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

SANABANAHALLI (4B3D3N1b) MICROWATERSHED

Gubbi Taluk, Tumkur 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 SanabanahalliMicrowatershed, Gubbi Taluk and Tumakuru 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 micowatershed. 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.

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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

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

The present study covers an area of 462 ha in Gubbi taluk of Tumakuru district, Karnataka. The climate is semiarid and categorized as drought- prone with an average annual rainfall of 813 mm, of which about 466 mm is received during south –west monsoon, 196 mm during north-east and the remaining 151 mm during the rest of the year. An area of about 97 per cent is covered by soils and three per cent by others. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 7 soil series and 13 soil phases (management units) and 3 land use classes.*
- *The length of crop growing period is about 150 days starting from 3rd week of June to third week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 250 m grid interval.*
- *Land suitability for growing 34 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *About 97 per cent area is suitable for agriculture.*
- *About 97 per cent of the soils are deep (100-150 cm) to very deep (>150 cm).*
- *About 21 per cent of the area has clayey soils at the surface and 76 per cent loamy soils.*
- *About 81 per cent of the area has non-gravelly soils and 16 per cent gravelly soils (15-35 % gravel).*
- *About 42 per cent has soils that are low (51-100 mm/m) in available water capacity, 32 per cent medium (101-150 mm/m) and 24 per cent has very high (>200 mm/m) available water capacity.*
- *About 89 per cent of the area has very gently sloping (1-3% slope) lands and 8 per cent area has nearly level (0-1%) lands.*
- *An area of about 65 per cent has soils that are slightly eroded (e1) and 32 per cent moderately eroded (e2).*

- *An area of about 39 per cent has soils that are slightly acid (pH 6.0-6.5), 31 per cent moderately acid (pH 5.5-6.0), 13 per cent strongly acid (pH 5.0-5.5) and 13 per cent area is neutral (pH 6.5-7.3).*
- *The Electrical Conductivity (EC) of the soils are dominantly <2 dsm^{-1} indicating that the soils are non-saline.*
- *About 80 per cent of the soils are low (<0.5%) in organic carbon and 16 per cent soils are medium (0.5-0.75%).*
- *Entire area in the microwatershed is high (>57 kg/ha) in available phosphorus.*
- *About 14 per cent of the soils are low (<145 kg/ha) in available potassium and medium (145-337 kg/ha) in 83 per cent.*
- *Available sulphur is low (<10 ppm) in about 7 per cent area and medium (10-20 ppm) in about 90 per cent area.*
- *Available boron is low (0.5 ppm) in about 60 per cent area and medium (0.5-1.0 ppm) in 37 per cent area.*
- *Available iron is sufficient (>4.5 ppm) in 86 per cent area and deficient (<4.5 ppm) in 11 per cent microwatershed area.*
- *Available manganese and copper are sufficient in all the soils of the microwatershed.*
- *Available zinc is deficient (<0.6 ppm) in 80 per cent and sufficient (>0.6 ppm) in 16 per cent of soils of the microwatershed.*
- *The land suitability for 34 major 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	*205 (44)*	*85 (18)*	*Guava*	*186 (40)*	*211 (46)*
Fodder Sorghum	*205 (44)*	*85 (18)*	*Pomegranate*	*205 (44)*	*85 (18)*
Maize	*77(17)*	*164 (35)*	*Banana*	*205 (44)*	*85 (18)*
Upland paddy	*205 (44)*	*85 (18)*	*Jackfruit*	*205 (44)*	*36(8)*
Finger millet	*205 (44)*	*36(8)*	*Jamun*	*199(43)*	*91 (20)*
Red gram	*205 (44)*	*85 (18)*	*Musambi*	*205 (44)*	*85 (18)*
Horse gram	*205 (44)*	*241 (52)*	*Lime*	*205 (44)*	*85 (18)*
Field bean	*205 (44)*	*85 (18)*	*Cashew*	*186 (15)*	*55 (12)*
Cowpea	*205 (44)*	*85 (18)*	*Custard apple*	*205 (44)*	*241(52)*
Groundnut	*6 (1)*	*373 (81)*	*Amla*	*205 (44)*	*241(52)*
Sunflower	*205 (44)*	*85 (18)*	*Tamarind*	*199(43)*	*91 (20)*
Onion	*97 (21)*	*194 (42)*	*Marigold*	*205 (44)*	*85 (18)*
Chilli	*205 (44)*	*85 (18)*	*Chrysanthemum*	*205 (44)*	*85 (18)*
Brinjal	*205 (44)*	*85 (18)*	*Jasmine*	*205 (44)*	*85 (18)*
Tomato	*205 (44)*	*85 (18)*	*Coconut*	*186 (40)*	*55 (12)*
Mango	*199(43)*	*42 (9)*	*Arecanut*	*186 (40)*	*55 (12)*
Sapota	*205 (44)*	*36(8)*	*Mulbery*	*6 (1)*	*2832)*

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 3 identified LUCs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and horticulture crops.

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

Chapter 1

INTRODUCTION

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

Further, land degradation has emerged as a serious problem which has already affected about 38 lakh ha of cultivated area in the state. Soil erosion alone has degraded about 35 lakh ha. Almost all the uncultivated areas are facing various degrees of degradation, particularly soil erosion. Salinity and alkalinity has emerged as a major problem affecting 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 the potential and problem areas, developing sustainable land use plans, estimation of surface run off and water harvesting potential, preparation of soil and water conservation plans, land degradation/desertification etc. The Bureau is presently engaged in developing an LRI methodology using high resolution satellite remote sensing data and Digital Elevation Model (DEM) data to prepare Landscape Ecological Units (LEU) map representing agro-ecosystem as a whole. The LEU is preferred over landform as the base map for LRI. LEU is the assemblage of landform, slope and land use.

The land resource inventory aims to provide site specific database for Sanabanahalli microwatershed in Gubbi Taluk, Tumakuru 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.

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

Tumakuru District popularly known as *Kalpataru Nadu* (famous for production of Coconuts) is located in the south-eastern part of Karnataka State. The Sanabanahalli microwatershed (Bangihalli Subwatershed) is located in the southern part of Karnataka in Gubbi Taluk, Tumakuru District, Karnataka State (Fig.2.1). It comprises parts of Anthapura, Gadi Ankanahalli, Madhenahalli, Sanabanahalli and Thalekoppa villages. It lies between 13^0 27' and 13^0 28' North latitudes and 76^0 51' and 76^0 54' East longitudes and covers an area of 462 ha. It is about 71 km south of Tumakuru and is surrounded by Thalekoppa on the north, Sanabanahalli on the northwest, Madhenahalli on the west, Gadi Ankanahalli on the south and Anthapur on eastern side.

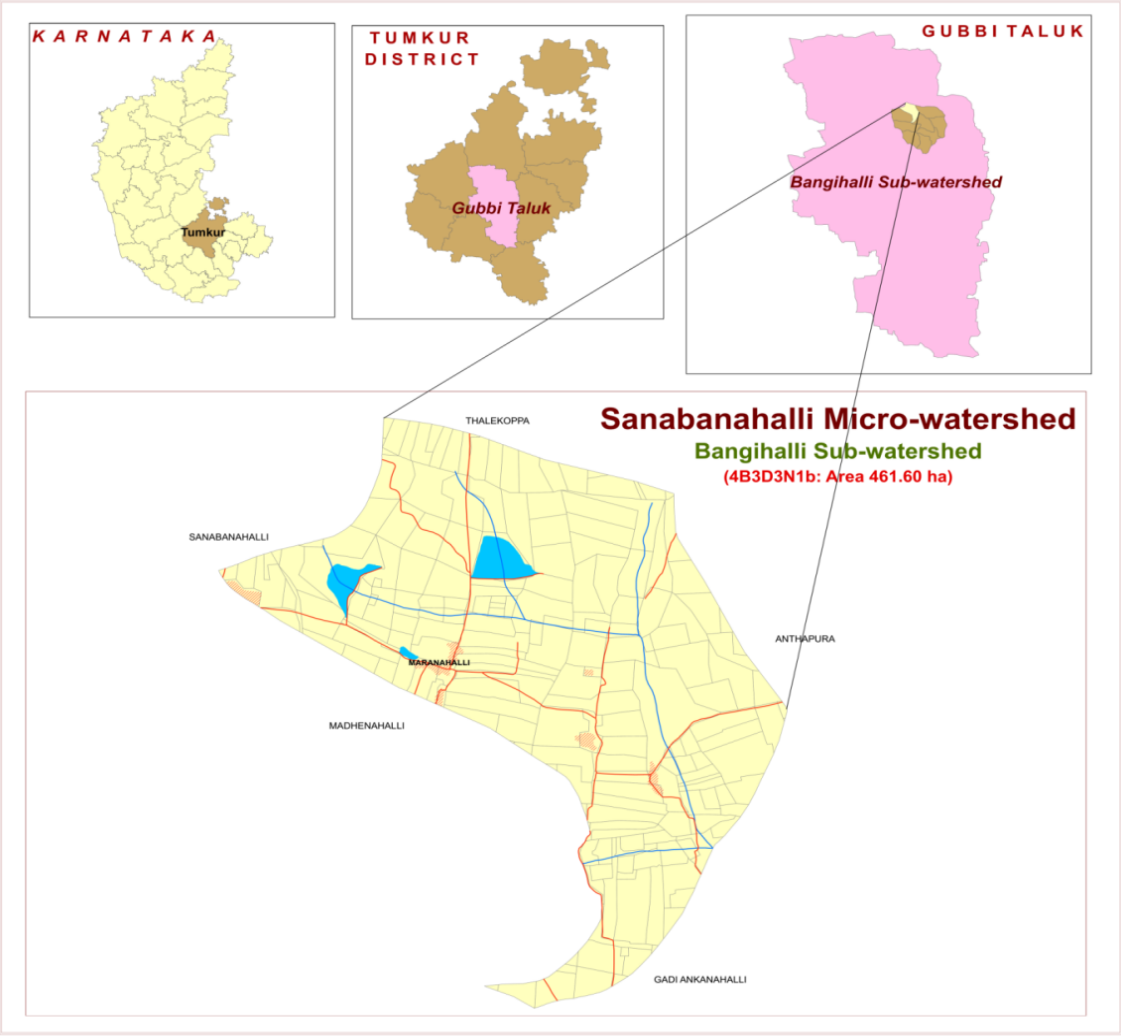


Fig.2.1 Location map of Sanabanahalli Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are granite gneiss and alluvium (Figs.2.2 and 2.3). Granite and gneiss are essentially pink to gray and are coarse to medium grained. Granite and gneiss consist primarily of quartz, feldspar, biotite and hornblende. The gray granites and gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. The most widespread and characteristic development of alluvium in the watershed region lying in the Suvarnamukhi is a wide belt, the underlying formation is gneiss and alluvial soils occur over gneiss, limestone and shale are far more extensive and homogeneous than those found on the Deccan Trap country lying to the river Suvarnamukhi. The soil thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2 Granite and granite gneiss rocks

Fig. 2.3 Alluvium

2.3 Physiography

Physiographically, the area has been identified as Granite gneiss and Alluvial landscapes based on geology. It has been further divided into three landforms *viz*; mounds/ ridges, uplands and lowlands based on slope and other relief features. They have been further subdivided into four physiographic units, *viz;* summits, side slopes, very gently sloping uplands and lowlands/valleys. The elevation ranges from 831-876 m. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

There are no perennial rivers flowing in Gubbi taluk. However, the area is drained by several small seasonal streams like Hosa *kaluve* which joins the river Shimsha along its course. Though, they are not perennial, during rainy season, it carries large quantities of rain water. The microwatershed area has only few small tanks which are not capable of storing water that flows 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 new tanks and recharge structures at appropriate places in the villages, then the drinking and irrigation needs of the area can be easily met. The drainage network is dendritic to sub parallel.

2.5 Climate

The district falls under semiarid tract and is categorized as drought-prone with average annual rainfall of 813 mm (Table 2.1). Of the total rainfall, a maximum of 466 mm is received during south–west monsoon period from June to September, north-east monsoon from October to early December contributes about 196 mm and the remaining 151 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 35°C and in December and January, the temperatures will go down to 20°C. Rainfall distribution is shown in Figure 2.4. The average Potential Evapo-Transpiration (PET) is 110 mm and varies from a low of 73 mm in December to 152 mm in the month of April. The PET is always higher than precipitation in all the months except in the month of August, September and October. Generally, the Length of crop Growing Period (LGP) is 150 days and starts from 3rd week of June to third week of November.

Table 2.1 Mean Monthly Rainfall, PET, 1/2 PET in Gubbi Taluk, Tumakuru District

Sl. no.	Months	Rainfall	PET	1/2 PET
1	JAN	6.50	78.30	39.15
2	FEB	7.00	102.70	51.35
3	MAR	24.40	142.60	71.30
4	APR	40.50	151.60	75.80
5	MAY	72.50	149.70	74.85
6	JUN	78.50	121.10	60.55
7	JUL	99.20	107.60	53.80
8	AUG	119.70	105.80	52.90
9	SEP	168.30	101.20	50.60
10	OCT	141.90	100.20	50.10
11	NOV	47.00	85.00	42.50
12	DEC	7.30	73.00	36.50
Total		812.80	109.90	

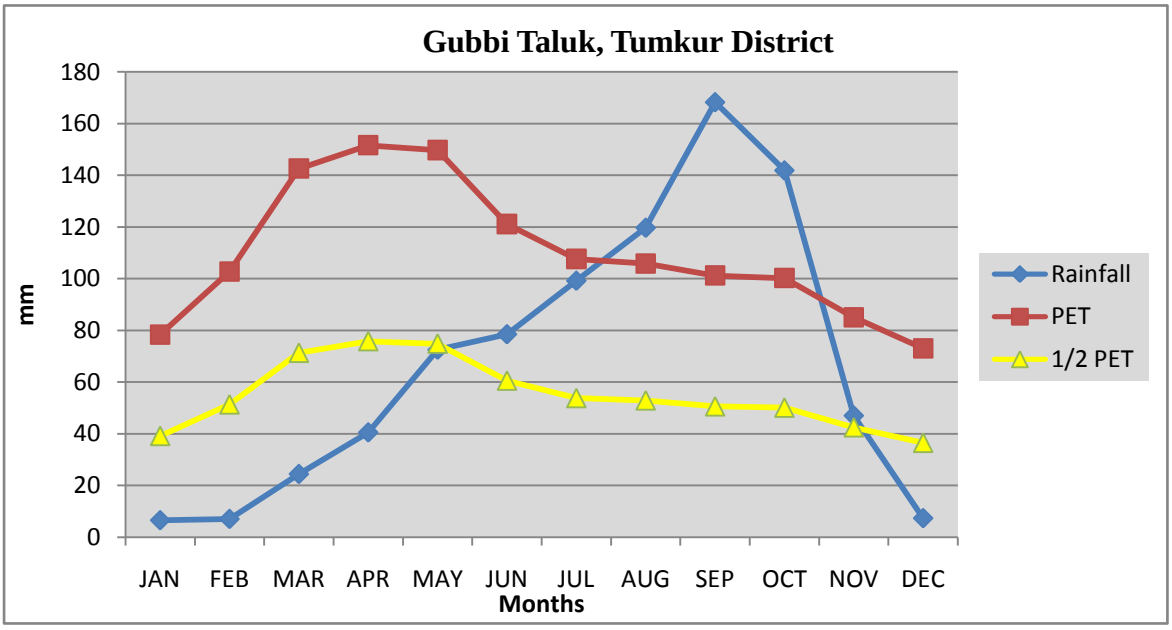


Fig 2.4 Rainfall distribution in Gubbi Taluk, Tumkur District

2.6 Natural Vegetation

The natural vegetation is sparse comprising few tree species, shrubs and herbs. The mounds, ridges and boulders occupy very sizeable 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.

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

Fig. 2.5 Natural vegetation of Sanabanahalli Microwatershed

2.7 Land Utilization

About 64 per cent area (Table 2.2) in Gubbi taluk is cultivated at present. An area of about 4 per cent is currently barren. Forests occupy an area of about 8 per cent. Most of the mounds, ridges and boulders have very poor vegetative cover. Major crops grown in the area are Ragi, Groundnut, Maize, Sorghum, Redgram, Horse gram, Sunflower, Field bean, Cowpea, Mango, Banana, Mulberry and plantation crops like Coconut, Banana and Arecanut. The cropping intensity is 116 per cent in the Gubbi taluk. While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the Sanabanahalli microwatershed is prepared. The current land use map generated shows the arable and non-arable lands, other land uses and different types of crops grown in the area (Fig. 2.6). The different crops and cropping systems adopted in the microwatershed is presented in Figures 2.8 a &b. simultaneously, enumeration of wells (bore wells and open wells) and existing conservation structures in the microwatershed are made and their location in different survey numbers is located on the cadastral map. Map showing the location of wells and other water bodies in Sanabanahalli microwatershed is given in Fig.2.7.

Table 2.2 Land Utilization in Gubbi Taluk

Sl. No.	Agricultural land use	Area (ha)	Per cent
1	Total geographical area	122057	-
2	Total cultivated area	78418	64.24
3	Area sown more than once	12934	-
4	Cropping intensity	-	116.49
5	Trees and grooves	2811	2.30
6	Forest	10090	8.26
7	Cultivable wasteland	2731	2.23
8	Permanent Pasture land	3850	3.15
9	Barren land	4971	4.07
10	Non- Agriculture land	17390	14.24

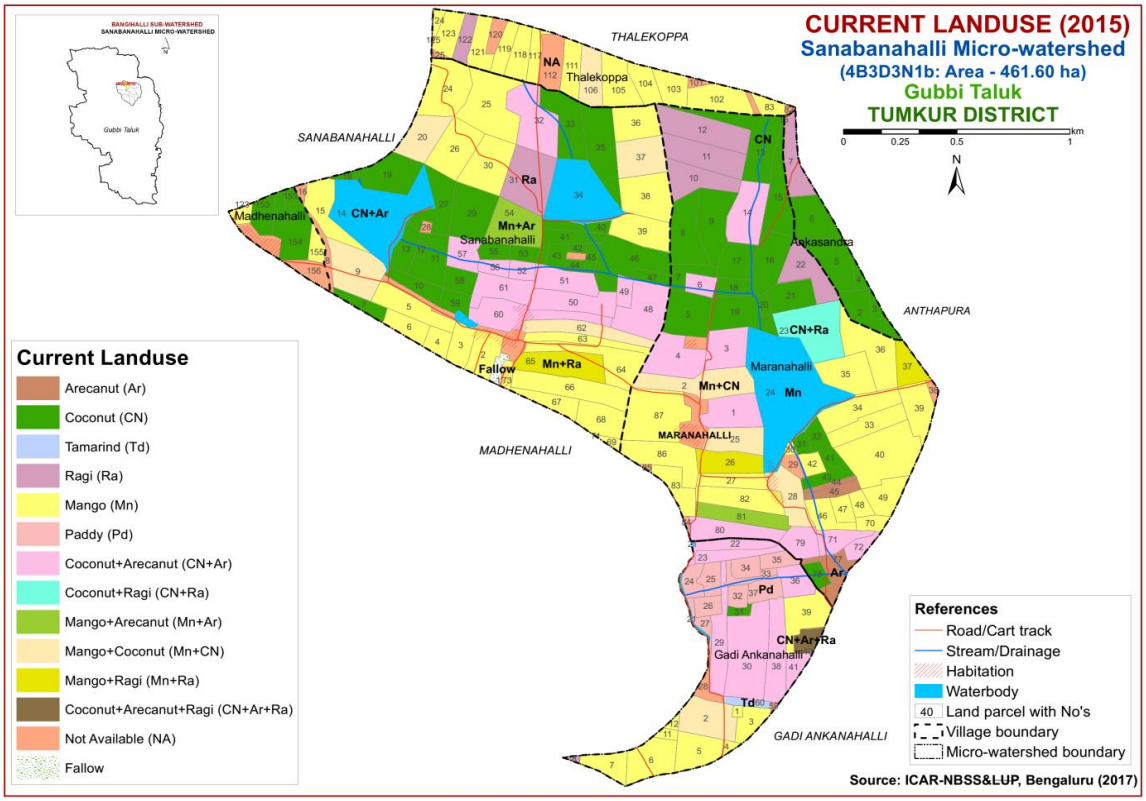


Fig.2.6 Current Land Use – Sanabanahalli Microwatershed

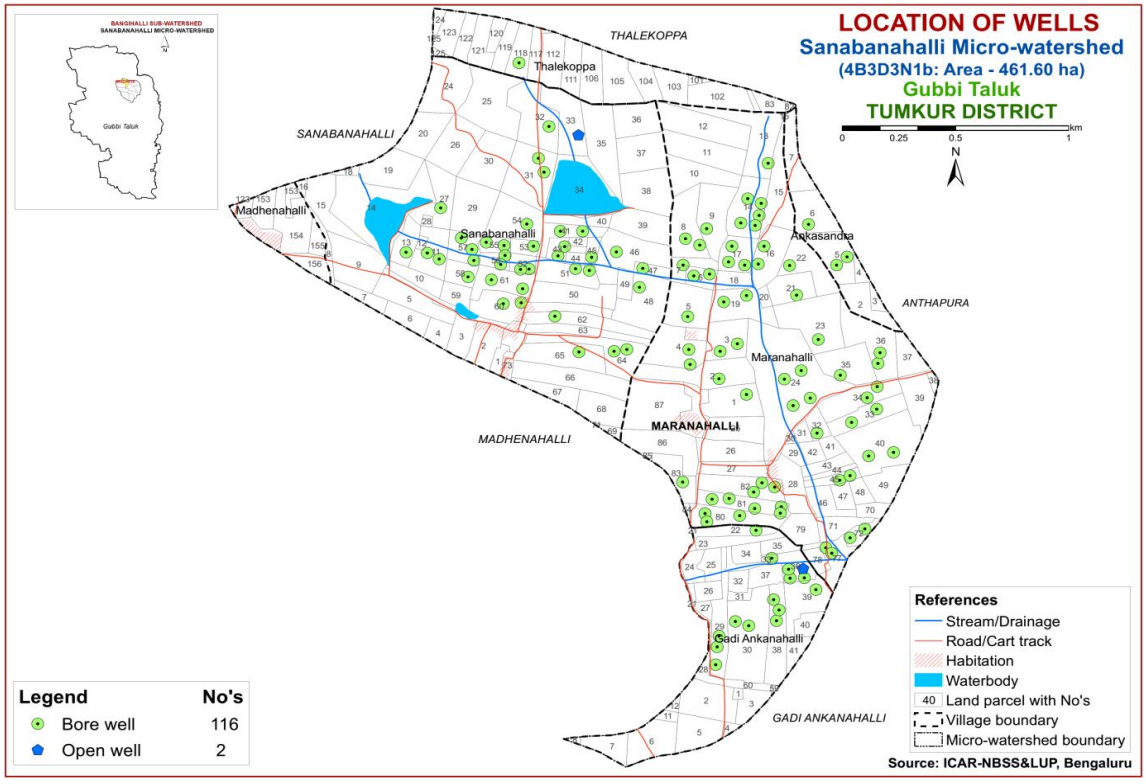


Fig.2.7 Location of Wells - Sanabanahalli Microwatershed

Fig.2.8.a Different crops and cropping systems in Sanabanahalli Microwatershed

Fig.2.8.b Different crops and cropping systems in Sanabanahalli Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly to a given level of management. This was achieved in Sanabanahalli microwatershed by the detailed study of all the soil characteristics (depth, texture, color, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site characteristics (slope of the land, erosion, drainage, occurrence of rock fragments etc.). This is 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 survey at 1:7920 scales was carried out in an area of 462 ha. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

False Colour Composites (FCCs) of Cartosat-I and LISS-IV merged satellite data covering the microwatershed area was visually interpreted using image interpretation elements along with the geology map 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 land forms such as ridges, mounds, uplands and valleys based on slope and other relief features. 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)
	G24		Valleys/ lowlands
		G241	Valleys, pink tones
		G242	Valleys gray mixed with pink tones

DSe – Alluvial landscape

DSe 1 – Summit

DSe 11 –

DSe 12 –

DSe 2 – Very gently sloping

DSe 21 – Very gently sloping, dark gray tone

DSe 22 – Very gently sloping, medium gray tone

DSe 23 – Very gently sloping, yellowish grey tone

DSe 24 – Very gently sloping, whitish grey tone

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

DSe 26- Very gently sloping, medium pink

DSe 3 – Valley/ Lowland

DSe 31 – Whitish gray/Calcareous

DSe 32 – Gray with pink patches

DSe 33 – Medium gray tone

DSe 34 – Lightish gray tone

DSe 35 – Dark gray tone

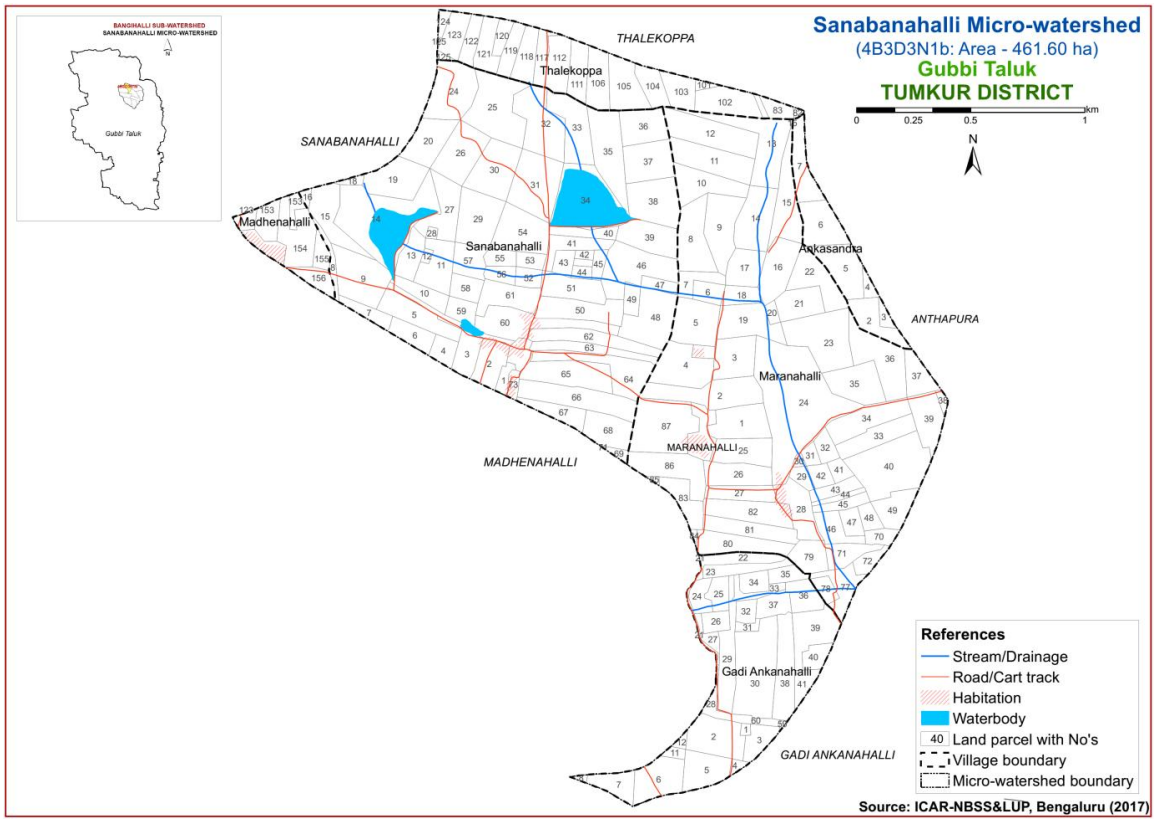


Fig 3.1 Scanned and Digitized Cadastral map of Sanabanahalli Microwatershed

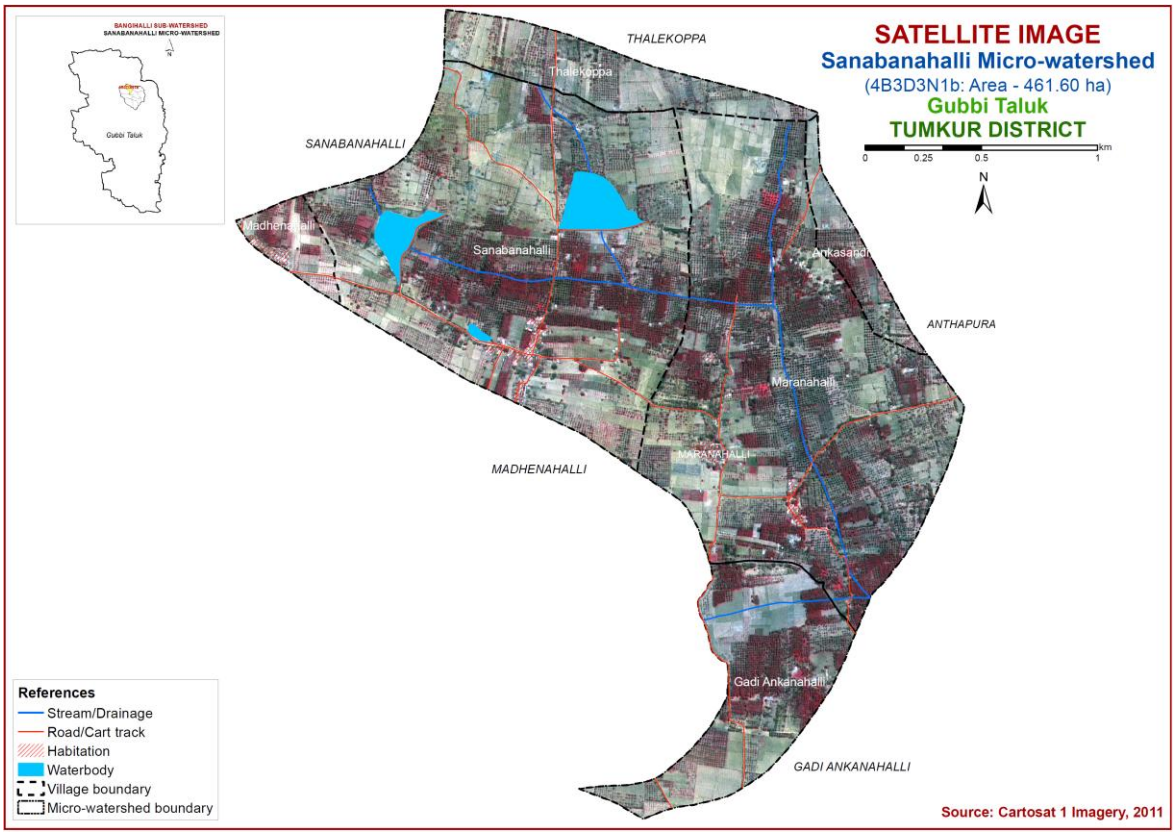


Fig.3.2 Satellite Image of Sanabanahalli Microwatershed

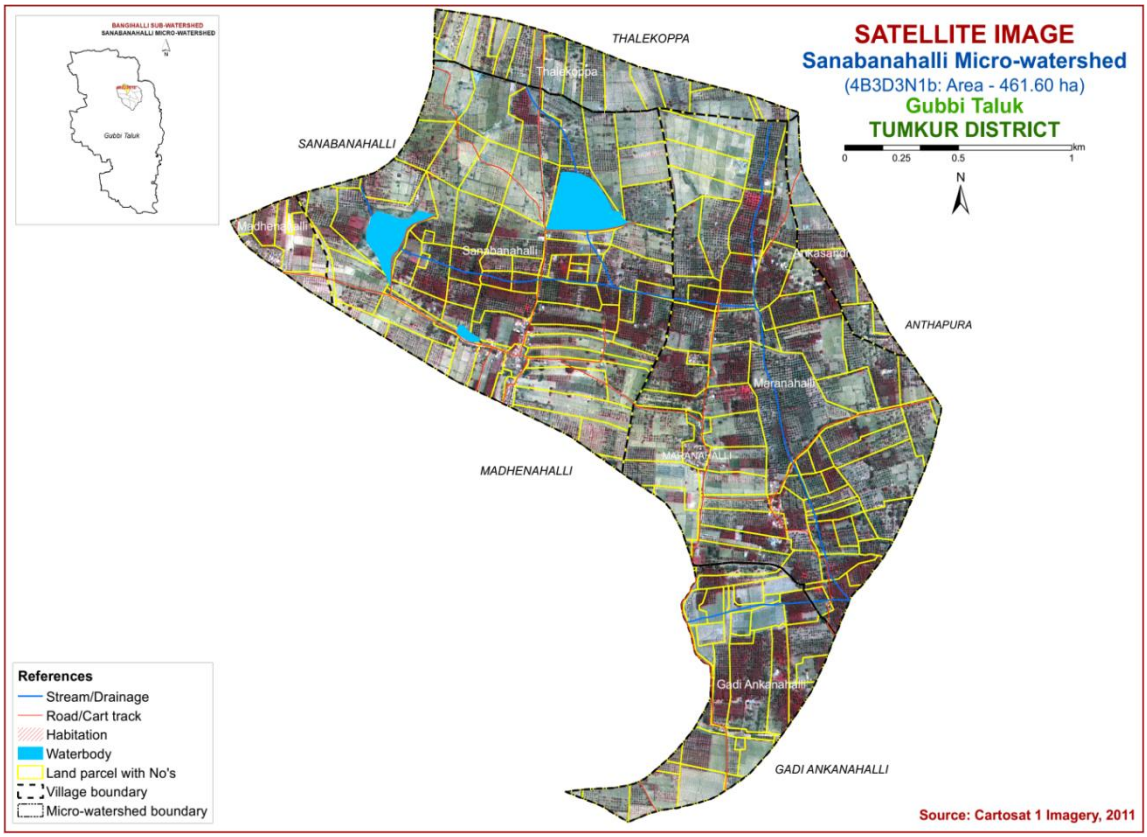


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Sanabanahalli Microwatershed

3.3 Field Investigation

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

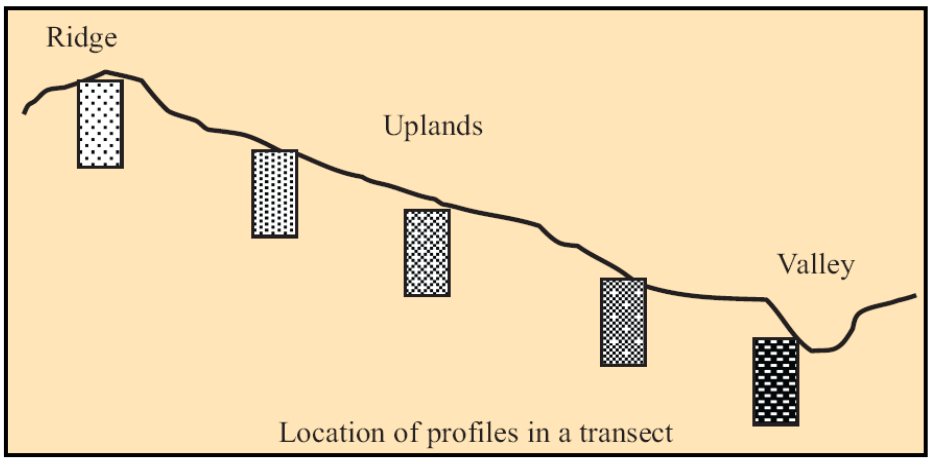


Fig: 3.4. Location of profiles in a transect

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

Based on 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, color, 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, 7 soil series were identified in the Sanabanahalli 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 (control section)**	**Gravel (%) (control section)**	**Horizon sequence**	**Calcareo-usness**
1.	Mornal (MNL)	>150	5YR3/3,3/4 7.5YR3/3,3/4	c	<15	Ap-Bt	-
2.	Balapur (BPR)	100-150	2.5YR2.5/4,3/4	sc-c	>35	Ap-Bt-Cr	-
3.	Nagalapur (NGP)	100-150	5YR2.5/2,3/2 2.5YR3/6,4/6	sc-c	>35	Ap-Bt-Cr	-
4.	Hallikere (HLK)	>150	5YR3/3,3/4 7.5YR3/3,3/4	c	<15	Ap-Bt	-
5.	Ranatur (RTR)	>150	2.5YR2.5/3,2.5/4 3/3,4/6	c	-	Ap-Bt	-
Low Land series							
6.	Thondigere (TDG)	>150	7.5YR3/3,3/4,4/6 10 YR 3/1, 4/3,4/4,4/6	s,ls,sl,scl,sc	-	Ap-Bw-C	-
Soils of Alluvial Landscape							
7.	Kadagathur (KDT)	>150	10 YR 3/1, 3/2, 3/3,7.5YR 3/3, 3/4	sc-c	-	Ap-Bw	-

3.4 Soil Mapping

The area under each soil series was further separated into 13 soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management.

The soil mapping units are shown on the map (Fig.3.5) in the form of symbols. During the survey many profile pits, few minipits and a few auger bores representing different landforms occurring in the microwatershed were studied. In addition to the profile study, spot observations in the form of minipits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map. The soil map shows the geographic distribution of 13 soil mapping units representing 7 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2. The soil phase map (management units) shows the distribution of 13 soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

The 13 soil phases identified and mapped in the microwatershed were grouped into 3 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(LMUs) based on the management needs. One or more than one soil site characteristic having influence on the management have been choosen for identification and delineation of LMUs. For Sanabanahalli microwatershed, five soil and site characteristics, namely 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 were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected from farmer's fields (76 samples) for fertility status (major and micronutrients) at 250 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Sanabanahalli Microwatershed (Soil Legend)

Soil No	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
SOILS OF GRANITE GNEISS LANDSCAPE				
	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red clay soils occurring on very gently sloping uplands under cultivation		**6 (1.30)**
1		MNLhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	6 (1.30)
	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 very gently sloping uplands under cultivation		**157 (33.9)**
2		BPRcB1	Sandy loam surface, slope 1-3%, slight erosion	52 (11.17)
3		BPRhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	21 (4.47)
4		BPRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	84 (18.26)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on gently sloping uplands under cultivation		**36 (7.75)**
5		NGPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	36 (7.75)
	HLK	Hallikere soils are very deep (>150 cm), well drained, have dark brown to dark reddish brown clayey soils occurring on very gently sloping uplands under cultivation		**71 (15.47)**
6		HLKcB2	Sandy loam surface, slope 1-3%, moderate erosion	20 (4.32)
7		HLKhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	51 (11.15)
	RTR	Ranatur soils are very deep (>150 cm), well drained, have dark reddish brown to dark red clay soils occurring on very gently sloping uplands under cultivation		**19 (4.16)**
8		RTRcA1	Sandy loam surface, slope 0-1%, slight erosion	0.13 (0.03)
9		RTRhB1	Sandy clay loam surface, slope 1-3%, slight erosion	19 (4.13)
	TDG	Thondigere soils are very deep (>150 cm), well drained, have dark brown to dark yellowish brown sandy loam to sandy clay stratified soils occurring on very gently sloping lowlands under cultivation		**49 (10.66)**
10		TDGhB1	Sandy clay loam surface, slope 1-3%, slight erosion	49 (10.66)
Soils of Alluvial landscape				
	KDT	Kadagathur soils are very deep (>150 cm), moderately well drained, have dark brown to very dark grayish brown sandy clay to clay soils occurring on very gently sloping uplands under cultivation		**108 (23.57)**
11		KDThB1	Sandy clay loam surface, slope 1-3%, slight erosion	11 (2.43)
12		KDTiA1	Sandy clay surface, slope 0-1%, slight erosion	37 (8.03)
13		KDTiB1	Sandy clay surface, slope 1-3%, slight erosion	60(13.11)
		Others	Habitation & Water body	15 (3.19)

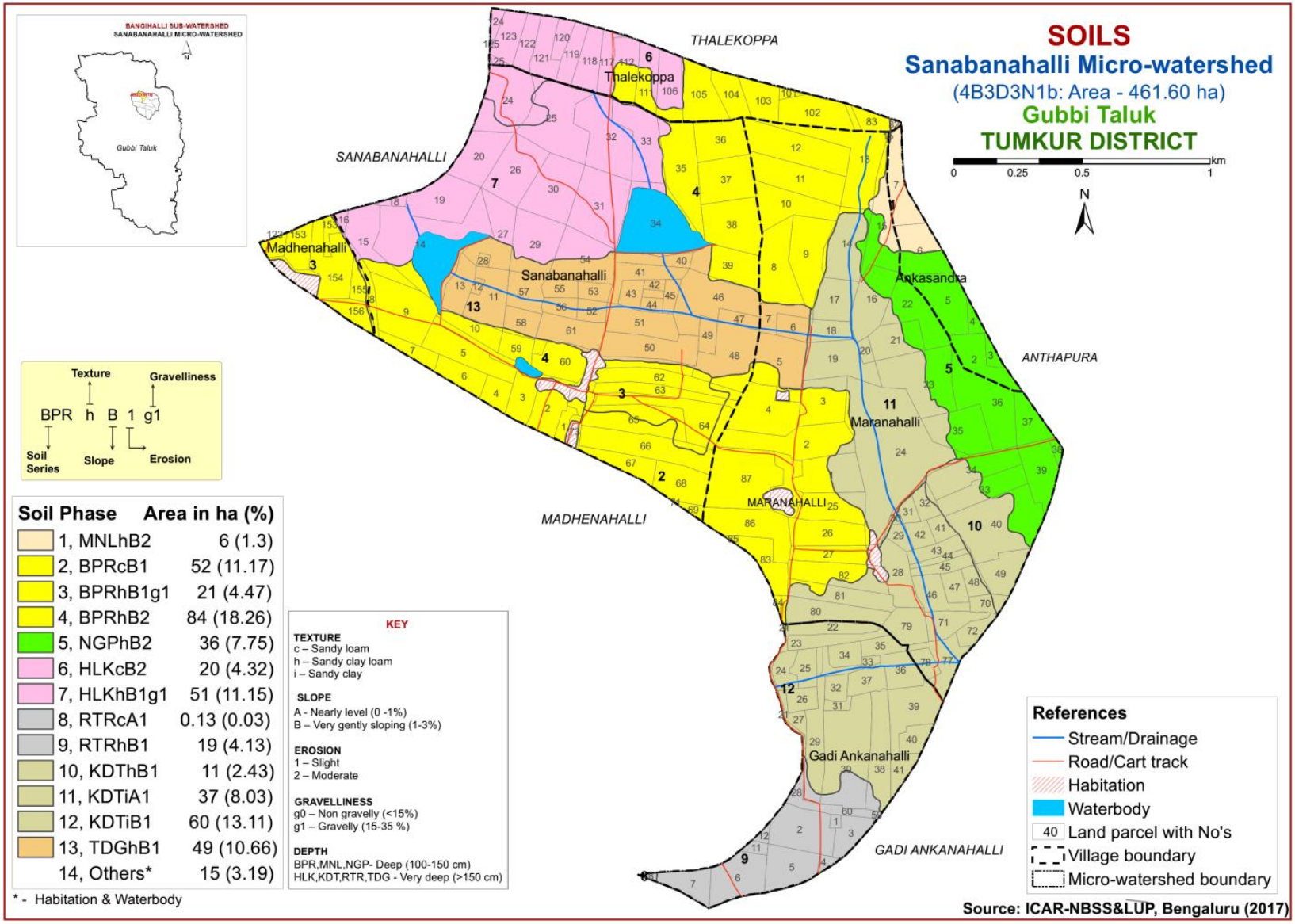


Fig 3.5 Soil Phase or Management Units Map - Sanabanahalli Microwatershed

Chapter 4

THE SOILS

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

A brief description of each of the 7 soil series identified followed by the phases (management units) mapped under each series (Fig. 3.5) are furnished below. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Granite Gneiss Landscape

In this landscape, 6 soil series are identified and mapped. Brief description of each series identified is given below. Of these, Balapur (BPR) series occupies major area of about 157 ha (34%) followed by Hallikere (HLK) 71 ha (15%). The mapping unit description (Soil Legend) of the phases identified and mapped under each series is given in Table 3.2.

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

The thickness of the solum ranges from 112 to 149 cm. The thickness of A-horizon ranges from 15 to 25 cm. Its colour is in 5 YR, 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture is sandy clay loam, sandy clay and clay with 15 to 30 per cent gravel. The thickness of B-horizon ranges from 103 to 131 cm. Its colour is in 2.5 YR and 5 YR hue with value 2.5 to 4 and chroma 3 to 6. Texture is sandy clay loam to sandy clay with less than15 per cent gravel. The available water capacity is medium (101-150 mm/m). Only one phase was identified and mapped.

Landscape and soil profile characteristics of Mornal (MNL) Series

4.1.2 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. These soils are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Balapur series has been tentatively classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Rhodic Paleustalfs.

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 medium (100-150 mm/m). Three phases were identified and mapped.

Landscape and Soil Profile Characteristics of Balapur (BPR) Series

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

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

Landscape and Soil Profile Characteristics of Nagalapur (NGP) Series

4.1.4 Hallikere (HLK) Series: Hallikere soils are very deep (>150 cm), well drained, have dark brown and dark reddish brown clayey soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands. The Hallikere series has been tentatively classified as a member of the fine, mixed, isohyperthermic family of Typic Paleustalfs.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 11 to 14 cm. Its colour is in 7.5 YR and 5 YR hue with value 3 to 4 and chroma 3 to 4. The texture varies from sandy loam to sandy clay loam. The thickness of B horizon is more than 150 cm. Its colour is in 7.5 YR and 5 YR hue with value and chroma 3 to 4. Its texture is clay. The available water capacity is high (150-200 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile Characteristics of Hallikere (HLK) Series

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

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

Landscape and soil profile characteristics of Ranatur (RTR) Series

4.1.6 Thondigere (TDG) : Thondigere soils are very deep (>150 cm), well drained, have dark brown to dark yellowish brown, sandy loam to sandy clay loam and sandy clay stratified soils. They have developed from alluvio- colluvium and occur on nearly level to very gently sloping lowlands under cultivation. The Thondigere soils have been classified as a member of the fine loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum is more than 150 cm. The thickness of A-horizon ranges from 12 to 19 cm. Its colour is in 10 YR, 5 YR and 7.5 YR hue with value 3 to 4 and chroma 4. The texture is sandy clay loam. The thickness of B horizon is more than 150 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 4 and chroma 3 to 6. Its texture is sand to loamy sand and sandy loam, sandy clay loam and sandy clay. The available water capacity is medium (101-150 mm/m). Only one phase was indentified and mapped.

Landscape and soil profile characteristics of Thondigere (TDG) Series

4.2 Soils of Alluvial Landscape

In this landscape, only one soil series (Kadagathur) is identified and mapped. It covers about 108 ha in the microwatershed. The brief description of Kadagathur (KDT) series identified and mapped is given below.

4.2.1 Kadagathur (KDT) Series: Kadagathur soils are very deep (>150 cm), moderately well drained, have dark brown to very dark grayish brown sandy clay to clay soils. They have developed from alluvium and occur on nearly level to very gently sloping uplands under cultivation.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 8 to 14 cm. Its colour is in 10 YR hue with value 3 and chroma 4. The texture is sandy loam to sandy clay loam and sandy clay. The thickness of B horizon is more than 150 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 and chroma 1 to 4. Its texture is sandy clay to clay. The available water capacity is very high (>200 mm/m). Three phases were identified and mapped.

Landscape and soil profile characteristics of Kadagathur (KDT) Series

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

Soil characteristics: Depth, texture, gravel content, calcareousness.

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

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

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

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

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

Class III: They are moderately good lands that have 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 wind mills.

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

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

The 13 soil map units identified in the Sanabanahalli microwatershed are grouped under 2 land capability classes and 4 land capability subclasses. About 97 percent area in the microwatershed is suitable for agriculture and 3 percent is not suitable for agriculture (Fig. 5.1).

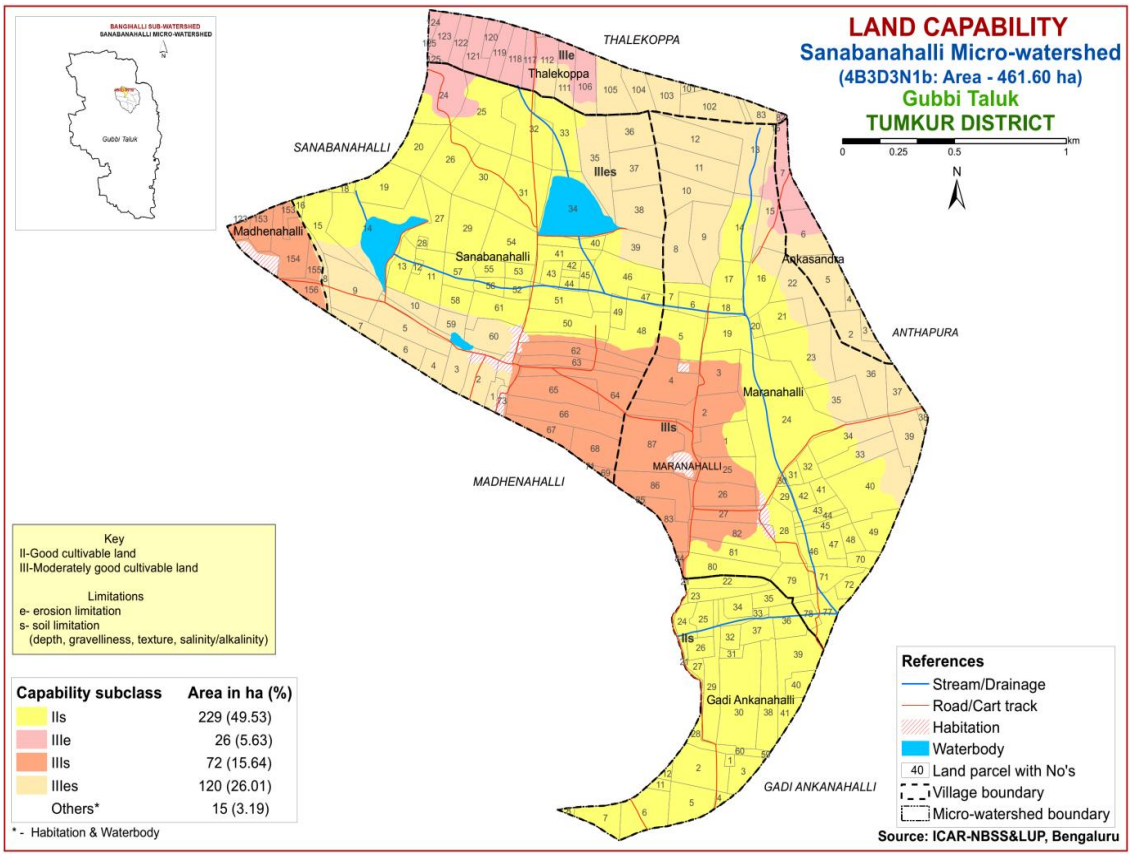


Fig. 5.1 Land Capability map of Sanabanahalli Microwatershed

Good cultivable lands (Class II) cover an area of about 229 ha (49%) and are distributed in the southern, central and northwestern part of the microwatershed with minor problem of soil. Moderately good cultivable lands (Class III) cover an area of about 218 ha (47%) and are distributed in the northern, eastern and western part of the microwatershed with moderate problems of erosion and soil.

5.2 Soil Depth

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

An area of about 198 ha (43%) is occupied by deep (100-150 cm) soils and are distributed in the western and northeastern part of the microwatershed. Very deep (>150 cm) soils cover an area of 249 ha (54%) and are distributed in the northern, southern and central part of the microwatershed.

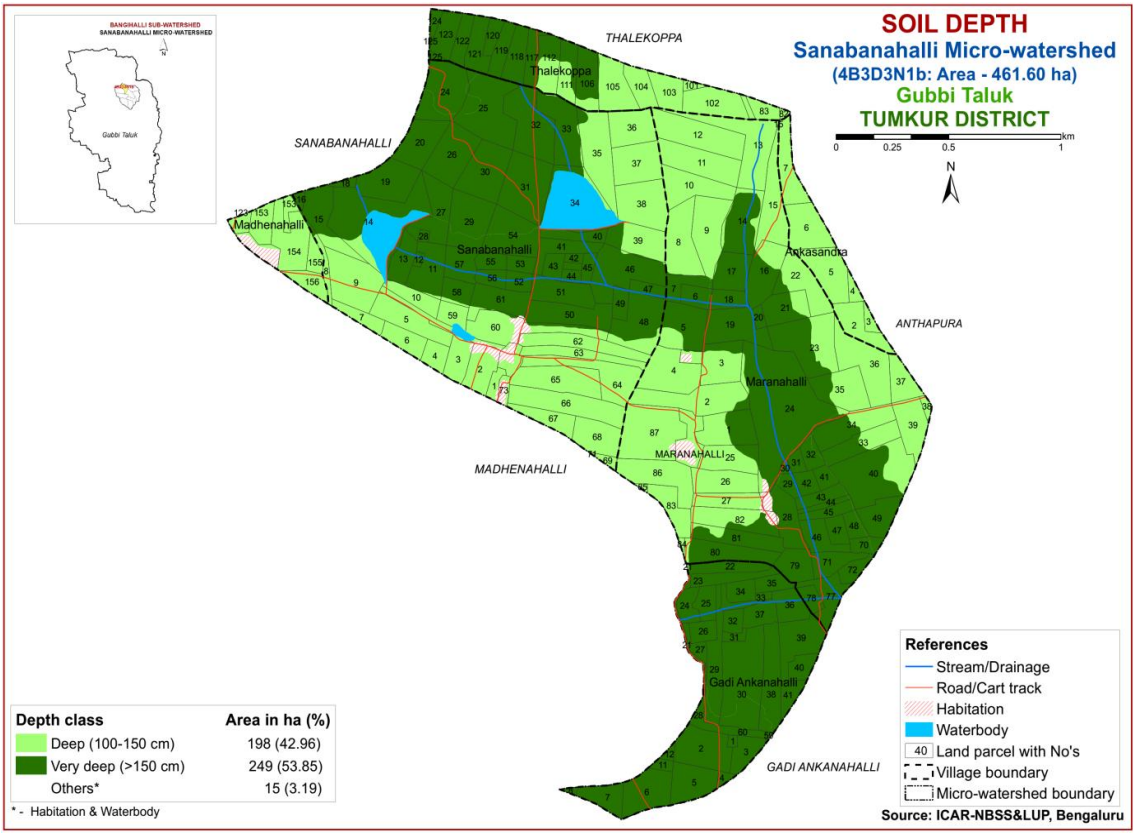


Fig. 5.2 Soil Depth map of Sanabanahalli Microwatershed

Entire area in the microwatershed is more productive with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown in very deep (>150 cm depth) and deep (100-150 cm) soils.

5.3 Surface Soil Texture

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

Maximum area of about 350 ha (76%) has soils that are loamy at the surface. They are distributed in all parts of the microwatershed. An area of 98 ha (21%) has soils that are clayey at the surface and are distributed in the south-eastern and central part of the microwatershed (Fig. 5.3).

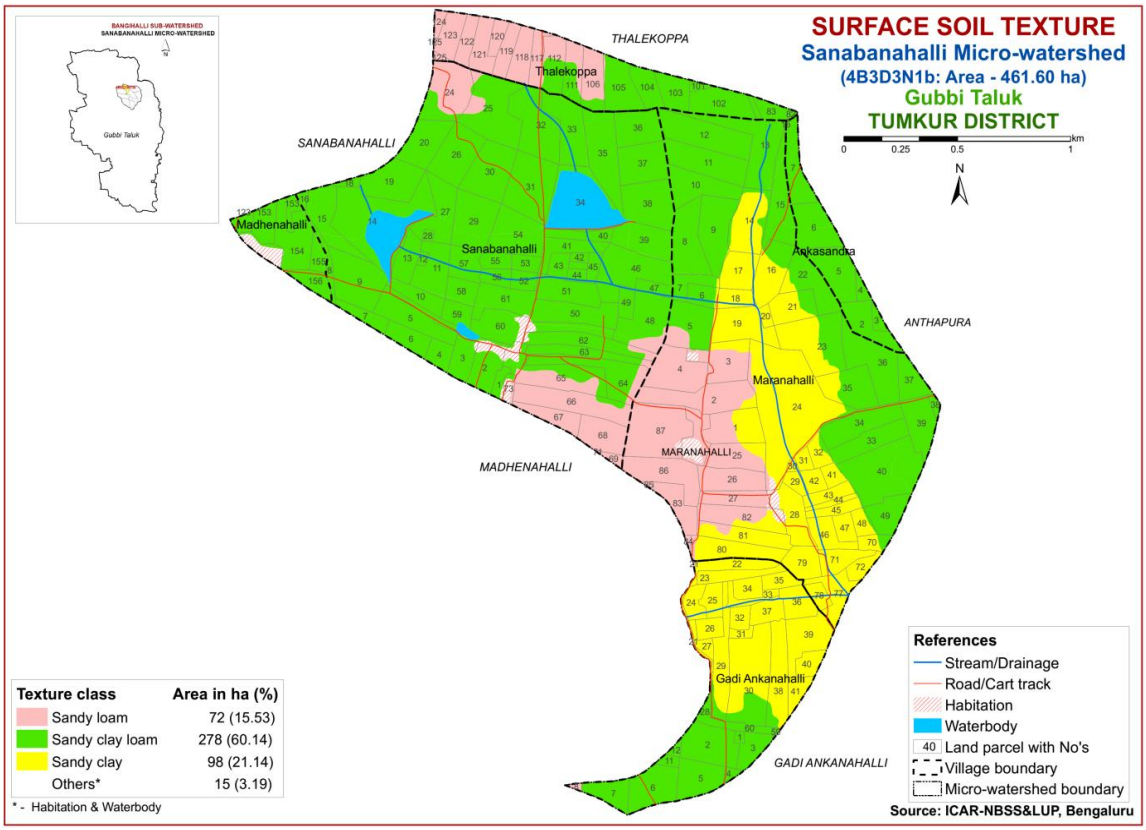


Fig. 5.3 Surface Soil Texture map of Sanabanahalli Microwatershed

The most productive lands (21%) with respect to surface soil texture are the clayey soils that have high potential for soil-water retention and availability, and nutrient

retention and availability, but have problems of drainage, infiltration, workability and other physical problems. The other most productive lands (76%) are loamy soils which also have high potential for AWC, nutrient availability but have no drainage or other physical problems.

5.4 Soil Gravelliness

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

Maximum area in the microwatershed has soils that are non gravelly (<15%) covering an area of about 375 ha (81%) and are distributed in all parts of the microwatershed. Gravelly (15-35%) soils covering an area of about 72 ha (16%) are distributed in the northwestern part of the microwatershed (Fig 5.4).

The problem soils (16%) that are gravelly (15-35%) where only short duration crops can be grown and are distributed in the northwestern part of the microwatershed. The most productive soils (81%) that are non gravelly (<15%) are distributed in the major part of the microwatershed.

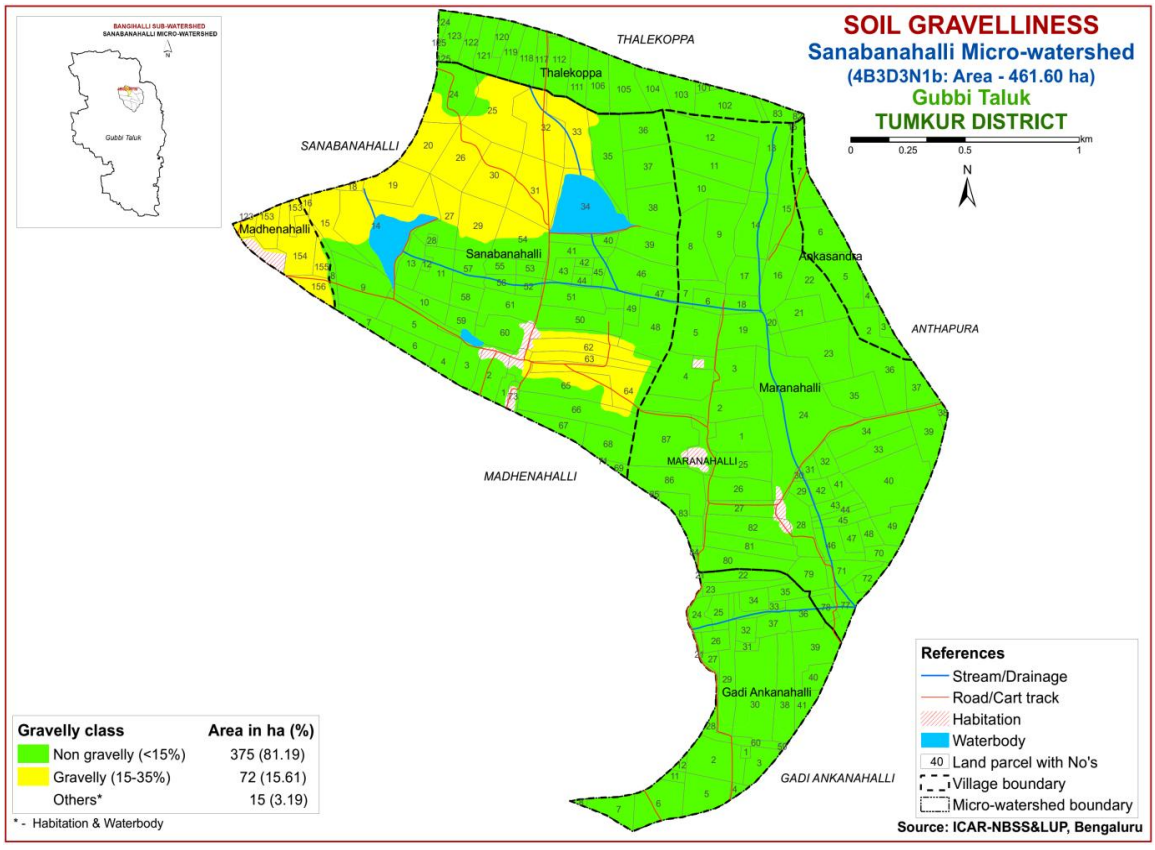


Fig. 5.4 Soil Gravelliness map of Sanabanahalli Microwatershed

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 bars 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 are given in Figure 5.5.

Maximum area of about 192 ha (42%) has soils that are low (51-100 mm/m) in available water capacity and are distributed in the northern, western and eastern part of the microwatershed. An area of about 146 ha (32%) is medium (101-150 mm/m) in available water capacity and are distributed in the northwestern and southern part of the microwatershed. An area of 109 ha (24%) is very high (>200 mm/m) and are distributed in the south-eastern part of the microwatershed.

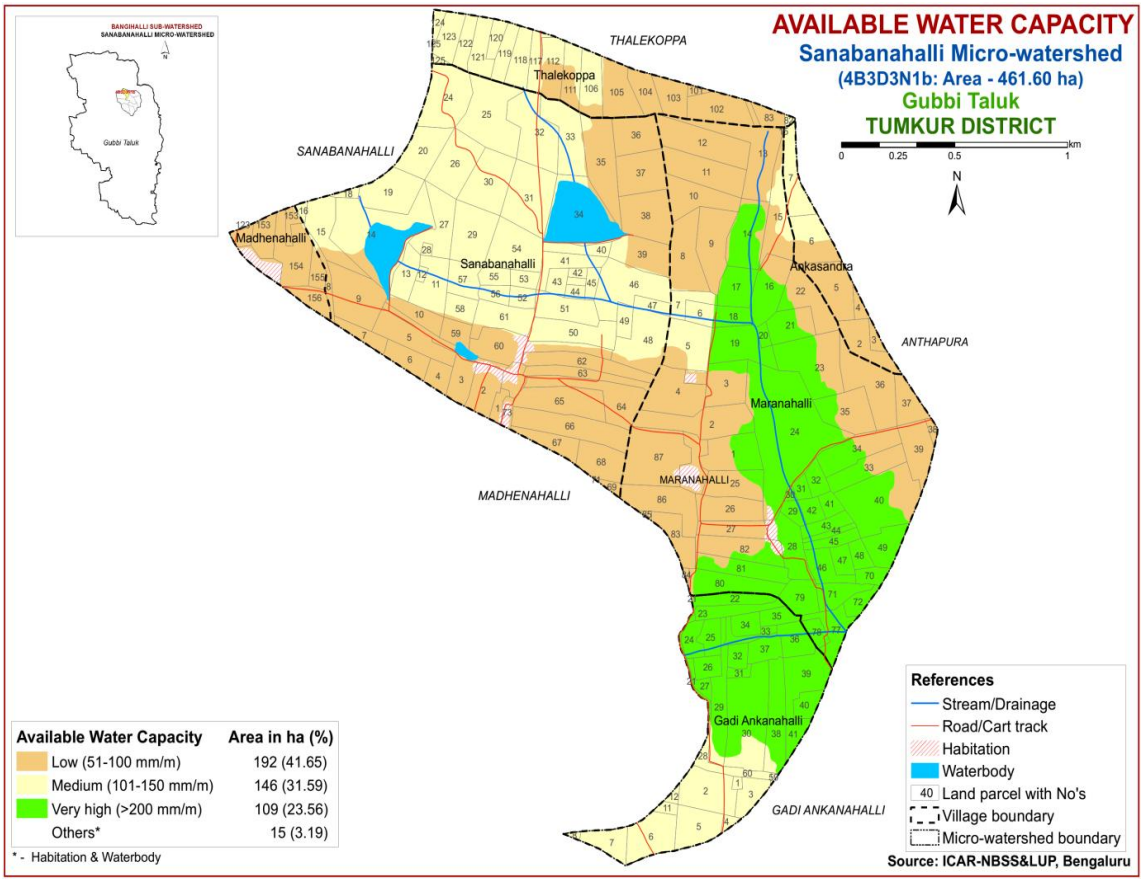


Fig. 5.5 Soil Available Water Capacity map of Sanabanahalli Microwatershed

About 338 ha (73%) area in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short or medium duration crops can be grown and the probability of crop failure is very high. These areas are best put to other

alternative uses. The most productive lands cover about 24 per cent area where all climatically adapted long duration crops can be grown successfully.

5.6 Soil Slope

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

Major area of about 410 ha (89%) falls under very gently sloping (1-3% slope) lands and is distributed in all parts of the microwatershed. An area of about 37 ha (8%) is under nearly level (0-1%) and distributed in the central part of the microwatershed.

In these nearly level and very gently sloping (0-3%) areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

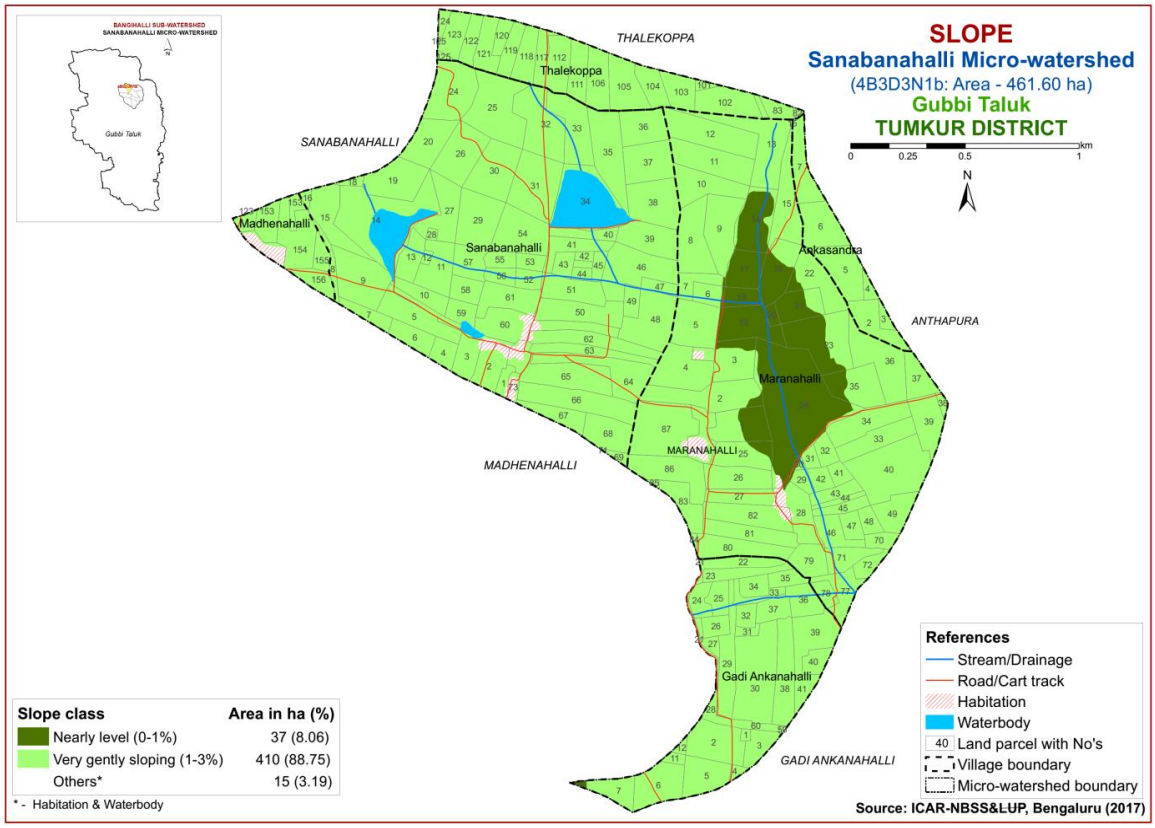


Fig. 5.6 Soil Slope map of Sanabanahalli Microwatershed

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 was generated. The area extent and their spatial distribution in the microwatershed is given in Figure 5.7.

Soils that are moderately eroded (e2 class) cover an area of about 146 ha (32%) in the microwatershed. They are distributed in the northern, western and eastern part of the microwatershed. Slightly eroded (e1 class) soils cover a maximum area of about 301 ha (65%) and are distributed in the major part of the microwatershed.

An area of about 146 ha (32%) in the microwatershed is problematic because of moderate erosion. For these areas taking up soil and water conservation and other land development measures is needed.

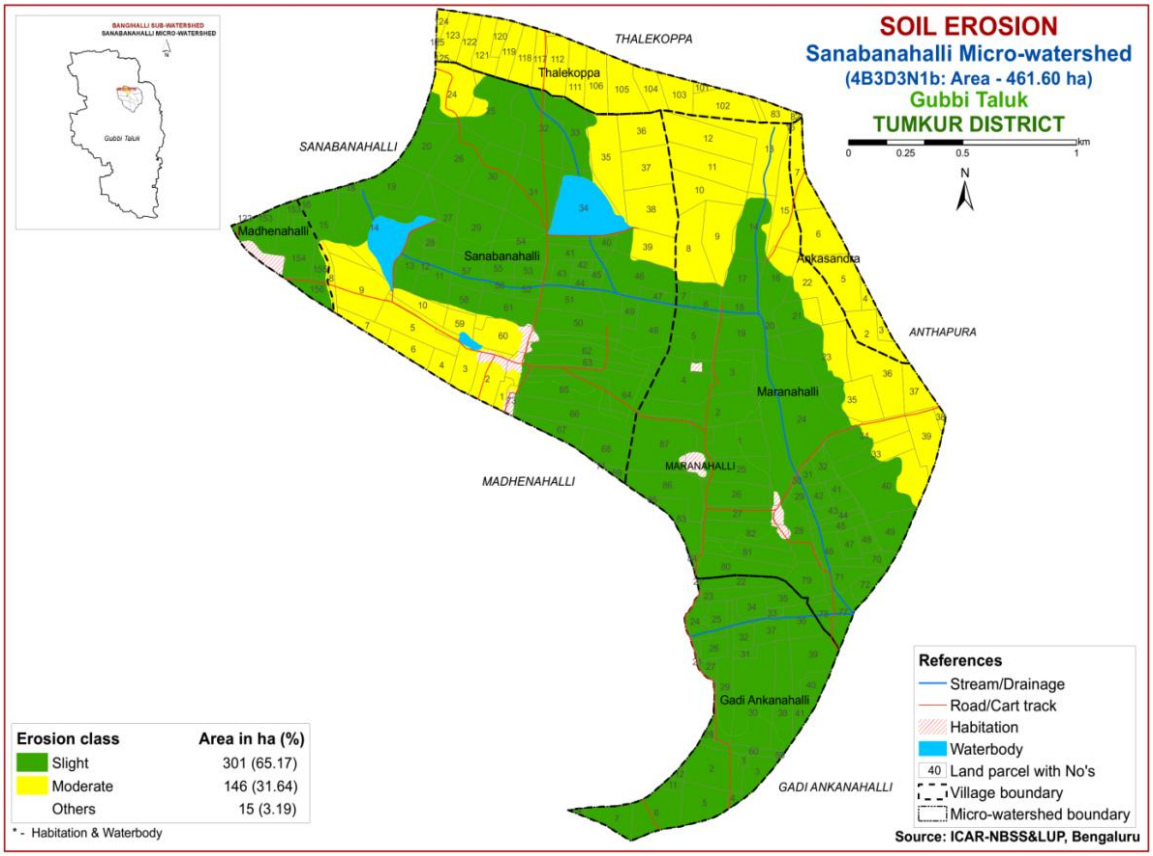


Fig. 5.7 Soil Erosion map of Sanabanahalli Microwatershed

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 the area is characterised by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 250 m grid interval) all over the microwatershed through land resource inventory in the year 2015 were analysed for pH, EC, organic carbon, available phosphorus and potassium and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

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

6.1 Soil Reaction (pH)

The soil analysis of the Sanabanahalli microwatershed for soil reaction (pH) showed that an area of about 62 ha (13%) is neutral (pH 6.5-7.3) and are distributed in the central part of the microwatershed. An area of 60 ha (13%) is strongly acid (pH 5.0-5.5) and are distributed in the western, central and northern part of the microwatershed. An area of 145 ha (31%) is moderately acid (pH 5.5-6.0) and are distributed in the northwestern and western part of the microwatershed. Slightly acid (pH 6.0-6.5) soils occupy maximum area of about 180 ha (39%) and are distributed in the major part of the microwatershed (Fig.6.1). Thus, the soils in the microwatershed are acidic and neutral in soil reaction.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is medium (0.5-0.75%) covering an area of about 76 ha (16%) and is distributed in the northwestern, central and south-eastern part of the microwatershed and low (<0.5%) in maximum area of about 371 ha (80%) and are distributed in all parts of the microwatershed (Fig.6.3).

6.4 Available Phosphorus

Available phosphorus content is high (>57 kg/ha) in the entire microwatershed area (Fig 6.4).

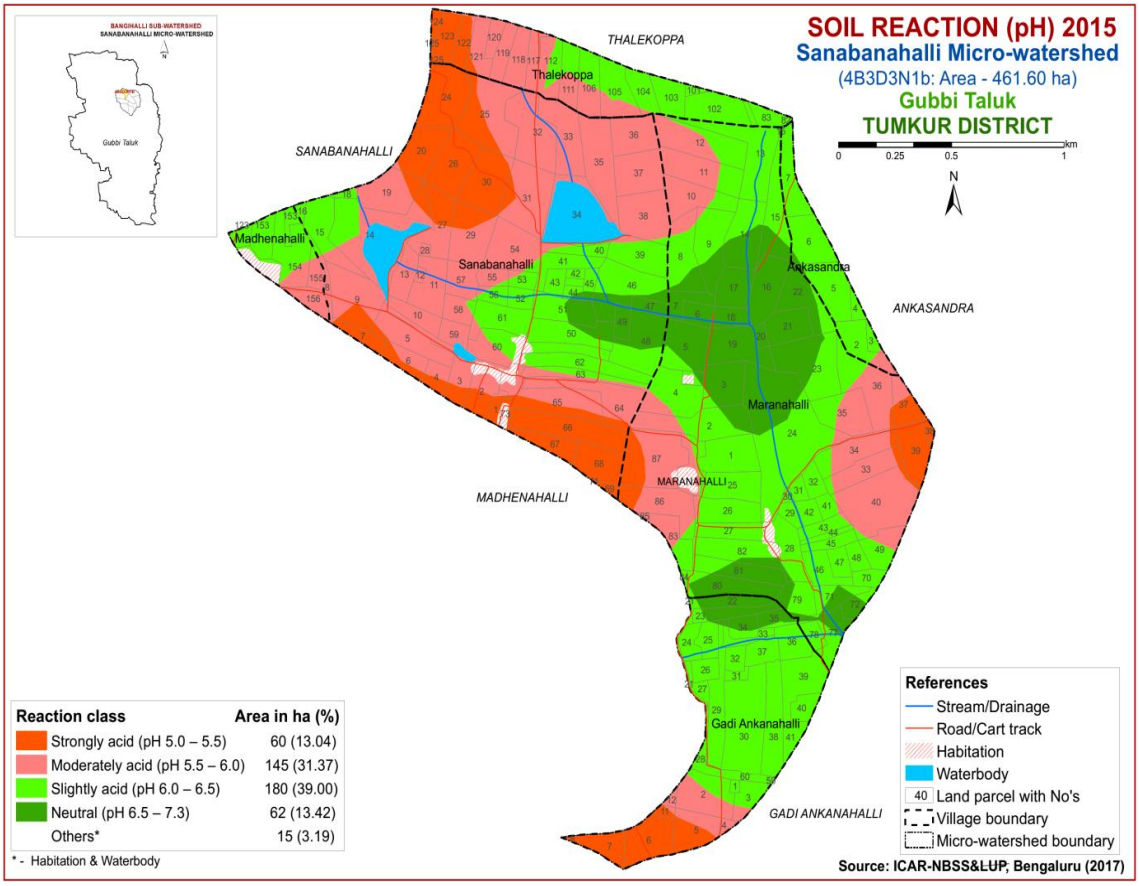


Fig.6.1 Soil Reaction (pH) map of Sanabanahalli Microwatershed

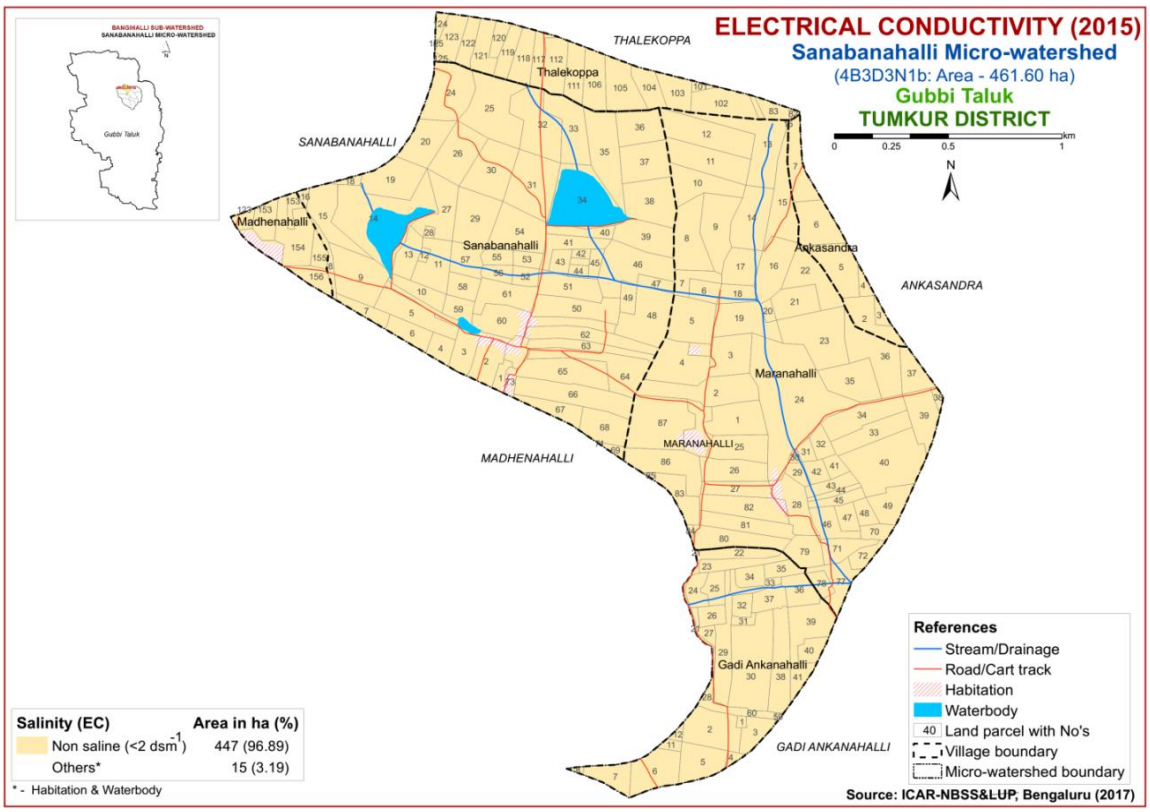


Fig.6.2 Electrical Conductivity (EC) map of Sanabanahalli Microwatershed

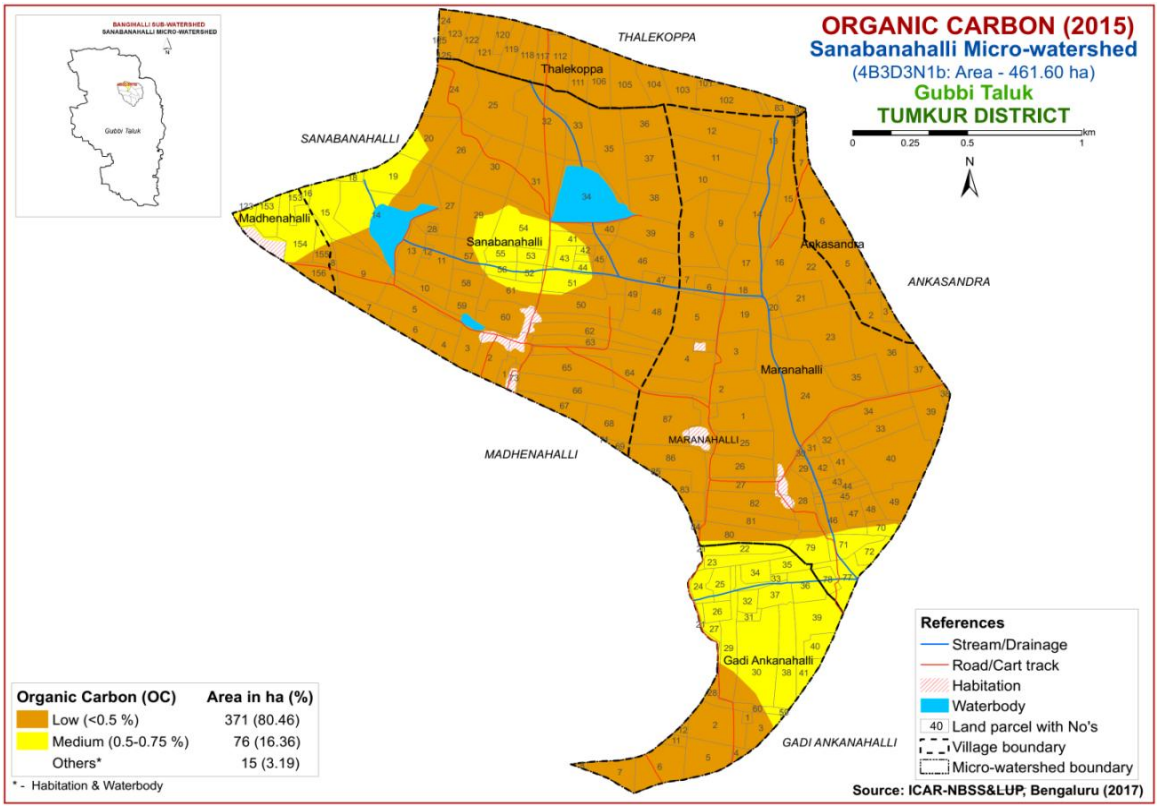


Fig.6.3 Soil Organic Carbon map of Sanabanahalli Microwatershed

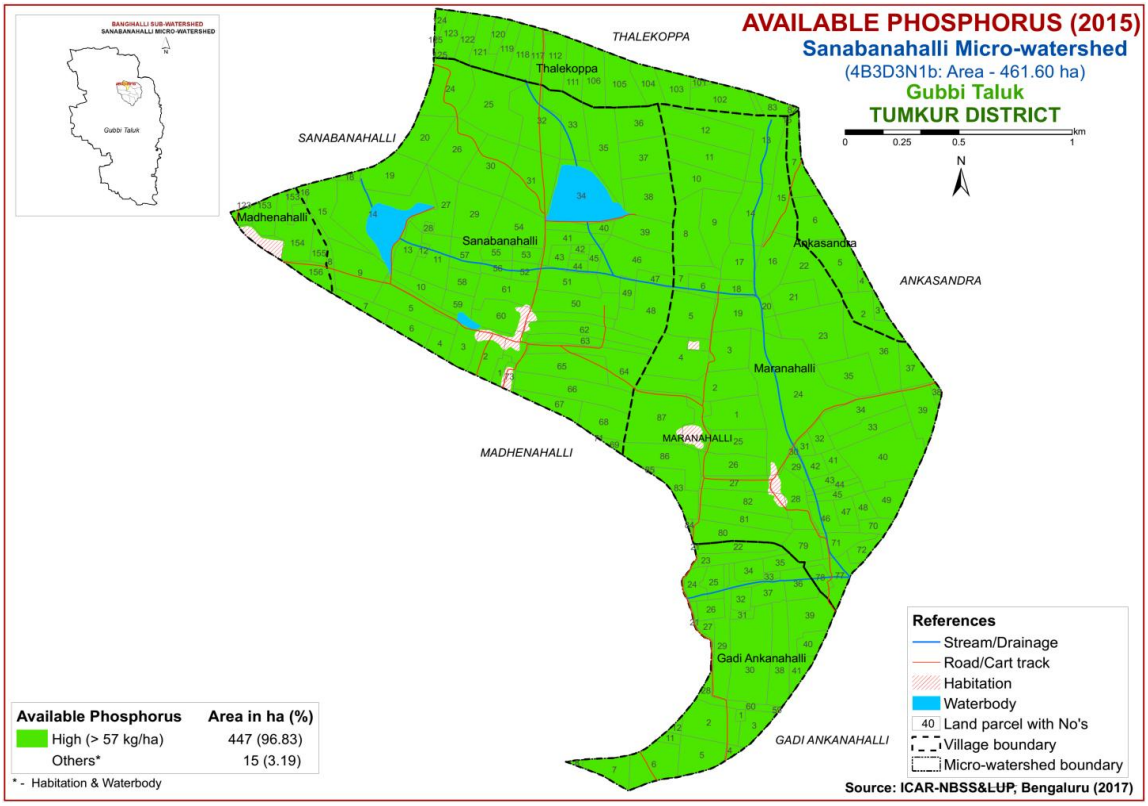


Fig.6.4 Soil Available Phosphorus map of Sanabanahalli Microwatershed

6.5 Available Potassium

Available potassium content is medium (145-337 kg/ha) in maximum area of about 383 ha (83%) and is distributed in all parts of the microwatershed (Fig.6.5). Low available potassium (<145 kg/ ha) is in an area of 64 ha (14%) and is distributed in the southern, western and northwestern part of the microwatershed.

6.6 Available Sulphur

Available sulphur content is medium (10-20 ppm) in maximum area of about 413 ha (90%) and are distributed in all parts of the microwatershed and an area of about 33 ha (7%) is low in available sulphur (<10 ppm) and occur in the eastern part of the microwatershed (Fig.6.6).

6.7 Available Boron

Available boron content is medium (0.5-1.0 ppm) in an area of 169 ha (37%) and occur in the south-eastern, eastern and northwestern part of the microwatershed. Maximum area of about 278 ha (60%) is low (<0.5 ppm) in available boron and is distributed in all parts of the microwatershed (Fig.6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) in maximum area of about 398 ha (86%) and are distributed in all parts of the microwatershed and deficient (<4.5 ppm) in an area of about 48 ha (10%) and occur in the northwestern 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 maximum area of 371 ha (80%) and are distributed in all parts of the microwatershed. An area of 76 ha (16%) is sufficient (>0.6 ppm) and are distributed in the south-eastern and central part of the microwatershed (Fig 6.11).

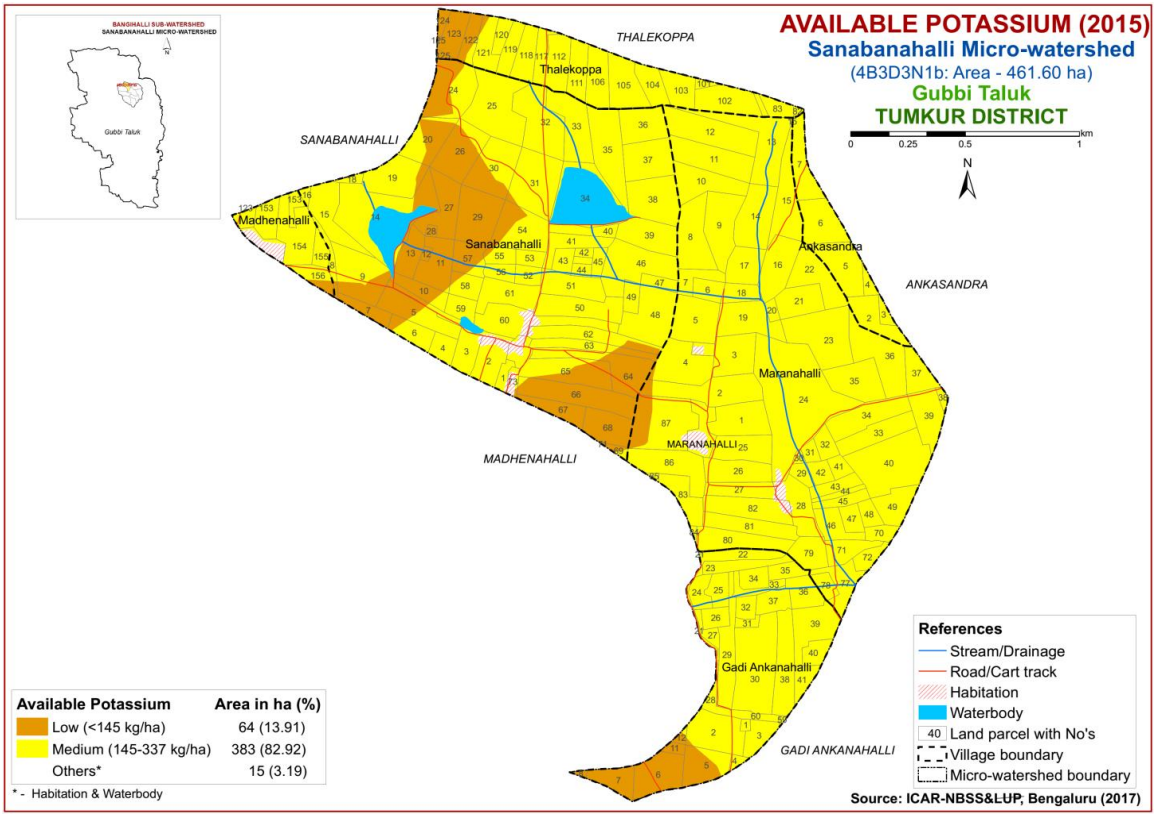


Fig.6.5 Soil Available Potassium map of Sanabanahalli Microwatershed

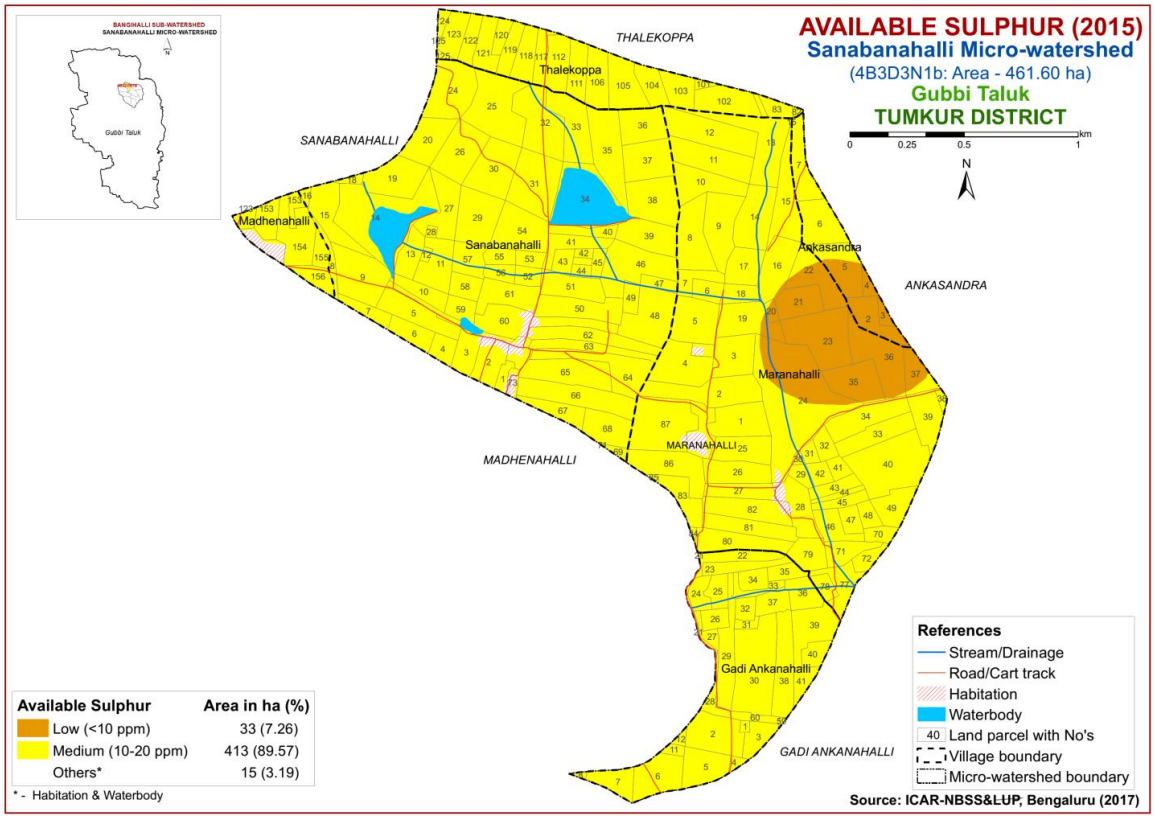


Fig.6.6 Soil Available Sulphur map of Sanabanahalli Microwatershed

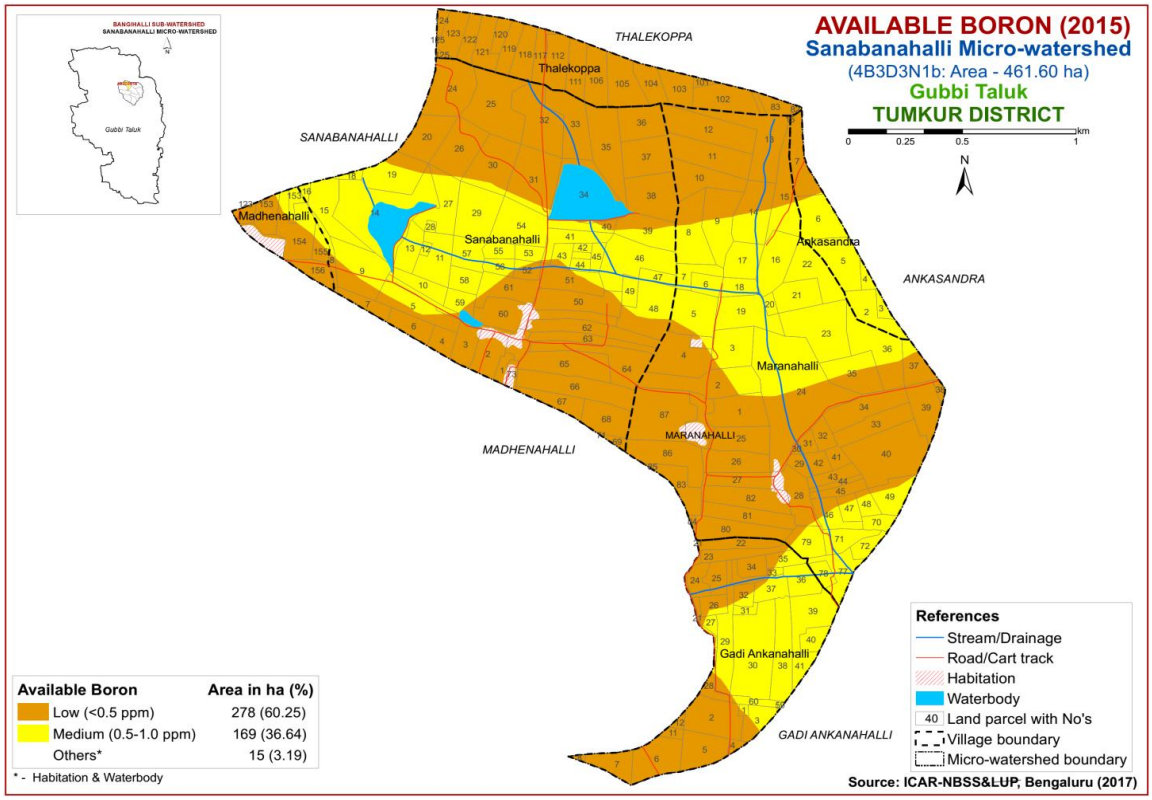


Fig.6.7 Soil Available Boron map of Sanabanahalli Microwatershed

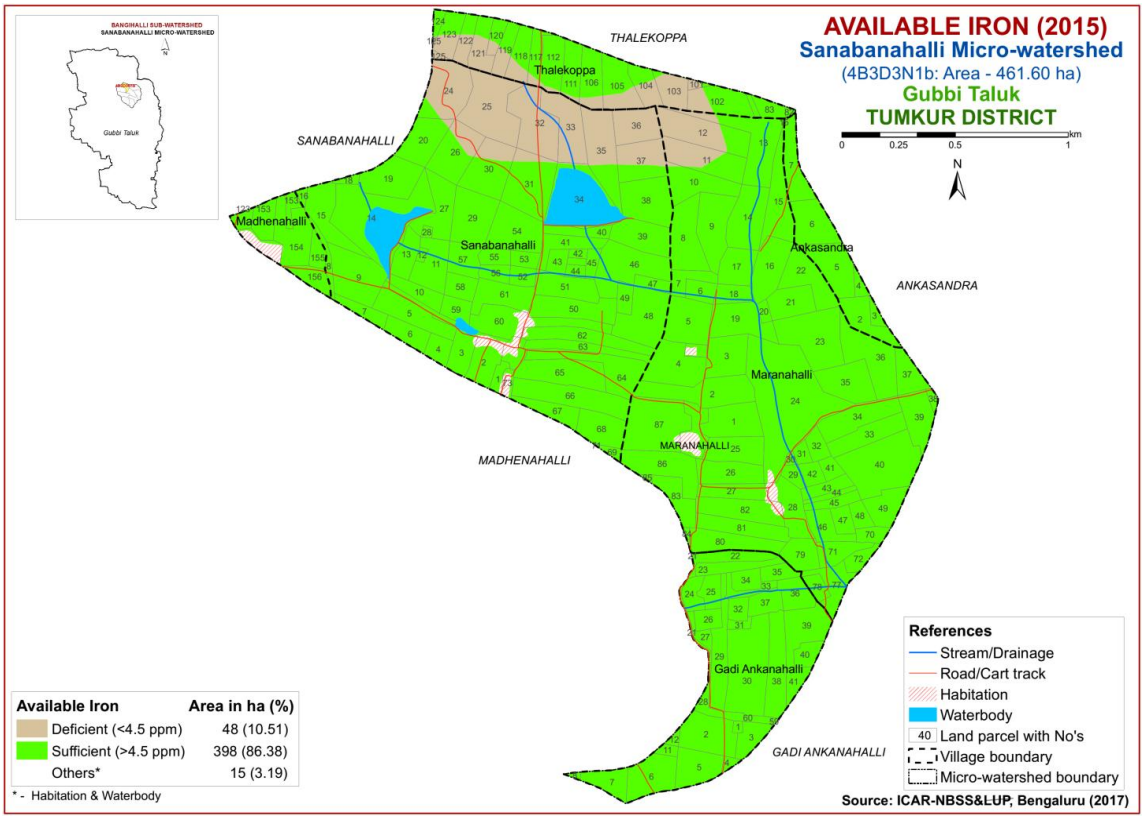


Fig.6.8 Soil Available Iron map of Sanabanahalli Microwatershed

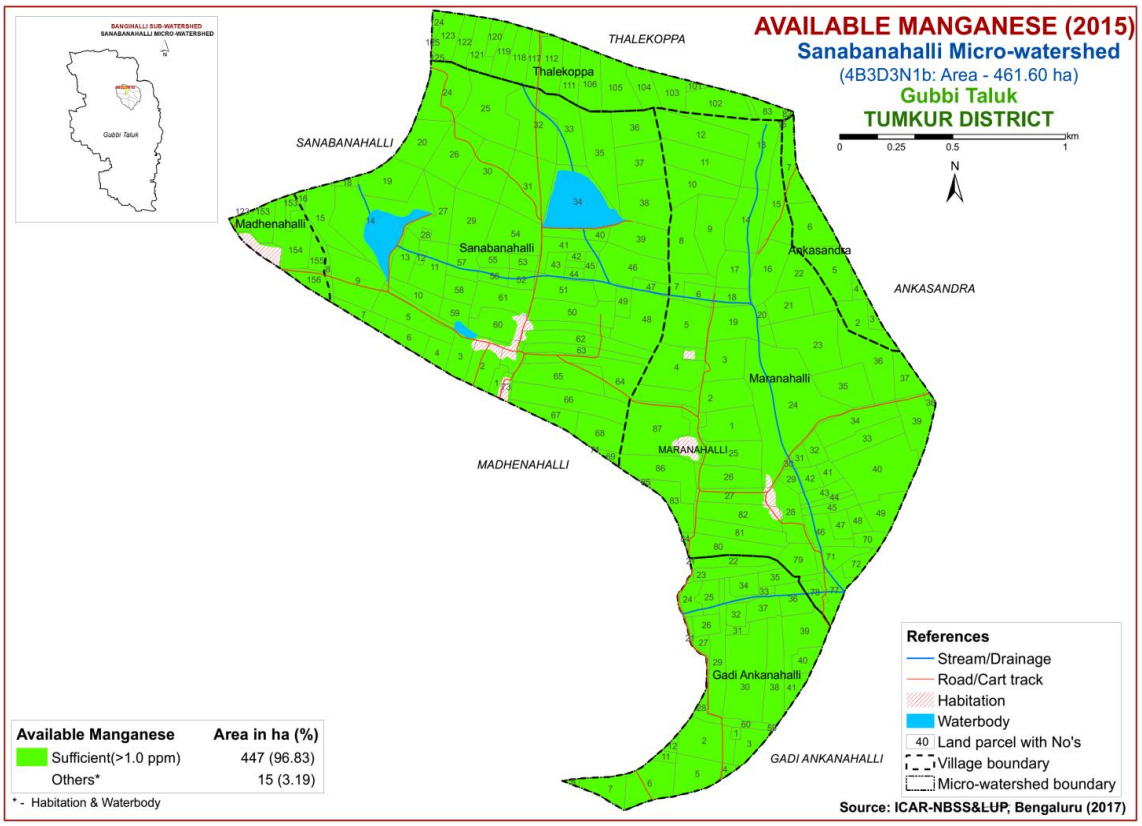


Fig.6.9 Soil Available Manganese map of Sanabanahalli Microwatershed

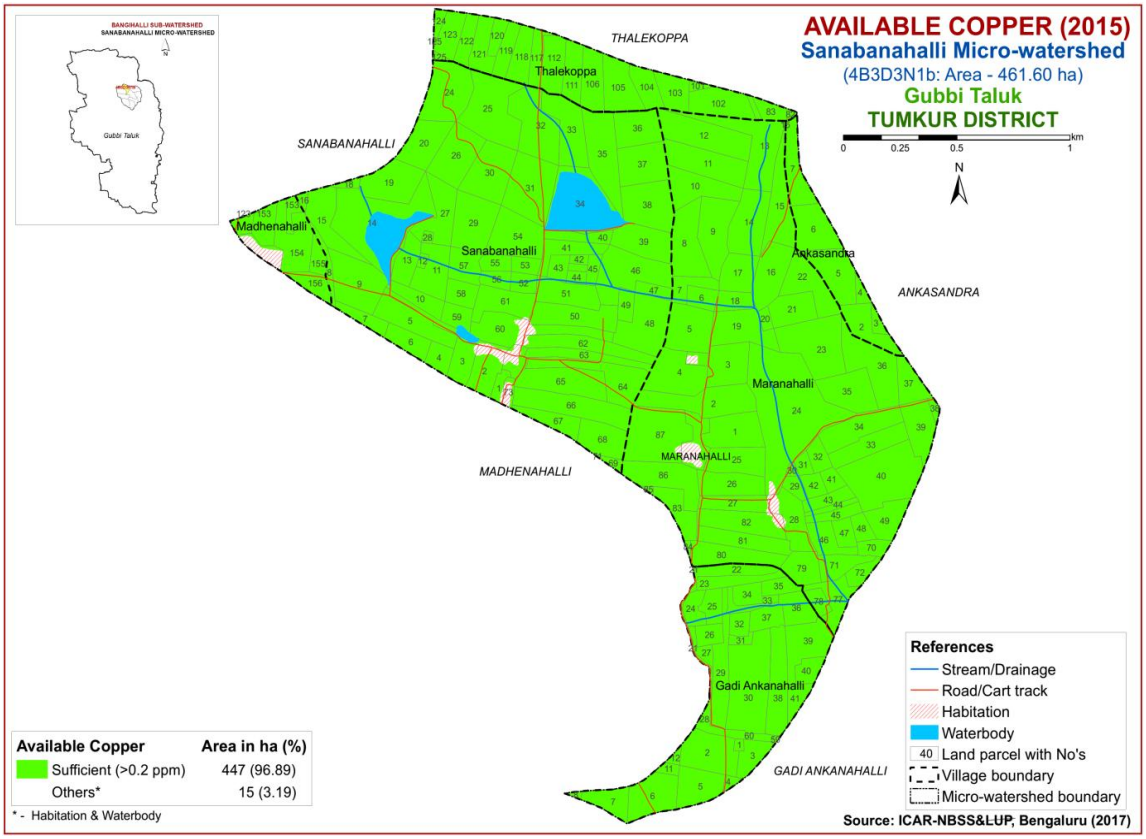


Fig.6.10 Soil Available Copper map of Sanabanahalli Microwatershed

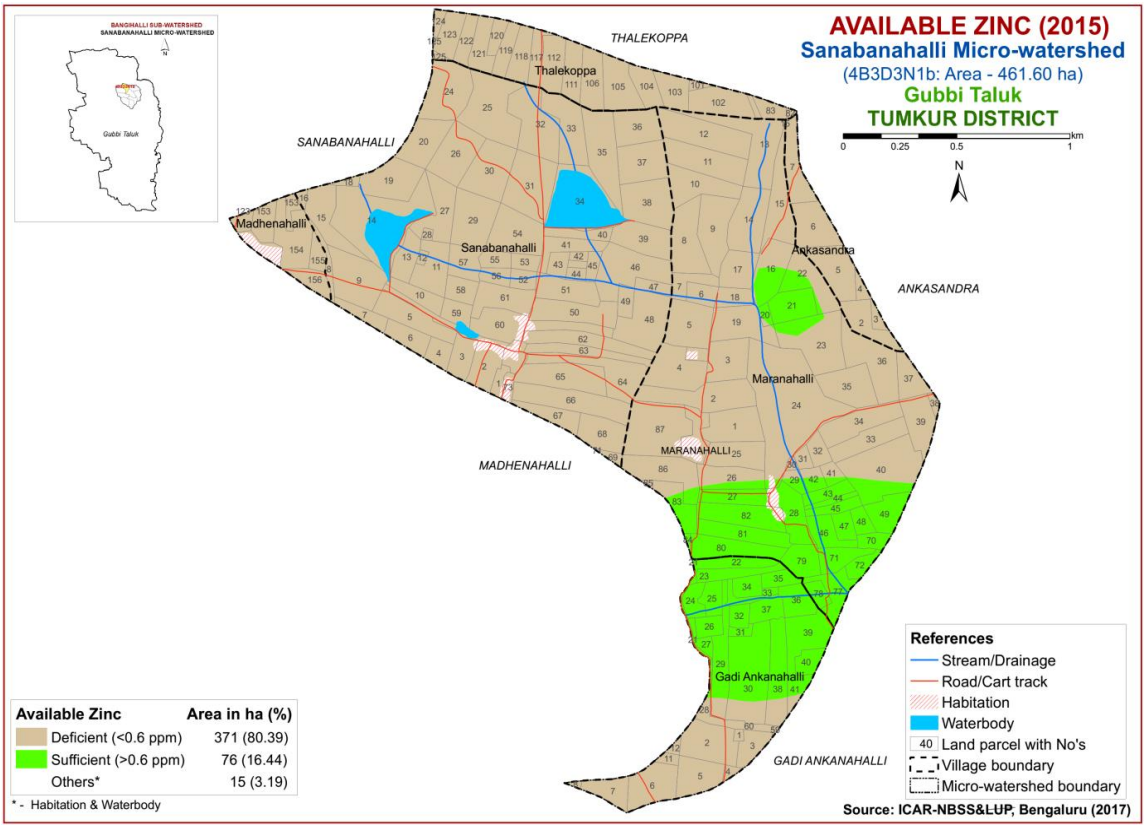


Fig.6.11 Soil Available Zinc map of Sanabanahalli Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Sanabanahalli microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S- Suitable and Order N- Not suitable. The orders have classes, subclasses and units. Order-S has three classes, class S1- Highly Suitable, class S2- Moderately Suitable and class S3- Marginally Suitable. Order N has two classes, N1- Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the class S1 as they will have very minor or no limitations for crop growth. Classes S2 and S3 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'z' for calcareousness and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable land with the limitations of soil depth and erosion is 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 34 major annual and perennial crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

Maximum area of about 205 ha (44%) is highly suitable (Class S1) for growing sorghum and are distributed in the northern, southern, central and northeastern part of the microwatershed.

Table 7.1 Soil-Site Characteristics of Sanabanahalli Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC	ESP	CEC [Cmol (p^+)kg^{-1}]	BS (%)
					Surface	Sub-surface	Surface (%)	Subsurface(%)								
MNLhB2	813	150	WD	100-150	scl	sc-scl	-	15-35	101-150	1-3	moderate					
BPRcB1	813	150	WD	100-150	sl	sc-c	-	>35	51-100	1-3	slight					
BPRhB1g1	813	150	WD	100-150	scl	sc-c	15-35	>35	51-100	1-3	slight					
BPRhB2	813	150	WD	100-150	scl	sc-c	-	>35	51-100	1-3	moderate					
NGPhB2	813	150	WD	100-150	scl	sc-c	-	>35	51-100	0-1	moderate					
HLKcB2	813	150	WD	>150	sl	c	-	<15	>200	1-3	moderate					
HLKhB1g1	813	150	WD	>150	scl	c	15-35	<15	>200	1-3	slight					
RTRcA1	813	150	WD	>150	sl	c	-	-	101-150	0-1	slight					
RTRhB1	813	150	WD	>150	scl	c	-	-	101-150	1-3	slight					
KDThB1	813	150	MWD	>150	scl	sc-c	-	-	>200	1-3	slight					
KDTiA1	813	150	MWD	>150	sc	sc-c	-	-	>200	0-1	slight					
KDTiB1	813	150	MWD	>150	sc	sc-c	-	-	>200	1-3	slight					
TDGhB1	813	150	WD	>150	scl	s,ls,sl,scl,sc	-	-	101-150	1-3	slight					

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

An area of about 85 ha (18%) is moderately suitable (Class S2) for growing sorghum and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing sorghum occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed and have moderate limitation of gravelliness.

Table 7.2 Crop suitability criteria for Sorghum

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

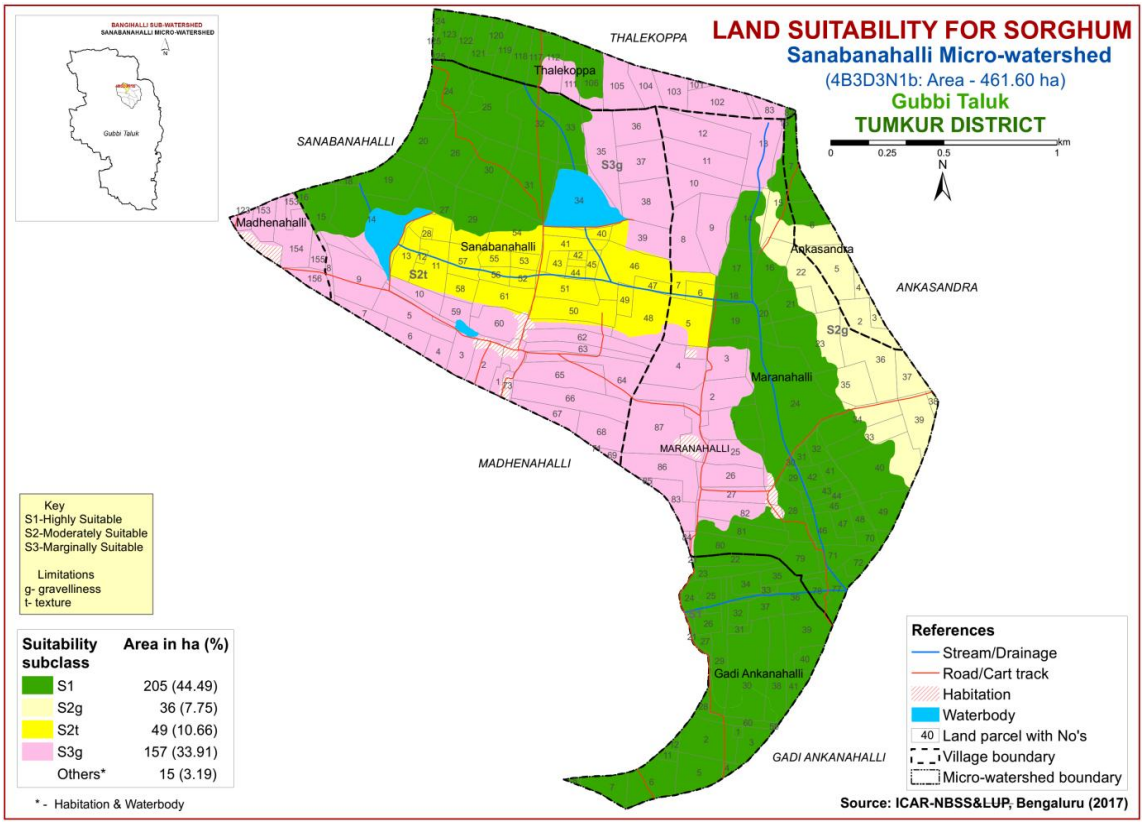


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Fodder Sorghum (*Sorghum bicolor*)

Fodder Sorghum is one of the major fodder crops grown in Southern Karnataka in Tumakuru, Chikkaballapur, Mysore, Mandya, Bengaluru Rural and Kolar districts. The crop requirements for growing Fodder sorghum (Table 7.3) 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 7.2.

Highly suitable (Class S1) lands for growing fodder sorghum occupy maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing fodder sorghum occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.3 Crop suitability criteria for Fodder Sorghum

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

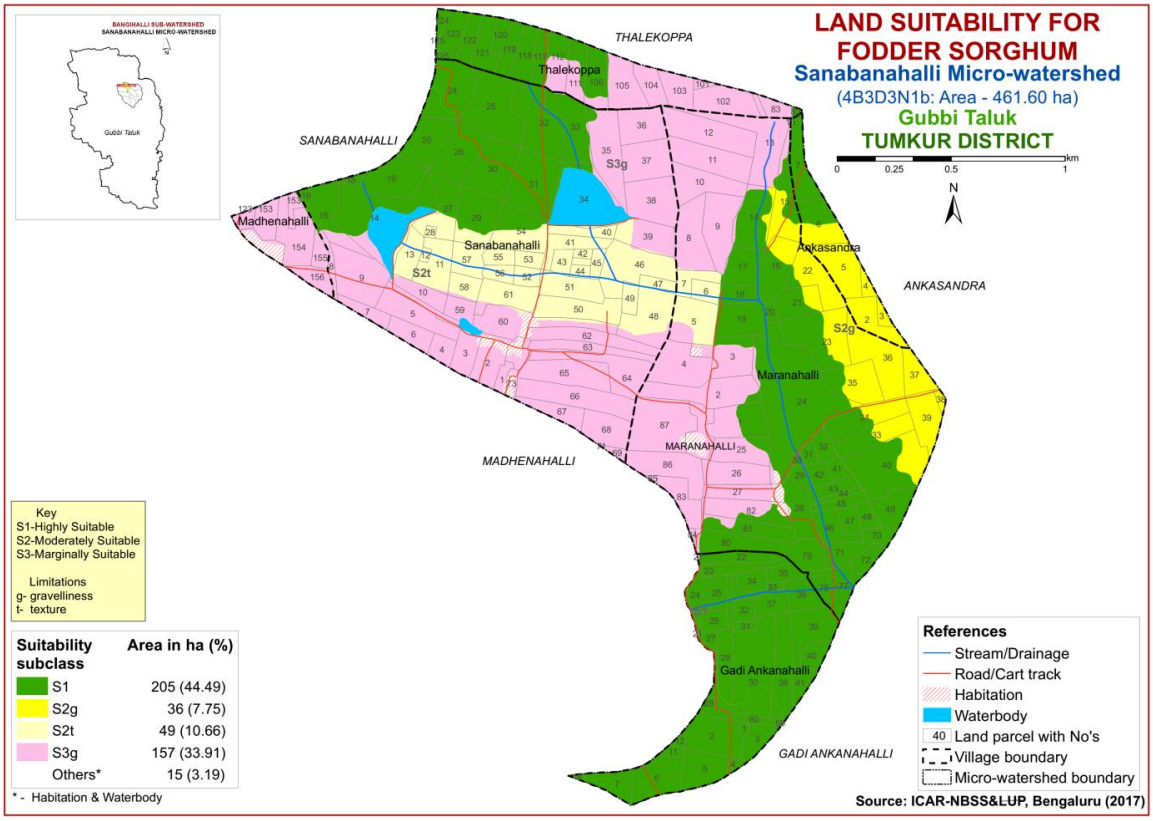


Fig. 7.2 Land Suitability map of Fodder Sorghum

7.3 Land Suitability for Maize (*Zea mays*)

Maize is 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 7.4) 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 7.3.

Table 7.4 Crop suitability criteria for Maize

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

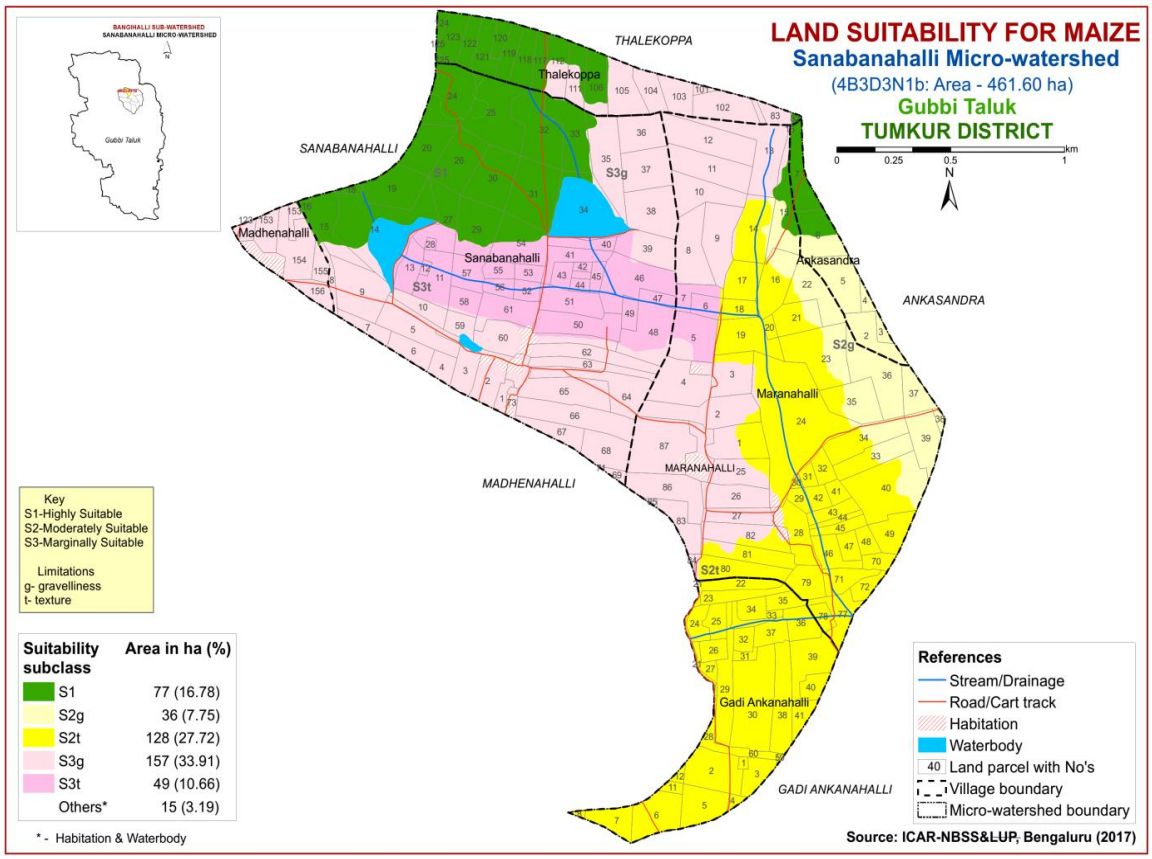


Fig. 7.3 Land Suitability map of Maize

Highly suitable lands occupy an area of about 77 ha (17%) and are distributed in the northern and northeastern part of the microwatershed. An area of about 164 ha (35%) is moderately suitable (Class S2) for growing maize and are distributed in the central, southern and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing maize occupy major area of about 206 ha (45%) and occur in the western, northwestern and northeastern part of the microwatershed with moderate limitations of gravelliness and texture.

7.4 Land Suitability for Upland Paddy (*Oryaza Sativa*)

Upland paddy is the most important food crop grown in many districts of the State under rainfed conditions. The crop requirements for growing Upland paddy (Table 7.5) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Upland paddy was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.4.

Highly suitable (Class S1) lands for growing upland paddy occupy maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally

suitable lands (Class S3) for growing upland paddy occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.5 Land suitability criteria for Upland paddy

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	1-3	1-3	3-5	>5
Soil drainage	class	Well to mod.	poorly	Very poorly	
Soil reaction	pH	5.5-6.5	6.5-7.3 4.5-5.4	7.3-8.4	>8.4
Surface soil texture	Class	C, sic, cl, sicl, sc	Scl, sil, l	Sl, ls	S
Soil depth	Cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	60-80

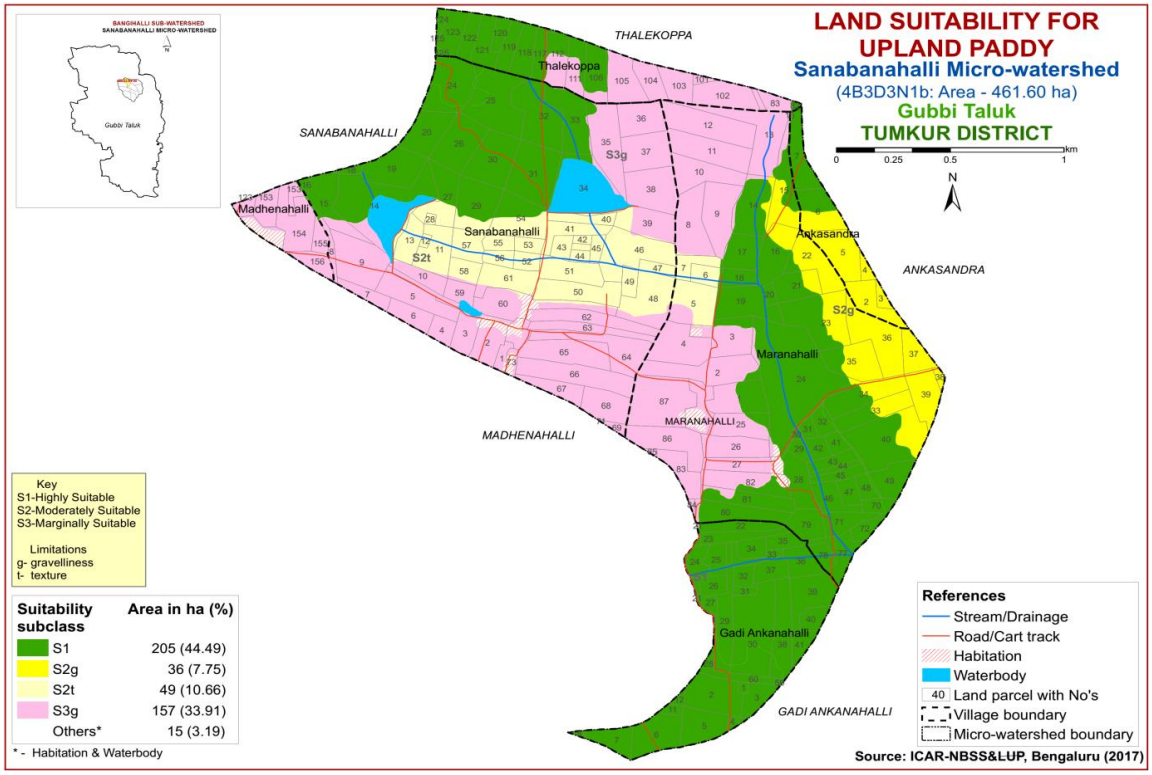


Fig. 7.4 Land Suitability map of Upland paddy

7.5 Land Suitability for Finger millet (*Eleusine coracana*)

Finger millet is the most important food crop grown in an area of 7.08 lakh ha in almost all the districts of south Karnataka. The crop requirements for growing Finger millet (Table 7.6) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Finger millet was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.5.

Table 7.6 Land suitability criteria for Finger millet

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>110	90-110	60-90	<60
Soil drainage	class	Well to mod. drained	Imperfectly drained	Poorly/excessively	V.poorly
Soil reaction	pH	5.5-7.3	7.3-8.4	8.4-9.0	>9.0
Surface soil texture	Class	l, sil, sl, cl, sicl, scl	sic, c, sc	ls, s,c >60%	
Soil depth	Cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	
Sodicity (ESP)	%	<10	10-15	15-25	>25

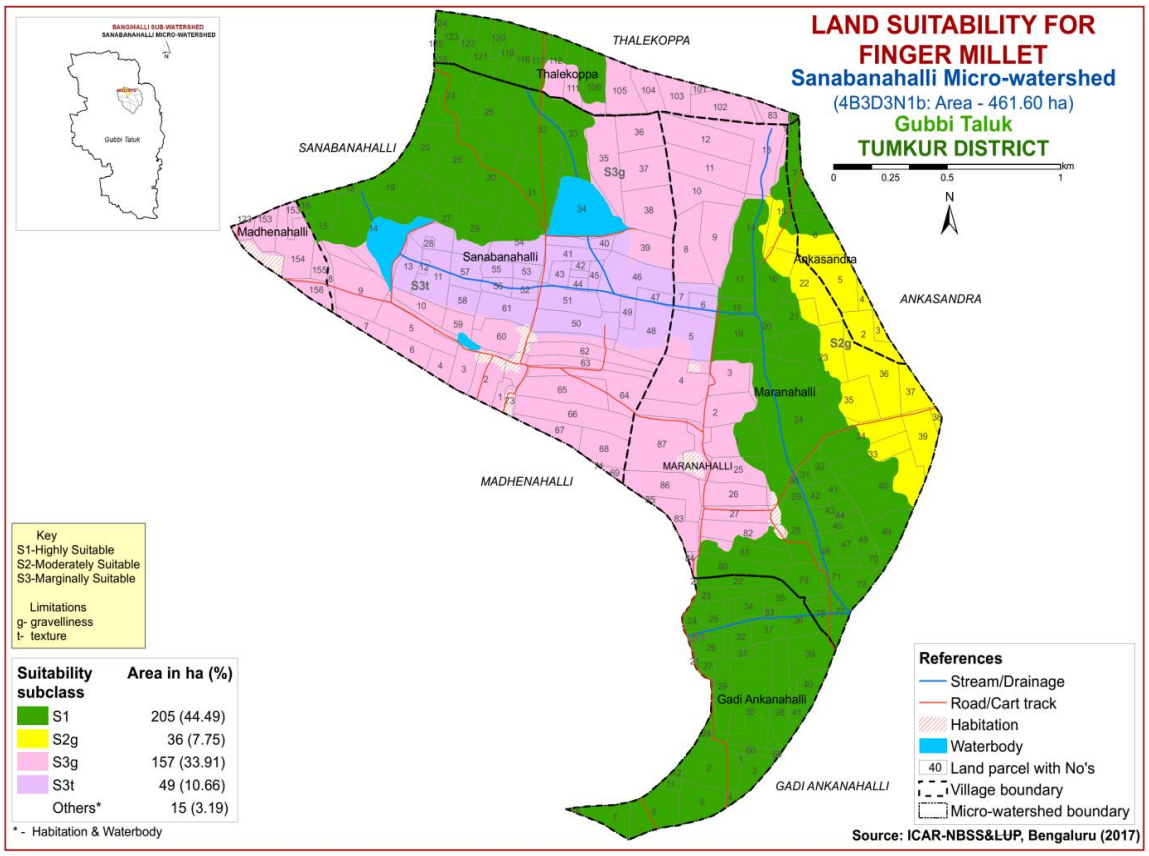


Fig. 7.5 Land Suitability map of Finger millet

Highly suitable (Class S1) lands for growing finger millet occupy an area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 36 ha (8%) is moderately suitable (Class S2) and are distributed in the eastern part of the microwatershed. They have minor limitation of gravelliness. Marginally suitable lands (Class S3) for growing finger millet occupy an area of about 206 ha (45%) and occur in the northwestern, western and northeastern part of the microwatershed. They have moderate limitations of gravelliness and texture.

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

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

Table 7.7 Land suitability criteria for Red gram

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

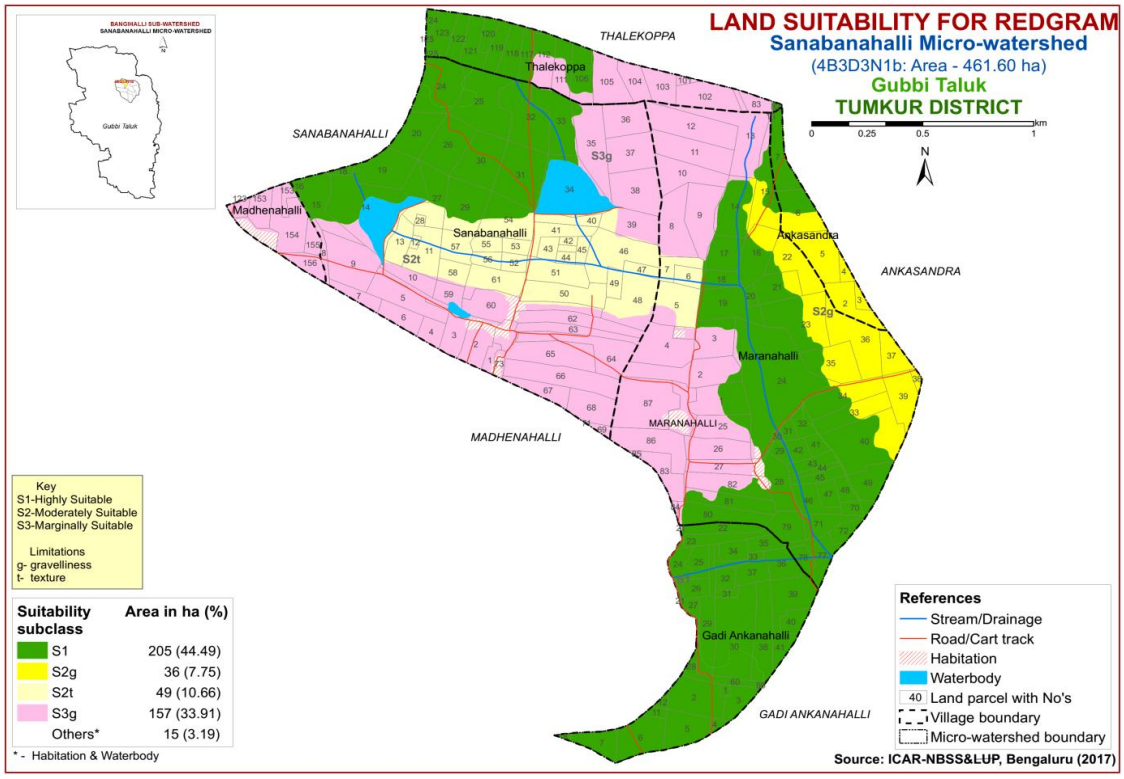


Fig. 7.6 Land Suitability map of Redgram

Highly suitable (Class S1) lands for growing red gram occupy maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class

S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing red gram occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

7.7 Land suitability for Horse Gram (*Macrotyloma uniflorum*)

Horse gram is the most important pulse crop grown in an area of 1.8 lakh ha in almost all the districts of the State. The crop requirements for growing horse gram (Table 7.8) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing horse gram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Fig. 7.7.

Highly suitable (Class S1) lands for growing horse gram occupy an area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. Maximum area of about 241 ha (52%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of gravelliness and texture.

Table 7.8 Land suitability criteria for Horse gram

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days				
Soil drainage	Class	Well drained/ mod.well drained	imperfectly drained	Poorly drained	V.Poorly drained
Soil reaction	pH	6.0-8.5	8.5-9.0 5.5-5.9	9.1-9.5 5.0-5.4	>9.5
Surface soil texture	Class	l, sl, scl,cl,sc	Ls,sic,sicl,c,ls	Heavy clays (>60%)	-
Soil depth	Cm	50-75	25-50	<25	-
$CaCO_3$ in root zone	% vol.	<15	15-25	25-30	>30
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	-

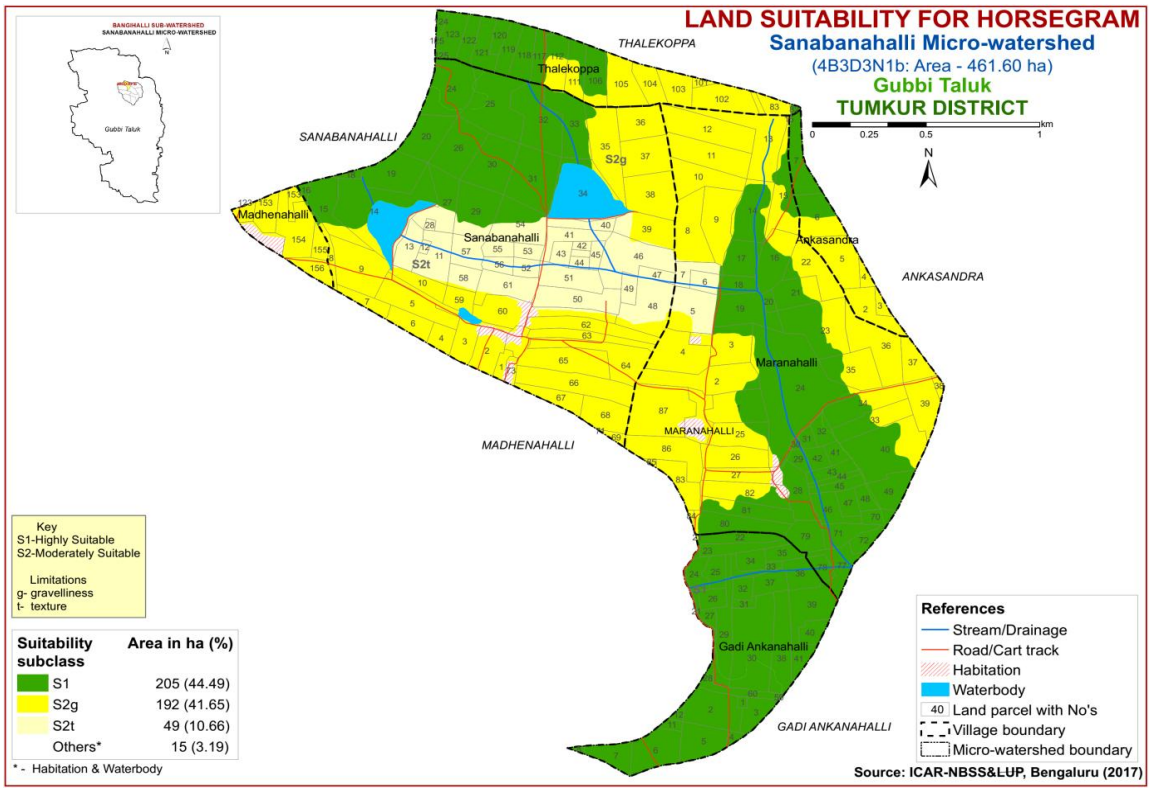


Fig. 7.7 Land Suitability map of Horse gram

7.8 Land suitability for Field Bean (*Dolichos lablab*)

Field Bean is the most important pulse crop grown in an area of 0.59 lakh ha in almost all the districts of the State. The crop requirements (Table 7.9) for growing field bean were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing field bean was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Fig. 7.8.

Table 7.9 Land suitability criteria for Field Bean

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>120	90-120	70-90	<70
Soil drainage	Class	Well drained/ mod.well drained	imperfectly drained	Poorly drained	V.Poorly drained
Soil reaction	pH	6.0-8.5	8.5-9.0,5.5-5.9	9.1-9.5,5.0-5.4	>9.5
Sub Surface soil texture	Class	l, sl, scl, cl, sc	sic, sicl, c	Heavy clays (>60%), ls	s
Soil depth	Cm	>75	50-75	25-50	<25
$CaCO_3$ in root zone	% vol.	<15	15-35	35-50	>50
Salinity (EC)	dsm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	15-20	>20

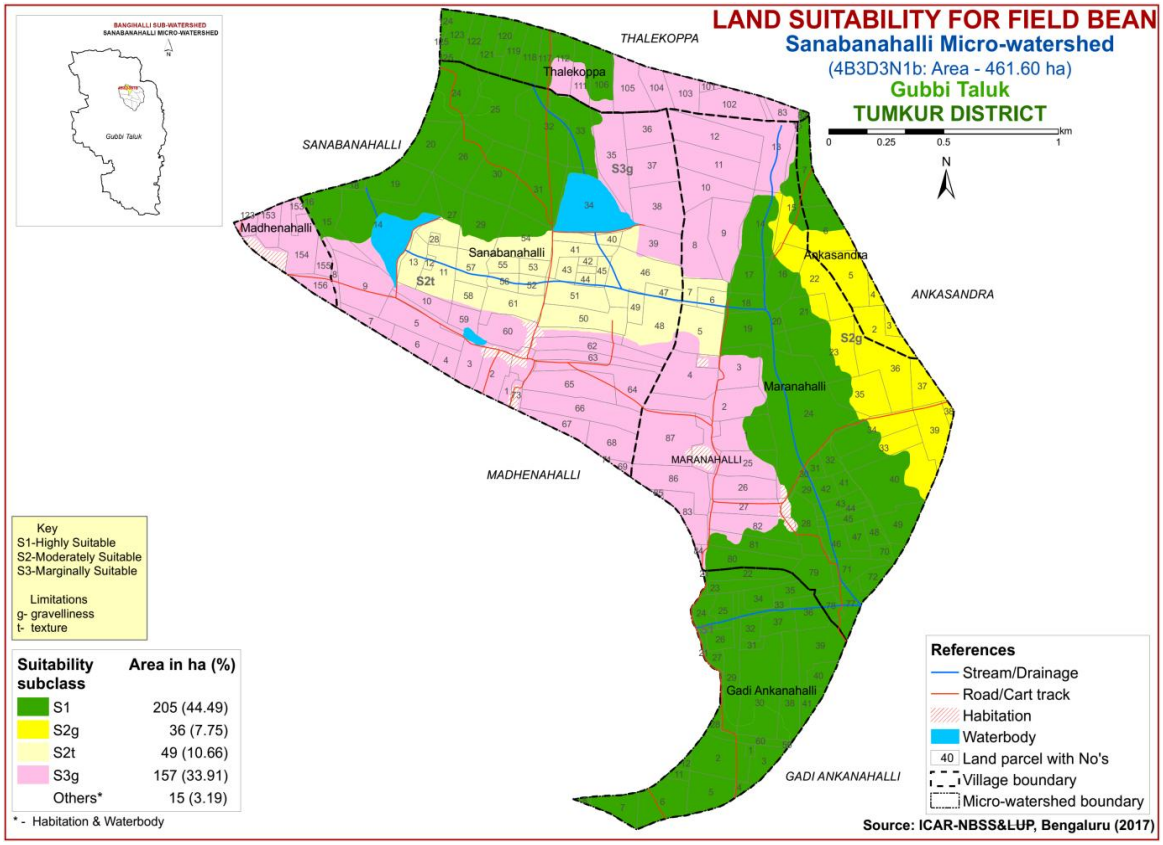


Fig. 7.8 Land Suitability map of Field bean

Highly suitable (Class S1) lands for growing field bean occupy maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing field bean occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

7. 9 Land Suitability for Cowpea (*Vigna radiata*)

Cowpea is the most important pulse crop grown in an area of 0.80 lakh ha in almost all the districts of the State. The crop requirements for growing cowpea were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cowpea was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Fig. 7.9.

Highly suitable (Class S1) lands for growing cowpea occupy a maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing cowpea occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

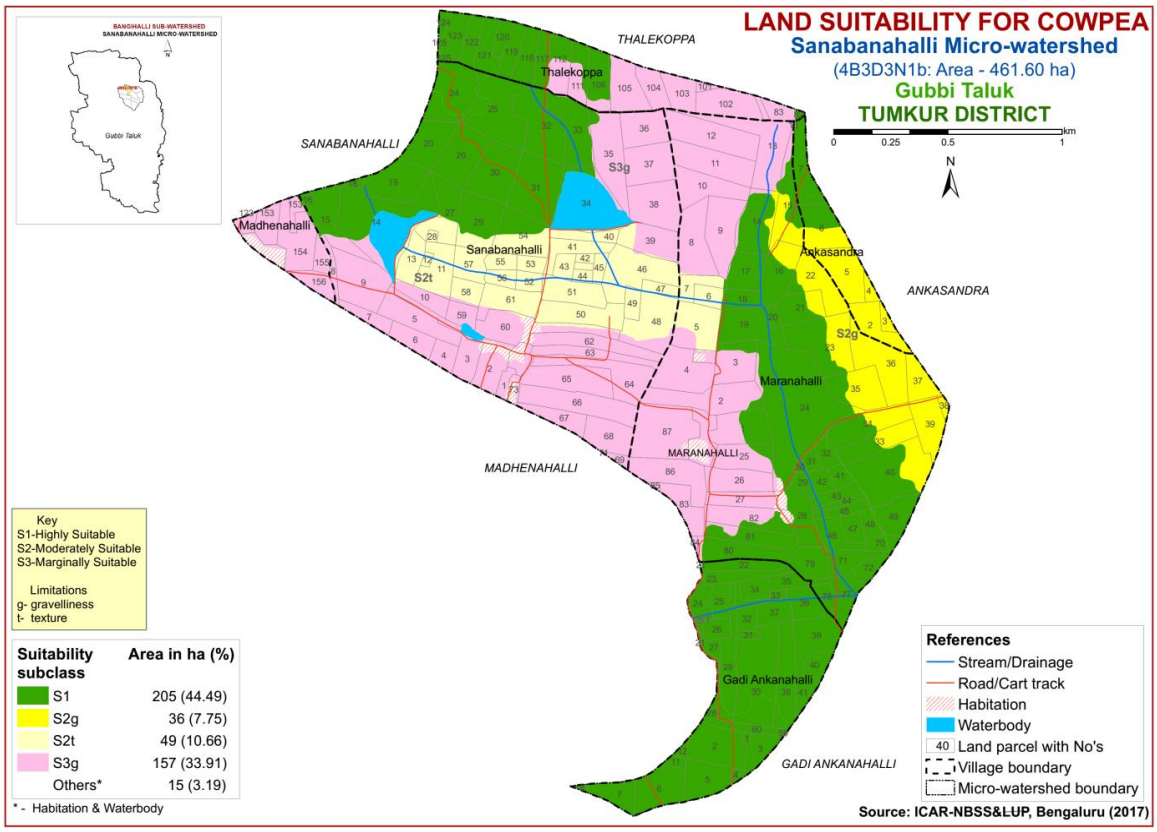


Fig. 7.9 Land Suitability map of Cowpea

7.10 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 rain fed or irrigated crop. The crop requirements for growing groundnut (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 groundnut was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.10.

Highly suitable (Class S1) lands for growing groundnut occupy a very small area of about 6 ha (1%) and are distributed in the northeastern part of the microwatershed. Maximum area of about 373 ha (81%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing groundnut occupy an area of about 68 ha (15%) and occur in the southern and central part of the microwatershed. They have moderate limitation of texture.

Table 7.10 Crop suitability criteria for Groundnut

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

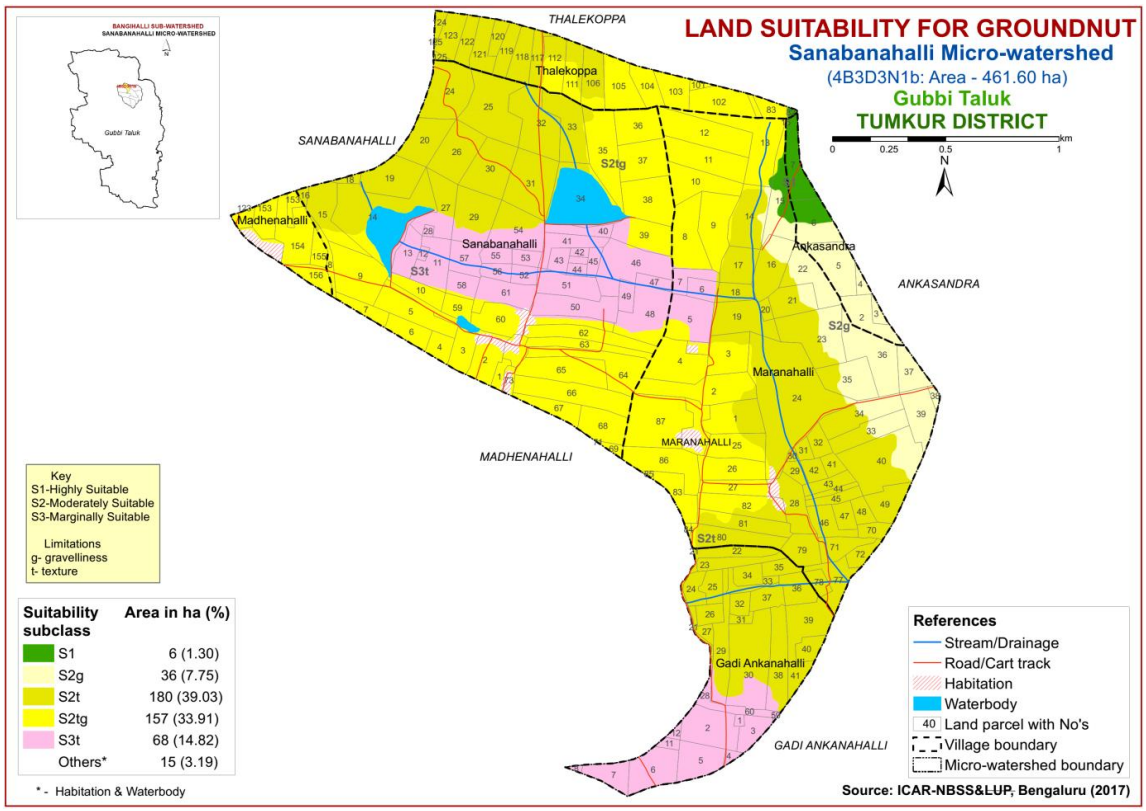


Fig. 7.10 Land Suitability map of Groundnut

7.11 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is 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 7.11) 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 7.11.

Table 7.11 Crop suitability criteria for Sunflower

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

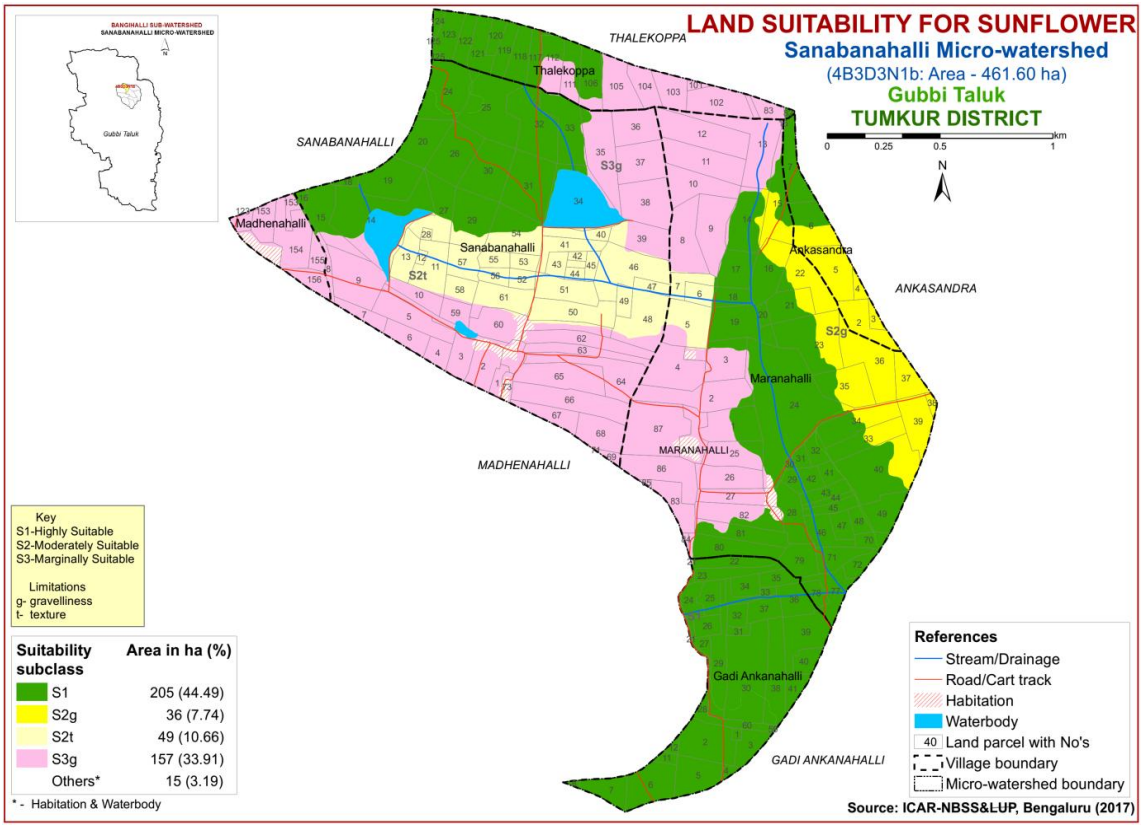


Fig. 7.11 Land Suitability map of Sunflower

Highly suitable (Class S1) lands for growing sunflower occupy maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing sunflower occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

7.12 Land Suitability for Onion (*Allium cepa*)

Onion is the most important vegetable crop grown in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and Tumakuru districts. The crop requirements for growing onion (Table 7.12) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Onion was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.12.

Highly suitable (Class S1) lands for growing onion occupy an area of about 97 ha (21%) and are distributed in the northern, southern and northeastern part of the microwatershed. Maximum area of about 194 ha (42%) is moderately suitable (Class S2) and are distributed in the south-eastern, central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing onion occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.12 Land suitability criteria for Onion

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

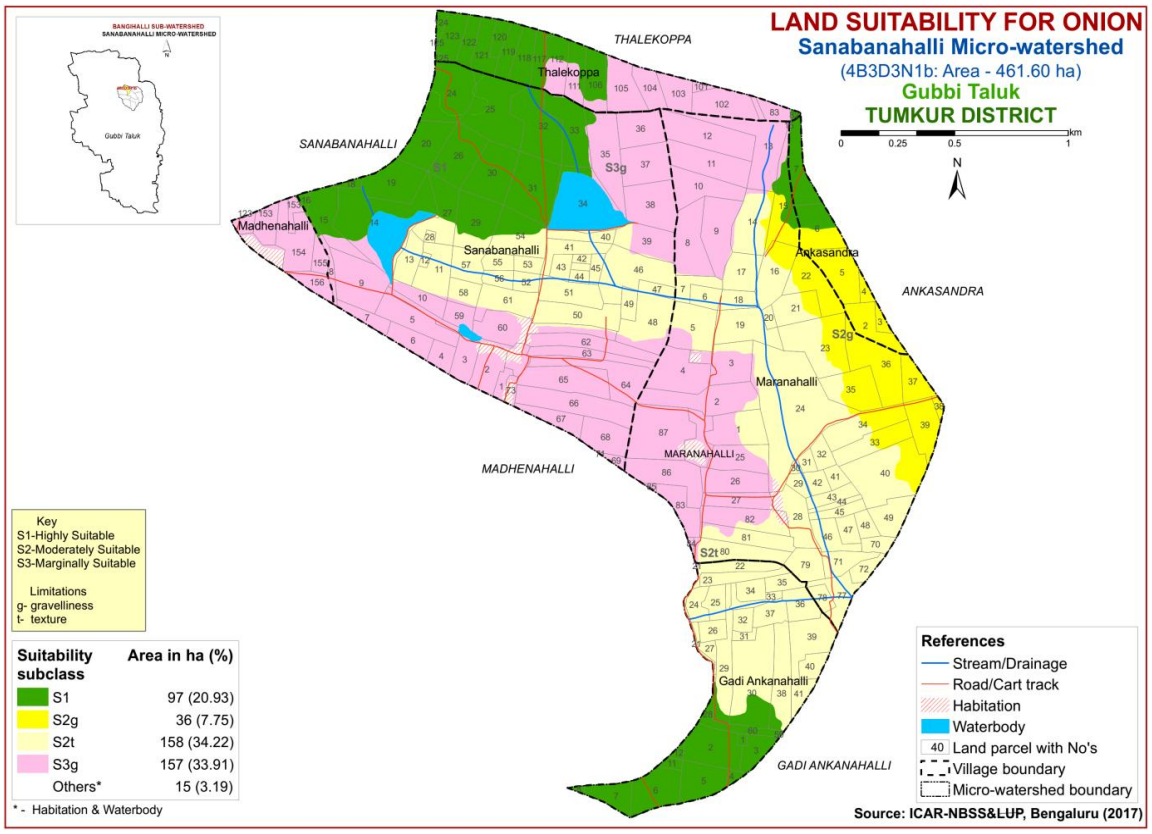


Fig. 7.12 Land Suitability map of Onion

7.13 Land Suitability for Chilli (*Capscicum annuum L.*)

Chilli is the most important commercial crop grown in an area of 0.42 lakh ha in the State in all the districts. The crop requirements for growing chilli (Table 7.13) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing chilli was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.13.

Table 7.13 Land suitability criteria for chillies

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	
LGP	Days	>150	120-150	90-120	<90
Soil drainage	class	Well drained	Mod. to imperf.drained	Poor drained/ excessively	Very poorly drained
Soil reaction	pH	6.0-7.0	7.1-8.0	8.1-9.0,5.0-5.9	>9.0
Surface soil texture	Class	L,scl,cl,sil	sl,sc,sic,c(m/k)	c (ss), ls, s	
Soil depth	Cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	>35	
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	<4
Sodicity (ESP)	%	<5	5-10	10-15	

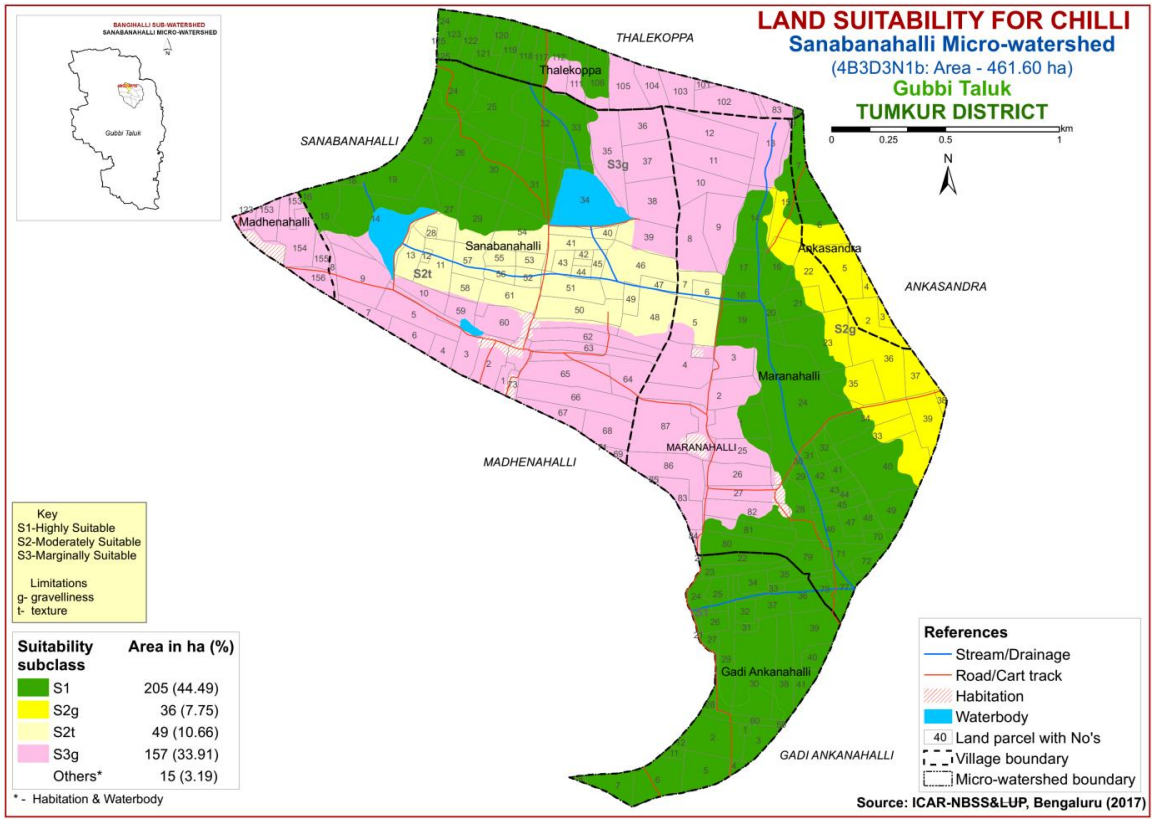


Fig. 7.13 Land Suitability map of Chilli

Highly suitable (Class S1) lands for growing chilli occupy maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing chilli occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

7.14 Land suitability for Brinjal (*Solanum melongena*)

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

Highly suitable (Class S1) lands for growing brinjal occupy maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing brinjal and occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.14 Land suitability criteria for Brinjal

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

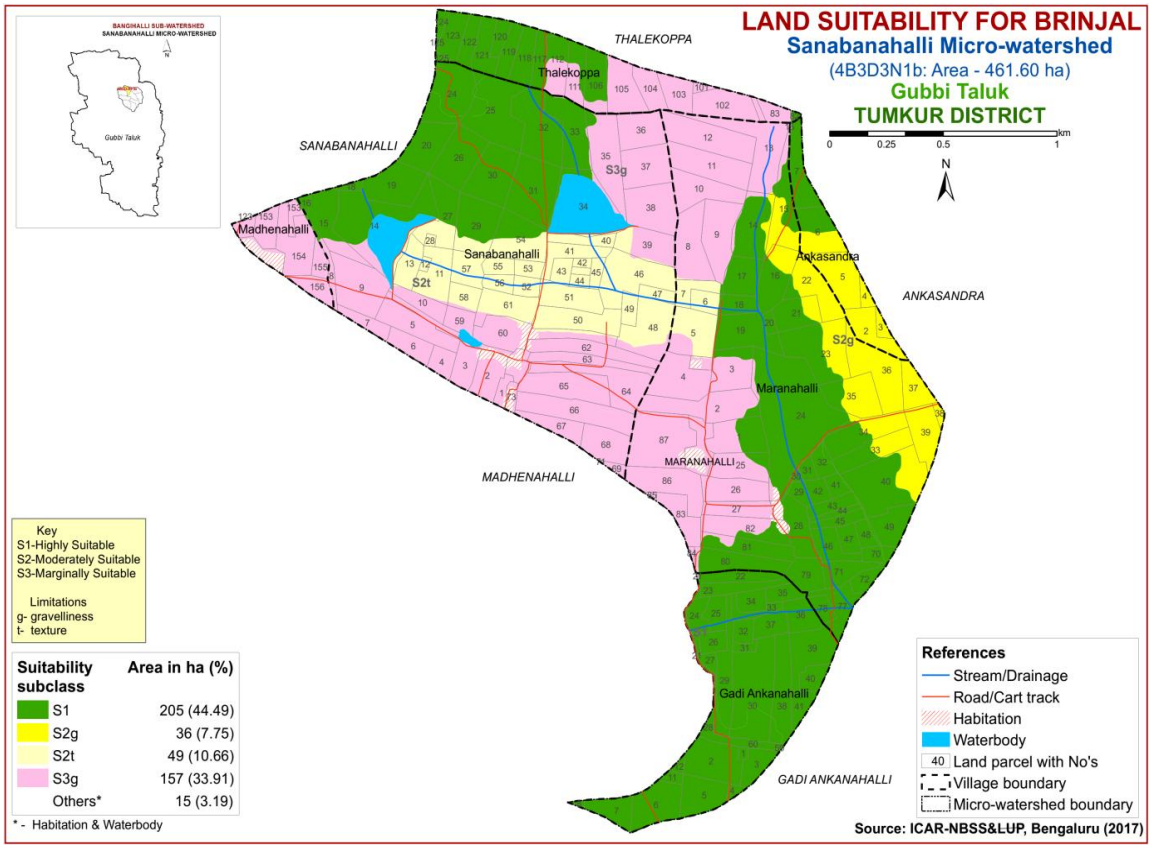


Fig. 7.15 Land Suitability map of Brinjal

7.15 Land suitability for Tomato (*Lycopersicon esculentum*)

Tomato is 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 for growing Tomato (Table 7.15) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Tomato was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.15.

Highly suitable (Class S1) lands for growing tomato occupy maximum area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class

S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing tomato occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.15 Land suitability criteria for Tomato

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

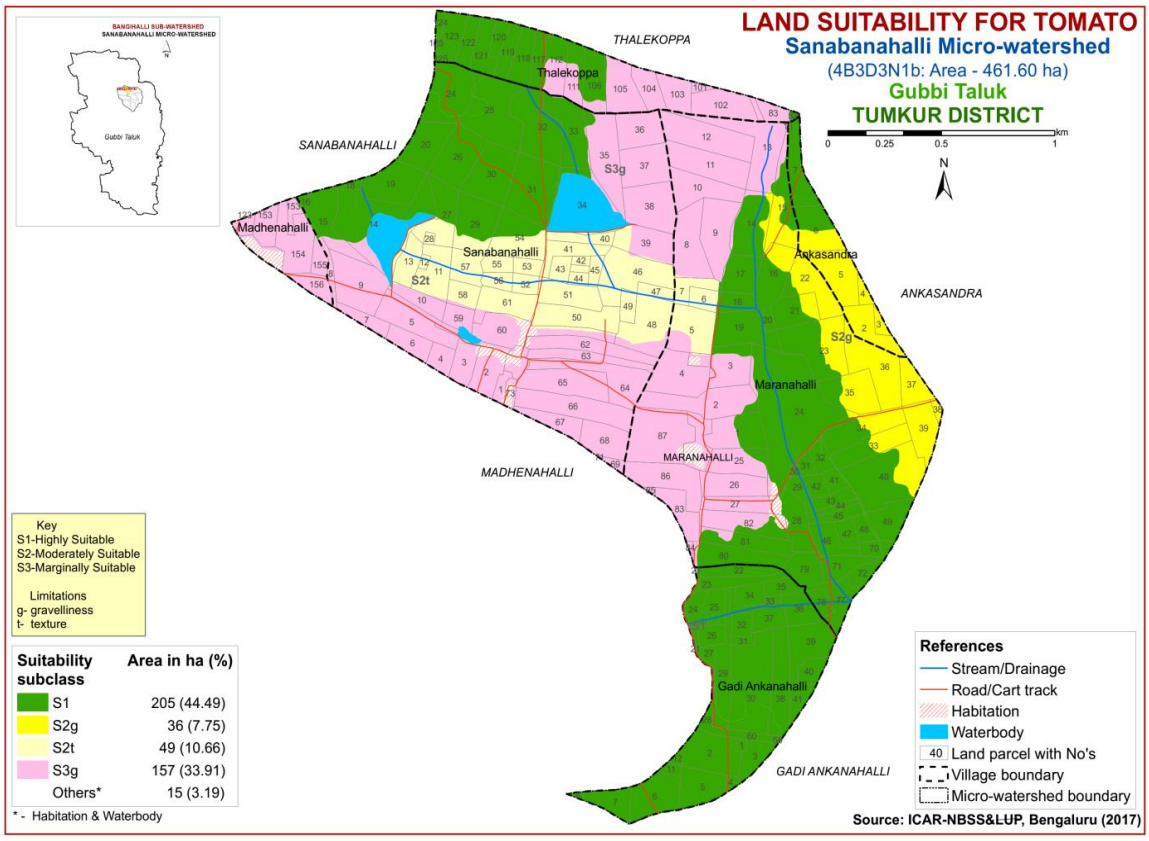


Fig. 7.15 Land Suitability map of Tomato

7.16 Land suitability for Mango (*Mangifera indica*)

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

Highly suitable (Class S1) lands for growing mango occupy an area of about 199 ha (43%) and are distributed in the northern, southern and central part of the microwatershed. An area of about 42 ha (9%) is moderately suitable (Class S2) and are distributed in the eastern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable lands (Class S3) occupy major area of about 206 ha (45%) and occur in the northwestern, western, central and northeastern part of the microwatershed. They have moderate limitations of gravelliness and texture.

Table 7.16 Crop suitability criteria for Mango

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

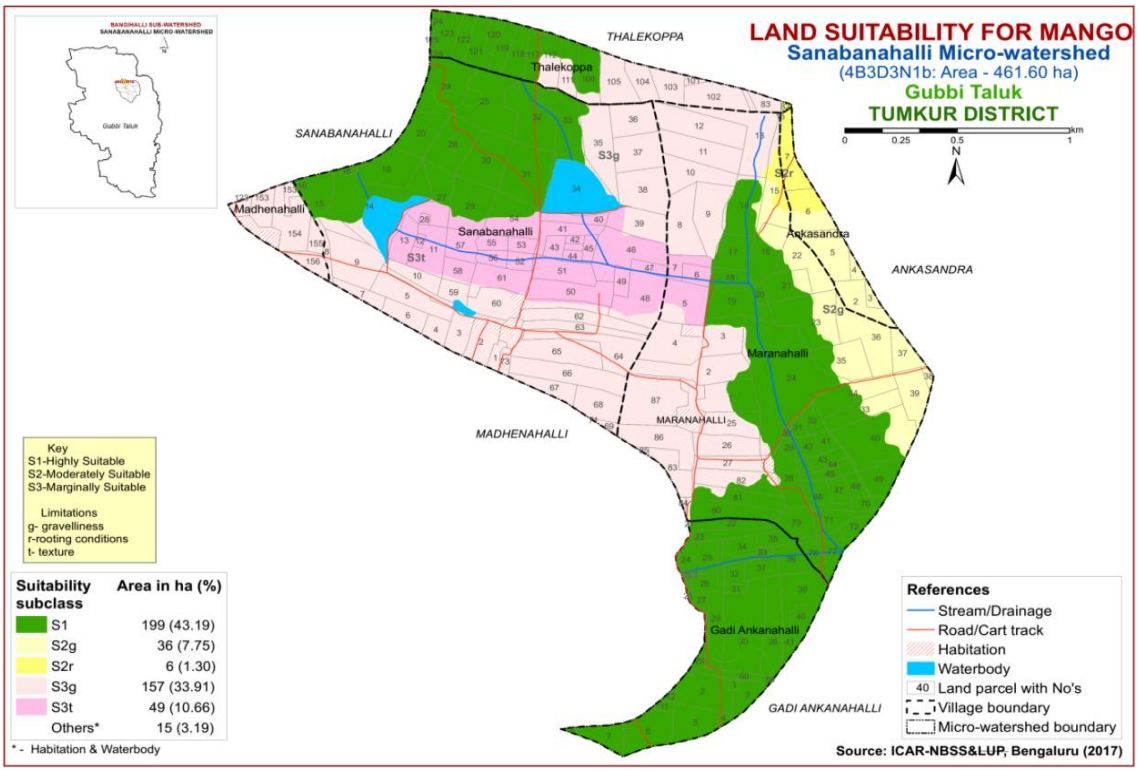


Fig. 7.16 Land Suitability map of Mango

7.17 Land suitability for Sapota (*Manilkara zapota*)

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

Highly suitable (Class S1) lands for growing sapota occupy an area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 36 ha (8%) is moderately suitable (Class S2) and are distributed in the eastern part of the microwatershed. They have minor limitation of gravelliness. Marginally suitable lands (Class S3) for growing sapota occupy an area of about 206 ha (44%) and occur in the southwestern, western, central and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.17 Crop suitability criteria for Sapota

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

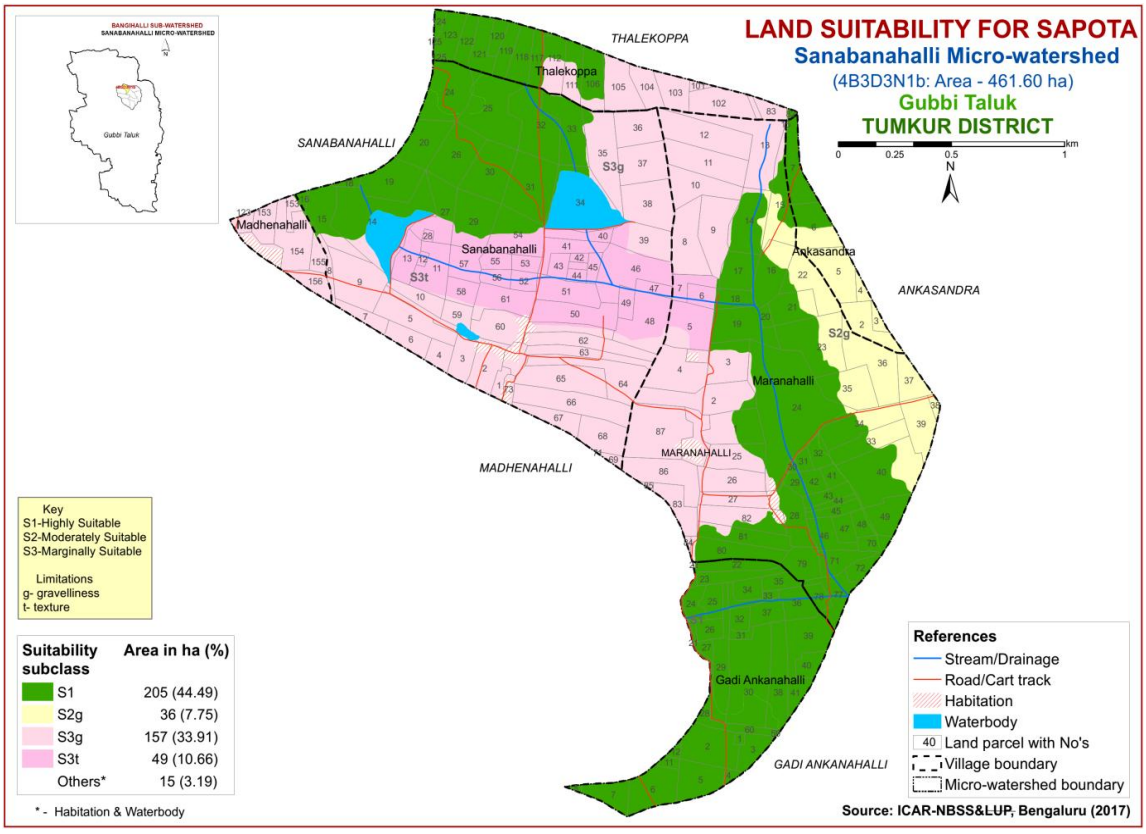


Fig. 7.18 Land Suitability map of Sapota

7.18 Land suitability for Guava (*Psidium guajava*)

Guava is the most important fruit crop grown in an area of 6558 ha in almost all the districts of the State. The crop requirements (Table 7.18) for growing guava were matched with the soil-site characteristics (7.1) and a land suitability map for growing guava was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.18.

Highly suitable (Class S1) lands for growing guava occupy an area of about 186 ha (40%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. Maximum area of about 211 ha (46%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) for growing guava occupy an area of about 49 ha (11%) and occur in the central part of the microwatershed. They have moderate limitation of texture.

Table 7.18 Crop suitability criteria for Guava

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

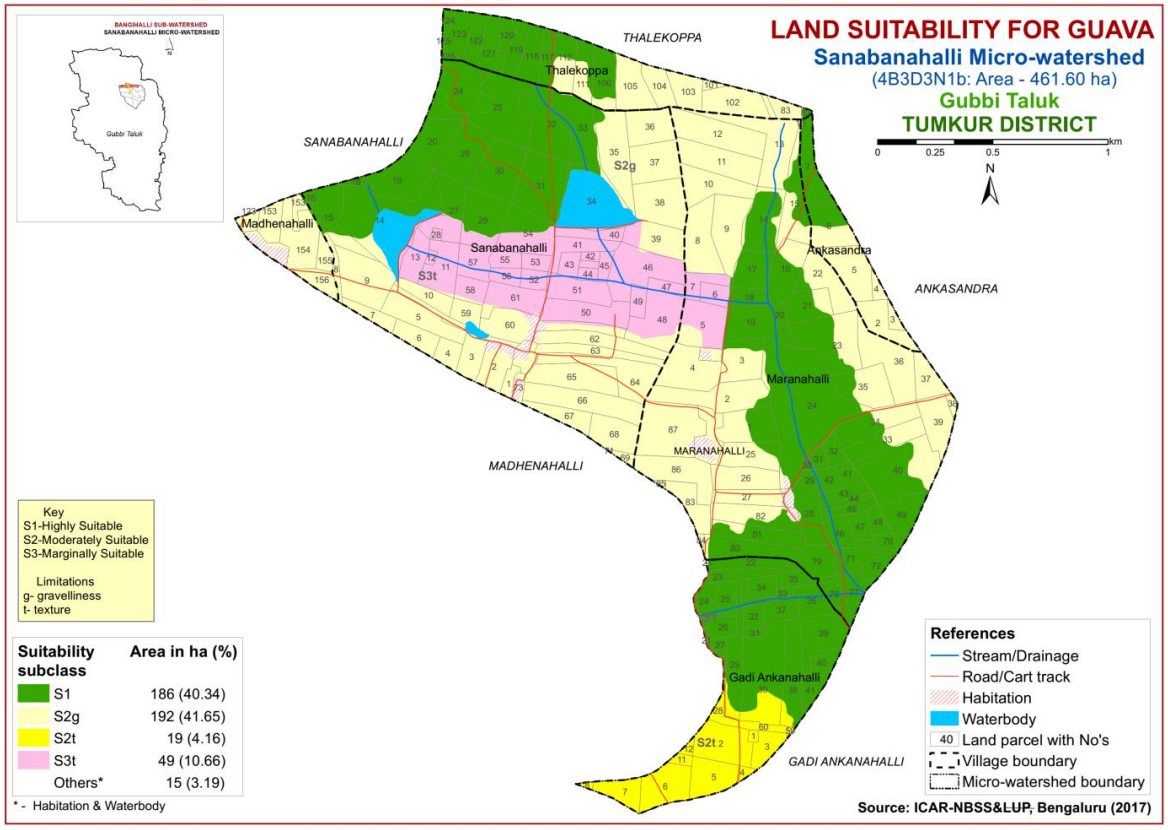


Fig. 7.18 Land Suitability map of Guava

7.19 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the commercially grown fruit crop in Karnataka in an area of 0.18 lakh ha mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing pomegranate (Table 7.19) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing pomegranate was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.19.

Maximum area of about 205 ha (44%) is highly suitable (Class S1) for growing pomegranate and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.19 Crop suitability criteria for Pomegranate

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

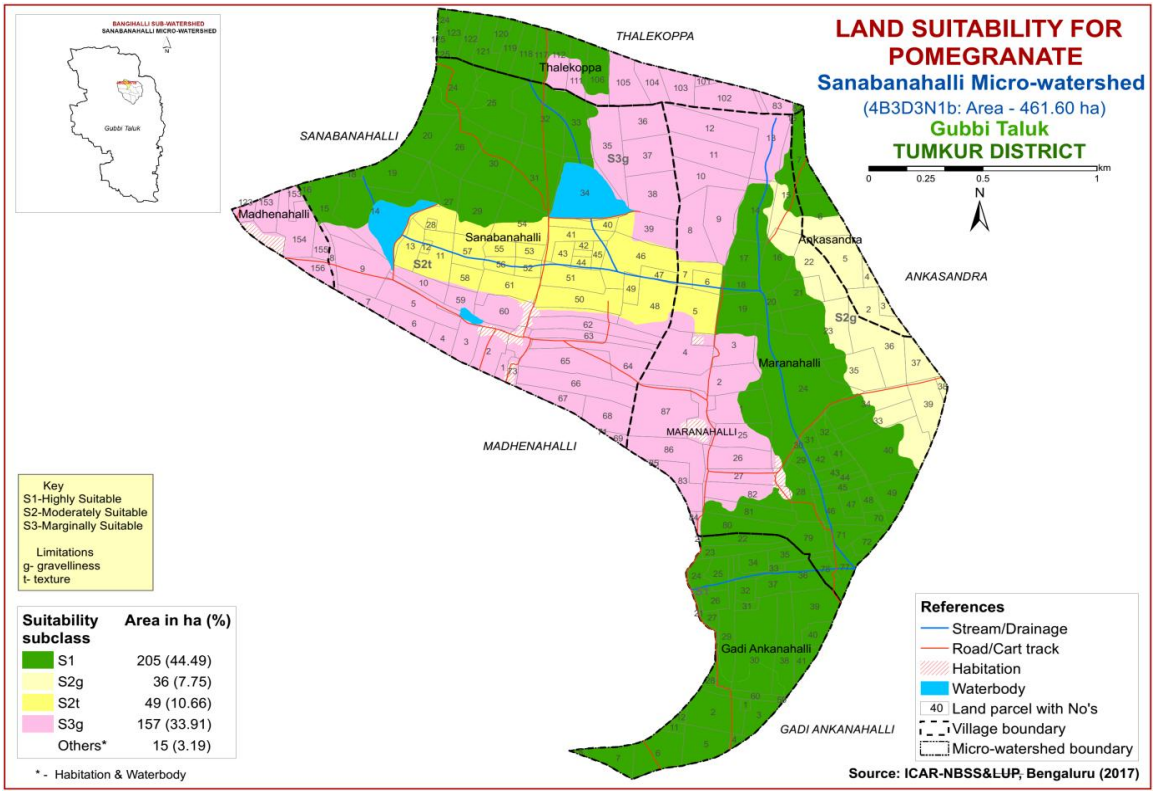


Fig. 7.19 Land Suitability map of Pomogranate

7.20 Land Suitability for Banana (*Musa paradisiaca*)

Banana is one of the major fruit crop grown in an area of 1.02 lakh ha in Karnataka State. The crop requirements for growing banana (Table 7.20) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing banana was generated. The area extent and their geographic

distribution of different suitability subclasses in the microwatershed are given in Figure 7.20.

Table 7.20 Crop suitability criteria for Banana

Crop requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	26-33	34-36 24-25	37-38	>38
Soil aeration	Soil drainage	Class	Well drained	Moderately to imperf.drained	Poorly drained	V.poorly drained
Nutrient availability	Texture	Class	l,cl, scl,sil	sicl, sc, c(<45%)	c (>45%), sic, sl	ls, s
	pH	1:2.5	6.5-7.0	7.1-8.5,5.5-6.4	>8.5,<5.5	
Rooting conditions	Soil depth	Cm	>125	76-125	50-75	<50
	Stoniness	%	<10	10-15	15-35	>35
Soil toxicity	Salinity	dS/m	<1.0	1-2	>2	
	Sodicity	%	<5	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-15	>15

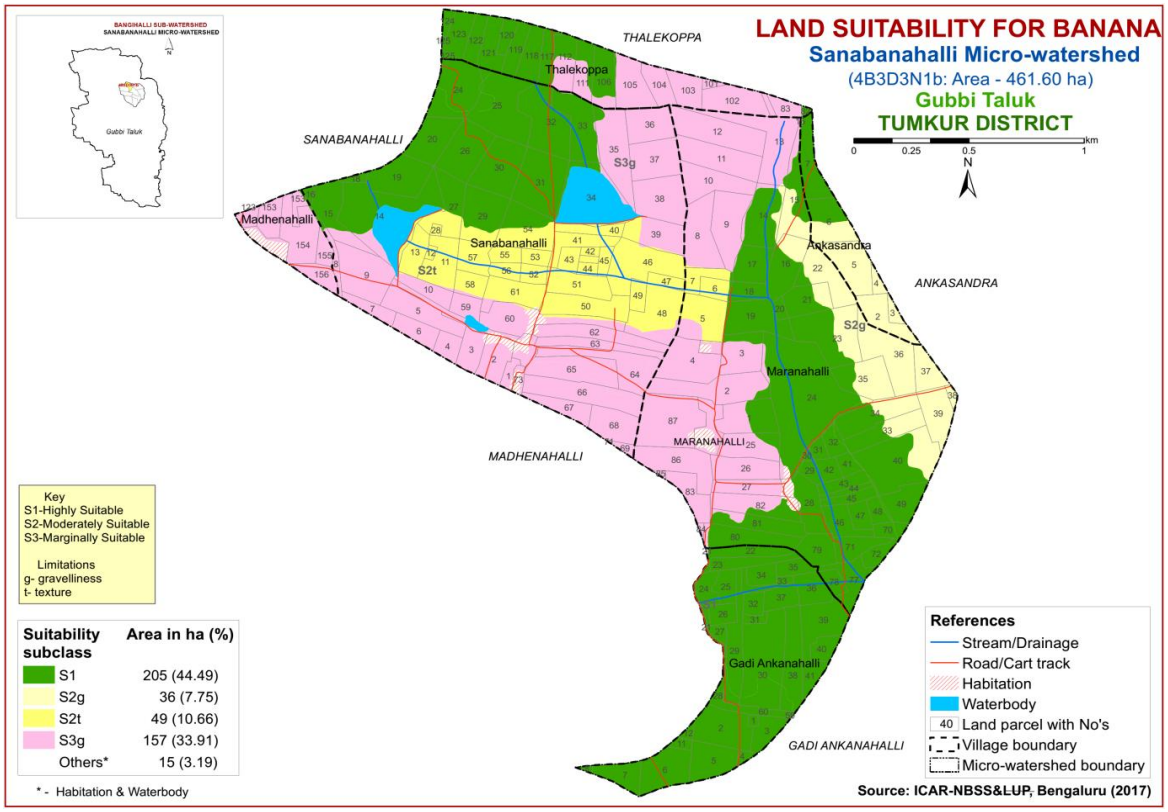


Fig. 7.20 Land Suitability map of Banana

Maximum area of about 205 ha (44%) is highly suitable (Class S1) for growing banana and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy an

area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

7.21 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is the most important fruit crop grown in 5368 ha in all the districts of the state. The crop requirements for growing jackfruit were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jackfruit (Table 7.21) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.21.

Table 7.21 Land suitability criteria for Jackfruit

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

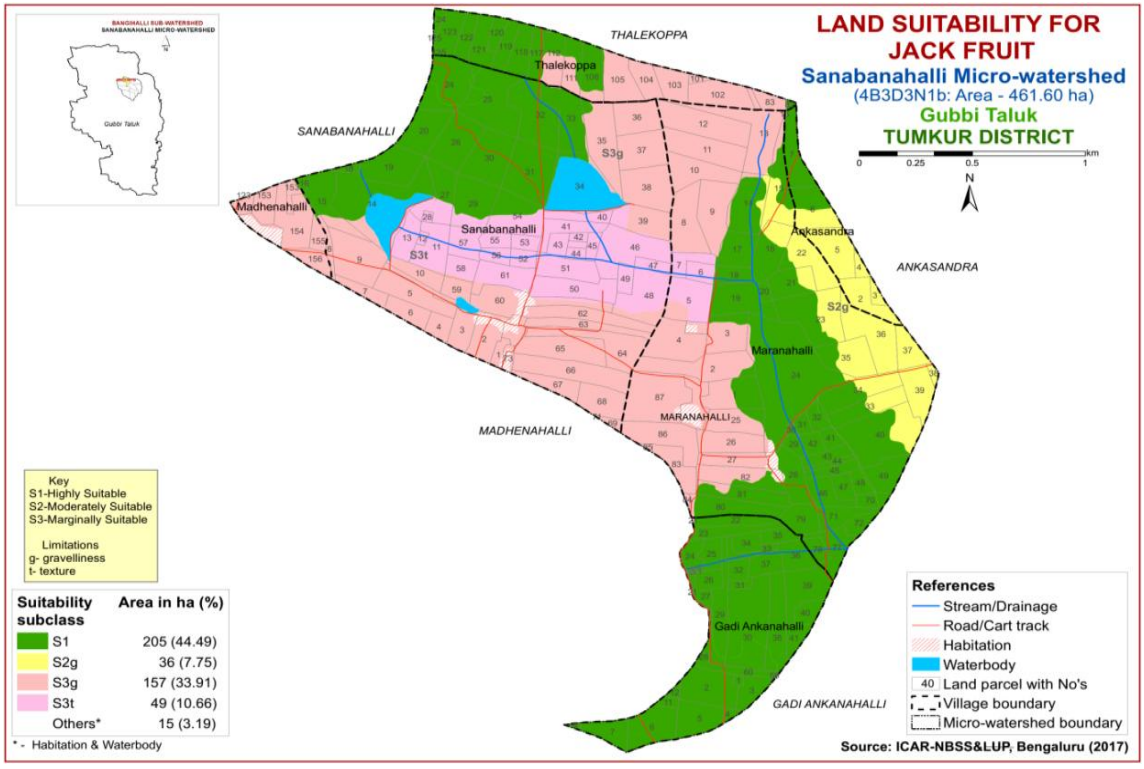


Fig. 7.21 Land Suitability map of Jackfruit

Highly suitable (Class S1) lands for growing jackfruit occupy an area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 36 ha (8%) is moderately suitable (Class S2) and are distributed in the eastern part of the microwatershed. They have minor limitation of

gravelliness. Marginally suitable lands (Class S3) for growing jackfruit occupy an area of about 206 ha (44%) and occur in the southwestern, western, central and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

7.22 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jamun (Table .22) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.22.

Table .22 Land suitability criteria for jamun

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

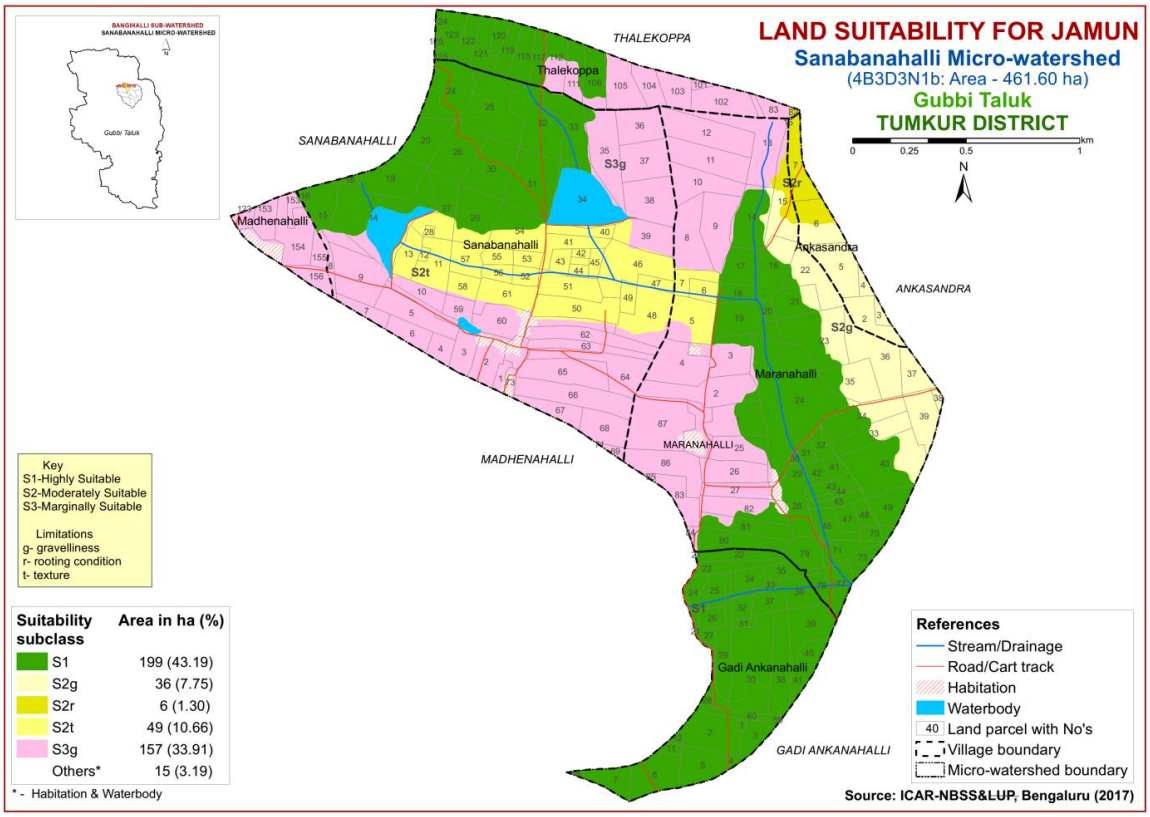


Fig. 7.22 Land Suitability map of Jamun

Highly suitable (Class S1) lands for growing jamun occupy maximum area of about 199 ha (43%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 91 ha (20%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitation of gravelliness and rooting depth. Marginally suitable lands (Class S3) for growing jamun occupy an area of about 157 ha (34%) and occur in the southwestern, western, central and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

7.23 Land Suitability for Musambi (*Citrus limetta*)

Musambi is the most important fruit crop grown in an area of 5446 ha in almost all the districts of the state. The crop requirements (Table 7.23) 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 geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.23.

Maximum area of about 205 ha (44%) is highly suitable (Class S1) for growing musambi and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.23 Crop suitability criteria for Musambi

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

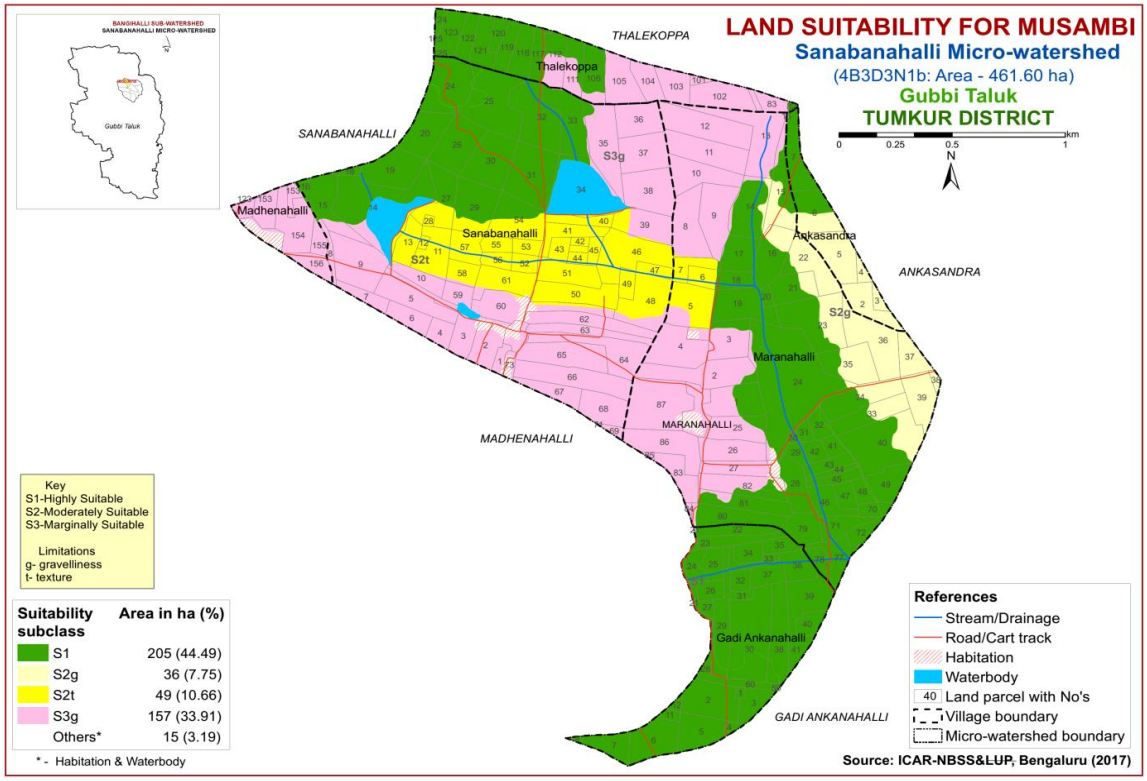


Fig. 7.23 Land Suitability map of Musambi

7.24 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 7.24) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7. 24.

Maximum area of about 205 ha (44%) is highly suitable (Class S1) for growing lime and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.24 Crop suitability criteria for Lime

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	28-30	31-35 24-27	36-40 20-23	>40 <20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imperf.drained	poorly	Very poorly
Nutrient availability	Texture	Class	scl,l,sicl,cl,s	sc, sc, c	c (>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.47.6-8.0	4.0-5.4 8.1-8.5	<4.0 >8.5
	$CaCO_3$ in root zone	%	Non 34calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	Cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

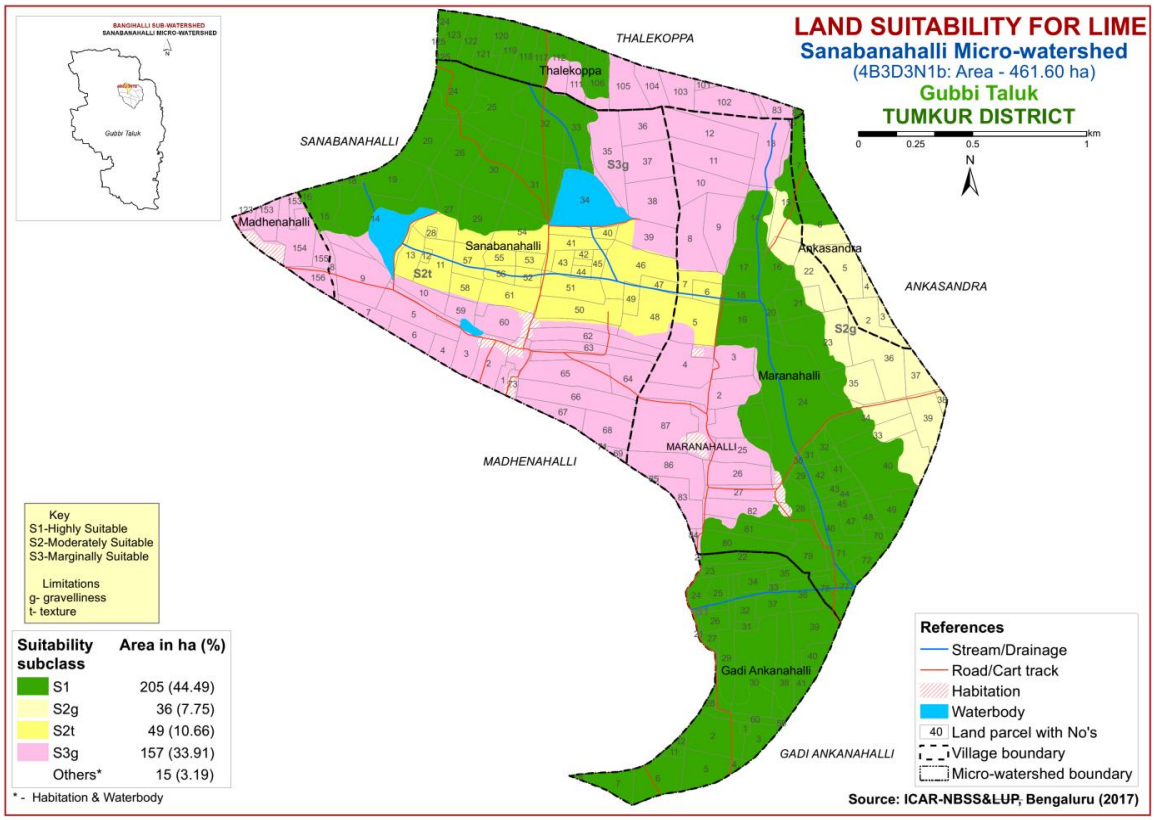


Fig. 7.24 Land Suitability map of Lime

7.25 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important nut and fruit crop grown in an area of 7052 ha in almost all the districts of the State. The crop requirements (Table 7.25) for growing

cashew were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

Table 7.25 Land suitability criteria for Cashew

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

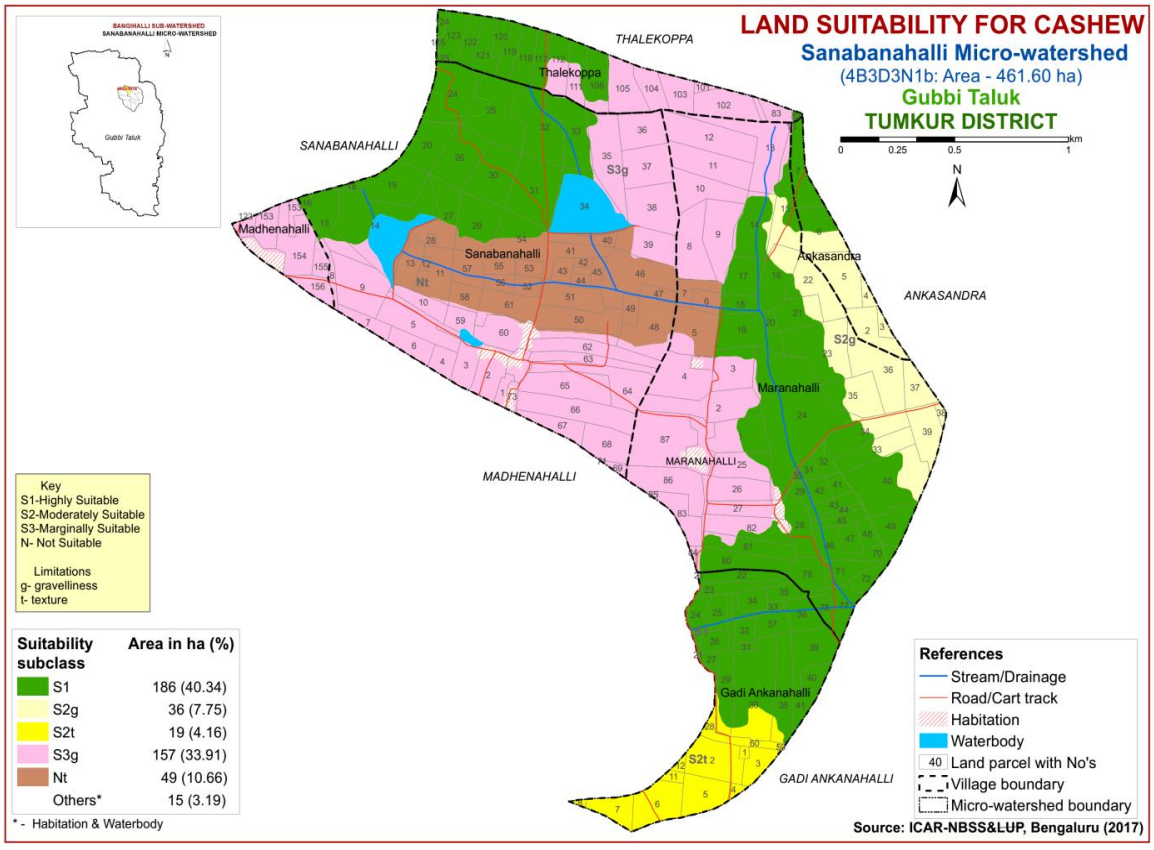


Fig. 7.25 Land Suitability map of Cashew

Maximum area of about 186 ha (40%) is highly suitable (Class S1) for growing cashew and are distributed in the northern, south-eastern, central and northeastern part of the microwatershed. An area of about 55 ha (12%) is moderately suitable (Class S2) and are distributed in the southern and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy an

area of about 157 ha (34%) and occur in the northwestern, western and northeastern part of the microwatershed. They have moderate limitation of gravelliness. An area of about 49 (11%) is not suitable (Class N) and occur in the central part of the microwatershed and have severe limitation of texture.

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

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements (Table 26) for growing custard apple were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.26.

Highly suitable (Class S1) lands for growing custard apple occupy an area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. Maximum area of about 241 ha (52%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of gravelliness and texture.

Table 7.26 Land suitability criteria for Custard apple

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

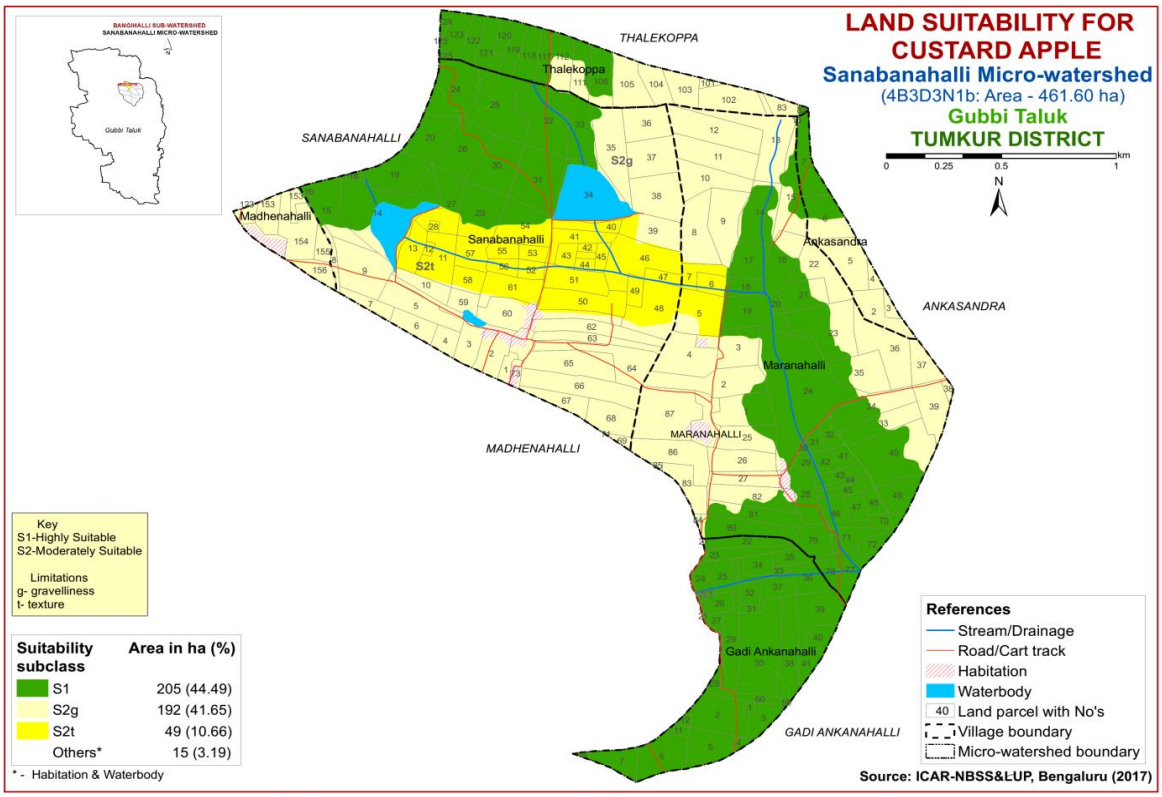


Fig. 7.26 Land Suitability map of Custard Apple

7.27 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the fruit and medicinal crop grown in almost all the districts of the State. The crop requirements (Table 7.27) 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 geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.27.

Table 7. 27 Land suitability criteria for Amla

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

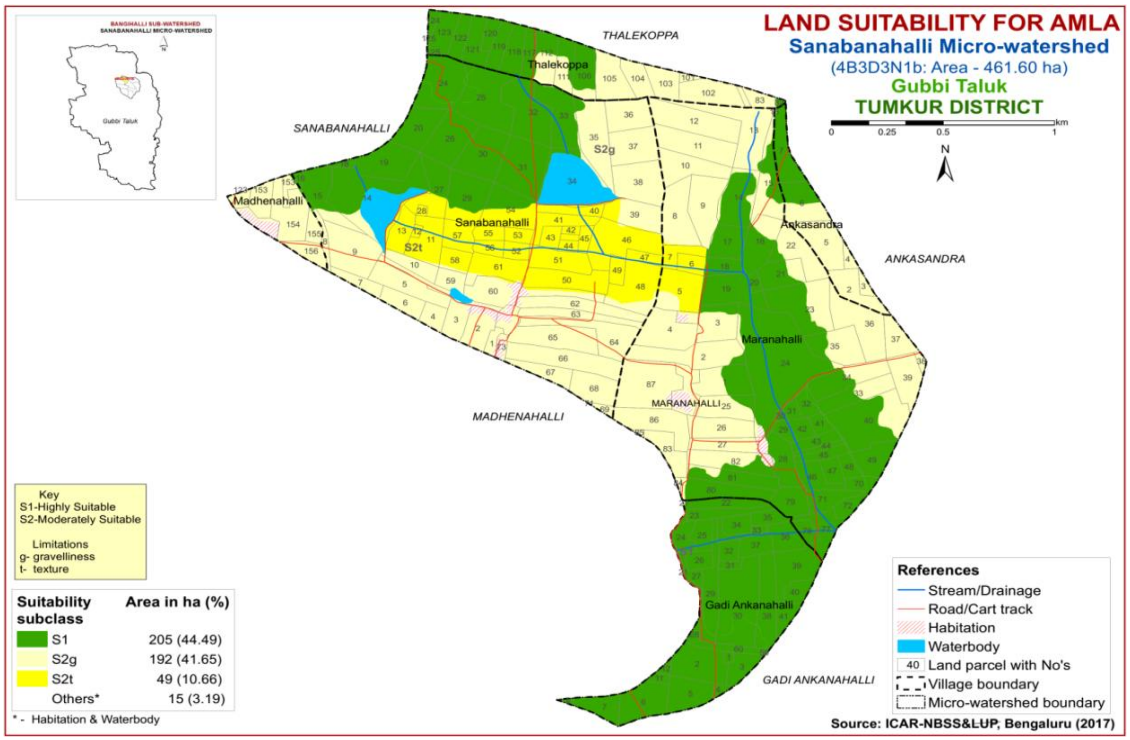


Fig. 7.27 Land Suitability map of Amla

Highly suitable (Class S1) lands for growing amla occupy an area of about 205 ha (44%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. Maximum area of about 241 ha (52%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of gravelliness and texture.

7.28 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is the most important spice crop grown in 14897 ha in all the districts of the state. The crop requirements (Table 7.28) 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 Fig. 7.28.

Highly suitable (Class S1) lands for growing tamarind occupy maximum area of about 199 ha (43%) and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 91 ha (20%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable lands (Class S3) for growing tamarind occupy an area of about 157 ha (34%) and occur in the southwestern, western, central and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.28 Land suitability criteria for Tamarind

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

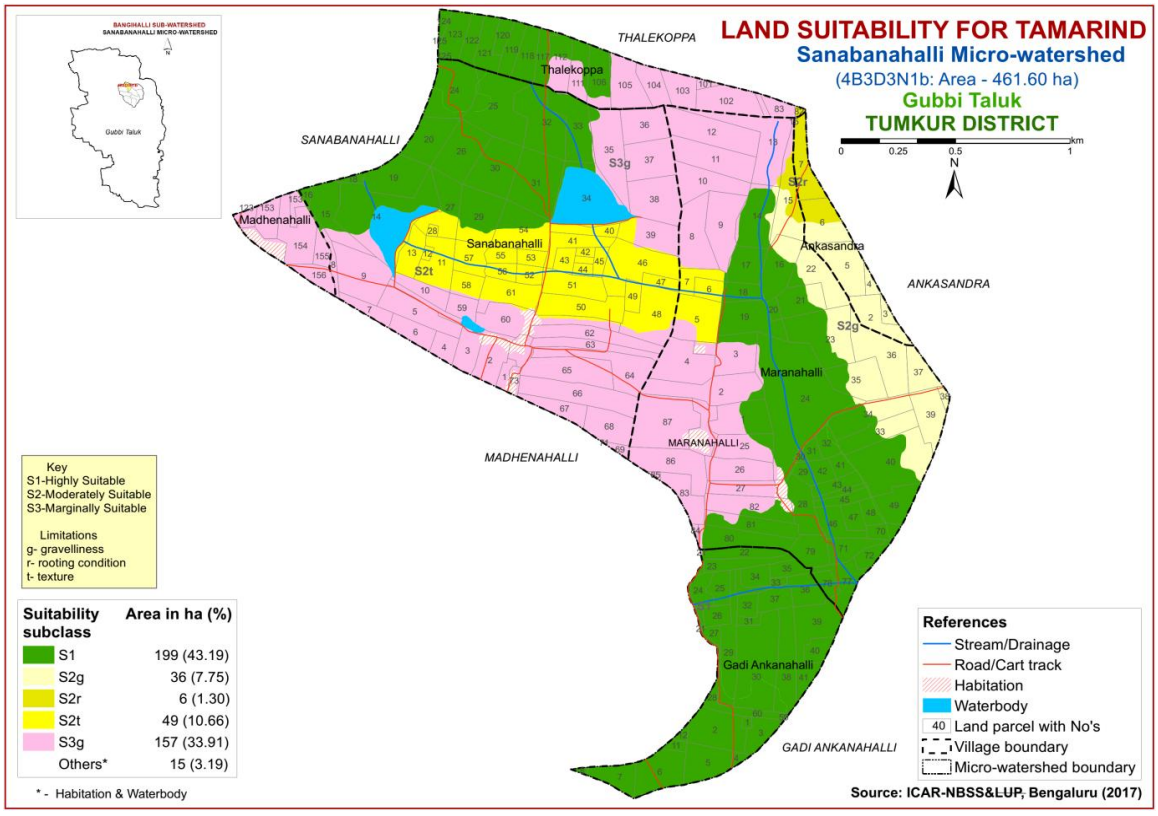


Fig. 7.28 Land Suitability map of Tamarind

7.29 Land suitability for Marigold (*Tagetes sps*.)

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

Table 7.29 Land suitability criteria for Marigold

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

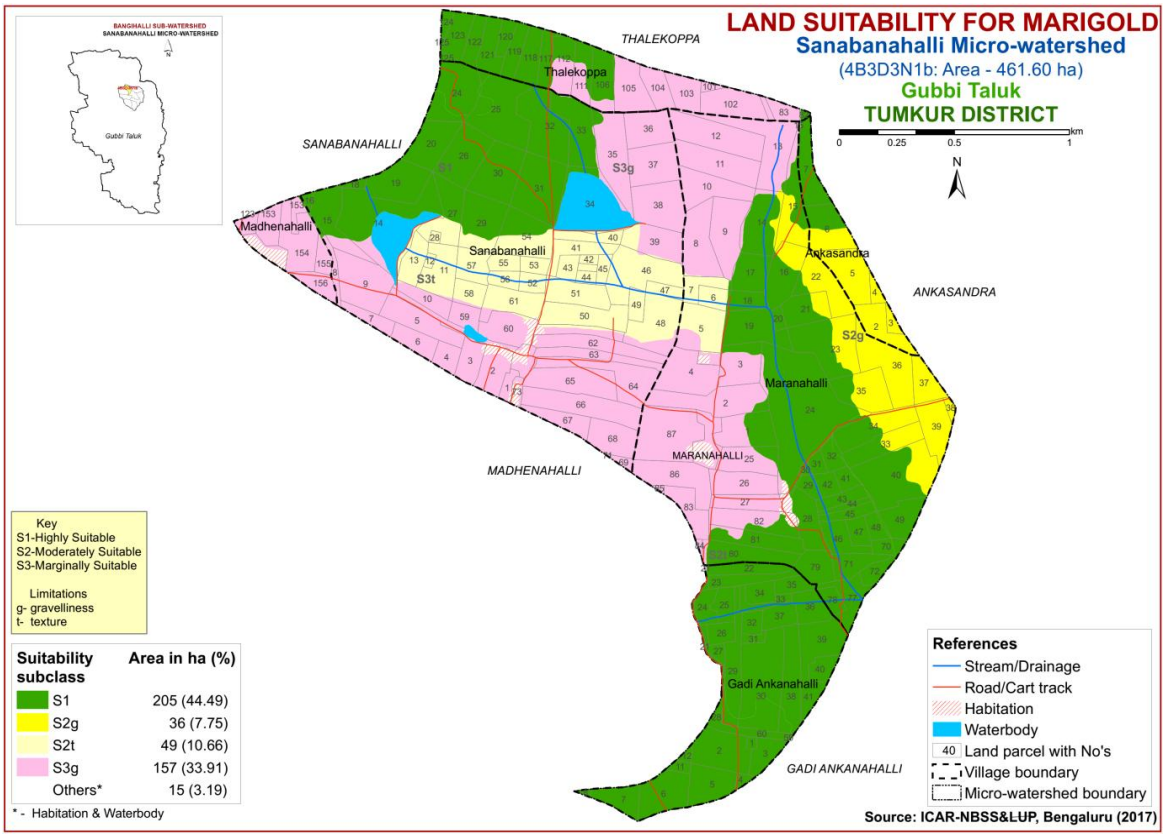


Fig. 7.29 Land Suitability map of Marigold

Maximum area of about 205 ha (44%) is highly suitable (Class S1) for growing marigold and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy an

area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

7.30 Land Suitability for Chrysanthemum (*Dendranthema grandiflora*)

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

Maximum area of about 205 ha (44%) is highly suitable (Class S1) for growing chrysanthemum and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.30 Land suitability criteria for Chrysanthemum

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

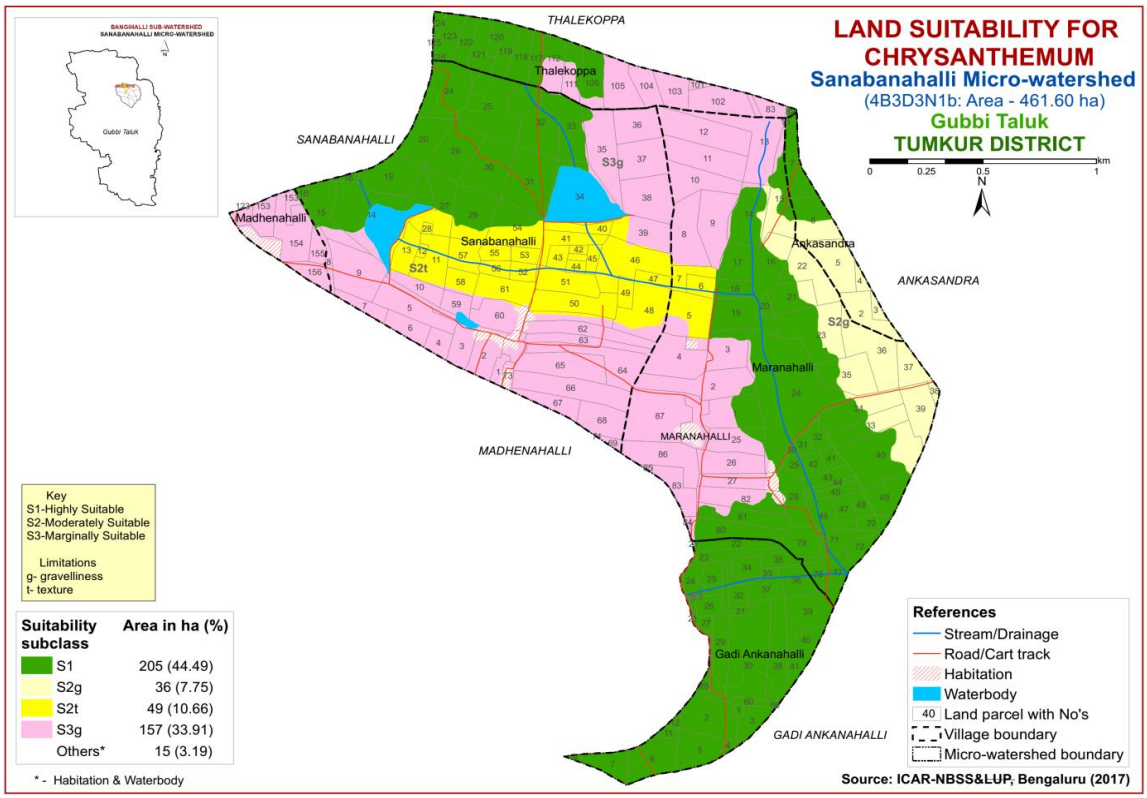


Fig. 7.30 Land Suitability map of Chrysanthemum

7. 31 Land Suitability for Jasmine *(Jasminum sp.)*

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

Maximum area of about 205 ha (44%) is highly suitable (Class S1) for growing jasmine and are distributed in the northern, southern, central and northeastern part of the microwatershed. An area of about 85 ha (18%) is moderately suitable (Class S2) and are distributed in the central and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy an area of about 157 ha (34%) and occur in the western and northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.31 Land suitability criteria for Jasmine (irrigated)

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

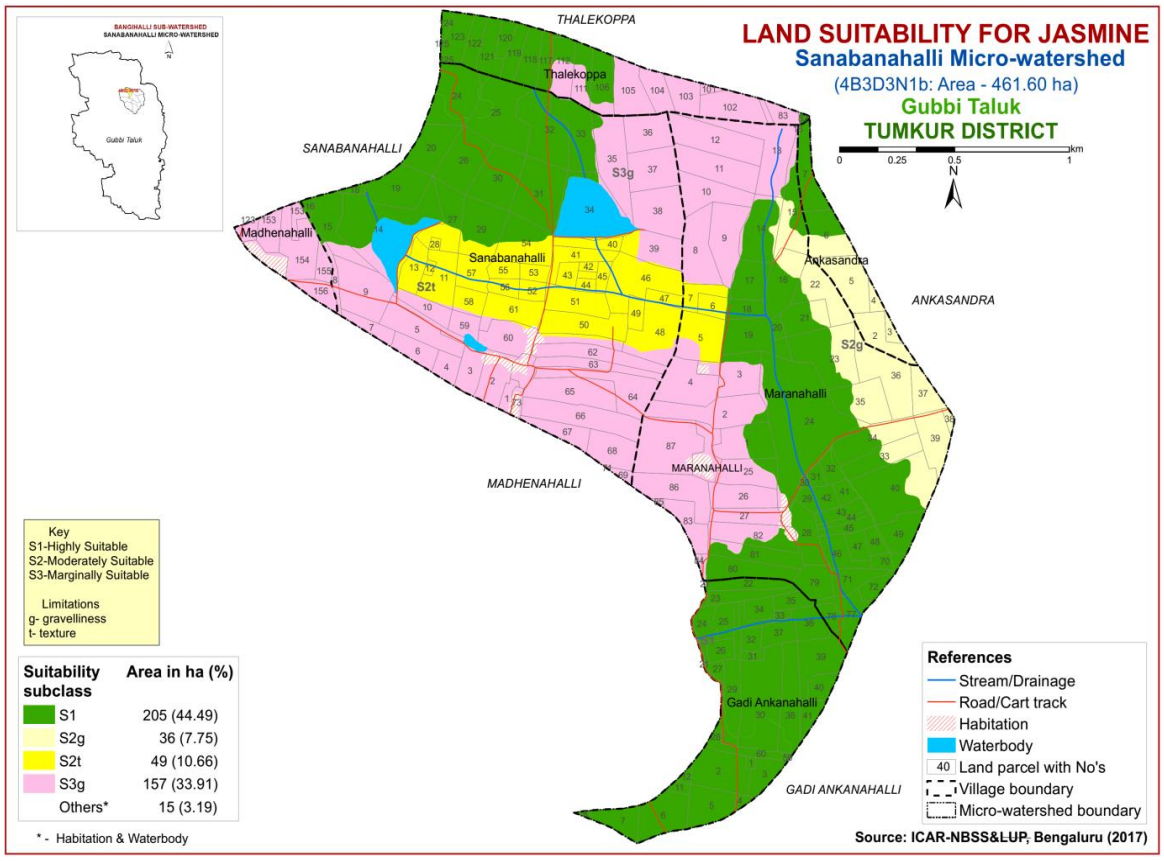


Fig. 7.31 Land Suitability map of Jasmine

7.32 Land Suitability for Coconut (*Cocos nucifera*)

Coconut is the most important flower crop grown in almost all the districts of the State. The crop requirements (Table 7.32) for growing coconut were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing coconut was

generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.32.

Maximum area of about 186 ha (40%) is highly suitable (Class S1) for growing coconut and are distributed in the northern, south-eastern, central and northeastern part of the microwatershed. An area of about 55 ha (12%) is moderately suitable (Class S2) and are distributed in the southern and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy major area of about 206 ha (45%) and occur in the northwestern, western and northeastern part of the microwatershed. They have moderate limitations of gravelliness and texture.

Table 7. 32 Land suitability criteria for Coconut

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Slope	%	0-3	3-5	5-10	>10
Soil drainage	class	Well drained	Mod. drained	Poorly	Very poorly
Soil reaction	pH	5.1-6.5	6.6-7.5	7.6-8.5	-
Surface soil texture	Class	sc, cl, scl	c (red), sl	c (black),ls	-
Soil depth	Cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	35-60	>60

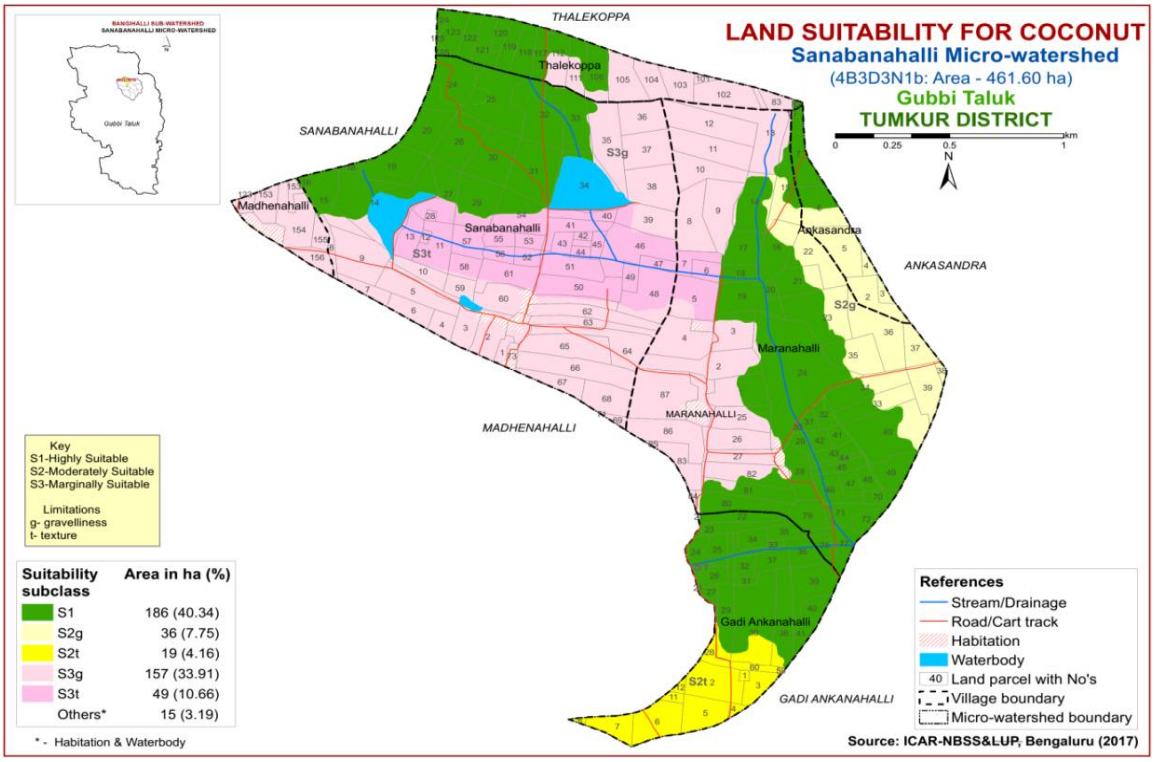


Fig. 7.32 Land Suitability map of Coconut

7.33 Land Suitability for Areca nut (*Areca catechu*)

Areca nut is the most important plantation crop commonly called as betel nut that is used for mastication with betel leaf grown in almost all the districts of the State. The crop requirements (Table 7.33) for growing Areca nut were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Areca nut was

generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.33.

Table 7.33 Land suitability criteria for Arecanut

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Slope	%	0-3	3-5	5-10	>10
Soil drainage	class	Well drained	Mod. to poorly drained	-	Very poorly
Soil reaction	pH	5.0-6.5	6.6-7.5	7.6-8.5	
Surface soil texture	Class	sc, cl, scl	cz (red), sl	c (black), ls	-
Soil depth	Cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	35-60	>60

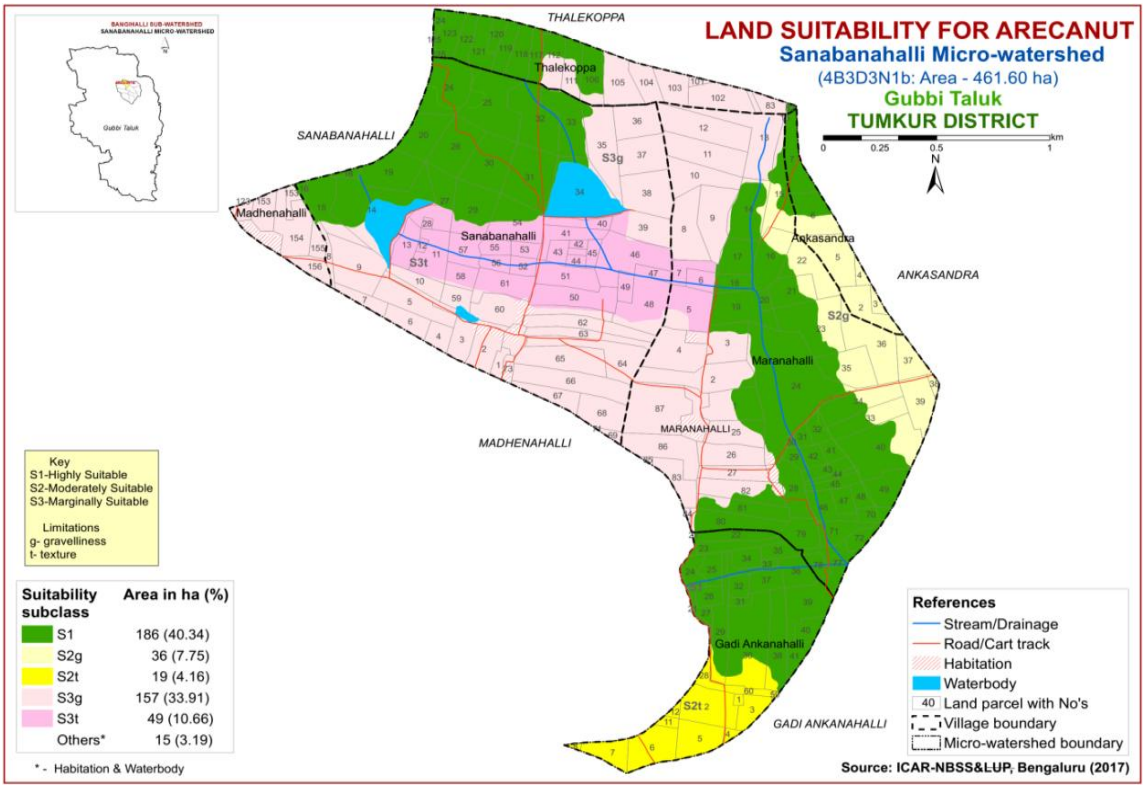


Fig. 7.33 Land Suitability map of Arecanut

Maximum area of about 186 ha (40%) is highly suitable (Class S1) for growing arecanut and are distributed in the northern, south-eastern, central and northeastern part of the microwatershed. An area of about 55 ha (12%) is moderately suitable (Class S2) and are distributed in the southern and eastern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands (Class S3) occupy major area of about 206 ha (45%) and occur in the northwestern, western and northeastern part of the microwatershed. They have moderate limitations of gravelliness and texture.

7.34 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is the most important crop grown mainly for sericulture in an area of about 1.66 lakh ha in all the districts of the state. The crop requirements for growing mulberry (Table 7.34) 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 7.34.

Table.34 Land suitability criteria for Mulberry

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

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

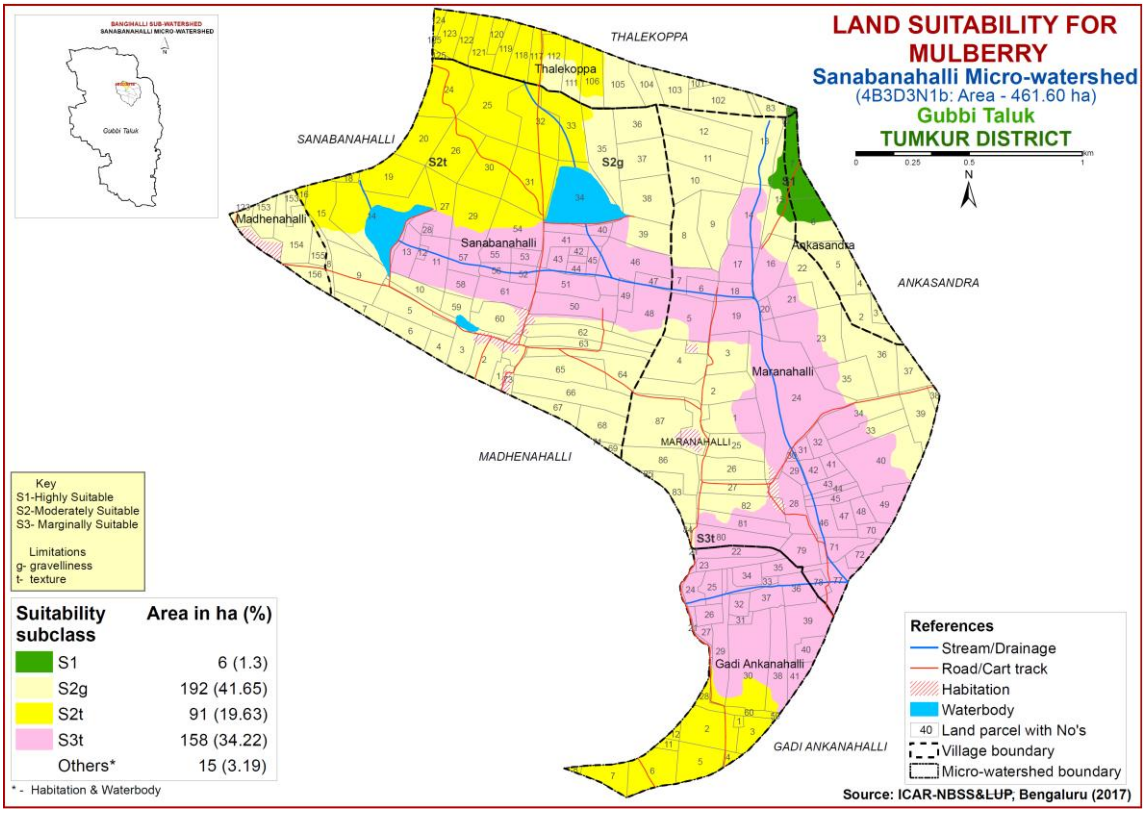


Fig. 7.34 Land Suitability map of Mulberry

Highly suitable (Class S1) lands occupy a very small area of about 6 ha (1%) for growing mulberry and occur in the northeastern part of the microwatershed. Moderately

suitable (Class S2) lands occupy maximum area of about 283 ha (62%) and occur in the major part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands cover an area of about 158 ha (34%) and occur in the central and south-eastern part of the microwatershed. They have moderate limitation of rooting depth.

7.35 Land Management Units (LMUs)

The 13 soil map units identified in Sanabanahalli microwatershed have been regrouped into 3 Land Management Units(LMU's) for the purpose of a preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig.7.28) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

The map units that have been grouped into 3 Land Management Units along with brief description of soil and site characteristics are given below.

LMU NO.	Soil map units	Soil and site characteristics
1	HLKcB2, HLKhB1g1, RTRcA1, RTRhB1, MNLhB2	Deep to very deep (100- >150 cm), red sandy loam to sandy clay loam soils with slopes of 0-3%, gravelly (15-35%) and slight to moderate erosion
2	KDThB1, KDTiA1, KDTiB1, TDGhB1	Very deep (>150 cm), black sandy clay loam to sandy clay soils with slopes of 0-3% and slight erosion
3	BPRcB1, BPRhB1g1, BPRhB2, NGPhB2	Deep (100-150 cm), gravelly red sandy loam to sandy clay loam soils with slopes of 1-3%, gravelly (15-35%) and slight to moderate erosion

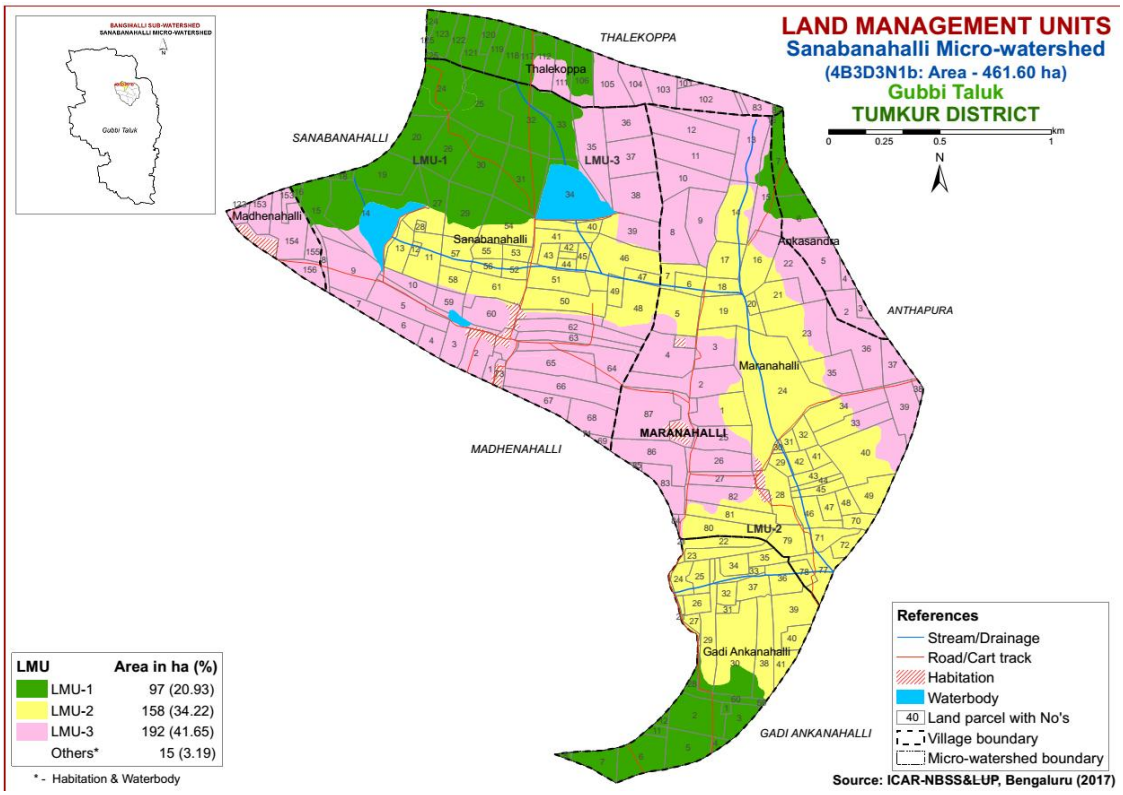


Fig. 7.35 Land Management Units Map- Sanabanahalli Microwatershed

7.36 Proposed Crop Plan for Sanabanahalli Microwatershed

After assessing the land suitability for the 34 crops, the proposed crop plan has been prepared for the 3 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 34 crops. The resultant proposed crop plan is presented below in Table 7.34

Table 7.35 Proposed Crop Plan for Sanabanahalli Microwatershed

LMU No	Mapping Units	Survey Number	Soil and site characteristics	Field Crops	Forestry/ Grasses	Horticulture Crops with suitable interventions	Suitable Interventions
LMU1 (179 ha.)	HLKcB2 HLKhB1g1 RTRcA1 RTRhB1 MNLhB2	Ankasandra: 7 Gadi Ankanahalli:1,2,3,4,5,6,7,8,11,12,28,59,60 Sanabanahalli:15,16,18,19,20,24,25,26,27,29,30,31,32,33 Thalekoppa:82,106,117,118,119,120,121,122,123,124,125	Deep to very deep (100- >150 cm), red sandy loam to sandy clay loam soils with slopes of 0-3%, gravelly (15-35%) and slight to moderate erosion	**Sole Crops:** Ragi, Upland paddy, Maize, Sorghum, Fodder sorghum, Sunflower, Groundnut, Redgram, Fieldbean, Cowpea **Intercropping:** Redgram+Fodder sorghum Ragi+Cowpea, Ragi+Redgram, Ragi+Fieldbean	Neem, Silver Oak **Grasses** *Styloxanthes hamata*, *Styloxanthes Scabra*, Hybrid Napier, Sesbania,	**Vegetables**: Onion, Tomato, Brinjal, Chillies, Coriander, Drumstick. **Flower crops:** Marigold, Chrysanthemum, China aster, Crossandra, Jasmine. **Fruit crops/ Plantation crops:** Mango, Sapota, Guava, Cashew, Coconut Pomegranate, Jackfruit, Musambi, Arecanut.	Summer ploughing, cultivation on raised beds with mulches, Drip irrigation and suitable conservation practices (Crescent Bunding with Catch Pit etc)
LMU 2 (158 ha.)	KDThB1 KDTiA1 KDTiB1 TDGhB1	Gadi Ankanahalli: 22,23,24 ,25,26,27,29,30,31,32 ,33,34,35,36,37,38,39 ,40,41,21_TANK Maranahalli:1,5,6,7,14,16,17,18,19,20,21,23,24_TANK,28,29,30,31,32,34,40,41,42,43,44,45,46,47,48,49,70,71,72,77, 78,79,80,81 Sanabanahalli: 11,12,13,28,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,61,XX	Very deep (>150 cm), black sandy clay loam to sandy clay soils with slopes of 0-3% and slight erosion	**Sole crops**: Sorghum, Sunflower, Fodder sorghum, Redgram, Field bean, Horse gram. **Intercropping:** Redgram+Fodder sorghum	Hebbevu, Silveroak **Grasses:** *Styloxanthes hamata*, *Styloxanthes scabra*, Hybrid napier	**Vegetables:** Brinjal, Tomato, chillies, Cucurbits. **Flower crops:** Marigold, Chrysanthemum. **Fruit crops/ Plantation crops:** Pomegranate, Tamarind, Custard, Apple, Amla, Lime, Musambi Arecanut, Coconut.	Application of FYM and micronutrients, drip irrigation, Mulching, suitable conservation practises

LMU 3 (192 ha.)	BPRcB1 BPRhB1g1 BPRhB2 NGPhB2	Ankasandra:2,3,4,5,6 Madhenahalli:123,153,154,155,156, HATTI Maranahalli:2,3,4,8,9,10,11,12,13,15,22,25,26,27,33,35,36,37,38,39,82,83,84,85,86,87 Sanabanahalli:1,2,3,4,5,6,7,8,9,10,35,36,37,38,39,59,60,62,63,64,65,66,67,68,69,71 Thalekoppa:83,101,102,103,104,105,111,112	Deep (100-150 cm), gravelly red sandy loam to sandy clay loam soils with slopes of 1-3%, gravelly (15-35%) and slight to moderate erosion	**Sole Crop:** Ragi, Upland paddy, Maize, Sorghum, Fodder sorghum, Groundnut, Redgram, Fieldbean, Cowpea **Intercropping:** Redgram+Fodder sorghum Ragi+Cowpea Ragi+Redgram Ragi+Fieldbean	Neem, Silver Oak **Grasses** *Styloxanthes hamata*, *Styloxanthes Scabra*, Hybrid Napier, Sesbania,	**Vegetables**: Onion, Tomato, Brinjal, Chillies, Coriander, Drumstick **Flower crops:** Jasmine, Chrysanthemum, China aster, Marigold **Fruit crops/ Plantation crops:** Mango, Sapota, Guava, Cashew, Custard apple, Amla, Jackfruit, Pomegranate, Musambi, Arecanut, Coconut	Summer ploughing, sowing across the slope and split application of nitrogen fertilizers. Application of tank silt and drip irrigation is recommended

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Sanabanahalli Microwatershed

- The soil phases identified in the microwatershed belonged to the soil series of BPR 157 ha (34%), KDT 108 ha (24%), HLK 71 ha (15%), TDG 49 ha (11%), NGP 36 ha (8%), RTR 19 ha (4%) and MNL 6 ha (1%).
- As per land capability classification, an area of about 97 per cent in the microwatershed falls under arable land category (Class II & III). The major limitations identified in the arable lands were soil and erosion.
- On the basis of soil reaction, maximum area of about 385 ha (83%) is slightly acid to strongly acid (pH 5.0 -6.5). An area of about 62 ha (13%) is neutral (pH 6.5-7.3).

❖ **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

(Slightly acid to strongly acid soils)

1. Application of lime in the form of calcium carbonate or limestone ($CaCO_3$)
2. 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.
3. Use of rock phosphate (30-50 % of CaO, which helps in improving soil pH).
4. Application of basic fertilizers (Sodium nitrate, basic slag etc, reduces acidity in acid soils)

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

Alkaline soils

(Slightly alkaline to moderately alkaline soils)

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

Neutral soils

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

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

Soil Degradation

Soil erosion is not a major factor affecting the soil health in the microwatershed. Out of total 462 ha area in the microwatershed, an area of about 146 ha is suffering from moderate erosion. These areas need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of information and communication of benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning in IWMP is focusing on preparation of

1. Soil and Water Conservation 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 (Saturation Plan) are briefly presented below.

- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.
- **Surface soil texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.
- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Sanabanahalli microwatershed.

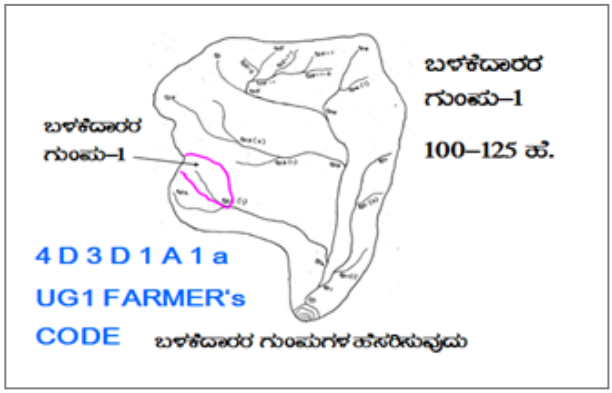
- **Organic Carbon:** The OC content (an index of available Nitrogen) is medium (0.5-0.75%) in about 76 ha (16%) area and low (<0.5%) in about 371 ha (80%). The areas that are low and medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops costs Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be supplemented by 25% in addition to the recommended level in 371 ha area where OC is less than 0.5% and 76 ha area medium (0.5-0.75%) in OC. 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**: The available phosphorus is high (>57 kg/ha) in the entire area.
- **Available Potassium:** Available potassium is medium in maximum area of 383 ha (83%) in the microwatershed and an area of about 64 ha (14%) is low (<145kg/ha) in available potassium. Hence, in all these plots, where available potassium is low and medium, for all the crops, additional 25 % potassium may be applied.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. It is medium in 413 ha (90%) and low in an area of 33 ha (7%). These areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** Available boron is medium in an area of 169 ha (37%) and low in 278 ha (60%) in the microwatershed. These areas need to be applied with sodium borate @ 10 kg/ha as soil application or 0.2% borax as foliar application to correct the boron deficiency.
- **Available Iron:** An area of about 398 ha (86%) is sufficient and 48 ha (10%) is deficient in available iron in the microwatershed.
- **Available Manganese and Available Copper:** Entire area in the microwatershed is sufficient for both available manganese and copper.
- **Available Zinc:** It is deficient (<0.6 ppm) in 371 ha (80%) area of the microwatershed. Application of Zinc sulphate @25 kg/ha is to be recommended and about 76 ha (16%) area is sufficient (>0.6 ppm) in available Zinc.
- **Soil acidity:** The microwatershed has 385 ha (83%) area with soils that are slightly to strongly acid. These areas need application of lime (Calcium Carbonate).
- **Land Suitability for various crops:** Areas that are highly, moderately and marginally suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase 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 Sanabanahalli 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
- Soil gravelliness
- Available water capacity
- Soil slope
- Soil erosion
- Land capability
- Present land use and land cover
- Crop suitability
- Rainfall
- Hydrology
- Water Resources
- Socio-economic data
- Contour plan with existing features- network of waterways, pothissa boundaries, cut up/ minor terraces etc.
- Cadastral map (1:7920 scale)
- Satellite imagery (1:7920 scale)



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

Steps for Survey and Preparation of Treatment Plan

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

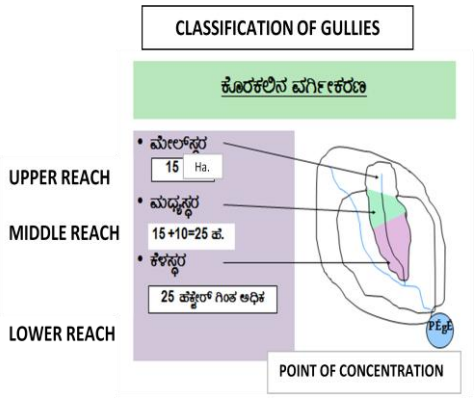
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

9.1.1 Arable Land Treatment

A. BUNDING

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

Measurement of Land Slope

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

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

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

Note: (i) The above intervals are maximum.

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

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

Section of the Bund

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

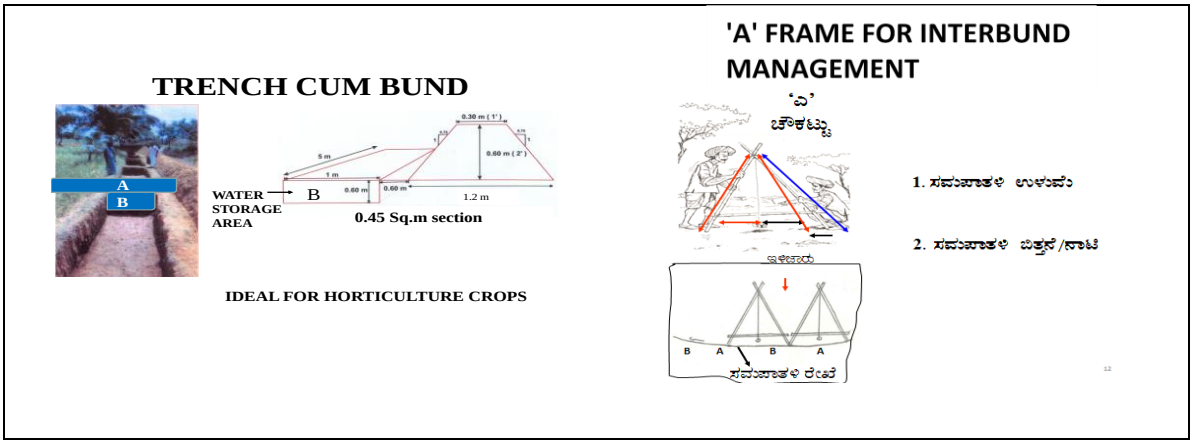
Recommended Bund Section

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 black clayey soils	
0.6	3.1	0.7	1.78:1	1.29	Medium black clayey soils	
0.5	3	0.85	1.47:1	1.49		

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below



Size of Borrow Pit/ 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

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

C. Farm Ponds

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

D. Diversion channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

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

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

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

e) Detailed Leveling Survey using Dumpy Level / Total Station has to be carried out to arrive at the site-specific designs as shown in the Manual.

f) The location of ground water recharge structures are decided by examining the lineaments and fracture zones from geological maps.

g) Rainfall intensity data of the nearest Rain Gauge Station is considered for Hydrologic Designs.

h) Silt load to the Storage/Recharge structures is reduced by providing vegetative, boulder and earthern checks in the natural water course. Location and design details are given in the Manual.

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been generated which shows the spatial distribution and extent of area. A maximum area of about 289 ha (63%) requires trench cum bunding, about 121 ha (26%) area requires graded bunding and a small area of about 37 ha (8%) requires Bunding / Strengthening of existing bunds. The conservation plan generated may be presented to all the stakeholders including farmers and after considering their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

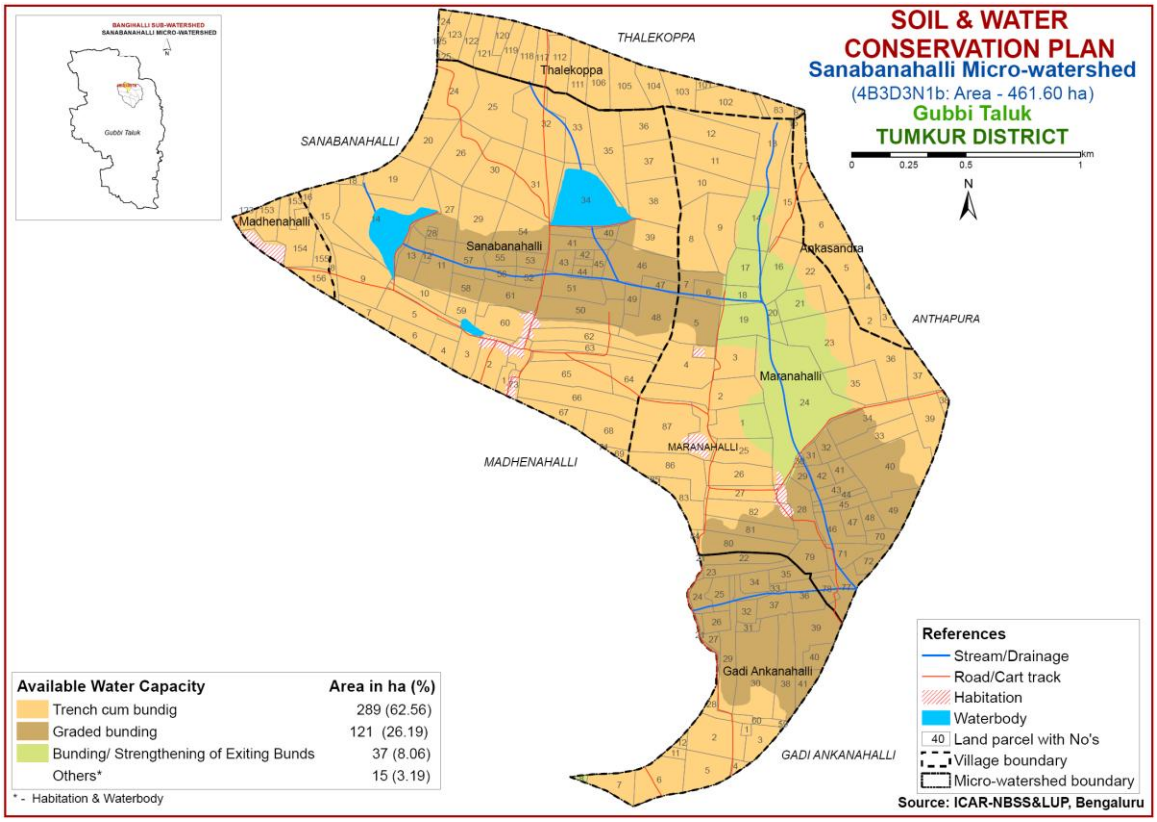


Fig. 9.1 Soil and Water Conservation Plan map of Sanabanahalli Microwatershed

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

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

References

1. FAO (1976) Framework for Land Evaluation, Food and Agriculture Organization, Rome.72 pp.
2. FAO (1983) Guidelines for Land Evaluation for Rainfed Agriculture, FAO, Rome, 237 pp.
3. IARI (1971) Soil Survey Manual, All India Soil and Land Use Survey Organization, IARI, New Delhi, 121 pp.
4. Katyal, J.C. and Rattan, R.K. (2003) Secondary and Micronutrients; Research Gap and future needs. Fert. News 48 (4); 9-20.
5. Naidu, L.G.K., Ramamurthy, V., Challa, O., Hegde, R. and Krishnan, P. (2006) Manual Soil Site Suitability Criteria for Major Crops, NBSS Publ. No. 129, NBSS &LUP, Nagpur, 118 pp.
6. Natarajan, A. and Dipak Sarkar (2010) Field Guide for Soil Survey, National Bureau of Soil Survey and Land Use Planning (ICAR), Nagpur, India.
7. Natarajan, A., Rajendra Hegde, Raj, J.N. and Shivananda Murthy, H.G. (2015) Implementation Manual for Sujala-III Project, Watershed Development Department, Bengaluru, Karnataka.
8. Sarma, V.A.K., Krishnan, P. and Budihal, S.L. (1987) Laboratory Manual, Tech. Bull. 23, NBSS &LUP, Nagpur.
9. Sehgal, J.L. (1990) Soil Resource Mapping of Different States of India; Why and How? National Bureau of Soil Survey and Land Use Planning, Nagpur, 49 pp.
10. Shivaprasad, C.R., R.S. Reddy, J. Sehgal and M. Velayuthum (1998) Soils of Karnataka for Optimizing Land Use, NBSS Publ. No. 47b, NBSS & LUP, Nagpur, India.
11. Soil Survey Staff (2006) Keys to Soil Taxonomy, Tenth edition, U.S. Department of Agriculture/ NRCS, Washington DC, U.S.A.
12. Soil Survey Staff (2012) Soil Survey Manual, Handbook No. 18, USDA, Washington DC, USA.

Appendix I

Sanabanahalli Microwatershed

Soil Phase Information

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Ankasandra	2	2.47	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	Not Available	IIIes	TCB
Ankasandra	3	0.51	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	Not Available	IIIes	TCB
Ankasandra	4	0.53	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	Not Available	IIIes	TCB
Ankasandra	5	3.47	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	2 Bore well	IIIes	TCB
Ankasandra	6	3.25	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	1 Bore well	IIIes	TCB
Ankasandra	7	2.76	MNLhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Ragi (Ra)	Not Available	IIIe	TCB
Gadi Ankanahalli	1	0.22	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Gadi Ankanahalli	2	3.87	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Coconut (Mn+CN)	Not Available	IIs	TCB
Gadi Ankanahalli	3	1.58	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Gadi Ankanahalli	4	0.33	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Gadi Ankanahalli	5	2.86	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Gadi Ankanahalli	6	3.46	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Gadi Ankanahalli	7	1.89	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Gadi Ankanahalli	8	0.14	RTRcA1	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Ragi (Ra)	Not Available	IIs	Bunding/ Field Bunds
Gadi Ankanahalli	11	0.41	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Gadi Ankanahalli	12	0.28	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Gadi Ankanahalli	21	0.37	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Waterbody	Not Available	IIs	Graded bunding
Gadi Ankanahalli	22	1.77	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	1 Bore well	IIs	Graded bunding
Gadi Ankanahalli	23	1.59	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	24	1.2	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	25	1.26	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Gadi Ankanahalli	26	1.05	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	27	0.72	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	28	0.85	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Gadi Ankanahalli	29	3.19	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	3 Bore well	IIs	Graded bunding
Gadi Ankanahalli	30	7.17	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIs	Graded bunding
Gadi Ankanahalli	31	0.42	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	32	0.88	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	33	0.91	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	1 Bore well	IIs	Graded bunding
Gadi Ankanahalli	34	1.15	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	35	1.05	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	36	1.83	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	3 Bore well,1 Open well	IIs	Graded bunding
Gadi Ankanahalli	37	1.45	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	38	3.7	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	3 Bore well	IIs	Graded bunding
Gadi Ankanahalli	39	3.37	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	1 Bore well	IIs	Graded bunding
Gadi Ankanahalli	40	1.14	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut+ Ragi (CN+Ar+Ra)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	41	1.12	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	Not Available	IIs	Graded bunding
Gadi Ankanahalli	59	0.09	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Gadi Ankanahalli	60	0.68	RTRhB1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Tamarind (Td)	Not Available	IIs	TCB
Madhenahalli	123	0.66	BPRhB1g1	LMU-3	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Madhenahalli	153	2.2	BPRhB1g1	LMU-3	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIIs	TCB
Madhenahalli	154	3.66	BPRhB1g1	LMU-3	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIIs	TCB
Madhenahalli	155	0.9	BPRhB1g1	LMU-3	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Madhenahalli	156	1.42	BPRhB1g1	LMU-3	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIIs	TCB
Maranahalli	1	3.42	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut+Arecanut (CN+Ar)	1 Bore well	IIs	Bunding/ Field Bunds

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Maranahalli	2	4.9	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Coconut (Mn+CN)	1 Bore well	IIIs	TCB
Maranahalli	3	3.16	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIIs	TCB
Maranahalli	4	4.05	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIIs	TCB
Maranahalli	5	3.75	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Maranahalli	6	1.17	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIs	Graded bunding
Maranahalli	7	1.39	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Maranahalli	8	4.08	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	2 Bore well	IIIes	TCB
Maranahalli	9	4.02	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	1 Bore well	IIIes	TCB
Maranahalli	10	3.31	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Ragi (Ra)	Not Available	IIIes	TCB
Maranahalli	11	4.09	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Ragi (Ra)	Not Available	IIIes	TCB
Maranahalli	12	4.75	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Ragi (Ra)	Not Available	IIIes	TCB
Maranahalli	13	5.14	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	1 Bore well	IIIes	TCB
Maranahalli	14	4.06	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut+Arecanut (CN+Ar)	5 Bore well	IIs	Bunding/ Field Bunds
Maranahalli	15	3.74	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	Not Available	IIIes	TCB
Maranahalli	16	3.4	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIs	Bunding/ Field Bunds
Maranahalli	17	2.39	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	3 Bore well	IIs	Bunding/ Field Bunds
Maranahalli	18	1.31	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIs	Bunding/ Field Bunds
Maranahalli	19	3.65	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIs	Bunding/ Field Bunds
Maranahalli	20	0.45	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIs	Bunding/ Field Bunds
Maranahalli	21	2.5	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIs	Bunding/ Field Bunds
Maranahalli	22	3.4	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Ragi (Ra)	1 Bore well	IIIes	TCB
Maranahalli	23	5.69	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut+Ragi (CN+Ra)	1 Bore well	IIs	Bunding/ Field Bunds
Maranahalli	24	14.54	KDTiA1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	4 Bore well	IIs	Bunding/ Field Bunds
Maranahalli	25	2.89	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Coconut (Mn+CN)	Not Available	IIIs	TCB

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Maranahalli	26	2.81	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Ragi (Mn+Ra)	Not Available	IIIs	TCB
Maranahalli	27	2.01	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Maranahalli	28	2.93	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Coconut (Mn+CN)	Not Available	IIs	Graded bunding
Maranahalli	29	0.73	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	Graded bunding
Maranahalli	30	0.25	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Maranahalli	31	0.59	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Maranahalli	32	1.04	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Maranahalli	33	2.82	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	2 Bore well	IIIes	TCB
Maranahalli	34	3.49	KDThB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	2 Bore well	IIs	Graded bunding
Maranahalli	35	3.54	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	1 Bore well	IIIes	TCB
Maranahalli	36	4.75	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	2 Bore well	IIIes	TCB
Maranahalli	37	1.89	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango+Ragi (Mn+Ra)	Not Available	IIIes	TCB
Maranahalli	38	0.31	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Maranahalli	39	2.79	NGPhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Maranahalli	40	7.03	KDThB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	2 Bore well	IIs	Graded bunding
Maranahalli	41	0.76	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Maranahalli	42	0.92	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Maranahalli	43	1.21	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Maranahalli	44	0.53	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut (Ar)	Not Available	IIs	Graded bunding
Maranahalli	45	1.04	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut (Ar)	2 Bore well	IIs	Graded bunding
Maranahalli	46	1.83	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Maranahalli	47	1.04	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Maranahalli	48	0.9	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Maranahalli	49	2.21	KDThB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Maranahalli	70	0.9	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Maranahalli	71	1.77	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	Not Available	IIs	Graded bunding
Maranahalli	72	0.99	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIs	Graded bunding
Maranahalli	77	2.23	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut (Ar)	2 Bore well	IIs	Graded bunding
Maranahalli	78	0.88	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Maranahalli	79	2.01	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	Not Available	IIs	Graded bunding
Maranahalli	80	3.16	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	3 Bore well	IIs	Graded bunding
Maranahalli	81	2.73	KDTiB1	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Arecanut (Mn+Ar)	5 Bore well	IIs	Graded bunding
Maranahalli	82	3.48	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	3 Bore well	IIIs	TCB
Maranahalli	83	2.13	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	1 Bore well	IIIs	TCB
Maranahalli	84	0.13	BPRcB1	LMU-3	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
Maranahalli	85	0.12	BPRcB1	LMU-3	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
Maranahalli	86	3.96	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Maranahalli	87	6.01	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Sanabanahalli	1	0.64	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow	Not Available	IIIes	TCB
Sanabanahalli	2	2.41	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Sanabanahalli	3	1.81	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Sanabanahalli	4	1.2	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Sanabanahalli	5	3.19	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Sanabanahalli	6	1.72	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Sanabanahalli	7	1.23	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	Not Available	IIIes	TCB
Sanabanahalli	8	0.78	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Sanabanahalli	9	4.61	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango+Coconut (Mn+CN)	Not Available	IIIes	TCB
Sanabanahalli	10	1.63	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	Not Available	IIIes	TCB

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Sanabanahalli	11	2.92	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	2 Bore well	IIs	Graded bunding
Sanabanahalli	12	0.24	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Sanabanahalli	13	1.84	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Sanabanahalli	14	9.96	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	Not Available	IIs	TCB
Sanabanahalli	15	3.19	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Sanabanahalli	16	0.29	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Sanabanahalli	18	0.36	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	TCB
Sanabanahalli	19	3.69	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	TCB
Sanabanahalli	20	3.15	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Coconut (Mn+CN)	Not Available	IIs	TCB
Sanabanahalli	24	4.66	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIe	TCB
Sanabanahalli	25	5.95	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Sanabanahalli	26	3.99	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Sanabanahalli	27	3.21	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	TCB
Sanabanahalli	28	0.23	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	Graded bunding
Sanabanahalli	29	4.09	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	TCB
Sanabanahalli	30	4.24	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Sanabanahalli	31	5.21	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	2 Bore well	IIs	TCB
Sanabanahalli	32	4.92	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	1 Bore well	IIs	TCB
Sanabanahalli	33	3.92	HLKhB1g1	LMU-1	Very deep (>150 cm)	Sandy clay loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Open well	IIs	TCB
Sanabanahalli	34	6.87	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Sanabanahalli	35	4.77	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	Not Available	IIIes	TCB
Sanabanahalli	36	2.96	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Sanabanahalli	37	3.54	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango+Coconut (Mn+CN)	Not Available	IIIes	TCB
Sanabanahalli	38	4.2	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Sanabanahalli	39	3.24	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Sanabanahalli	40	1.33	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Sanabanahalli	41	1.95	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	2 Bore well	IIs	Graded bunding
Sanabanahalli	42	0.33	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Sanabanahalli	43	0.93	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	2 Bore well	IIs	Graded bunding
Sanabanahalli	44	0.48	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Sanabanahalli	45	0.69	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Sanabanahalli	46	5.03	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Sanabanahalli	47	0.83	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Sanabanahalli	48	4.55	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	1 Bore well	IIs	Graded bunding
Sanabanahalli	49	0.92	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	Not Available	IIs	Graded bunding
Sanabanahalli	50	3.52	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	Not Available	IIs	Graded bunding
Sanabanahalli	51	2.77	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIs	Graded bunding
Sanabanahalli	52	0.96	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIs	Graded bunding
Sanabanahalli	53	0.86	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Sanabanahalli	54	4.08	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Arecanut (Mn+Ar)	1 Bore well	IIs	Graded bunding
Sanabanahalli	55	0.98	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	2 Bore well	IIs	Graded bunding
Sanabanahalli	56	0.95	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIs	Graded bunding
Sanabanahalli	57	1.95	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	3 Bore well	IIs	Graded bunding
Sanabanahalli	58	1.4	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Sanabanahalli	59	1.29	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut (CN)	Not Available	IIIes	TCB
Sanabanahalli	60	4.51	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Coconut+Arecanut (CN+Ar)	2 Bore well	IIIes	TCB
Sanabanahalli	61	2.9	TDGhB1	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Arecanut (CN+Ar)	2 Bore well	IIs	Graded bunding
Sanabanahalli	62	3.12	BPRhB1 g1	LMU-3	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Coconut (Mn+CN)	1 Bore well	IIIs	TCB

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Sanabanahalli	63	2.08	BPRhB1g1	LMU-3	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Sanabanahalli	64	4.19	BPRhB1g1	LMU-3	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	2 Bore well	IIIs	TCB
Sanabanahalli	65	4.16	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Ragi (Mn+Ra)	1 Bore well	IIIs	TCB
Sanabanahalli	66	4.62	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Sanabanahalli	67	1.8	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Sanabanahalli	68	2.77	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Sanabanahalli	69	0.37	BPRcB1	LMU-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	TCB
Sanabanahalli	71	0.02	BPRcB1	LMU-3	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
Sanabanahalli	73	0.57	Habitation	Others	Others	Others	Others	Others	Others	Others	Mango (Mn)	Not Available	Others	Others
Thalekoppa	82	0.15	MNLhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIe	TCB
Thalekoppa	83	0.96	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Thalekoppa	101	0.29	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Thalekoppa	102	3.08	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Thalekoppa	103	1.95	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Thalekoppa	104	1.78	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Thalekoppa	105	3.18	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Thalekoppa	106	2.54	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Mango+Coconut (Mn+CN)	Not Available	IIIe	TCB
Thalekoppa	111	2.03	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIes	TCB
Thalekoppa	112	2.41	BPRhB2	LMU-3	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Thalekoppa	117	1.33	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIe	TCB
Thalekoppa	118	2.01	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	1 Bore well	IIIe	TCB
Thalekoppa	119	1.49	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIe	TCB
Thalekoppa	120	0.88	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIe	TCB
Thalekoppa	121	1.98	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIe	TCB

Village	Sy No.	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Thalekoppa	122	1.36	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Ragi (Ra)	Not Available	IIIe	TCB
Thalekoppa	123	1.84	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIe	TCB
Thalekoppa	124	0.45	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIIe	TCB
Thalekoppa	125	0.24	HLKcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIe	TCB

Appendix II

Sanabanahalli Microwatershed

Soil Fertility Information

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Ankasandra	2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	3	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	4	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	5	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	6	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	7	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Gadi Ankanahalli	1	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Gadi Ankanahalli	2	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Gadi Ankanahalli	3	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Gadi Ankanahalli	4	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Gadi Ankanahalli	5	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Gadi Ankanahalli	6	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Gadi Ankanahalli	7	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Gadi Ankanahalli	8	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Gadi Ankanahalli	11	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Gadi Ankanahalli	12	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Gadi Ankanahalli	21	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	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)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	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)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	24	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	25	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	26	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Gadi Ankanahalli	27	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	28	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Gadi Ankanahalli	29	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	30	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	31	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	32	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	33	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	34	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	35	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	36	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	37	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	38	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	39	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	40	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	41	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Gadi Ankanahalli	59	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Gadi Ankanahalli	60	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Madhenahalli	123	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Madhenahalli	153	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Madhenahalli	154	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Madhenahalli	155	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Madhenahalli	156	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	1	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Maranahalli	3	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	4	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	5	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	6	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	7	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	8	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	9	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	10	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	11	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	12	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	13	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	14	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	15	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	16	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	17	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	18	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	19	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	20	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	21	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	22	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	23	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	24	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	25	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	26	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Maranahalli	27	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	28	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	29	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	30	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	31	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	32	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	33	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	34	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	35	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	36	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	37	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Low (<10 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	38	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	39	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	40	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	41	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	42	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	43	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	44	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	45	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	46	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	47	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	48	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	49	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	70	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Maranahalli	71	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	72	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	77	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	78	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	79	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	80	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	81	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	82	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	83	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	84	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Maranahalli	85	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	86	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	87	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	1	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	2	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	3	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	4	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	5	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	6	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	7	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	8	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	9	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	10	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	11	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Sanabanahalli	12	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	13	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	14	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	15	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	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)
Sanabanahalli	16	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	18	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	19	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	20	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	24	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	25	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	26	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	27	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	28	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	29	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	30	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	31	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	32	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	33	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	34	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Sanabanahalli	35	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	36	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	37	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	38	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	39	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Sanabanahalli	40	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	41	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	42	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	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)
Sanabanahalli	43	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	44	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	45	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	46	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	47	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	48	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	49	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	50	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	51	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	52	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	53	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	54	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	55	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	56	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	57	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	58	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	59	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	60	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	61	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	62	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Sanabanahalli	63	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Sanabanahalli	64	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	65	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	66	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	67	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	68	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	69	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	71	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Sanabanahalli	73	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Thalekoppa	82	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	83	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	101	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	102	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	103	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	104	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	105	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	106	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	111	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	112	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	117	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	118	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	119	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	120	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	121	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Thalekoppa	122	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Thalekoppa	123	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Thalekoppa	124	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 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)
Thalekoppa	125	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Deficient (<4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

Appendix III

Sanabanahalli Microwatershed
Soil Suitability Information

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Ground nut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder Sorghum	Upland-Paddy	Jasmine	Cowpea	Mulberry
Ankasandra	2	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	3	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	4	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	5	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	6	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	7	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Gadi Ankanahalli	1	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	2	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	3	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	4	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	5	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	6	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	7	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	8	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	11	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	12	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	21	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	22	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	23	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	24	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	25	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	26	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Ground nut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horsegram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder Sorghum	Upland-Paddy	Jasmine	Cowpea	Mulberry
Gadi Ankanahalli	27	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	28	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	29	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	30	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	31	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	32	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	33	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	34	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	35	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	36	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	37	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	38	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	39	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	40	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	41	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Gadi Ankanahalli	59	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S2t
Gadi Ankanahalli	60	S1	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S2t
Madhena halli	123	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Madhena halli	153	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Madhena halli	154	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Madhena halli	155	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Madhena halli	156	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	2	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Ground nut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder Sorghum	Upland-Paddy	Jasmine	Cowpea	Mulberry
Maranahalli	3	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	4	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	5	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S3t
Maranahalli	6	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S3t
Maranahalli	7	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S3t
Maranahalli	8	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	9	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	10	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	11	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	12	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	13	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	14	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	15	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Maranahalli	16	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	17	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	18	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	19	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	20	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	21	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	22	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Maranahalli	23	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	24	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	25	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	26	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	27	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	28	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	29	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	30	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	31	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	32	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Ground nut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder Sorghum	Upland-Paddy	Jasmine	Cowpea	Mulberry
Maranahalli	33	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Maranahalli	34	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	35	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Maranahalli	36	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Maranahalli	37	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Maranahalli	38	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Maranahalli	39	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Maranahalli	40	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	41	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	42	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	43	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	44	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	45	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	46	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	47	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	48	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	49	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	70	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	71	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	72	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	77	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	78	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	79	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	80	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	81	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t
Maranahalli	82	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	83	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	84	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	85	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Maranahalli	86	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Ground nut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder Sorghum	Upland-Paddy	Jasmine	Cowpea	Mulberry
Maranahalli	87	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	1	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	2	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	3	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	4	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	5	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	6	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	7	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	8	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	9	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	10	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabana halli	11	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabana halli	12	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabana halli	13	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabana halli	14	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	15	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	16	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	18	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	19	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	20	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	24	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	25	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	26	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabana halli	27	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Ground nut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horsegram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder Sorghum	Upland-Paddy	Jasmine	Cowpea	Mulberry
Sanabanahalli	28	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	29	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabanahalli	30	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabanahalli	31	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabanahalli	32	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabanahalli	33	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Sanabanahalli	34	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Sanabanahalli	35	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	36	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	37	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	38	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	39	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	40	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	41	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	42	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	43	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	44	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	45	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	46	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	47	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	48	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	49	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	50	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	51	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Ground nut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horsegram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder Sorghum	Upland-Paddy	Jasmine	Cowpea	Mulberry
Sanabanahalli	52	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	53	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	54	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	55	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	56	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	57	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	58	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	59	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	60	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	61	S3t	S3t	S3t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t	S2t	Nt	S2t	S2t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S3t
Sanabanahalli	62	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	63	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	64	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	65	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	66	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	67	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	68	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	69	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	71	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Sanabanahalli	73	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Thalekoppa	82	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Thalekoppa	83	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Thalekoppa	101	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Thalekoppa	102	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Thalekoppa	103	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horsegram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder Sorghum	Upland-Paddy	Jasmine	Cowpea	Mulberry
Thalekoppa	104	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Thalekoppa	105	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Thalekoppa	106	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	111	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Thalekoppa	112	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Thalekoppa	117	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	118	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	119	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	120	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	121	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	122	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	123	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	124	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t
Thalekoppa	125	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

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Chapter 1

EXECUTIVE SUMMARY

Baseline socioeconomic characterisation is prerequisite to prepare action plan for program implementation and to assess the project performance before making any changes in the watershed development program. The baseline provides appropriate policy direction for enhancing productivity and sustainability in agriculture.

Methodology: *Sanabanahalli microwatershed (Bangihalli sub-watershed, Gubbi taluk, Tumkur district) is located in between $13^0$27' – $13^0$28' North latitudes and ^{0}51'$76^0$54' East longitudes, covering an area of about 604.37 ha, bounded by Anthapura, Gadi Ankanahalli, Madhenahalli, Sanabanahalli and Thalekoppa villages with an length of growing period (LGP) 120-150 days. We used soil resource map as basis for sampling farm households to test the hypothesis that soil quality influence crop selection, and conservation investment of farm households. The level of technology adoption and productivity gaps and livelihood patterns were analyses. The cost of soil degradation and ecosystem services were quantified.*

Results: *The socio-economic outputs for the Sanabanahalli micro-watershed (Bangihalli sub-watershed, Gubbi taluk, Tumkur district) presented here.*

Social Indicators;

- *Male and female ratio is 40.3 to 59.7 per cent to the total sample population.*
- *Younger age 18 to 50 years group of population is around 52 per cent to the total population.*
- *Literacy population is around 57.6 per cent.*
- *Social groups belong to other backward castes (OBC) is around 45.5 per cent.*
- *Wood is the source of energy for a cooking among 27.3 per cent.*
- *About 27.3 per cent of households have a yashaswini health card.*
- *Majority of farm households 45.5% per cent are having MGNREGA card for rural employment.*
- *Dependence on ration cards for food grains through public distribution system is around 72.7 per cent.*
- *Swach bharath program providing closed toilet facilities around 72.7 per cent of sample households.*
- *Institutional participation is only 1.92 per cent of sample households.*

Economic Indicator*:*

- *The average land holding is 0.5 ha indicates that majority of farm households are belongs to marginal and small farmers. The accounted for dry land of 54.7 per cent and irrigated land of 45.3 per cent to total cultivated land among sample households.*

- *Agriculture is the main occupation among 10.5 per cent and agriculture is the main and non agriculture labour is subsidiary occupation for 86.8 per cent of sample households.*
- *The average value of domestic assets is around Rs. 67494 per household. Mobile and television are popular media mass communication.*
- *The average value of livestock is around Rs. 27500 per household; about 66.7 per cent of household are having livestock.*
- *The average per capita food consumption is around 731.6 grams (1605.1 kilo calories) against national institute of nutrition (NIN) recommendation at 827 gram. Around 72.7 per cent of sample households are consuming less than the NIN recommendation.*
- *The annual average income is around Rs.40810 per household. About 18.1 per cent of farm households are below poverty line.*
- *The per capita average monthly expenditure is around Rs.1194.*

Environmental Indicators-Ecosystem Services;

- *The value of ecosystem service helps to support investment to decision on soil and water conservation and in promoting sustainable land use.*
- *The onsite cost of different soil nutrients lost due to soil erosion is around Rs. 463 per ha/year. The total cost of annual soil nutrients is around Rs. 207147 per year for the total area of 461.60 ha.*
- *The average value of ecosystem service for food production is around Rs. 18763/ ha/year. Per hectare food production services is maximum in coconut (Rs. 78340) followed by mango (Rs. 76674), ragi (Rs.10415), horse gram (Rs. 8039), cowpea (Rs. 6799), greengram (Rs. 2496) maize (Rs. 353), bajra and sorghum is negative returns.*
- *The average value of ecosystem service for fodder production is around Rs. 10074/ ha/year. Per hectare fodder production services is maximum in maize (Rs. 35568) followed by bajra (Rs. 6367), sorghum (Rs.5443), horse gram (Rs. 1547) and ragi (Rs. 1445).*
- *The data on water requirement for producing one quintal of grain is considered for estimating the total value of water required for crop production. The per hectare value of water used and value of water was maximum in coconut (Rs. 256015) followed maize (Rs. 72440), green gram (Rs. 48736), mango (Rs. 48121), bajra (Rs. 46641), sorghum (Rs. 45171), horse gram (Rs. 21379), ragi (Rs. 12914) and cowpea (Rs. 9306).*

Economic Land Evaluation;

- *The major cropping pattern followed by bajra (1.0 %), coconut (12.7 %), cowpea (0.4 %), greengram (0.8 %), horse gram (16.9 %), maize (0.6 %), mango (12.6 %), ragi (35.0 %) and sorghum (20.1 %).*

- *In Sanabanahalli Microwatershed, major soil is soil of Balapura (BPR) series is having deep soil depth cover around 33.9 % of area. On this soil farmers are presently growing horse gram (34.3 %) mango (31.2 %) ragi (34.3 %), Hallikere (HLK) are also having very deep depth cover 15.47 % of area, the crops are horse gram (26.7 %) mango (10.9 %), ragi (49.4 %), sorghum (12.8 %) and Kadagathur (KDT) soil series having very deep soil depth cover around 23.57 % of areas, crops are green gram (25.1 %) and maize (14.9 %) ragi (59.8 %). Thondigere (TDG) soil series having very deep soil depth cover around 10.66 % of area, crops are bajra, coconut, cowpea, horse gram, ragi and sorghum.*
- *The total cost of cultivation and benefit cost ratio (BCR) in study area for mango ranges between Rs. 57315/ha in HLK soil (with BCR of 3.04) and Rs. 29944/ha in BPR soil (with BCR of 1.65).*
- *In ragi the cost of cultivation range between Rs. 31318/ha in KDT soil (with BCR of 1.23) and Rs. 24711/ha in BPR soil (with BCR of 1.25).*
- *In sorghum the cost of cultivation ranges between Rs. 38190/ha in TDG soil (with BCR of 1.11) and Rs. 22068/ha in HLK soil (with BCR of 1.23).*
- *In horse gram the cost of cultivation range between is Rs.24611/ha in HLK soil (with BCR of 1.20) and Rs. 11655/ha in TDG soil (with BCR of 1.38).*
- *In maize the cost of cultivation in KDT soil is Rs. 106350/ha (with BCR of 1.34).*
- *In bajra the cost of cultivation in TDG soil is Rs.47903/ha (with BCR of 0.84)*
- *In coconut the cost of cultivation in TDG soil is Rs.26467/ha (with BCR of 2.73) and green gram the cost of cultivation in KDT soil is Rs.34200/ha (with BCR of 1.07).*
- *The land management practices reported by the farmers are crop rotation, tillage practices, fertilizer application and use of farm yard manure (FYM). Due to higher wages farmer are following labour saving strategies is not prating soil and water conservation measures. Less ownership of live stock limiting application of FYM.*
- *It was observed soil quality influences on the type and intensity of land use. More fertilizer applications in deeper soil to maximize returns.*

Suggestions;

- *Involving farmers is watershed planning helps in strengthing institutional participation.*
- *The per capita food consumption and monthly income is very low. Diversifying income generation activities from crop and livestock production in order to reduce risk related to drought and market prices.*
- *Majority of farmers reported that they are not getting timely support/extension services from the concerned development departments.*

- *By strengthing agricultural extension for providing timely advice improved technology there is scope to increase in net income of farm households.*
- *By adopting recommended package of practices by following the soil test fertiliser recommendation there is scope to increase yield in mango (89.9 to 55.3 %), ragi (67.8 to 59.5 %), sorghum (56.0 to 42.8 %), hors egram (49.4 to 29.1 %), coconut (47.7 %) cowpea (39.3 %), bajra (28.8 %), maize (28.6 %) and greengram (17.4 %).*

Chapter 2

INTRODUCTION

Watershed Development program aim to restore degraded watersheds in rainfed regions to increase their capacity to capture and store rain water, reduce soil erosion, and improved soil nutrients and carbon contents so they can produce greater agricultural yields and other benefits. As majority of rural poor live in these regions and dependent on natural resources for their livelihood and sustenance, improvements in agricultural yields improve human welfare and simultaneously improve national food security.

Sujala–III Watershed Development Project conceptualised by the Government of Karnataka and implemented by the Watershed Development Department of Government of Karnataka with tripartite cost-sharing arrangements. The World Bank through International Development Association provided major portion of plan outlay as a loan to Government of India and in turn loan to Government of Karnataka.

The Project Development Objective of Sujala-III is to demonstrate more effective watershed management through greater integration of programs related to rain fed agriculture, innovative and science based approaches and strengthened institutions and capacities. The project is implemented in 11 districts of Bidar, Vijayapura, Gulbarga, Yadgir, Koppal, Gadag, Raichur, Davanagere, Tumkur, Chikkamangalur and Chamarajanagar which have been identified by the Watershed Development Department based on rainfall water and socio-economic conditions. The project will be implemented over six years and linked with the centrally financed IWMP.

Economic evaluations can better guide watershed development program development and implementation, as well as raise awareness of benefits of ecosystem restoration for food security and poverty alleviation program. The present study aims to characterize socio-economic status of farm households, assess the land and water use status, evaluate the economic viability of land use and prioritize farming constraints and suggest the measures for soil and water conservation for sustainable agriculture.

Objectives of the study

1. To characterize socio-economic status of farm households
2. To evaluate the economic viability of land use and land related constraints
3. To estimate the ecosystem service provided by the watershed and
4. To suggest alternatives for sustainable agriculture production.

Chapter 3

METHODOLOGY

Study area

Sanabanahalli micro watershed is located Eastern Dry Zone of Karnataka. The zone covers entire Bangalore and Kolar districts and 2 taluks of Tumkur. It has an area of 1.80 M ha with 0.85 M ha under cultivation. About 0.23 M ha is irrigated mainly from tanks and wells. Elevation ranges from 800 to 1500m MSL with major area falling between 800 and 900m. The major soil type is non-gravelly red loam with a narrow belt of lateritic soil. Average annual rainfall ranges between 680 and 890mm. The principal crops of the zone are ragi, rice, pulses, maize, oil seeds and mulberry. A sizeable area is also under vegetables and flowering plants**.** It's represented Agro Ecological Region (AER)-3 having LGP 120-150 days.

Sanabanahalli micro-watershed (Bangihalli sub-watershed, Gubbi taluk, Tumkur district) is located in between $13^0$27' – $13^0$28' North latitudes and $76^0$51' – $76^0$54' East longitudes, covering an area of about 604.37 ha, bounded by Anthapura, Gadi Ankanahalli, Madhenahalli, Sanabanahalli and Thalekoppa villages.

Sampling Procedure:

In this study we have followed soil variability as criterion for sampling the farm households. In each micro-watershed the survey numbers and associated soil series are listed. Minimum three farm households for each soil series were taken and summed up to arrive at total sample for analysis. Sources of data and analysis:

Sources of data and analysis:

For evaluating the specific objectives of the study, primary data was collected from the sample respondents by personal interview method with the help of pre-tested questionnaire. The data on socio-economic characteristics of respondents such as family size and composition, land holdings, asset position, occupational pattern and education level was collected. The present cropping pattern and the level of input use and yields collected during survey. The data collected from the representative farm households were analysed using Automated Land Potential Evaluation System (Figure 2).

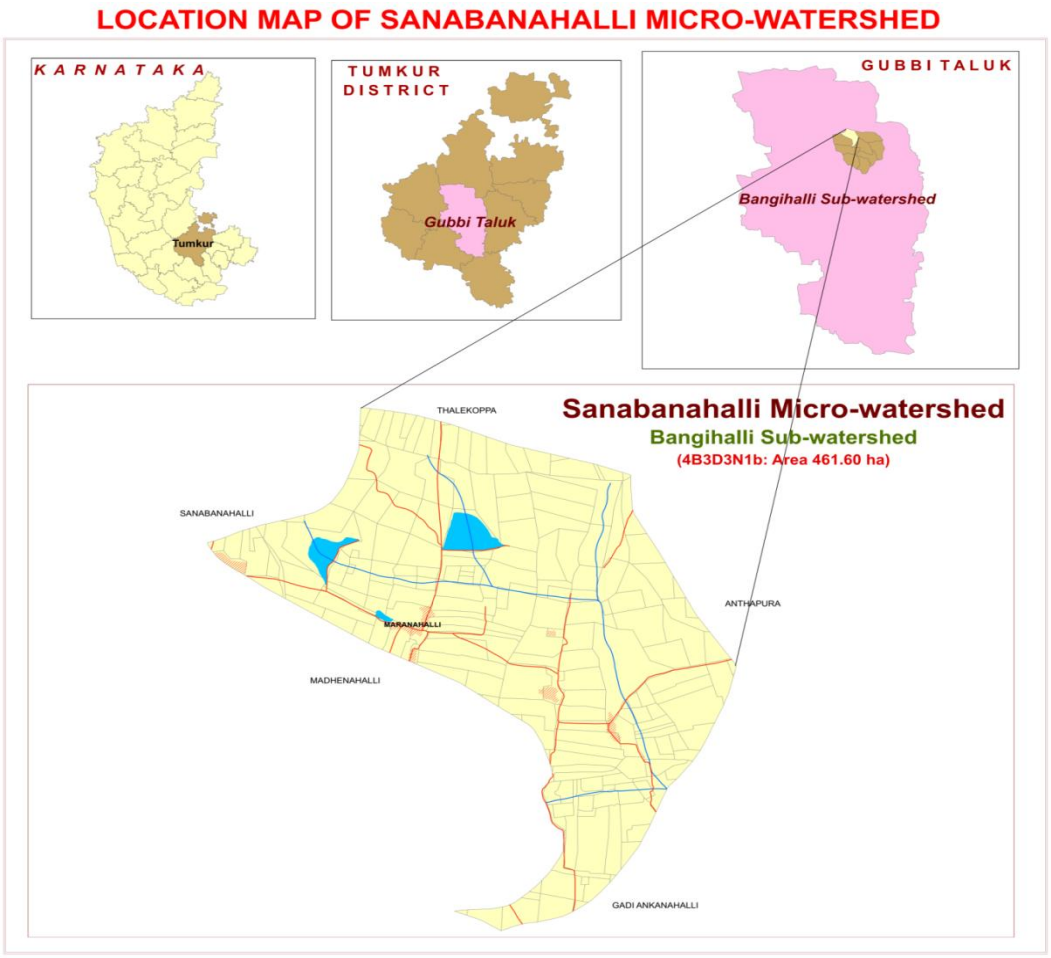


Figure 1: Location of study area

Steps followed in socio-economic assessment

1. •After the completion of soil profile study link the cadastral number to the soil profile in the micro watershed.
2. • Download the names of the farmers who are owning the land for each cadastral number in the Karnataka BHOOMI Website.
3. • Compiling the names of the farmers representing for all the soil profiles studied in the micro watershed for socio-economic Survey.
4. • Conducting the socioeconomic survey of selected farm households in the micro watershed .
5. • Farm households database created using the Automated Land Potential Evaluation System (ALPES) for analysis of socio economic status for each micro watershed .
6. • Synthesis of tables and preparation of report for each micro watershed .

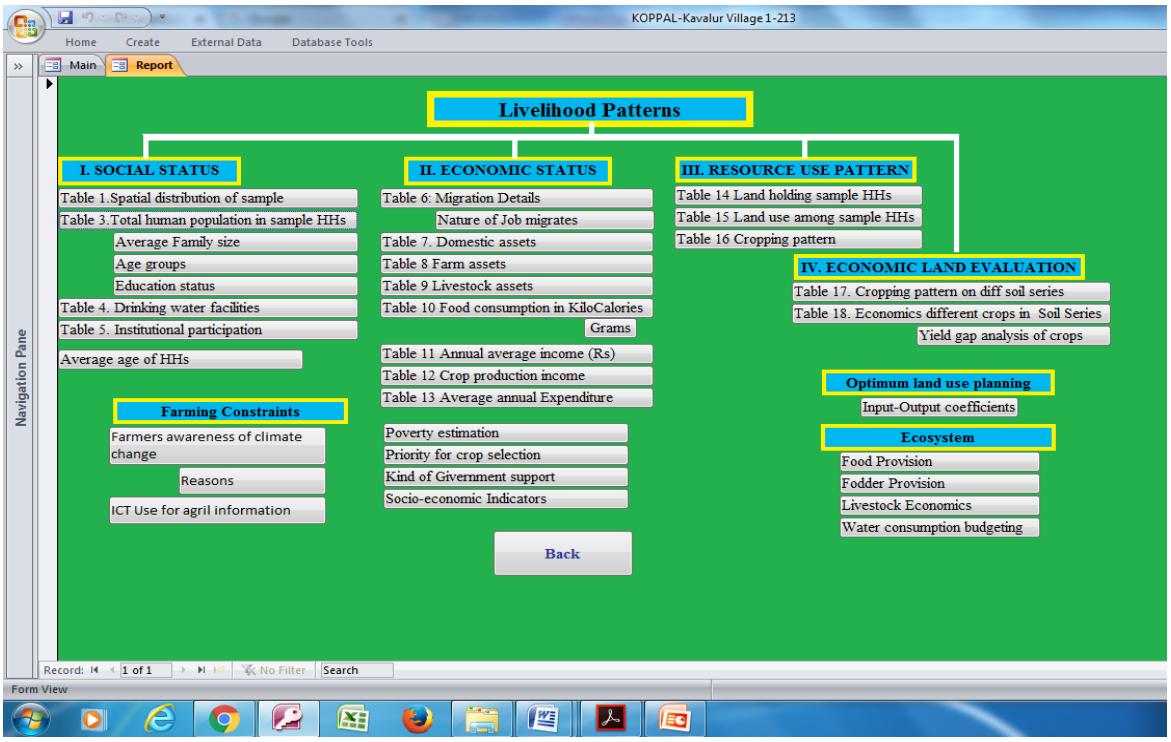


Figure 2: ALPES FRAMEWORK

The sample farmers were post classified in to marginal and small (0.0 to <=2 ha), medium and semi medium (>2 to <=10 ha) and large (>10 ha). The steps involved in estimation of soil potential involve estimation of total cost of cultivation, the yield/gross returns and net income per hectare. The cost of inputs such seed, manure and fertilizer, plant protection chemicals, payment towards human and bullock labour and interest on working capita are included under operational costs. In the case of perennial crops, the cost of establishment was estimated by using actual physical requirements and prevailing market prices. Estimation cost included maintenance cost up to bearing period. The value of main product and by product from the crop enterprise at the market rates were the gross returns of the crop. Net returns were worked out by deducting establishment and maintained cost from gross returns.

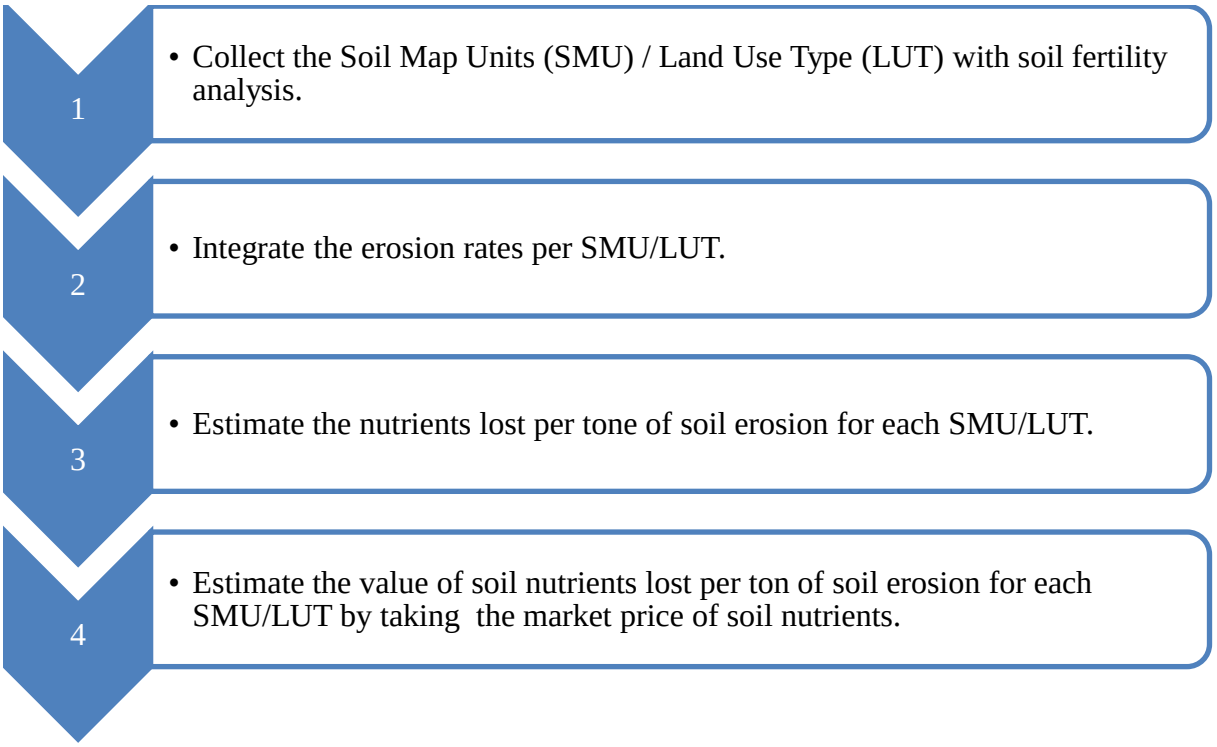
Operational Cost = cost of seeds, fertilizers, pesticides. Cost of human and bullock labour, cost of machinery, cost of irrigation water + interest on working capital.
Gross returns = Yield (Quintals/hectare)*Price (Rs/Quintal)
Net returns = Gross returns-Operational cost.
Benefit Cost Ratio = Net returns/Total cost.

Economic suitability classes: once each land use –land area combination has been assigned an economic value by the land evaluation, the question arises as to its 'suitability', that is, the degree to which it satisfies the land user. The FAO framework defines two suitability orders: 'S'(suitable if benefit cost ratio (BCR)>1) and 'N'(not suitable if (BCR<1), which are dived into five economic suitability classes:'S1'(highly suitable if BCR>3), 'S2'(suitable if BCR>2 and <3),'S3'(Marginally suitable if BCR >1 and <2), 'N1'(Not suitable for economic reasons but physically suitable) and 'N2'(not suitable for physical reasons). The limit between 'S3' and 'N1'must be at least at the point of financial feasibility (i.e. net returns, NPV, or IRR>0 and BCR>1). The other limits depend on social factors such as farm size, family size, alternative employment or investment possibilities and wealth expectations; these need to be specified for the Soil series.

Economic Valuation of Soil ecosystem services:

The replacement cost approach was followed for estimating the onsite cost of soil erosion, Market price method was followed for estimating the value of food and fodder production. Value transfer menthods was followed for estimating the value of water demand by different crops in the micro watershed.

Steps followed in Replacement cost methods for estimation of onsite cost of soil erosion



Chapter 4

RESULTS AND DISCUSSIONS

The demographic information shows that the household population dynamics encompasses the socioeconomic status of the farmer. For a rural family, the household size should be optimal to earn a comfortable livelihood through farm and non-farm wage earning. The total number of population in watershed area was 52, out of which 40.3 per cent were males and 59.7 per cent females. Average family size of the households is 4.7. Age is an important factor, which affects the potential employment and mobility status of respondents. The data on age wise distribution of farmers in the sample households indicated that majority of the farmers are coming under the age group of 30 to 50 years (30.7 %) followed by 0 to18 years (26.9 %), more than 50 years (21.1 %) and 18 to 30 years (21.1 %). Hence, in the study area in general, the respondents were of young and middle age, indicating thereby that the households had almost settled with whatever livelihood options they were practicing and sample respondents were young by age who could venture into various options of livelihood sources. Data on literacy indicated that 25.0per cent of respondents were illiterate and 57.6 per cent literate (Table 1).

Table 1: Human population among sample households in Sanabanahalli Microwatershed

Particulars	**Units**	**Value**
Total human population in sample HHs	Number	52
Male	% to total Population	40.3
Female	% to total Population	59.7
Average family size	Number	4.7
Age group		
0 to 18 years	% to total Population	26.9
18 to 30 years	% to total Population	21.1
30 to 50 years	% to total Population	30.7
>50 years	% to total Population	21.1
Average age	Age in years	35.5
Education Status		
Illiterates	% to total Population	25.0
Literates	% to total Population	57.6
Primary School (<5 class)	% to total Population	15.3
Middle School (6- 8 class)	% to total Population	7.6
High School (9- 10 class)	% to total Population	34.6
Others	% to total Population	17.3

The ethnic groups among the sample farm households found to be 45.5per cent belonging to other backward castes (OBC) followed by 54.6 per cent belonging to general

castes. About 27.3 per cent of sample households are using fire wood as source of fuel for cooking gas 72.7per cent. All the sample farmers are having electricity connection. About 27.3 per cent are sample households having health cards. Majority 45.3 per cent are having MNREGA job cards for employment generation. About 72.7 per cent of farm households are having ration cards for taking food grains from public distribution system. About 72.7 per cent of farm households are having toilet facilities and drinking water facilities tube well 100.0 per cent of farm households, (Table 2 and Figure 3).

Table 2: Basic needs of sample households in Sanabanahalli Microwatershed

Particulars	Units	Value
Social groups		
OBC	% of Households	45.5
General	% of Households	54.6
Types of fuel use for cooking		
Fire wood	% of Households	27.3
Gas	% of Households	72.7
Energy supply for home		
Electricity	% of Households	100
Number of households having Health card		
Yes	% of Households	27.3
No	% of Households	72.7
MGNREGA Card		
Yes	% of Households	45.5
No	% of Households	54.6
Ration Card		
Yes	% of Households	72.7
No	% of Households	27.3
Households with toilet		
Yes	% of Households	72.7
No	% of Households	27.3
Drinking water facilities		
Tube Well	% of Households	100

The data collected on the source of drinking water in the study area is presented in Table 2. All the sample respondents are having tube well sources for water supply for domestic purpose.

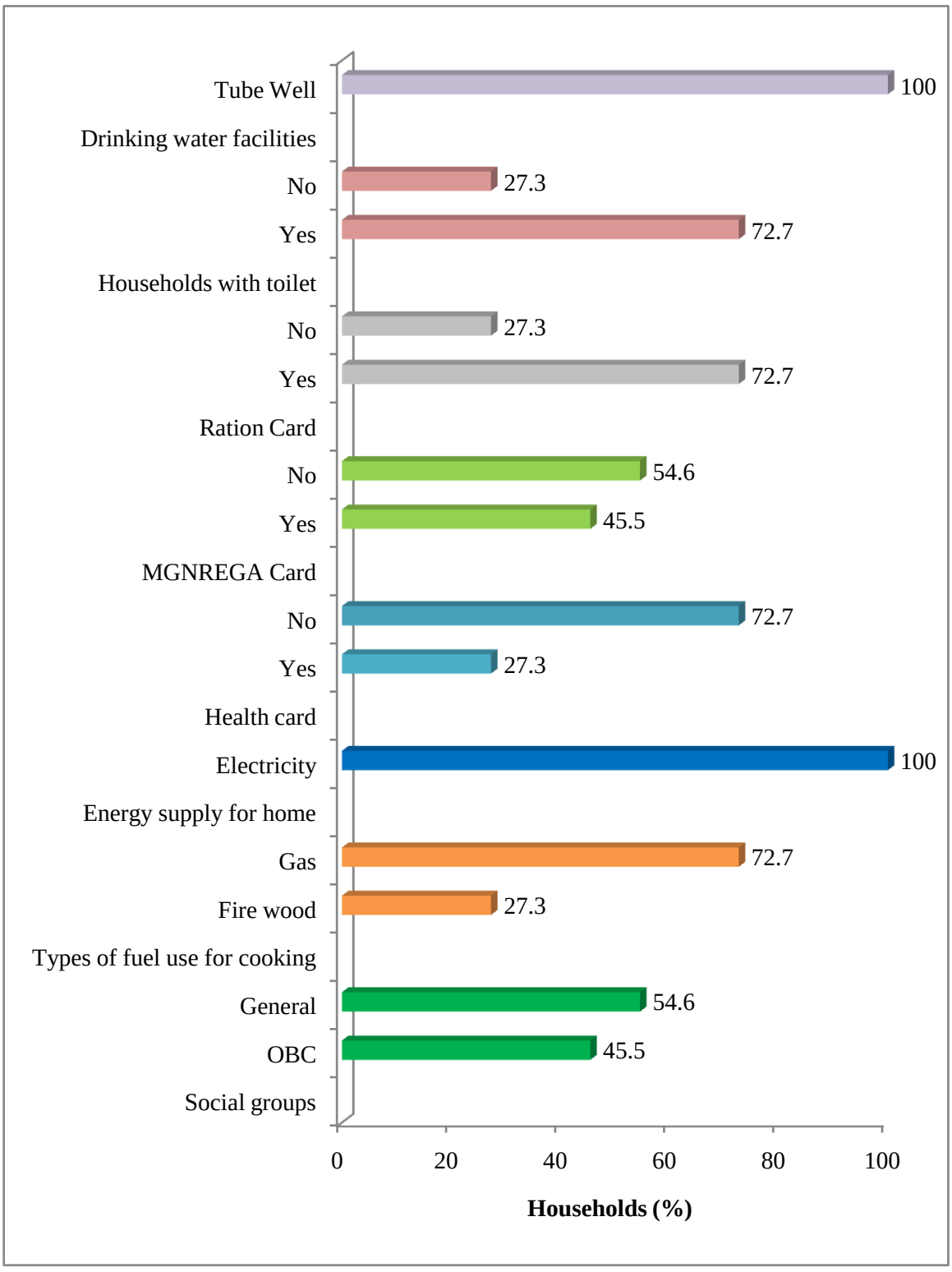


Figure 3: Basic needs of sample households in Sanabanahalli Microwatershed

Only 1.9 per cent of the farmers are participating in community based organizations (Table 3). Among majority were participating in marketing co-operatives societies (1.9%).

Table 3: Institutional participation among the sample population in Sanabanahalli Microwatershed

Particulars	Units	Value
No. Of people participating	% to total	1.9
Co-operative Societies - Marketing	% to total	1.9
No. Of people not participating	% to total	98.1

The occupational pattern (Table 4) among sample households shows that agriculture is the main occupation around 10.5 per cent of farmers followed by agriculture is the main and subsidiary occupations like agricultural labour (86.8 %) and trade and business (2.6 %).

Table 4: Occupational pattern in sample population in Sanabanahalli Microwatershed

Occupation		**% to total**
Main	**Subsidiary**	
Agriculture	Agriculture	10.5
	Agriculture Labour	86.8
	Trade and business	2.6
Family labour availability		**Man days/month**
Male		36.1
Female		20.0
Total Family labour availability		56.1

The important assets especially with reference to domestic assets were analyzed and are given in Table 5 and Figure 4. The important domestic assets possessed by all categories of farmers are mobile phones (63.6%) followed by television (72.7%), mixer/grinder (72.7 %), motorcycle (63.6 %), landline phone (9.1%), radio (9.1%), tempo (9.1%) The average value of domestic assets is around Rs 67494 per households (Table 5 and figure 4).

Table 5: Domestic assets among the sample households in Sanabanahalli Microwatershed

Particulars	% of households	Average value in Rs
Landline Phone	9.1	2000
Mixer/grinder	72.7	2625
Mobile Phone	63.6	4857
Motorcycle	63.6	48857
Radio	9.1	6000
Television	72.7	8125
Tempo	9.1	400000
Average Value	67494	

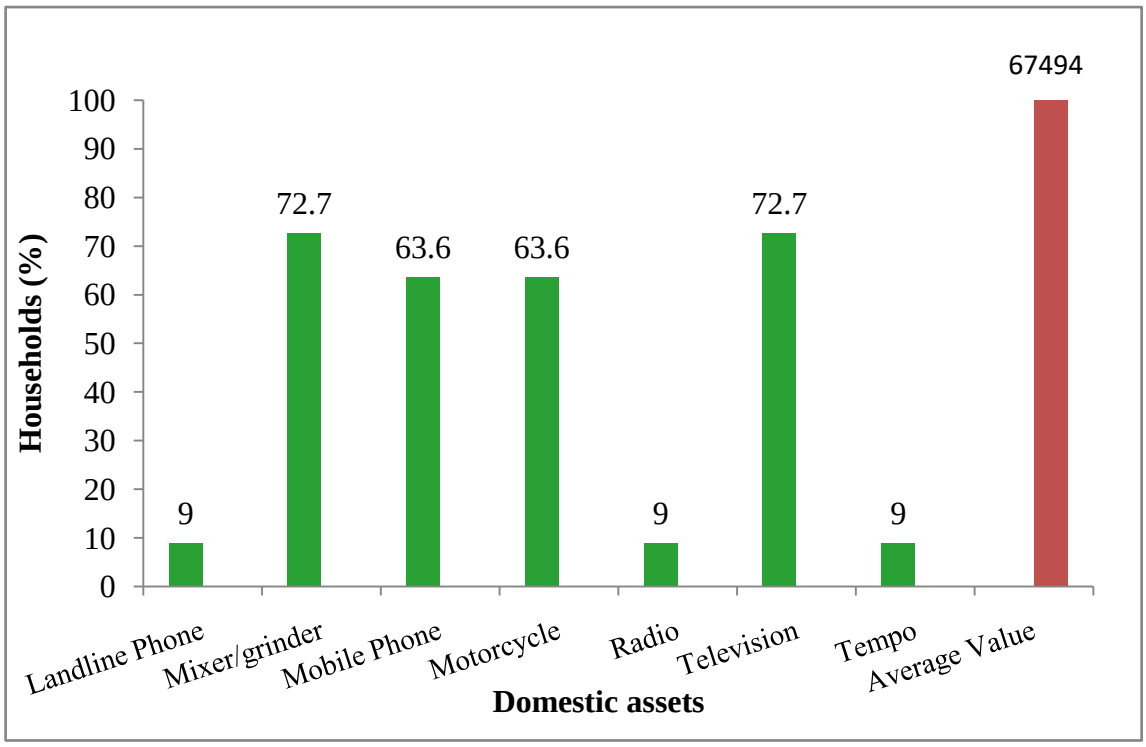


Figure 4: Domestic assets among the sample households in Sanabanahalli Microwatershed

Livestock is an integral component of the conventional farming systems (Table 6 and Figure 5). The highest livestock population is bullocks were per cent followed by crossbred milching cow (37.5 %), dry buffalos (12.0 %) and milching buffalos (50 %). The average livestock value was Rs 27500 per household.

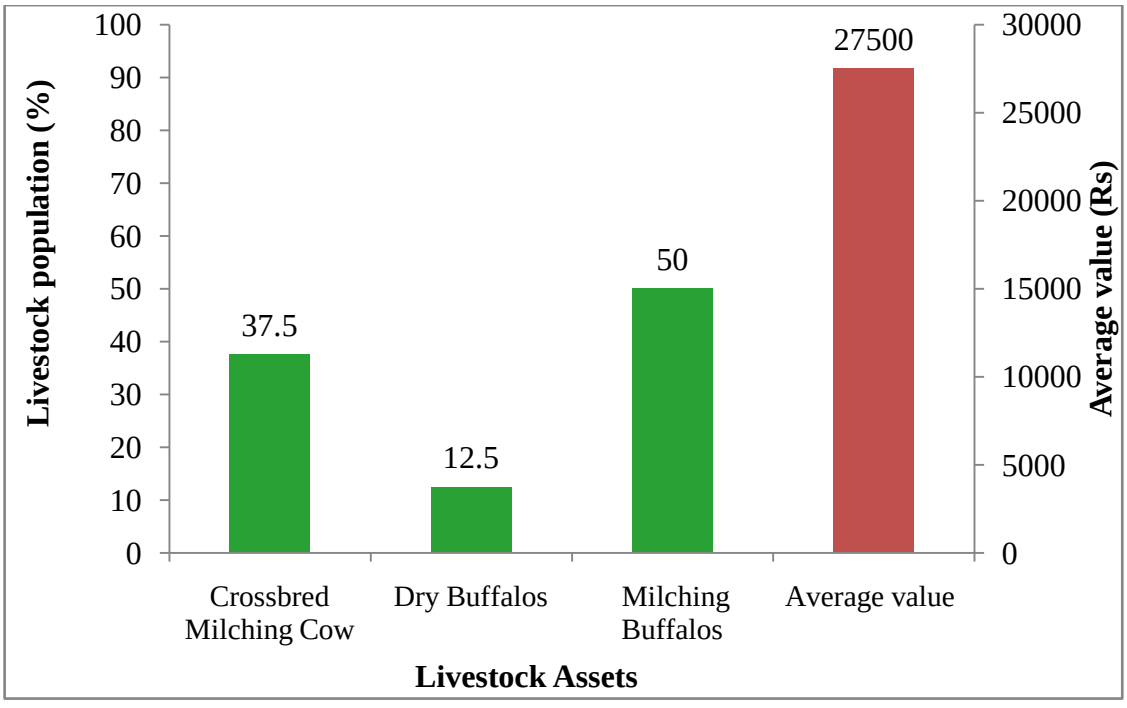


Figure 5: Livestock assets among sample households in Sanabanahalli Microwatershed

Table 6: Livestock assets among sample households in Sanabanahalli Microwatershed

Particulars	**% of livestock population**	**Average value in Rs**
Crossbred Milching Cow	37.5	45000
Dry Buffalos	12.5	15000
Milching Buffalos	50	22500
Average value	27500	

Average milk produced in sample households is 985 litters/ annum. Among the farm households Maize, Bajra, Sorghum, horsegram, and ragi are the main crops for domestic food and fodder for animals. About 2361 kg /ha of average fodder is available per season for the livestock feeding (Table 7).

Table 7: Milk produced and fodder availability of sample households in Sanabanahalli Microwatershed

Particulars	
Name of the Livestock	**Ltr/Lactation/animal**
Crossbred Milching Cow	1520
Milching Buffalos	585
Average Milk Produced	985
Fodder produces yield(kg/ha)	**Fodder**
Maize	16666
Bajra	2083
Sorghum	1666
Horse gram	1666
Ragi	1250
Average fodder availability	2361
Livestock having households (%)	66.67
Livestock population (Numbers)	8

The food intake in terms of kilo calorie (kcal) per person per day was calculated and presented in the Table 8 and Figure 6. More quantity of cereals is consumed by sample farmers which accounted for 969.3 kcal per person. The other important food items consumed was pulses 129.8 kcal, pulses 129.8 kcal followed by cooking oil 230.3 kcal, milk 140.7 kcal, vegetables 17.6 kcal, egg 92.8 kcal and meat 24.4 kcal. In the sampled households, farmers were consuming less (1605 kcal) than NIN- recommended food requirement (2250 kcal).

Table 8: Per capita daily consumption of food among the sample households in Sanabanahalli Microwatershed

Particulars	NIN recommendation (gram/ per day/ person)	Present level of consumption (gram/ per day/ person)	Kilo Calories /day/person
Cereals	396.0	285.1	969.3
Pulses	43.0	37.8	129.8
Milk	200.0	216.5	140.7
Vegetables	143.0	73.6	17.6
Cooking Oil	31.0	40.4	230.3
Egg	0.5	61.9	92.8
Meat	14.2	16.2	24.4
Total	**827.7**	**731.6**	**1605.1**
Threshold of NIN recommendation		827 gram*	2250 Kcal*
% Below NIN		72.7	90.9
% Above NIN		27.2	9.09

Note: * day/person

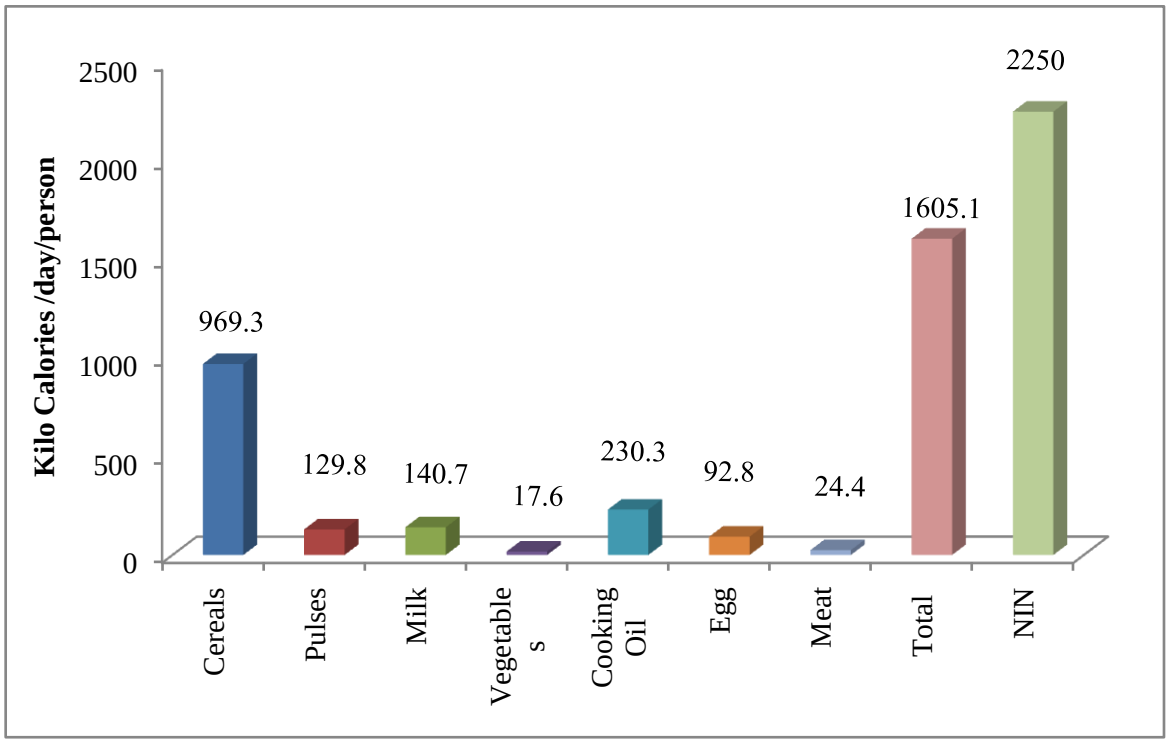


Figure 6: Per capita daily consumption of food among the sample households in Sanabanahalli Microwatershed.

Annual income of the sample HHs: The average annual household income is around Rs 40810. Major source of income to the farmers in the study area is from crop production (Rs 21073) followed by livestock income (Rs. 19737). The monthly per capita income is

Rs.719. which is less than the threshold monthly income of Rs 975 for considering above poverty line. Due to the fact that erratic rainfall and shortage of water, farmers are diverting from crop production activities to enable the household for a comfortable livelihood. The incomes from the other aforesaid sources are very meagre (Table 9).

Table 9: Annual average income of HHs from various sources in Sanabanahalli Microwatershed

Particulars	**Income ***
Nonfarm income (Rs)	0 (0)
Livestock income (Rs)	19737 (63.6)
Crop Production (Rs)	21073 (100)
Total Annual Income (Rs)	40810
Average monthly per capita income (Rs)	719
Threshold for Poverty level (Rs 975 per month/person)	
% of households below poverty line	72.7
% of households above poverty line	27.3

* Figure in the parenthesis indicates % of Households

The average annual expenditure of farm households indicated that farmers in the study area spend highest on food (Rs.40412) followed by education Rs 3727, clothing (Rs.5909), social function (Rs. 8272) and health (Rs.9454). Now a day's education is most important among all of us. In today's competitive world, education is a necessity for man after food, clothing, and shelter. It is the only fundamental way by which a desired change in the society can happen. The average per capita monthly expenditure is around Rs 1194 and about 27.3 per cent of farm households are above poverty line (Table 10 and Figure 7).

Table 10: Average annual expenditure of sample HHs in Sanabanahalli Microwatershed

Particulars	**Value in Rupees**	**Per cent**
Food	40412	59.6
Education	3727	5.4
Clothing	5909	8.7
Social functions	8272	12.4
Health	9454	13.9
Total Expenditure (Rs/year)	67776	100.0
Monthly per capita expenditure (Rs)	1194	

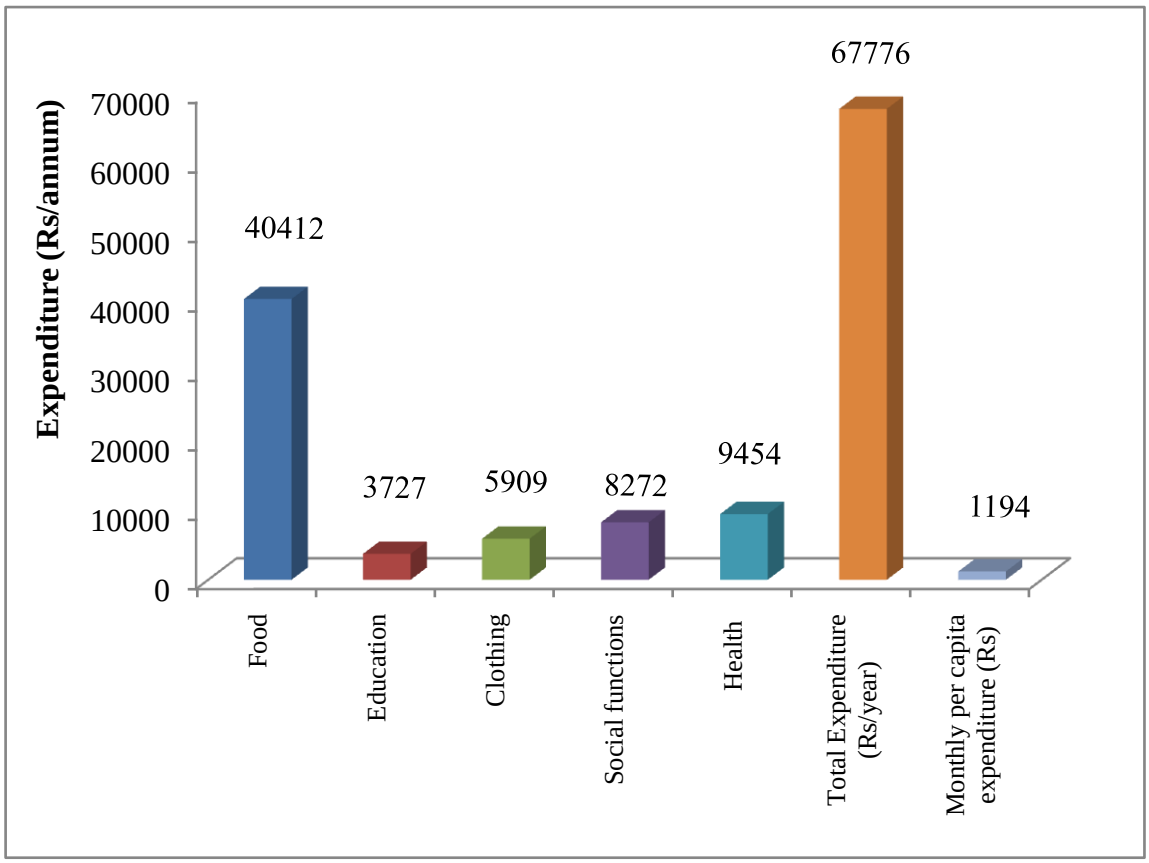


Figure 7: Average annual expenditure of sample HHs in Sanabanahalli Microwatershed

Land use: The total land holding in the Sanabanahalli micro-watershed is 5.7 ha (Table 11). Of which 3.1 ha is rain fed land and 2.6 ha is irrigated land. The average land holding per household is worked out to be 0.5 ha.

Table 11: Land use among samples households in Sanabanahalli Microwatershed

Particulars	Percent	Area in ha
Irrigated land	45.3	2.6
Rain fed Land	54.7	3.1
Fallow Land	0.0	0.0
Total land holding	100	5.7
Average land holding	0.5	

In the micro-watershed, the prevalent present land uses under perennial plants are coconut (44.6%) followed by mango (51.6%), neem (1.2%), pongamia (0.4%) and teak trees (2.2%) (Table12).

Table 12: Number of trees/plants covered in sample farm households in Sanabanahalli Microwatershed

Particulars	Number of Plants/trees	Per cent
Coconut	217	44.6
Mango	251	51.6
Neem	6	1.2
Pongamia	2	0.4
Teak	10	2.2
Grand Total	486	100.0

The land use decisions are usually based on experience of farmers, tradition, expected profit, personal preferences, resources and social requirements.

The present dominant crops grown in dry lands in the study area were followed by bajra (0.5 %), coconut (12.7 %), cowpea (0.4 %), maize (0.6 %), mango (12.6 %), and ragi (23.6 %) which are taken during kharif and bajra (0.5 %), green gram (0.8 %), horse gram (16.9 %), ragi (11.4 %), and sorghum (20.1 %) which are taken during Rabi season respectively. The cropping intensity was 198.4 per cent (Table 13 and Figure 8).

Table 13: Present cropping pattern and cropping intensity in Sanabanahalli Microwatershed % to Grand Total

Crops	Kharif	Rabi	Grand Total
Bajra	0.5	0.5	1.0
Coconut	12.7	0.0	12.7
Cowpea	0.4	0.0	0.4
Greengram	0.0	0.8	0.8
Horsegram	0.0	16.9	16.9
Maize	0.6	0.0	0.6
Mango	12.6	0.0	12.6
Ragi	23.6	11.4	35.0
Sorghum	0.0	20.1	20.1
Grand Total	***50.4***	***49.7***	***100.0***
Cropping intensity (%)	198.4		

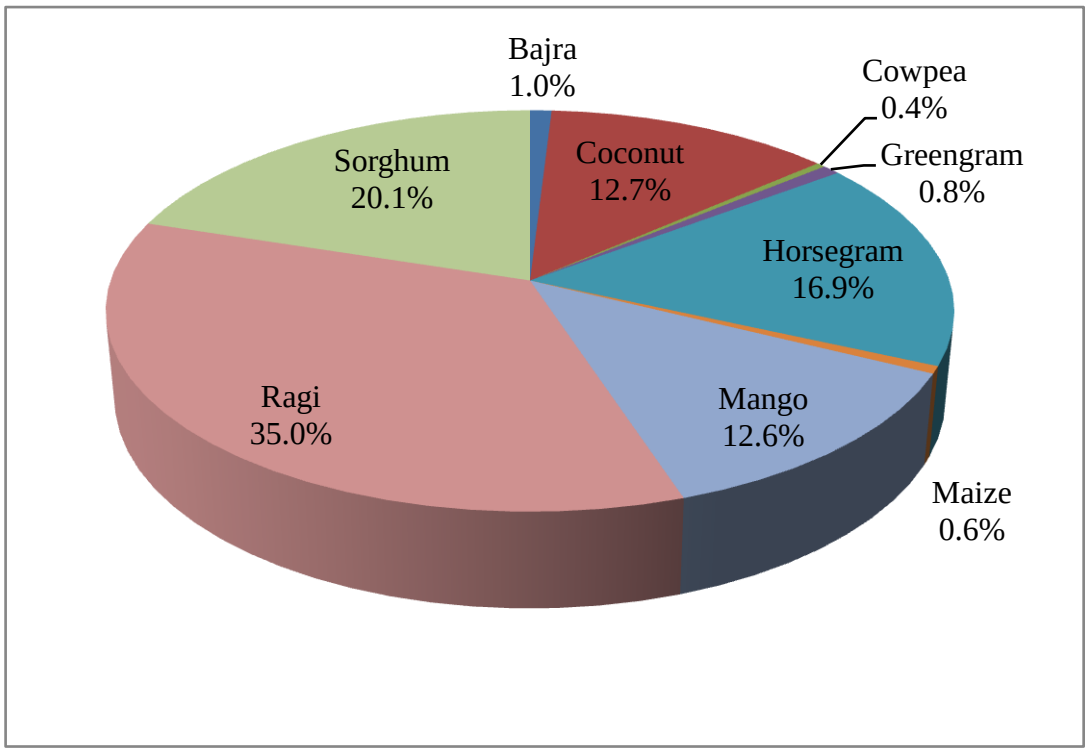


Figure 8: Present cropping pattern in Sanabanahalli Microwatershed

Economic land evaluation

The main purpose of economic land evaluation in the watershed is to identify the existing production constraints and propose the potential/alternate options for agro-technology transfer and for bridging the adoption and yield gap.

In Sanabanahalli micro-watershed, 7 soil series are identified and mapped (Table 14). The distribution of major soil series are Balapur covering an area of 157 ha (33.9) followed by Kadagathur 108 ha (23.57 %), Hallikere 71 ha (15.47 %), Thondigere 49 ha (10.66%), Nagalapur 36 ha (7.75 %), Ranatur 19 ha (4.16 %) and Mornal 6 ha (1.30 %).

Table 14: Distribution of soil series in Sanabanahalli Microwatershed

Soil No	Soil Series	Mapping Unit Description	Area in ha (%)
1	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands under cultivation	6 (1.30)
2	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 very gently sloping uplands under cultivation	157 (33.9)
3	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils	36 (7.75)

		occurring on gently sloping uplands under cultivation	
4	HLK	Hallikere soils are very deep (>150 cm), well drained, have dark brown to dark reddish brown clayey soils occurring on very gently sloping uplands under cultivation	71 (15.47)
5	RTR	Ranatur soils are very deep (>150 cm), well drained, have dark reddish brown to dark red clay soils occurring on very gently sloping uplands under cultivation	19 (4.16)
6	KDT	Kadagathur soils are very deep (>150 cm), moderately well drained, have dark brown to very dark greyish brown sandy clay to clay soils occurring on very gently sloping uplands under cultivation	108 (23.57)
7	TDG	Thondigere soils are very deep (>150 cm), well drained, have dark brown to dark yellowish brown sandy loam to sandy clay soils occurring on very gently sloping lowlands under cultivation	49 (10.66)

Present cropping pattern on different soil series are given in Table 15. Crops grown on Balapur (BPR) soils are horse gram, mango, and ragi. Horse gram, mango, Ragi, sorghum on Hallikere (HLK) soils is grown. Green gram, maize, ragi, on Kadagathur (KDT) soils are grown. Bajra, coconut, cowpea, horse gram, ragi, sorghum on Thondigere (TDG) soils is grown.

Table 15: Cropping pattern on major soil series in Sanabanahalli Microwatershed

(Area in per cent)

Soil Series	Soil Depth	Crops	Dry		Irrigated		Grand Total
			Kharif	Rabi	Kharif	Rabi	
0BPR	Deep (100-150 cm)	Horsegram	0.0	34.3	0.0	0.0	34.3
		Mango	31.2	0.0	0.0	0.0	31.2
		Ragi	34.2	0.0	0.0	0.0	34.2
HLK	Very deep (>150 cm)	Horse gram	0	26.7	0.0	0.0	26.7
		Mango	10.9	0.0	0.0	0.0	10.9
		Ragi	38.5	10.9	0.0	0.0	49.4
		Sorghum	0.0	12.8	0.0	0.0	12.8
KDT	Very deep (>150 cm)	Green gram	0.0	25.1	0.0	0.0	25.1
		Maize	14.9	0.0	0.0	0.0	14.9
		Ragi	59.8	0.0	0.0	0.0	59.8
TDG	Very deep (>150 cm)	Bajra	0.0	0.0	33.5	0.0	33.5
		Coconut	0.0	10.4	0.0	0.0	10.4
		Cowpea	0.0	10.4	0.0	0.0	10.4
		Horse gram	0.0	12.6	0.0	10.4	23.1
		Ragi	0.0	15.6	0.0	0.0	15.6
		Sorghum	3.3	52.6	33.5	10.4	100

Land is used for agricultural use for growing cereals, pulse, oilseeds and commercial crops. The soil/ land potential are measures in terms of physical yield and net income. The alternative land use options for each micro-watershed are given below (Table 16).

Table 16: Alternative land use options for different size group of farmers (Benefit Cost Ratio) in Sanabanahalli Microwatershed

Soil Series	**Small farmers**
BPR	Horse gram (2.66), Mango (1.65), Ragi (1.25)
HLK	Horse gram (1.20), Mango(3.04), Ragi (1.92), Sorghum(1.23)
KDT	Green gram (1.07), Maize (1.34), Ragi (1.23)
TDG	Bajra(0.84), Coconut (2.73),Cowpea(1.37),Horse gram (1.38),Ragi (1.50) Sorghum (1.11).

The productivity of different crops grown in Sanabanahalli micro-watershed under potential yield of the crops is given in Table 17.

The data on cost of cultivation and benefit cost ratio (BCR) of different crops is given in Table 17. The total cost of cultivation in study area for maize Rs106350/ha in KDT soil (with BCR of 1.34), mango ranges between Rs.57315/ha in HLK soil (with BCR of 3.04) and Rs.29944/ha in BPR soil (with BCR of 1.65), bajra Rs47903/ha in TDG soil (with BCR of 0.84). ragi range between Rs 31318/ha in KDT soil (with of 1.23) and Rs.24711/ha in BPR soil (With BCR of 1.25), sorghum range between Rs. 38190/ha in TDG soil (with BCR of 1.11) and Rs. 22068/ha in HLK soil (with BCR of 1.23), horse gram cost of cultivation range between is Rs.24611/ha in HLK soil (with BCR of 1.20) and Rs 11655/ha in TDG soil (with BCR of 1.38), coconut cost of cultivation in TDG soil is Rs 26467/ha (with BCR 2.73).Green gram cultivation in KDT soil is Rs 34200/ha (with BCR 1.07).

The data on FYM, Nitrogen, Phosphorus and Potash application by the farmers to different crops and recommended FYM for different crops is given in Table 17. There is a huge gap between FYM application by farmers and recommended FYM in all the crops across the soils. There is a larger yield gap in crops grown across different soil series. Adequate knowledge about recommended package of practices is the pre-requisite for their use in cultivation of crops. It is a fact that, recommended practices are major contributing factors to yield. Inadequate knowledge about recommended practices leads to their improper adoption. Strengthening of extension services by concerned agency is required to increase adoption of recommended cultivation practices and ultimately reducing the gap. By adopting soil-test fertiliser recommendation, there is scope to increase yield and income to a maximum of Rs 382603 in mango and a minimum of Rs 2468 in green gram cultivation.

Table 17: Economic land evaluation and bridging yield gap for different crops in Sanabanahalli Microwatershed

Particulars	BPR (100-150 cm)			HLK (>150 cm)				KDT (>150 cm)			TDG (>150 cm)					
	Horse gram	Mango	Ragi	Horse gram	Mango	Ragi	Sorg hum	Green gram	Maize	Ragi	Bajra	Coco nut	Cow pea	Horse gram	Ragi	Sor ghum
Total cost (Rs/ha)	11159	29944	24711	24611	57315	21129	22068	34200	106350	31318	47903	26467	18395	11655	24320	38190
Gross Return (Rs/ha)	29640	49400	30987	29541	174353	35934	27170	36697	142272	38532	40330	79409	25194	16055	36367	42484
Net returns (Rs/ha)	18481	19456	6276	4931	117038	14806	5102	2497	35922	7214	-7572	52942	6799	4400	12047	4294
BCR	2.66	1.65	1.25	1.20	3.04	1.92	1.23	1.07	1.34	1.23	0.84	2.73	1.37	1.38	1.50	1.11
Farmers Practices (FP)																
FYM (t/ha)	0.0	3.8	3.4	0.0	9.8	2.3	0.0	3.0	10.0	5.0	0.0	1.1	2.5	0.0	0.0	0.0
Nitrogen (kg/ha)	81.8	42.5	81.8	30.6	83.3	55.9	53.6	16.0	175.0	16.0	52.7	49.6	45.6	45.6	49.6	49.6
Phosphorus (kg/ha)	67.0	90.0	67.0	40.5	176.5	95.7	70.1	25.9	315.0	25.9	134.8	64.8	43.1	43.1	64.8	64.8
Potash (kg/ha)	0.0	0.0	0.0	18.8	0.0	16.7	31.3	0.0	85.0	0.0	0.0	5.7	0.0	0.0	5.7	5.7
Grain (Qtl/ha)	9.1	10.0	10.2	7.0	44.1	10.8	12.5	7.1	60.0	12.5	10.5	96.4	7.5	5.0	9.9	16.3
Price of Yield (Rs/Qtl)	3200	5000	3000	4100	4000	3267	2000	5200	1800	3000	3250	1100	3400	3000	3500	2300
Soil test based fertilizer Recommendation (STBR)																
FYM (t/ha)	0.0	61.8	8.6	0.0	61.8	8.6	7.4	7.4	8.6	8.6	6.2	10.0	7.4	0.0	8.6	7.4
Nitrogen (kg/ha)	30.9	231.6	92.6	30.9	231.6	92.6	101.9	23.2	154.4	92.6	49.4	128.1	24.7	24.7	92.6	101.9
Phosphorus (kg/ha)	27.8	37.1	32.4	27.8	37.1	32.4	42.6	27.8	46.3	32.4	29.6	48.8	37.1	27.8	32.4	42.6
Potash (kg/ha)	24.7	172.9	44.5	30.9	216.1	51.9	39.5	37.1	32.1	44.5	0.0	245.0	24.7	24.7	44.5	39.5
Grain (Qtl/ha)	9.9	98.8	30.9	9.9	98.8	30.9	28.4	8.6	84.0	30.9	14.8	184.5	12.4	9.9	30.9	28.4
% of Adoption/yield gap (STBR-FP) / (STBR)																
FYM (%)	0.0	93.9	60.6	0.0	84.1	73.5	100.0	59.8	-15.7	42.2	100.0	88.7	66.3	0.0	100.0	100.0
Nitrogen (%)	-165.0	81.6	11.7	0.8	64.0	39.7	47.3	31.1	-13.4	82.8	-6.7	61.3	-84.7	-84.7	46.4	51.3
Phosphorus (%)	-141.3	-142.9	-106.8	-45.7	-376.3	-195.1	-64.4	6.7	-580.2	20.0	-354.7	-33.0	-16.4	-55.2	-100.0	-52.2
Potash (%)	100.0	100.0	100.0	39.3	100.0	67.9	20.9	100.0	0.0	100.0	0.0	97.7	0.0	100.0	87.3	85.7
Grain (%)	8.0	89.9	66.9	29.1	55.3	65.2	56.0	17.4	28.6	59.5	28.8	47.7	39.3	49.4	67.8	42.8
Value of yield and Fertilizer (Rs)																
Additional Cost (Rs/ha)	-1845	61397	4731	-314	51913	4715	6947	5343	-14483	5740	1509	13889	4886	-432	8510	7736
Additional Benefits (Rs/ha)	2525	444000	61943	11808	218729	65736	31810	7811	43164	55125	13888	96870	16490	14640	73243	27957
Net change Income (Rs/ha)	4370	382603	57212	12122	166817	61021	24863	2468	57647	49385	12378	82981	11604	15072	64733	20221

Economic valuation of Ecosystem Services (ES) was aimed at combining use and non-use values to determine Total Economic Value (TEV) of ES. Ecosystem Services (ES) were valued based on their annual flow or utilization in common monetary units, Rs/year. The valuation of ES was based on market price in 2017 or market cost approaches whichever is applicable, and in other cases on value or benefit transfer from previous valuation studies.

The onsite cost of different soil nutrients lost due to soil erosion is given in Table 18 and Figure 9. The average value of soil nutrient loss is around Rs 463 per ha/year. The total cost of annual soil nutrients is around Rs 207147 per year for the total area of 461.60 ha.

Table 18: Estimation of onsite cost of soil erosion in Sanabanahalli Microwatershed

Particulars	Quantity(kg)		Value (Rs)	
	Per ha	Total	Per ha	Total
Organic matter	60.43	27013	380.7	170181
Phosphorus	0.32	145	14.2	6361
Potash	0.67	299	13.4	5990
Iron	0.10	45	4.7	2136
Manganese	0.15	69	42.1	18858
Cupper	0.01	3	4.2	1881
Zinc	0.00	1	0.1	59
Sulphur	0.09	40	3.6	1614
Boron	0.00	2	0.1	67
Total	61.78	27617	463.4	207147

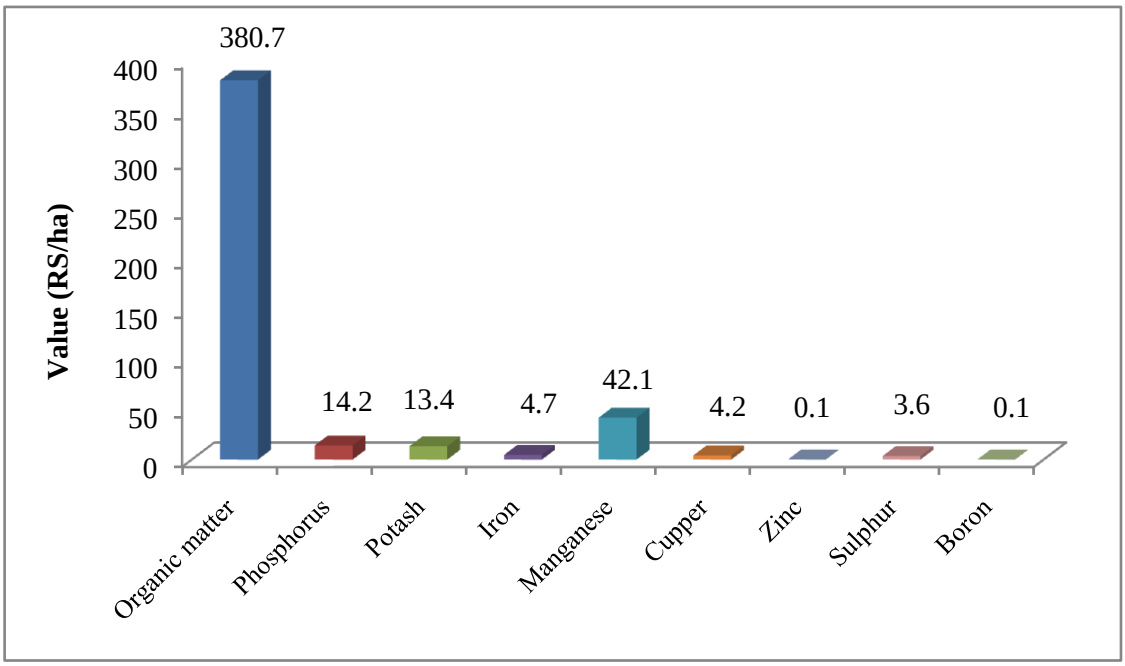


Figure 9: Estimation of onsite cost of soil erosion in Sanabanahalli Microwatershed

The average value of ecosystem service for food grain production is around Rs 18763/ ha/year (Table 19 and Figure 10). Per hectare food grain production services is maximum in coconut (Rs.78340) followed by mango (Rs.76674), ragi (Rs.10415), horse gram (Rs.8039), cowpea (Rs.6799), green gram (Rs.2496), maize (Rs.354), bajra and sorghum are negative returns.

Table 19: Ecosystem services of food grain production in Sanabanahalli Microwatershed

Production items	Crops	Area in ha	Yield (Qtl/ha)	Price (Rs/Qtl)	Gross Returns (Rs/ha)	Cost of Cultivation (Rs/ha)	Net returns (Rs/ha)
Cereals	Bajra	0.3	10.4	3250	33866	47903	-14037
	Maize	0.1	59.3	1800	106704	106350	354
	Ragi	4.1	10.6	3257	34423	24008	10415
	Sorghum	1.1	14.8	2200	32604	32816	-212
Pulses	Cowpea	0.4	7.4	3400	25194	18395	6799
	Greengram	0.2	7.1	5200	36697	34200	2497
	Horsegram	2.3	6.9	3433	23848	15808	8039
Oil seeds	Coconut	1.3	95.3	1100	104807	26467	78341
Fruits	Mango	1.2	26.7	4500	120304	43629	76674
Average		10.9	27	3127	57605	38842	18763

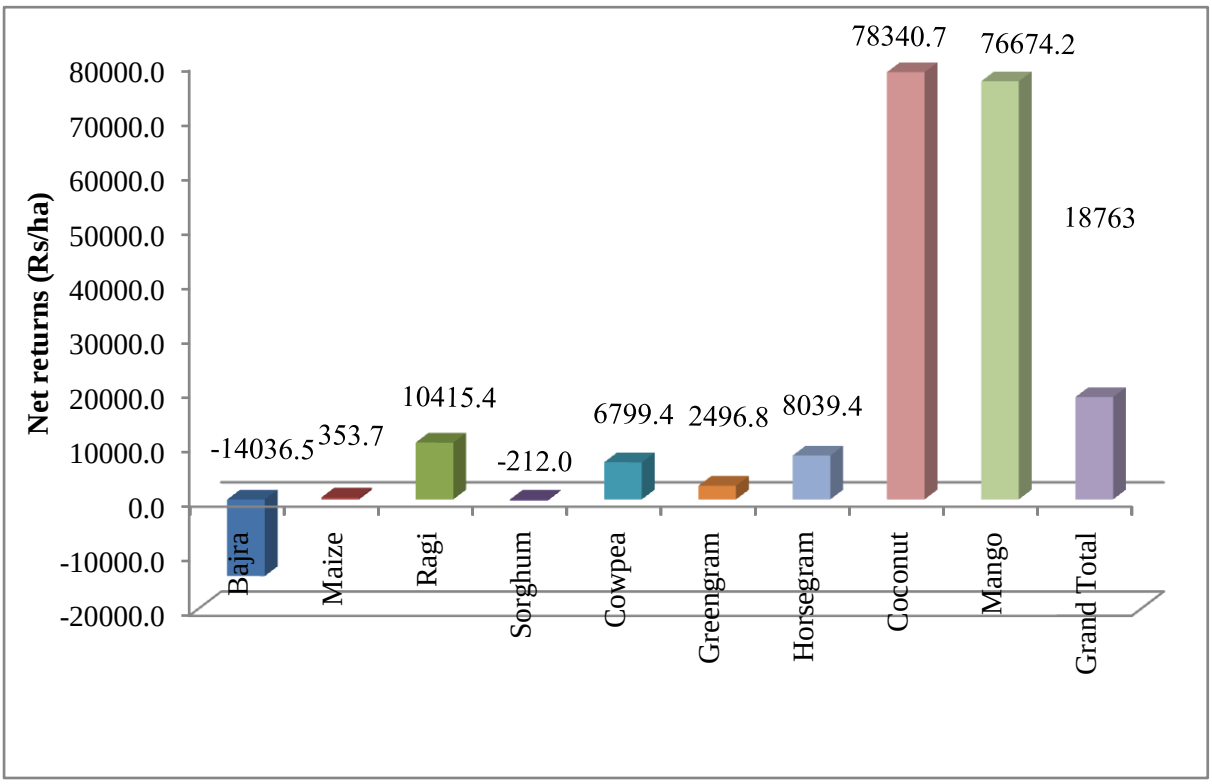


Figure 10: Ecosystem services of food grain production in Sanabanahalli Micro-watershed

The average value of ecosystem service for fodder production is around Rs10074/ ha/year (Table 20). Per hectare fodder production services is maximum in maize (Rs 35568) followed by bajra (Rs6367), sorghum (Rs5443), horsegram (Rs1547) and ragi (Rs1445).

Table 20: Ecosystem services of fodder production in Sanabanahalli Microwatershed

Production items	Crops	Area in ha	Yield (Qtl/ha)	Price (Rs/Qtl)	Net Returns (Rs/ha)
Cereals	Bajra	0.3	5.8	1100	6368
	Maize	0.1	19.8	1800	35568
	Ragi	4.1	1.9	743	1445
	Sorghum	1.1	4.8	1133	5443
Pulses	Horsegram	2.3	1.9	833	1547
Average		7.9	6.8	1121	10074

The water demand for production of different crops was worked out in arriving at the ecosystem services of water support to crop growth. The data on water requirement for producing one quintal of grain is considered for estimating the total value of water required for crop production. The per hectare value of water used and value of water was maximum (Table 21 and Figure 11)in coconut (Rs. 256015) followed by maize(Rs.72440), greengram (Rs.48736), mango(Rs.48121), bajra(Rs.46641), sorghum(Rs.45171), horsegram (Rs.21379), ragi (Rs.12914) and cowpea (Rs.9306).

Table 21: Ecosystem services of water supply in Sanabanahalli Microwatershed

Crops	Yield (Qtl/ha)	Virtual water (cubic meter) per ha	Value of Water (Rs/ha)	Water consumption (Cubic meters/Qtl)
Bajra	10.42	4664	46641	447
Coconut	95.28	25601	256015	268
Cowpea	7.41	930	9306	125
Green gram	7.06	4873	48736	690
Horse gram	6.95	2137	21379	307
Maize	59.28	7244	72440	122
Mango	26.73	4812	48121	180
Ragi	10.57	1291	12914	122
Sorghum	14.82	4517	45171	304
Grand Total	223.7	6230	62303	285

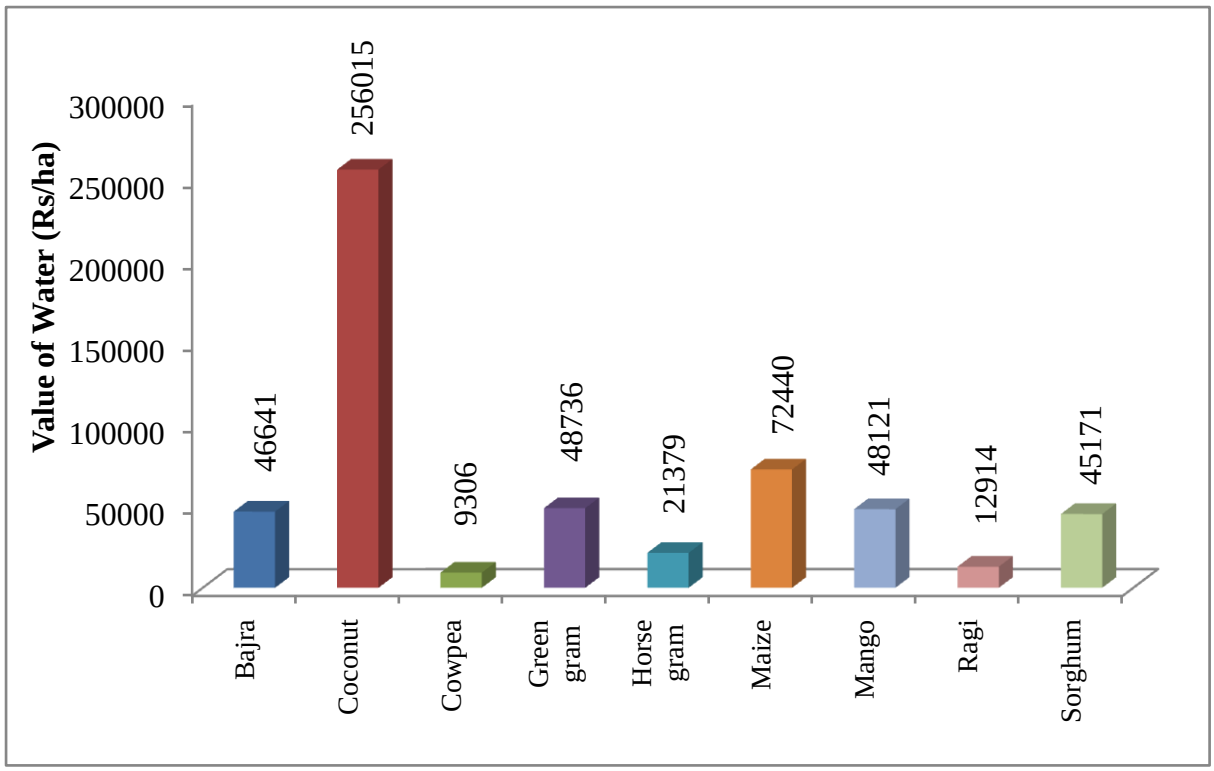


Figure 11: Ecosystem services of water supply in Sanabanahalli Microwatershed

The main farming constraints in Devihal 3micro-watershed to be found are less rainfall, non availability fertilizers, high crop pests & diseases, animal pests & diseases, damage of crops by wild animals and non availability of plant protection chemicals. Majority of farmers depend up on money lender of the sources of loan for purpose of crop production. Farmers to sell the agriculture produce through village market and the farmers getting the agriculture related information on newspaper. Farmers reported that they are not getting timely support/extension services from the concerned development department (Table 22).

Table 22: Farming constraints related land resources of sample households in Sanabanahalli Microwatershed

SI.NO	Particulars	Percent
1	Less Rainfall	100.0
2	Damage of crops by Wild Animals	100.0
3	**Source of lone**	
	Money Leander	100.0
5	**Marketing constraints**	
	Village market	100.0
7	**Sources of Agri-Technology information**	
	Newspaper	100

The findings of the study would be very much useful to the planners and policy makers of the study area to identify the irrationality in the existing production pattern and to suggest appropriate production plans for efficient utilization of their scarce resources resulting in increased net farm incomes and employment. The study also throws light on future potentialities of increasing net farm income and employment under different situations viz., with existing and recommended technology.