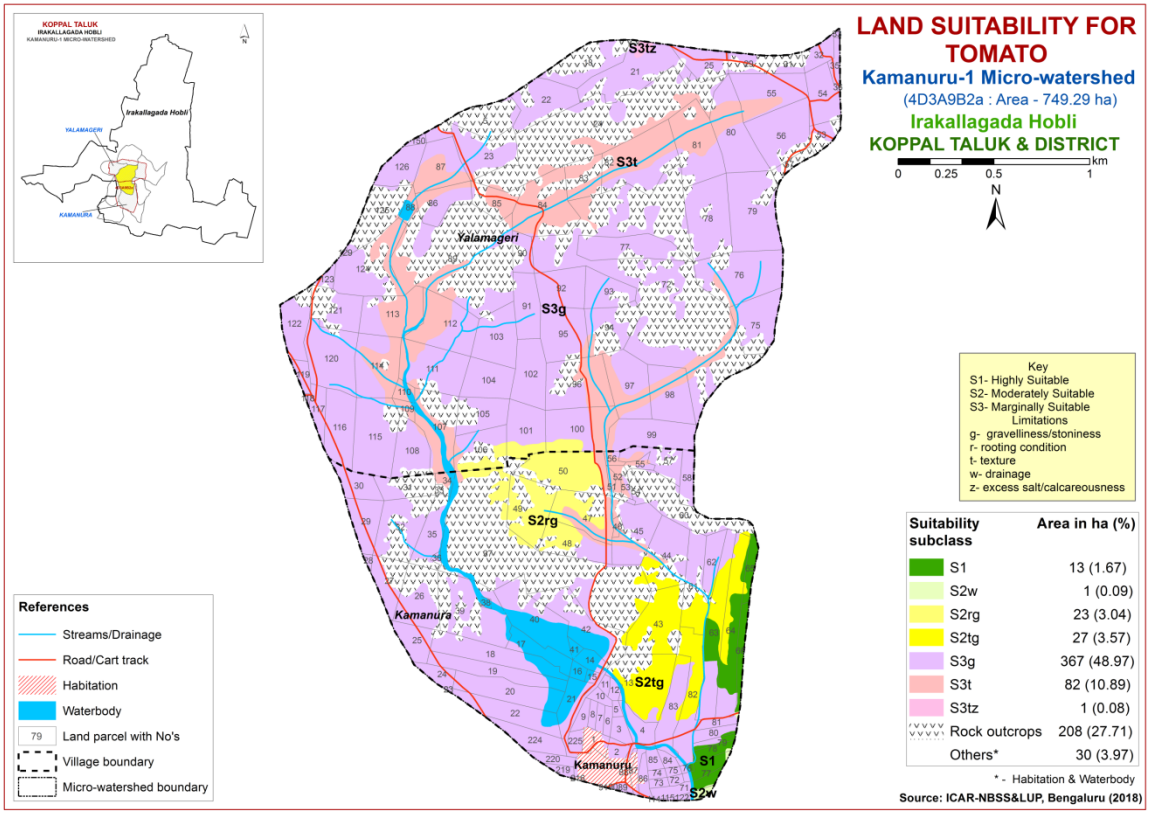

Fig. 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Drumstick (*Moringa oleifera)*

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

Moderately suitable (Class S2) lands cover a maximum area of about 353 ha (47%) and are distributed in the major part of the microwatershed. They have minor limitations of gravelliness, rooting depth, texture, drainage and calcareousness. Marginally suitable (Class S3) lands cover an area of about 161 ha (21%) and occur in the southern, northern, central and western part of the microwatershed. They have moderate limitations of gravelliness and rooting depth.

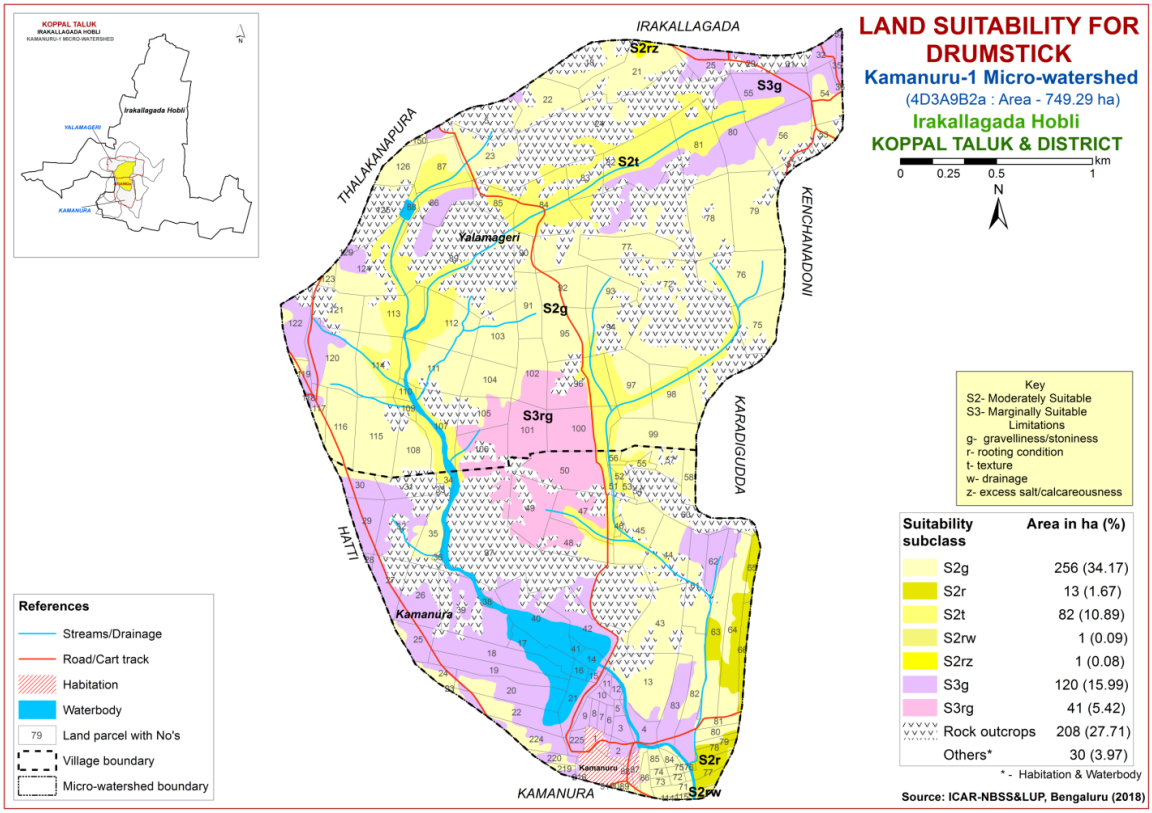

Fig. 7.11 Land Suitability map of Drumstick

7.12 Land Suitability for Mulberry (*Morus nigra*)

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

Maximum area of about 473 ha (63 %) is moderately suitable (Class S2) for growing mulberry and distributed in the major part of the microwatershed. They have minor limitations of texture, rooting depth, gravelliness, calcareousness and drainage. Marginally suitable (Class S3) lands cover an area of about 41 ha (5%) and occur in the central part of the microwatershed. They have moderate limitations of rooting depth and gravelliness.

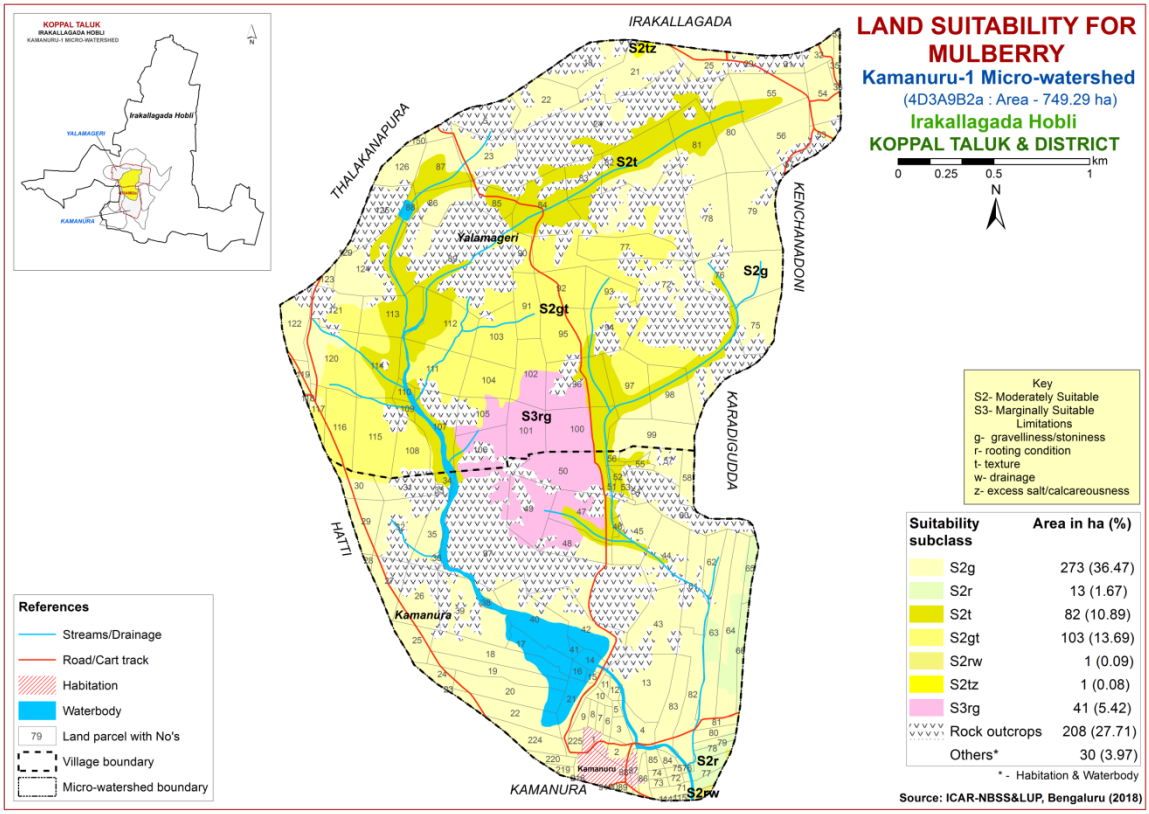

Fig. 7.12 Land Suitability map of Mulberry

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.

Moderately suitable (S2) lands cover an area of about 27 ha (4%) and distributed in the western part of the microwatershed. They have minor limitation of gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 447 ha (59 %) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness, texture, calcareousness and drainage. Area currently not suitable (Class N1) for growing mango cover about 41 ha (5 %) and distributed in the central part of the microwatershed with severe limitations of rooting depth and gravelliness.

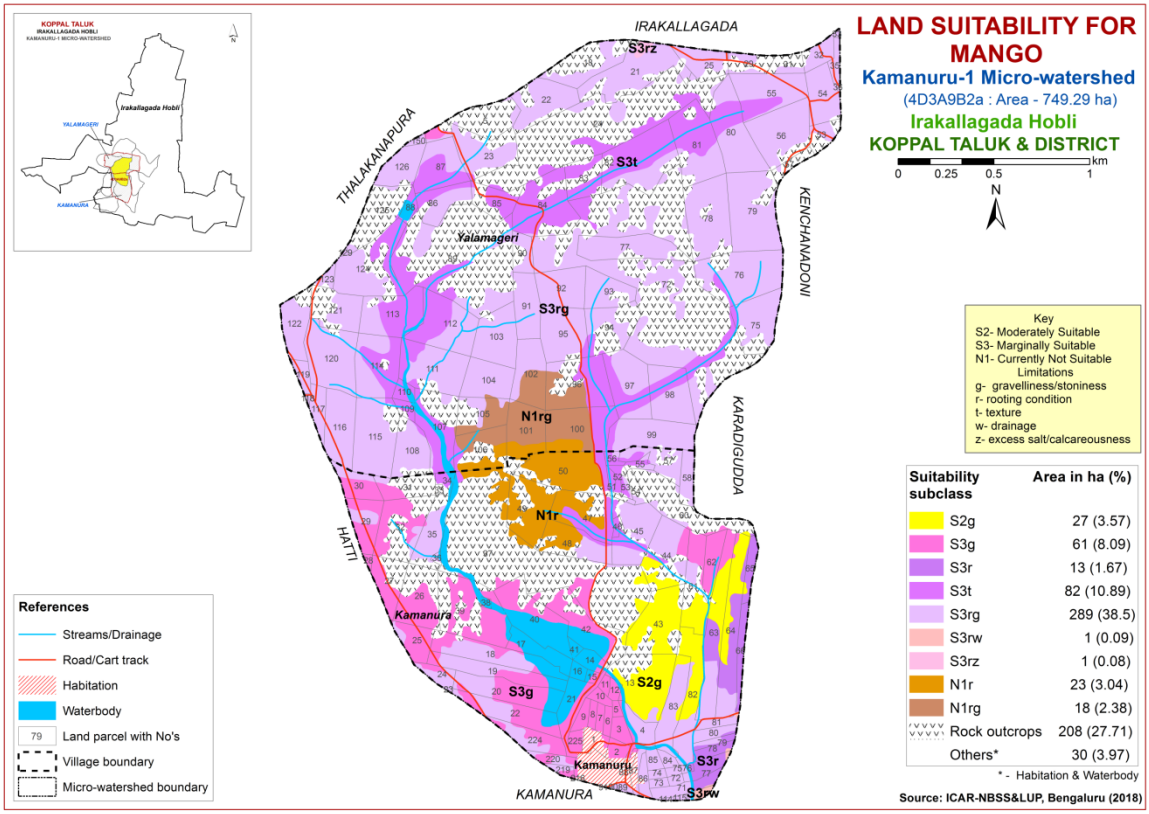

Fig. 7.13 Land Suitability map of Mango

7.14 Land Suitability for Sapota (*Manilkara zapota*)

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

Moderately suitable (S2) lands cover an area of about 100 ha (13%) and are distributed in the southern and northern part of the microwatershed. They have minor limitations of rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 414 ha (55 %) and occur in the major part of the microwatershed. They have moderate limitations of gravelliness, rooting depth, texture and calcareousness.

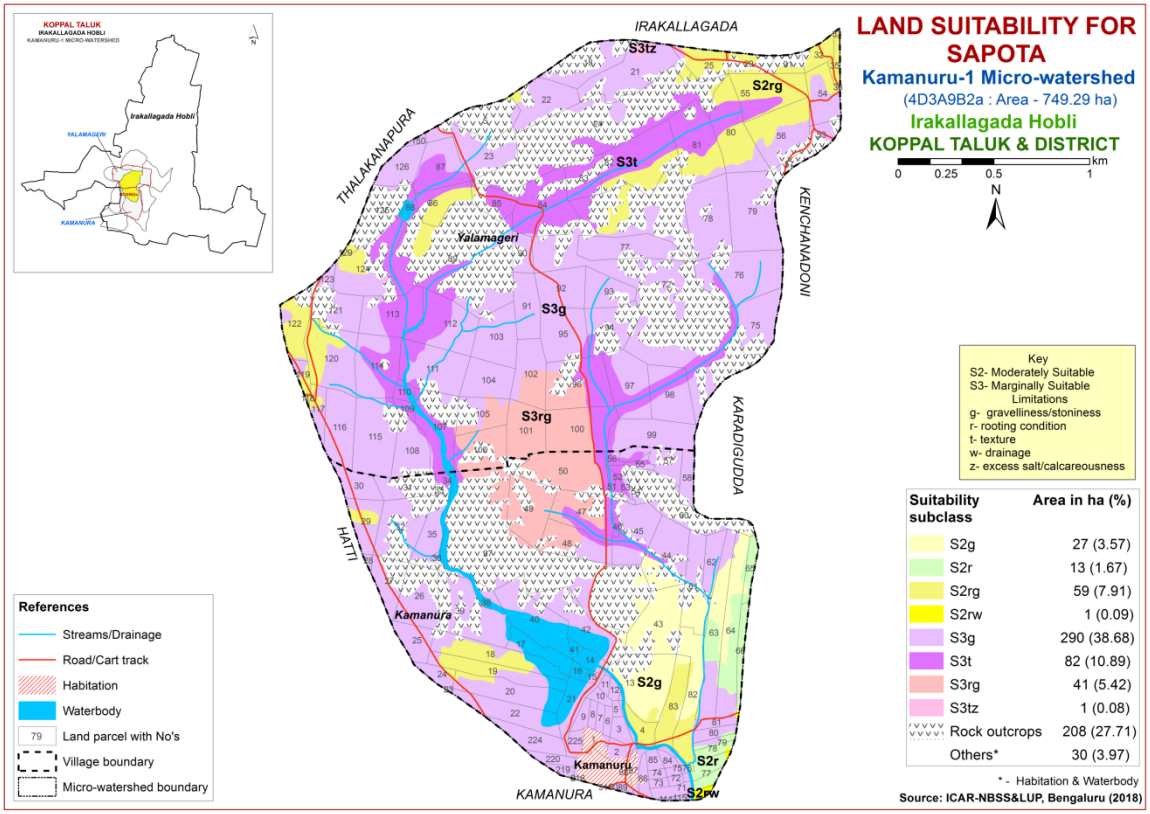

Fig. 7.14 Land Suitability map of Sapota

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.

Moderately suitable (Class S2) lands occupy an area of about 183 ha (24%) and are distributed in the northern southern and central part of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture and drainage. Marginally suitable (Class S3) lands for growing pomegranate occupy an area of about 331 ha (44 %) and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth.

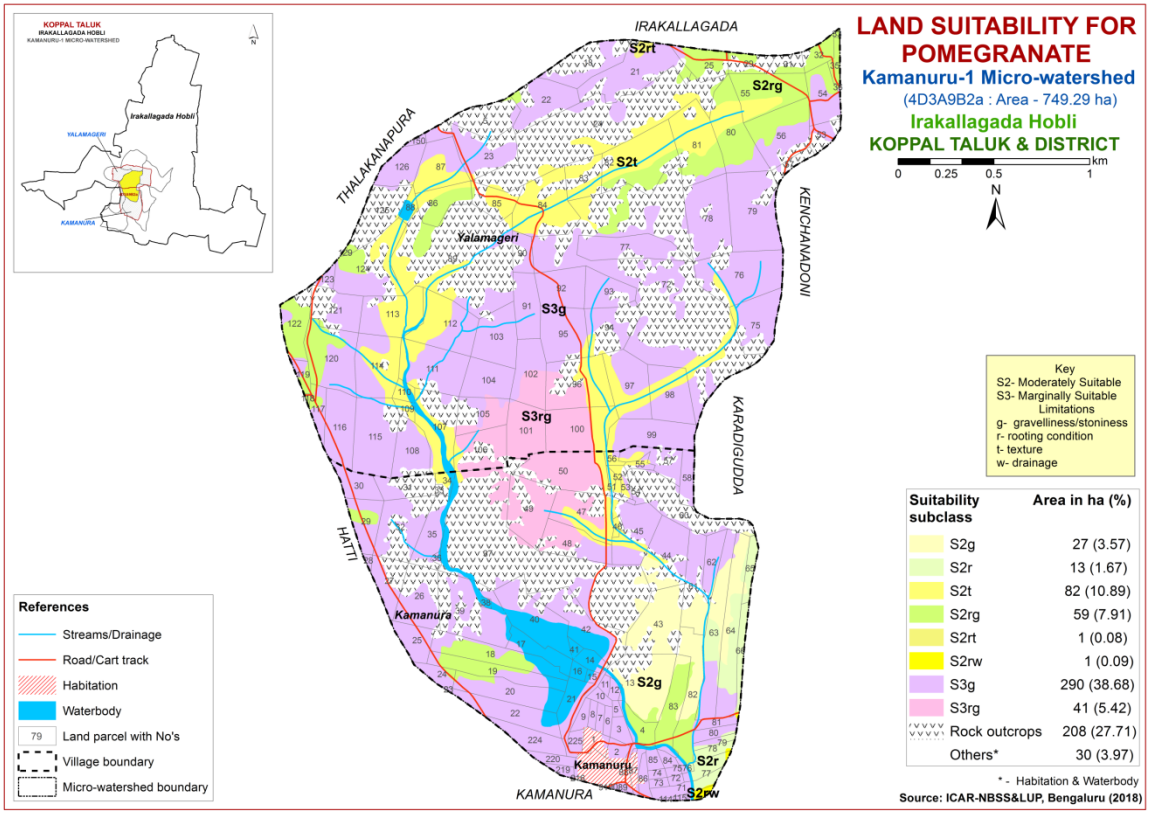

Fig. 7.15 Land Suitability map of Pomegranate

7.16 Land Suitability for Guava (*Psidium guajava*)

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

Moderately suitable (Class S2) lands occupy an area of about 100 ha (13%) and are distributed in the southeastern and northern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture and drainage. Marginally suitable (Class S3) lands for growing guava occupy a maximum area of about 414 ha (55%) and are distributed in the major part of the microwatershed with moderate limitations of gravelliness, rooting depth, calcareousness and texture.

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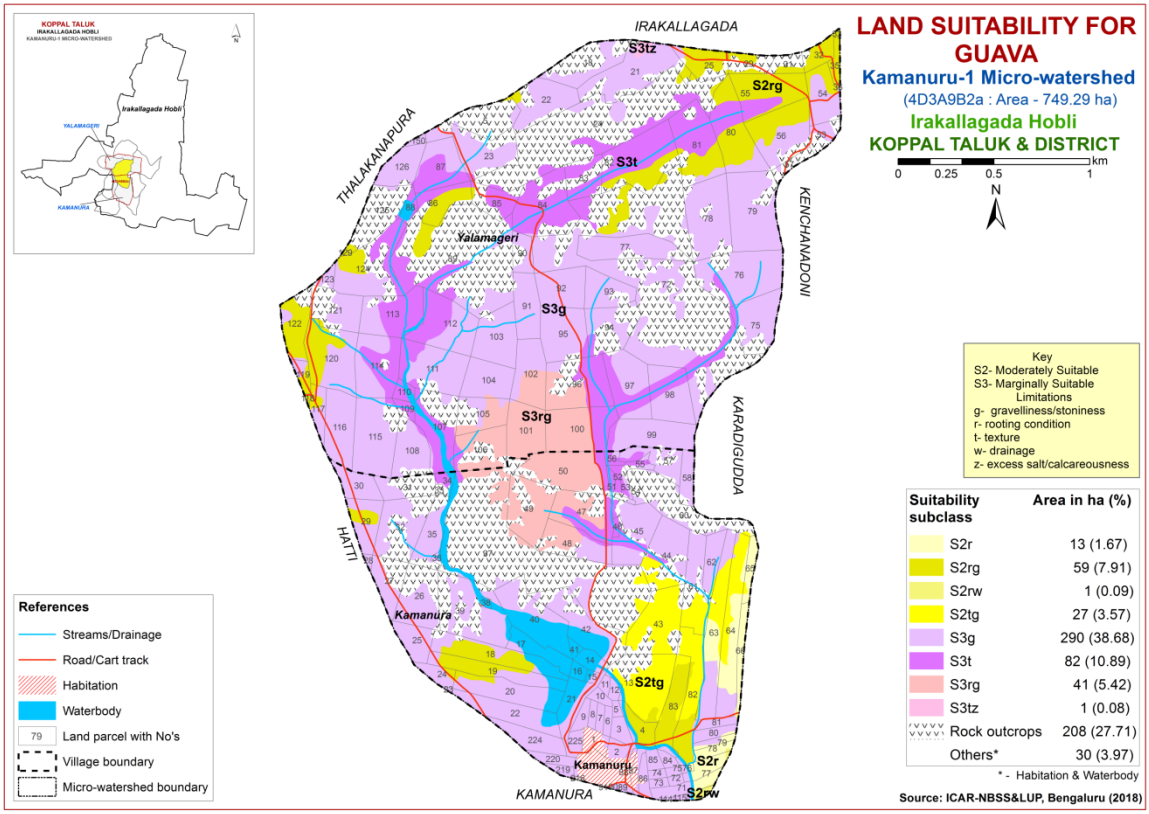


Fig. 7.16 Land Suitability map of Guava

7.17 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

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

Moderately suitable (Class S2) lands cover an area of about 100 ha (13%) and are distributed in the northern, central and western part of the microwatershed. They have minor limitations of rooting depth, gravelliness and drainage. Marginally suitable (Class S3) lands cover a maximum area of about 414 ha (55%) and occur in the major part of the microwatershed. They have moderate limitations of gravelliness, rooting depth, texture and calcareousness.

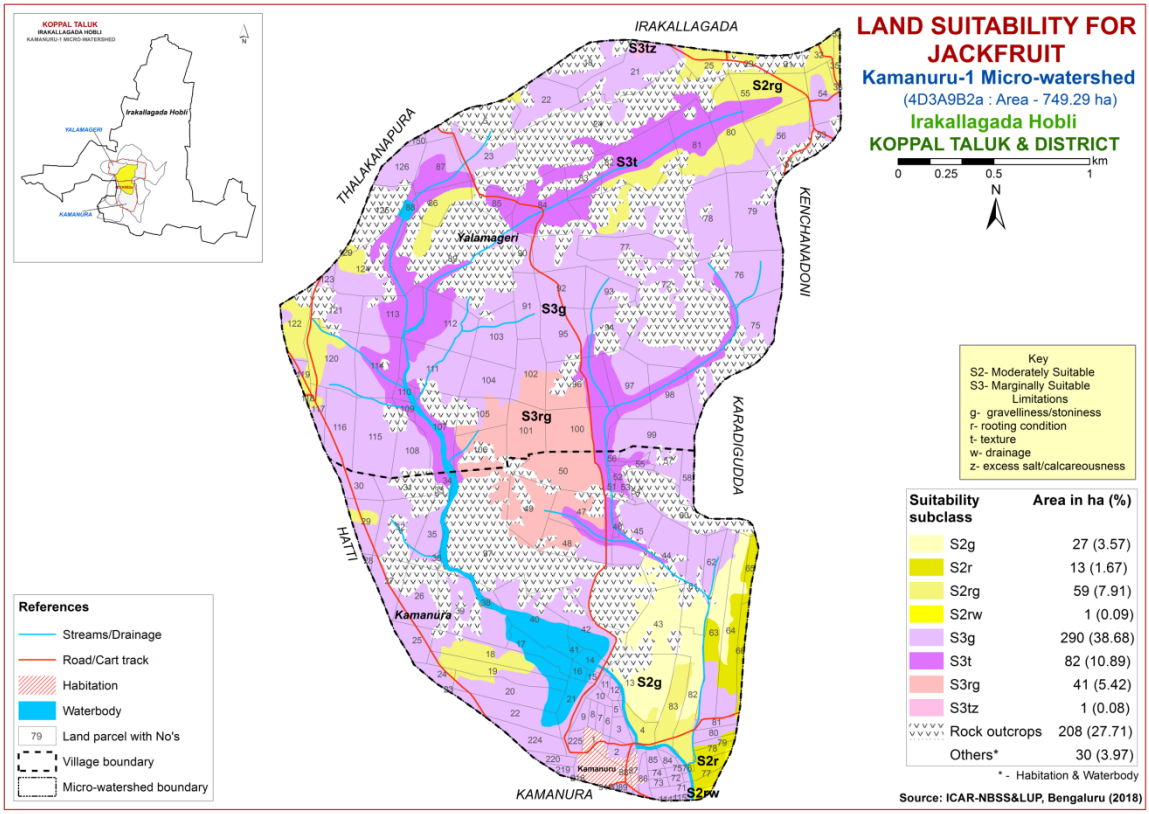


Fig. 7.17 Land Suitability map of Jackfruit

7.18 Land Suitability for Jamun (*Syzygium cumini*)

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

Moderately suitable (Class S2) lands occupy an area of about 168 ha (22%) and distributed in the southern, western and northern part of the microwatershed. They have minor limitations of rooting depth, texture and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 345 ha (46 %) and are distributed in the major part of the microwatershed with moderate limitations of rooting depth, gravelliness, drainage, calcareousness and texture.

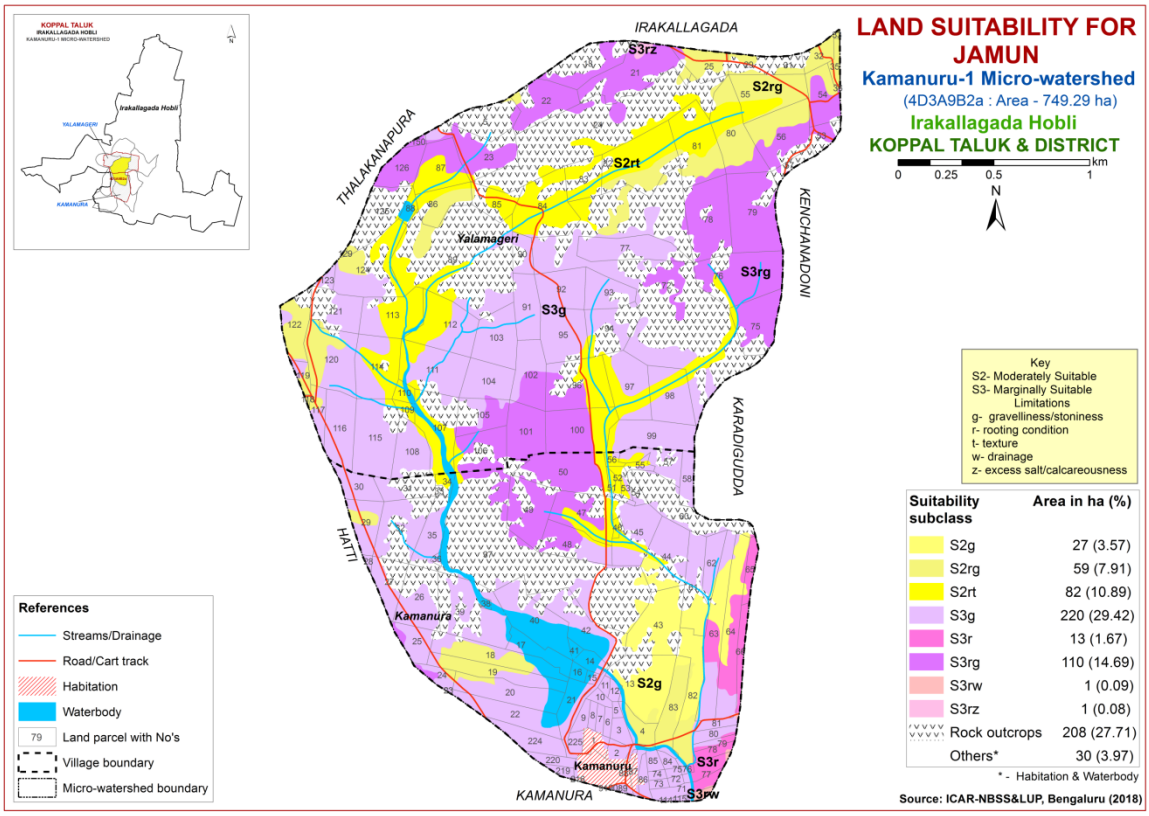


Fig. 7.18 Land Suitability map of Jamun

7.19 Land Suitability for Musambi (*Citrus limetta*)

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

An area of about 82 ha (11%) is highly suitable (Class S1) for growing musambi and are distributed in the central and northern part of the microwatershed. An area of about 101 ha (13 %) is moderately suitable (Class S2) and occur in the southern, northern and western part of the microwatershed. They have minor limitations of gravelliness, rooting depth, calcareousness and drainage. Maximum area of about 331 ha (44%) is marginally suitable (Class S3) for growing musambi and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth.

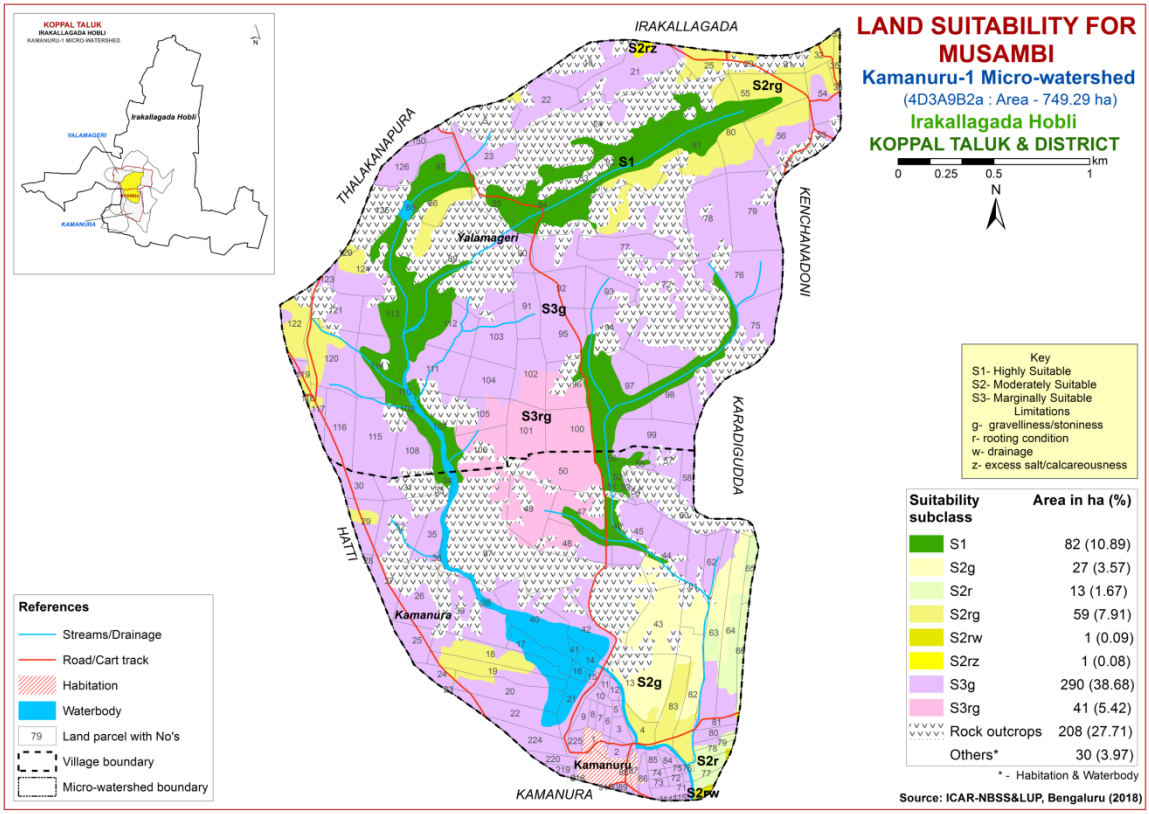


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

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

An area of about 82 ha (11%) is highly suitable (Class S1) for growing lime and are distributed in the central and northern part of the microwatershed. An area of about 101 ha (13 %) is moderately suitable (Class S2) and occur in the southern, northern and western part of the microwatershed. They have minor limitations of gravelliness, rooting depth, calcareousness and drainage. Maximum area of about 331 ha (44%) is marginally suitable (Class S3) for growing lime and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth

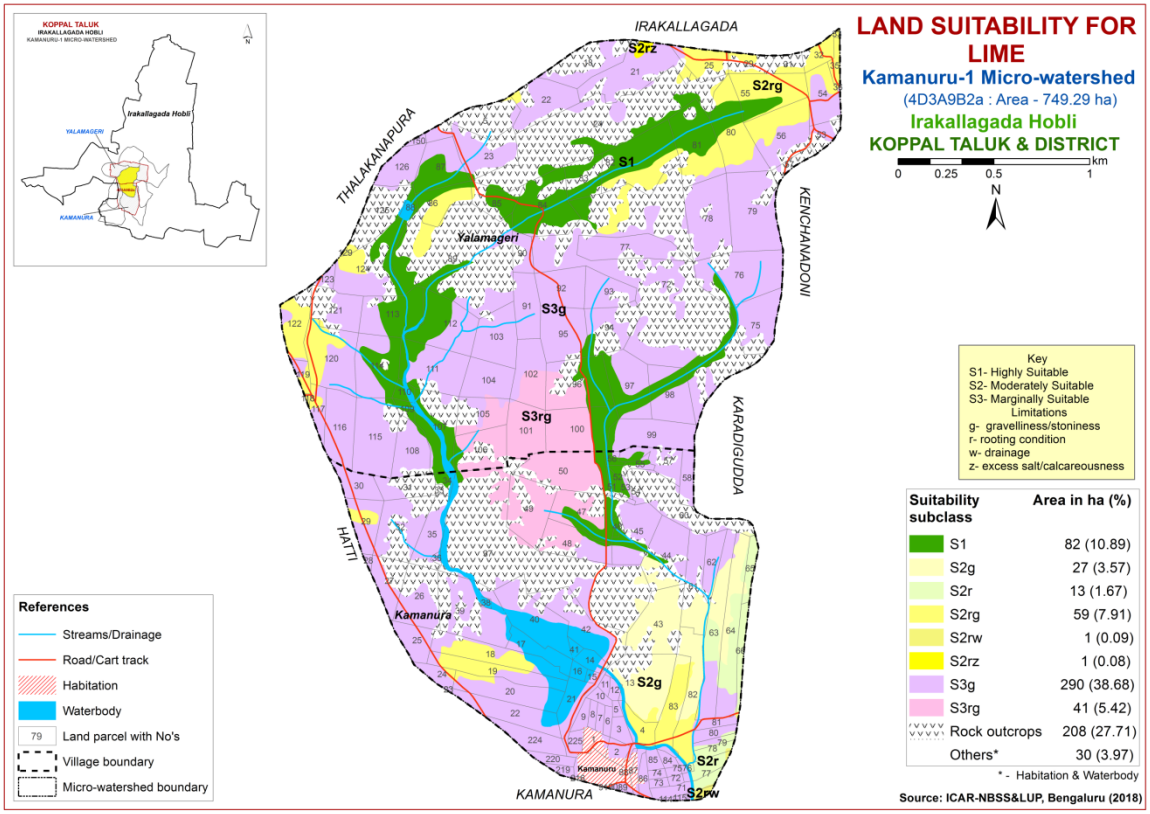


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

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

An area of about 13 ha (2 %) is highly suitable (Class S1) for growing cashew and are distributed in the southeastern part of the microwatershed. An area of about 147 ha (20 %) is moderately suitable (Class S2) and occur in the southern, western and northern part of the microwatershed. They have minor limitations of gravelliness, texture and rooting depth. An area of about 270 ha (36%) is marginally suitable (Class S3) for growing cashew and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth. An area of about 84 ha (11%) is currently not suitable (Class N1) for growing cashew and distributed in the central and northern part of the microwatershed with severe limitations of texture, drainage and calcareousness.

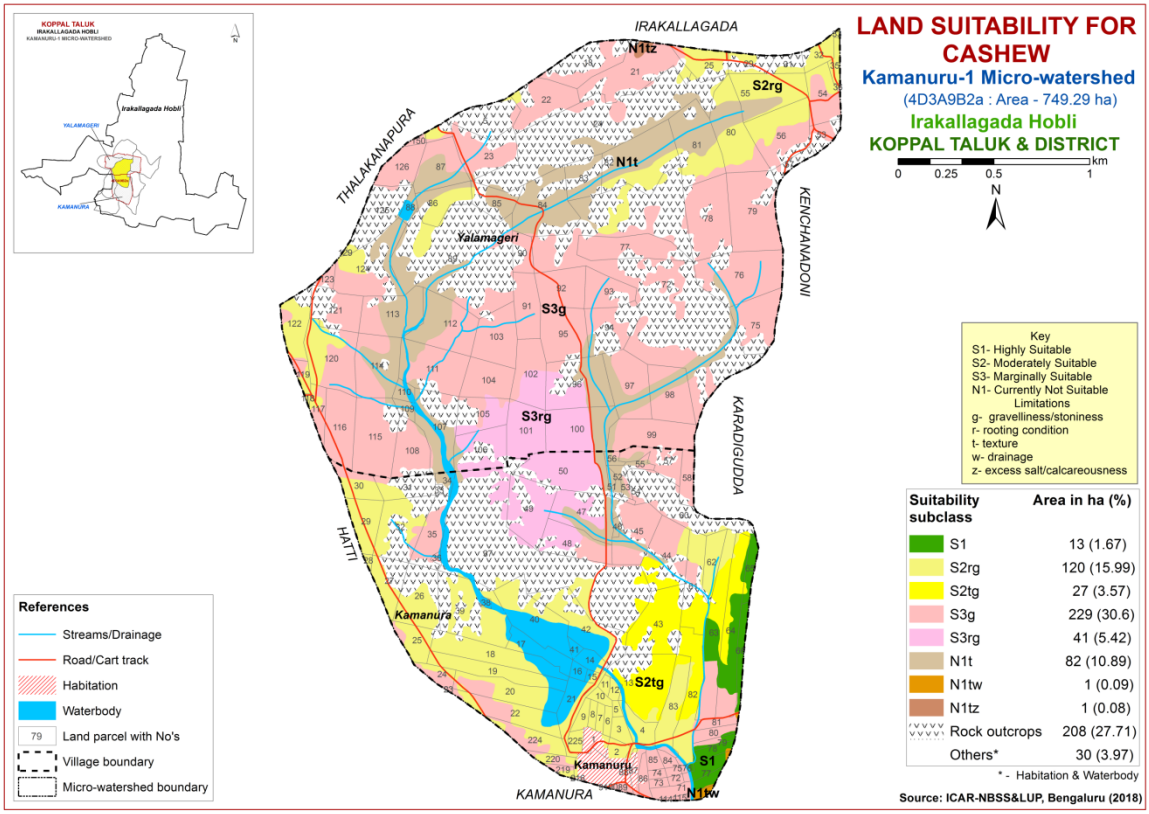


Fig. 7.21 Land Suitability map of Cashew

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

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

An area of about 94 ha (13%) is highly suitable (Class S1) for growing custard apple and are distributed in the central, northern and southeastern part of the microwatershed. Moderately suitable (Class S2) lands cover a maximum area of about 419 ha (56%) and occur in the major part of the microwatershed. They have minor limitations of rooting depth, gravelliness, drainage and calcareousness.

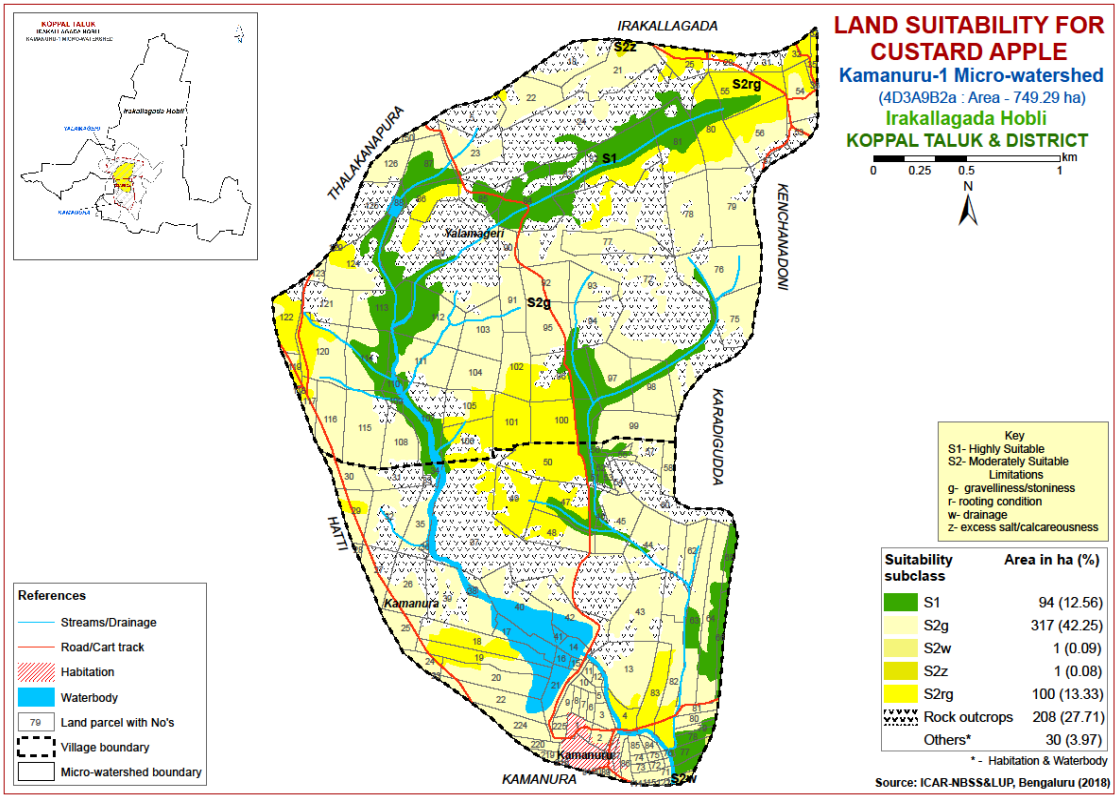


Fig. 7.22 Land Suitability map of Custard Apple

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

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

An area of about 13 ha (2%) is highly suitable (Class S1) for growing amla and are distributed in the southeastern part of the microwatershed. Moderately suitable (Class S2) lands cover a maximum area of about 501 ha (67%) and occur in the major part of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture, drainage and calcareousness.

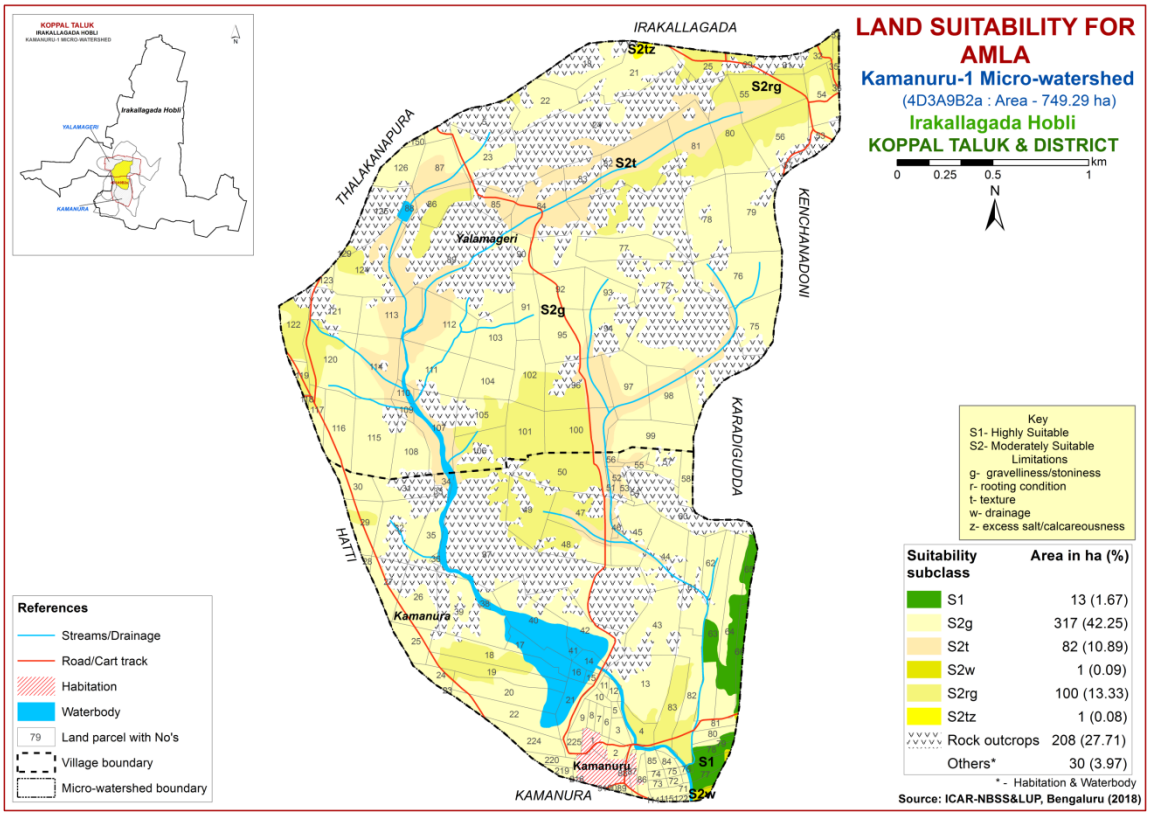


Fig. 7.23 Land Suitability map of Amla

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

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

An area of about 126 ha (17 %) is moderately suitable (Class S2) and occur in the southern, central and northwestern part of the microwatershed. They have minor limitations of rooting depth and gravelliness. Maximum area of about 347 ha (46 %) is marginally suitable (Class S3) for growing tamarind and are distributed in the major part of the microwatershed with moderate limitations of gravelliness, rooting depth, calcareousness and drainage. An area of about 41 ha (5%) is currently not suitable (Class N1) for growing tamarind and distributed in the central part of the microwatershed with severe limitations of rooting depth and gravelliness.

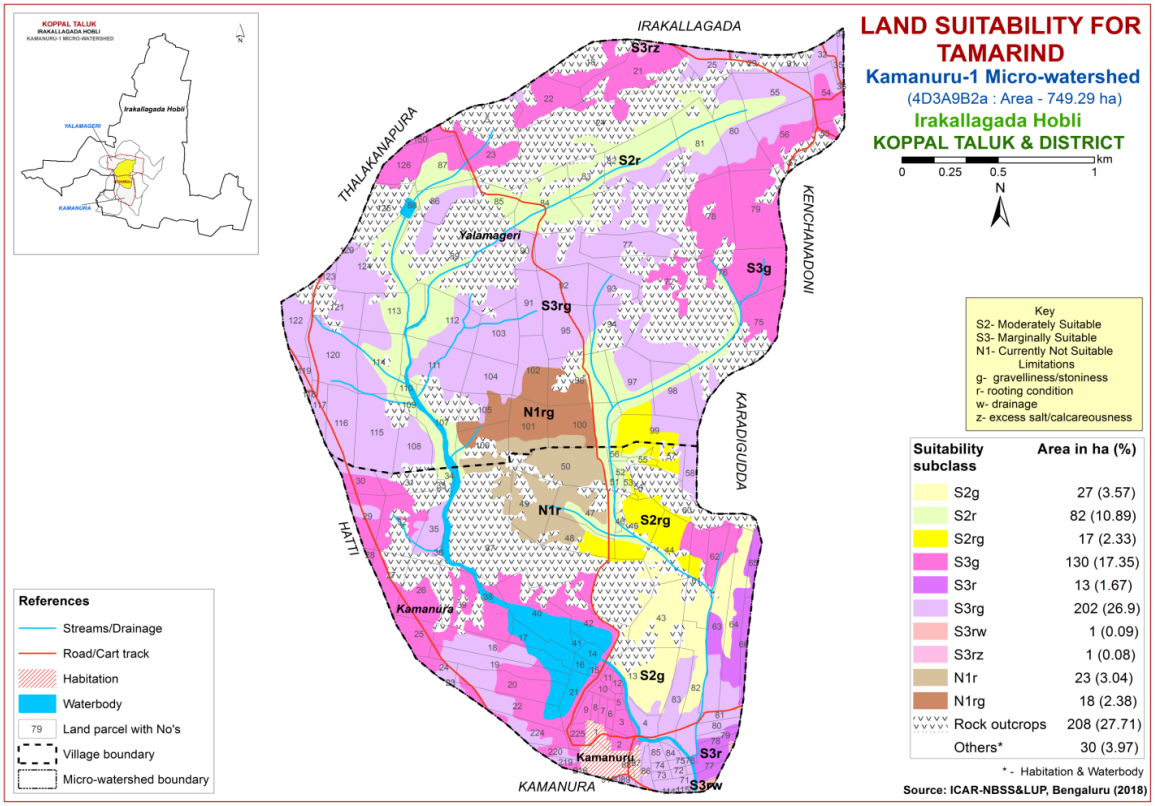


Fig. 7.21 Land Suitability map of Tamarind

7.25 Land Suitability for Marigold (*Tagetes erecta*)

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

An area of about 13 ha (2%) is highly suitable (Class S1) for growing marigold and are distributed in the southeastern part of the microwatershed. An area of about 134 ha (18%) is moderately suitable (Class S2) and occur in the major part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage, texture and calcareousness. An area of about 367 ha (49 %) is marginally suitable (Class S3) for growing marigold and are distributed in the major part of the microwatershed with moderate limitation of gravelliness.

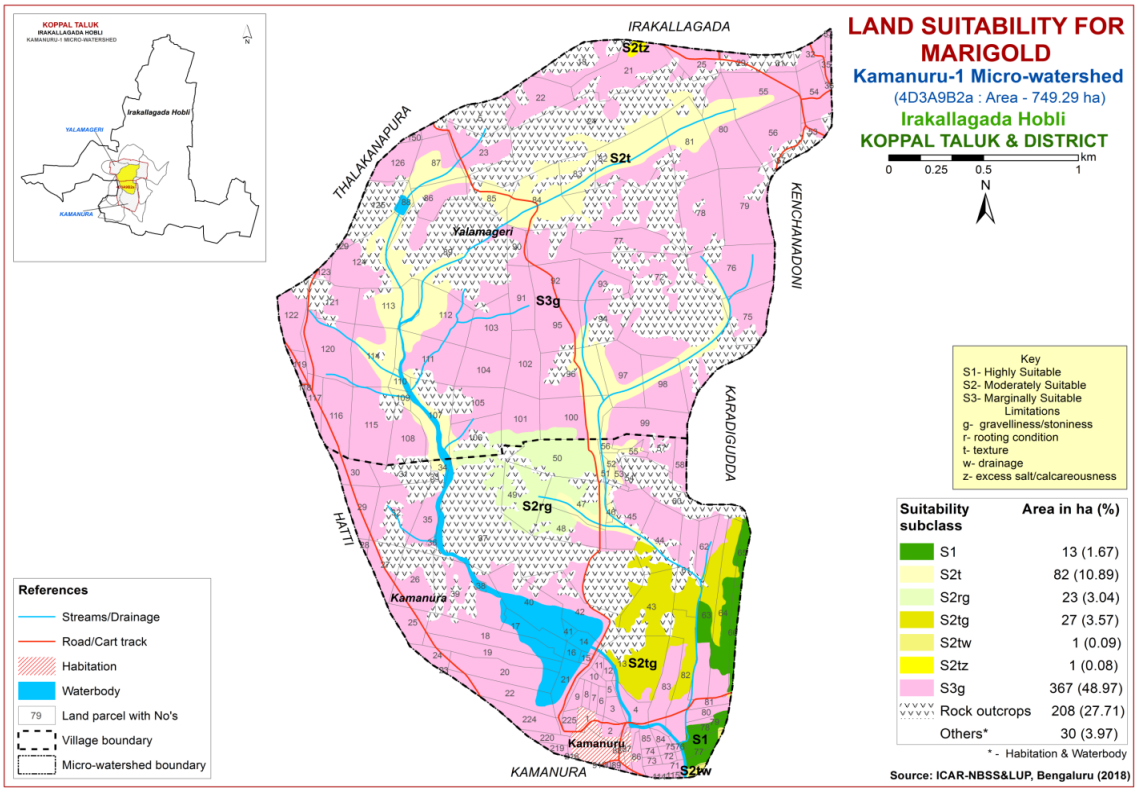


Fig. 7.25 Land Suitability map of Marigold

7.26 Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

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

An area of about 13 ha (2%) is highly suitable (Class S1) for growing chrysanthemum and are distributed in the southeastern part of the microwatershed. An area of about 134 ha (18 %) is moderately suitable (Class S2) and occur in the northern, western and southeastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage, texture and calcareousness. An area of about 367 ha (49%) is marginally suitable (Class S3) for growing chrysanthemum and are distributed in the major part of the microwatershed with moderate limitation of gravelliness.

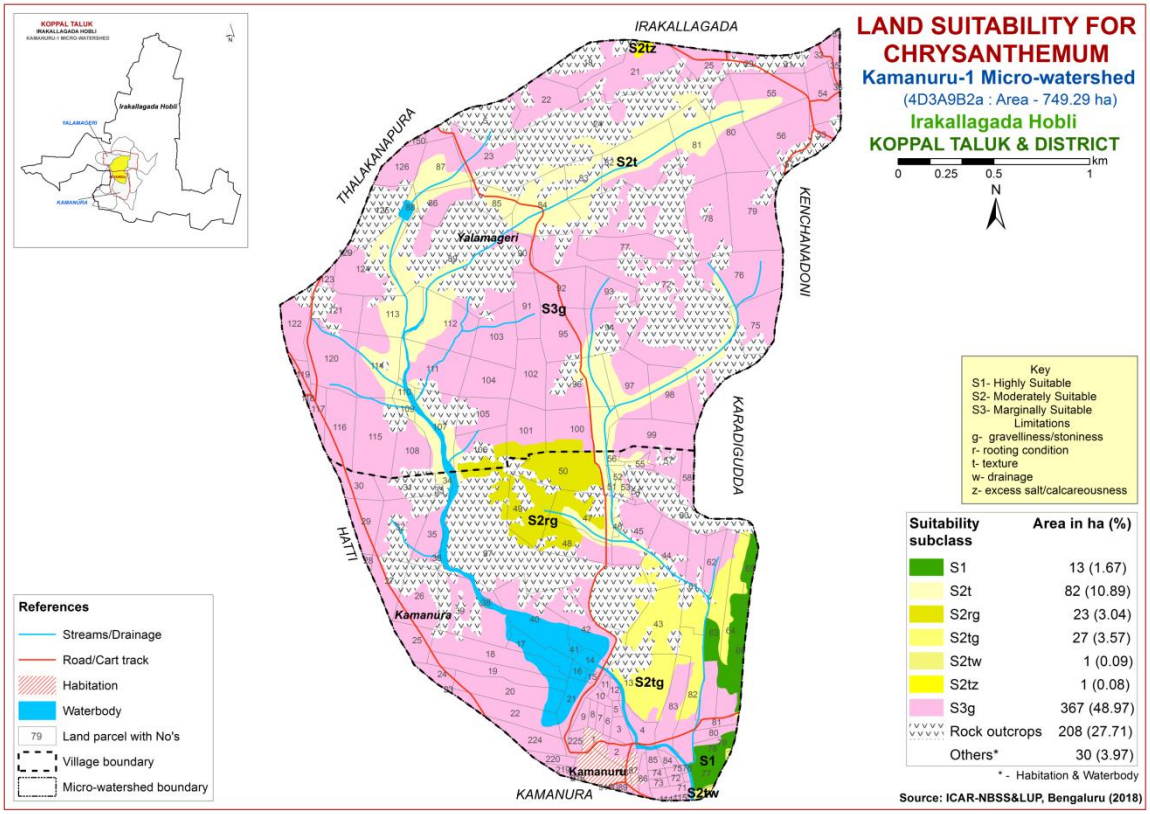


Fig. 7.26 Land Suitability map of Chrysanthemum

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

Jasmine is one of the most important flower crop grown in an area of 803 ha in almost all the districts of the State. The crop requirements (Table 7.28) 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.

An area of about 13 ha (2 %) is highly suitable (Class S1) for growing jasmine and are distributed in the southeastern part of the microwatershed. An area of about 51 ha (7%) is moderately suitable (Class S2) and occur in the southeastern and central part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage and texture. Maximum area of about 450 ha (60%) is marginally suitable (Class S3) for growing jasmine and are distributed in the major part of the microwatershed with moderate limitations of gravelliness, texture and calcareousness.

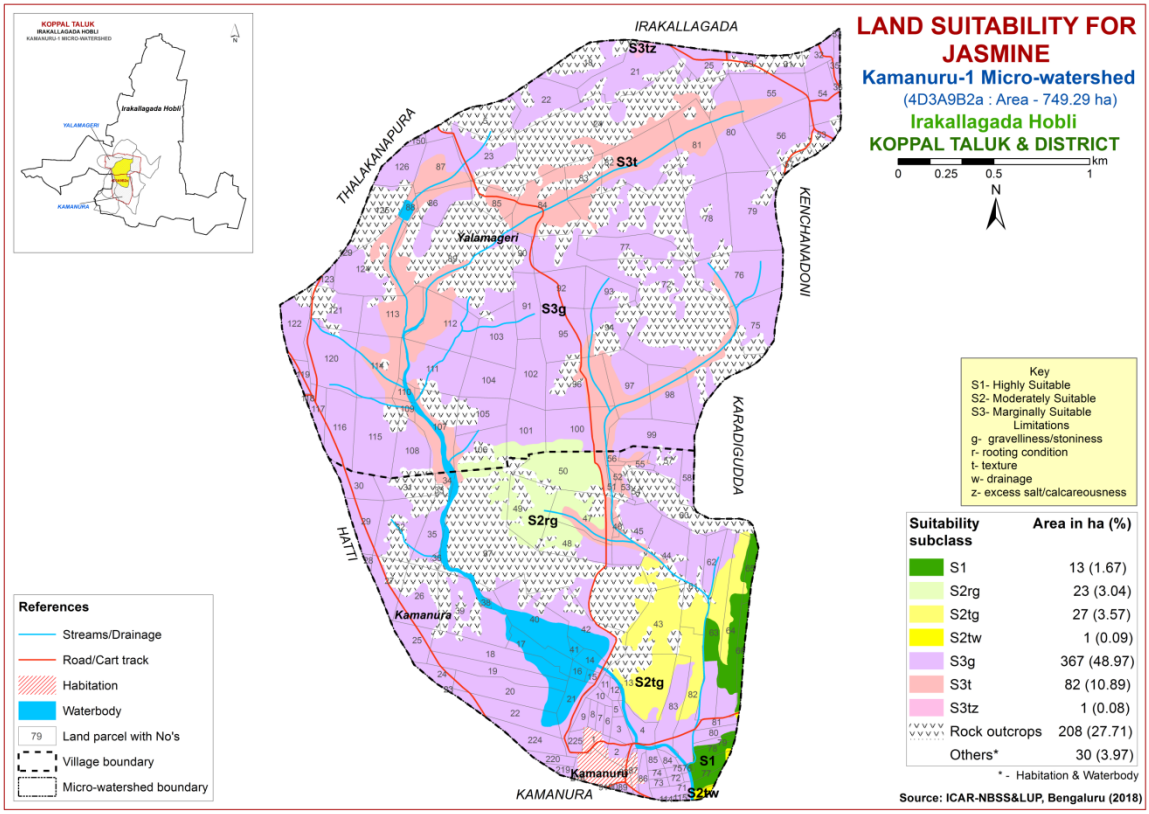


Fig. 7.27 Land Suitability map of Jasmine

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

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

An area of about 13 ha (2%) is highly suitable (Class S1) for growing crossandra and are distributed in the southeastern part of the microwatershed. An area of about 52 ha (7%) is moderately suitable (Class S2) and occur in the northwestern and central part of the microwatershed. They have minor limitations of gravelliness, rooting depth, and calcareousness. Maximum area of about 449 ha (60 %) is marginally suitable (Class S3) for growing crossandra and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and texture.

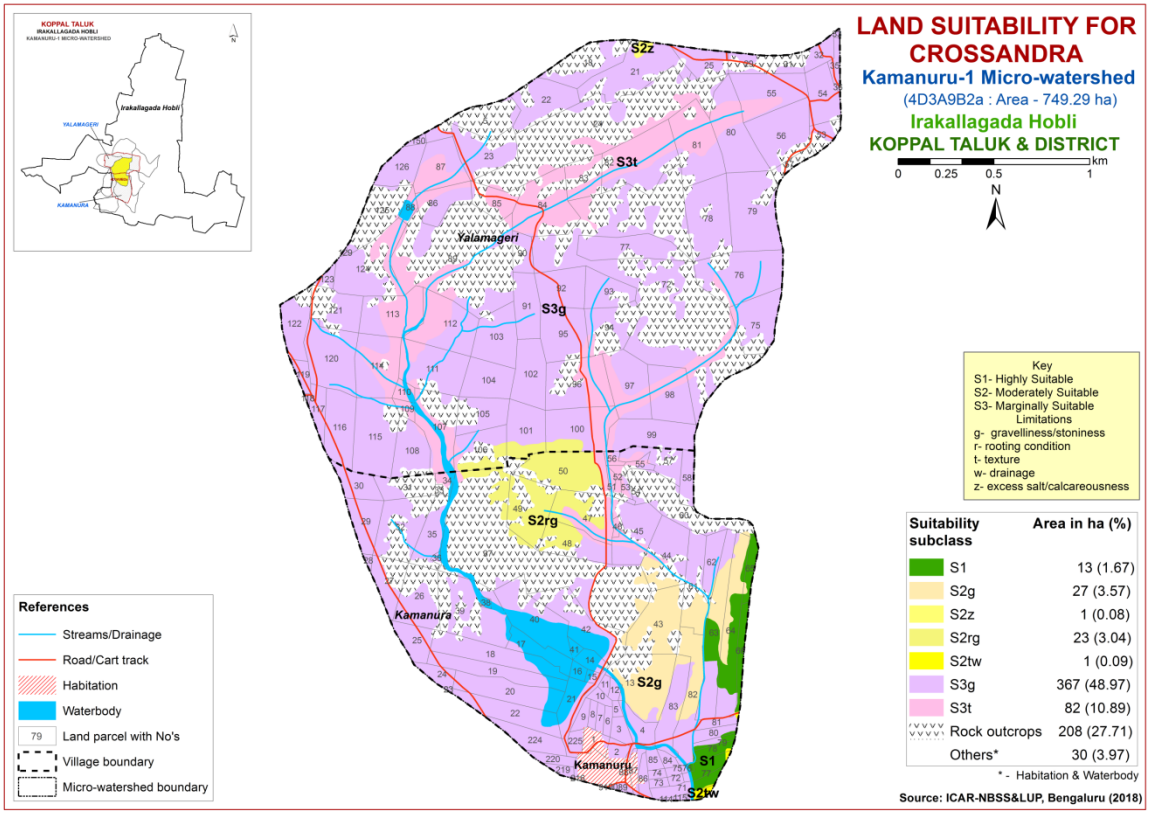


Fig. 7.28 Land Suitability map of Crossandra

Table 7.1 Soil-Site Characteristics of Kamanuru -1 Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP	CEC [Cmol (p^{+})kg^{-1}]	BS (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface								
LKRcB2g1	662	<90	WD	50-75	sl	gsc	15-35	40-60	<50	1-3	moderate	8.18	0.30	4.51	12.19	100
MKHcB1g1	662	<90	WD	50-75	sl	gscl	15-35	>35	<50	1-3	slight	7.38	0.09	1.49	14.84	93
MKHcB2	662	<90	WD	50-75	sl	gscl	-	>35	<50	1-3	moderate	7.38	0.09	1.49	14.84	93
HDHcB1	662	<90	WD	75-100	sl	gsc-gc	-	>35	51-100	1-3	slight	6.54	0.07	7.11	3.84	84.7
HDHcB2	662	<90	WD	75-100	sl	gsc-gc	-	>35	51-100	1-3	moderate	6.54	0.07	7.11	3.84	84.7
HDHcB2g1	662	<90	WD	75-100	sl	gsc-gc	15-35	>35	51-100	1-3	moderate	6.54	0.07	7.11	3.84	84.7
HDHhB1	662	<90	WD	75-100	scl	gsc-gc	-	>35	51-100	1-3	slight	6.54	0.07	7.11	3.84	84.7
HDHhB2	662	<90	WD	75-100	scl	gsc-gc	-	>35	51-100	1-3	moderate	6.54	0.07	7.11	3.84	84.7
HDHhB2g1	662	<90	WD	75-100	scl	gsc-gc	15-35	>35	51-100	1-3	moderate	6.54	0.07	7.11	3.84	84.7
BSRcB1	662	<90	WD	75-100	sl	gsc	-	15-35	51-100	1-3	slight	6.59	0.12	6.00	8.80	77.55
BDGcB1g1	662	<90	WD	75-100	sl	gc	15-35	35-60	51-100	1-3	slight	6.24	0.06	0.35	3.76	52.56
BDGcB1g2	662	<90	WD	75-100	sl	gc	35-60	35-60	51-100	1-3	slight	6.24	0.06	0.35	3.76	52.56
BDGhB2	662	<90	WD	75-100	scl	gc	-	35-60	51-100	1-3	moderate	6.24	0.06	0.35	3.76	52.56
BPRbB1g1	662	<90	WD	100-150	ls	gsc-gc	15-35	>35	51-100	1-3	slight	6.64	0.03	0.51	5.45	63.48
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	63.48
BPRcB1	662	<90	WD	100-150	sl	gsc-gc	-	>35	51-100	1-3	slight	6.64	0.03	0.51	5.45	63.48
BPRcB1g1	662	<90	WD	100-150	sl	gsc-gc	15-35	>35	51-100	1-3	slight	6.64	0.03	0.51	5.45	63.48
BPRcB2	662	<90	WD	100-150	sl	gsc-gc	-	>35	51-100	1-3	moderate	6.64	0.03	0.51	5.45	63.48
BPRcB2g1	662	<90	WD	100-150	sl	gsc-gc	15-35	>35	51-100	1-3	moderate	6.64	0.03	0.51	5.45	63.48
BPRhB1	662	<90	WD	100-150	scl	gsc-gc	-	>35	51-100	1-3	slight	6.64	0.03	0.51	5.45	63.48
BPRhB2	662	<90	WD	100-150	scl	gsc-gc	-	>35	51-100	1-3	moderate	6.64	0.03	0.51	5.45	63.48
BPRhB2g1	662	<90	WD	100-150	scl	gsc-gc	15-35	>35	51-100	1-3	moderate	6.64	0.03	0.51	5.45	63.48
BPRhC3g2	662	<90	WD	100-150	scl	gsc-gc	35-60	>35	51-100	3-5	severe	6.64	0.03	0.51	5.45	63.48
BPRiB1	662	<90	WD	100-150	sc	gsc-gc	-	>35	51-100	1-3	slight	6.64	0.03	0.51	5.45	63.48
BPRhB1	662	<90	WD	100-150	scl	gsc-gc	-	>35	51-100	1-3	slight	6.64	0.03	0.51	5.45	63.48

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP	CEC [Cmol (p^{+})kg^{-1}]	BS (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface								
NGPbB1	662	<90	WD	100-150	ls	gsc-gc	-	>35	51-100	1-3	slight	6.67	0.09	0.46	7.10	82.70
NGPhB1g2	662	<90	WD	100-150	scl	gsc-gc	35-60	>35	51-100	1-3	slight	6.67	0.09	0.46	7.10	82.70
NGPiB2g1	662	<90	WD	100-150	sc	gsc-gc	15-35	>35	51-100	1-3	moderate	6.67	0.09	0.46	7.10	82.70
NDLcB2g1	662	<90	WD	>150	sl	gsc	15-35	>35	51-100	1-3	moderate	7.46	0.08	0.32	11.45	91.88
NDLiB2	662	<90	WD	>150	sc	gsc	-	>35	51-100	1-3	moderate	7.46	0.08	0.32	11.45	91.88
HLPiB2	662	<90	WD	75-100	sc	scl	-	-	51-100	1-3	moderate	-	-	-	-	-
DRLiB2	662	<90	MWD	75-100	sc	c	-	<15	151-200	1-3	moderate	8.78	0.42	5.62	49.70	100
GRHiB2	662	<90	MWD	100-150	sc	c	-	<15	>200	1-3	moderate	9.08	0.23	7.11	63.21	100

Table 7.2 Land suitability criteria for Sorghum

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime1	Mean temperature in growing season	°C	26–30	30–34; 24–26	34–40; 20–24	>40; <20
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristics					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sc, c (red), c (black)	scl, cl	ls, sl	-
	pH	1:2.5	5.5-7.8	5.0-5.5 7.8-9.0	>9.0	-
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	10-15
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	dS/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	5-10	10-15	>15	
Erosion hazard	Slope	%	0-3	3-5	5-10	>10

Table 7.3 Land suitability criteria for Maize

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

Table 7.4 Land suitability criteria for Bajra

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

Table 7.5 Land suitability criteria for Groundnut

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

Table 7.6 Land suitability criteria for Sunflower

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

Table 7.7 Land suitability criteria for Cotton

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

Table 7.8 Land suitability criteria for Red gram

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

Table 7.9 Land suitability criteria for Bengal gram

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

Table 7.10 Land suitability criteria for Chilli

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

Table 7.11 Land suitability criteria for Tomato

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

Table 7.12 Land suitability criteria for Drumstick

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

Table 7.13 Land suitability criteria for Mulberry

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

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

Table 7.14 Land suitability criteria for Mango

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

Table 7.15 Land suitability criteria for Sapota

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

Table 7.16 Land suitability criteria for Pomegranate

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

Table 7.17 Land suitability criteria for Guava

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

Table 7.18 Land suitability criteria for Jackfruit

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

Table 7.19 Land suitability criteria for Jamun

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

Table 7.20 Land suitability criteria for Musambi

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

Table 7.21 Land suitability criteria for Lime

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

Table 7.22 Land suitability criteria for Cashew

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

Table 7.23 Land suitability criteria for Custard apple

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

Table 7.24 Land suitability criteria for Amla

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

Table 7.25 Land suitability criteria for Tamarind

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

Table 7.26 Land suitability criteria for Marigold

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

Table 7.27 Land suitability criteria for Chrysanthemum

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

Table 7.28 Land suitability criteria for Jasmine (irrigated)

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

7.29 Land suitability criteria for Crossandra

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

7.29 Land management units (LMUs)

The 33 soil map units identified in Kamanuru-1 microwatershed have been grouped into five Land management units (LMUs) for the purpose of preparing a Proposed Crop Plan. Land management units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land management units map (Fig.7.29) 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 five Land management units along with brief description of soil and site characteristics are given below.

LMU	Mapping unit	Soil and site characteristics
1	HLPiB2	Moderately deep, sandy clay lowland soils with slopes of 1-3%, moderate erosion
2	DRLiB2 GRHiB2	Moderately deep to deep, black calcareous to non calcareous clayey soils with slopes of 1-3%, moderate erosion
3	BDGcB1g1, BDGcB1g2, BDGhB2, NDLcB2g1, NDLiB2, BPRbB1g1, BPRbB2g1, BPRcB1, BPRcB1g1, BPRcB2, BPRcB2g1, BPRhB1, BPRhB2, BPRhB2g1, BPRhC3g2, BPRiB1, NGPbB1, NGPhB1g2, NGPiB2g1, HDHcB1, HDHcB2, HDHcB2g1, HDHhB1, HDHhB2, HDHhB2g1	Moderately deep to deep, gravelly red sandy clay to clay soils with slopes of 1-5%, slight to moderate erosion, gravelly to very gravelly (15-60%)
4	BSRcB1	Moderately deep to deep red sandy clay soils with slopes of 1-3 %, slight erosion
5	LKRcB2g1, MKHcB1g1, MKHcB2	Moderately shallow, red gravelly sandy clay to sandy clay loam soils with slopes of 1-3%, slight to moderate erosion, gravelly (15-35%)

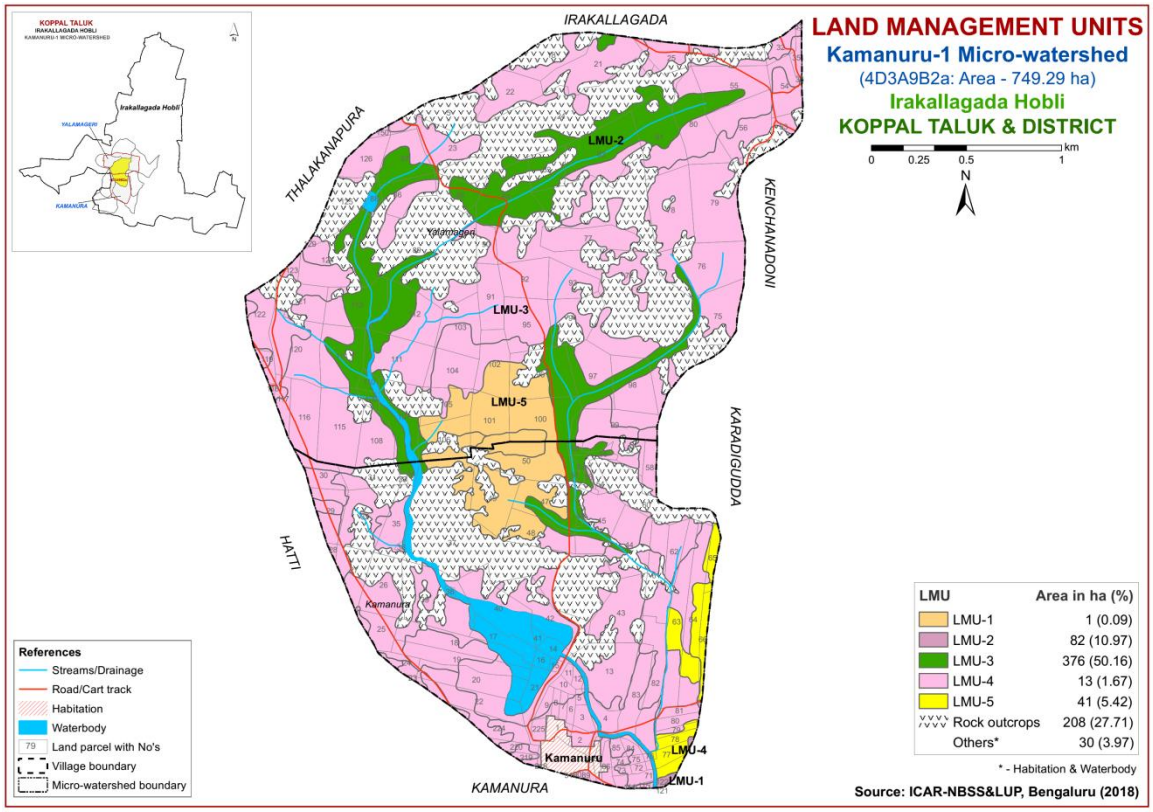


Fig 7.29 Land management units map of Kamanuru-1 microwatershed

7.30 Proposed Crop Plan for Kamanuru-1 Microwatershed

After assessing the land suitability for the 28 crops, the proposed crop plan has been prepared for the five 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 7.30 Proposed Crop Plan for Kamanuru-1 Microwatershed

LMU	Soil Map Units	Survey Number	Field Crops	Horticulture Crops	Suitable Interventions
1	438.HLPiB2 (Moderately deep, sandy clay lowland soils)	**Kamanura :**121,122	Paddy, Sunflower, Maize	**Fruit crops:** Custard Apple, Amla **Vegetable crops:** Brinjal, Tomato, Chillies **Flower crops:** Marigold, Chrysanthemum, Jasmine	Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practices
2	342.DRLiB2 368.GRHiB2 (Moderately deep to deep, black calcareous to non calcareous clayey soils)	**Kamanura:**34,46,51,52,53,56 **Yalamageri:**81,82,83,84,85,87,96, 107,109,110,113	Sorghum, Sunflower, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Pomegranate, Jamun, Lime, Musambi, Tamarind, Amla, Custard apple **Vegetable crops:** Drumstick, Chilli, Coriander, Bhendi **Flower crops:** Marigold,Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
3	180.BDGcB1g1 181.BDGcB1g2 187.BDGhB2 291.NDLcB2g1 300.NDLiB2 215.BPRbB1g1 217.BPRbB2g1 222.BPRcB1 223.BPRcB1g1 224.BPRcB2 225.BPRcB2g1 228.BPRhB1 230.BPRhB2	**Kamanura:**2,3,4,5,6,7,8,9,10,11,12, 13,15,18,19,20,22,23,24,25,26,27,28,29,30,35,36,42,43,44,45,55,57,58,61,62,63,71,72,73,74,75,76,80,81,82,83,84,85,86,89,90,91,114,115,219,220,224, 225 **Yalamageri :** 21,22,23,25,32,33,35, 36,54,55,56,75,76,77,78,79,80,86,90,91,92,93,95,97,98,99,103,104,108,111,112,114,115, 116,117,118,119,	Groundnut, Red gram, Bajra, Horse gram, Castor	**Fruit crops:** Lime, Musambi**,** Jackfruit, Mango, Tamarind, Jamun, Amla, Cashew, Custard apple **Vegetable crops:** Drumstick	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)

	231.BPRhB2g1 233.BPRhC3g2 237.BPRiB1 249.NGPbB1 259.NGPhB1g2 265.NGPiB2g1 108.HDHcB1 110.HDHcB2 111.HDHcB2g1 119.HDHhB1 122.HDHhB2 123.HDHhB2g1 (Moderately deep to deep, gravelly red sandy clay to clay soils)	120,122,123,124, 126,129,150			
4	159.BSRcB1 (Moderately deep to deep red sandy clay soils)	**Kamanura :** 64,65,66,77,78,79	Maize, Sorghum, Bajra, Groundnut, Redgram, Castor	**Fruit crops:** Pomegranate, Guava, Sapota, Jackfruit, 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)
5	43.LKRcB2g1 75.MKHcB1g1 76.MKHcB2 (Moderately shallow, red gravelly sandy clay to sandy clay loam soils)	**Kamanura :** 47,48,49,50 **Yalamageri :** 100,101,102,105, 106	Sorghum, Groundnut, Bajra, Castor	**Fruit crops:** Amla, Cashew, Custard apple	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)

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-1 Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of BPR (159 ha), GRH (82 ha), NGP (70 ha), BDG (61 ha), HDH (60 ha), NDL (27 ha), MKH (23 ha), LKR (18 ha), BSR (13 ha), DRL (1 ha) and HLP (1 ha).
- As per land capability classification, entire area in the microwatershed falls under arable land category (Class II and III). The major limitations identified in the arable lands were soil, erosion and drainage.
- On the basis of soil reaction, an area of about 18 ha (2%) is moderately acid (pH 5.5-6.0), 30 ha (4%) is slightly acid (pH 6.0-6.5), 443 ha (59%) is neutral (pH 6.5-7.3), 20 ha (3%)

is slightly alkaline (pH 7.3-7.8) and 1 ha (<1 %) is moderately alkaline (pH 7.8-8.4) in reaction.

Soil Health Management

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

Acid soils

Acid soils occupy an area of about 48 ha (6%) in the microwatershed. The following measures are recommended for reclaiming acid soils.

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

Liming materials:

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

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

Alkaline soils

An area of about 21 ha (3%) is under alkaline soils. The following actions are recommended.

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

Neutral soils

Neutral soils cover about 443 ha (59 %) and the following actions are recommended.

1. Regular addition of organic manure, green manuring, green leaf manuring, crop residue incorporation and mulching needs to be taken up to improve the soil organic matter status.
2. Application of biofertilizers, (Azospirullum, Azotobacter, Rhizobium).
3. Application of 100 per cent RDF.
4. Need based micronutrient applications.

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

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. An area of about 326 ha (44%) is under moderate and severe erosion. The areas with moderate and severe erosion need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning in IWMP is focusing on preparation of

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

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

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

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Kamanuru-1 Microwatershed.
- **Organic Carbon:** An area of about 447 ha (60%) is medium (0.5-0.75%) and 65 ha (9%) is high (>0.75) in OC content. The areas that are 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 447 ha area where OC is less than 0.75 per cent. For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus**: Available phosphorus is low (<23 kg/ha) in 80 ha (11%), medium in 206 ha (28 %) and high (>57 kg/ha) in 226 ha (30 %) of the soils. The areas with high phosphorus content reduce 25% from the RDF to avoid the excess application of fertilizer and apply additional 25% phosphorus in areas where it is medium.
- **Available Potassium:** Available potassium is low (<145 kg/ha) in 14 ha (2 %) and medium (145-337 kg/ha) in 498 ha (67%) area of the microwatershed. The areas with high potassium content reduce 25% from the RDF to avoid the excess application of fertilizer and apply additional 25% potassium in areas where it is low and medium.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. Available sulphur is low (<10 ppm) in 469 ha (63%), medium in 40 ha (5%) area of the microwatershed and high (>20 ppm) 3 ha (<1%) area of the microwatershed. Areas with low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available iron:** It is deficient (<4.5 ppm) in 111 ha (15 %) and sufficient (>4.5 ppm) in 401 ha (54 %) area of the microwatershed. To manage iron deficiency iron sulphate @ 25 kg/ha needs to be applied for 2-3 years.
- **Available Zinc:** It is deficient (<0.6 ppm) in the 464 ha (62 %) and sufficient (>0.6 ppm) in 48 ha (6 %) area of the microwatershed. Application of zinc sulphate @ 25kg/ha is to be followed in areas that are deficient in available zinc.
- **Available Boron:** Available boron is low in (<0.5ppm) 424 ha (57%) and medium (0.5-1.0 ppm) in 88 ha (12 %) area in the microwatershed. The areas with low in boron content

need to be applied with sodium borate @ 10kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency.

- **Available manganese**: It is sufficient in the entire area of the microwatershed**.**
- **Available copper:** It is sufficient in the entire area of the microwatershed**.**
- **Soil acidity:** The microwatershed has 48 ha (6 %) area with soils that are slightly to moderately acid. These areas need application of lime (Calcium Carbonate).
- **Soil alkalinity:** An area of about 21 ha (3 %) in the microwatershed has soils that are slightly to strongly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

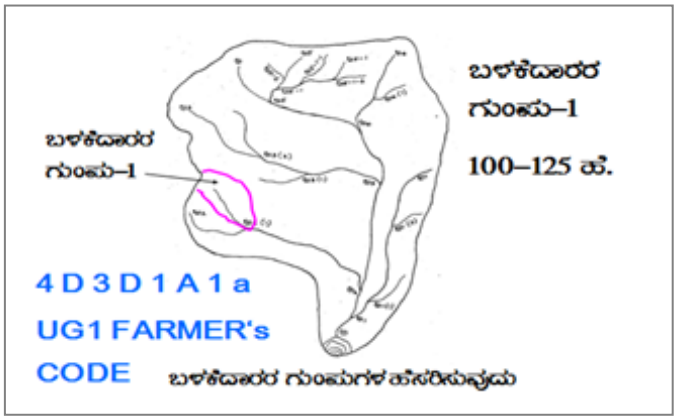
  Land Suitability for various crops: Areas that are highly, moderately and marginally suitable and not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

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

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



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

Steps for Survey and Preparation of Treatment Plan

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

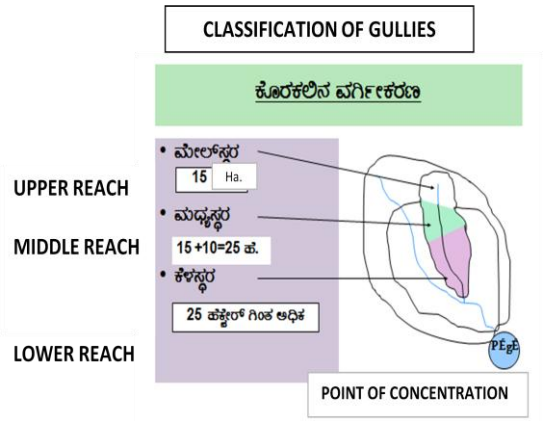
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

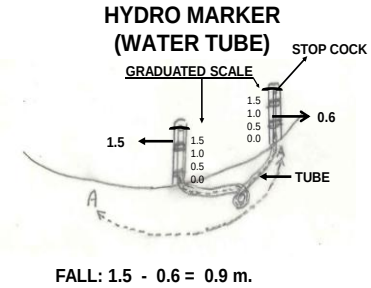
9.1.1 Arable Land Treatment

A. BUNDING

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

Measurement of Land Slope

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



FALL: 1.5 - 0.6 = 0.9 m.

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

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

Note: i) The above intervals are maximum.

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

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

Section of the Bund

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

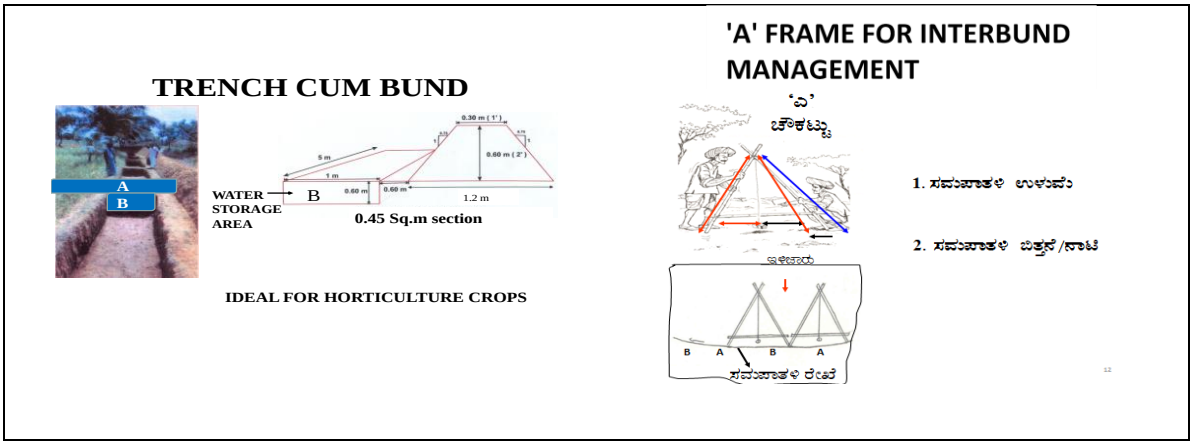
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below



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

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

B. Waterways

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

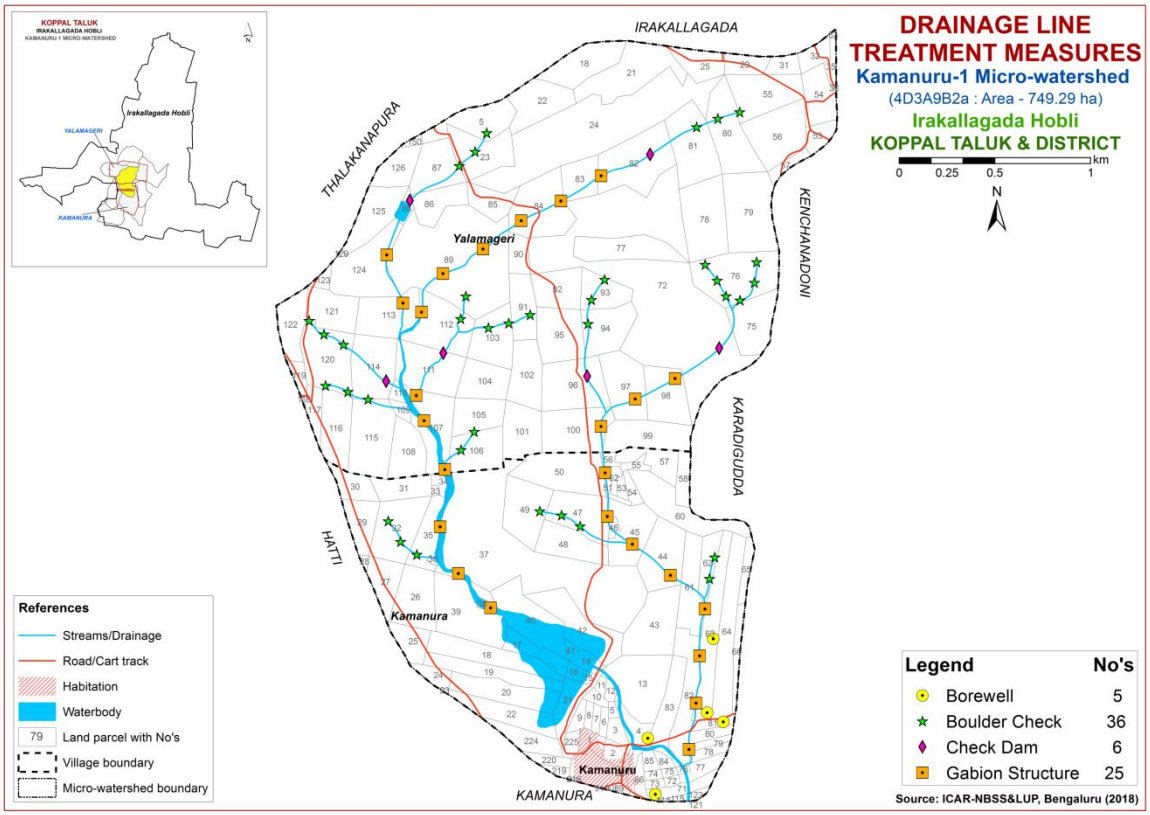


Fig. 9.1 Drainage line treatment map of Kamanuru-1 Microwatershed

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.2) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. A maximum area of about 429 ha (57 %) needs trench cum bunding and an area of about 83 ha (11 %) needs graded bunding. The conservation plan prepared may be presented to all the stakeholders including farmers and after considering their suggestions, the conservation plan for the microwatershed may be finalized in a participatory approach.

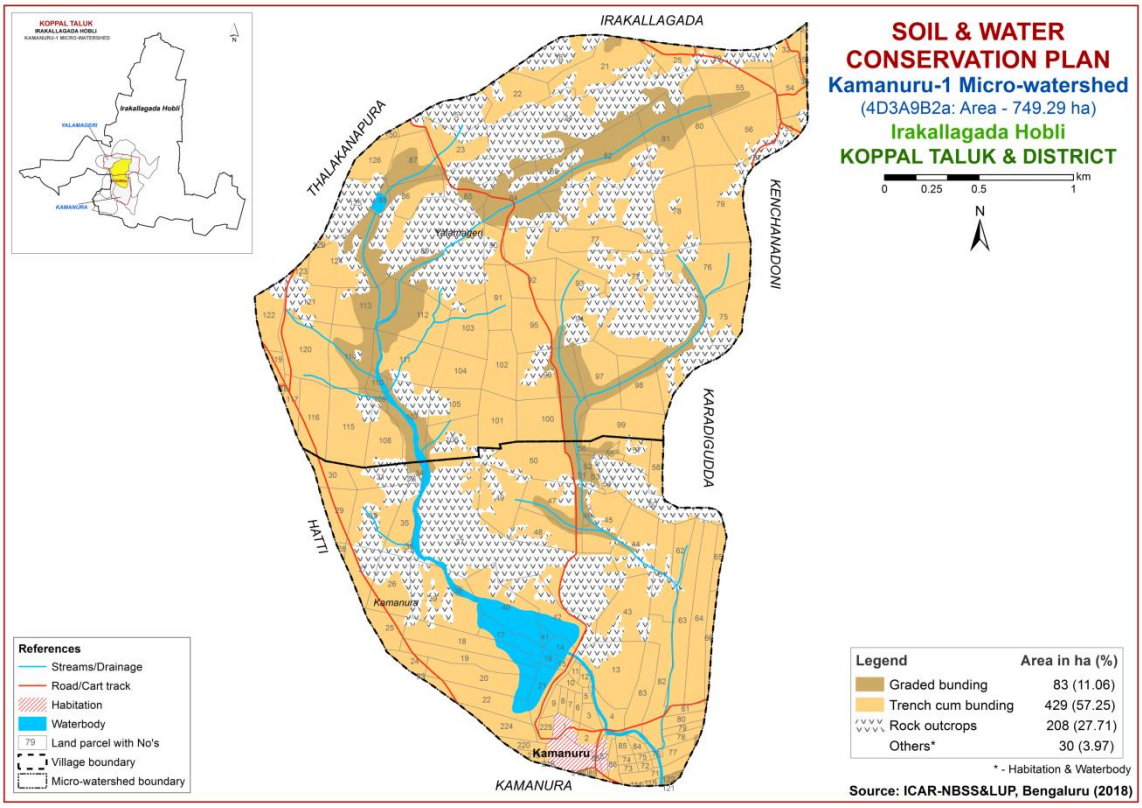


Fig. 9.2 Soil and Water Conservation Plan map of Kamanuru-1 Microwatershed

9.3 Greening of Microwatershed

As part of the greening programme in the watersheds, it is envisaged to plant a variety of horticultural and other tree plants that are edible, economical and produce lot of biomass which helps to restore the ecological balance in the watersheds. The lands that

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

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

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

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

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Appendix I

Kamanura-1Microwatershed

Soil Phase Information

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Kamanura	1	1.48	Others	Habitation	Others	Others	Others	Others	Others	Others	Habitation (Hb)	Not Available	Others	Others
Kamanura	2	1.2	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIIes	TCB
Kamanura	3	1.2	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	4	2.18	LMU-3	HDHhB1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	1 Borewell	IIs	TCB
Kamanura	5	0.38	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Kamanura	6	0.63	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	7	0.61	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	8	0.58	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	9	0.96	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	10	0.69	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	11	0.45	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	12	0.61	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	13	8.8	LMU-3	NDLiB2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIe	TCB
Kamanura	14	1.35	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Kamanura	15	0.42	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Kamanura	16	0.67	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Kamanura	17	2.93	Others	Waterbody	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Kamanura	18	6.59	LMU-3	HDHcB2g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize+Neem (Jw+Mz+Nm)	Not Available	IIes	TCB
Kamanura	19	5.16	LMU-3	HDHcB2g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	TCB
Kamanura	20	6.16	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Jowar+Maize (Gn+Jw+Mz)	Not Available	IIIes	TCB
Kamanura	21	2.64	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Kamanura	22	5.37	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize+Redgram (Jw+Mz+Rg)	Not Available	IIIes	TCB

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Kamanura	23	0.08	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize+Redgram (Jw+Mz+Rg)	Not Available	IIIs	TCB
Kamanura	24	1.59	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	TCB
Kamanura	25	2.97	LMU-3	BDGcB1g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	TCB
Kamanura	26	6.29	LMU-3	BDGcB1g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	TCB
Kamanura	27	3.78	LMU-3	BDGcB1g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Cultivated Fallow Land (CFL)	Not Available	IIIs	TCB
Kamanura	28	0.27	LMU-3	BDGcB1g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	TCB
Kamanura	29	3.74	LMU-3	BDGcB1g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Cultivated Fallow Land+Maize (CFL+Mz)	Not Available	IIIs	TCB
Kamanura	30	2.91	LMU-3	BDGcB1g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	TCB
Kamanura	31	3.42	RO	RO	RO	RO	RO	RO	RO	RO	Cultivated Fallow Land (CFL)	Not Available	RO	RO
Kamanura	32	7.38	RO	RO	RO	RO	RO	RO	RO	RO	Jowar (Jw)	Not Available	RO	RO
Kamanura	33	0.21	RO	RO	RO	RO	RO	RO	RO	RO	Not Available (NA)	Not Available	RO	RO
Kamanura	34	0.87	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Kamanura	35	4.22	LMU-3	BPRcB2g1	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIIes	TCB
Kamanura	36	0.24	LMU-3	BPRcB2g1	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Kamanura	37	38.1	RO	RO	RO	RO	RO	RO	RO	RO	Cultivated Fallow Land+Jowar+RO (CFL+Jw+RO)	Not Available	RO	RO
Kamanura	38	0.27	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Kamanura	39	10.26	RO	RO	RO	RO	RO	RO	RO	RO	Jowar (Jw)	Not Available	RO	RO
Kamanura	40	7.76	Others	Waterbody	Others	Others	Others	Others	Others	Others	RO	Not Available	Others	Others
Kamanura	41	0.45	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Kamanura	42	7.6	LMU-3	BDGcB1g1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	RO	Not Available	IIIs	TCB
Kamanura	43	7.93	LMU-3	NDLiB2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIe	TCB
Kamanura	44	7.02	LMU-3	BPRhB2g1	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	45	6.38	LMU-3	BPRhB2g1	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIIes	TCB
Kamanura	46	0.46	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Kamanura	47	6.47	LMU-5	MKHcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Paddy (Jw+Pd)	Not Available	IIIes	TCB
Kamanura	48	5.3	LMU-5	MKHcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	49	6.8	LMU-5	MKHcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Kamanura	50	8.44	LMU-5	MKHcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIIes	TCB
Kamanura	51	0.71	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Kamanura	52	0.71	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Kamanura	53	0.56	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Kamanura	54	0.93	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Kamanura	55	0.73	LMU-3	BPRhB2g1	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Kamanura	56	0.61	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Kamanura	57	3.45	LMU-3	BPRhB2g1	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Paddy (Jw+Pd)	Not Available	IIIes	TCB
Kamanura	58	2	LMU-3	BPRcB1g1	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	TCB
Kamanura	60	7.25	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Kamanura	61	5.49	LMU-3	NDLcB2g1	Very deep (>150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	TCB
Kamanura	62	2.7	LMU-3	BDGcB1g2	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Cultivated Fallow Land+Jowar (CFL+Jw)	Not Available	IIIes	TCB
Kamanura	63	7.88	LMU-3	NDLcB2g1	Very deep (>150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	2 Borewell	IIes	TCB
Kamanura	64	8.31	LMU-4	BSRcB1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIs	TCB
Kamanura	65	1.51	LMU-4	BSRcB1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIs	TCB
Kamanura	66	1.8	LMU-4	BSRcB1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Maize (Mn+Mz)	Not Available	IIs	TCB
Kamanura	71	2.15	LMU-3	BPRiB1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	1 Borewell	IIIs	TCB
Kamanura	72	0.4	LMU-3	BPRiB1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB
Kamanura	73	0.48	LMU-3	BPRiB1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB
Kamanura	74	0.44	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Kamanura	75	0.36	LMU-3	BPRiB1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB
Kamanura	76	0.29	LMU-3	BPRiB1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIIs	TCB
Kamanura	77	1.75	LMU-4	BSRcB1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	TCB
Kamanura	78	1.14	LMU-4	BSRcB1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	TCB
Kamanura	79	0.81	LMU-4	BSRcB1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	TCB
Kamanura	80	1.28	LMU-3	BPRhB1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB
Kamanura	81	1.08	LMU-3	BPRhB1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	1 Borewell	IIIs	TCB
Kamanura	82	6.52	LMU-3	NDLcB2g1	Very deep (>150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	TCB
Kamanura	83	4.71	LMU-3	HDHhB1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	TCB
Kamanura	84	0.62	LMU-3	BPRiB1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB
Kamanura	85	0.82	LMU-3	BPRiB1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB
Kamanura	86	1.11	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Banana+Jowar+Maize (Bn+Jw+Mz)	Not Available	IIIs	TCB
Kamanura	87	0.91	Others	Habitation	Others	Others	Others	Others	Others	Others	Maize (Mz)	Not Available	Others	Others
Kamanura	88	0.7	Others	Habitation	Others	Others	Others	Others	Others	Others	Maize (Mz)	Not Available	Others	Others
Kamanura	89	0.17	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB
Kamanura	90	0.14	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	TCB
Kamanura	91	0.02	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	TCB
Kamanura	114	0.11	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIIs	TCB
Kamanura	115	0.19	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIIs	TCB
Kamanura	121	0.02	LMU-1	HLPiB2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIew	Graded bunding
Kamanura	122	0.56	LMU-1	HLPiB2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIew	Graded bunding
Kamanura	216	0.11	Others	Habitation	Others	Others	Others	Others	Others	Others	Groundnut+Jowar+Maize (Gn+Jw+Mz)	Not Available	Others	Others
Kamanura	219	0.64	LMU-3	BPRcB1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut+Jowar+Maize (Gn+Jw+Mz)	Not Available	IIIs	TCB
Kamanura	220	1.17	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Jowar+Maize (Gn+Jw+Mz)	Not Available	IIIes	TCB

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Kamanura	224	3.37	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Jowar+Maize (Gn+Jw+Mz)	Not Available	IIIes	TCB
Kamanura	225	0.86	LMU-3	BDGhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	TCB
Yalamageri	5	5.86	RO	RO	RO	RO	RO	RO	RO	RO	Dyke (Dy)	Not Available	RO	RO
Yalamageri	18	6.23	RO	RO	RO	RO	RO	RO	RO	RO	Redgram+MAize+Dyke (Rg+Mz+Dy)	Not Available	RO	RO
Yalamageri	21	9.23	LMU-3	NGPhB1g2	Deep (100-150 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Eucalyptus+Horsegram (Eu+Hg)	Not Available	IIIs	TCB
Yalamageri	22	6.05	LMU-3	NGPhB1g2	Deep (100-150 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Eucalyptus (Eu)	Not Available	IIIs	TCB
Yalamageri	23	6.32	LMU-3	NGPiB2g1	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Dyke+Horsegram (Dy+Hg)	Not Available	IIIes	TCB
Yalamageri	24	27.79	RO	RO	RO	RO	RO	RO	RO	RO	Dyke (Dy)	Not Available	RO	RO
Yalamageri	25	3.57	LMU-3	HDHhB2g1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	TCB
Yalamageri	29	2.29	RO	RO	RO	RO	RO	RO	RO	RO	Eucalyptus+Redgram (Eu+Rg)	Not Available	RO	RO
Yalamageri	31	1.66	RO	RO	RO	RO	RO	RO	RO	RO	Maize (Mz)	Not Available	RO	RO
Yalamageri	32	1.91	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Horsegram+Maize+Redgram (Hg+Mz+Rg)	Not Available	IIes	TCB
Yalamageri	33	0.12	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	TCB
Yalamageri	35	1	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Cultivated Fallow Land (Mz+CFL)	Not Available	IIes	TCB
Yalamageri	36	0.1	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Eucalyptus (Eu)	Not Available	IIes	TCB
Yalamageri	53	1.93	RO	RO	RO	RO	RO	RO	RO	RO	Dyke+Eucalyptus (Dy+Eu)	Not Available	RO	RO
Yalamageri	54	4.42	LMU-3	NGPbB1	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Horsegram (Mz+Hg)	Not Available	IIIs	TCB
Yalamageri	55	7.14	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Mesta+Redgram (Mst+Rg)	Not Available	IIes	TCB
Yalamageri	56	7.99	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Eucalyptus (Eu)	Not Available	IIes	TCB
Yalamageri	57	1.27	RO	RO	RO	RO	RO	RO	RO	RO	Eucalyptus (Eu)	Not Available	RO	RO
Yalamageri	72	52.61	RO	RO	RO	RO	RO	RO	RO	RO	Dyke (Dy)	Not Available	RO	RO
Yalamageri	75	6.11	LMU-3	NGPbB1	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Yalamageri	76	10.27	LMU-3	NGPbB1	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIIs	TCB
Yalamageri	77	6.28	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Pearl Millet (Rg+Pm)	Not Available	IIIes	TCB

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Yalamageri	78	8.93	LMU-3	NGPbB1	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Pearl Millet (Rg+Pm)	Not Available	IIIs	TCB
Yalamageri	79	10.36	LMU-3	NGPbB1	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Eucalyptus+Pearl Millet (Eu+Pm)	Not Available	IIIs	TCB
Yalamageri	80	8.06	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Eucalyptus+Maize (Eu+Mz)	Not Available	IIes	TCB
Yalamageri	81	8.43	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Rainfall Paddy (RPd)	Not Available	IIes	Graded bunding
Yalamageri	82	10.02	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Rainfall Paddy (RPd)	Not Available	IIes	Graded bunding
Yalamageri	83	3.75	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Yalamageri	84	8.82	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Dyke+Paddy (Dy+Pd)	Not Available	IIes	Graded bunding
Yalamageri	85	3.32	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Pearl Millet (Pm)	Not Available	IIes	Graded bunding
Yalamageri	86	4.01	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Yalamageri	87	5.53	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Pearl Millet (Rg+Pm)	Not Available	IIes	Graded bunding
Yalamageri	88	0.96	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Yalamageri	89	27.32	RO	RO	RO	RO	RO	RO	RO	RO	Dyke (Dy)	Not Available	RO	RO
Yalamageri	90	2.13	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Yalamageri	91	4.39	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Horsegram (Hg)	Not Available	IIIes	TCB
Yalamageri	92	4.9	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Yalamageri	93	4.08	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Yalamageri	94	5.89	RO	RO	RO	RO	RO	RO	RO	RO	Maize+Paddy (Mz+Pd)	Not Available	RO	RO
Yalamageri	95	6.55	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Paddy (Mz+Pd)	Not Available	IIIes	TCB
Yalamageri	96	8.47	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Rainfall Paddy (RPd)	Not Available	IIes	Graded bunding
Yalamageri	97	6.88	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Pearl Millet (Rg+Pm)	Not Available	IIIes	TCB
Yalamageri	98	6.12	LMU-3	BPRhC3g2	Deep (100-150 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Gently sloping (3-5%)	Severe	Redgram+Pearl Millet (Rg+Pm)	Not Available	IIIes	TCB
Yalamageri	99	6.65	LMU-3	BPRhB2g1	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Horsegram (Mz+Hg)	Not Available	IIIes	TCB
Yalamageri	100	7.88	LMU-5	LKRcB2g1	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Horsegram+Paddy (Hg+Pd)	Not Available	IIes	TCB
Yalamageri	101	5.42	LMU-5	LKRcB2g1	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Castor seeds (Rg+CaS)	Not Available	IIes	TCB

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Yalamageri	102	5.5	LMU-5	LKRcB2g1	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Horsegram (Rg+Hg)	Not Available	IIes	TCB
Yalamageri	103	5.93	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIIes	TCB
Yalamageri	104	4.75	LMU-3	BPRbB1g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Maize+Castor seeds (Rg+Mz+CaS)	Not Available	IIIs	TCB
Yalamageri	105	4.48	LMU-5	LKRcB2g1	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Yalamageri	106	5.6	LMU-5	LKRcB2g1	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Yalamageri	107	7.34	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yalamageri	108	4.91	LMU-3	BPRbB1g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Maize (Rg+Mz)	Not Available	IIIs	TCB
Yalamageri	109	0.84	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yalamageri	110	1	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yalamageri	111	7.87	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIIes	TCB
Yalamageri	112	7.75	LMU-3	BPRbB2g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIIes	TCB
Yalamageri	113	6.77	LMU-2	GRHiB2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIes	Graded bunding
Yalamageri	114	7.25	LMU-3	BPRbB1g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIIs	TCB
Yalamageri	115	8.75	LMU-3	BPRbB1g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Maize (Rg+Mz)	Not Available	IIIs	TCB
Yalamageri	116	5.79	LMU-3	BPRbB1g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Pearl Millet+Castor seeds (Pm+CaS)	Not Available	IIIs	TCB
Yalamageri	117	1.9	LMU-3	BPRbB1g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Castorseeds+Cultivated Fallow Land (CaS+CFL)	Not Available	IIIs	TCB
Yalamageri	118	0.13	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+PearlMillet+Cultivated Fallow Land (Rg+Pm+CFL)	Not Available	IIes	TCB
Yalamageri	119	1.14	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	TCB
Yalamageri	120	8.27	LMU-3	BPRbB1g1	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Yalamageri	121	5.1	RO	RO	RO	RO	RO	RO	RO	RO	Redgram+Maize (Rg+Mz)	Not Available	RO	RO
Yalamageri	122	4.33	LMU-3	HDHhB2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIes	TCB
Yalamageri	123	0.78	LMU-3	BPRhB2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Yalamageri	124	9.07	LMU-3	BPRhB2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIIes	TCB
Yalamageri	125	5.86	RO	RO	RO	RO	RO	RO	RO	RO	Dyke (Dy)	Not	RO	RO

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
												Available		
Yalamageri	126	3.74	LMU-3	NGPiB2g1	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIIes	TCB
Yalamageri	129	0.1	LMU-3	HDHcB2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Pearl Millet (Rg+Pm)	Not Available	IIes	TCB
Yalamageri	150	0.38	LMU-3	NGPiB2g1	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Pearl Millet (Rg+Pm)	Not Available	IIIes	TCB

***Note: TCB- Trench cum bunding**

Appendix II

Kamanura-1 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
Kamanura	1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	2	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	3	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	4	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	5	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	6	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	7	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	8	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	9	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	10	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	11	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	12	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	13	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	14	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	15	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	16	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	17	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	18	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)
Kamanura	19	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)
Kamanura	20	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)
Kamanura	21	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	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)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Kamanura	23	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)
Kamanura	24	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)
Kamanura	25	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)
Kamanura	26	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)
Kamanura	27	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)
Kamanura	28	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)
Kamanura	29	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)	Deficient (< 0.6 ppm)
Kamanura	30	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	31	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	32	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)	Deficient (< 0.6 ppm)
Kamanura	33	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	34	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)
Kamanura	35	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	36	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)
Kamanura	37	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	38	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	39	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)
Kamanura	40	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	41	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	42	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	RO	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)
Kamanura	43	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)
Kamanura	44	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)
Kamanura	45	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)
Kamanura	46	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)
Kamanura	47	Neutral (pH 6.5 –	Non saline	Medium (0.5	High (> 57	Medium (145 –	Low (<10	Low (< 0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		7.3)	(<2 dsm)	– 0.75 %)	kg/ha)	337 kg/ha)	ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Kamanura	48	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)
Kamanura	49	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)
Kamanura	50	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)
Kamanura	51	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)
Kamanura	52	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)
Kamanura	53	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)
Kamanura	54	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	55	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)
Kamanura	56	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)
Kamanura	57	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)
Kamanura	58	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)
Kamanura	60	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kamanura	62	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)
Kamanura	63	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)
Kamanura	64	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)
Kamanura	65	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)
Kamanura	66	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)
Kamanura	71	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	72	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	73	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	74	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	75	Slightly alkaline (pH	Non saline	Medium (0.5	High (> 57	Medium (145 –	Low (<10	Low (< 0.5	Deficient (<	Sufficient (>	Sufficient (>	Sufficient (>

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		7.3 – 7.8)	(<2 dsm)	– 0.75 %)	kg/ha)	337 kg/ha)	ppm)	ppm)	4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Kamanura	76	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	77	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	78	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	79	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	80	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	81	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	82	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	83	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	84	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	85	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	86	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	87	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	88	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	89	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	90	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	91	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	114	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	115	Moderately alkaline (pH 7.8 – 8.4)	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	121	Moderately alkaline (pH 7.8 – 8.4)	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	122	Moderately alkaline (pH 7.8 – 8.4)	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kamanura	216	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	219	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)
Kamanura	220	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)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Kamanura	224	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)
Kamanura	225	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yalamageri	5	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	18	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	21	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 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)
Yalamageri	22	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 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)
Yalamageri	23	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	24	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	25	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	29	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	31	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	33	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	35	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	36	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	53	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	54	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	55	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	56	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	57	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	72	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	75	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)
Yalamageri	76	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)
Yalamageri	77	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)
Yalamageri	78	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	79	Slightly acid (pH 6.0	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Low (<10	Low (< 0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		– 6.5)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Yalamageri	80	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	81	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	82	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	83	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)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	84	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	85	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	86	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)
Yalamageri	87	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)
Yalamageri	88	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Yalamageri	89	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	90	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)
Yalamageri	91	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	92	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)
Yalamageri	93	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)
Yalamageri	94	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	95	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)
Yalamageri	96	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)
Yalamageri	97	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)
Yalamageri	98	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)
Yalamageri	99	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	100	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)
Yalamageri	101	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)
Yalamageri	102	Neutral (pH 6.5 –	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Low (<10	Low (< 0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		7.3)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Yalamageri	103	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)
Yalamageri	104	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)
Yalamageri	105	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)
Yalamageri	106	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)
Yalamageri	107	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	108	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	109	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	110	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	111	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	112	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	113	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	114	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	115	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	116	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	117	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	118	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	119	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	120	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yalamageri	121	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 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)
Yalamageri	122	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)
Yalamageri	123	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)
Yalamageri	124	Neutral (pH 6.5 –	Non saline	Medium (0.5	Low (< 23	Medium (145 –	Low (<10	Medium (0.5 –	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		7.3)	(<2 dsm)	– 0.75 %)	kg/ha)	337 kg/ha)	ppm)	1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Yalamageri	125	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	126	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)
Yalamageri	129	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)
Yalamageri	150	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Appendix III

Kamanura-1 Microwatershed

Soil Suitability Information

Village	Survey Number	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsnda_Leg	Dstick_Leg	Mulb_Leg
Kamanura	1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	2	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kamanura	3	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kamanura	4	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
Kamanura	5	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
Kamanura	6	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kamanura	7	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kamanura	8	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
Kamanura	9	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
Kamanura	10	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
Kamanura	11	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
Kamanura	12	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
Kamanura	13	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
Kamanura	14	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
Kamanura	15	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
Kamanura	16	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
Kamanura	17	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
Kamanura	18	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Kamanura	19	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
Kamanura	20	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
Kamanura	21	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
Kamanura	22	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
Kamanura	23	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	24	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	25	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
Kamanura	26	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
Kamanura	27	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kamanura	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
Kamanura	29	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
Kamanura	30	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
Kamanura	31	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	32	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	33	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	34	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kamanura	35	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g

Village	Survey Number	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsnda_Leg	Dstick_Leg	Mulb_Leg
Kamanura	36	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	37	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	38	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
Kamanura	39	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	40	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
Kamanura	41	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kamanura	42	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
Kamanura	43	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
Kamanura	44	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	45	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	46	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kamanura	47	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Kamanura	48	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Kamanura	49	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Kamanura	50	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Kamanura	51	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kamanura	52	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kamanura	53	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kamanura	54	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	55	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	56	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kamanura	57	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	58	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	60	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Kamanura	61	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
Kamanura	62	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
Kamanura	63	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
Kamanura	64	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Kamanura	65	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Kamanura	66	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Kamanura	71	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	72	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	73	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	74	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	75	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	76	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	77	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Kamanura	78	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r

Village	Survey Number	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsnda_Leg	Dstick_Leg	Mulb_Leg
Kamanura	79	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Kamanura	80	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	81	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	82	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
Kamanura	83	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Kamanura	84	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	85	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	86	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	87	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
Kamanura	88	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
Kamanura	89	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	90	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	91	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	114	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	115	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	121	S3rw	S2w	S2rw	S2w	S2rw	S2w	S3rw	S2rw	S2w	S2rw	S2rw	S2w	S2rw	S2w	N1tw	S3rw	S2rw	S2tw	S2w	S2w	S2tw	S2tw	S2rw	S2w	S2tw	S2tw	S2rw	S2rw
Kamanura	122	S3rw	S2w	S2rw	S2w	S2rw	S2w	S3rw	S2rw	S2w	S2rw	S2rw	S2w	S2rw	S2w	N1tw	S3rw	S2rw	S2tw	S2w	S2w	S2tw	S2tw	S2rw	S2w	S2tw	S2tw	S2rw	S2rw
Kamanura	216	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
Kamanura	219	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kamanura	220	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
Kamanura	224	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
Kamanura	225	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
Yalamageri	5	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	18	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	21	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
Yalamageri	22	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
Yalamageri	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
Yalamageri	24	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	25	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
Yalamageri	29	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	31	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	32	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
Yalamageri	33	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Yalamageri	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
Yalamageri	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
Yalamageri	53	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	54	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
Yalamageri	55	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

Village	Survey Number	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsnda_Leg	Dstick_Leg	Mulb_Leg
Yalamageri	56	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
Yalamageri	57	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	72	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	75	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
Yalamageri	76	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
Yalamageri	77	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	78	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
Yalamageri	79	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
Yalamageri	80	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Yalamageri	81	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	82	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	83	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	84	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	85	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	86	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
Yalamageri	87	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	88	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
Yalamageri	89	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	90	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	91	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	92	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	93	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	94	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	95	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	96	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	97	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	98	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Yalamageri	99	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Yalamageri	100	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Yalamageri	101	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Yalamageri	102	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Yalamageri	103	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	104	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	105	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Yalamageri	106	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3rg	S3rg
Yalamageri	107	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	108	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	109	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t

Village	Survey Number	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsnda_Leg	Dstick_Leg	Mulb_Leg
Yalamageri	110	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	111	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	112	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	113	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Yalamageri	114	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	115	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	116	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	117	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	118	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
Yalamageri	119	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
Yalamageri	120	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Yalamageri	121	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	122	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
Yalamageri	123	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Yalamageri	124	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Yalamageri	125	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yalamageri	126	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
Yalamageri	129	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
Yalamageri	150	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

***Note: RO-Rock outcrops**

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 78 (53.79%) men and 67 (46.21%) were women among the sampled households. The average family size of marginal farmers was 4, small farmer was 3, semi medium farmer was 6, medium farmers were 10 and for landless farmers it was 4.*
- *There were 31 (21.38%) people were in 0-15 years of age, 48 (33.1%) were in 16-35 years of age, 54 (37.24 %) were in 36-60 years of age and 12 (8.28%) were above 61 years of age.*
- *The micro watershed had 22.76 per cent illiterates, 4.83 per cent functional literates, 27.59 per cent of them had primary school education, 11.72 per cent of them had middle school education, 17.24 per cent of them had high school education, 3.45 per cent of them had PUC education, 0.69 per cent of them had ITI, 9.66 per cent of them had degree education and 0.69 per cent of them had masters education.*
- *The results indicate that, 51.43 per cent of households practicing agriculture and 8.57 per cent of the household heads were agricultural labourers.*
- *The results indicate that agriculture was the major occupation for 54.48 per cent of the household members, 2.76 per cent were agricultural labourers, 6.9 per cent were general labours,4.14 percent were in government service, 1.38 per cent of them were in private sector, 21.38 per cent of them were students and 3.45 per cent were housewives.*
- *The results shows that 3.45 per cent of them participated in self help groups, 1.38 per cent of them participated in gram panchayat, 1.38 per cent of them participated in cooperative bank, 0.69 percent of them participated in zilla panchayat and 96.19 per cent of them have not participated in any local institutions. Landless and medium farmers were found to have no participation in any local institutions. Semi medium farmers were found to participate in one or the other local institutions.*
- *The results indicate that 97.14 per cent of the households possess Katcha house and 8.57 per cent of them possess pucca house. 100 percent of the landless, marginal and small farmers possess katcha house.*
- *The results shows that 2.86 per cent of the households possess radio, 77.14 per cent of the households possess TV, 48.57 per cent of the households possess Mixer grinder, 45.71 per cent of the households possess bicycle, 34.29 per cent of the households possess motor cycle, 97.14 per cent of the households possess mobile phones. The average value of radio was Rs.100, television was Rs.2185, mixer grinder was Rs.1094, DVD player was Rs.2000, motor cycle was Rs.31153 and mobile phone was Rs.890.*
- *About 45.71 per cent of the households possess plough, 34.29 per cent of them possess bullock cart and 31.43 per cent of the households possess sprayer, 20 per cent*

of them possess chaff cutter and 82.86 per cent of the households possess weeder. The average value of plough was Rs.745, the average value of bullock cart was Rs. 18500 and the average value of sprayer was Rs.1913.

- *The results indicate that, 40 per cent of the households possess bullocks, 22.86 per cent of the households possess local cow, 2.86 per cent of the households possess crossbred cows, 5.17 per cent of the households possess buffalo, 2.86 per cent of the households possess sheep.*
- *Average own labour men available in the micro watershed was 1.6, average own labour (women) available was 1.1, average hired labour (men) available was 6.5 and average hired labour (women) available was 10.17.*
- *The results indicate that, 80 per cent of the household opined that hired labour was adequate and 2.86 per cent of the households opined that hired labour was inadequate.*
- *The results indicate that, 1 and 3 persons were migrated from micro watershed that belonged to marginal and medium farmer category.*
- *People have migrated on an average of 212 Kms and average duration was 22.5 months. Marginal farmers have migrated 370 kms and on an average for 36 months.*
- *Job/work and education of the children were equally important reasons for migration for all the migrants.*
- *Households of the Kammanur-1 micro watershed possess 30.64 ha (88.85%) of dry land and 3.44 ha (9.98%) of irrigated land.*
- *The average value of dry land was Rs.260995 and average value of irrigated was Rs.348705.*
- *There were 1 functioning and 1 defunct bore wells in the micro watershed. Bore well was the major irrigation source for 2.86 per cent of the farmers and open well was the source of irrigation for 5.71 per cent of the farmers.*
- *There was only 2.43 ha of irrigated area in total in the micro watershed which belonged to semi medium farmers.*
- *Farmers have grown Maize (12.05 ha), Navane (5.09 ha), Sajje (3.64ha), Bajra (4.66ha), Bengal gram (2.63 ha), Paddy (2.02 ha), Horse gram (1.31ha), Sorghum (0.96 ha) and Red gram (0.43ha). Marginal farmers have grown Maize, Navane, Bajra, Sorghum and Redgram. Small farmers have grown Maize, Navane, Bajra, and Horse gram. Semi medium farmers have grown Maize, Bengal gram and Paddy. Medium farmers have grown Maize and Bengal gram.*
- *The cropping intensity in Kammanur-1 micro watershed was found to be 97.93 per cent. In case of Marginal farmers it was 113.48 per cent, for small farmers it was 100 per cent, in case of semi medium farmers it was 79.32 per cent, and medium farmers had cropping intensity of 100 per cent.*
- *The results indicate that, 97.14 per cent of the households have both bank account and savings. Among landless farmers 80 percent of them possess bank account and*

savings. Hundred per cent of marginal, small, semi medium and medium category of farmers possess bank account and also savings.

- *The results indicate that, 56.25 per cent have availed loan in grameena bank, 15.63 per cent have availed loan in money lender and 3.13 per cent have availed loan from SHGs/CBOs.*
- *Landless, marginal, small, semi medium and medium have availed Rs.2500, Rs.35000, Rs. 98846, Rs.148333, and Rs. 70000 respectively. Overall average credit amount availed by households in the micro watershed is 68593.*
- *The results indicate that, 94.44 per cent of the households have borrowed loan for agriculture and 5.56 per cent of them have borrowed loan for animal husbandry.*
- *Only small farmers (11.1%) have borrowed credit for the purpose of animal husbandry and all other category of farmers have borrowed loan for agriculture purpose.*
- *The results indicate that, house hold consumption and other reasons were the main purpose for which landless and small farmers borrowed loan. Another 25 percent of small farmers also borrowed loan for social functions like marriage.*
- *The results indicate that, 47.37 per cent of the households have repaid partially which includes 20 per cent of marginal farmers, 60 per cent of small farmers and 66.67 per cent of semi medium farmers.*
- *The data also shows that 47.37 per cent of households have not repaid their loans and only 5.26 per cent of households have fully repaid their loans. Results indicated that 33.33 per cent of the households have repaid partially, another 33.33 per cent have unpaid their loan and 16.67 percent of the households have full paid their loan.*
- *The results indicate that, the total cost of cultivation for bajra was Rs. 14769. The gross income realized by the farmers was Rs. 23450.5. The net income from bajra cultivation was Rs.8680.82, thus the benefit cost ratio was found to be 1:1.6.*
- *The total cost of cultivation for horsegram was Rs.14451.57. The gross income realized by the farmers was Rs. 14167. The net income from horsegram cultivation was Rs.-284.51. Thus the benefit cost ratio was found to be 1:0.98.*
- *The total cost of cultivation for maize was Rs. 37053.58. The gross income realized by the farmers was Rs. 36730.47. The net income from maize cultivation was Rs. -323.12, thus the benefit cost ratio was found to be 1:0.99.*
- *The total cost of cultivation for navane was Rs. 17786.45. The gross income realized by the farmers was Rs. 23546.38. The net income from navane cultivation was Rs. 5759.93. Thus the benefit cost ratio was found to be 1:1.32.*
- *The total cost of cultivation for paddy was Rs. 19170.22. The gross income realized by the farmers was Rs. 21143.20. The net income from paddy cultivation was Rs. 1972.98. Thus the benefit cost ratio was found to be 1:1.1.*

- *The total cost of cultivation for redgram was Rs. 24733.95. The gross income realized by the farmers was Rs. 20039.62. The net income from redgram cultivation was Rs. -4694.33. Thus the benefit cost ratio was found to be 1:0.81.*
- *The total cost of cultivation for sorghum was Rs. 13408.29. The gross income realized by the farmers was Rs. 48465.96. The net income from sorghum cultivation was Rs. 35057.67. Thus the benefit cost ratio was found to be 1:3.61.*
- *The total cost of cultivation for bengalgram was Rs. 48019.12. The gross income realized by the farmers was Rs. 86046.57. The net income from bengalgram cultivation was Rs. 38027.45. Thus the benefit cost ratio was found to be 1:1.79.*
- *The results indicate that, 8.57 per cent of the households opined that dry fodder was adequate which includes 7.69 per cent of small, 66.67 per cent of semi medium farmers. The data revealed that 22.86 per cent of the farmers opined that dry fodder is inadequate and 2.86 per cent opined that green fodder is inadequate.*
- *The results indicate that, sampled households have grown 30 coconut trees in their field and 6 in backyard. Mango (6) trees and a jackfruit tree were also grown by the households.*
- *Households have planted 57 neem trees in field and 2 in backyard, 2 acacia, 2 banyan tree, 2 peepul tree and 1 tamarind tree.*
- *Households have an average investment capacity of Rs.1428 for land development and Rs.21,142 in irrigation facility. Marginal households have an average investment capacity of Rs.3846 for land development and Rs. 21538 in irrigation facility. Small farm households have an average investment capacity Rs.25384 in irrigation facility. Semi medium households have an average investment capacity of Rs. 43333 for irrigation.*
- *The results indicated that for land development 2.86 per cent dependent on government subsidy. For irrigation facility 68.57 percent depend on government subsidy and 2.86 percent depend on loan from bank loan.*
- *The results indicated that, 60 percent of the households have sold their produce to local/village merchants which includes, 46.15 per cent the marginal farmers, 84.62 percent small farmers and 100 percent semi medium farmers. About 34.29 percent of the households sold their produce in regulated markets which includes 53.85 percent marginal farmers, 23.08 percent small farmers and 100 percent medium farmers.*
- *The results indicated that 77.14 per cent of the households have used cart as a mode of transport and 17.14 per cent have used tractor.*
- *The results indicated that, 5.71 per cent of the households have experienced the soil and water erosion problems i.e. 7.96 percent of small farmers and 33.33 percent semi medium farmers.*
- *About 82.86 per cent of the households have shown interest in soil testing i.e. 92.31 per cent of marginal farmers, 100 per cent of small farmers, 100 per cent of semi medium and 100 per cent of medium farmers have shown interest in soil testing.*

- *The results indicated that, 45.71 per cent of the households have adopted field bunding which includes 30.77 per cent of marginal, 69.23 per cent of small farmers, 66.67 per cent of semi medium farmers, 100 per cent of medium farmers. Summer ploughing was adopted by 62.86 per cent of the households i.e. 69.23 per cent of the marginal farmers, 76.92 per cent of the small farmers, 66.67 per cent of semi medium and 100 per cent medium farmers. Combination of deep and shallow root crops was followed by 62.86 per cent of the farmers.*
- *The results indicated that, 6.67 per cent of the households who adopted field bunding opined that bunds are good, 13.33 per cent opined that bunds are slightly damaged, and 6.67 per cent of the households opined that bunds are severely damaged and 73.33 per cent opined that the bunds required full replacement.*
- *Piped supply was the major source for drinking water for 94.29 per cent which includes 100 per cent of landless, 84.62 per cent of marginal, 100 per cent of small farmers, 100 per cent of semi medium and 100 per cent of medium farmers.*
- *Electricity was the major source of light for 100 per cent of the households in micro watershed.*
- *About 42.86 per cent of the households possess sanitary toilet i.e. 60 per cent of landless, 53.85 per cent of marginal, 23.08 per cent of small, 33.33 per cent of semi medium and 100 per cent of medium farmers have sanitary toilet facility.*
- *Around 91.43 per cent of the sampled households possessed BPL card and 40 per cent of the households participated in NREGA programme.*
- *The results indicated that, Lower fertility status of the soil was the constraint experienced by 48.57 per cent of the households, wild animal menace on farm field (57.14%), frequent incidence of pest and diseases (57.14%), inadequacy of irrigation water (57.14%), high cost of fertilizers and plant protection chemicals (80%), high rate of interest on credit (82.86%), low price for the agricultural commodities (74.29%), lack of marketing facilities in the area (82.86%), inadequate extension services (82.86%), lack of transport for safe transport of the agricultural produce to the market (82.86%).*

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-1 micro-watershed (Tavaregere sub-watershed, Koppal Taluk and District) is located at North latitude 15^0 25' 35.045" and 15^0 27' 33.305" and East longitude 76^0 12' 48.39" and 76^0 14' 38.26" covering an area of 749.29 ha and spread across Kamanuru and Yalamageri villages.

Methodology followed in assessing socio-economic status of households

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

Chapter 4

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Kammanur-1 micro watershed is presented in Table 1 and it indicated that 35 farmers were sampled in Kammanur-1 micro watershed among them 13 (37.14%) were marginal farmers, 13 (37.14%) were small farmers, 3 (8.75%) were semi medium farmers and 1 (2.86%) was medium farmer. Apart from these 5 landless farmers were also interviewed for the survey.

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

S.N	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	14.29	13	37.14	13	37.14	3	8.57	1	2.86	**35**	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Kammanur-1 micro watershed is presented in Table 2. The data indicated that there were 78 (53.79%) men and 67 (46.21%) were women among the sampled households. The average family size of marginal farmers was 4, small farmer was 3, semi medium farmer was 6, medium farmers were 10 and for landless farmers it was 4.

Table 2. Population characteristics of Kammanur-1 micro-watershed

S.N	Particulars	LL (20)		MF (51)		SF (45)		SMF (19)		MDF (10)		All (145)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Male	10	50	26	50.98	28	62.22	8	42.11	6	60	78	53.79
2	Female	10	50	25	49.02	17	37.78	11	57.89	4	40	67	46.21
Total		20	100	51	100	45	100	19	100	10	100	145	100
Average family size		4		4		3		6		10		4	

Age wise classification of population: The age wise classification of household members in Kammanur-1 micro watershed is presented in Table 3. The data indicated that the there were 31 (21.38%) people were in 0-15 years of age, 48 (33.1%) were in 16-35 years of age, 54 (37.24 %) were in 36-60 years of age and 12 (8.28%) were above 61 years of age.

Table 3: Age wise classification of household members in Kammanur-1 micro watershed

S.N	Particulars	LL (20)		MF (51)		SF (45)		SMF (19)		MDF (10)		All (145)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	7	35	11	21.57	5	11.11	7	36.84	1	10	31	21.38
2	16-35 years of age	7	35	19	37.25	17	37.78	3	15.79	2	20	48	33.1
3	36-60 years of age	6	30	17	33.33	18	40	7	36.84	6	60	54	37.24
4	> 61 years	0	0	4	7.84	5	11.11	2	10.53	1	10	12	8.28
Total		**20**	**100**	**51**	**100**	**45**	**100**	**19**	**100**	**10**	**100**	**145**	**100**

Education level of household members: Education level of household members in Kammanur-1 micro watershed is presented in Table 4. The results indicated that the Kammanur-1 had 22.76 per cent illiterates, 4.83 per cent functional literates, 27.59 per cent of them had primary school education, 11.72 per cent of them had middle school education, 17.24 per cent of them had high school education, 3.45 per cent of them had PUC education, 0.69 per cent of them had ITI, 9.66 per cent of them had degree education and 0.69 per cent of them had masters education.

Table 4. Education level of household members in Kammanur-1 micro watershed

S. N.	Particulars	LL (20)		MF (51)		SF (45)		SMF (19)		MDF (10)		All (145)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	7	35	10	19.61	15	33.33	1	5.26	0	0	33	22.76
2	Functional Literate	1	5	4	7.84	1	2.22	1	5.26	0	0	7	4.83
3	Primary School	7	35	17	33.33	10	22.22	4	21.05	2	20	40	27.59
4	Middle School	3	15	8	15.69	3	6.67	3	15.79	0	0	17	11.72
5	High School	1	5	7	13.73	9	20	6	31.58	2	20	25	17.24
6	PUC	1	5	0	0	1	2.22	3	15.79	0	0	5	3.45
8	ITI	0	0	0	0	1	2.22	0	0	0	0	1	0.69
9	Degree	0	0	3	5.88	4	8.89	1	5.26	6	60	14	9.66
10	Masters	0	0	0	0	1	2.22	0	0	0	0	1	0.69
12	Others	0	0	2	3.92	0	0	0	0	0	0	2	1.38
Total		**20**	**100**	**51**	**100**	**45**	**100**	**19**	**100**	**10**	**100**	**145**	**100**

Occupation of household heads: The data regarding the occupation of the household heads in Kammanur-1 micro watershed is presented in Table 5. The results indicate that, 51.43 per cent of households practicing agriculture and 8.57 per cent of the household heads were agricultural labourers.

Table 5: Occupation of household heads in Kammanur-1 micro watershed

S. N.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	9	69.23	7	53.85	2	66.67	0	0	18	51.43
2	Agricultural Labour	3	60	0	0	0	0	0	0	0	0	3	8.57
3	General Labour	2	40	1	7.69	0	0	0	0	0	0	3	8.57
4	Others	0	0	0	0	1	7.69	1	33.33	1	100	3	8.57
5	Housewife	0	0	1	7.69	0	0	0	0	1	100	3	8.57
Total		**5**	**100**	**11**	**100**	**8**	**100**	**3**	**100**	**2**	**100**	**30**	**100**

Occupation of the household members: The data regarding the occupation of the household members in Kammanur-1 micro watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 54.48 per cent of the household members, 2.76 per cent were agricultural labourers, 6.9 per cent were general labours,4.14 percent were in government service, 1.38 per cent of them were in private sector, 21.38 per cent of them were students and 3.45 per cent were housewives. In case of landless households 20 per cent were agricultural labourers, 40 per cent were general

labour, and 40 per cent were students. In case of marginal farmers 66.676 per cent were agriculturist, 3.92 percent were general labour, 3.92 per cent were in private sector and 15.69 per cent were students. In case of small farmers, 82.22 per cent of the household members were practicing agriculture and 15.56 per cent of them were students. In case of semi medium farmers 42.11 per cent of the household members were practicing agriculture and 36.84 per cent of them were students. In case of medium farmers, 60 per cent of the household members were in government service.

Table 6: Occupation of family members in Kammanur-1 micro watershed

S. N.	Particulars	LL (20)		MF (51)		SF (45)		SMF (19)		MDF (10)		All (145)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	34	66.67	37	82.22	8	42.11	0	0	79	54.48
2	Agricultural Labour	4	20	0	0	0	0	0	0	0	0	4	2.76
3	General Labour	8	40	2	3.92	0	0	0	0	0	0	10	6.9
4	Government Service	0	0	0	0	0	0	0	0	6	60	6	4.14
5	Private Service	0	0	2	3.92	0	0	0	0	0	0	2	1.38
6	Student	8	40	8	15.69	7	15.56	7	36.84	1	10	31	21.38
7	Others	0	0	1	1.96	1	2.22	2	10.53	1	10	5	3.45
8	Housewife	0	0	1	1.96	0	0	2	10.53	2	20	5	3.45
9	Children	0	0	3	5.88	0	0	0	0	0	0	3	2.07
Total		**20**	**100**	**51**	**100**	**45**	**100**	**19**	**100**	**10**	**100**	**145**	**100**

Institutional participation of the household members: The data regarding the institutional participation of the household members in Kammanur-1 micro watershed is presented in Table 7. The results shows that 3.45 per cent of them participated in self help groups, 1.38 per cent of them participated in gram panchayat, 1.38 per cent of them participated in cooperative bank, 0.69 percent of them participated in zilla panchayat and 96.19 per cent of them have not participated in any local institutions. Landless and medium farmers were found to have no participation in any local institutions. Semi medium farmers were found to participate in one or the other local institutions.

Table 7. Institutional Participation of household members in Kammanur-1 micro watershed

S.N.	Particulars	LL (20)		MF (51)		SF (45)		SMF (19)		MDF (10)		All (145)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Gram Panchayat	0	0	0	0	1	2.22	1	5.26	0	0	2	1.38
2	Zilla Panchayat	0	0	0	0	0	0	1	5.26	0	0	1	0.69
3	Self Help Group	0	0	1	1.96	2	4.44	2	10.53	0	0	5	3.45
4	No Participation	20	100	50	98.04	42	93.33	13	68.42	10	100	135	93.1
5	Cooperative bank	0	0	0	0	0	0	2	10.53	0	0	2	1.38
Total		**20**	**100**	**51**	**100**	**45**	**100**	**19**	**100**	**10**	**100**	**145**	**100**

Type of house owned: The data regarding the type of house owned by the households in Kammanur-1 micro watershed is presented in Table 8. The results indicate that 97.14 per

cent of the households possess Katcha house and 8.57 per cent of them possess pucca house. 100 percent of the landless, marginal and small farmers possess katcha house.

Table 8. Type of house owned by households in Kammanur-1 micro watershed

S.N.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Katcha	5	100	13	100	13	100	3	100	0	0	34	97.14
2	Pucca/RCC	0	0	0	0	0	0	1	33.33	2	200	3	8.57
Total		**5**	**100**	**13**	**100**	**13**	**100**	**4**	**100**	**2**	**100**	**37**	**100**

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Kammanur-1 micro watershed is presented in Table 9. The results shows that 2.86 per cent of the households possess radio, 77.14 per cent of the households possess TV, 48.57 per cent of the households possess Mixer grinder, 45.71 per cent of the households possess bicycle, 34.29 per cent of the households possess motor cycle, 97.14 per cent of the households possess mobile phones.

Table 9. Durable Assets owned by households in Kammanur-1 micro watershed

S. N.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Radio	0	0	0	0	1	7.69	0	0	0	0	1	2.86
2	Television	1	20	10	76.92	12	92.31	3	100	1	100	27	77.14
3	DVD/VCD Player	0	0	0	0	0	0	1	33.33	0	0	1	2.86
4	Mixer/Grinder	0	0	5	38.46	8	61.54	3	100	1	100	17	48.57
5	Refrigerator	0	0	1	7.69	0	0	2	66.67	0	0	3	8.57
6	Bicycle	1	20	6	46.15	7	53.85	2	66.67	0	0	16	45.71
7	Motor Cycle	1	20	3	23.08	4	30.77	3	100	1	100	12	34.29
8	Mobile Phone	4	80	13	100	13	100	3	100	1	100	34	97.14

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Kammanur-1 micro watershed is presented in Table 10. The results shows that the average value of radio was Rs.100, television was Rs.2185, mixer grinder was Rs.1094, DVD player was Rs.2000, motor cycle was Rs.31153 and mobile phone was Rs.890.

Table 10. Average value of durable assets owned by households in Kammanur-1 micro watershed

Average Value (Rs.)

S.N.	Particulars	LL (5)	MF (13)	SF (13)	SMF (3)	MDF (1)	All (35)
1	Radio	0	0	100	0	0	**100**
2	Television	2,000.00	2,000.00	1,916.00	3,666.00	3,000.00	**2,185.00**
3	DVD/VCD Player	0	0	0	2,000.00	0	**2,000.00**
4	Mixer/Grinder	0	1,040.00	1,025.00	1,233.00	1,500.00	**1,094.00**
5	Refrigerator	0	2,000.00	0	13,000.00	0	**9,333.00**
6	Bicycle	1,000.00	1,000.00	1,000.00	833	0	**970**
7	Motor Cycle	20,000.00	33,333.00	32,500.00	28,750.00	40,000.00	**31,153.00**
8	Mobile Phone	1,175.00	772	1,054.00	577	1,000.00	**890**

Farm Implements owned: The data regarding the farm implements owned by the households in Kammanur-1 micro watershed is presented in Table 11. About 45.71 per cent of the households possess plough, 34.29 per cent of them possess bullock cart and 31.43 per cent of the households possess sprayer, 20 per cent of them possess chaff cutter and 82.86 per cent of the households possess weeder.

Table 11. Farm Implements owned by households in Kammanur-1 micro watershed

S. N.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	6	46.15	5	38.46	1	33.33	0	0	12	34.29
2	Plough	0	0	6	46.15	9	69.23	1	33.33	0	0	16	45.71
3	Sprayer	0	0	4	30.77	6	46.15	1	33.33	0	0	11	31.43
4	Weeder	2	40	12	92.31	12	92.31	3	100	0	0	29	82.86
5	Harvester	0	0	1	7.69	0	0	0	0	0	0	1	2.86
6	Chaff Cutter	0	0	4	30.77	3	23.08	0	0	0	0	7	20
7	Blank	0	0	0	0	1	7.69	0	0	1	100	2	5.71
8	Earth remover/Duster	0	0	1	7.69	0	0	0	0	0	0	1	2.86

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Kammanur-1 micro watershed is presented in Table 12. The results show that the average value of plough was Rs.745, the average value of bullock cart was Rs. 18500 and the average value of sprayer was Rs.1913.

Table 12. Average value of farm implements owned by households in Kammanur-1 micro watershed **(**Avg value in Rs)

S.N.	Particulars	LL (5)	MF (13)	SF (13)	SMF (3)	All (35)
1	Bullock Cart	0	20,000.00	16,400.00	20,000.00	**18,500.00**
2	Plough	0	684	762	1,000.00	**745**
3	Sprayer	0	2,000.00	2,050.00	1,150.00	**1,913.00**
4	Weeder	25	27	24	25	**25**
5	Harvester	0	1,500.00	0	0	**1,500.00**
6	Chaff Cutter	0	3,000.00	2,333.00	0	**2,714.00**
8	Earth remover/Duster	0	2,000.00	0	0	**2,000.00**

Livestock possession by the households: The data regarding the Livestock possession by the households in Kammanur-1 micro watershed is presented in Table 13. The results indicate that, 40 per cent of the households possess bullocks, 22.86 per cent of the households possess local cow, 2.86 per cent of the households possess crossbred cows, 5.17 per cent of the households possess buffalo, 2.86 per cent of the households possess sheep.

In case of marginal farmers, 46.15 per cent of the households possess bullock, 23.08 per cent of the households possess local cow. In case of small farmers, 61.54 per cent of households possess bullock, 30.77 per cent possess local cow, 7.69 per cent possess buffalo and sheep. In case of semi medium farmers, 33.33 per cent of the households possess local cow, crossbred cows and buffalo.

Table 13. Livestock possession by households in Kammanur-1 micro watershed

S.N.	Particulars	MF (13)		SF (13)		SMF (3)		All (35)	
		N	%	N	%	N	%	N	%
1	Bullock	6	46.15	8	61.54	0	0	14	40
2	Local cow	3	23.08	4	30.77	1	33.33	8	22.86
3	Crossbred cow	0	0	0	0	1	33.33	1	2.86
4	Buffalo	0	0	1	7.69	1	33.33	2	5.71
5	Sheep	0	0	1	7.69	0	0	1	2.86
6	blank	6	46.15	3	23.08	1	33.33	11	31.43

Average Labour availability : The data regarding the average labour availability in Kammanur-1 micro watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.6, average own labour (women) available was 1.1, average hired labour (men) available was 6.5 and average hired labour (women) available was 10.17.

Table 14. Average Labour availability in Kammanur-1 micro watershed

S.N.	Particulars	MF (13)	SF (13)	SMF (3)	MDF (1)	All (35)
		N	N	N	N	N
1	Own labour Male	1.38	1.85	1.67	1	1.6
2	Own Labour Female	1.23	1.08	1	0	1.1
3	Hired labour Male	3.92	6.85	11.67	20	6.5
4	Hired labour Female	5.23	10.92	18.33	40	10.17

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Kammanur-1 micro watershed is presented in Table 15. The results indicate that, 80 per cent of the household opined that hired labour was adequate and 2.86 per cent of the households opined that hired labour was inadequate. About 84.62 per cent of the marginal farmers, 100 per cent of small, 100 per cent of semi medium and medium farmers have opined that the hired labour was adequate.

Table 15. Adequacy of Hired Labour in Kammanur-1 micro watershed

S.N.	Particulars	MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Adequate	11	84.62	13	100.00	3	100.00	1	100.00	28	80.00
2	Inadequate	1	7.69	0	0.00	0	0.00	0	0.00	1	2.86

Migration among the households: The data regarding the migration among the households in Kammanur-1 micro watershed is presented in Table 16. The results indicate that, 1 and 3 persons were migrated from micro watershed that belonged to marginal and medium farmer category. Total migration in the micro watershed was only 2.76 per cent.

Table 16. Migration among the households in Kammanur-1 micro watershed

S.N.	Particulars	MF (51)		MDF (10)		All (145)	
		N	%	N	%	N	%
1	Migration	1	1.96	3	30	**4**	2.76

Average distance and duration of migration: The data regarding the average distance and duration of migration in Kammanur-1 micro watershed is presented in Table 17. The

results indicate that, people have migrated on an average of 212 Kms and average duration was 22.5 months. Marginal farmers have migrated 370 kms and on an average for 36 months.

Table 17. Average distance and duration of migration in Kammanur-1 micro watershed

S.N.	Particulars	MF (1)	MDF (3)	All (4)
		N	N	N
1	Avg. Distance (kms)	370	54	**212**
2	Avg. Duration (months)	36	9	**22.5**

Purpose of migration: The data regarding the average distance and duration of migration in Kammanur-1 micro watershed is presented in Table 18. The results indicate that, job/work and education of the children were equally important reasons for migration for all the migrants.

Table 18. Purpose of migration by household members in Kammanur-1 micro watershed

S.N.	Particulars	MF (1)		MDF (3)		All (4)	
		N	%	N	%	N	%
1	Job/wage/work	0	0	1	33.33	1	25
2	Education of the children	1	100	0	0	1	25
3	Other	0	0	2	66.67	2	50
Total		**1**	**100**	**3**	**100**	**4**	**100**

Positive consequences of migration: The data regarding the positive consequences of migration in Kammanur-1 micro watershed is presented in Table 19. The results indicate that, improved quality of the life was the major Positive consequences of migration for 25 per cent of the persons migrated and another 25 percents experienced no positive consequences.

Table 19. Positive consequences of migration by household members in Kammanur-1 micro watershed

S.N.	Particulars	MF (1)		MDF (3)		All (4)	
		N	%	N	%	N	%
1	Improved quality of life	0	0	1	33.33	1	25
2	None	1	100	0	0	1	25

Negative consequences of migration: The data regarding the negative consequences of migration in Kammanur-1 micro watershed is presented in Table 20. The results indicate that, 25 per cent of the migrated persons opined that there were no negative consequences.

Table 20. Negative consequences of migration by household members in Kammanur-1 micro watershed

S.N.	Particulars	MF (1)		MDF (3)		All (4)	
		N	%	N	%	N	%
1	None	1	100	0	0	**1**	25
2	Other	0	0	1	33.33	**1**	25

Distribution of land (ha): The data regarding the distribution of land (ha) in Kammanur-1 micro watershed is presented in Table 21. The results indicate that, households of the Kammanur-1 micro watershed possess 30.64 ha (88.85%) of dry land and 3.44 ha (9.98%) of irrigated land. Marginal farmers possess 7.48 ha (94.87%) of dry land and 0.4 ha (5.13 %) permanent fallow. Small farmers possess 17.76 ha (100%) of dry land. Semi medium farmers possess 5.4 ha (81.64%) of dry land and 1.21 ha (18.36%) of irrigated land. Medium farmers possess 2.23 ha (100%) of irrigated land.

Table 21. Distribution of land (Ha) in Kammanur-1 micro watershed

S.N.	Particulars	MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	7.48	94.87	17.76	100	5.4	81.64	0	0	30.64	88.85
2	Irrigated	0	0	0	0	1.21	18.36	2.23	100	3.44	9.98
3	Permanent Fallow	0.4	5.13	0	0	0	0	0	0	0.4	1.17
Total		**7.88**	**100**	**17.76**	**100**	**6.61**	**100**	**2.23**	**100**	**34.48**	**100**

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Kammanur-1 micro watershed is presented in Table 22. The results indicate that, the average value of dry land was Rs.260995 and average value of irrigated was Rs.348705. In case of marginal famers, the average land value was Rs. 427705 for dry land and Rs. 741000 for permanent fallow. In case of small famers, the average land value was Rs. 225108 for dry land. In case of semi medium famers, the average land value was Rs.148125 for dry land and Rs. 494000 for irrigated land. In case of medium famers, the average land value was Rs. 269454 for irrigated land.

Table 22. Average land value (Rs./ha) in Kammanur-1 micro watershed

S.N.	Particulars	MF (13)	SF (13)	SMF (3)	MDF (1)	All (35)
1	Dry	427,705.62	225,108.22	148,125.94	0.00	260,995.90
2	Irrigated	0.00	0.00	494,000.00	269,454.55	348,705.88
3	Permanent Fallow	741,000.00	0.00	0.00	0.00	741,000.00

Status of bore wells: The data regarding the status of bore wells in Kammanur-1 micro watershed is presented in Table 23. The results indicate that, there were 1 functioning and 1 defunctioning bore wells in the micro watershed.

Table 23. Status of bore wells in Kammanur-1 micro watershed

S.N.	Particulars	LL (5)	MF (13)	SF (13)	SMF (3)	MDF (1)	All (35)
		N	N	N	N	N	N
1	De-functioning	0	0	0	0	1	1
2	Functioning	0	0	0	0	1	1

Table 24. Status of open wells in Kammanur-1 micro watershed

S.N.	Particulars	LL (5)	MF (13)	SF (13)	SMF (3)	MDF (1)	All (35)
		N	N	N	N	N	N
1	De-functioning	0	0	0	0	1	1
2	Functioning	0	0	0	1	1	2

Status of open wells: The data regarding the status of open wells in Kammanur-1 micro watershed is presented in Table 24. The results indicate that, there was 2 functioning and 1 defunct open well reported among the sampled households in the micro watershed.

Source of irrigation: The data regarding the source of irrigation in Kammanur-1 micro watershed is presented in Table 25. The results indicate that, bore well was the major irrigation source for 2.86 per cent of the farmers and open well was the source of irrigation for 5.71 per cent of the farmers.

Table 25. Source of irrigation in Kammanur-1 micro watershed

S.N.	Particulars	SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%
1	Bore Well	0	0	1	100	1	2.86
2	Canal	0	0	0	0	0	0
3	Open Well	1	33.33	1	100	2	5.71

Irrigated Area (ha): The data regarding the irrigated area (ha) in Kammanur-1 micro watershed is presented in Table 26. The results indicate that, there was only 2.43 ha of irrigated area in total which belonged to semi medium farmers.

Table 26. Irrigated Area (ha) in Kammanur-1 micro watershed

S.N.	Particulars	LL (5)	MF (13)	SF (13)	SMF (3)	MDF (1)	All (35)
1	Kharif	0.00	0.00	0.00	1.21	0.00	1.21
2	Rabi	0.00	0.00	0.00	1.21	0.00	1.21
Total		0.00	0.00	0.00	2.43	0.00	2.43

Table 27. Cropping pattern in Kammanur-1 micro watershed (Area in Ha)

S.N	Particulars	MF (13)	SF (13)	SMF (3)	MDF (1)	All (35)
1	Kharif - Maize	3.06	3.79	2.97	2.23	**12.05**
2	Kharif - Navane (Fox Millet)	0.85	4.24	0	0	**5.09**
3	Kharif - Pearl millet (Sajje)	0.81	2.83	0	0	**3.64**
4	Kharif - Bajra	0.4	2.52	0	0	**2.92**
5	Rabi - Bengal gram	0	0	1.21	1.42	**2.63**
6	Kharif - Paddy	0	0	2.02	0	**2.02**
7	Kharif - Pearlmillet [bajra]	0	1.74	0	0	**1.74**
8	Kharif - Horse gram	0	1.31	0	0	**1.31**
9	Rabi - Horse gram	0	1.3	0	0	**1.3**
10	Kharif - Sorghum	0.96	0	0	0	**0.96**
11	Summer - Maize	0.88	0	0	0	**0.88**
12	Kharif - Red gram (togari)	0.43	0	0	0	**0.43**
Total		**7.4**	**17.73**	**6.21**	**3.64**	**34.98**

Cropping pattern: The data regarding the cropping pattern in Kammanur-1 micro watershed is presented in Table 27. The results indicate that, farmers have grown Maize (12.05 ha), Navane (5.09 ha), Sajje (3.64ha), Bajra (4.66ha), Bengal gram (2.63 ha), Paddy (2.02 ha), Horse gram (1.31ha), Sorghum (0.96 ha) and Red gram (0.43ha). Marginal farmers have grown Maize, Navane, Bajra, Sorghum and Redgram. Small farmers have grown Maize, Navane, Bajra, and Horse gram. Semi medium farmers have

grown Maize, Bengal gram and Paddy. Medium farmers have grown Maize and Bengal gram.

Cropping intensity: The data regarding the cropping intensity in Kammanur-1 micro watershed is presented in Table 28. The results indicate that, the cropping intensity in Kammanur-1 micro watershed was found to be 97.93 per cent. In case of Marginal farmers it was 113.48 per cent, for small farmers it was 100 per cent, in case of semi medium farmers it was 79.32 per cent, and medium farmers had cropping intensity of 100 per cent.

Table 28. Cropping intensity in Kammanur-1 micro watershed

S.N.	Particulars	MF (13)	SF (13)	SMF (3)	MDF (1)	All (35)
1	Cropping Intensity	113.48	100	79.32	100	**97.93**

Possession of Bank account: The data regarding the possession of Bank account and savings in Kammanur-1 micro watershed is presented in Table 29. The results indicate that, 97.14 per cent of the households have both bank account and savings. Among landless farmers 80 percent of them possess bank account and savings. Hundred per cent of marginal, small, semi medium and medium category of farmers possess bank account and also savings.

Table 29. Possession of Bank account and savings in Kammanur-1 micro watershed

S.N.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	4	80.00	13	100.00	13	100.00	3	100.00	1	100.00	34	97.14
2	Savings	4	80.00	13	100.00	13	100.00	3	100.00	1	100.00	34	97.14

Borrowing status: The data regarding the possession of borrowing status in Kammanur-1 micro watershed is presented in Table 30. The results indicate that, 80 per cent of landless, 7.69 per cent of marginal, 100 per cent of small, 100 per cent semi medium and 100 per cent of medium farmers have borrowed credit from different sources.

Table 30. Borrowing status in Kammanur-1 micro watershed

S.N.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	4	80.00	1	7.69	13	100.00	3	100.00	1	100.00	22	62.86

Source of credit: The data regarding the source of credit availed by households in Kammanur-1 micro watershed is presented in Table 31. The results indicate that, 56.25 per cent have availed loan in grameena bank, 15.63 per cent have availed loan in money lender and 3.13 per cent have availed loan from SHGs/CBOs.

Table 31. Source of credit availed by households in Kammanur-1 micro watershed

S.N.	Particulars	LL (4)		MF (11)		SF (13)		SMF (3)		MDF (1)		All (32)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Grameena Bank	0	0	5	45.45	9	69.23	3	100	1	100	18	56.25
2	Money Lender	1	25	0	0	3	23.08	1	33.33	0	0	5	15.63
3	SHGs/CBOs	0	0	0	0	1	7.69	0	0	0	0	1	3.13

Average credit amount: The data regarding the average credit amount availed by households in Kammanur-1 micro watershed is presented in Table 32. The results indicate that, landless, marginal, small, semi medium and medium have availed Rs.2500, Rs.35000, Rs. 98846, Rs.148333, and Rs. 70000 respectively. Overall average credit amount availed by households in the micro watershed is 68593.

Table 32. Average Credit amount availed by households in Kammanur-1 micro watershed

S.N.	Particulars	LL (4)	MF (11)	SF (13)	SMF (3)	MDF (1)	All (32)
		N	N	N	N	N	N
1	Average Credit	2,500.00	35,000.00	98,846.23	148,333.33	70,000.00	68,593.78

Purpose of credit borrowed (institutional Source): The data regarding the purpose of credit borrowed from institutional sources by households in Kammanur-1 micro watershed is presented in Table 33. The results indicate that, 94.44 per cent of the households have borrowed loan for agriculture and 5.56 per cent of them have borrowed loan for animal husbandry. Only small farmers (11.1%) have borrowed credit for the purpose of animal husbandry and all other category of farmers have borrowed loan for agriculture purpose.

Table 33. Purpose of credit borrowed (institutional Source) by households in Kammanur-1 micro watershed

S.N.	Particulars	MF (5)		SF (9)		SMF (3)		MDF (1)		All (18)	
		N	%	N	%	N	%	N	%	N	%
1	Agriculture production	5	100	8	88.89	3	100	1	100	17	94.44
2	Animal husbandry	0	0	1	11.11	0	0	0	0	1	5.56

Purpose of credit borrowed (Private Credit): The data regarding the purpose of credit borrowed from private sources by households in Kammanur-1 micro watershed is presented in Table 34. The results indicate that, house hold consumption and other reasons were the main purpose for which landless and small farmers borrowed loan. Another 25 percent of small farmers also borrowed loan for social functions like marriage.

Table 34. Purpose of credit borrowed (Private Credit) by households in Kammanur-1 micro watershed

S.N.	Particulars	LL (1)		SF (4)		All (5)	
		N	%	N	%	N	%
1	Household consumption	1	100	1	25	2	40
2	Social functions like marriage	0	0	1	25	1	20
3	Other	0	0	2	50	2	40

Repayment status of households (Institutional): The results (Table 35) indicate that, 47.37 per cent of the households have repaid partially which includes 20 per cent of marginal farmers, 60 per cent of small farmers and 66.67 per cent of semi medium farmers. The data also shows that 47.37 per cent of households have unpaid their loans and only 5.26 per cent of households have fully repaid their loans.

Table 35. Repayment status of households (Institutional) in Kammanur-1 micro watershed

S.N.	Particulars	MF (5)		SF (10)		SMF (3)		MDF (1)		All (19)	
		N	%	N	%	N	%	N	%	N	%
1	Partially paid	1	20.00	6	60.00	2	66.67	0	0.00	9	47.37
2	Un paid	4	80.00	3	30.00	1	33.33	1	100.00	9	47.37
3	Fully paid	0	0.00	1	10.00	0	0.00	0	0.00	1	5.26

Repayment status of households (Private): The data regarding the repayment status of credit borrowed from private sources by households in Kammanur-1 micro watershed is presented in Table 36. Results indicated that 33.33 per cent of the households have repaid partially, another 33.33 per cent have unpaid their loan and 16.67 percent of the households have full paid their loan.

Table 36. Repayment status of households (Private) in Kammanur-1 micro watershed

S.N.	Particulars	LL (1)		SF (4)		All (6)	
		N	%	N	%	N	%
1	Partially paid	1	100.00	1	25.00	2	33.33
2	Un paid	0	0.00	2	50.00	2	33.33
3	Fully paid	0	0.00	1	25.00	1	16.67

Cost of Cultivation of Bajra: The data regarding the cost of cultivation of groundnut in Kammanur-1 micro watershed is presented in Table 37. The results indicate that, the total cost of cultivation for bajra was Rs. 14769. The gross income realized by the farmers was Rs. 23450.5. The net income from bajra cultivation was Rs.8680.82, thus the benefit cost ratio was found to be 1:1.6.

Table 37. Cost of Cultivation of Bajra in Kammanur-1 micro watershed

S.N	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	11.28	1808.08	12.24
2	Bullock		Pairs/day	1.95	959.35	6.5
3	Tractor		Hours	0.89	330.8	2.24
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	5.76	967.32	6.55
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	0.74	899.17	6.09
8	Fertilizer + micronutrients		Quintal	4.85	3979.26	26.94
9	Pesticides (PPC)		Kgs / ltrs	0	0	0
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	857.14	5.8
13	Depreciation charges			0	187.03	1.27
14	Land revenue and Taxes			0	3.06	0.02
II	**Cost B1**					
16	Interest on working capital				701.49	4.75
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				10692.7	72.4
III	**Cost B2**					
18	Rental Value of Land				128.57	0.87
19	**Cost B2 = (Cost B1 + Rental value)**				10821.3	73.27
IV	**Cost C1**					
20	Family Human Labour			13.61	2605.66	17.64
21	**Cost C1 = (Cost B2 + Family Labour)**				13426.9	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				13426.9	90.91
VI	**Cost C3**					
24	Managerial Cost				1342.69	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				14769.6	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		13.35	23450.5	
		b) Main Crop Sales Price (Rs.)			1757.14	
b.	Gross Income (Rs.)				23450.5	
c.	Net Income (Rs.)				8680.82	
d.	Cost per Quintal (Rs./q.)				1106.69	
e.	Benefit Cost Ratio (BC Ratio)				01:01.6	

Cost of cultivation of Horsegram: The data regarding the cost of cultivation of horsegram in Kammanur-1 micro watershed is presented in Table 38. The results indicate that, the total cost of cultivation for horsegram was Rs.14451.57. The gross income realized by the farmers was Rs. 14167. The net income from horsegram cultivation was Rs.-284.51. Thus the benefit cost ratio was found to be 1:0.98.

Table 38. Cost of Cultivation of horsegram in Kammanur-1 micro watershed

S.N	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	11.91	1902.15	13.16
2	Bullock		Pairs/day	2.31	1154.23	7.99
3	Tractor		Hours	0.00	0.00	0.00
4	Machinery		Hours	0.38	229.41	1.59
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	5.37	713.54	4.94
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.30	2297.70	15.90
8	Fertilizer + micronutrients		Quintal	3.85	3037.08	21.02
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	750.00	5.19
13	Depreciation charges			0.00	216.08	1.50
14	Land revenue and Taxes			0.00	1.65	0.01
II	**Cost B1**					
16	Interest on working capital				725.80	5.02
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				11027.64	76.31
III	**Cost B2**					
18	Rental Value of Land				133.33	0.92
19	**Cost B2 = (Cost B1 + Rental value)**				11160.97	77.23
IV	**Cost C1**					
20	Family Human Labour			11.13	1976.82	13.68
21	**Cost C1 = (Cost B2 + Family Labour)**				13137.79	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				13137.79	90.91
VI	**Cost C3**					
24	Managerial Cost				1313.78	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				14451.57	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		5.38	13982.89	
		b) Main Crop Sales Price (Rs.)			2600.00	
	By Product	e) Main Product (q)		3.07	184.17	
		f) Main Crop Sales Price (Rs.)			60.00	
b.	Gross Income (Rs.)				14167.06	
c.	Net Income (Rs.)				-284.51	
d.	Cost per Quintal (Rs./q.)				2687.15	
e.	Benefit Cost Ratio (BC Ratio)				1:0.98	

Cost of Cultivation of Maize: The data regarding the cost of cultivation of maize in Kammanur-1 micro watershed is presented in Table 39. The results indicate that, the total cost of cultivation for maize was Rs. 37053.58. The gross income realized by the farmers was Rs. 36730.47. The net income from maize cultivation was Rs. -323.12, thus the benefit cost ratio was found to be 1:0.99.

Table 39. Cost of Cultivation of Maize in Kammanur-1 micro watershed

S.N	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	14.20	2325.63	6.28
2	Bullock		Pairs/day	5.24	2625.52	7.09
3	Tractor		Hours	1.62	1155.07	3.12
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	23.28	2876.75	7.76
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	3.23	4849.63	13.09
8	Fertilizer + micronutrients		Quintal	12.07	9609.52	25.93
9	Pesticides (PPC)		Kgs / liters	0.90	1796.36	4.85
10	Irrigation		Number	42.66	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	687.50	1.86
13	Depreciation charges			0.00	580.99	1.57
14	Land revenue and Taxes			0.00	4.01	0.01
II	**Cost B1**					
16	Interest on working capital				2295.87	6.20
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				28806.86	77.74
III	**Cost B2**					
18	Rental Value of Land				175.00	0.47
19	**Cost B2 = (Cost B1 + Rental value)**				28981.86	78.22
IV	**Cost C1**					
20	Family Human Labour			25.72	4703.22	12.69
21	**Cost C1 = (Cost B2 + Family Labour)**				33685.07	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				33685.07	90.91
VI	**Cost C3**					
24	Managerial Cost				3368.51	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				37053.58	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		23.55	36359.04	
		b) Main Crop Sales Price (Rs.)			1543.75	
	By Product	e) Main Product (q)		6.91	371.43	
		f) Main Crop Sales Price (Rs.)			53.75	
b.	Gross Income (Rs.)				36730.47	
c.	Net Income (Rs.)				-323.12	
d.	Cost per Quintal (Rs./q.)				1573.24	
e.	Benefit Cost Ratio (BC Ratio)				1:0.99	

Cost of Cultivation of Navane: The data regarding the cost of cultivation of navane in Kammanur-1 micro watershed is presented in Table 40. The results indicate that, the total cost of cultivation for navane was Rs. 17786.45. The gross income realized by the farmers was Rs. 23546.38. The net income from navane cultivation was Rs. 5759.93. Thus the benefit cost ratio was found to be 1:1.32.

Table 40. Cost of Cultivation of Navane in Kammanur-1 micro watershed

S.N	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	12.04	1885.61	10.60
2	Bullock		Pairs/day	4.13	2180.63	12.26
3	Tractor		Hours	0.00	0.00	0.00
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	6.56	791.21	4.45
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.25	3368.18	18.94
8	Fertilizer + micronutrients		Quintal	3.68	2639.53	14.84
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	800.00	4.50
13	Depreciation charges			0.00	381.47	2.14
14	Land revenue and Taxes			0.00	3.29	0.02
II	**Cost B1**					
16	Interest on working capital				815.87	4.59
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				12865.80	72.33
III	**Cost B2**					
18	Rental Value of Land				133.33	0.75
19	**Cost B2 = (Cost B1 + Rental value)**				12999.13	73.08
IV	**Cost C1**					
20	Family Human Labour			17.26	3170.37	17.82
21	**Cost C1 = (Cost B2 + Family Labour)**				16169.50	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				16169.50	90.91
VI	**Cost C3**					
24	Managerial Cost				1616.95	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				17786.45	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		12.08	23546.38	
		b) Main Crop Sales Price (Rs.)			1950.00	
b.	Gross Income (Rs.)				23546.38	
c.	Net Income (Rs.)				5759.93	
d.	Cost per Quintal (Rs./q.)				1472.99	
e.	Benefit Cost Ratio (BC Ratio)				1:1.32	

Cost of cultivation of Paddy: The data regarding the cost of cultivation of paddy in Kammanur-1 micro watershed is presented in Table 41. The results indicate that, the total cost of cultivation for paddy was Rs. 19170.22. The gross income realized by the farmers was Rs. 21143.20. The net income from paddy cultivation was Rs. 1972.98. Thus the benefit cost ratio was found to be 1:1.1.

Table 41. Cost of Cultivation of Paddy in Kammanur-1 micro watershed

S.N	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	12.84	2050.10	10.69
2	Bullock		Pairs/day	0.49	271.70	1.42
3	Tractor		Hours	1.98	1482.00	7.73
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	49.40	3211.00	16.75
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	0.00	0.00	0.00
8	Fertilizer + micronutrients		Quintal	8.89	6619.60	34.53
9	Pesticides (PPC)		Kgs /liters	0.49	444.60	2.32
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	1000.00	5.22
13	Depreciation charges			0.00	23.71	0.12
14	Land revenue and Taxes			0.00	4.94	0.03
II	**Cost B1**					
16	Interest on working capital				1233.02	6.43
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				16340.68	85.24
III	**Cost B2**					
18	Rental Value of Land				0.00	0.00
19	**Cost B2 = (Cost B1 + Rental value)**				16340.68	85.24
IV	**Cost C1**					
20	Family Human Labour			5.93	1086.80	5.67
21	**Cost C1 = (Cost B2 + Family Labour)**				17427.48	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				17427.48	90.91
VI	**Cost C3**					
24	Managerial Cost				1742.75	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				19170.22	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		14.82	20748.00	
		b) Main Crop Sales Price (Rs.)			1400.00	
	By Product	e) Main Product (q)		4.94	395.20	
		f) Main Crop Sales Price (Rs.)			80.00	
b.	Gross Income (Rs.)				21143.20	
c.	Net Income (Rs.)				1972.98	
d.	Cost per Quintal (Rs./q.)				1293.54	
e.	Benefit Cost Ratio (BC Ratio)				1:1.1	

Cost of cultivation of Redgram: The data regarding the cost of cultivation of redgram in Kammanur-1 micro watershed is presented in Table 42. The results indicate that, the total cost of cultivation for redgram was Rs. 24733.95. The gross income realized by the farmers was Rs. 20039.62. The net income from redgram cultivation was Rs. -4694.33. Thus the benefit cost ratio was found to be 1:0.81.

Table 42. Cost of Cultivation of Redgram in Kammanur-1 micro watershed

S.N	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	11.65	1747.64	7.07
2	Bullock	Pairs/day	6.99	3495.28	14.13
3	Tractor	Hours	0.00	0.00	0.00
4	Machinery	Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	6.99	978.68	3.96
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	0.00	0.00	0.00
8	Fertilizer + micronutrients	Quintal	9.32	7456.60	30.15
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	500.00	2.02
13	Depreciation charges		0.00	1216.36	4.92
14	Land revenue and Taxes		0.00	3.29	0.01
II	**Cost B1**				
16	Interest on working capital			1012.23	4.09
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			16410.09	66.35
III	**Cost B2**				
18	Rental Value of Land			133.33	0.54
19	**Cost B2 = (Cost B1 + Rental value)**			16543.43	66.89
IV	**Cost C1**				
20	Family Human Labour		34.95	5941.98	24.02
21	**Cost C1 = (Cost B2 + Family Labour)**			22485.41	90.91
V	**Cost C2**				
22	Risk Premium			0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**			22485.41	90.91
VI	**Cost C3**				
24	Managerial Cost			2248.54	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			24733.95	100.00
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	4.66	20039.62	
		b) Main Crop Sales Price (Rs.)		4300.00	
b.	Gross Income (Rs.)			20039.62	
c.	Net Income (Rs.)			-4694.33	
d.	Cost per Quintal (Rs./q.)			5307.28	
e.	Benefit Cost Ratio (BC Ratio)			1:0.81	

Cost of cultivation of Sorghum: The data regarding the cost of cultivation of sorghum in Kammanur-1 micro watershed is presented in Table 43. The results indicate that, the total cost of cultivation for sorghum was Rs. 13408.29. The gross income realized by the farmers was Rs. 48465.96. The net income from sorghum cultivation was Rs. 35057.67. Thus the benefit cost ratio was found to be 1:3.61.

Table 43. Cost of Cultivation of Sorghum in Kammanur-1 micro watershed

S.N	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	21.79	3424.79	25.54
2	Bullock		Pairs/day	2.08	1141.60	8.51
3	Tractor		Hours	0.00	0.00	0.00
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	10.38	985.92	7.35
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	0.00	0.00	0.00
8	Fertilizer + micronutrients		Quintal	4.15	3321.01	24.77
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	1000.00	7.46
13	Depreciation charges			0.00	2.08	0.02
14	Land revenue and Taxes			0.00	3.29	0.02
II	**Cost B1**					
16	Interest on working capital				516.83	3.85
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				10395.52	77.53
III	**Cost B2**					
18	Rental Value of Land				133.33	0.99
19	**Cost B2 = (Cost B1 + Rental value)**				10528.85	78.52
IV	**Cost C1**					
20	Family Human Labour			9.34	1660.50	12.38
21	**Cost C1 = (Cost B2 + Family Labour)**				12189.36	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				12189.36	90.91
VI	**Cost C3**					
24	Managerial Cost				1218.94	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				13408.29	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		20.76	47739.49	
		b) Main Crop Sales Price (Rs.)			2300.00	
	By Product	e) Main Product (q)		10.38	726.47	
		f) Main Crop Sales Price (Rs.)			70.00	
b.	Gross Income (Rs.)				48465.96	
c.	Net Income (Rs.)				35057.67	
d.	Cost per Quintal (Rs./q.)				645.99	
e.	Benefit Cost Ratio (BC Ratio)				1:3.61	

Cost of cultivation of Bengalgram: The data regarding the cost of cultivation of bengalgram in Kammanur-1 micro watershed is presented in Table 44. The results indicate that, the total cost of cultivation for bengalgram was Rs. 48019.12. The gross income realized by the farmers was Rs. 86046.57. The net income from bengalgram cultivation was Rs. 38027.45. Thus the benefit cost ratio was found to be 1:1.79.

Table 44. Cost of Cultivation of Bengalgram in Kammanur-1 micro watershed

S.N	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	33.35	5495.75	11.44
2	Bullock		Pairs/day	0.82	411.67	0.86
3	Tractor		Hours	2.47	1790.75	3.73
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	123.50	11732.50	24.43
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	0.00	0.00	0.00
8	Fertilizer + micronutrients		Quintal	9.88	7574.67	15.77
9	Pesticides (PPC)		Kgs / liters	4.53	9056.67	18.86
10	Irrigation		Number	49.40	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	1000.00	2.08
13	Depreciation charges			0.00	0.83	0.00
14	Land revenue and Taxes			0.00	6.59	0.01
II	**Cost B1**					
16	Interest on working capital				3403.66	7.09
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				40473.08	84.29
III	**Cost B2**					
18	Rental Value of Land				216.67	0.45
19	**Cost B2 = (Cost B1 + Rental value)**				40689.74	84.74
IV	**Cost C1**					
20	Family Human Labour			16.06	2964.00	6.17
21	**Cost C1 = (Cost B2 + Family Labour)**				43653.74	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				43653.74	90.91
VI	**Cost C3**					
24	Managerial Cost				4365.37	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				48019.12	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		22.23	85585.50	
		b) Main Crop Sales Price (Rs.)			3850.00	
	By Product	e) Main Product (q)		6.59	461.07	
		f) Main Crop Sales Price (Rs.)			70.00	
		h) Intercrop Sales Price (Rs.)			0.00	
b.	Gross Income (Rs.)				86046.57	
c.	Net Income (Rs.)				38027.45	
d.	Cost per Quintal (Rs./q.)				2160.10	
e.	Benefit Cost Ratio (BC Ratio)				1:1.79	

Adequacy of fodder: The data regarding the adequacy of fodder in Kammanur-1 micro watershed is presented in Table 45. The results indicate that, 8.57 per cent of the households opined that dry fodder was adequate which includes 7.69 per cent of small, 66.67 per cent of semi medium farmers. The data revealed that 22.86 per cent of the farmers opined that dry fodder is inadequate and 2.86 per cent opined that green fodder is inadequate.

Table 45. Adequacy of fodder in Kammanur-1 micro watershed

Sl.No.	Particulars	MF (13)		SF (13)		SMF (3)		All (35)	
		N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	1	7.69	2	66.67	3	8.57
2	Inadequate-Dry Fodder	3	23.08	5	38.46	0	0	8	22.86
4	Inadequate-Green Fodder	1	7.69	0	0	0	0	1	2.86

Horticulture species grown: The data regarding horticulture species grown in Kammanur-1 micro watershed is presented in Table 46. The results indicate that, sampled households have grown 30 coconut trees in their field and 6 in backyard. Mango (6) trees and a jackfruit tree was also grown by the households.

Table 46. Horticulture species grown in Kammanur-1 micro watershed

S.N	Particulars	LL (5)		MF (13)		SF (13)		MDF (1)		All (35)	
		F	B	F	B	F	B	F	B	F	B
1	Coconut	0	3	0	2	0	1	30	0	30	6
2	Mango	0	0	1	0	3	0	2	0	6	0
3	Jack fruit	0	1	0	0	0	0	0	0	0	1

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

Interest towards cultivation of horticulture crops: The data regarding horticulture species grown in Kammanur-1 micro watershed is presented in Table 47. The results indicate that, 54.29 per cent of the households are interested in growing horticultural crops which include 53.85 per cent marginal farmers, 69.23 per cent small farmers, 66.67 per cent semi medium farmers and 100 per cent medium farmers.

Table 47. Interest towards cultivation of horticulture crops in Kammanur-1 micro watershed

S.N	Particulars	MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Interested towards cultivation of horticulture crops	7	53.85	9	69.23	2	66.67	1	100.00	19	54.29

Table 48. Forest species grown in Kammanur-1 micro watershed

Sl.No.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		All (35)	
		F	B	F	B	F	B	F	B	F	B
1	Neem	0	1	17	1	16	0	24	0	57	2
2	Acacia	0	0	0	0	2	0	0	0	2	0
3	Banyan	0	0	1	0	1	0	0	0	2	0
4	Peepul Tree	0	1	0	0	2	0	0	0	2	1
5	Tamarind	0	0	1	0	0	0	0	0	1	0

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

Forest species grown: The data regarding forest species grown in Kammanur-1 micro watershed is presented in Table 48. The results indicate that, households have planted 57 neem trees in field and 2 in backyard, 2 acacia, 2 banyan tree, 2 peepul tree and 1 tamarind tree.

Average additional investment capacity: The data regarding average additional investment capacity in Kammanur-1 micro watershed is presented in Table 49. The results indicate that, households have an average investment capacity of Rs.1428 for land development and Rs.21,142 in irrigation facility.

Table 49. Average additional investment capacity of households in Kammanur-1 micro watershed

Sl.No.	Particulars	MF (13)	SF (13)	SMF (3)	All (35)
		Rs.	Rs.	Rs.	Rs.
1	Land development	3,846.15	0	0	1,428.57
2	Irrigation facility	21,538.46	25,384.86	43,333.33	21,142.95

Source of funds for additional investment: The data regarding source of funds for additional investment in Kammanur-1 micro watershed is presented in Table 50. The results indicated that for land development 2.86 per cent dependent on government subsidy. For irrigation facility 68.57 percent depend on government subsidy and 2.86 percent depend on loan from bank loan.

Table 50. Source of funds for additional investment capacity in Kammanur-1 micro watershed

S.N	Item	Land development		Irrigation facility	
		N	%	N	%
1	Government subsidy	1	2.86	24	68.57
2	Loan from bank	0	0	1	2.86

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Kammanur-1 micro watershed is presented in Table 51. The results indicated that, Bengal gram, maize, navane, and sorghum was sold to the extent of 100 per cent.

Table 51. Marketing of the agricultural produce in Kammanur-1 micro watershed

S. N	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	122	0	122	100	1550
2	Bengal Gram	54	0	54	100	3850
3	Horse Gram	14	1	13	92.86	2600
4	Maize	232	0	232	100	1500
5	Navane	57	0	57	100	1950
6	Paddy	30	1	29	96.67	1400
7	Red Gram	2	0	2	100	2150
8	Sorghum	20	0	20	100	2300

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Kammanur-1 micro watershed is presented in Table 53. The results indicated that, 60 percent of the households have sold their produce to local/village merchants which includes, 46.15 per cent the marginal farmers, 84.62 percent small farmers and 100 percent semi medium farmers. About 34.29 percent of the households sold their produce in regulated markets which includes 53.85 percent marginal farmers, 23.08 percent small farmers and 100 percent medium farmers.

Table 52. Marketing Channels used for sale of agricultural produce in Kammanur-1 micro watershed

S.N	Particulars	MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%
2	Local/village Merchant	6	46.15	11	84.62	3	100	0	0	20	60
3	Regulated Market	7	53.85	3	23.08	0	0	1	100	11	34.29

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Kammanur-1 micro watershed is presented in Table 54. The results indicated that 77.14 per cent of the households have used cart as a mode of transport and 17.14 per cent have used tractor.

Table 53. Mode of transport of agricultural produce in Kammanur-1 micro watershed

S.N	Particulars	MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%
2	Cart	13	100	12	92.31	2	66.67	0	0	27	77.14
3	Tractor	0	0	2	15.38	2	66.67	2	200	6	17.14

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Kammanur-1 micro watershed is presented in Table 54. The results indicated that, 5.71 per cent of the households have experienced the soil and water erosion problems i.e. 7.96 percent of small farmers and 33.33 percent semi medium farmers.

Table 54. Incidence of soil and water erosion problems in Kammanur-1 micro watershed

S.N	Particulars	SF (13)		SMF (3)		All (35)	
		N	%	N	%	N	%
1	Soil and water erosion problems in the farm	1	7.69	1	33.33	2	5.71

Table 55. Interest shown towards soil testing in Kammanur-1 micro watershed

S.N	Particulars	MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	12	92.31	13	100	3	100	1	100	29	82.86

Interest towards soil testing: The data regarding interest shown towards soil testing in Kammanur-1 micro watershed is presented in Table 55. The results indicated that, 82.86 per cent of the households have shown interest in soil testing i.e. 92.31 per cent of

marginal farmers, 100 per cent of small farmers, 100 per cent of semi medium and 100 per cent of medium farmers have shown interest in soil testing.

Soil and water conservation practices and structures adopted: The data regarding soil and water conservation practices and structures adopted in Kammanur-1 micro watershed is presented in Table 56. The results indicated that, 45.71 per cent of the households have adopted field bunding which includes 30.77 per cent of marginal, 69.23 per cent of small farmers, 66.67 per cent of semi medium farmers, 100 per cent of medium farmers. Summer ploughing was adopted by 62.86 per cent of the households i.e. 69.23 per cent of the marginal farmers, 76.92 per cent of the small farmers, 66.67 per cent of semi medium and 100 per cent medium farmers. Combination of deep and shallow root crops was followed by 62.86 per cent of the farmers.

Table 56. Soil and water conservation practices and structures adopted in Kammanur-1 micro watershed

Sl.No.	Particulars	MF (13)		SF (13)		SMF (3)		MDF(1)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Field Bunding	4	30.77	9	69.23	2	66.67	1	100	16	45.71
2	Summer Ploughing	9	69.23	10	76.92	2	66.67	1	100	22	62.86
3	Combination of deep and shallow root crops	8	61.54	11	84.62	2	66.67	1	100	22	62.86

Status of soil and water conservation structures adopted: The data regarding status of soil and water conservation structures adopted in Kammanur-1 micro watershed is presented in Table 57. The results indicated that, 6.67 per cent of the households who adopted field bunding opined that bunds are good, 13.33 per cent opined that bunds are slightly damaged, and 6.67 per cent of the households opined that bunds are severely damaged and 73.33 per cent opined that the bunds required full replacement.

Table 57. Status of soil and water conservation structures adopted in Kammanur-1 micro watershed

S.N	Item	Good		Slightly Damaged		Severely Damaged		Full Replacement Required	
		N	%	N	%	N	%	N	%
1	Field Bunding	1	6.67	2	13.33	1	6.67	11	73.33

Table 58. Agencies involved in soil conservation structures in Kammanur-1 micro watershed

S.N	Particulars	MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Own	5	38.46	5	38.46	0	0	0	0	10	28.57
2	Govt.	3	23.08	9	69.23	1	33.33	1	100	14	40
3	Other	0	0	0	0	1	33.33	0	0	1	2.86

Agencies involved in soil conservation structures: The data regarding agencies involved in soil conservation structures in Kammanur-1 micro watershed is presented in Table 58. The results indicated that 28.57 per cent of soil conservation structure is

constructed by farmers on their own, 40 per cent of the soil conservation structures are constructed by the government and another 2.86 per cent is constructed by other agencies.

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Kammanur-1 micro watershed is presented in Table 59. The results indicated that, 5.71 percent of the households used dung cake as a source of fuel, 88.57 percent used fire wood and another 5.17 percent of the households used LPG.

Table 59. Usage pattern of fuel for domestic use in Kammanur-1 micro watershed

Sl.No.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Dung Cake	0	0	0	0	2	15.38	0	0	0	0	2	5.71
2	Fire Wood	5	100	12	92.31	11	84.62	2	66.67	1	100	31	88.57
5	LPG	0	0	1	7.69	0	0	1	33.33	0	0	2	5.71

Source of drinking water: The data regarding source of drinking water in Kammanur-1 micro watershed is presented in Table 60. The results indicated that, piped supply was the major source for drinking water for 94.29 per cent which includes 100 per cent of landless, 84.62 per cent of marginal, 100 per cent of small farmers, 100 per cent of semi medium and 100 per cent of medium.

Table 60. Source of drinking water in Kammanur-1 micro watershed

Sl.No.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	5	100	11	84.62	13	100	3	100	1	100	33	94.29

Source of light: The data regarding source of light in Kammanur-1 micro watershed is presented in Table 61. The results indicated that, electricity was the major source of light for 100 per cent of the households in micro watershed.

Table 61. Source of light in Kammanur-1 micro watershed

Sl.No.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
3	Electricity	5	100	13	100	13	100	3	100	1	100	35	100

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facilit**y** in Kammanur-1 micro watershed is presented in Table 62. The results indicated that, 42.86 per cent of the households possess sanitary toilet i.e. 60 per cent of landless, 53.85 per cent of marginal, 23.08 per cent of small, 33.33 per cent of semi medium and 100 per cent of medium had sanitary toilet facility.

Table 62. Existence of Sanitary toilet facility in Kammanur-1 micro watershed

S.N	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	3	60	7	53.85	3	23.08	1	33.33	1	100	15	42.86

Possession of PDS card: The data regarding possession of PDS card in Kammanur-1 micro watershed is presented in Table 63. The results indicated that, 91.43 per cent of the sampled households possessed BPL card.

Table 63. Possession of PDS card in Kammanur-1 micro watershed

Sl.No.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
2	BPL	5	100	13	100	13	100	1	33.33	0	0	32	91.43
3	Not Possessed	0	0	0	0	0	0	2	66.67	1	100	3	8.57

Participation in NREGA programme: The data regarding participation in NREGA programme in Kammanur-1 micro watershed is presented in Table 64. The results indicated that, 40 per cent of the households participated in NREGA programme which included 100 per cent of the landless, 23.08 percent of the marginal, 23.08 per cent of the small, 66.67 per cent of the semi medium and 100 percent of the medium farmers.

Table 64. Participation in NREGA programme in Kammanur-1 micro watershed

Sl. No.	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	5	100	3	23.08	3	23.08	2	66.67	1	100	**14**	40

Adequacy of food items: The data regarding adequacy of food items in Kammanur-1 micro watershed is presented in Table 65. The results indicated that, cereals, pulses, oilseeds and milk are adequate for 100 percent of the households. Egg was adequate for 94.29 percent of th households. Vegetables, fruits and meat are adequate only for 22.86, 20 and 34.29 per cent of the households respectively.

Table 65. Adequacy of food items in Kammanur-1 micro watershed

S.N	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	5	100	13	100	13	100	3	100	1	100	35	100
2	Pulses	5	100	13	100	13	100	3	100	1	100	35	100
3	Oilseed	5	100	13	100	13	100	3	100	1	100	35	100
4	Vegetables	0	0	2	15.38	4	30.77	2	66.67	0	0	8	22.86
5	Fruits	0	0	2	15.38	4	30.77	1	33.33	0	0	7	20
6	Milk	5	100	13	100	13	100	3	100	1	100	35	100
7	Egg	3	60	13	100	13	100	3	100	1	100	33	94.29
8	Meat	2	40	4	30.77	5	38.46	1	33.33	0	0	12	34.29

Table 66. Response on Inadequacy of food items in Kammanur-1 micro watershed

S.N	Particulars	LL (5)		MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Vegetables	5	100	11	84.62	9	69.23	1	33.33	1	100	27	77.14
2	Fruits	5	100	11	84.62	9	69.23	2	66.67	1	100	28	80
3	Egg	2	40	0	0	0	0	0	0	0	0	2	5.71
4	Meat	3	60	9	69.23	8	61.54	2	66.67	1	100	23	65.71

Response on Inadequacy of food items: The data regarding inadequacy of food items in Kammanur-1 micro watershed is presented in Table 66. The results indicated that, vegetables were inadequate for 77.14 per cent, fruits were inadequate for 80 per cent,

eggs were inadequate for 5.71 per cent and meat was inadequate for 65.71 per cent of the households.

Farming constraints: The data regarding farming constraints experienced by households in Kammanur-1 micro watershed is presented in Table 67. The results indicated that, Lower fertility status of the soil was the constraint experienced by 48.57 per cent of the households, wild animal menace on farm field (57.14%), frequent incidence of pest and diseases (57.14%), inadequacy of irrigation water (57.14%), high cost of Fertilizers and plant protection chemicals (80%), high rate of interest on credit (82.86%), low price for the agricultural commodities (74.29%), lack of marketing facilities in the area (82.86%), inadequate extension services (82.86%), lack of transport for safe transport of the agricultural produce to the market (82.86%), less rainfall (65.71%).

Table 67. Farming constraints Experienced in Kammanur-1 micro watershed

Sl. No.	Particulars	MF (13)		SF (13)		SMF (3)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	9	69.23	7	53.85	1	33.33	0	0	17	48.57
2	Wild animal menace on farm field	10	76.92	6	46.15	3	100	1	100	20	57.14
3	Frequent incidence of pest and diseases	10	76.92	8	61.54	2	66.67	0	0	20	57.14
4	Inadequacy of irrigation water	10	76.92	7	53.85	3	100	0	0	20	57.14
5	High cost of Fertilizers and plant protection chemicals	11	84.62	13	100	3	100	1	100	28	80
6	High rate of interest on credit	12	92.31	13	100	3	100	1	100	29	82.86
7	Low price for the agricultural commodities	11	84.62	12	92.31	2	66.67	1	100	26	74.29
8	Lack of marketing facilities in the area	12	92.31	13	100	3	100	1	100	29	82.86
9	Inadequate extension services	12	92.31	13	100	3	100	1	100	29	82.86
10	Lack of transport for safe transport of the Agril produce to the market.	12	92.31	13	100	3	100	1	100	29	82.86
11	Less rainfall	9	69.23	11	84.62	2	66.67	1	100	23	65.71

Chapter 5

SUMMARY

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

The data indicated that there were 78 (53.79%) men and 67 (46.21%) were women among the sampled households. The average family size of marginal farmers was 4, small farmer was 3, semi medium farmer was 6, medium farmers were 10 and for landless farmers it was 4. There were 31 (21.38%) people were in 0-15 years of age, 48 (33.1%) were in 16-35 years of age, 54 (37.24 %) were in 36-60 years of age and 12 (8.28%) were above 61 years of age. The micro watershed had 22.76 per cent illiterates, 4.83 per cent functional literates, 27.59 per cent of them had primary school education, 11.72 per cent of them had middle school education, 17.24 per cent of them had high school education, 3.45 per cent of them had PUC education, 0.69 per cent of them had ITI, 9.66 per cent of them had degree education and 0.69 per cent of them had masters education.

The results indicate that, 51.43 per cent of households practicing agriculture and 8.57 per cent of the household heads were agricultural labourers. The results indicate that agriculture was the major occupation for 54.48 per cent of the household members, 2.76 per cent were agricultural labourers, 6.9 per cent were general labours,4.14 percent were in government service, 1.38 per cent of them were in private sector, 21.38 per cent of them were students and 3.45 per cent were housewives. The results shows that 3.45 per cent of them participated in self help groups, 1.38 per cent of them participated in gram panchayat, 1.38 per cent of them participated in cooperative bank, 0.69 percent of them participated in zilla panchayat and 96.19 per cent of them have not participated in any local institutions. Landless and medium farmers were found to have no participation in any local institutions. Semi medium farmers were found to participate in one or the other local institutions.

The results indicate that 97.14 per cent of the households possess Katcha house and 8.57 per cent of them possess pucca house. 100 percent of the landless, marginal and small farmers possess katcha house. The results shows that 2.86 per cent of the households possess radio, 77.14 per cent of the households possess TV, 48.57 per cent of the households possess Mixer grinder, 45.71 per cent of the households possess bicycle, 34.29 per cent of the households possess motor cycle, 97.14 per cent of the households

possess mobile phones. The average value of radio was Rs.100, television was Rs.2185, mixer grinder was Rs.1094, DVD player was Rs.2000, motor cycle was Rs.31153 and mobile phone was Rs.890. About 45.71 per cent of the households possess plough, 34.29 per cent of them possess bullock cart and 31.43 per cent of the households possess sprayer, 20 per cent of them possess chaff cutter and 82.86 per cent of the households possess weeder. The average value of plough was Rs.745, the average value of bullock cart was Rs. 18500 and the average value of sprayer was Rs.1913.

The results indicate that, 40 per cent of the households possess bullocks, 22.86 per cent of the households possess local cow, 2.86 per cent of the households possess crossbred cows, 5.17 per cent of the households possess buffalo, 2.86 per cent of the households possess sheep. Average own labour men available in the micro watershed was 1.6, average own labour (women) available was 1.1, average hired labour (men) available was 6.5 and average hired labour (women) available was 10.17.

The results indicate that, 80 per cent of the household opined that hired labour was adequate and 2.86 per cent of the households opined that hired labour was inadequate. The results indicate that, 1 and 3 persons were migrated from micro watershed that belonged to marginal and medium farmer category. People have migrated on an average of 212 Kms and average duration was 22.5 months. Marginal farmers have migrated 370 kms and on an average for 36 months. Job/work and education of the children were equally important reasons for migration for all the migrants.

Households of the Kammanur-1 micro watershed possess 30.64 ha (88.85%) of dry land and 3.44 ha (9.98%) of irrigated land. The average value of dry land was Rs.260995 and average value of irrigated was Rs.348705. There were 1 functioning and 1 defunct bore wells in the micro watershed. Bore well was the major irrigation source for 2.86 per cent of the farmers and open well was the source of irrigation for 5.71 per cent of the farmers. There was only 2.43 ha of irrigated area in total in the micro watershed which belonged to semi medium farmers.

Farmers have grown Maize (12.05 ha), Navane (5.09 ha), Sajje (3.64ha), Bajra (4.66ha), Bengal gram (2.63 ha), Paddy (2.02 ha), Horse gram (1.31ha), Sorghum (0.96 ha) and Red gram (0.43ha). Marginal farmers have grown Maize, Navane, Bajra, Sorghum and Redgram. Small farmers have grown Maize, Navane, Bajra, and Horse gram. Semi medium farmers have grown Maize, Bengal gram and Paddy. Medium farmers have grown Maize and Bengal gram.The cropping intensity in Kammanur-1 micro watershed was found to be 97.93 per cent. In case of Marginal farmers it was 113.48 per cent, for small farmers it was 100 per cent, in case of semi medium farmers it was 79.32 per cent, and medium farmers had cropping intensity of 100 per cent.

The results indicate that, 97.14 per cent of the households have both bank account and savings. Among landless farmers 80 percent of them possess bank account and savings. Hundred per cent of marginal, small, semi medium and medium category of farmers possess bank account and also savings. The results indicate that, 56.25 per cent have availed loan in grameena bank, 15.63 per cent have availed loan in money lender and 3.13 per cent have availed loan from SHGs/CBOs. Landless, marginal, small, semi medium and medium have availed Rs.2500, Rs.35000, Rs. 98846, Rs.148333, and Rs. 70000 respectively. Overall average credit amount availed by households in the micro watershed is 68593.

The results indicate that, 94.44 per cent of the households have borrowed loan for agriculture and 5.56 per cent of them have borrowed loan for animal husbandry. Only small farmers (11.1%) have borrowed credit for the purpose of animal husbandry and all other category of farmers have borrowed loan for agriculture purpose. The results indicate that, house hold consumption and other reasons were the main purpose for which landless and small farmers borrowed loan. Another 25 percent of small farmers also borrowed loan for social functions like marriage.

The results indicate that, 47.37 per cent of the households have repaid partially which includes 20 per cent of marginal farmers, 60 per cent of small farmers and 66.67 per cent of semi medium farmers. The data also shows that 47.37 per cent of households have unpaid their loans and only 5.26 per cent of households have fully repaid their loans. Results indicated that 33.33 per cent of the households have repaid partially, another 33.33 per cent have unpaid their loan and 16.67 percent of the households have full paid their loan.

The results indicate that, the total cost of cultivation for bajra was Rs. 14769. The gross income realized by the farmers was Rs. 23450.5. The net income from bajra cultivation was Rs.8680.82, thus the benefit cost ratio was found to be 1:1.6. The total cost of cultivation for horsegram was Rs.14451.57. The gross income realized by the farmers was Rs. 14167. The net income from horsegram cultivation was Rs.-284.51. Thus the benefit cost ratio was found to be 1:0.98. The total cost of cultivation for maize was Rs. 37053.58. The gross income realized by the farmers was Rs. 36730.47. The net income from maize cultivation was Rs. -323.12, thus the benefit cost ratio was found to be 1:0.99.The total cost of cultivation for navane was Rs. 17786.45. The gross income realized by the farmers was Rs. 23546.38. The net income from navane cultivation was Rs. 5759.93. Thus the benefit cost ratio was found to be 1:1.32 .The total cost of cultivation for paddy was Rs. 19170.22. The gross income realized by the farmers was Rs. 21143.20. The net income from paddy cultivation was Rs. 1972.98. Thus the benefit cost ratio was found to be 1:1.1. The total cost of cultivation for redgram was Rs. 24733.95. The gross income realized by the farmers was Rs. 20039.62. The net income

from redgram cultivation was Rs. -4694.33. Thus the benefit cost ratio was found to be 1:0.81. The total cost of cultivation for sorghum was Rs. 13408.29. The gross income realized by the farmers was Rs. 48465.96. The net income from sorghum cultivation was Rs. 35057.67. Thus the benefit cost ratio was found to be 1:3.61. the total cost of cultivation for bengalgram was Rs. 48019.12. The gross income realized by the farmers was Rs. 86046.57. The net income from bengalgram cultivation was Rs. 38027.45. Thus the benefit cost ratio was found to be 1:1.79.

The results indicate that, 8.57 per cent of the households opined that dry fodder was adequate which includes 7.69 per cent of small, 66.67 per cent of semi medium farmers. The data revealed that 22.86 per cent of the farmers opined that dry fodder is inadequate and 2.86 per cent opined that green fodder is inadequate.

The results indicate that, sampled households have grown 30 coconut trees in their field and 6 in backyard. Mango (6) trees and a jackfruit tree was also grown by the households. Households have planted 57 neem trees in field and 2 in backyard, 2 acacia, 2 banyan tree, 2 peepul tree and 1 tamarind tree. Households have an average investment capacity of Rs.1428 for land development and Rs.21,142 in irrigation facility.

Marginal households have an average investment capacity of Rs.3846 for land development and Rs. 21538 in irrigation facility. Small farm households have an average investment capacity Rs.25384 in irrigation facility. Semi medium households have an average investment capacity of Rs. 43333 for irrigation. The results indicated that for land development 2.86 per cent dependent on government subsidy. For irrigation facility 68.57 percent depend on government subsidy and 2.86 percent depend on loan from bank loan.

The results indicated that, 60 percent of the households have sold their produce to local/village merchants which includes, 46.15 per cent the marginal farmers, 84.62 percent small farmers and 100 percent semi medium farmers. About 34.29 percent of the households sold their produce in regulated markets which includes 53.85 percent marginal farmers, 23.08 percent small farmers and 100 percent medium farmers. The results indicated that 77.14 per cent of the households have used cart as a mode of transport and 17.14 per cent have used tractor.

The results indicated that, 5.71 per cent of the households have experienced the soil and water erosion problems i.e. 7.96 percent of small farmers and 33.33 percent semi medium farmers. About 82.86 per cent of the households have shown interest in soil testing i.e. 92.31 per cent of marginal farmers, 100 per cent of small farmers, 100 per cent of semi medium and 100 per cent of medium farmers have shown interest in soil testing.

The results indicated that, 45.71 per cent of the households have adopted field bunding which includes 30.77 per cent of marginal, 69.23 per cent of small farmers, 66.67 per cent of semi medium farmers, 100 per cent of medium farmers. Summer

ploughing was adopted by 62.86 per cent of the households i.e. 69.23 per cent of the marginal farmers, 76.92 per cent of the small farmers, 66.67 per cent of semi medium and 100 per cent medium farmers. Combination of deep and shallow root crops was followed by 62.86 per cent of the farmers. The results indicated that, 6.67 per cent of the households who adopted field bunding opined that bunds are good, 13.33 per cent opined that bunds are slightly damaged, and 6.67 per cent of the households opined that bunds are severely damaged and 73.33 per cent opined that the bunds required full replacement.

Piped supply was the major source for drinking water for 94.29 per cent which includes 100 per cent of landless, 84.62 per cent of marginal, 100 per cent of small farmers, 100 per cent of semi medium and 100 per cent of medium farmers. Electricity was the major source of light for 100 per cent of the households in micro watershed. About 42.86 per cent of the households possess sanitary toilet i.e. 60 per cent of landless, 53.85 per cent of marginal, 23.08 per cent of small, 33.33 per cent of semi medium and 100 per cent of medium farmers have sanitary toilet facility, 91.43 per cent of the sampled households possessed BPL card and 40 per cent of the households participated in NREGA programme.

The results indicated that, Lower fertility status of the soil was the constraint experienced by 48.57 per cent of the households, wild animal menace on farm field (57.14%), frequent incidence of pest and diseases (57.14%), inadequacy of irrigation water (57.14%), high cost of fertilizers and plant protection chemicals (80%), high rate of interest on credit (82.86%), low price for the agricultural commodities (74.29%), lack of marketing facilities in the area (82.86%), inadequate extension services (82.86%), lack of transport for safe transport of the agricultural produce to the market (82.86%).