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

DEVARAHALLI (4B3E2F2c) MICROWATERSHED

Gundlupet Taluk, Chamarajanagara 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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TO OBTAIN COPIES,

Please write to:
Director, ICAR - NBSS & LUP,

Amaravati Road, NAGPUR - 440 033, India

Phone : (0712) 2500386, 2500664, 2500545 (O)

Telefax : 0712-2522534

E-Mail : director@nbsslup.ernet.in

Website URL : nbsslup.in

Or

Head, Regional Centre, ICAR - NBSS&LUP, Hebbal, Bangalore - 560 024

Phone : (080) 23412242, 23510350 (O)

Telefax : 080-23510350

E-Mail : nbssrcb@gmail.com

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PREFACE

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

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

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

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

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

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

Nagpur
Date:

S.K. SINGH
Director, ICAR - NBSS&LUP, Nagpur

Contributors

Dr. Rajendra Hegde Principal Scientist, Head & Project Leader, Sujala-III Project ICAR-NBSS&LUP, Regional Centre Bangalore	**Dr. S.K.Singh** Director, ICAR-NBSS&LUP Coordinator, Sujala-III Project Nagpur
Soil Survey, Mapping & Report Preparation	
Dr. B.A. Dhanorkar	Sh. R.S. Reddy
Dr. K.V. Niranjana	Sh. VenkataGiriyappa
	Dr. Savitha, H.R
	Sh. Nagendra, B.R.
	Smt. Chaitra, S.P.
	Dr. Gayathri, B
	Dr. Gopali Bardhan
Soil Survey and Mapping	
Sh. C.BacheGowda	Sh. Sandeep shastri
Sh. Somashekar	Sh. Rajeev
Sh. M. Jayaramaiah	Sh. GajananHegde
Sh. Paramesha, K.	Sh. Balasubramanyam
	Sh. Vijay kumar
GIS Work	
Dr. S.Srinivas	Sh. A.G. Devendra Prasad
Dr. M.Ramesh	Sh. Prakashanaik, M.K.
Sh. D.H.Venkatesh	Sh. AbhijithSastry, N.S.
Smt.K.Sujatha	Sh. Mahamad Ali, M.
Smt. K.V.Archana	Sh. Amar Suputhra, S.
Sh. N.Maddileti	Sh. Avinash, K.N.
	Sh. Anudeep, Y.
	Sh. Sudip Kumar Suklabaidya
	Smt. K.Karunya Lakshmi
	Ms. Seema, K.V.
Laboratory Analysis	
Dr. K.M.Nair	Smt. Thara, V.R.
Smt. ArtiKoyal	Smt. Roopa, G.
Smt. Parvathy, S.	Ms. Shwetha, N.K.
	Smt. Ishrat Haji

	Ms. PavanaKumari, P.
	Sh. Shanthaveeraswamy, H.M.
	Ms. Rashmi
	Ms. Padmaja, S.
	Ms. Veena, M.
Socio-Economic Analysis	
Dr. S.C. Ramesh Kumar	Sh. M. K. Prakashanaik
	Ms. Sowmya K.B
	Sh.Manjunath M
	Sh.Veerabhadraswamy R
	Sh.Lankesh RS
	Sh.Kalaveerachari R Kammar
	Sh.Pradyumma U
	Sh.Yogesha HN
	Sh.Vijay kumar lamani
	Sh.Arun N Kambar
	Sh.Vinay
	Sh.Basavaraj.Biradar
	Sh.Vinod R
	Sh.Praveenkumar P Achalkar
	Sh.Rajendra D
Watershed Development Department, GoK, Bangalore	
Sh. Rajeev Ranjan IFS Project Director & Commissioner, WDD	Dr. A. Natarajan NRM Consultant, Sujala-III Project
Dr. S.D. Pathak IFS Executive Director & Chief Conservator of Forests, WDD	

PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Devarahalli 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 boundries. The soil map shows the geographic distribution and extent, characterstics, classification and use potentials of the soils in the microwartershed.

The present study covers an area of 614 ha in Devarahalli microwatershed in Gundlupet taluk of Chamarajanagar district, Karnataka. The climate is semiarid and categorized as drought prone with an average annual rainfall of 734 mm. Maximum of 254 mm precipitation takes place during south–west monsoon period from June to September, the north-east monsoon contributes about 268 mm and prevails from October to early December and the remaining 212 mm takes place during the rest of the year. An area of about 92 per cent is covered by soils and 8 per cent by waterbodies, settlements, forest and others. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 11 soil series and 35 soil phases (management units) and 8 land management units.*
- *The length of crop growing period is about 150 days starting from the 3rd week of June to 3rd 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 by using kriging method.*
- *Land suitability for growing major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *About 92 per cent area is suitable for agriculture and 8 per cent is not suitable for agriculture but well suited for forestry, pasture, agroforestry, silvi-pasture, recreation, installation of wind mills and as habitat for wildlife.*
- *About 23 per cent of the soils are very deep (>150 cm) to deep (100 - 150 cm), 22 per cent moderately deep (75 - 100 cm) and 50 per cent are moderately shallow to shallow (25-75 cm).*
- *About 25 per cent of the area has clayey soils, 61 per cent loamy soils and 9 per cent sandy soils at the surface.*
- *About 13 per cent of the area has non-gravelly (<15% gravel) soils, 40 per cent gravelly soils (15-35 % gravel) and 43 per cent very gravelly to extremely gravelly soils (35- 80% gravel).*
- *About 14 per cent of the area has soils that are very high (>200mm/m) in available water capacity and about 82 per cent low (50-100 mm/m) to very low (<50mm/m) available water capacity.*
- *About 86 per cent of the area has gently sloping (3-5%) to very gently sloping (1-3% slope) lands, 3 per cent nearly level (0-1%), 3 per cent has moderately sloping (5-10%) and 4 per cent very strongly sloping (15-25 %) lands.*

- *An area of about 69 per cent has soils that are slightly eroded (e1), 17 per cent moderately eroded (e2) and 9 per cent severely eroded (e3).*
- *An area of about 37 per cent has soils that are neutral in reaction (pH 6.5 to 7.3), 8 per cent strongly acid to moderately acid (pH 5.0-6.0), 13 per cent slightly acid (pH 6.0-6.5) and 37 per cent slightly alkaline (pH 7.3-7.8) to moderately alkaline (pH 7.8 to 8.4).*
- *The Electrical Conductivity (EC) of the soils are dominantly <2 ds m^{-1} indicating that the soils are non-saline.*
- *About 37 per cent medium (0.5-0.75%), 55 per cent low (<0.5%) and 3 per cent high (>0.75%) in organic carbon.*
- *An area of 49 per cent has soils that are low (<23 kg/ha), 28 per cent medium (23-57 kg/ha) and 18 per cent high (>57 kg/ha) in available phosphorus*
- *About 38 per cent medium (145-337 kg/ha), 17 per cent low (<145kg/ha) and 40 per cent high (>337kg/ha) in available potassium.*
- *Available sulphur is low (<10 ppm) in about 68 per cent area and medium (10-20 ppm) in 28 per cent in available sulphur.*
- *Available boron is low (<0.5 ppm) in about 55 per cent area and 40 per cent medium (0.5-1.0 ppm).*
- *About 20 per cent area has soils that are deficient (<4.5 ppm) in available iron and 75 per cent sufficient (>4.5 ppm).*
- *Available manganese and copper are sufficient in all the soils in the microwatershed.*
- *About 77 per cent area has soils that are deficient (<0.6 ppm) in available zinc and 19 per cent sufficient (>0.6 ppm).*
- *The land suitability for 27 major crops (agricultural and horticultural) grown in the microwatershed were assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, price and finally the demand and supply position.*

Land suitability for various crops in the Devarahalli microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	105 (17)	138 (23)		Guava	30 (5)	163 (27)
Maize	48 (8)	176 (29)		Mango	13 (2)	60 (10)
Red gram	70(41)	160 (26)		Sapota	30 (5)	163 (27)
Groundnut	48 (8)	375(61)		Jackfruit	26 (4)	110 (18)
Sunflower	17 (3)	224 (40)		Jamun	13 (2)	130 (21)
Cotton	13 (2)	133 (21)		Musambi	30 (5)	113 (18)
Onion	13 (2)	261 (42)		Lime	30 (5)	113 (18)
Beans	13 (2)	261 (42)		Cashew	30 (5)	163 (27)
Potato	13 (2)	191 (31)		Custard apple	30 (5)	483 (79)
Beetroot	13 (2)	191(31)		Amla	30 (5)	483 (79)
Turmeric	13 (2)	191 (31)		Tamarind	13 (2)	130(21)
Horse gram	48 (8)	428 (70)		Marigold	48 (8)	295(48)
Field bean	13 (2)	344 (56)		Chrysanthemum	13 (2)	349 (57)
Banana	13 (2)	148 (28)				

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 8 identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fibre and horticulture crops that helps in maintaining the ecological balance in the microwatershed.

- *Maintaining soil-health is vital to crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested 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 and also in the hillocks, mounds and ridges.*

Chapter 1

INTRODUCTION

Soil is a finite natural resource that is central to sustainabile agriculture and food security. Over the years, this precious resource is faced with problems of erosion, salinity, alkalinity, degradation, depletion of nutrients and even decline in the availability of land for agriculture. It is a known fact, that it takes thousands of years to form a few centimetres of soil; thus, soil is a precious gift of nature. 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. However, the capacity of a soil to produce is limited and the limits to the production are set by its intrinsic characteristics, agro-climatic setting, and use and management. There is, therefore, tremendous pressure on land and water resources, which is causing decline in soil-health and stagnation in productivity. The soils have been degrading at an estimated rate of one million hectares per year and ground water levels have been receding at an alarming rate resulting in decline in the ground water resource. 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 (>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 situation 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. Added to this, every year there is a significant diversion of farm land and water resources for non-agricultural purposes. Thus, developing strategies to slow down the degradation process or reclaim the soils to normal condition and ensure sustainability of production system are the major issues today. This demands a systematic appraisal of our soil and land resources with respect to their extent, geographic distribution, characteristics, behaviour and uses potential, which is very important for developing an effective land use and cropping systems for augmenting agricultural production on a sustainable basis.

The soil and land resource inventories made so far in Karnataka had limited utility because the surveys were of different types, scales and intensities carried out at different times with specific objectives. Hence, there is an urgent need to generate 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 all the parameters which are critical for productivity *viz.*, soils, site characteristics like slope, erosion, gravelliness and stoniness, climate, water, topography, geology, hydrology, vegetation, crops, land use pattern, animal population, socio-economic conditions, infrastructure, marketing facilities and various schemes and developmental works of the government etc. From the data collected at farm level, the specific problems and potentials of the area can be identified and highlighted, conservation measures required for the area can be planned on a scientific footing, suitability of the area for various uses can be worked out and finally viable and sustainable land use options suitable for each and every land holding can be prescribed.

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

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

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

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Devarahalli microwatershed (Basavapur subwatershed) is located in the southern part of south Karnataka in Gundlupet Taluk, Chamarajanagar District, Karnataka State (Fig.2.1). It comprises parts of Puttanapur, Honnegaudanahalli, Hangala and Hangala Hosahalli villages. It lies between 11^0 43' to 11^0 45' North latitudes and 76^0 36' to 76^0 39' East longitudes and covers an area of 614 ha. It is surrounded by Honnegaudanahalli village in the northwest, Hangala village in the southeast, Hangala Hosahalli in the northeast and Kallipura village in the southwest side.

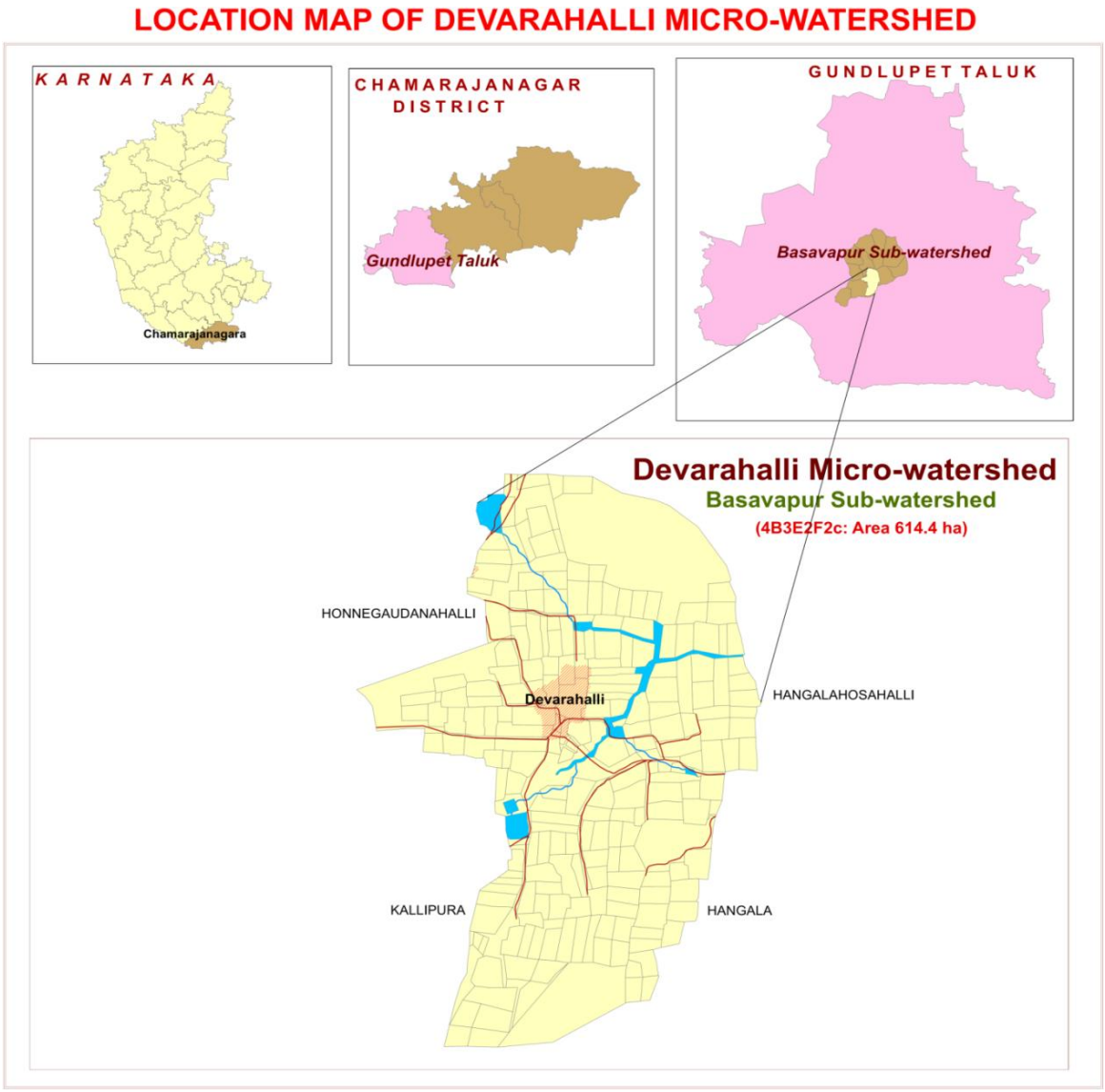


Fig.2.1 Location map of Devarahalli Microwatershed

2.2 Geology

Major rock formation observed in the microwatershed is of Archaean age and comprise of (Figs.2.2a and b) granite and gneiss. They are essentially pink to gray granite gneisses. The rocks are coarse to medium grained. They consist primarily of quartz, feldspar, biotite and hornblende. The gray granite gneisses are highly weatherd, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in Gopalapur village.

Fig.2.2a Granite and granite gneiss rocks

Fig. 2.2b Granite rocks

2.3 Physiography

Physiographically, the area has been identified as granite gneiss landscape based on geology. It has been further divided into three landforms *viz;* mounds/ ridges, uplands and lowlands based on geology, slope and other relief features.They have been further subdivided into four landforms, *viz;* summits, side slopes, very gently sloping uplands and lowlands/valleys. The elevation ranges from 855 to 905 m above MSL. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

There are no perennial rivers flowing in Gundlupet taluk. However, the area is drained by several small seasonal streams like Gundluhole along its course. Though, they are not perennial, during rainy season, they carry 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 subparallel.

2.5 Climate

The district falls under semiarid tract and is categorized as drought-prone with average annual rainfall of 734 mm (Table 2.1). Of the total rainfall, a maximum of 254 mm is received during south–west monsoon period from June to September, north-east monsoon from October to early December contributes about 268 mm and the remaining 212 mm is recived during the rest of the year. The winter season is from December to February. During April and May, the temperatures reach up to 42°C and in December and January, the temperatures will go down to 16°C. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo Transpiration (PET) is 128 mm and varies from a low of 106 mm in November to 165 mm in the month of March. The PET is always higher than precipitation in all the months except in the month of October and parts of September and November. 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 Gundlupet Taluk, Chamarajanagara District

Sl. no.	Months	Rainfall	PET	1/2 PET
1	JAN	0.80	129.10	64.55
2	FEB	6.80	133.80	66.90
3	MAR	26.90	164.90	82.45
4	APR	73.60	153.80	76.90
5	MAY	103.90	147.20	73.60
6	JUN	56.00	124.60	62.30
7	JUL	50.40	116.40	58.20
8	AUG	55.80	117.10	58.55
9	SEP	92.00	116.80	58.40
10	OCT	164.10	111.10	55.55
11	NOV	80.50	106.20	53.10
12	DEC	23.50	109.90	54.95
Total		**734.30**	**127.57**	

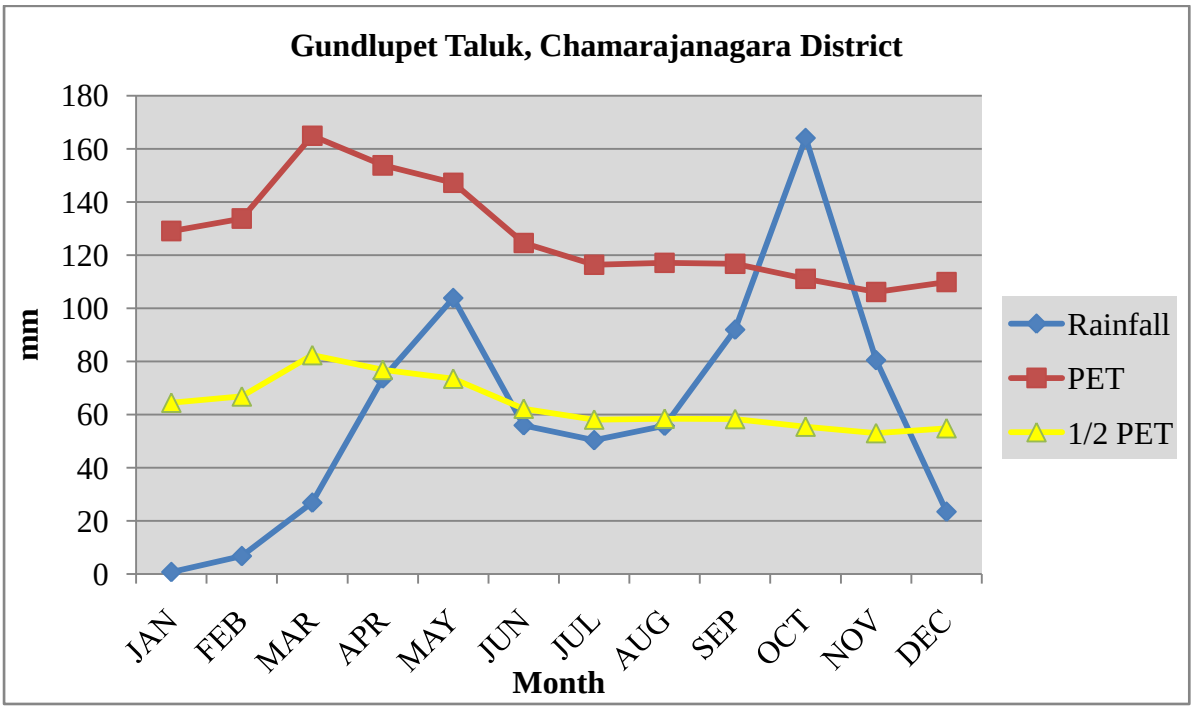


Fig 2.3 Rainfall distribution in Gundlupet Taluk, Chamarajanagara District

2.6 Natural Vegetation

Forests occupy about 32 per cent area in Gundlupet taluk. The major areas of these forests are found in Bandipur National Park and Himavad Gopalaswamy Betta (Fig. 2.4). The rest of the area in the taluk has sparse natural vegetation 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 is 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 slope, resulting in the formation of deep gullies in the foot slopes and eventually resulting in the heavy siltation of few tanks and reservoirs in the microwatershed.

Fig. 2.4 Natural Vegetation of Devarahalli Microwatershed

2.7 Land Utilization

About 48 per cent area (Table 2.2) in Gundlupet taluk is cultivated at present. An area of about 6 per cent is currently barren. Forests occupy an area of about 32 per cent and the tree cover is in a very poor state except in Bandipura National Park and Gopalaswamy Betta. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, cotton, onion, sunflower, marigold, groundnut, red gram, horsegram, banana and sapota. While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of the microwatershed is presented in Fig.2.5. The different crops and cropping systems adopted in the microwatershed is presented in Fig.2.6. 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, soil conservation structures and other water bodies in Devarahalli microwatershed is given in Fig.2.7.

Table 2.2 Land Utilization in Gundlupet Taluk

Sl. No.	Agricultural land use	Area (ha)	Per cent
1	Total geographical area	140607	
2	Total cultivated area	67339	47.84
3	Area sown more than once	13532	
4	Trees and grooves	3485	2.47
5	Forest	44859	31.98
6	Cultivable wasteland	3265	2.32
7	Permanent Pasture land	10287	7.31
8	Barren land	7988	5.68
9	Non- Agriculture land	3384	2.40

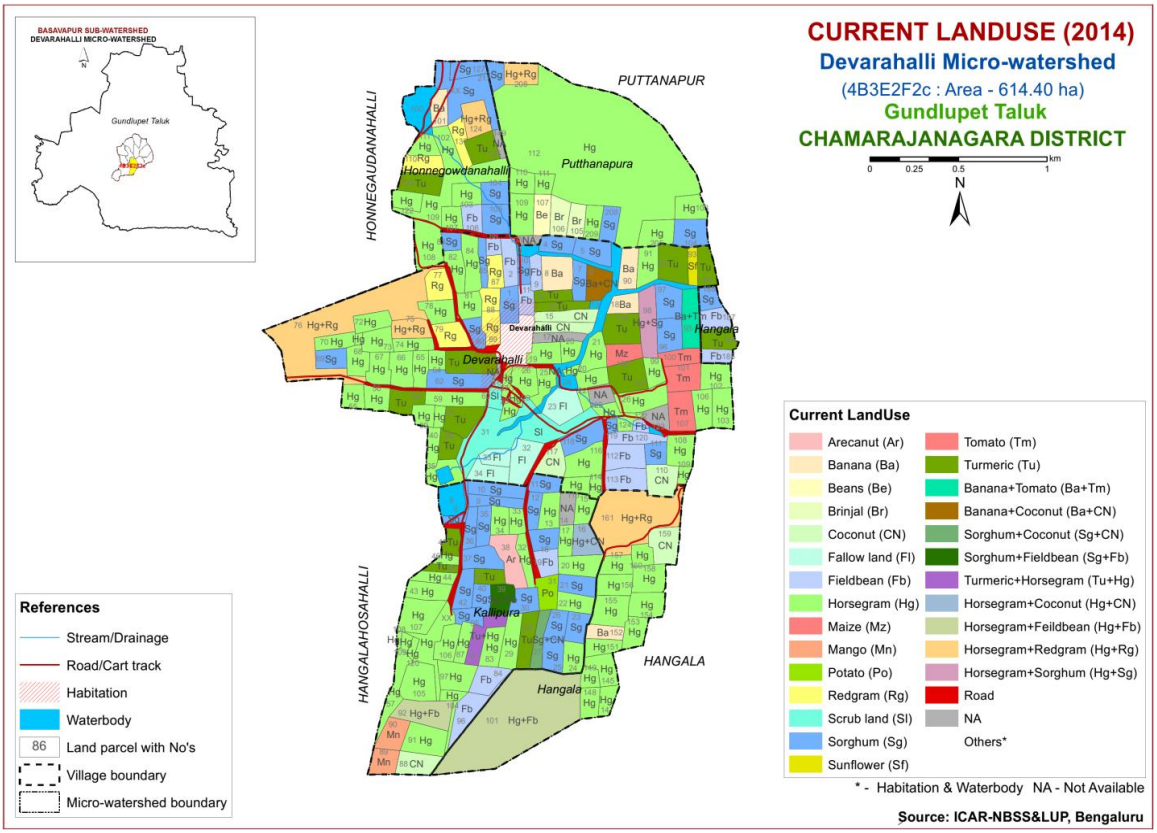


Fig. 2.5 Current Land Use map- Devarahalli Microwatershed

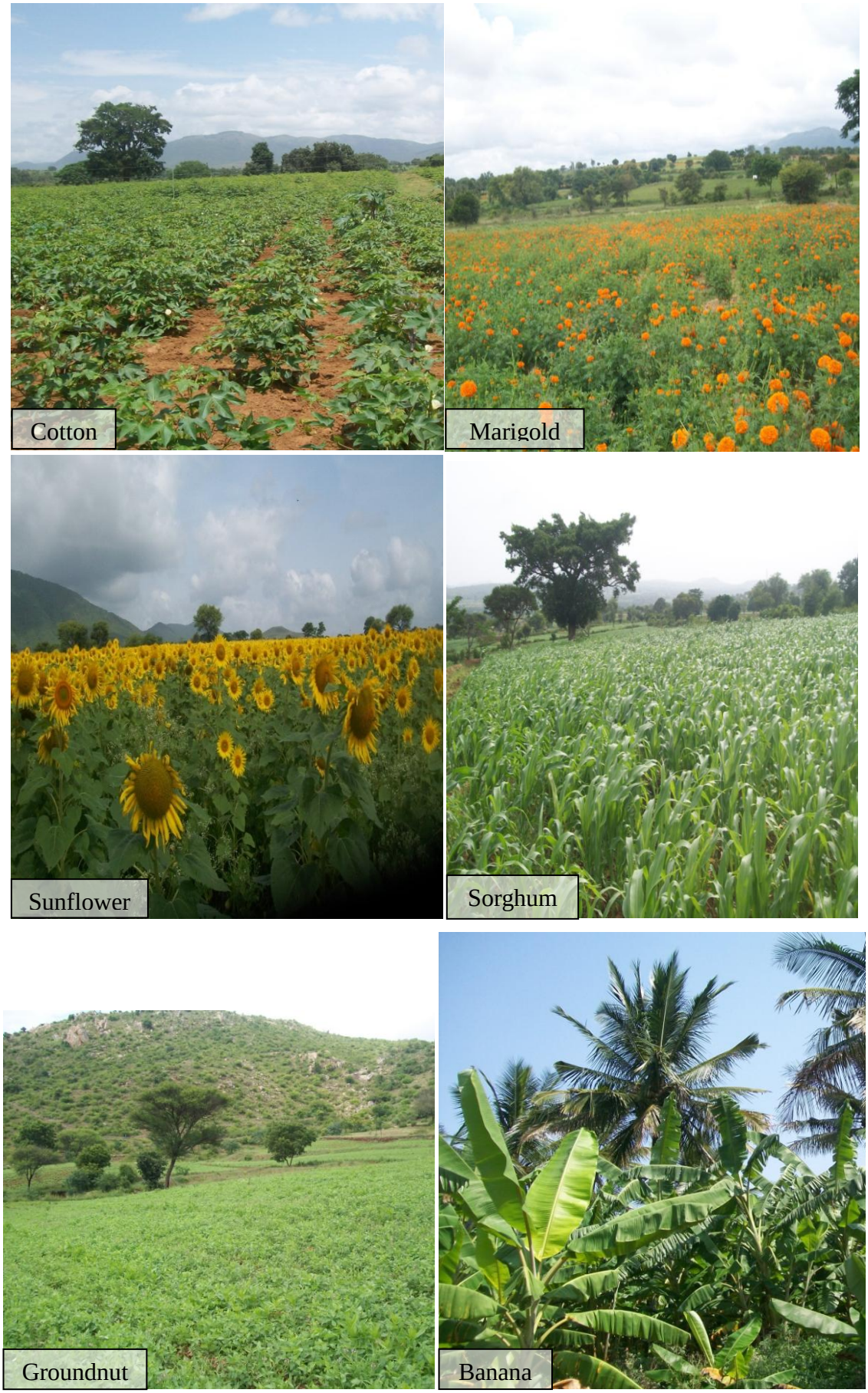


Fig.2.6. Different Crops and Cropping Systems in Dadal Microwatershed

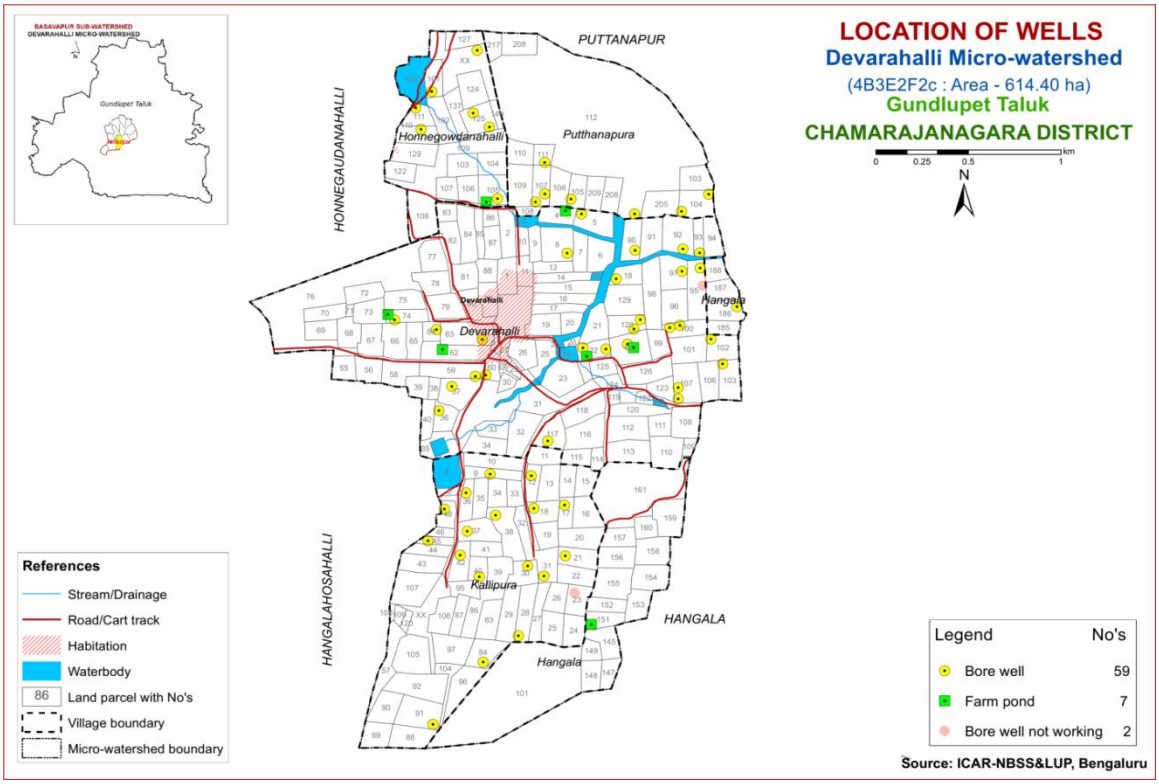


Fig. 2.7 Location of Wells and Conservation Structures - Devarahalli Microwatershed

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 Devarahalli microwatershed by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, soil horizons, porosity, soil reaction etc.) and site characteristics (slope of the land, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous units (management units) and showing their extent and geographic distribution on the microwatershed cadastral map. The detailed survey at 1:7920 scale was carried out in 614 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.*, 2015) which is briefly described below.

3.1 Base Maps

The detailed survey of the land resources occurring in the microwatershed was carried out by using digitized cadastral map 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 Survey of India topographical map to identify the geology landscapes, landforms and other surface features. The cadastral map was overlaid on the satellite imagery (Fig.3.2) that helps to identify the parcel boundaries and other permanent 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.3.3). Apart from cadastral maps and images, toposheets of the area (1:50,000 scale) were used for initial traversing, identification of geology and landforms, drainage features, present land use and also for selection of transects in the microwatershed.

3.2 Image Interpretation for Physiography

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

Image Interpretation Legend for Physiography

G- Granite Gneiss Landform

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

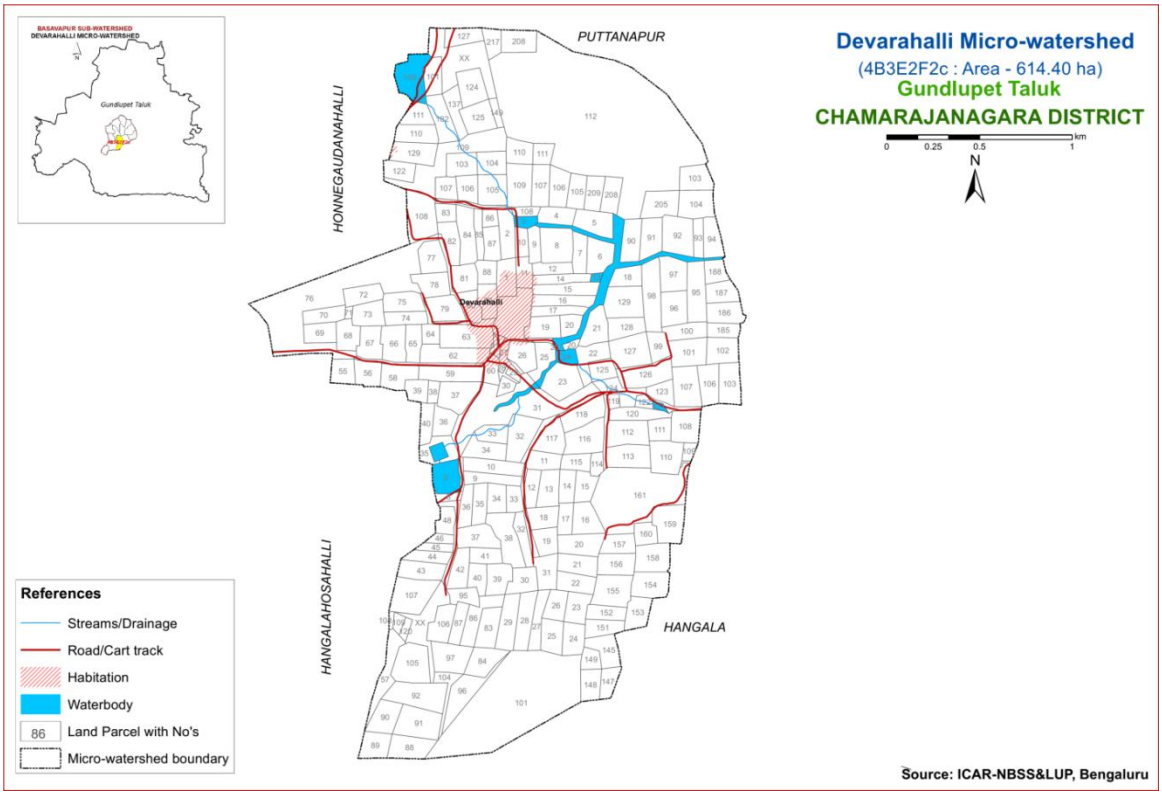


Fig. 3.1 Scanned and Digitized Cadastral map of Devarahalli Microwatershed

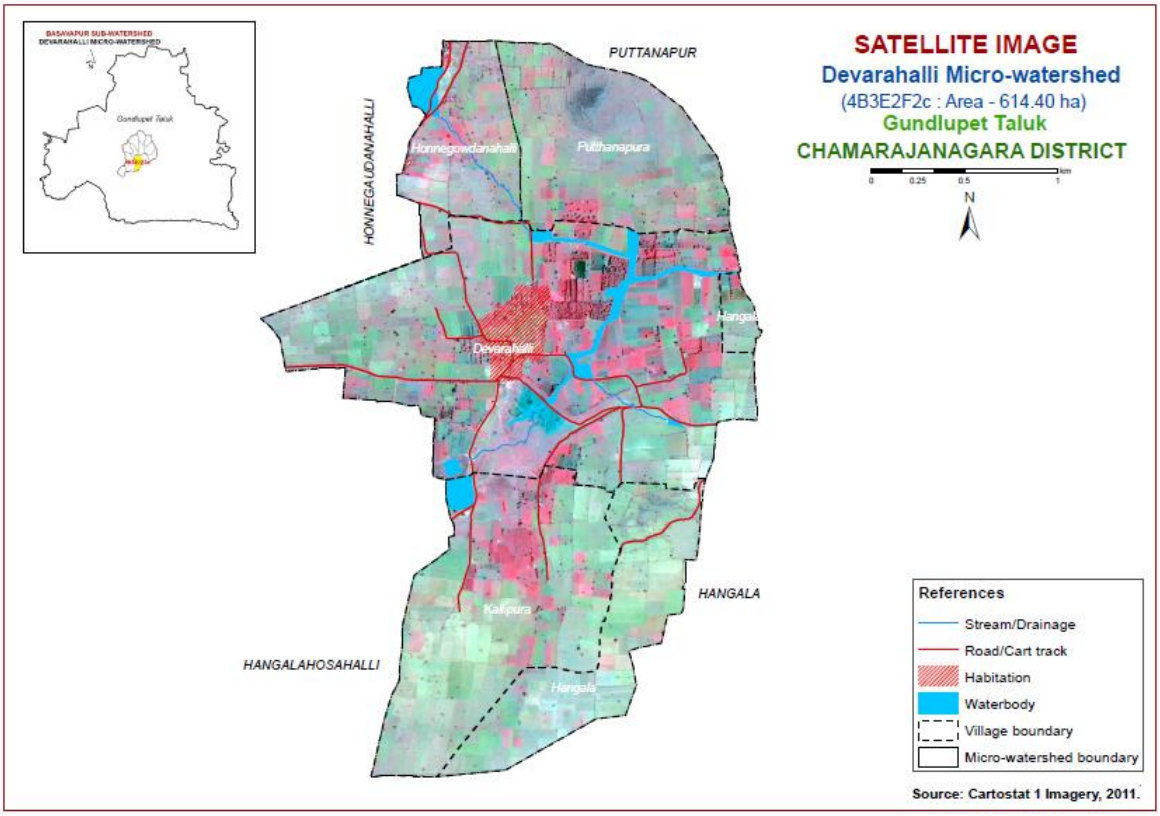


Fig. 3.2 Satellite image of Devarahalli Microwatershed

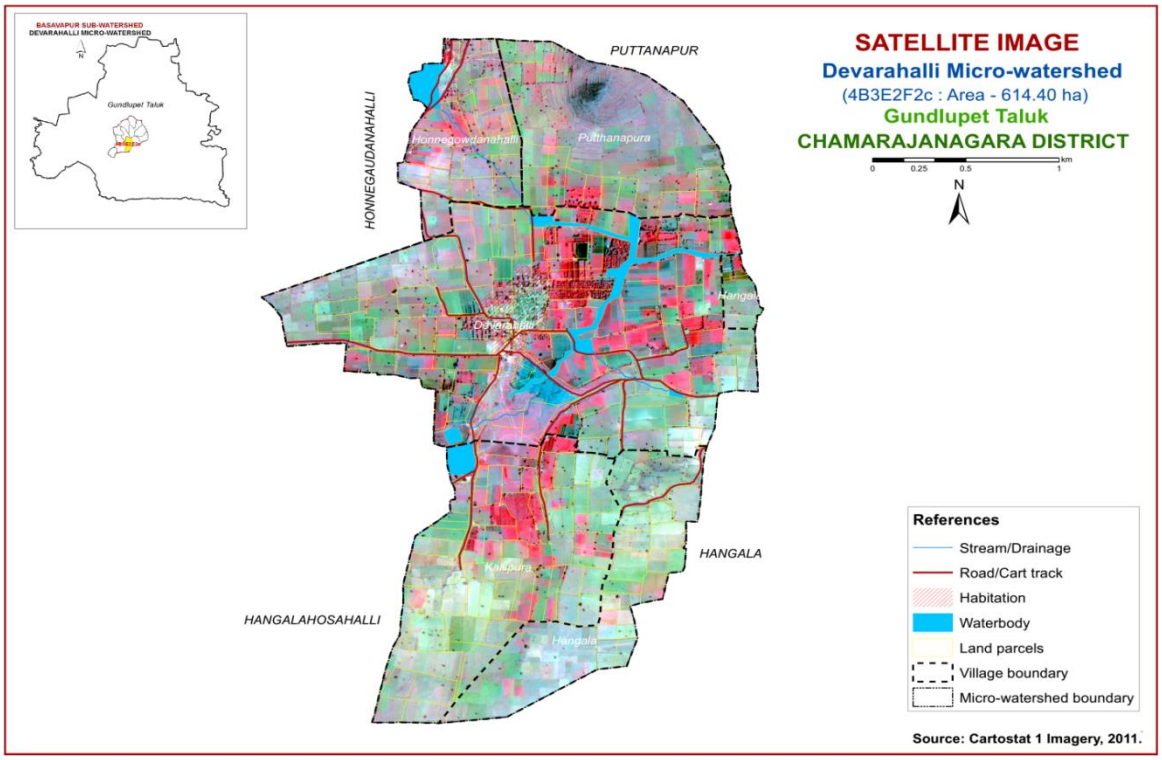


Fig. 3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Devarahalli Microwatershed

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 and uplands was carried out. Based on the variability observed on the surface, transects were selected across the slope covering all the landform units in the microwatershed (Natarajan and Dipak Sarkar, 2010). In the selected transect, soil profiles 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 the 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 the soil-site characteristics, the soils were grouped into different soil series (soil series is the most homogeneous unit having similar horizons and properties

and behaves similarly for a given level of management). Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, 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 in the microwatershed are given in Table 3.1. Based on the above characteristics, 11 soil series were identified in Devarahalli microwatershed.

Table 3.1 Differentiating Characteristics used for Identifying Soil Series (Characteristics are of series control section)

Sl. no	Soil Series	Depth (cm)	Colour	Texture	Gravel (%)	Horizon sequence
1	BMB (Beemanabeedu)	>150	2.5YR2.5/2,3/2, 2.5/3,3/3,2.5/4,3/4	sc-c	<15	Ap-Bt
2	DRH (Devarahalli)	50-75	2.5YR 2.5/4, 3/2,3/6	scl-sc	15-35	Ap-Bt-Cr
3	(GPR) (Gopalapur)	75-100	2.5 YR 3/2, 3/3 5YR3/3, 4/3	scl-sc	15-35	Ap-Bt-Cr-
4	HDR (Hundipura)	25-50	2.5YR2.5/4, 5YR3/2	scl-sc	<15	Ap-Bt-Cr
5	HGH (Honnegaudanahalli)	>150	7.5YR2.5/2, 2.5/3,3/3,2.5/4,3/4	scl	<15	Ap-Bw
6	HPR (Hullipura)	50-75	7.5YR2.5YR2.5/2,3/2	scl-sc	15-35	Ap-Bt-Cr
7	KLP (Kallipura)	100-150	2.5YR2.5/3,2.5/4,3/4	scl-sc	15-35	AP-Bt-Cr
8	KNG (Kannigala)	75-100	2.5YR2.5/4,3/4,3/6	scl-sc	>35	Ap-Bt-Cr
9	(MDH) (Maddinahundi)	100-150	2.5YR2.5/4, 3/4	sc	>35	AP-Bt-Cr
10	MGH (Magoonahalli)	50-75	2.5YR2.5/4,3/4	scl	>35	Ap-Bt-Cr
11	SPR (Shivapura)	25-50	2.5 YR2.5/4,3/4	scl-sc	>35	Ap-Bt-Cr

3.4 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 (98) collected from farmer's fields for fertility status (major and micronutrients) at 250 m grid interval was 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 krigging method for the microwatershed.

3.5 Finalization of Soil Map

The area under each soil series was further separated and mapped as 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.3.3) in the form of symbols. During the survey, about 24 profile pits and few minipits 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 mapping units representing 11 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2.

The soil phase map (management units) shows the distribution of 35 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 they have to be treated accordingly.

The 35 soil phases identified and mapped in the microwatershed were regrouped into 8 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 Devarahalli 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 units are expected to behave similarly for a given level of management.

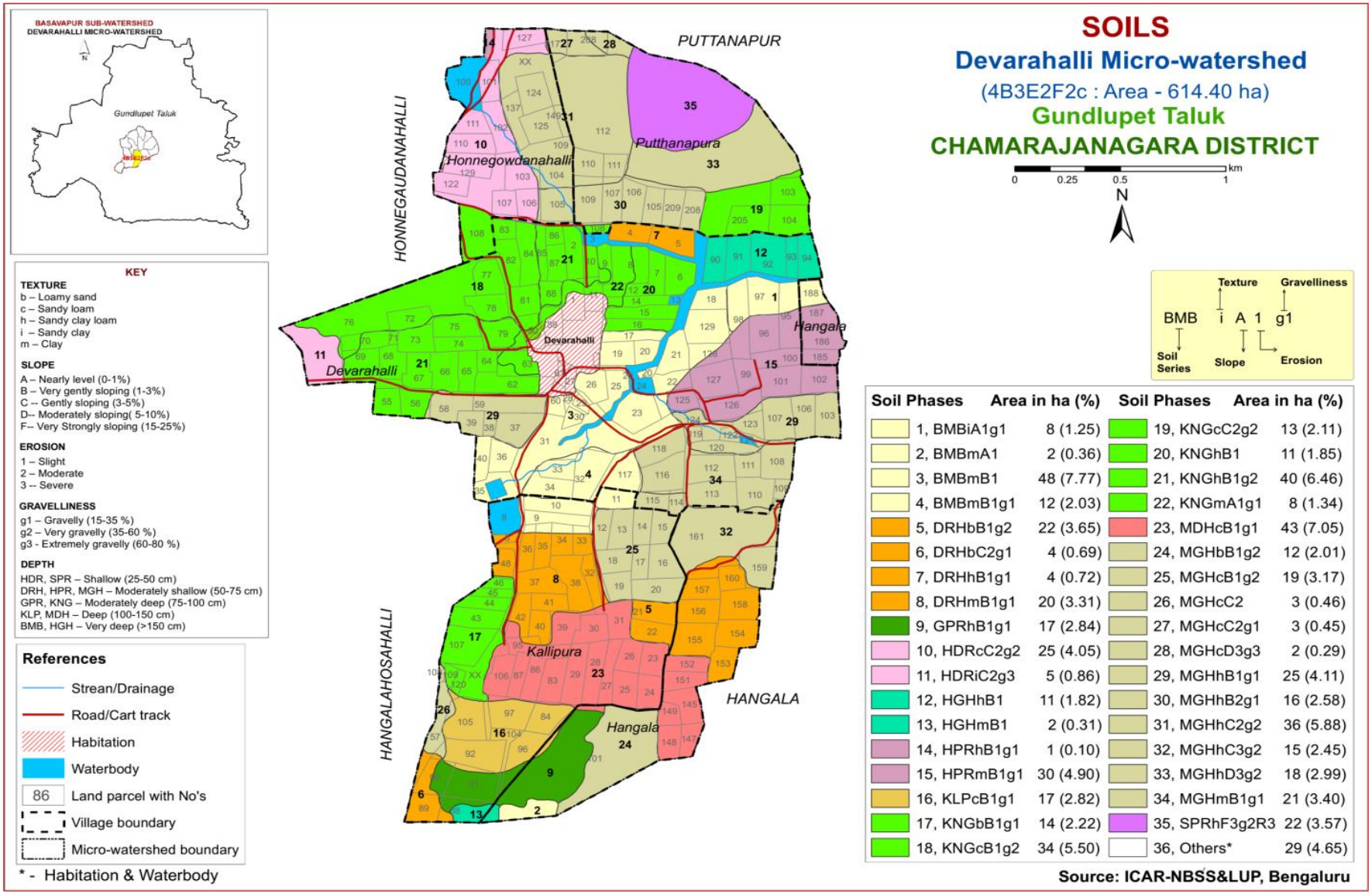


Fig. 3.4 Soil Phase or Management Units- Devarahalli Microwatershed

Table 3.2 Soil map unit description of Devarahalli microwatershed

Series	Map symbol	Soil map unit	Description	Area in ha
Soils of Granite gneiss Landscape				
BMB	Beemanabeedu soils are very deep (>150 cm), moderately well drained, have very dark greyish brown to dark grey and very dark brown clayey soils occurring on nearly level to very gently sloping lowlands under cultivation			**70.06 (11.41)**
	1	BMBiA1g1	Sandy clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	7.70 (1.25)
	2	BMBmA1	Clay surface, slope 0-1%, slight erosion	2.18 (0.36)
	3	BMBmB1	Clay surface, slope 1-3%, slight erosion	47.72 (7.77)
	4	BMBmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	12.46 (2.03)
DRH	Devarahalli soils are moderately shallow (50-75 cm), well drained, have dark red to reddish brown and dusky red gravelly sandy clay loam to sandy clay soils occurring on very gently to gently sloping uplands under cultivation			**51.46 (8.37)**
	5	DRHbB1g2	Loamy sand surface, slope 1-3%, slight erosion, very gravelly (35-60%)	22.45 (3.65)
	6	DRHbC2g1	Loamy sand surface, slope 3-5%, moderate erosion, gravelly (15-35%)	4.25 (0.69)
	7	DRHhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	4.45 (0.72)
	8	DRHmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	20.31 (3.31)
GPR	Gopalapur soils are moderately deep (75-100 cm), well drained, have dark brown to dark reddish brown and reddish brown gravelly sandy clay loam to sandy clay soils occurring on very gently to gently sloping uplands under cultivation			**17.47 (2.84)**
	9	GPRhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	17.47 (2.84)
HDR	Hundipura soils are shallow (25-50 cm), well drained, have dark reddish brown to dusky red sandy clay loam to sandy clay soils occurring on very gently sloping uplands and moderately sloping mounds and ridges			**30.16 (4.91)**
	10	HDRcC2g2	Sandy loam surface, slope 3-5 %, moderate erosion, very gravelly (35-60%)	24.89 (4.05)
	11	HDRiC2g3	Sandy clay surface, slope 3-5%, moderate	5.27

			erosion, extremely gravelly (60-80%)	(0.86)
HGH	Honnegaudanahalli soils are very deep (>150 cm), well drained, have very dark brown to brown and dark reddish brown sandy clay loam soils occurring on very gently sloping uplands under cultivation.			**13.08 (2.13)**
	12	HGHhB1	Sandy clay loam surface, slope 1-3 %, slight erosion	11.18 (1.82)
	13	HGHmB1	Clay surface, slope 1-3%, slight erosion	1.90 (0.31)
HPR	Hullipura soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark brown gravelly sandy clay loam to sandy clay soils occurring on very gently to gently sloping uplands under cultivation			**30.7 (5.00)**
	14	HPRhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	0.59 (0.10)
	15	HPRmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	30.11 (4.90)
KLP	Kallipura soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands under cultivation.			**17.34 (2.82)**
	16	KLPcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	17.34 (2.82)
KNG	Kannigala soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands and strongly sloping mounds and ridges.			**119.71 (19.48)**
	17	KNGbB1g1	Loamy sand surface, slope 1-3%, slight erosion, gravelly (15-35%)	13.66 (2.22)
	18	KNGcB1g2	Sandy loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)	33.78 (5.50)
	19	KNGcC2g2	Sandy loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%)	12.99 (2.11)
	20	KNGhB1	Sandy clay loam surface, slope 1-3%, slight erosion	11.37 (1.85)
	21	KNGhB1g2	Sandy clay loam surface, slope 1-3%, slight erosion, very gravely (35-60%)	39.69 (6.46)
	22	KNGmA1g1	Clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	8.22 (1.34)
MDH	Maddinahundi soils are deep (100-150 cm), well drained, have dark reddish brown gravelly sandy clay soils occurring on very gently to			**43.34 (7.05)**

	gently sloping uplands under cultivation.			
	23	MDHcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	43.34 (7.05)
MGH	Magoonahalli soils are moderately shallow (50-75 cm), well drained, have very dark brown to dark brown gravelly sandy clay loam soils occurring on very gently sloping uplands and moderatly sloping mounds and ridges			**170.62 (27.79)**
	24	MGHbB1g2	Loamy sand surface, slope 1-3%, slight erosion, very gravelly (35-60%)	12.33 (2.01)
	25	MGHcB1g2	Sandy loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)	19.45 (3.17)
	26	MGHcC2	Sandy loam surface, slope 3-5%, moderate erosion	2.82 (0.46)
	27	MGHcC2g1	Sandy loam surface, slope 3-5%, moderate erosion, gravelly (15-35%)	2.75 (0.45)
	28	MGHcD3g3	Sandy loam surface, slope 5-10%, severe erosion, extremely gravelly (60-80%)	1.77 (0.29)
	29	MGHhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	25.24 (4.11)
	30	MGHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	15.86 (2.58)
	31	MGHhC2g2	Sandy clay loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%)	36.12 (5.88)
	32	MGHhC3g2	Sandy clay loam surface, slope 3-5%, severe erosion, very gravelly (35-60%)	15.07 (2.45)
	33	MGHhD3g2	Sandy clay loam surface, slope 5-10%, severe erosion, very gravelly (35-60%)	18.34 (2.99)
	34	MGHmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	20.87 (3.40)
SPR	Shivapura soils are shallow (25-50 cm), well drained, have dark reddish brown gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands and very strongly sloping hills, mounds and ridges.			**21.91 (3.57)**
	35	SPRhF3g2R3	Sandy clay loam surface, slope 15-25%, severe erosion, very gravelly (35-60%), very rocky (25-50%)	21.91 (3.57)
MISCELLANEOUS LANDS				
	.	Others		28.57 (4.65)

Others – Habitation & Waterbody

Chapter 4

THE SOILS

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

A brief description of each of the 11 soil series identified followed by the soil phases (management units) mapped under each series 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 characteristics 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, ersion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatersheds in Appendix-I.

4.1 Soils of Granite gneiss Landscape

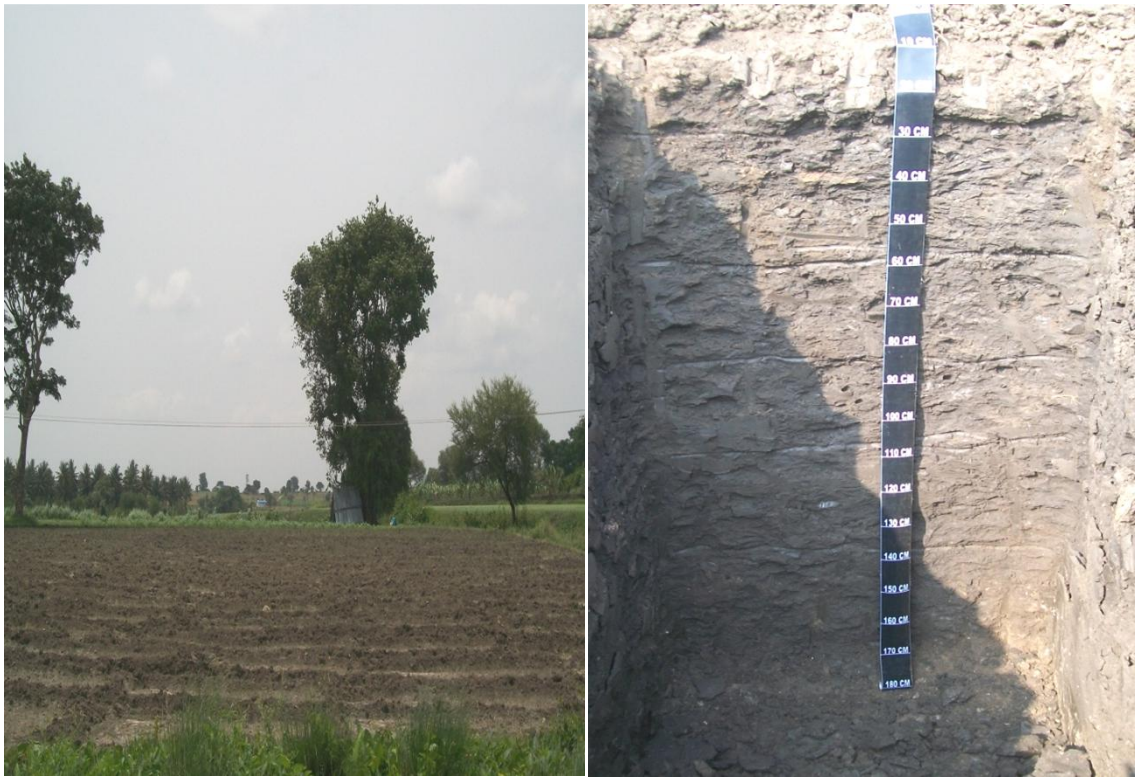
In this landscape, 11 soil series are identified and mapped. Of these, Magoonahalli (MGH) soil series occupies maximum area of about 171 ha (28%) followed by Kannigala (KNG) 120 ha (19%) area. Brief description of each series identified in the microwatershed is given below.

4.1.1 Beemanabeedu (BMB) Series: Beemanabeedu soils are very deep (>150 cm), moderately well drained, have very dark greyish brown to dark grey and very dark brown clayey soils. They are developed from weathered granite gneiss and occur on very gently sloping lowlands.

The thickness of the solum ranges from 150 to 200 cm. The thickness of A horizon ranges from 12 to 17 cm. Its colour is in 10 YR and 7.5 YR hue with value 2.5 to 4 and chroma 2 to 4. The texture varies from sandy clay to clay with 10 to 15 per cent gravel. The thickness of B horizon is more than 150 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 2. Texture is clay and is nongravelly. The available water capacity is very high (>200 mm/m).

Four phases were identified:

BMBiA1g1	Sandy clay surface, slope 0-1%, slight erosion, gravelly (15-35%)
BMBmA1	Clay surface, slope 0-1%, slight erosion
BMBmB1	Clay surface, slope 1-3%, slight erosion
BMBmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)



Landscape and Soil Profile characteristics of Beemanabeedu (BMB) Series

4.1.2 Devarahalli (DRH) Series: Devarahalli soils are moderately shallow (50-75 cm), well drained, have dark red to reddish brown and dusky red sandy clay loam to sandy clay soils. They have developed from granite gneiss and occur on very gently to gently sloping uplands.

The thickness of the solum ranges from 52 to 73 cm. The thickness of A horizon ranges from 7 to 15 cm. Its colour is in 7.5 YR and 5YR hue with value 3 to 4 and chroma 2 to 6. The texture varies from loamy sand to clay with 10 to 25 per cent gravel. The thickness of B horizon ranges from 45 to 58 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4 to 6. Its texture is gravelly sandy clay loam to gravelly sandy clay with gravel content of 15 to 35 per cent. The available water capacity is low (51-100 mm/m).

Four phases were identified:

DRHbB1g2	Loamy sand surface, slope 1-3%, slight erosion, very gravelly (35-60%)
DRHbC2g1	Loamy sand surface, slope 3-5%, moderate erosion, gravelly (15-35%)
DRHhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)
DRHmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)

Landscape and Soil Profile characteristics of Devarahalli (DRH) Series

4.1.3 Gopalapur (GPR) Series: Gopalapur soils are moderately deep (75-100 cm), well drained, have dark brown to dark reddish brown and reddish brown sandy clay loam to sandy clay soils.They have developed from granite gneiss and occur on very gently to gently sloping uplands.

The thickness of the solum ranges from 73 to 97 cm. The thickness of A horizon ranges from 12 to 18 cm. Its colour is in 2.5 YR and 7.5 YR hue with value 3 and chroma 2. The texture varies from gravelly sandy clay to sandy clay loam with 10-25 per cent gravel. The thickness of B horizon ranges from 66 to79 cm. Its colour is in 2.5 YR and 5 YR hue with value 3 to 4 and chroma 2 to 3. Its texture is gravelly sandy clay loam to gravelly sandy clay with gravel content of 15-35 per cent. The available water capacity is low (51-100 mm/m).

Only one phase was identified:

GPRhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)

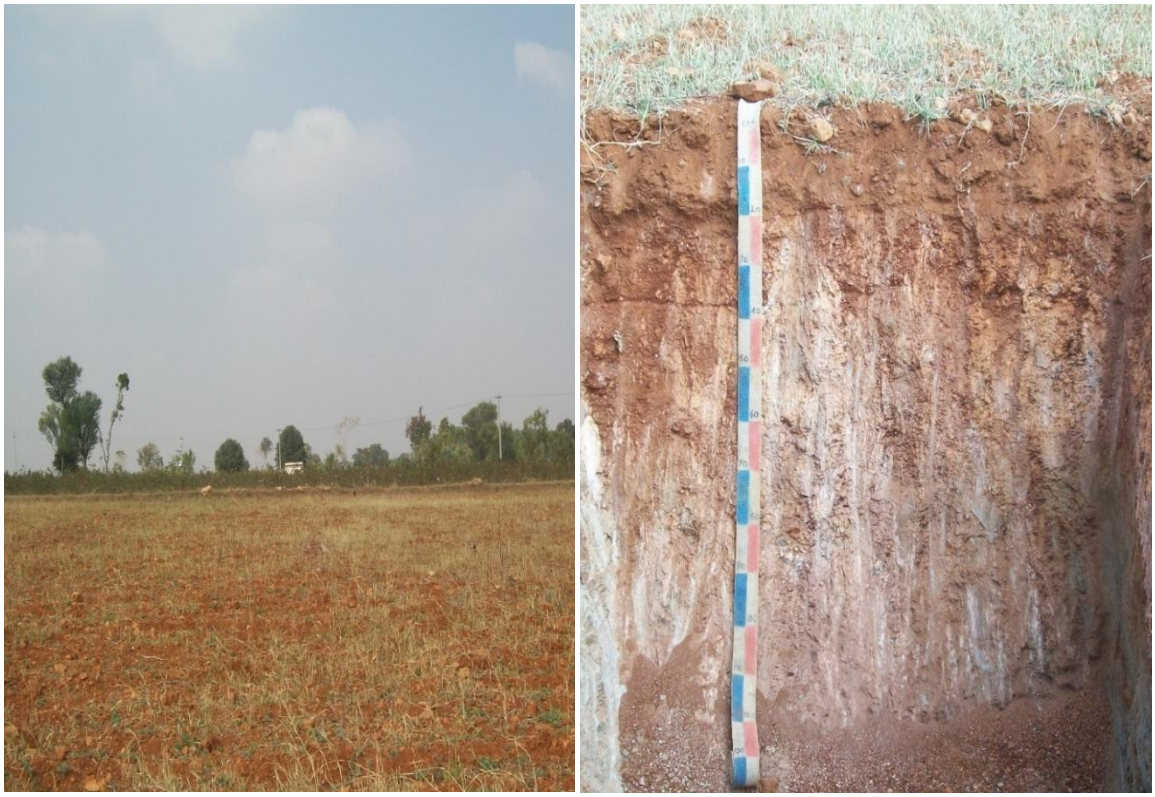
Landscape and Soil Profile characteristics of Gopalapur (GPR) Series

4.1.4 Hundipura (HDR) Series: Hundipura soils are shallow (25-50 cm), well drained, have dark reddish brown to dusky red sandy clay loam to sandy clay soils. They have developed from granite gneiss and occur on very gently to moderately sloping uplands.

The thickness of the solum ranges from 35 to 46 cm. The thickness of A horizon ranges from 7 to 18 cm. Its colour is in 7.5 YR and 5 YR hue with value 3 and chroma 3 to 4. The texture varies from loamy sand to clay with 10 to 20 per cent gravel. The thickness of B horizon ranges from 19 to 31 cm. Its colour is in 2.5 YR and 5 YR hue with value 2.5 to 3 and chroma 2 to 4. Its texture is sandy clay loam to sandy clay with gravel content of < 15 per cent. The available water capacity is very low (<50 mm/m).

Two phases were identified:

HDRcC2g2	Sandy loam surface, slope 3-5 %, moderate erosion, very gravelly (35-60%)
HDRiC2g3	Sandy clay surface, slope 3-5%, moderate erosion, extremely gravelly (60-80%)



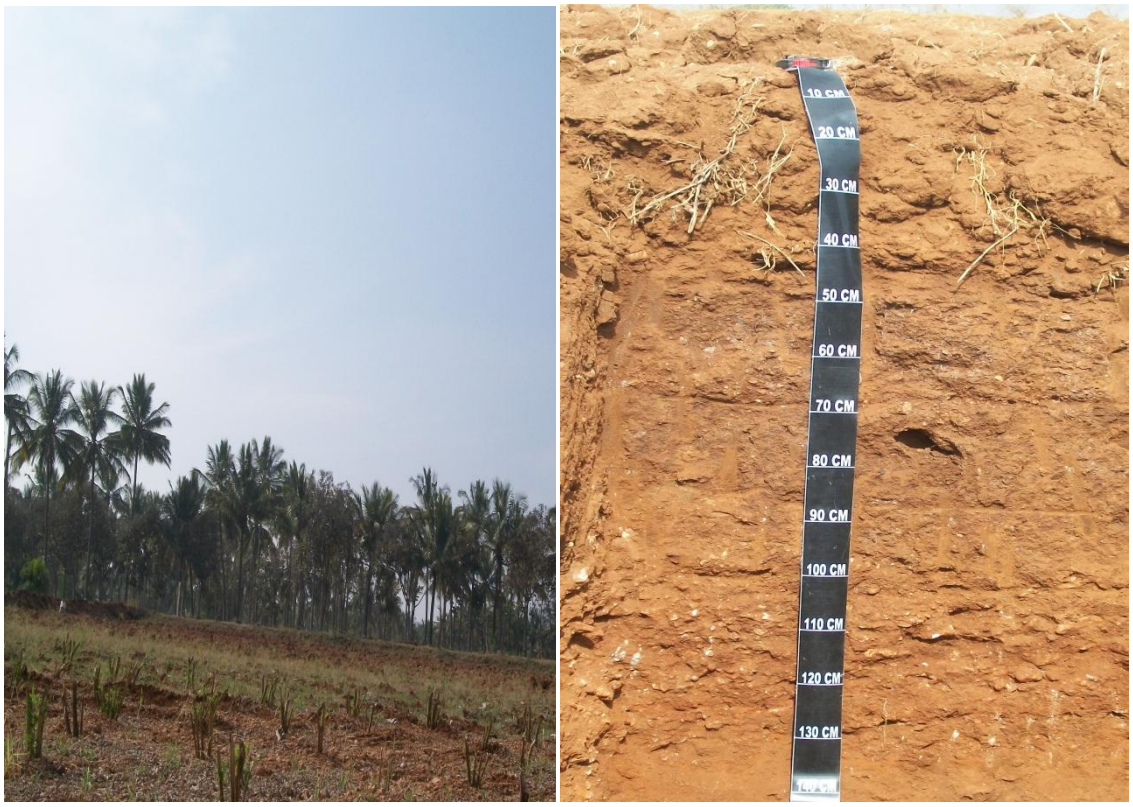
Landscape and Soil Profile characteristics of Hundipura (HDR) Series

4.1.5 Honnegaudanahalli (HGH) Series: Honnegaudanahalli soils are very deep (>150 cm), well drained, have very dark brown to brown and dark reddish brown sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 150-200 cm. The thickness of A horizon ranges from 14 to 19 cm. Its colour is in 7.5 YR hue with value 2.5 to 4 and chroma 2 to 6. The texture varies from sandy loam to clay with 10 to 15 per cent gravel. The thickness of B horizon is more than 150 cm. Its colour is in 7.5 YR hue with value 2.5 to 3 and chroma 2 to 4. Texture is sandy clay loam with <15 per cent gravel. The available water capacity is very high (>200mm/m).

Two phases were identified:

HGHhB1	Sandy clay loam surface, slope 1-3 %, slight erosion
HGHmB1	Clay surface, slope 1-3%, slight erosion



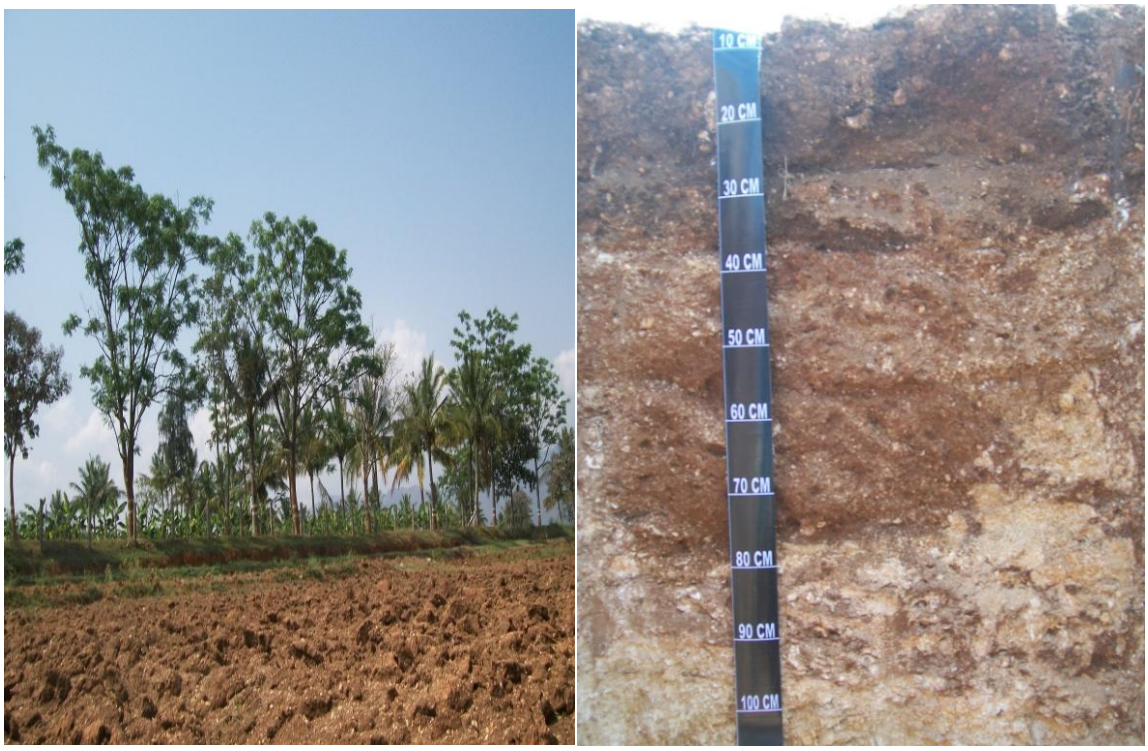
Landscape and Soil Profile characteristics of Honnegaudanahalli (HGH) Series

4.1.6 Hullipura (HPR) Series: Hullipura soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark brown sandy clay loam to sandy clay soils. They have developed from granite gneiss and occur on very gently to gently sloping uplands.

The thickness of the solum ranges from 51 to 71 cm. The thickness of A horizon ranges from 13 to 18 cm. Its colour is in 7.5YR and 10 YR hue with value 2.5 to 3 and chroma 2 to 4. The texture varies from gravelly sandy loam to gravelly clay with 15 to 25 per cent gravel. The thickness of B horizon ranges from 38 to 52 cm. Its colour is in 2.5 YR and 7.5 YR hue with value 2.5 to 3 and chroma 2. Its texture is gravelly sandy clay loam to gravelly sandy clay with gravel content of 15 to 35 per cent. The available water capacity is low (51-100 mm/m).

Two phases were identified:

HPRhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)
HPRmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)



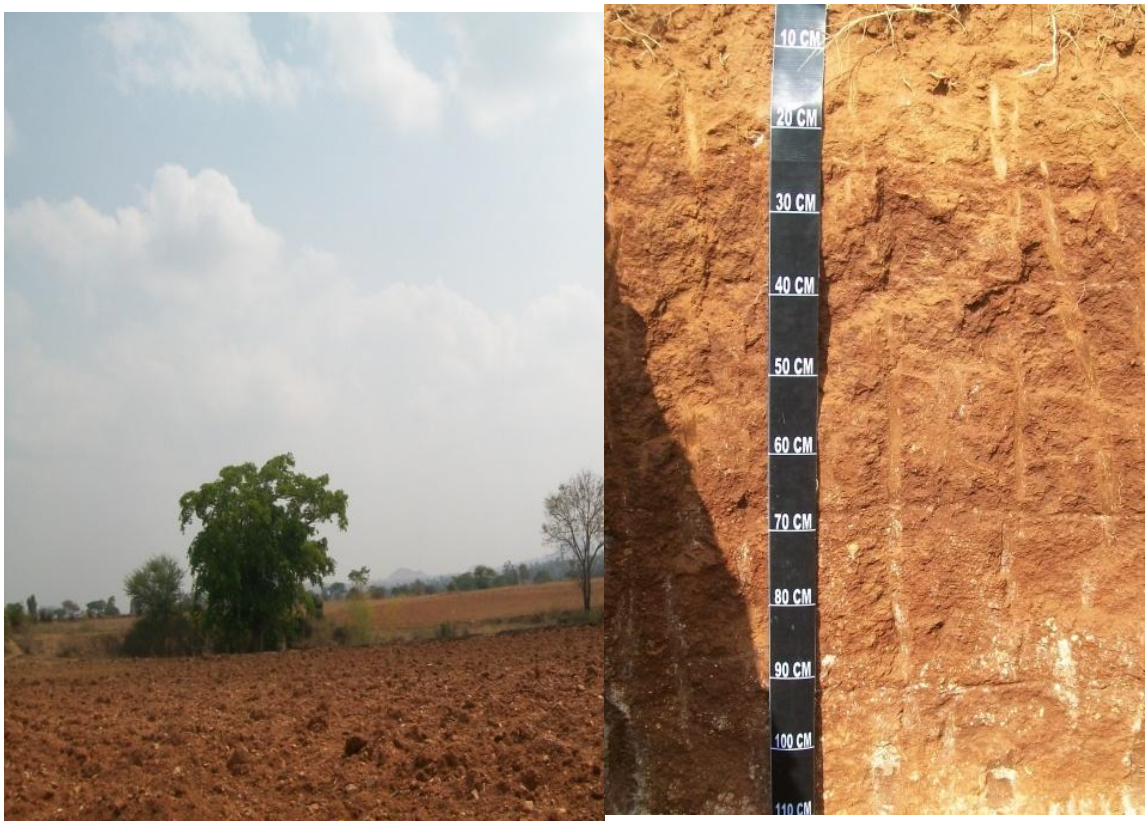
Landscape and Soil Profile characteristics of Hullipura (KDH) Series

4.1.7 Kallipura (KLP) Series: Kallipura soils are moderately shallow (50 to 75cm), well drained, have brown to very dark brown and dark reddish brown sandy loam to clay loam soils. They have developed from granite gneiss and occur on nearly level to gently sloping uplands.

The thickness of the solum ranges from 54 to 75 cm. The thickness of A horizon ranges from 11 to 19 cm. Its colour is in 7.5 YR, 5YR and 2.5 YR hue with value 2.5 to 4 and chroma 2 to 6. The texture varies from gravelly sandy loam to gravelly clay loam with 10 to 20 per cent gravel. The thickness of B horizon ranges from 43 to 60 cm. Its colour is in 2.5 YR hue with value 3 and chroma 4 to 6. Its texture is gravelly sandy clay loam to gravelly sandy clay with gravel content of 15 to 35 per cent. The available water capacity is low (51-100 mm/m).

Only one phase was identified:

KLPcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)



Landscape and Soil Profile characteristics of Kallipura (KLP) Series

4.1.8 Kannigala (KNG) Series: Kannigala soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red sandy clay loam to sandy clay soils. They have developed from granite gneiss and occur on very gently to strongly sloping uplands.

The thickness of the solum ranges from 78 to 94 cm. The thickness of A horizon ranges from 12 to 15 cm. Its colour is in 5YR, 2.5 YR and 7.5 YR hue with value 3 and chroma 3 to 4. The texture varies from gravelly loamy sand to clay with 15 to 25 per cent gravel. The thickness of B horizon ranges from 69 to 80 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4 to 6. Texture varies from gravelly sandy clay loam to gravelly sandy clay with 40 to 60 per cent gravel. The available water capacity is very low (<50 mm/m).

Six phases were identified:

KNGbB1g1	Loamy sand surface, slope 1-3%, slight erosion, gravelly (15-35%)
KNGcB1g2	Sandy loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)
KNGcC2g2	Sandy loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%)
KNGhB1	Sandy clay loam surface, slope 1-3%, slight erosion
KNGhB1g2	Sandy clay loam surface, slope 1-3%, slight erosion, very gravely (35-60%)
KNGmA1g1	Clay surface, slope 0-1%, slight erosion, gravelly (15-35%)

4.1.9 Maddinahundi (MDH) Series: Maddinahundi soils are deep (100-150 cm), well drained, have dark reddish brown sandy clay soils. They have developed from granite gneiss and occur on very gently to gently sloping uplands.

The thickness of the solum ranges from 102 to 150 cm. The thickness of A horizon ranges from 12 to 25 cm. Its colour is in 7.5 YR, 5 YR and 2.5 YR hue with value 3 and chroma 2 to 6. The texture varies from gravelly sandy loam to gravelly sandy clay with 15 to 30 per cent gravel. The thickness of B horizon ranges from 90 to 138 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4. Its texture is gravelly sandy clay with gravel content of >35 per cent. The available water capacity is low (51-100 mm/m).

Only one phase was identified:

MDHcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)

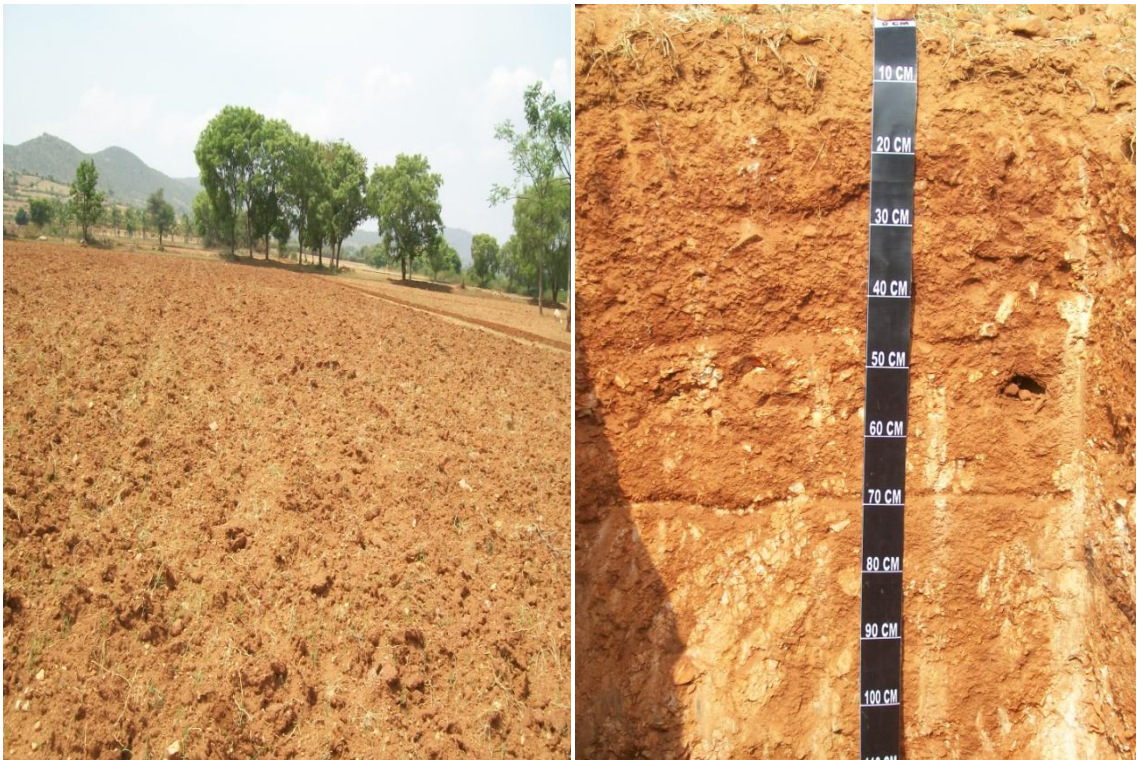
Landscape and Soil Profile characteristics of Maddinahundi (MDH) Series

4.1.10 Magoonahalli (MGH) Series: Magoonahalli soils are moderately shallow (50-75 cm), well drained, have very dark brown to dark brown sandy clay loam soils. They have developed from granite gneiss and occur on very gently to moderately sloping uplands.

The thickness of the solum ranges from 53 to 74 cm. The thickness of A horizon ranges from 15 to 18 cm. Its colour is in 7.5 YR and 5 YR hue with value 3 to 4 and chroma 2 to 6. The texture varies from gravelly sandy loam to gravelly clay with 15 to 25 per cent gravel. The thickness of B horizon ranges from 44 to 52 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4. Its texture is gravelly sandy clay loam with gravel content of >35 per cent. The available water capacity is very low (<50 mm/m).

Eleven phases were identified:

MGHbB1g2	Loamy sand surface, slope 1-3%, slight erosion, very gravelly (35-60%)
MGHcB1g2	Sandy loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)
MGHcC2	Sandy loam surface, slope 3-5%, moderate erosion
MGHcC2g1	Sandy loam surface, slope 3-5%, moderate erosion, gravelly (15-35%)
MGHcD3g3	Sandy loam surface, slope 5-10%, severe erosion, extremely gravelly (60-80%)
MGHhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)
MGHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)
MGHhC2g2	Sandy clay loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%)
MGHhC3g2	Sandy clay loam surface, slope 3-5%, severe erosion, very gravelly (35-60%)
MGHhD3g2	Sandy clay loam surface, slope 5-10%, severe erosion, very gravelly (35-60%)
MGHmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)



Landscape and Soil Profile characteristics of Magoonahalli (MGH) Series

4.1.11 Shivapura (SPR) Series: Shivapura soils are shallow (25-50 cm), well drained, have dark reddish brown sandy clay loam to sandy clay soils. They have developed from granite gneiss and occur on very gently to very strongly sloping uplands.

The thickness of the solum ranges from 26 to 46 cm. The thickness of A horizon ranges from 9 to 17 cm. Its colour is in 7.5 YR and 2.5 YR hue with value 3 to 4 and chroma 3 to 6. The texture varies from sandy loam to sandy clay with 15 to 25 per cent gravel. The thickness of B horizon ranges from 18 to 40 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4. Its texture is gravelly sandy clay loam to gravelly sandy clay with gravel content of >35 per cent. The available water capacity is very low (<50 mm/m).

Only one phase was identified:

SPRhF3g2R3	Sandy clay loam surface, slope 15-25%, severe erosion, very gravelly (35-60%), very rocky (25-50%)

Landscape and Soil Profile characteristics of Shivapura (SPR) 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 gathered through land resource inventory and several thematic maps are generated. These would help in identifying the areas suitable for growing crops and conservation structures needed thus helping to maintain good soil health for sustained crop production. The various thematic maps generated are described below.

5.1 Land Capability Classification

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

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

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

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

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

Class I: The soil map units have few or very few limitations that restrict their use.

Class II: The soil map units have moderate limitations that reduce the choice of crops or that require moderate conservation practices.

Class III: The soil map units have severe limitations that reduce the choice of crops or that require special conservation practices.

Class IV: The soil map units have very severe limitations that reduce the choice of crops or that require very careful management.

Class V: Soils in the mapping units are not likely to erode, but have other limitations that are impractical to remove and as such not suitable for agriculture.

Class VI: The lands have severe limitations that make them generally unsuitable for cultivation.

Class VII: The lands have very severe limitations that make them unsuitable for cultivation.

Class VIII: Soil and other miscellaneous areas that have very severe limitations that nearly preclude their use for any crop production.

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 or slopes, “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 subwatersheds have been classified upto land capability subclass level.

The 35 soil map units identified in Devarahall microwatershed in Gundlupet taluk have been grouped under four land capability classes and 7 land capability subclasses (Fig 5.1). About 92 per cent area in the microwatershed is suitable for agriculture and remaining 8 per cent is not suitable for agriculture.

Good cultivable lands (Class II) cover a maximum area of about 50 per cent and are distributed in the southern, southwestern, central, southeastern and western part of the micowatershed with minor problems of soil, wetness and erosion. Moderately good cultivable lands (Class III) cove r an area of about 34 per cent and are distributed in the southeastern, eastern, western and southern part of the microwatershed with moderate problems of erosion and soil. The fairly good cultivable lands (Class IV) cover a small area of about 8 per cent. They have severe limitations of erosion and soil and are distributed in the western and central part of the microwatershed. An area is 4 % occupied by lands that have severe limitations making them generally unsuitable for agriculture (Class VI) and are distributed in the northern part of the microwatershed. They have very severe limitations of erosion and soil.

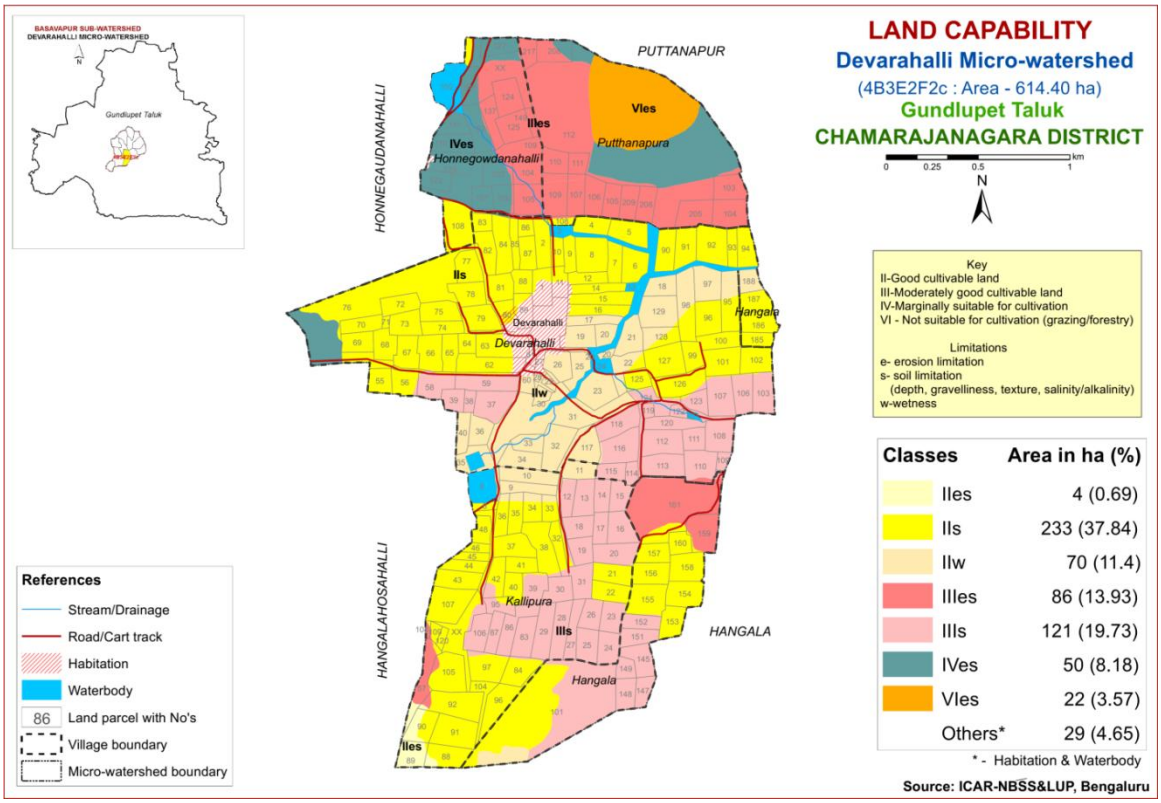


Fig. 5.1 Land Capability map of Devarahalli Microwatershed

5.2 Soil Depth

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

Deep soils (100-150 cm) occur in an area of about 61 ha (10%) and are distributed in the southern and southeastern part of the microwatershed. Very deep soils (>150 cm) occur in an area of about 83 ha (14%) and are distributed in the western, central and northeastern part of the microwatershed. Moderately deep (75-100 cm) soils occupy an area of about 137 ha (22%) and are distributed in the southern, southwestern, central and northwestern part of the microwatershed. Moderately shallow (50-75 cm) soils occupy maximum area of about 253 ha (41%) and are distributed in all parts of the microwatershed. Shallow soils (25-50 cm) occupy about 52 ha (8%) in the northern and northwestern part of the microwatershed.

The most productive lands 144 ha (23%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep (100-150 cm depth) and very deep (>150 cm depth) occurring in the southern, western, central and northeastern part of the microwatershed.

The most problem lands with an area of about 52 ha (8%) having shallow (25-50 cm) rooting depth occur in the northern and northwestern part of the microwatershed. They are not suitable for growing agricultural crops but well suited for pasture, forestry or other recreational purposes. Occasionally, short duration crops may be grown if rainfall is normal.

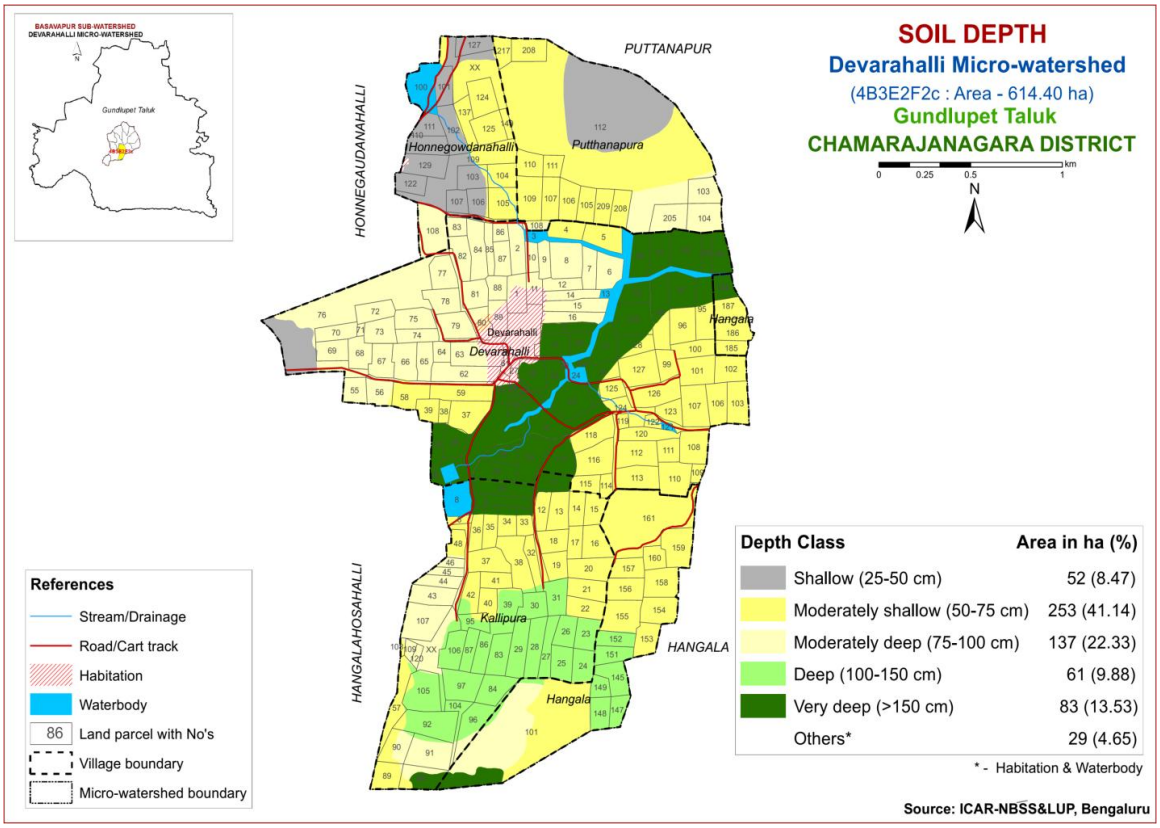


Fig. 5.2 Soil Depth map of Devarahalli Microwatershed

5.3 Surface Soil Texture

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

An area of 157 ha (25%) has soils that are clayey at the surface and are distributed in the western, central, eastern and southern part of the microwatershed. Loamy soils cover a maximum area of about 376 ha (61%) and are distributed in all parts of the microwatershed. An area of about 53 ha (9%) has soils that are sandy at the surface and are distributed in the southern, southwestern, southeastern and central part of the microwatershed.

The most productive lands (25%) 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 (61%) are loamy soils which are have high potential for AWC, nutrient availability but have no drainage or other physical problem.

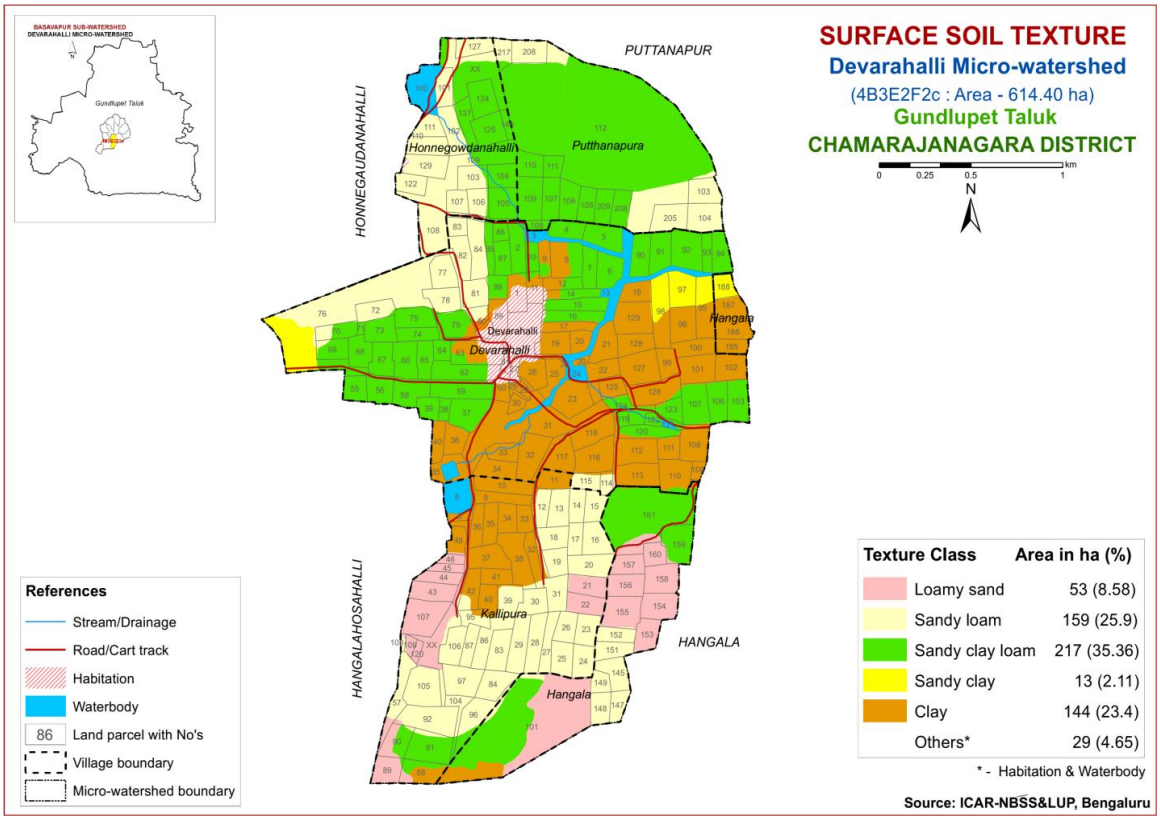


Fig. 5.3 Surface Soil Texture map of Devarahalli Microwatershed

5.4 Soil Gravelliness

Gravel is the term used for describing coarse fragments between 2 mm and 7.5 cm diameter and stones for those between 7.5 cm and 25 cm. The presence of gravel and stones in the 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 geographical distribution in the microwatershed is shown in Figure 5.4.

The soils that are very gravelly (35-60%) covering a maximum area of about 257 ha (42%) are distributed in the northern, western, southeastern and northeastern part of the microwatershed (Fig.5.4) followed by soils that are gravelly (15-35%) covering about 245 ha (40%) and are distributed in the southern, southwestern, southeastern, central and eastern part of the microwatershed.

An area in the microwatershed has soils that are non gravelly (<15%) covering about 77 ha (13%) and are distributed in the western, central and northeastern part of the microwatershed The soils that are extremely gravelly (60-80%) covering small area of about 7 ha (1%) are distributed in the western and northern part of the microwatershed.

The most productive lands with respect to gravelliness are found to be 13 %. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem soils (43%) that are very gravelly (35-60%) and extremely gravelly (60-80%) where only short duration crops can be grown.

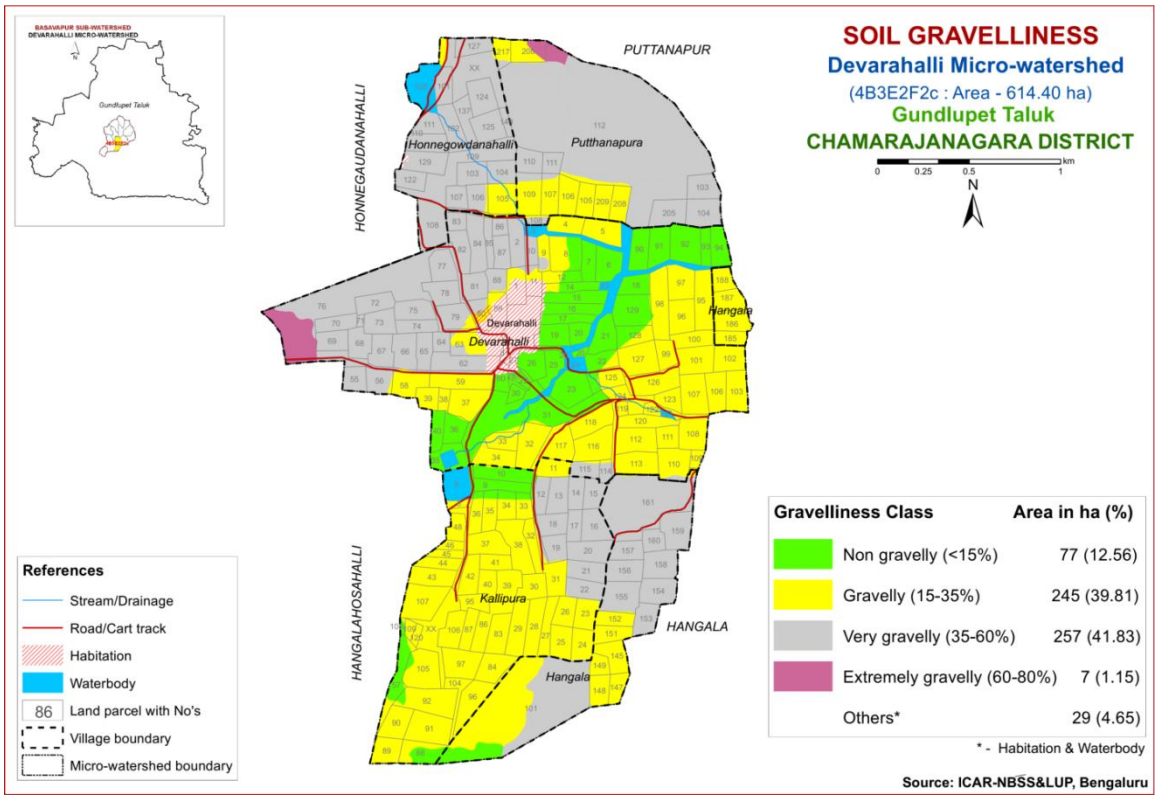


Fig. 5.4 Soil Gravelliness map of Devarahalli Microwatershed

5.5 Available Water Capacity

The soil available water capacity (AWC) is estimated based on the ability of the soil column to retain water between the tensions of 0.33 and 15 bar in a depth of 100 cm or the entire solum if the soil is shallower. The AWC of the soils (soil series) were 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 those classes an AWC map was generated. The area extent and their geographical distribution in the microwatershed is shown in Figure 5.5.

Major area of about 342 ha (56%) in the microwatershed has soils that are very low (<50 mm/m) in available water capacity and are distributed in all parts of the microwatershed. An area of about 160 ha (26%) has soils that are low (51-100 mm/m) in available water capacity and are distributed in the southern, southeastern and estern part of the microwatershed. An area of 83 ha (14%) has soils that have very high (>200 mm/m) available water capacity and are distributed in the western, central and northeastern part of the microwatershed.

An area of about 83 ha (14%) has soils that have high potential (>200 mm/m) with regard to available water capacity where all climatically adapted long duration crops can be grown successfully. About 502 ha (82%) 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.

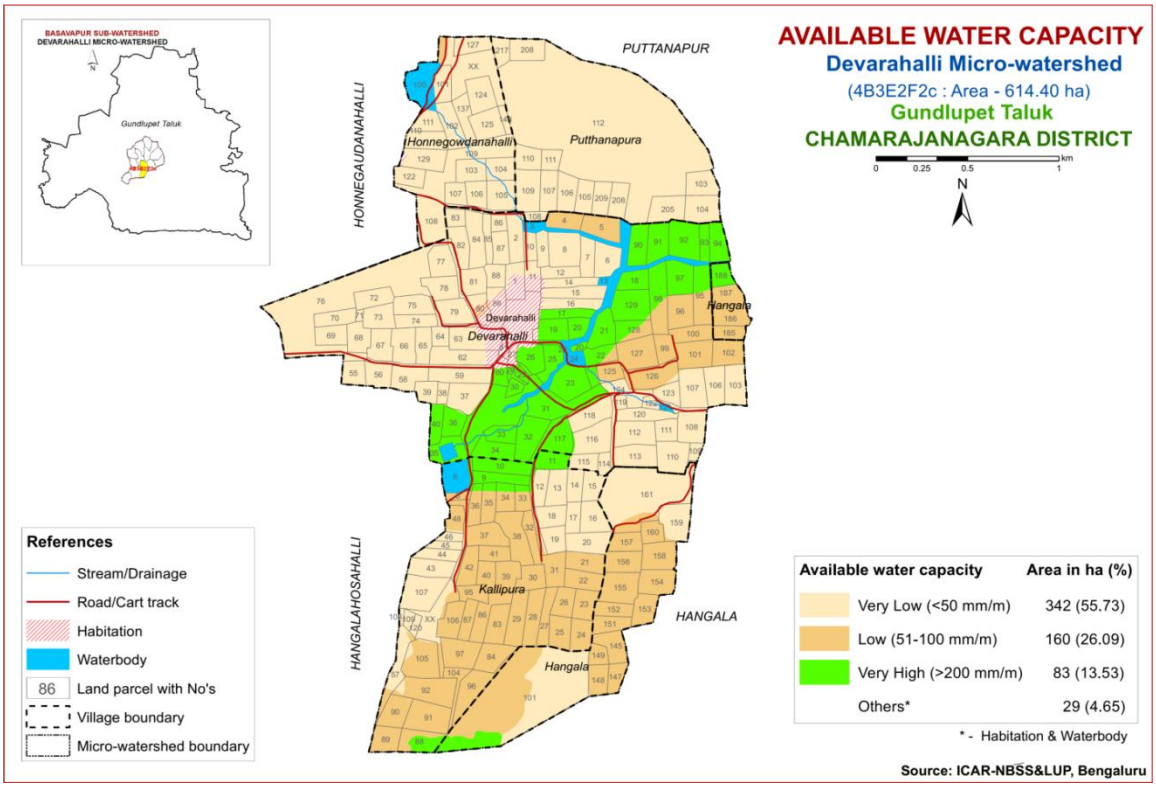


Fig. 5.5 Available Water Capacity map of Devarahalli Microwatershed

5.6 Soil Slope

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

Major area of about 422 ha (69%) falls under very gently sloping (1-3% slope) lands and are distributed in all parts of the microwatershed followed by a gently sloping (3-5% slope) lands. It covers an area of about 104 ha (17%) and is distributed in the northern, northeastern, northwestern, western and eastern part of the microwatershed. A small area of about 20 ha (3%) falls under moderately sloping (5-10% slope) lands and are distributed in northern part of the microwatershed. An area of about 22 ha (4%) falls under very strongly sloping (15-25% slope) lands and are distributed in northern part of the microwatershed. Nearly level (0-1%) lands cover a small area of about 18 ha (3%) and is distributed in the central part of the microwatershed.

An area of about 440 ha (72%) in the microwatershed has soils that have high potential in respect of soil slopes. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures. The problem soils with respect to slope are moderately sloping (5-10%) and very strongly sloping (15-25%) soils covering an area of 42 ha (7 %).

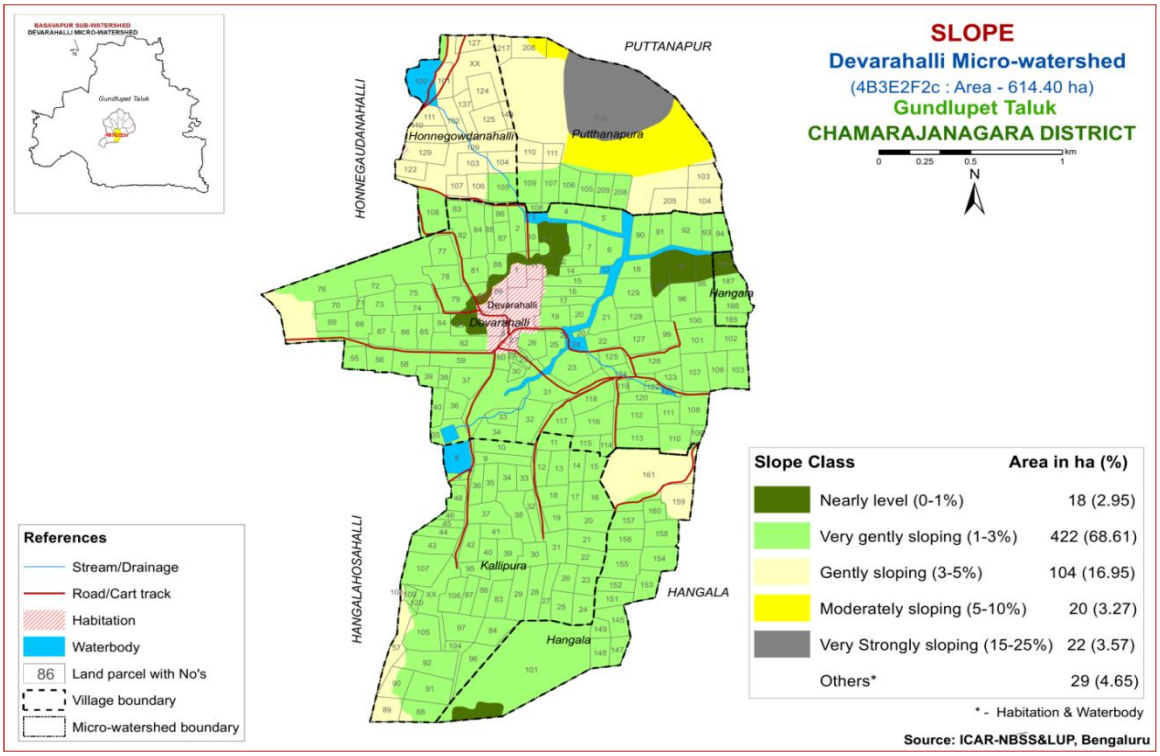


Fig. 5.6 Soil Slope map of Devarahalli Microwatershed

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 rain drop 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 soil erosion map generated. The area extent and their spatial distribution in different microwatersheds is given in Figure 5.7.

Soils that are slightly eroded (e1 class) cover a maximum area of about 424 ha (69%) in the microwatershed. They are distributed in all parts of the microwatershed. Moderately eroded (e2 class) soils cover an area of about 105 ha (17%) and are distributed in the northern, northwestern, northeastern and western part of the microwatershed. Soils that are severely eroded (e3 class) cover an area of about 57 ha (9%) in the microwatershed. They are distributed in the northeastern and eastern part of the microwatershed.

About 57 ha (9%) in the microwatershed is problematic because of severe erosion. Top priority is to be given to these areas for taking up soil and water conservation and other land development measures. Next in priority would be an area of about 105 ha (17%) where the soils are moderately eroded.

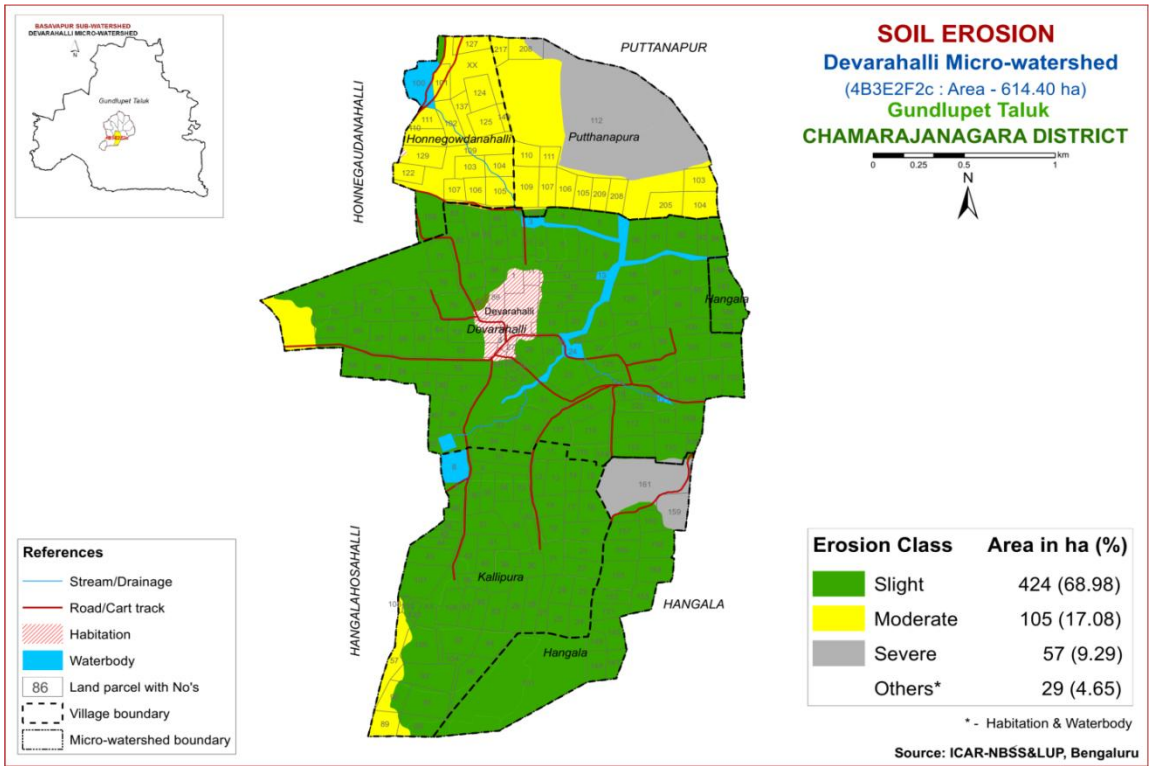


Fig. 5.7 Soil Erosion map of Devarahalli Microwatershed

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. 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 (98 samples) collected from the grid points (one soil sample at every 250 m interval) all over the watershed through land resource inventory in the year 2014 were analysed for pH, ECe, organic carbon, available phosphorus and potassium and for micronutrients like zinc, 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 Devarahalli microwatershed for soil reaction (pH) showed that an area of about 104 ha (17%) is moderately alkaline (pH 7.8-8.4) and is distributed in the western, central and eastern part of the microwatershed. An area of about 126 ha (21%) is slightly alkaline (pH 7.3-7.8) and is distributed in the western, central, eastern and northwestern part of the microwatershed. An area of about 79 ha (13%) is slightly acid (pH 6.0-6.5) and is distributed in the southern, southwestern and southeastern part of the microwatershed followed by an area of about 33 ha (5%) that is moderately acid (pH 5.5-6.0) and is distributed in the southeastern part of the microwatershed. A small area of about 15 ha (2%) is under strongly acid (pH 5.0-5.5) and is distributed in the southeastern part of the microwatershed. Maximum area of about 229 ha (37%) is under neutral (pH 6.5-7.3) and is distributed in the northern, northeastern, northwestern, southern and central part of the microwatershed (Fig.6.1).

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 nonsaline.

6.3 Organic Carbon

The soil organic carbon content in the soils of the microwatershed is low (<0.5%) in maximum area of about 338 ha (55%) and is distributed in all parts of the microwatershed followed by an area of 228 ha (37%) where it is medium (0.5-0.75%) in organic carbon and is distributed in the southern, western, northwestern and northeastern part of the microwatershed. A small area of about 20 ha (3%) is high (>0.75%) in organic carbon and is distributed in the northern part of the microwatershed (Fig.6.3).

6.4 Available Phosphorus

The soil analysis revealed that available phosphorus (Fig.6.4) is medium (23-57kg/ha) in an area of about 174 ha (29%) and is distributed in the central, eastern, southern and western part of the microwatershed. Maximum area of about 300 ha (49%) is low (<23 kg/ha) and is distributed in all parts of the microwatershed. An area of about 112 ha (18%) is high (>57 kg/ha) and is distributed in the central, eastern and southwestern part of the microwatershed.There is an urgent need to increase the dose of phosphorous for all the crops by 25 per cent over the recommended dose to realize better crop performance.

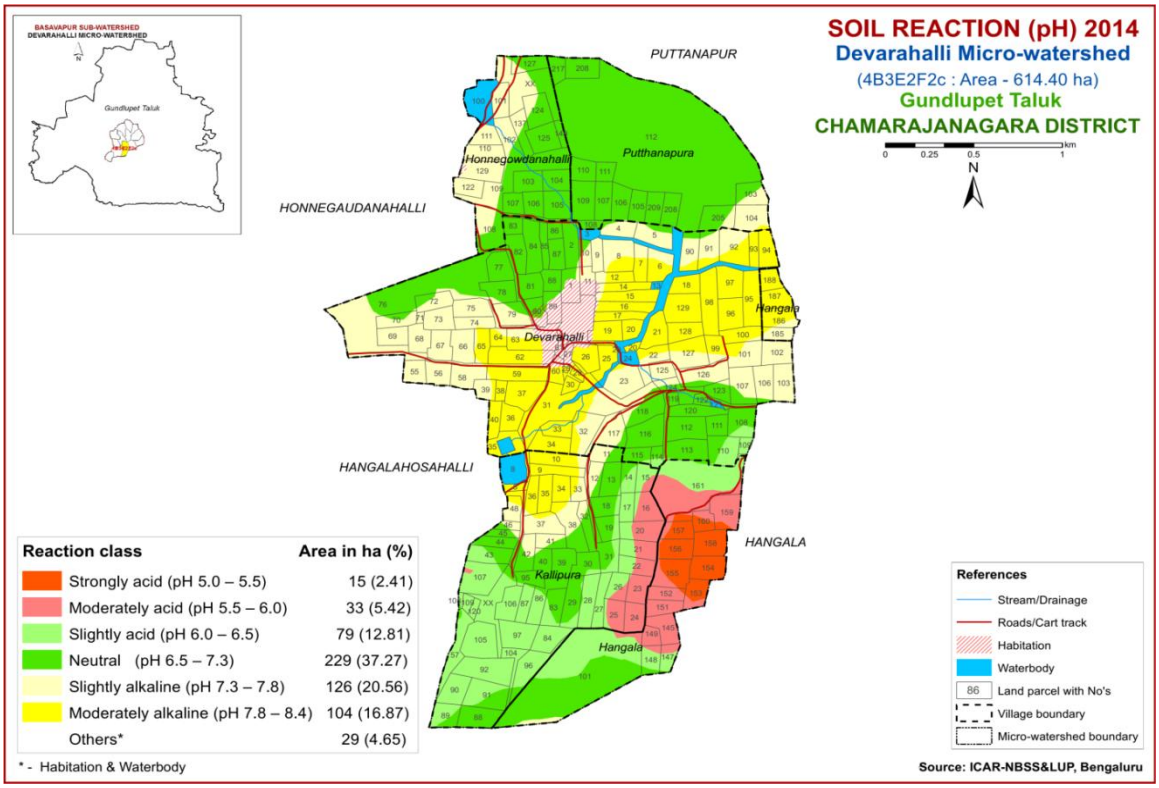


Fig. 6.1 Soil Reaction (pH) map of Devarahalli microwatershed

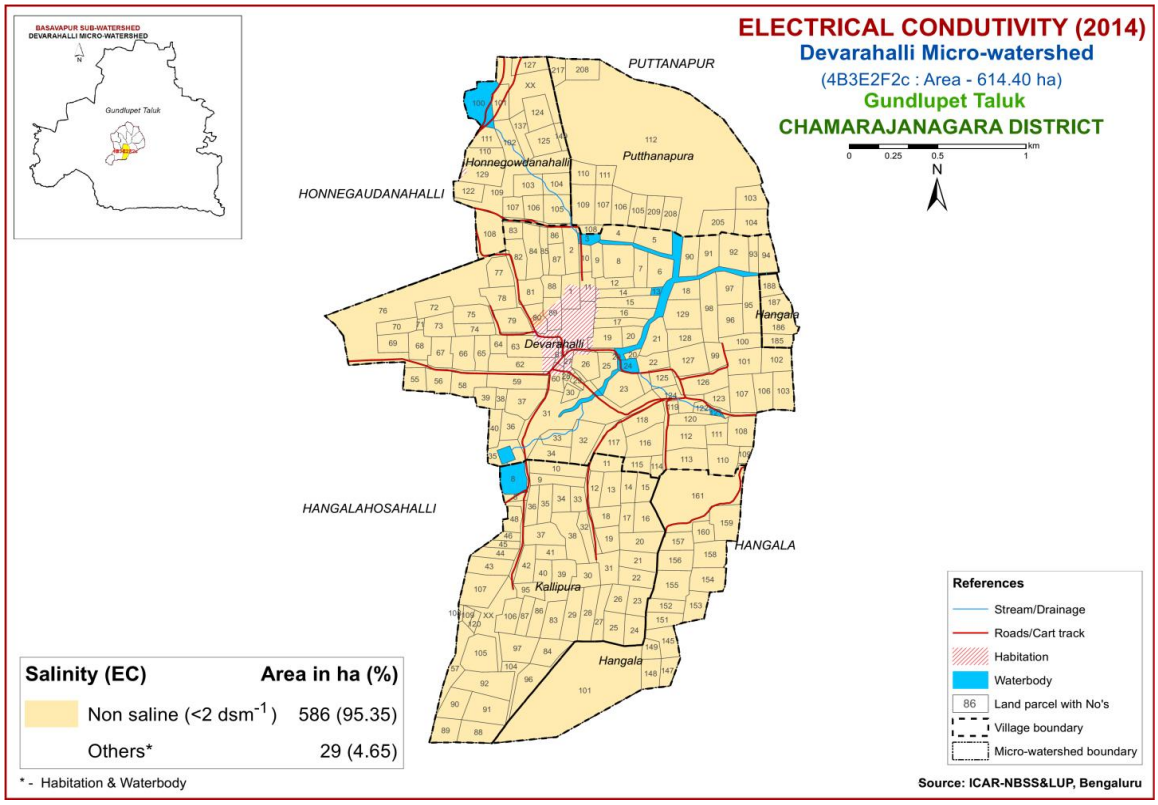


Fig. 6.2 Electrical Conductivity (EC) map of Devarahalli microwatershed

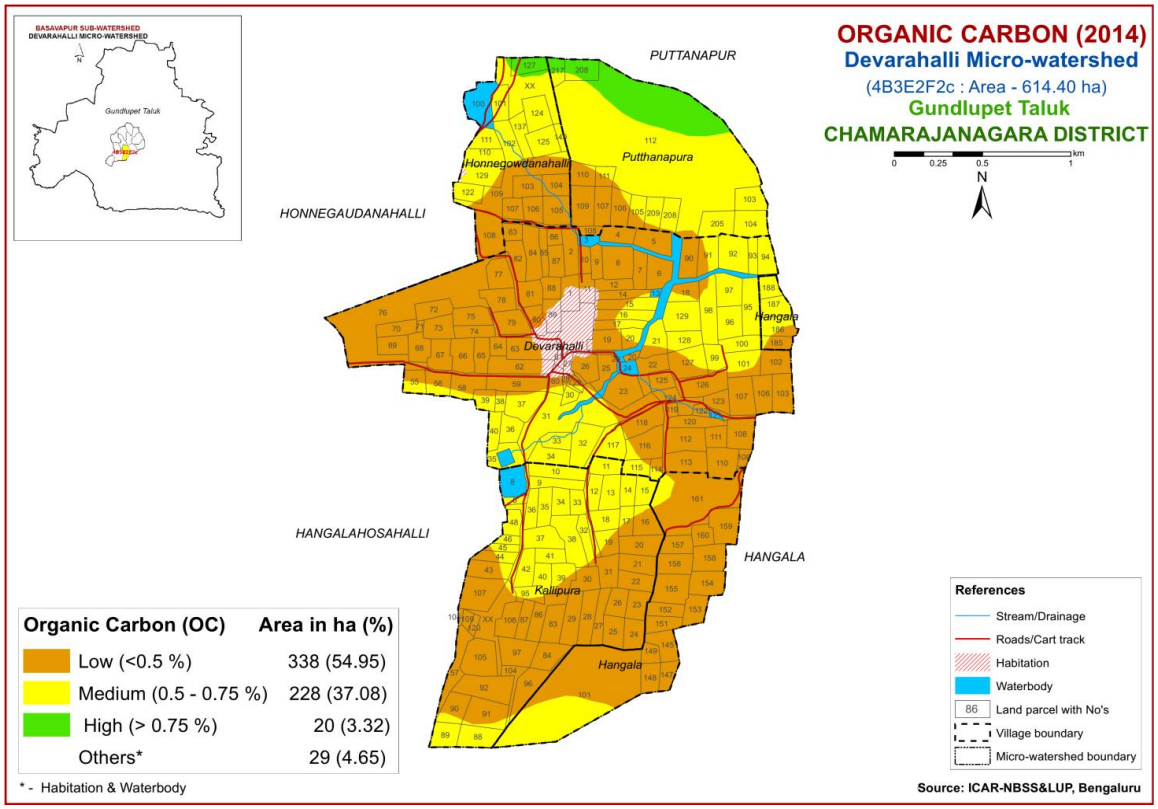


Fig.6.3 Soil Organic Carbon map of Devarahalli Microwatershed

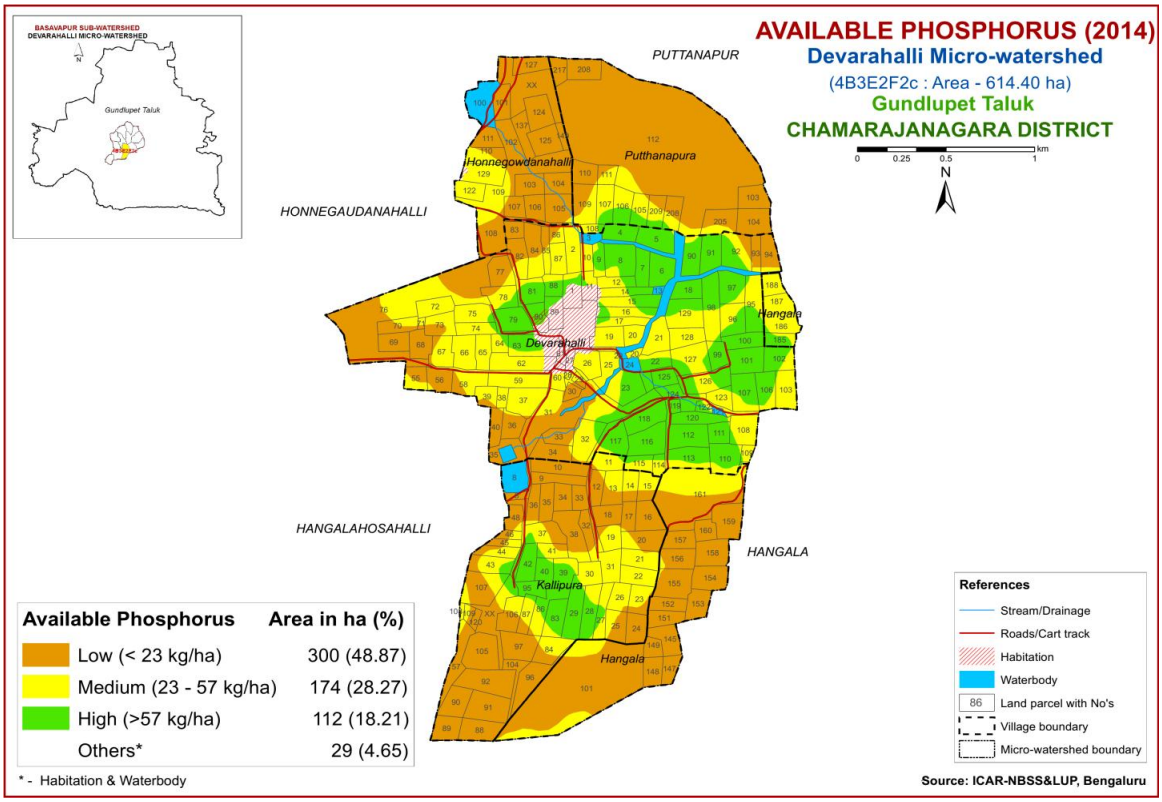


Fig.6.4 Soil available Phosphorus map of Devarahalli Microwatershed

6.5 Available Potassium

Available potassium is high (>337 kg/ha) in maximum area of about 247 ha (40%) and is distributed in the central, northwestern, southern, eastern and western part of the microwatershed (Fig.6.5). The available potassium is medium (145-337 kg/ha) in an area of 232 ha (38%) and is distributed in the southern, northern, northwestern and central part of the microwatershed. An area of about 107 ha (17%) is low (<145 kg/ha) in available potassium and are distributed in the northeastern, southeastern and central part of the microwatershed.

6.6 Available Sulphur

Available sulphur is low (<10 ppm) in maximum area of about 415 ha (68%) and is distributed in all parts of the microwatershed. An area of about 171 ha (28%) is medium (10-20 ppm) in available sulphur and is distributed in the central, eastern, southern and western part of the microwatershed (Fig.6.6).

6.7 Available Boron

Available boron content (Fig 6.7) is low (<0.5 ppm) in maximum area of about 339 ha (55%) and is distributed in the northern, eastern, western and central part of the microwatershed. Available boron is medium (0.5-1.0 ppm) in an area of about 247 ha (40%) and is distributed in the central, southern, western and eastern part of the microwatershed.

6.8 Available Iron

Available iron is deficient (<4.5 ppm) in an area of 125 ha (20%) and is distributed in the central, western and eastern part of the microwatershed. Maximum area of about 460 ha (75%) is sufficient in available iron and is distributed in all parts of the microwatershed (Fig 6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc is deficient (<0.6 ppm) in maximum area of about 471 ha (77%) and is distributed in all parts of the microwatershed. An area of about 114 ha (19%) is sufficient in available zinc and is distributed in the central, western and southern part of the microwatershed (Fig 6.11).

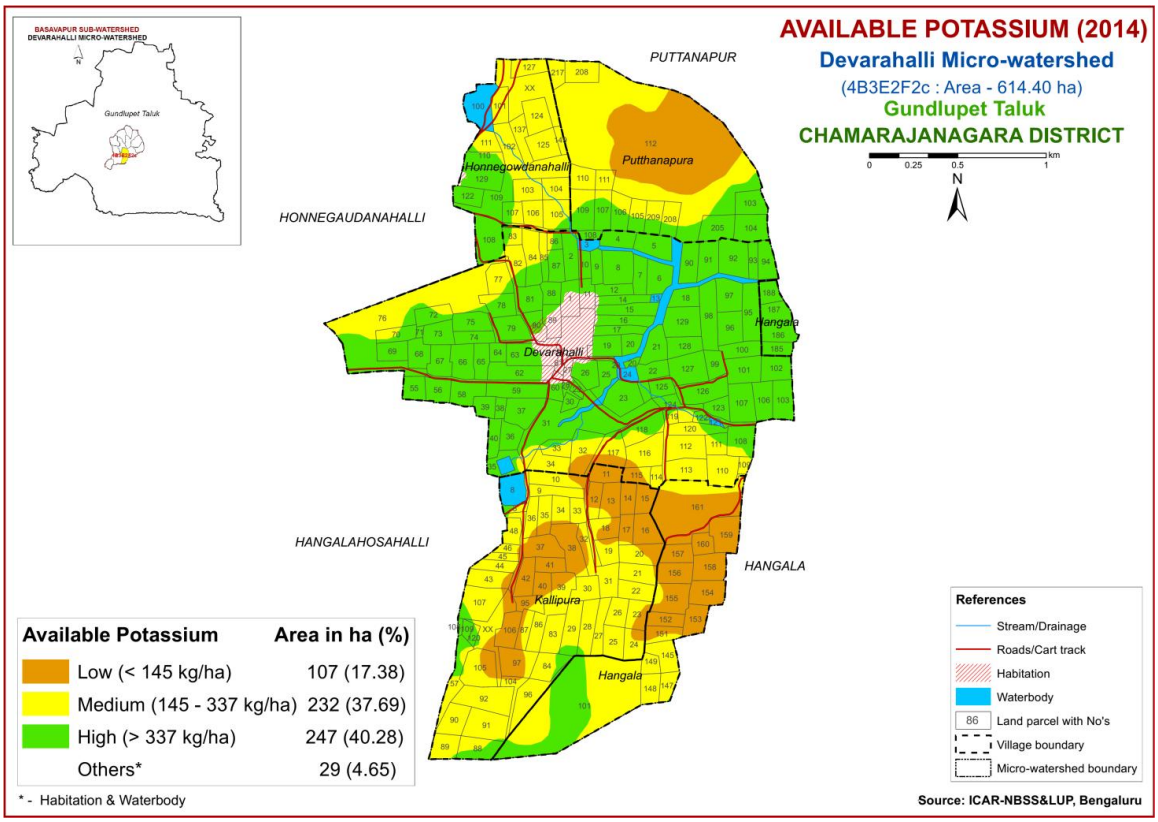


Fig.6.5 Soil available Potassium map of Devarahalli Microwatershed

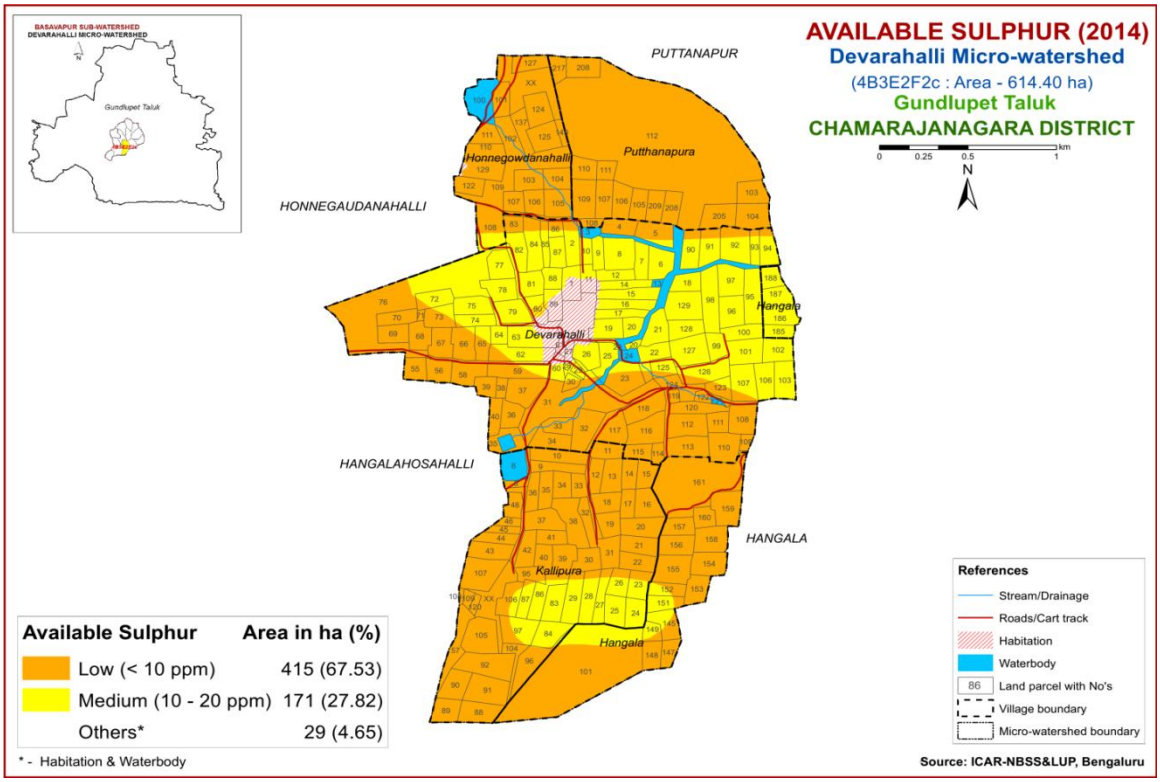


Fig.6.6 Soil available Sulphur map of Devarahalli Microwatershed

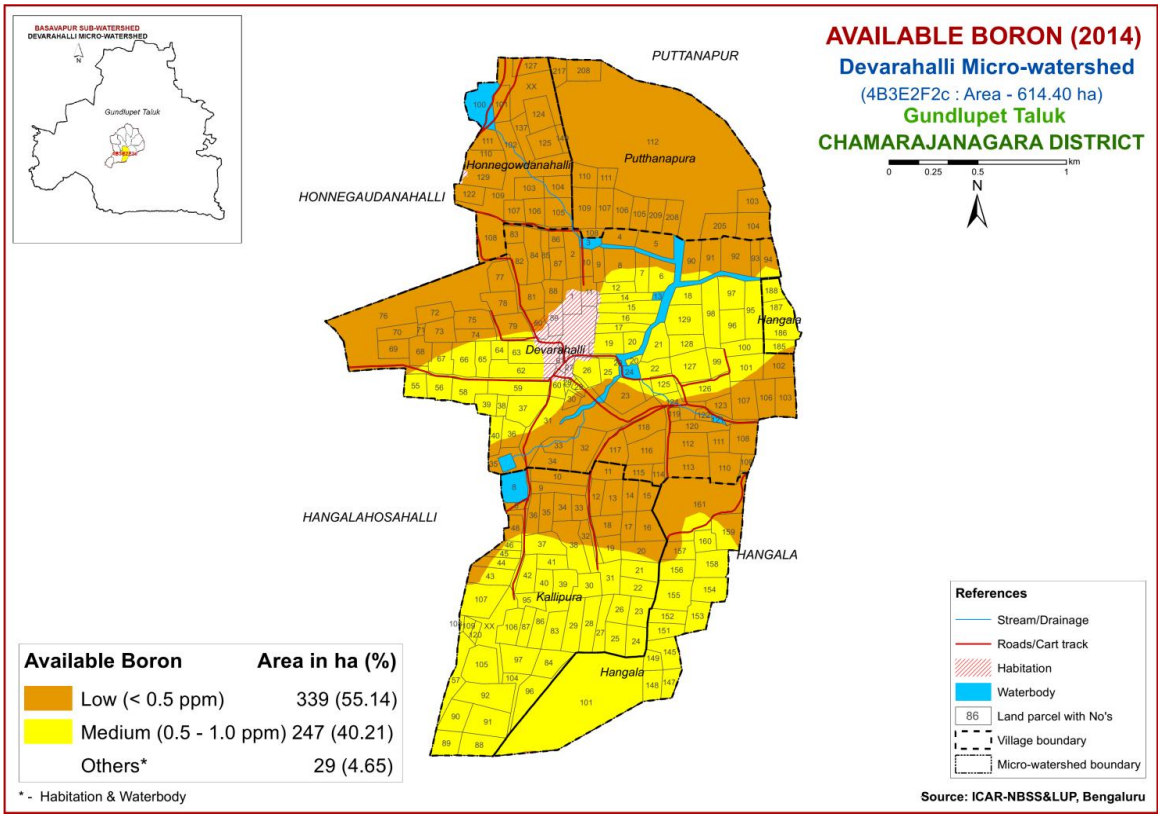


Fig.6.7 Soil available Boron map of Devarahalli Microwatershed

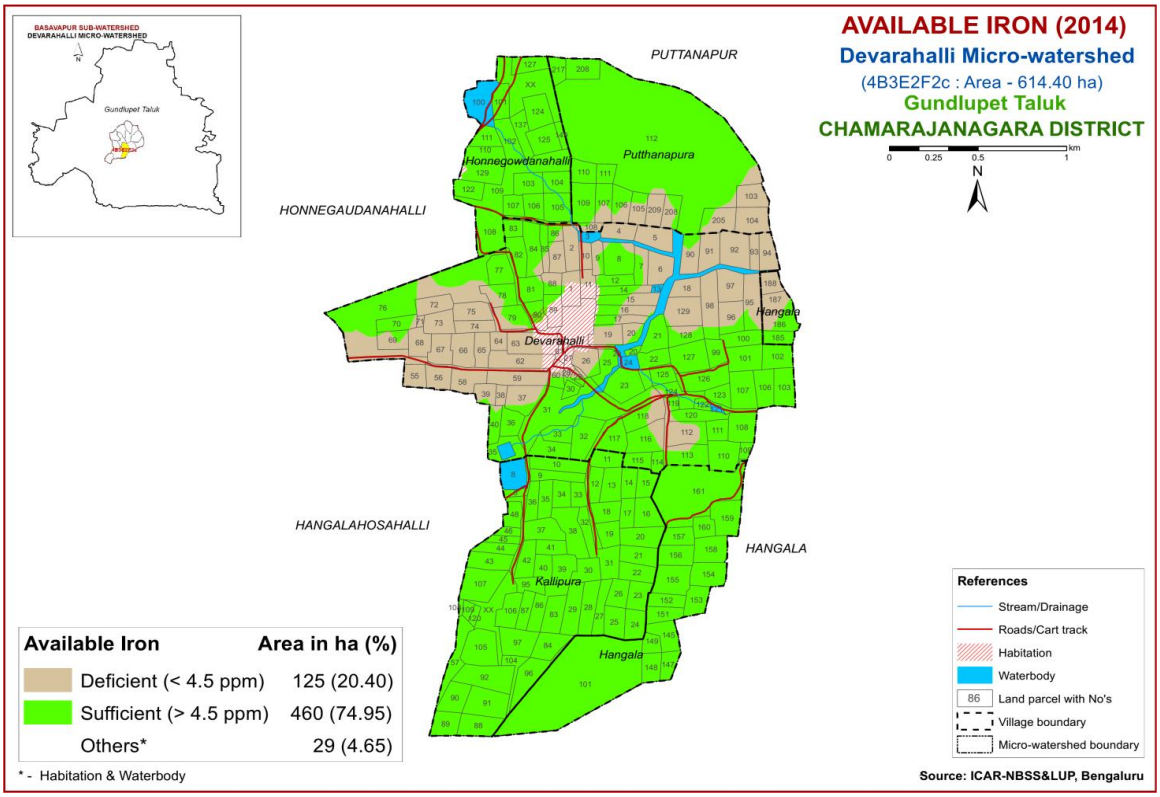


Fig.6.8 Soil available Iron map of Devarahalli Microwatershed

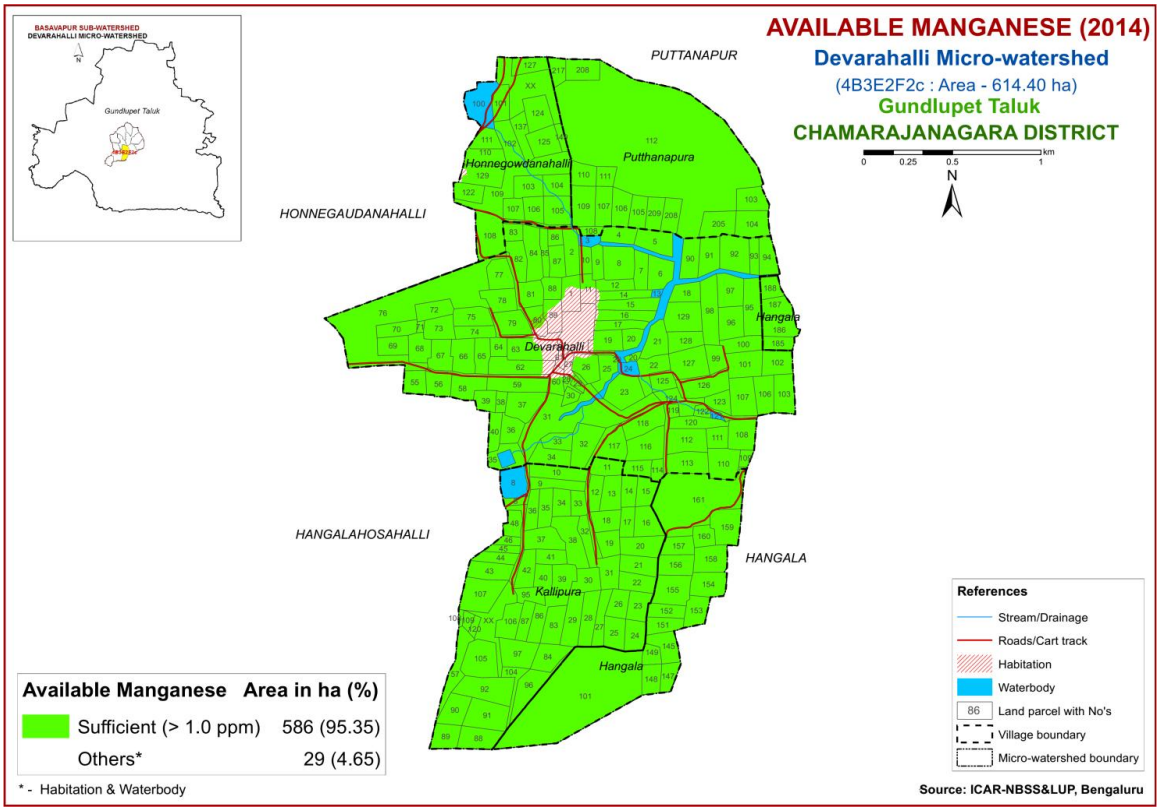


Fig.6.9 Soil available Manganese map of Devarahalli Microwatershed

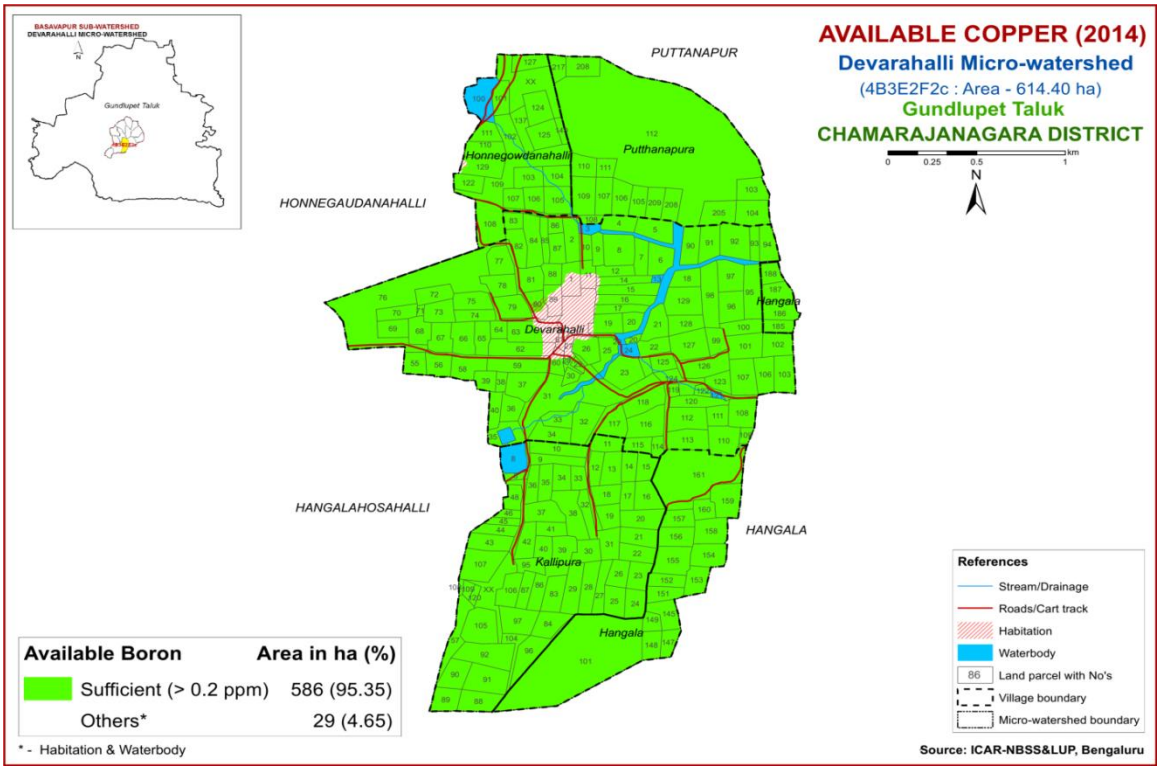


Fig.6.10 Soil available Copper map of Devarahalli Microwatershed

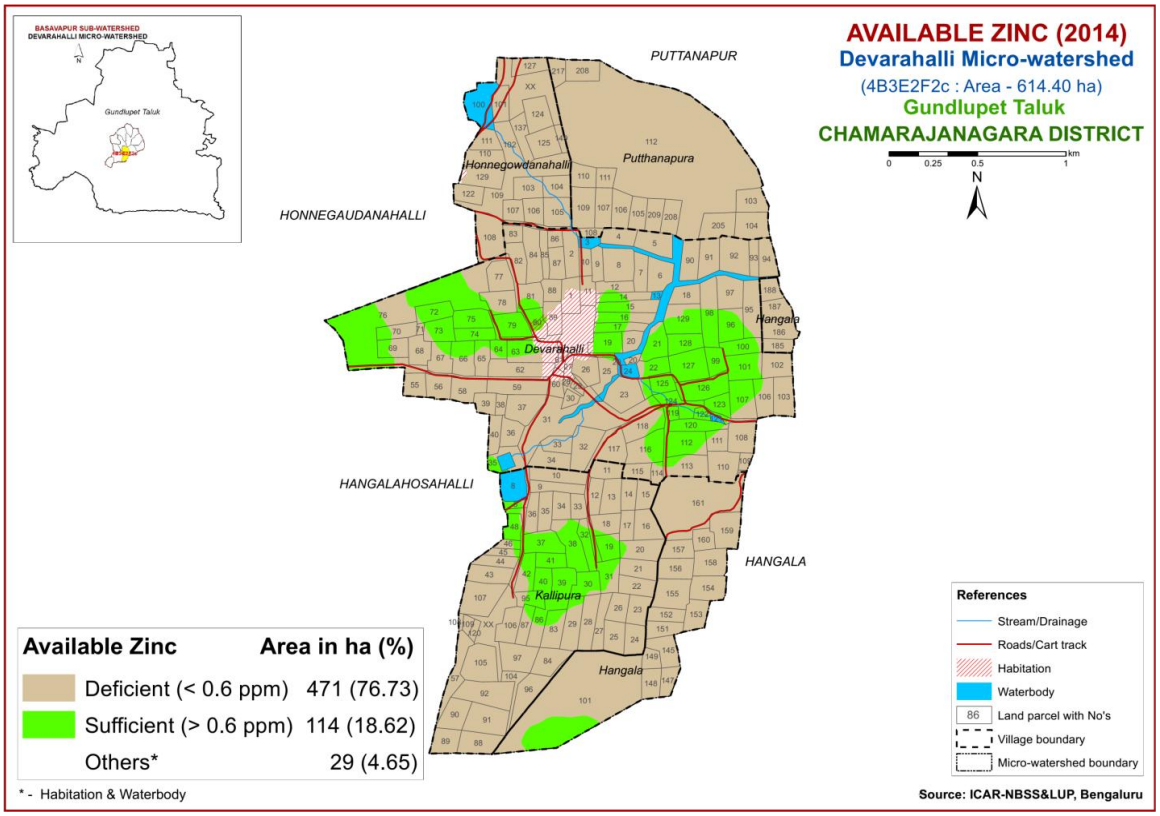


Fig.6.11 Soil available Zinc map of Devarahalli Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Devarahalli 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 excess salt/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 are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 27 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 bicolar*)

Sorghum is one of the major crops grown in Karnataka in an area of 11.02 lakh ha in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad, Bellary, Chitradurga, Mysore and Chamarajnagar districts. The crop requirements for growing sorghum (Table 7.2) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing sorghum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.1.

An area of about 105 ha (17%) in the microwatershed has soils that are highly suitable (Class S1) for growing sorghum crop. They have minor or no limitations for growing sorghum and are distributed in the southern, western, central and eastern part of the microwatershed. An area of about 138 ha (23%) is moderately suitable (Class S2) for growing sorghum and are distributed in the southern, southeastern, southwestern and eastern part of the microwatershed.

Table 7.1 Soil-Site Characteristics of Devarahalli Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC	ESP	CEC Cmol(p^+)kg^{-1}	BS (%)
					Surface	Subsurface	Surface (%)	Subsurface (%)								
BMBiA1g1	734	150	wd	>150	sc	c	15-35	-	200	0-1	Slight					
BMBmA1	734	150	wd	>150	c	c	-	-	>200	0-1	Slight					
BMBmB1	734	150	wd	>150	c	c	-	-	>200	1-3	Slight					
BMBmB1g1	734	150	wd	>150	c	c	15-35	-	>200	1-3	Slight					
DRHbB1g2	734	150	wd	50-75	sl	scl-sc	35-60	15-35	51-100	1-3	Slight					
DRHbC2g1	734	150	wd	50-75	sl	scl-sc	15-35	15-35	51-100	3-5	Moderate					
DRHhB1g1	734	150	wd	50-75	sc	scl-sc	15-35	15-35	51-100	1-3	Slight					
DRHmB1g1	734	150	wd	50-75	c	scl-sc	15-35	15-35	51-100	1-3	Slight					
GPRhB1g1	734	150	wd	75-100	sc	scl-sc	15-35	15-35	51-100	1-3	Slight					
HDRcC2g2	734	150	wd	25-50	sl	scl-sc	35-60	<15	<50	3-5	Moderate					
HDRiC2g3	734	150	wd	25-50	scl	scl-sc	60-80	<15	<50	3-5	Moderate					
HGHhB1	734	150	wd	>150	scl	scl	-	<15	>200	1-3	Slight					
HGHmB1	734	150	wd	>150	c	scl	-	<15	>200	1-3	Slight					
HPRhB1g1	734	150	wd	50-75	scl	scl-sc	15-35	15-35	51-100	1-3	Slight					
HPRmB1g1	734	150	wd	50-75	c	scl-sc	15-35	15-35	51-100	1-3	Slight					
KLPcB1g1	734	150	wd	100-150	scl	scl-sc	15-35	15-35	101-150	1-3	Slight					
KNGbB1g1	734	150	wd	75-100	sl	scl-sc	15-35	>35	<50	1-3	Slight					
KNGcB1g2	734	150	wd	75-100	sl	scl-sc	35-60	>35	<50	1-3	Slight					
KNGcC2g2	734	150	wd	75-100	sl	scl-sc	35-60	>35	<50	3-5	Moderate					

KNGhB1	734	150	wd	75-100	scl	scl-sc	-	>35	<50	1-3	Slight					
KNGhB1g2	734	150	wd	75-100	scl	scl-sc	35-60	>35	<50	1-3	Slight					
KNGmA1g1	734	150	wd	75-100	c	scl-sc	15-35	>35	<50	0-1	Slight					
MDHcB1g1	734	150	wd	100-150	sl	sc	15-35	>35	101-150	1-3	Slight					
MGHbB1g2	734	150	wd	50-75	sl	scl	35-60	>35	51-100	1-3	Slight					
MGHcB1g2	734	150	wd	50-75	sl	scl	35-60	>35	51-100	1-3	Slight					
MGHcC2	734	150	wd	50-75	sl	scl	-	>35	51-100	3-5	Moderate					
MGHcC2g1	734	150	wd	50-75	sl	scl	15-35	>35	51-100	3-5	Moderate					
MGHcD3g3	734	150	wd	50-75	sl	scl	60-80	>35	51-100	5-10	Severe					
MGHhB1g1	734	150	wd	50-75	scl	scl	15-35	>35	51-100	1-3	Slight					
MGHhB2g1	734	150	wd	50-75	scl	scl	15-35	>35	51-100	1-3	Moderate					
MGHhC2g2	734	150	wd	50-75	scl	scl	35-60	>35	51-100	3-5	Moderate					
MGHhC3g2	734	150	wd	50-75	scl	scl	35-60	>35	51-100	3-5	Severe					
MGHhD3g2	734	150	wd	50-75	scl	scl	35-60	>35	51-100	5-10	Severe					
MGHmB1g1	734	150	wd	50-75	c	scl	15-35	>35	51-100	1-3	Slight					
SPRhF3g2R3	734	150	wd	25-50	scl	scl-sc	35-60	>35	<50	15-25	Severe					

They have minor limitations of gravelliness, texture and rooting depth. Marginally suitable lands (Class S3) for growing sorghum occupy maximum area of about 315 ha (51%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth, topography and gravelliness. A small area of about 27 ha (4%) is not suitable (Class N) for growing sorghum and occur in the western and northeastern part of the microwatershed. They have very severe limitations of gravelliness and topography.

Table 7.2 Land suitability criteria for Sorghum

Crop requirement		**Rating**			
Soil site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately Suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N)**
Slope	%	<3	3-8	8-15	>15
LGP	Days	120-150	120-90	<90	
Soil drainage	class	Well to mod. 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
Sub Surface soil texture	Class	C, cl, sicl, sc	l, sil, sic	l, ls	S, fragmental skeletal
Soil depth	Cm	100-75	50-75	30-50	<30
Gravel content	% vol.	<15	15-30	30-60	>60
Salinity (EC)	dsm^{-1}	2-4	4-8	8-10	>10
Sodicity (ESP)	%	5-8	8-10	10-15	>15

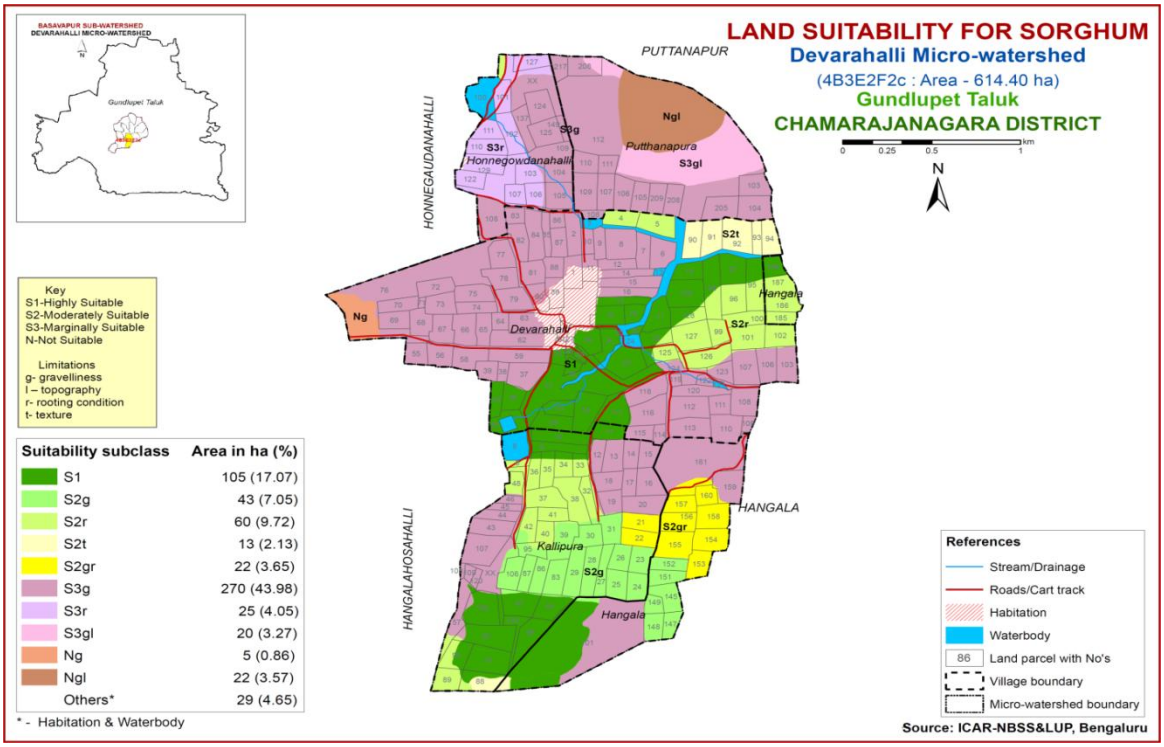


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea maize*)

Maize is the most important food crop grown in an area of 13.73 lakh ha in almost all the districts of the State. The crop requirements for growing maize (Table 7.3) were matched with the soil-site characteristics (Table 7.1) of soils of the microwatershed and a land suitability map for growing maize was generated. The area extent and theirgeographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.2.

An area of about 48 ha (8%) in the microwatershed has soils that are highly suitable (Class S1) for growing maize crop. They have minor or no limitations for growing maize and are distributed in the southern and northeastern part of the microwatershed. An area of about 176 ha (29%) is moderately suitable (Class S2) for growing maize and are distributed in the southeastern, southwestern, central, eastern and western part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover major area of about 334 ha (54%) and occur in all parts of the microwatershed. They have moderate limitations of gravelliness, topography, drainage, texture and rooting depth. A small area of about 27 ha (4%) is not suitable (Class N) for growing maize and occur in the western and northeastern part of the microwatershed. They have very severe limitations of gravelliness and topography.

Table 7.3 Land 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	
Sub Surface soil texture	Class	l, cl, scl, sil	sicl, sic,c	C(s-s), ls, sl	
Soil depth	Cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-50	>50
Salinity (EC)	dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	
Sodicity (ESP)	%	<10	10-15	>15	

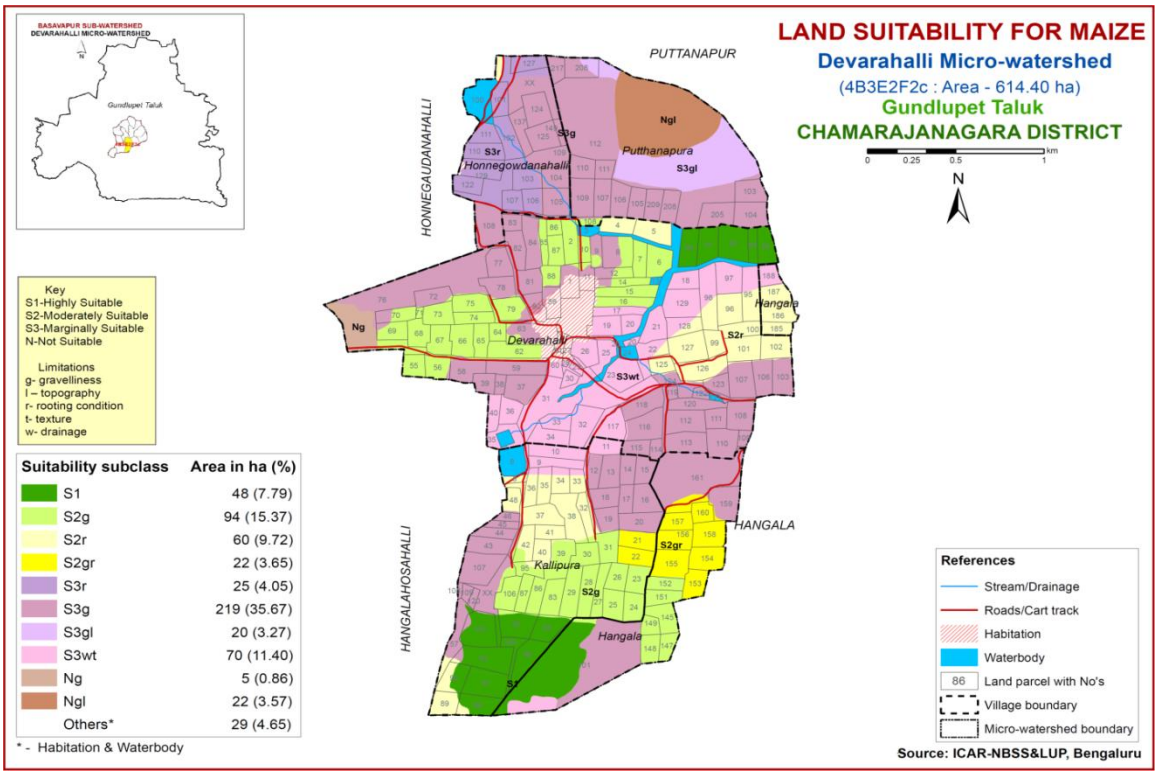


Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Redgram (*Cajanus cajan*)

Redgram is the most important pulse crop grown in an area of 8.23 lakh ha in almost all the districts of the State. The crop requirements for growing redgram (Table 7.4) were matched with the soil-site characteristics (Table 7.1) of the soils of

microwatershed and a land suitability map for growing redgram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.3.

An area of about 70 ha (11%) in the microwatershed has soils that are highly suitable (Class S1) for growing redgram. They have minor or no limitations for growing redgram and are distributed mainly in the western, central and eastern part of the microwatershed. An area of about 160 ha (26%) is moderately suitable (Class S2) for redgram. They are distributed in the southern, southeastern, central and eastern part of the microwatershed. They have minor limitations of gravelliness, texture and rooting depth. Marginally suitable (Class S3) lands cover major area of about 328 ha (53%) and occur in all parts of the microwatershed. They have moderate limitations of gravelliness, topography, texture and rooting depth. A small area of about 27 ha (4%) is not suitable (Class N) for growing redgram and occur in the western and northeastern part of the microwatershed. They have very severe limitations of gravelliness and topography.

Table 7.4 Land suitability criteria for Redgram

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

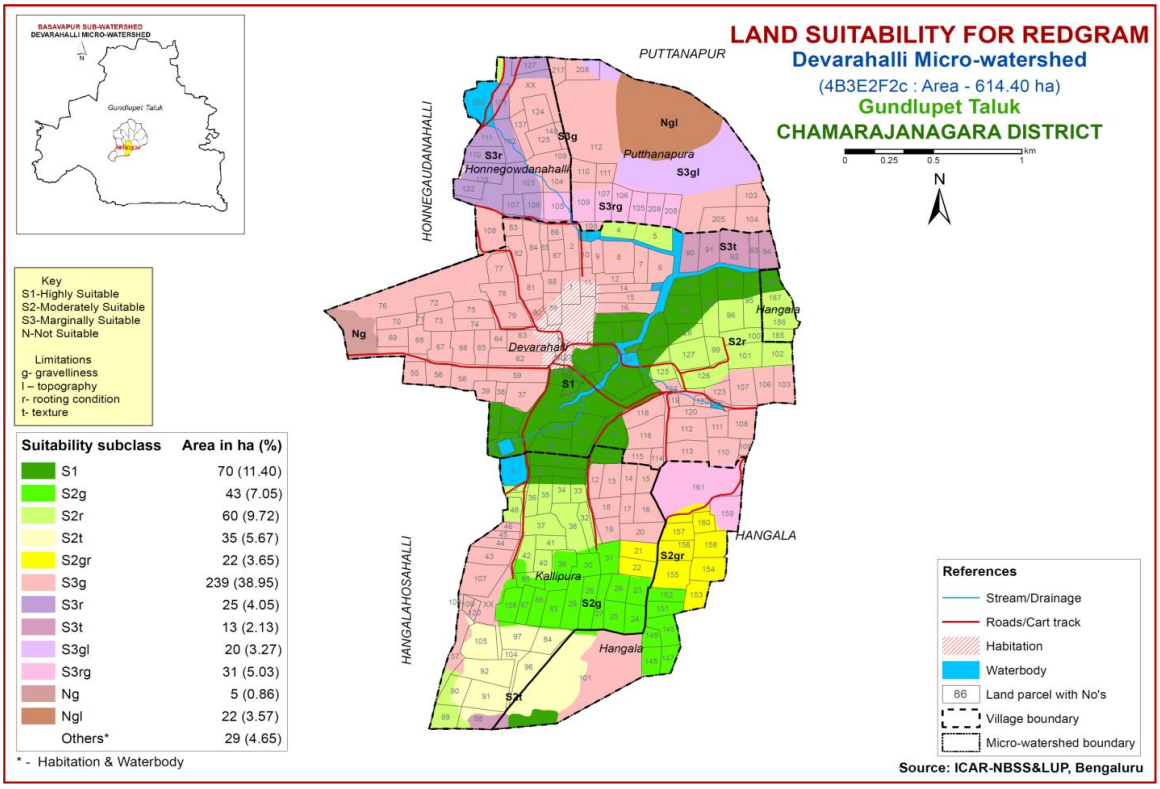


Fig. 7.3 Land Suitability map of Redgram

7.4 Land suitability for Horsegram (*Marcotyloma uniflorum*)

Horsegram is an 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 horsegram (Table 7.5) were matched with the soil-site characteristics and a land suitability map for growing horsegram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.4.

An area of about 48 ha (8%) in the microwatershed has soils that are highly suitable (Class S1) for growing horsegram. They have minor or no limitations for growing horsegram and are distributed in the southern and southeastern part of the microwatershed. Maximum area of about 428 ha (70%) is moderately suitable (Class S2) for growing horsegram and are distributed in all parts of the microwatershed. They have minor limitations of gravelliness, drainage and rooting depth. Marginally suitable (Class S3) lands cover an area of about 87 ha (14%) and occur in the southern, western, central and northern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and topography. A small area of about 22 ha (4%) is not suitable (Class N) for growing horsegram and occur in the western and northern part of the microwatershed. They have very severe limitations of gravelliness and topography.

Table 7.5 Land suitability criteria for Horsegram

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	Very 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	ls,sic, sicl, c, ls	Heavy clays (>60%), ls	
Soil depth	Cm	50-75	25-50	<25	
$CaCO_3$ in root zone	% vol.	<15	15-35	25-30	>30
Salinity (EC)	dsm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

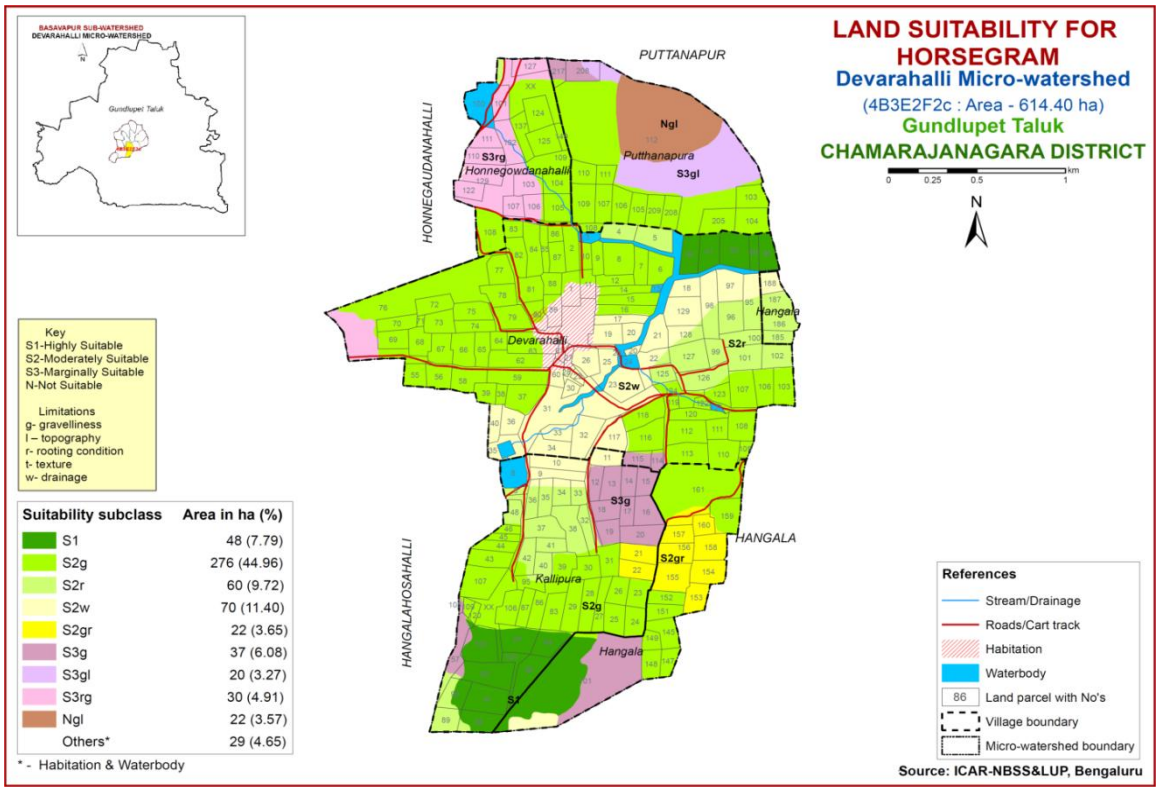


Fig. 7.4 Land Suitability map of Horsegram

7.5 Land suitability for Field bean (*Dolichos lablab*)

Field bean is the most important pulse crop grown in an area of 0.68 lakh ha in almost all the districts of the State. The crop requirements (Table 7.6) for growing field bean were matched with the soil-site characteristics 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 is given in Figure 7.5.

A very small area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing field bean. They have minor or no limitations for growing field bean and are distributed in the northeastern part of the microwatershed. A maximum area of about 344 ha (56%) is moderately suitable (Class S2) for growing field bean and are distributed in all parts of the microwatershed. They have minor limitations of gravelliness, drainage and rooting depth. Marginally suitable (Class S3) lands cover an area of about 201 ha (33%) and occur in the southwestern, eastern, western, central and northern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and topography. A small area of about 27 ha (4%) is not suitable (Class N) for growing field bean and occur in the western and northeastern part of the microwatershed. They have very severe limitations of gravelliness and topography.

Table 7.6 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	Very 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

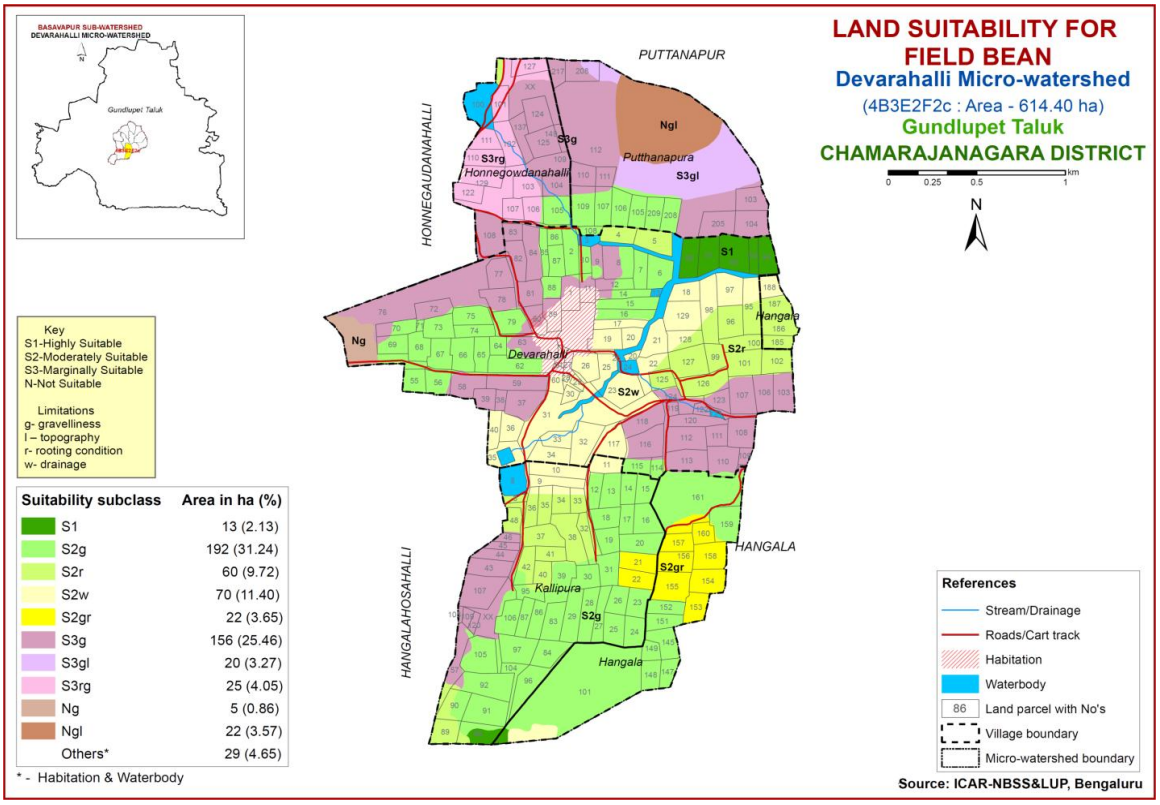


Fig. 7.5 Land Suitability map of Field bean

7.6 Land suitability for Groundnut (*Arachis hypogaea*)

Groundnut is the most important oilseed crop grown in an area of 6.5 lakh ha in almost all the districts of the State. The crop requirements for growing groundnut (Table 7.7) were matched with the soil-site characteristics (Table 7.1) of soils of the microwatershed and a land suitability map for growing groundnut was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.6.

An area of about 48 ha (8%) in the microwatershed has soils that are highly suitable (Class S1) for growing groundnut. They have minor or no limitations for growing groundnut and are distributed in the southern and northeastern part of the microwatershed. A maximum area of about 375 ha (61%) is moderately suitable (Class S2) for growing groundnut and are distributed in all parts the microwatershed. They have minor limitations of gravelliness, drainage and rooting depth. Marginally suitable (Class S3) lands cover an area of about 110 ha (18%) and occur in the southern, eastern, southeastern and northern part of the microwatershed. They have moderate limitations of gravelliness, topography and rooting depth. A small area of about 52 ha (8%) is not suitable (Class N) for growing groundnut and occur in the western, northwestern and northeastern part of the microwatershed. They have very severe limitations of gravelliness, rooting depth and topography.

Table 7.7 Land 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 rained	imperfectly drained	Poorly drained
Soil reaction	pH	6.0-8.0	8.1-8.5 5.5-5.9	>8.5 <5.5	
Sub Surface soil texture	Class	l, cl, sil, scl, sicl	Sc, sic, c,sl	S, ls, c (>60%)	
Soil depth	Cm	>75	50-75	25-50	<25
Gravel content	% vol.	<35	35-50	>50	
$CaCO_3$ in root zone	%	low	Medium	high	
Salinity (EC)	dsm^{-1}	<2.0	2.0-4.0	4.0-8.0	
Sodicity (ESP)	%	<5	5-10	>10	

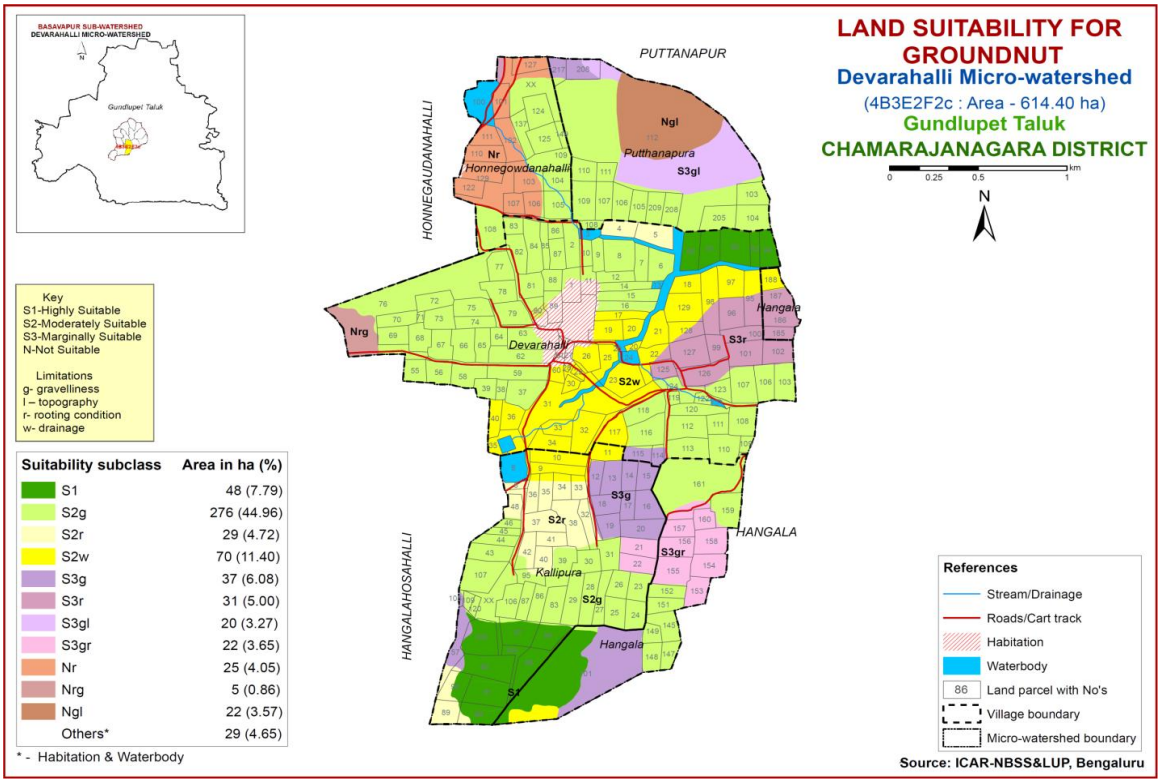


Fig. 7.6 Land Suitability map of Groundnut

7.7 Land suitability for Sunflower (*Helianthus annus*)

Sunflower is the most important oilseed crop grown in an area of 4.1 lakh ha in almost all the districts of the State. The crop requirements (Table 7.8) for growing sunflower were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sunflower was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.7.

A small area of about 17 ha (3%) in the microwatershed has soils that are highly suitable (Class S1) for growing sunflower. They have minor or no limitations for growing sunflower and are distributed in the southern part of the microwatershed. An area of about 224 ha (40%) is moderately suitable (Class S2) for growing sunflower and are distributed in the southern, southeastern, southwestern, northwestern and northeastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth and texture. Marginally suitable (Class S3) lands cover major area of about 322 ha (52%) and occur in all parts of the microwatershed. They have moderate limitations of gravelliness, topography, drainage, texture and rooting depth. An area of about 22 ha (4%) is not suitable (Class N) for growing sunflower and occur in the northern part of the microwatershed. They have very severe limitations of gravelliness and topography.

Table 7.8 Land 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	8.1-8.5 5.5-6.4	8.6-9.0; 4.5-5.4	>9.0 <4.5
Sub Surface soil texture	Class	l, cl, sil, sc	cl, sic, c,	c (>60%), sl	ls, s
Soil depth	Cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (EC)	dsm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

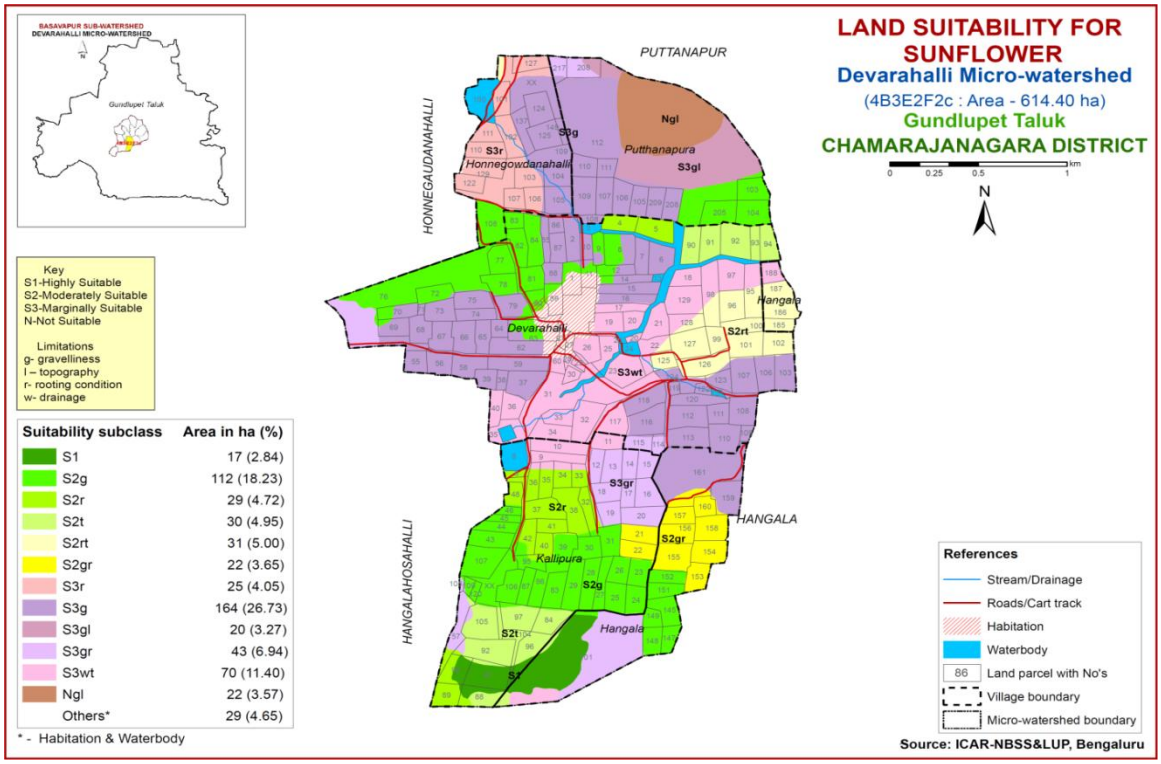


Fig. 7.7 Land Suitability map of Sunflower

7.8 Land suitability for Cotton (*Gossypium hirsutum*)

Cotton is the most important fibre crop grown in the State in about 6.6 lakh ha in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and Chamarajnagar districts. The crop requirements (Table 7.9) for growing cotton were matched with the soil-site (Table 7.1) characteristics and a land suitability map for growing cotton was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.8.

An area of about 133 ha (21%) is moderately suitable (Class S2) for growing cotton and are distributed in the southern, central, western and northeastern part of the microwatershed. They have minor limitations of gravelliness, drainage and texture. Marginally suitable (Class S3) lands cover maximum area of about 401 ha (65%) and occur in all parts of the microwatershed. They have moderate limitations of gravelliness, topography and rooting depth. An area of about 52 ha (8%) is not suitable (Class N) for growing cotton and occur in the northern, western and northeastern part of the microwatershed. They have very severe limitations of gravelliness, rooting depth and topography.

Table 7.9 Land suitability criteria for Cotton

Crop requirement		Rating			
Soil-site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately Suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N)**
Slope	%	1-2	2-3	3-5	>5
LGP	Days	180-240	120-180	<120	
Soil drainage	class	Well to moderately well	imperfectly drained	Poor somewhat excessive	Stagnant/excessive
Soil reaction	pH	6.5-7.5	7.6-8.0	8.1-9.0	>9.0>6.5
Sub Surface soil texture	Class	Sic, c	Sicl, cl	Si, sil, sc, scl, l	Sl, s,ls
Soil depth	Cm	100-150	75-100	50-75	<50
Gravel content	% vol.	<5	5-10	10-15	15-35
$CaCO_3$ in root zone	%	<3	3-5	5-10	10-20
Salinity (EC)	dsm^{-1}	2-4	4.0-8.0	8.0-12	>12
Sodicity (ESP)	%	5-10	10-20	20-30	>30

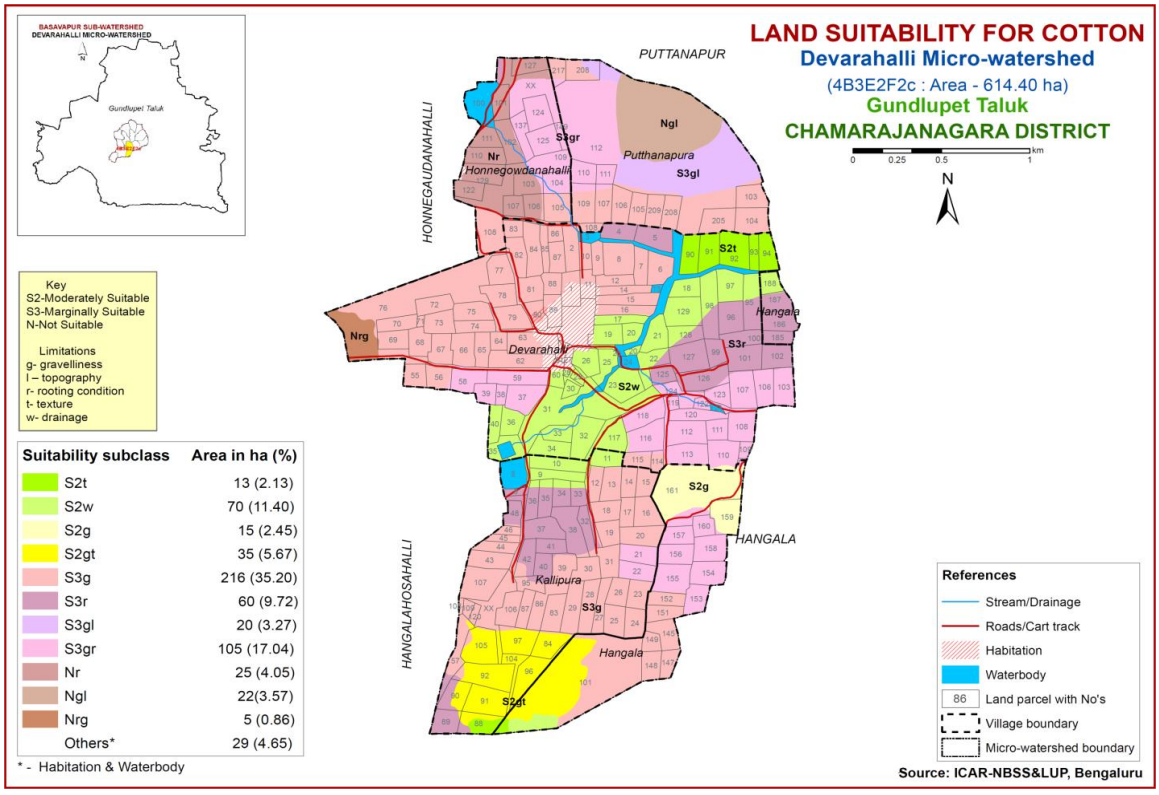


Fig. 7.8 Land Suitability map of Cotton

7.9 Land suitability for Onion (*Allium cepa*)

Onion is the most important vegetable crop grown in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and Chamarajanagar districts. The crop requirements for growing onion (Table 7.10) were matched with the soil-site (Table 7.1) characteristics and a land suitability map for growing onion was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.9.

A small area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing onion. They have minor or no limitations for growing onion and are distributed in the northeastern part of the microwatershed. An area of about 261 ha (42%) is moderately suitable (Class S2) for growing onion and are distributed in the southern, central, southeastern, western and northeastern part of the microwatershed. They have minor limitations of gravelliness, texture, drainage and rooting depth. Marginally suitable (Class S3) lands cover maximum area of about 284 ha (46%) and occur in all parts of the microwatershed. They have moderate limitations of gravelliness, topography and rooting depth. An area of about 27 ha (4%) is not suitable (Class N) for growing onion and occur in the northern and western part of the microwatershed. They have very severe limitations of gravelliness and topography.

Table 7.10 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	^0C	20-30	30-35	35-40	>40
Slope	%	<3	3-5	5-10	>10
Soil drainage	class	Well drainage	Moderately/ imperfectly	Poor drained	Very poorly drained
Soil reaction	pH	6.5-7.3	7.3-7.8, 5.0-5.4	7.8-8.4 <5.0	>8.4
Surface soil texture	Class	scl, sil, sl	Sc, sicl, c (red soil)	Sc, c (black soil)	ls
Soil depth	Cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	<4
Salinity (EC)	dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	<4
Sodicity (ESP)	%	<5	5-10	10-15	>15

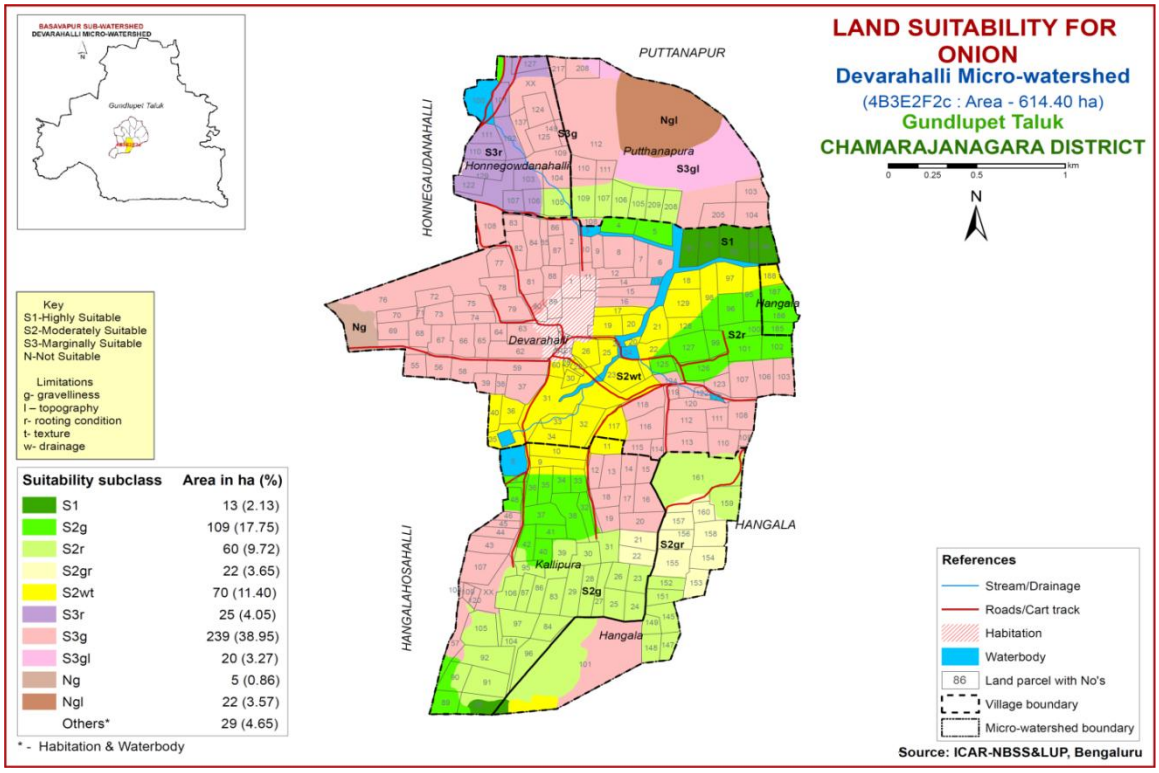


Fig. 7.9 Land Suitability map of Onion

7.10 Land suitability for Potato (*Solanum tuberosum*)

Potato is one of the major vegetable crops grown in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga, Chikkaballapur, Kolar, Chikkamangalore and Chamarajanagar districts. The crop requirements for growing potato (Table 7.11) were matched with the soil-site characteristics of the soils of the microwatershed and a land suitability map for growing potato was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.10.

A small area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing potato. They have minor or no limitations for growing potato and are distributed in the northeastern part of the microwatershed. An area of about 191 ha (31%) is moderately suitable (Class S2) for growing potato and are distributed in the southern, southeastern, southwestern, eastern and central part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover maximum area of about 354 ha (58%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth, gravelliness, drainage, texture and topography. An area of about 27 ha (4%) is not suitable (Class N) for growing potato and occur in the northern and western part of the microwatershed. They have very severe limitations of gravelliness and topography.

Table 7.11 Land suitability criteria for Potato

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately Suitable (S2)	Marginally suitable (S3)	Not suitable(N)
Slope	Hills	%	<5	5-10	10-15	>15
	Plains	%	<3	3-5	5-8	>8
Mean temperature in growing season		^{0}c	16-25	26-30 13-15	31-32 10-12	>32 <10
Soil drainage		class	Well drained	Moderately /imperfectly	Poor drained	Very poorly drained
Soil reaction		pH	5.5-6.5	6.6-8.2; 5.0-5.4	>8.2 ; <5.0	-
Surface soil texture		Class	Scl, sil	S, sil	s	
Soil depth		Cm	75-100	50-75	25-50	<25
Stoniness		%	0-10	10-15	15-35	>35
Salinity (ECe)		dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	>4.0
Sodicity (ESP)		%	<10	10-15	>15	-

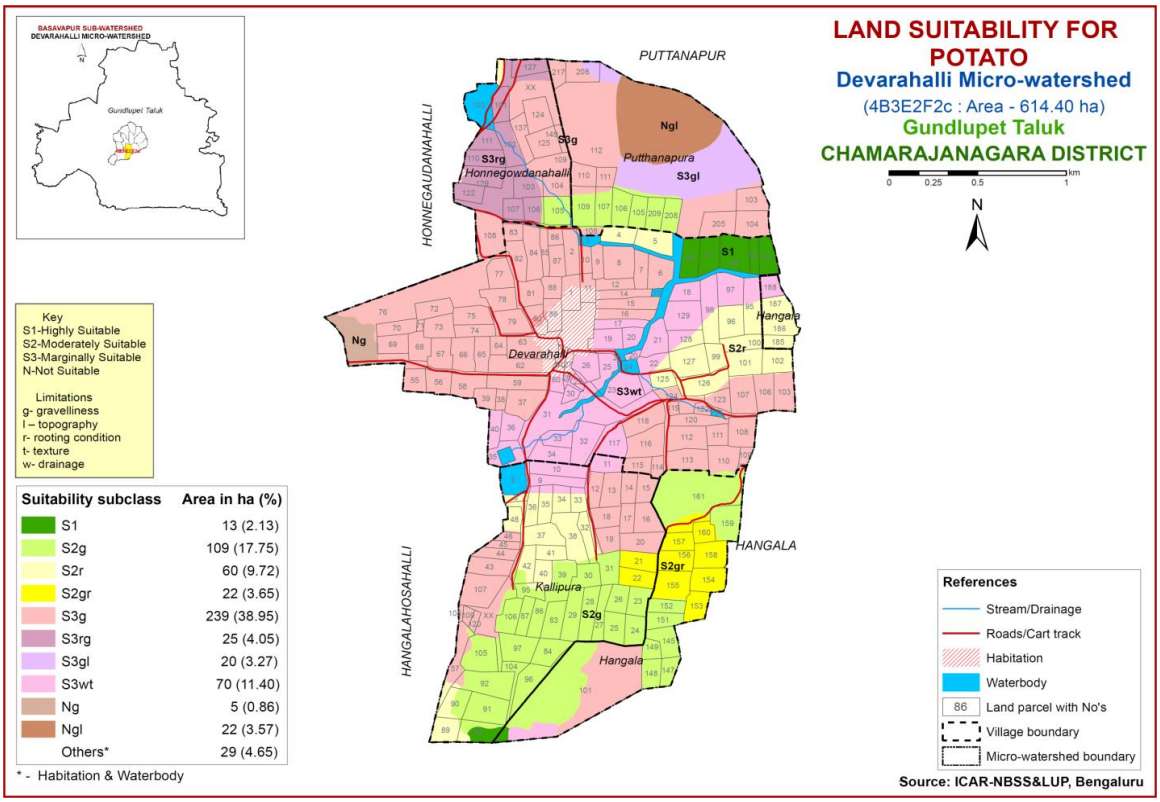


Fig. 7.10 Land Suitability map of Potato

7.11 Land suitability for Beans (*Phaseolus vulgaris*)

Beans are the most important pulse and vegetable crop grown in almost all the districts of the state. The crop requirements for growing beans were matched with the soil-site characteristics of the soils of the microwatershed and a land suitability map for growing beans was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.11.

A small area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing beans. They have minor or no limitations for growing beans and are distributed in the northeastern part of the microwatershed. An area of about 261 ha (42%) is moderately suitable (Class S2) for growing beans and are distributed in the southern, central, southeastern, western and northeastern part of the microwatershed. They have minor limitations of gravelliness, texture, drainage and rooting depth. Marginally suitable (Class S3) lands cover maximum area of about 284 ha (46%) and occur in all parts of the microwatershed. They have moderate limitations of gravelliness, topography and rooting depth. An area of about 27 ha (4%) is not suitable (Class N) for growing beans and occur in the northern and western part of the microwatershed. They have very severe limitations of gravelliness and topography.

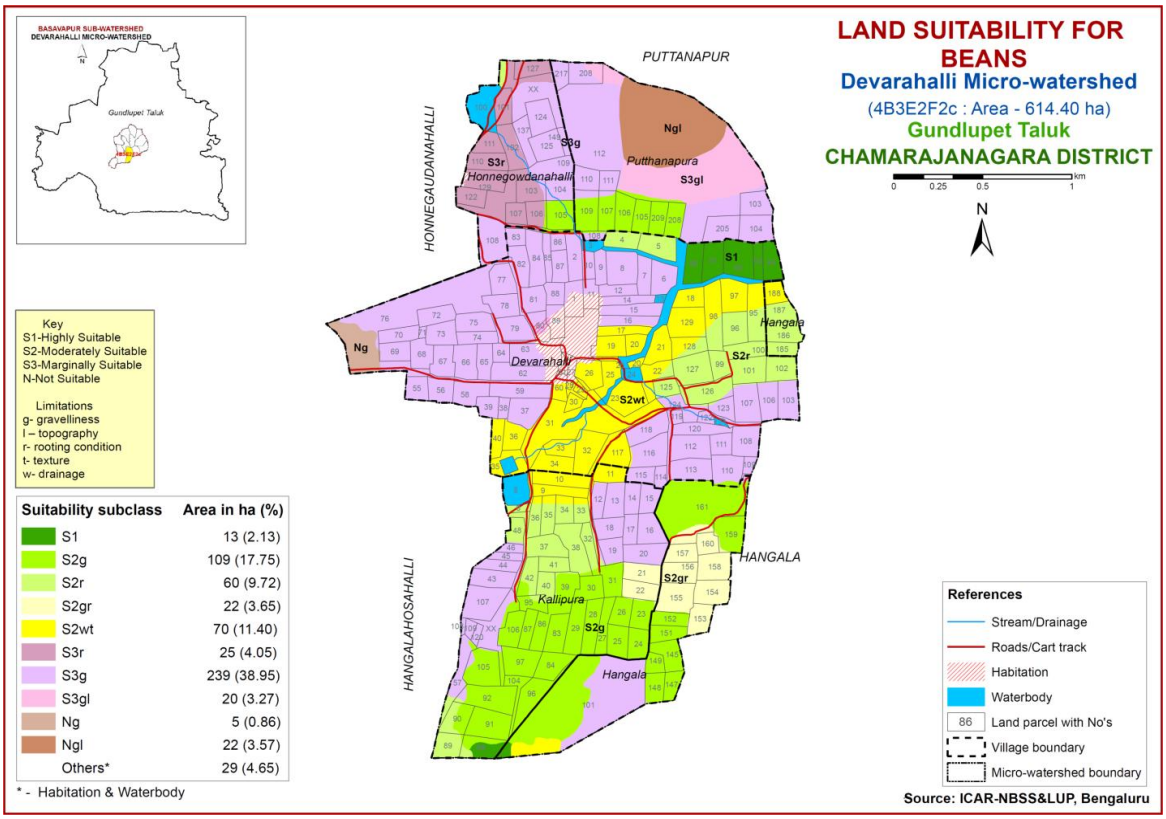


Fig. 7.11 Land Suitability map of Beans

7.12 Land suitability for Beetroot (*Beta vulgaris*)

Beetroot is one of the major vegetable crop grown in almost all the districts of Karnataka. The crop requirements for growing beetroot were matched with the soil-site characteristics of the soils of the microwatershed and a land suitability map for growing beetroot was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.12.

A small area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing beet root. They have minor or no limitations for growing beet root and are distributed in the northeastern part of the microwatershed. An area of about 191 ha (31%) is moderately suitable (Class S2) for growing beet root and are distributed in the southern, southeastern, southwestern, eastern and central part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover maximum area of about 354 ha (58%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth, gravelliness, drainage, texture and topography. An area of about 27 ha (4%) is not suitable (Class N) for growing beet root and occur in the northern and western part of the microwatershed. They have very severe limitations of gravelliness and topography.

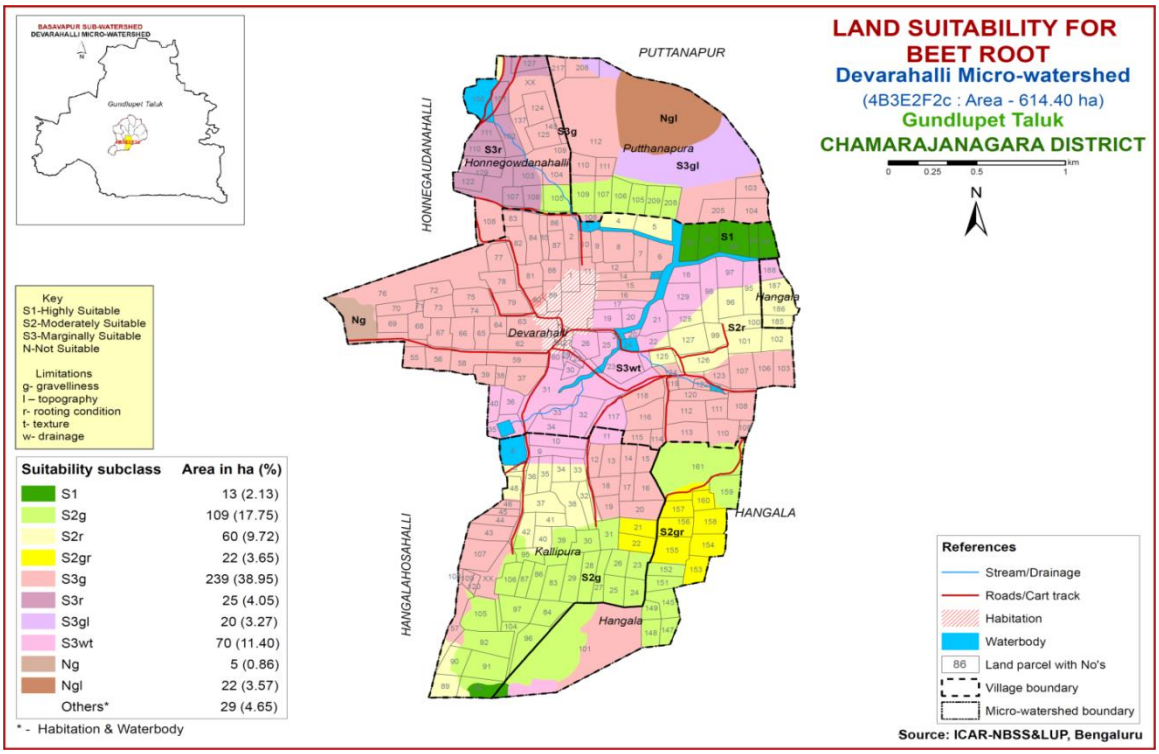


Fig. 7.12 Land Suitability map of Beet root

7.13 Land suitability for Mango (*Mangifera indica*)

Mango is the most important fruit crop grown in almost all the districts of the State. The crop requirements (Table 7.12) for growing mango were matched with the soil-site (Table 7.1) characteristics and a land suitability map for growing mango was

generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.13.

An area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing mango. They have minor or no limitations for growing mango and are distributed in the northeastern part of the microwatershed. An area of about 60 ha (10%) is moderately suitable (Class S2) for growing mango and are distributed in the southern and southeastern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover an area of about 207 ha (34%) and occur in the southern, western, central, southwestern and northeastern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness, drainage and texture. Maximum area of about 305 ha (50%) is not suitable (Class N) for growing mango and occur in all parts of the microwatershed. They have severe limitations of gravelliness, rooting depth and topography.

Table 7.12 Land suitability criteria for Mango

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
climate	Tempin 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 imperfectly drained	Poor drained	Very poorly drained
	Water table	M	>3	2.50-3.0	2.5-1.5	<1.5
Nutrient availability	Texture	Class	Sc, l, sil, cl	Sl, sc, sic, l, c	C (<60%)	C (>60%),
	pH	1:2.5	5.5-7.5	7.6-8.55.0-5.4	8.6-9.04.0-4.9	>9.0<4.0
	OC	%	High	medium	low	
	$CaCO_3$ in root zone	%	Non calcareous	<5	5-10	>10
Rooting conditions	Soil depth	cm	>200	125-200	75-125	<75
	Gravel content	%vol	Nongravelly	<15	15-35	>35
	Hard pans	cm	>250	150-250	100-150	<100
Soil toxicity	Salinity	ds/m	Non saline	<2.0	2.0-3.0	>3.0
	Sodicity	%	Non sodic	<10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

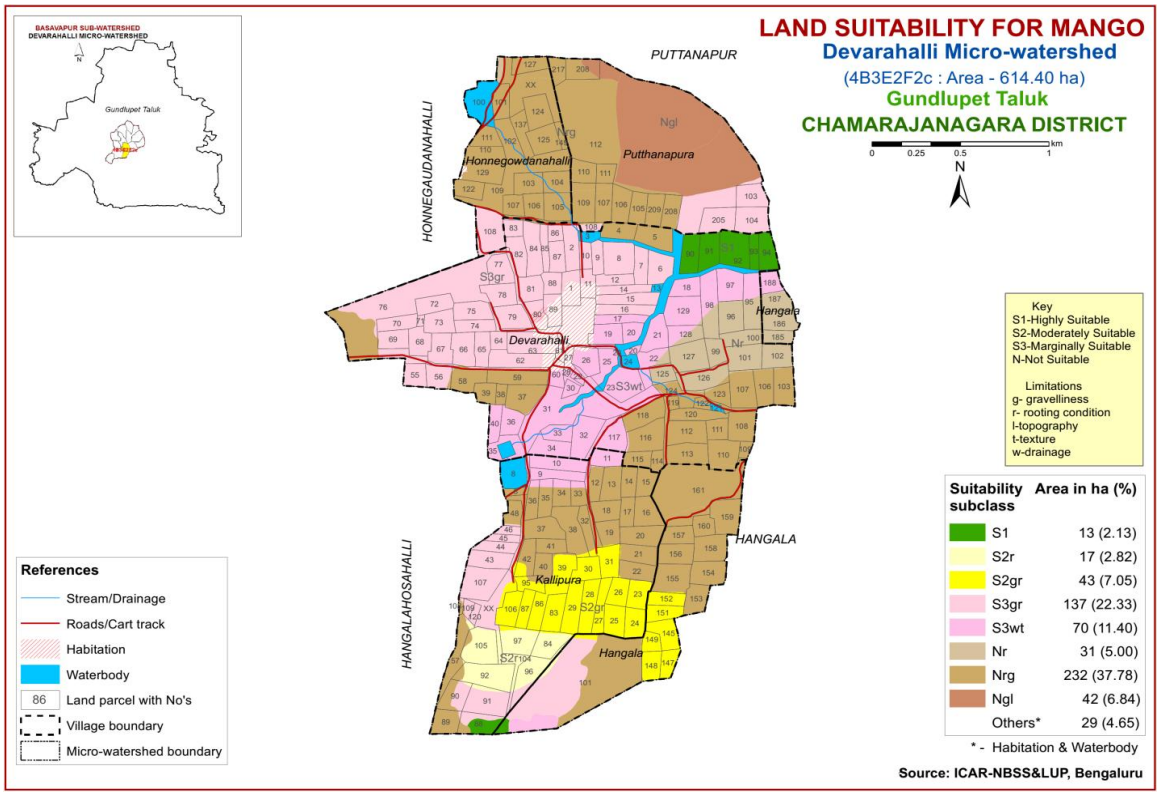


Fig. 7.13 Land Suitability map of Mango

7.14 Land suitability for Sapota (*Manilkara zapota*)

Sapota is the most important fruit crop grown in an area of 3.11 lakh ha in almost all the districts of the State. The crop requirements (Table 7.13) for growing sapota were matched with the soil-site (Table 7.1) characteristics and a land suitability map for growing sapota was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.14.

An area of about 30 ha (5%) in the microwatershed has soils that are highly suitable (Class S1) for growing sapota. They have minor or no limitations for growing sapota and are distributed in the southern and northeastern part of the microwatershed. An area of about 163 ha (27%) is moderately suitable (Class S2) for growing sapota and are distributed in the southwestern, southeastern, western, central and northeastern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover maximum area of about 320 ha (52%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth, texture, drainage and gravelliness. An area of about 72 ha (12%) is not suitable (Class N) for growing sapota and occur in the western and northwestern part of the microwatershed. They have severe limitations of gravelliness, rooting depth and topography.

Table 7.13 Land suitability criteria for Sapota

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

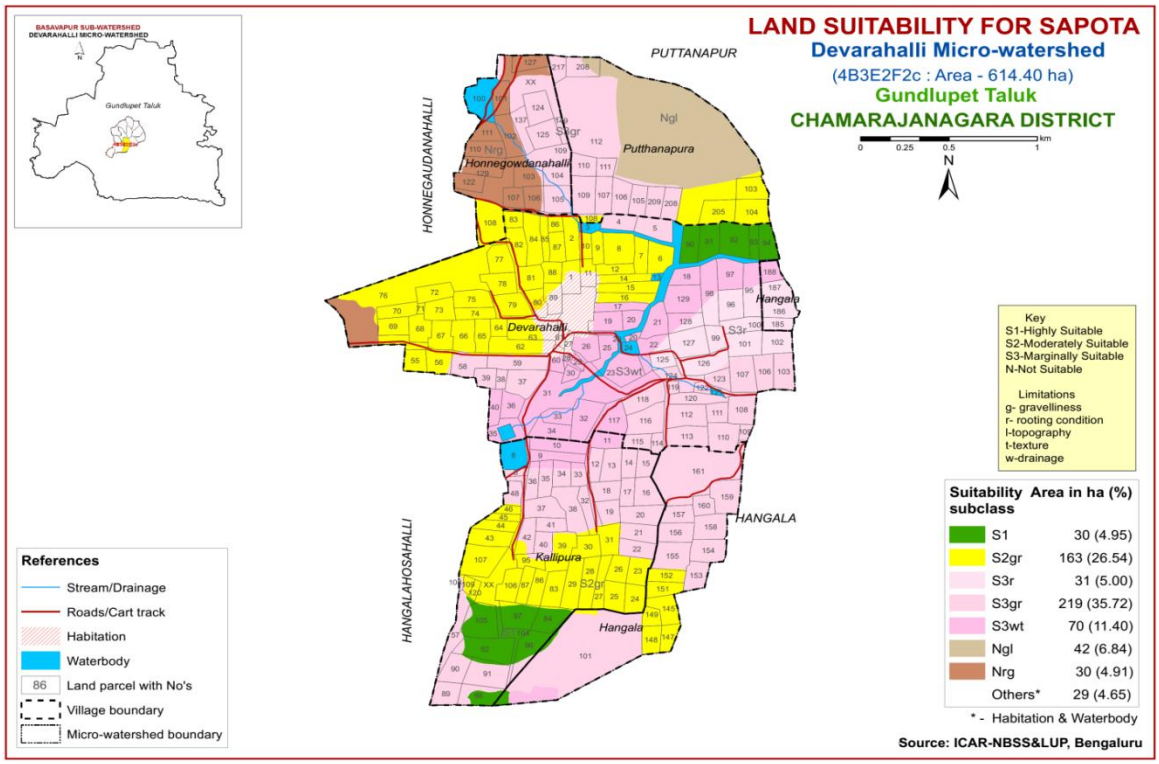


Fig. 7.14 Land Suitability map of Sapota

7.15 Land suitability for Guava (*Psidium guajava*)

Guava is the most important fruit crop grown in an area of 0.64 lakh ha in almost all the districts of the State. The crop requirements (Table 7.14) for growing guava were matched with the soil-site (Table 7.1) characteristics and a land suitability map for growing guava was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.15

An area of about 30 ha (5%) in the microwatershed has soils that are highly suitable (Class S1) for growing guava. They have minor or no limitations for growing guava and are distributed in the southern and northeastern part of the microwatershed. An area of about 163 ha (27%) is moderately suitable (Class S2) for growing guava and are distributed in the southwestern, southeastern, western, central and northeastern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover maximum area of about 320 ha (52%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth, texture, drainage and gravelliness. An area of about 72 ha (12%) is not suitable (Class N) for growing guava and occur in the western and northwestern part of the microwatershed. They have severe limitations of gravelliness, rooting depth and topography.

Table 7.14 Land 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 drained	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

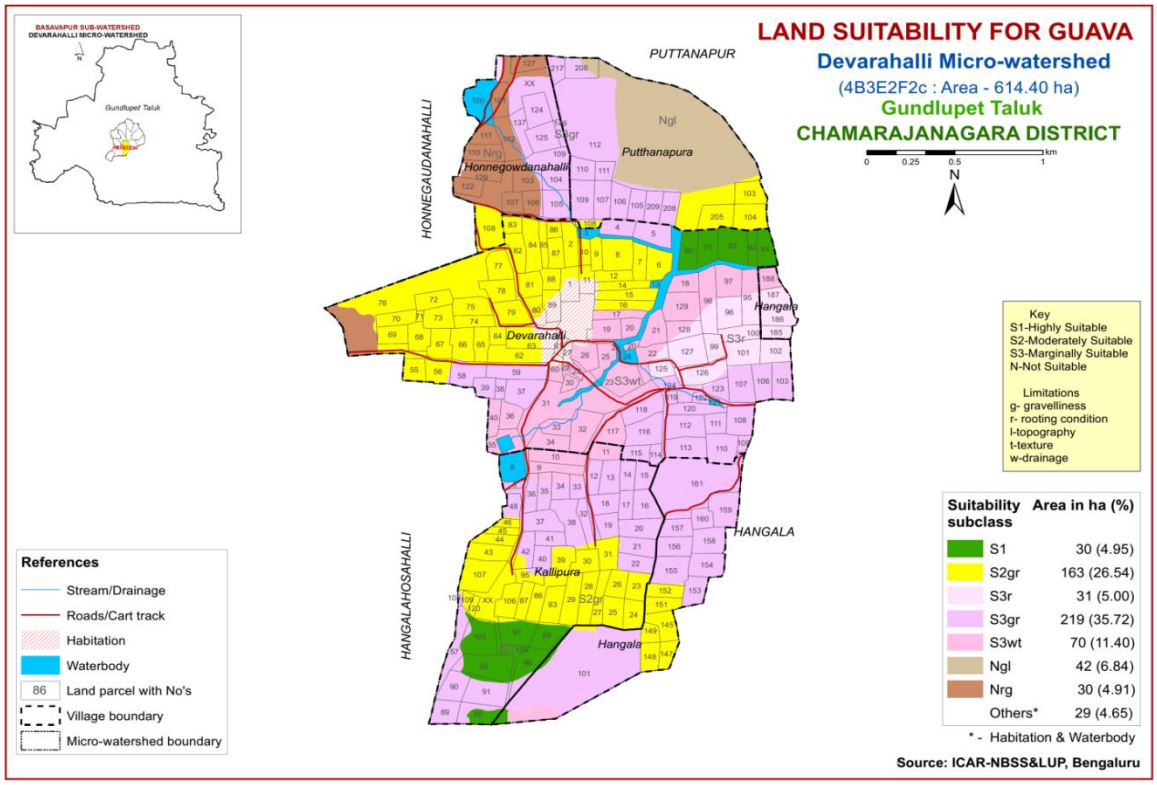


Fig. 7.15 Land Suitability map of Guava

7.16 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 (Table 7.15) for growing banana were matched with the soil-site (Table 7.1) characteristics 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 is given in Figure 7.16.

A small area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing banana crop. They have minor or no limitations for growing banana and are distributed in the northeastern part of the microwatershed. An area of about 148 ha (24%) is moderately suitable (Class S2) for growing banana and are distributed in the southern, central, southeastern, western and northeastern part of the microwatershed. They have minor limitations of gravelliness, texture and drainage. Marginally suitable (class S3) lands cover major area of about 372 ha (61%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth, gravelliness and topography. An area of about 52 ha (8%) is not suitable (Class N) for growing banana and occur in the western, northeastern and northwestern part of the microwatershed. They have severe limitations of gravelliness, rooting depth and topography.

Table 7.15 Land 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 imperfectly drained	Poorly drained	Very 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
	Gravelliness	%	<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	%	<1	1-3	3-8	>8

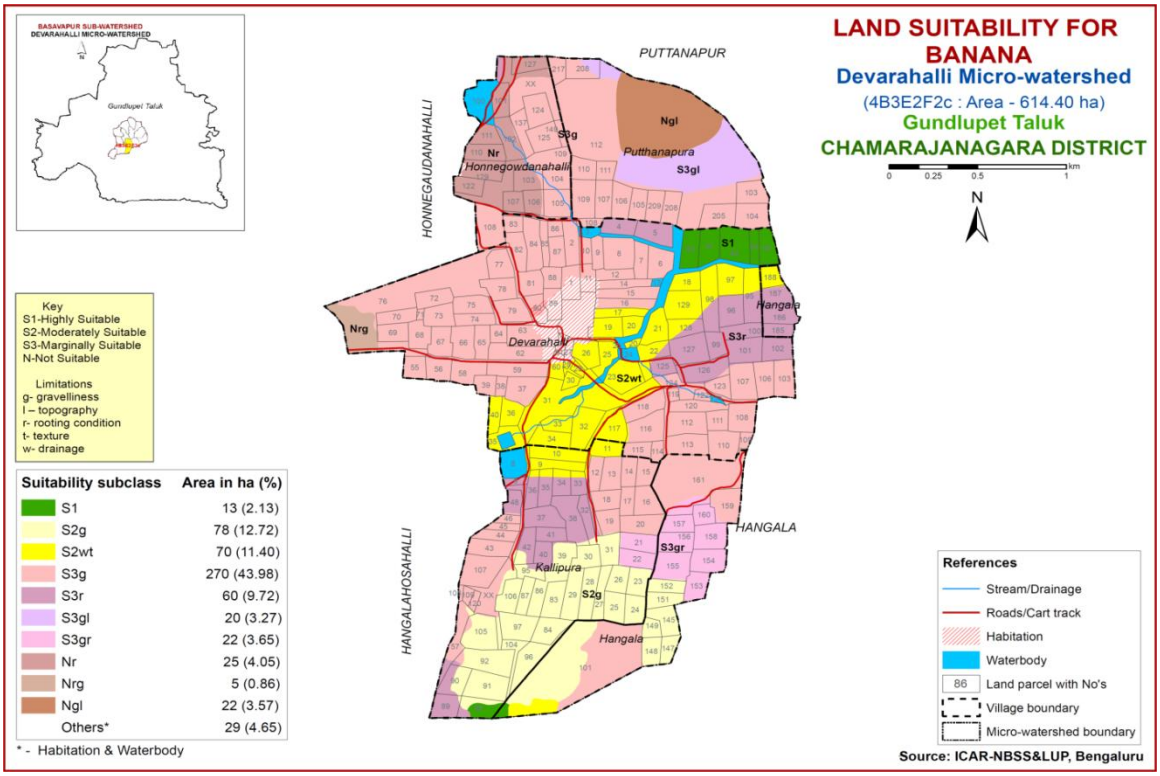


Fig. 7.16 Land Suitability map of Banana

7.17 Land suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing jackfruit were matched with the soil-site characteristics and a land suitability map for growing jackfruit was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.17.

An area of about 26 ha (4%) in the microwatershed has soils that are highly suitable (Class S1) for growing jackfruit. They have minor or no limitations for growing jackfruit and are distributed in the northeastern and central part of the microwatershed. An area of about 110 ha (18%) is moderately suitable (Class S2) for growing jackfruit and are distributed in the southwestern, western and southeastern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover an area of about 146 ha (24%) and occur in the southwestern, central, western and northeastern part of the microwatershed. They have moderate limitations of rooting depth, texture and gravelliness. Major area of about 303 ha (49%) is not suitable (Class N) for growing jackfruit and occur in all parts of the microwatershed.

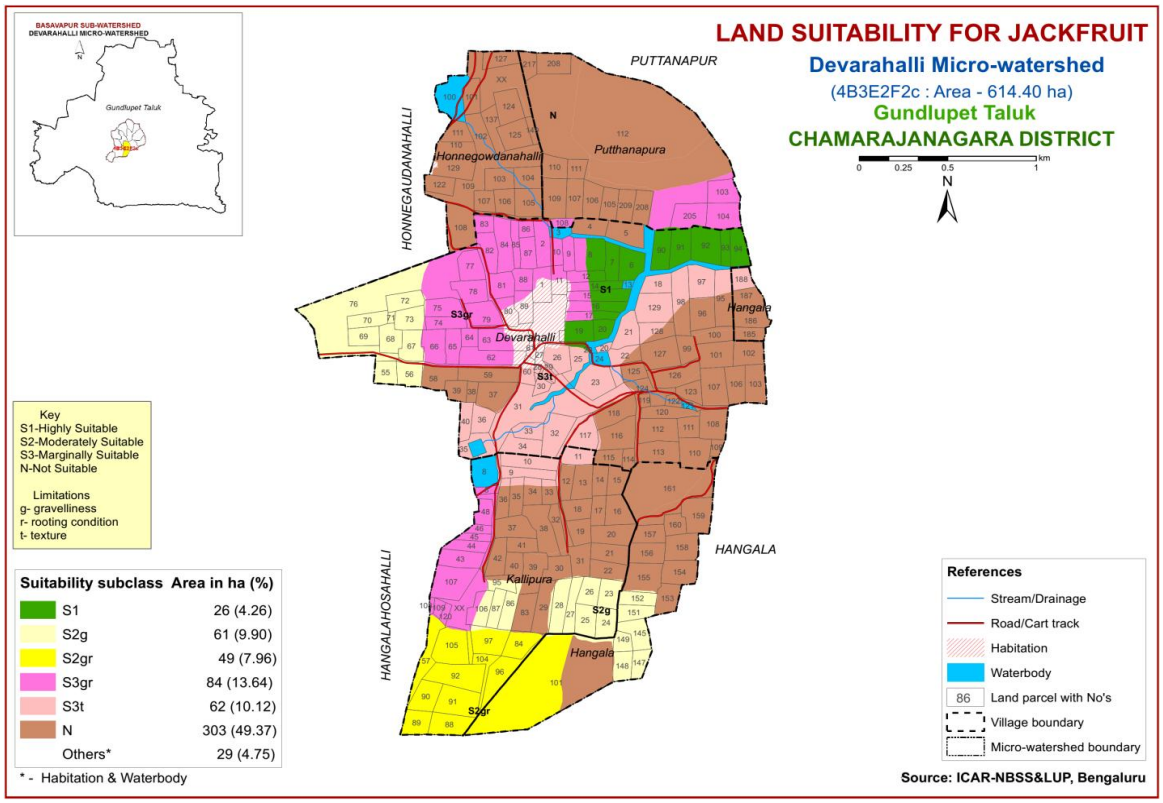


Fig. 7.17 Land Suitability map of Jackfruit

7.18 Land suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun were matched with the soil-site characteristics and a

land suitability map for growing jamun was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.18.

An area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing jamun crop. They have minor or no limitations for growing jamun and are distributed in the northeastern part of the microwatershed. An area of about 130 ha (21%) is moderately suitable (Class S2) for growing jamun and are distributed in the southern, southeastern, western, central and northeastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth, drainage and texture. Marginally suitable (Class S3) lands cover maximum area of about 370 ha (60%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of about 72 ha (12%) is not suitable (Class N) for growing jamun and occur in the western and central part of the microwatershed. They have severe limitations of gravelliness, rooting depth and topography.

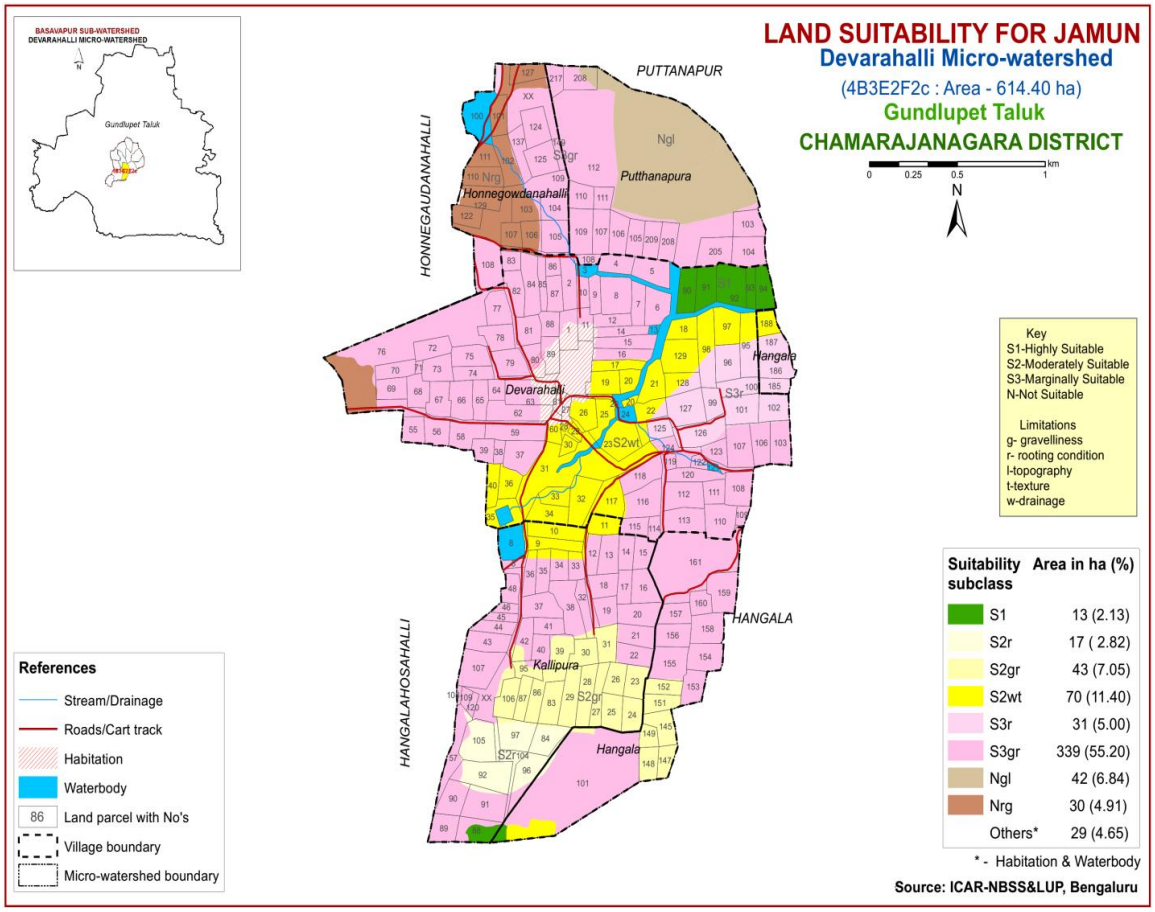


Fig. 7.18 Land Suitability map of Jamun

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the important fruit crop grown in almost all the districts of the State. The crop requirements for growing musambi were matched with the soil-site characteristics and a land suitability map for growing musambi was generated. The area

extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.19.

An area of about 30 ha (5%) in the microwatershed has soils that are highly suitable (Class S1) for growing musambi crop. They have minor or no limitations for growing musambi and are distributed in the southern and northeastern part of the microwatershed. An area of about 113 ha (18%) is moderately suitable (Class S2) for growing musambi and are distributed in the southeastern, western, central and northeastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth and drainage. Marginally suitable (Class S3) lands cover maximum area of about 370 ha (60%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of about 72 ha (12%) is not suitable (Class N) for growing musambi and occur in the western and northwestern part of the microwatershed. They have severe limitations of gravelliness, rooting depth and topography.

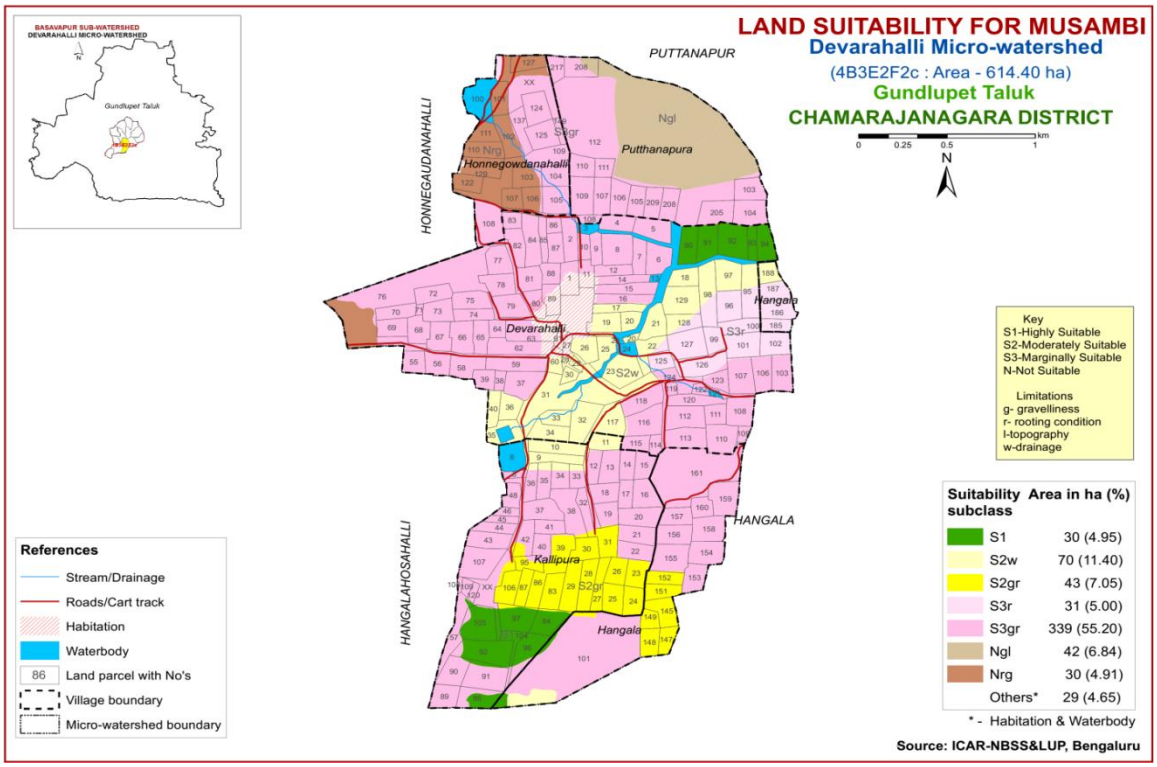


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 0.11 lakh ha in almost all the districts of the State. The crop requirements for growing lime (Table 7.16) were matched with the soil-site characteristics and a land suitability map for growing lime was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.20.

An area of about 30 ha (5%) in the microwatershed has soils that are highly suitable (Class S1) for growing lime. They have minor or no limitations for growing lime and are distributed in the southern and northeastern part of the microwatershed. An area of about 113 ha (18%) is moderately suitable (Class S2) for growing lime and are distributed in the southeastern, western, central and northeastern part of the microwatershed. They have minor limitations of gravelliness, rooting depth and drainage. Marginally suitable (Class S3) lands cover maximum area of about 370 ha (60%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of about 72 ha (12%) is not suitable (Class N) for growing lime and occur in the western and northwestern part of the microwatershed. They have severe limitations of gravelliness, rooting depth and topography.

Table 7.16 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 imperfectly drained	poorly	Very poorly
Nutrient availability	Texture	Class	Scl, l, sicl, cl, s	Sc, sc, c	C(>70%)	S, ls
	pH	1:2.5	6.0-7.5	5.5-6.47.6-8.0	4.0-5.4 8.1-8.5	<4.0 >8.5
	$CaCO_3$ in root zone	%	Non calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	Cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

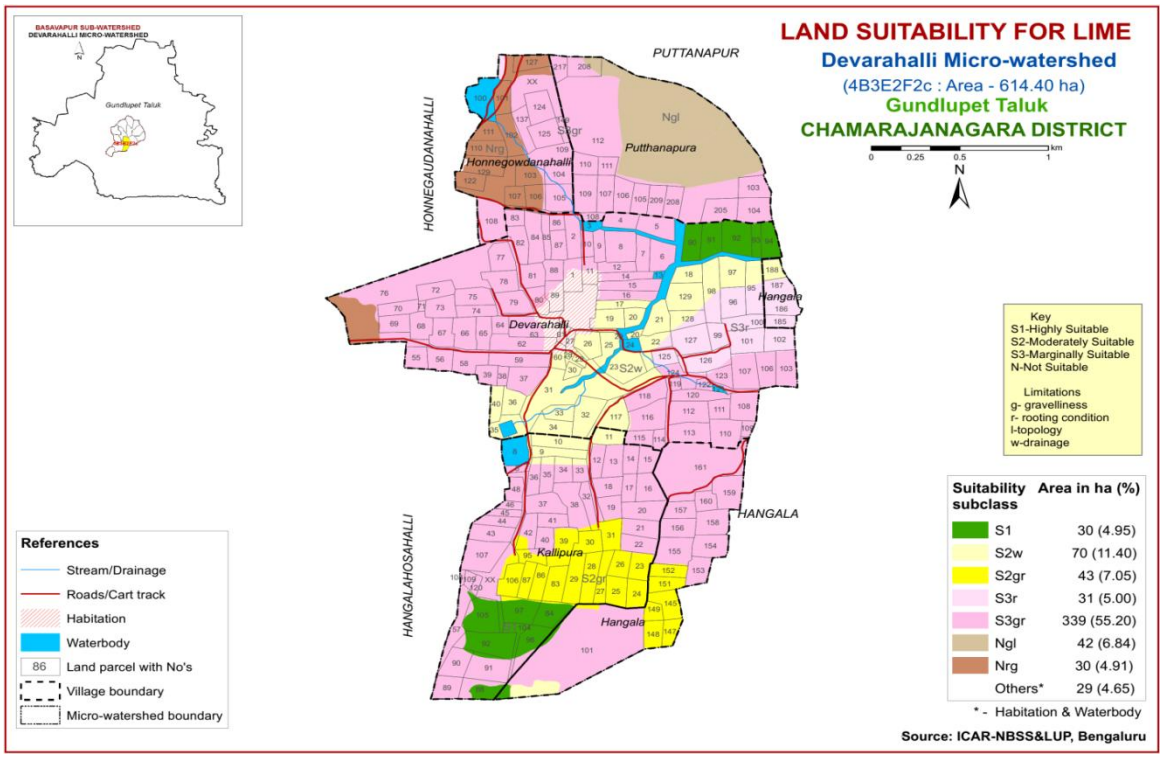


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

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

An area of about 30 ha (5%) in the microwatershed has soils that are highly suitable (Class S1) for growing cashew. They have minor or no limitations for growing cashew and are distributed in the southern and northeastern part of the microwatershed. An area of about 163 ha (27%) is moderately suitable (Class S2) for growing cashew and are distributed in the southwestern, southeastern, western, central and northeastern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover major area of about 250 ha (41%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of about 142 ha (23%) is not suitable (Class N) for growing cashew and occur in the western, central, northeastern and northwestern part of the microwatershed. They have severe limitations of gravelliness, rooting depth, drainage, texture and topography.

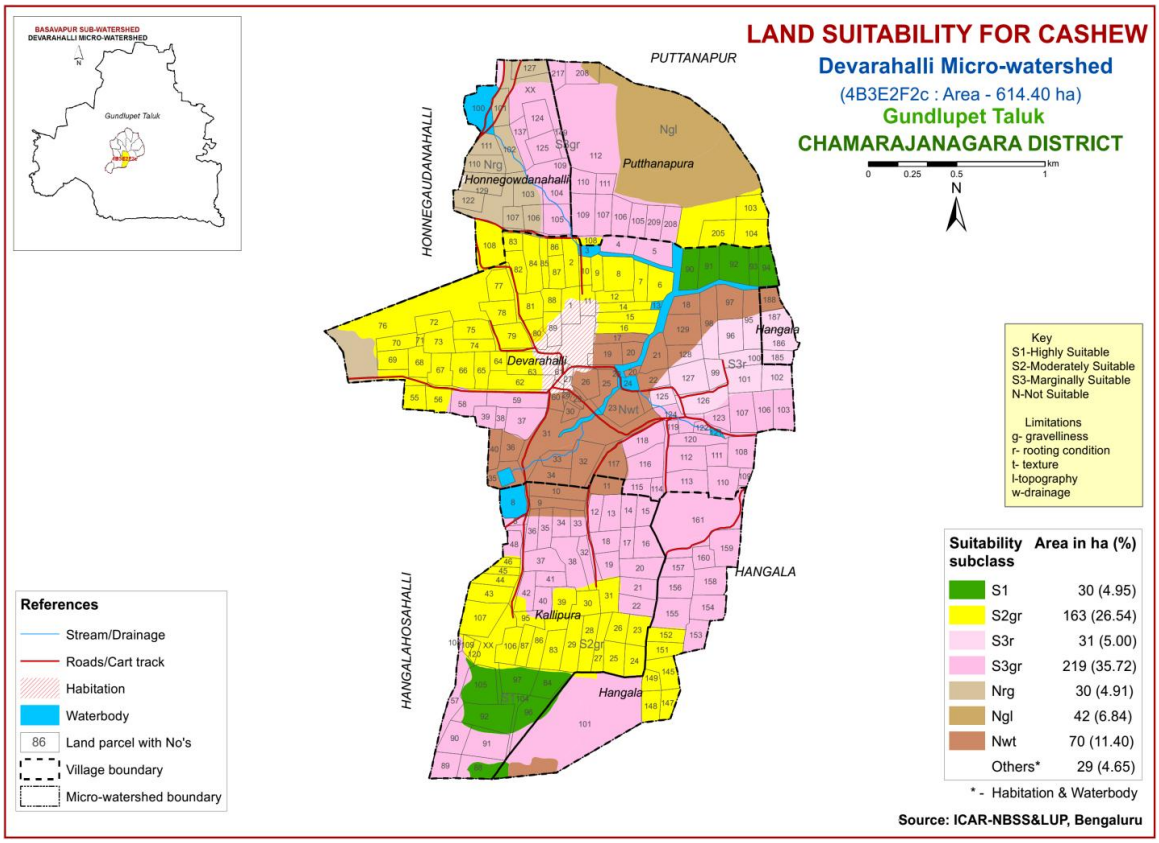


Fig. 7.21 Land Suitability map of Cashew

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

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

An area of about 30 ha (5%) in the microwatershed has soils that are highly suitable (Class S1) for growing custard apple. They have minor or no limitations for growing custard apple and are distributed in the southern and northeastern part of the microwatershed. Major area of about 483 ha (79%) is moderately suitable (Class S2) for growing custard apple and are distributed in all parts of the microwatershed. They have minor limitations of gravelliness, drainage and rooting depth. Marginally suitable (Class S3) lands cover a small area of about 30 ha (5%) and occur in the western and northwestern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of about 42 ha (7%) is not suitable (Class N) for growing custard apple and occur in the northeastern part of the microwatershed. They have severe limitations of gravelliness and topography.

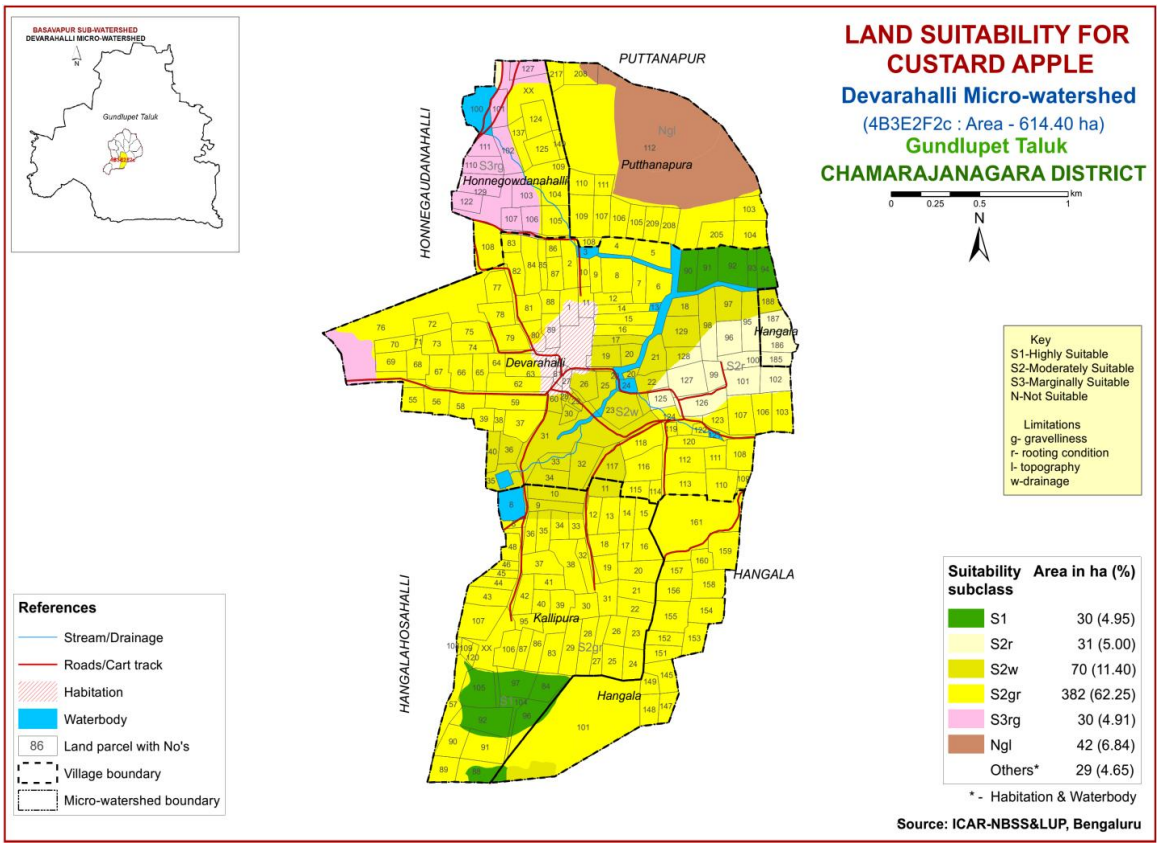


Fig. 7.22 Land Suitability map of Custard Apple

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

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

An area of about 30 ha (5%) in the microwatershed has soils that are highly suitable (Class S1) for growing amla. They have minor or no limitations for growing amla and are distributed in the southern and northeastern part of the microwatershed. Major area of about 483 ha (79%) is moderately suitable (Class S2) for growing amla and are distributed in all parts of the microwatershed. They have minor limitations of gravelliness, drainage and rooting depth. Marginally suitable (Class S3) lands cover a small area of about 30 ha (5%) and occur in the western and northwestern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of about 42 ha (7%) is not suitable (Class N) for growing amla and occur in the northeastern part of the microwatershed. They have severe limitations of gravelliness and topography.

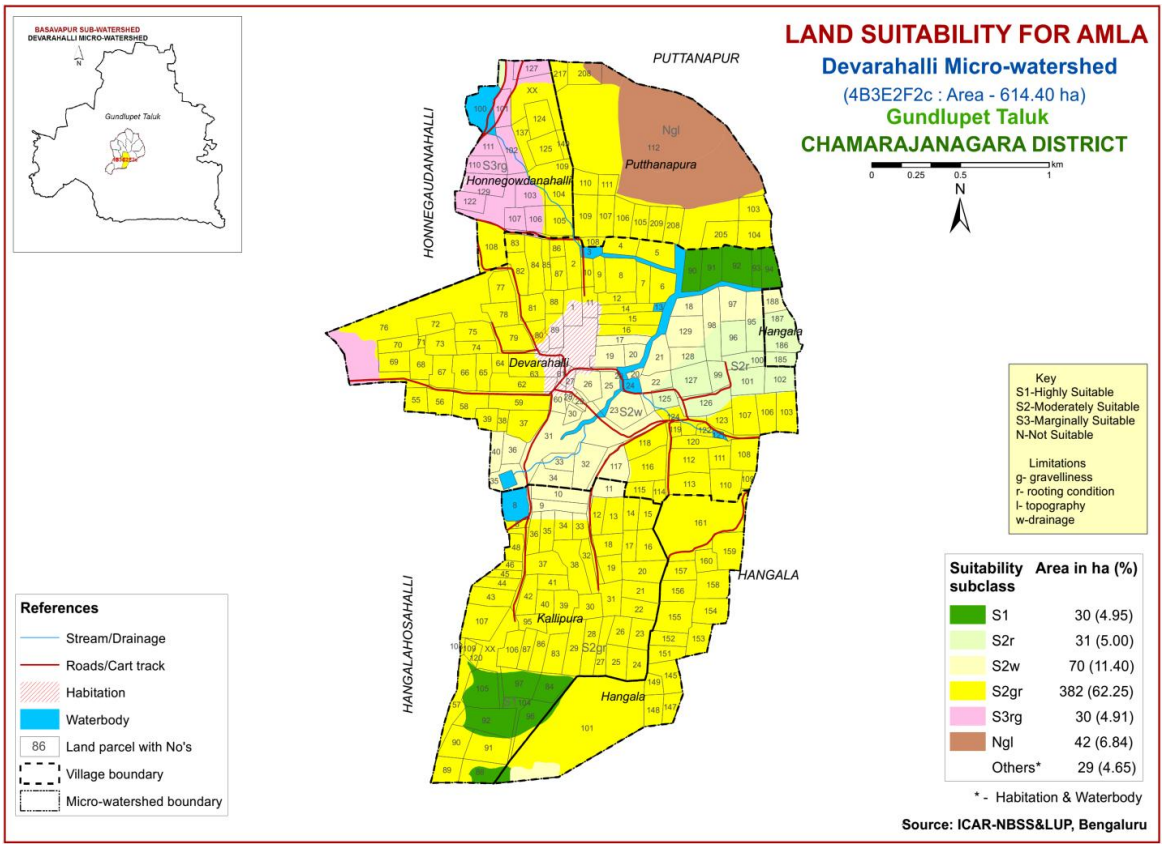


Fig. 7.23 Land Suitability map of Amla

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the fruit and spice crop grown in almost all the districts of the State. The crop requirements for growing tamarind were matched with the soil-site characteristics and a land suitability map for growing tamarind was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.24.

A small area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing tamarind. They have minor or no limitations for growing tamarind and are distributed in the northeastern part of the microwatershed. An area of about 130 ha (21%) is moderately suitable (Class S2) for growing tamarind and are distributed in the southern, southeastern, western, central and northeastern part of the microwatershed. They have minor limitations of gravelliness, texture, drainage and rooting depth. Marginally suitable (Class S3) lands cover major area of about 370 ha (60%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of about 72 ha (12%) is not suitable (Class N) for growing tamarind and occur in the western and northwestern part of the microwatershed. They have severe limitations of gravelliness, rooting depth and topography.

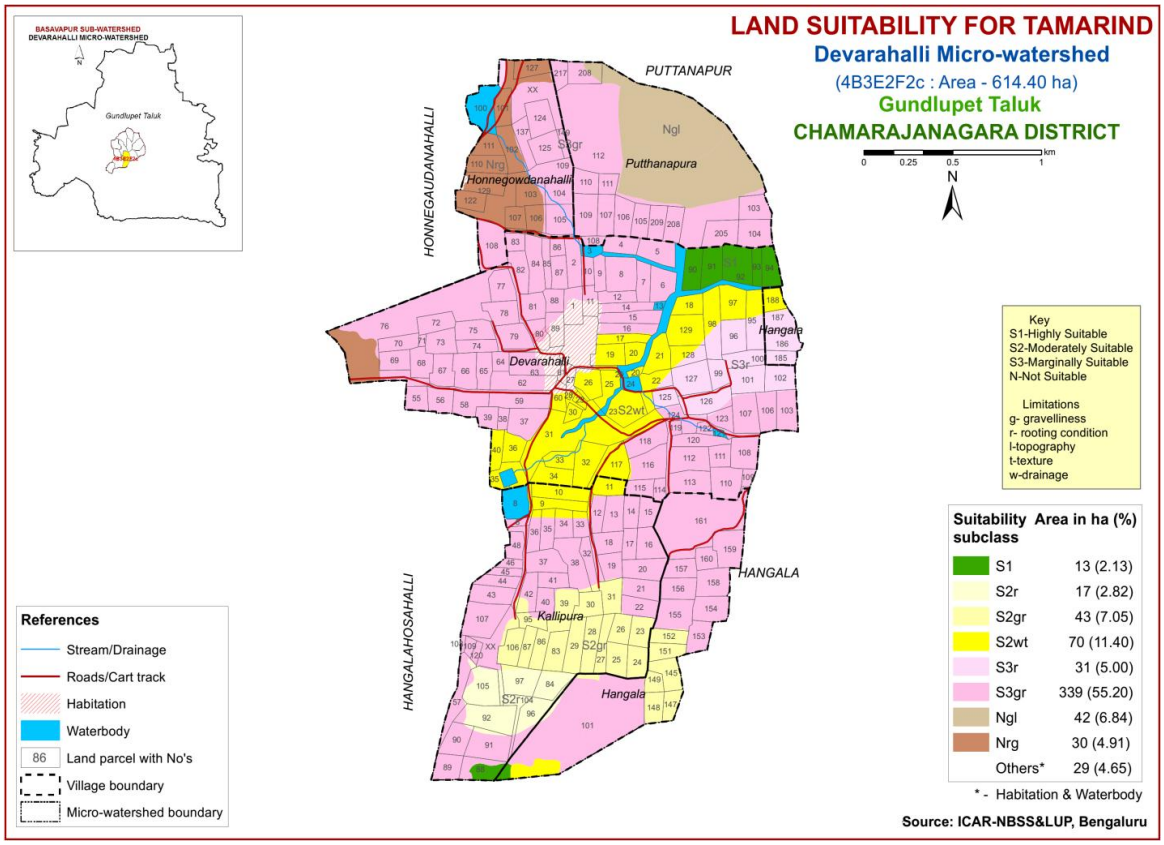


Fig. 7.24 Land Suitability map of Tamarind

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

Marigold is the most important flower crop grown in an area of 1858 ha in almost all the districts of the State. The crop requirements for growing marigold (Table 7.17) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

An area of about 48 ha (8%) in the microwatershed has soils that are highly suitable (Class S1) for growing marigold. They have minor or no limitations for growing marigold and are distributed in the southern and northeastern part of the microwatershed. Major area of about 295 ha (48%) is moderately suitable (Class S2) for growing marigold and are distributed in the sourhern, southwestern, southeastern, eastern, northeastern and northwestern part of the microwatershed. They have minor limitations of gravelliness, texture, drainage and rooting depth. Marginally suitable (Class S3) lands cover an area of abou 216 ha (35%) and occur in the southern, western, eastern, northern and central part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and topography. An area of about 27 ha (4%) is not suitable (Class N) for growing marigold and occur in the western and northeastern part of the microwatershed. They have severe limitations of gravelliness and topography.

Table 7.17 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	-

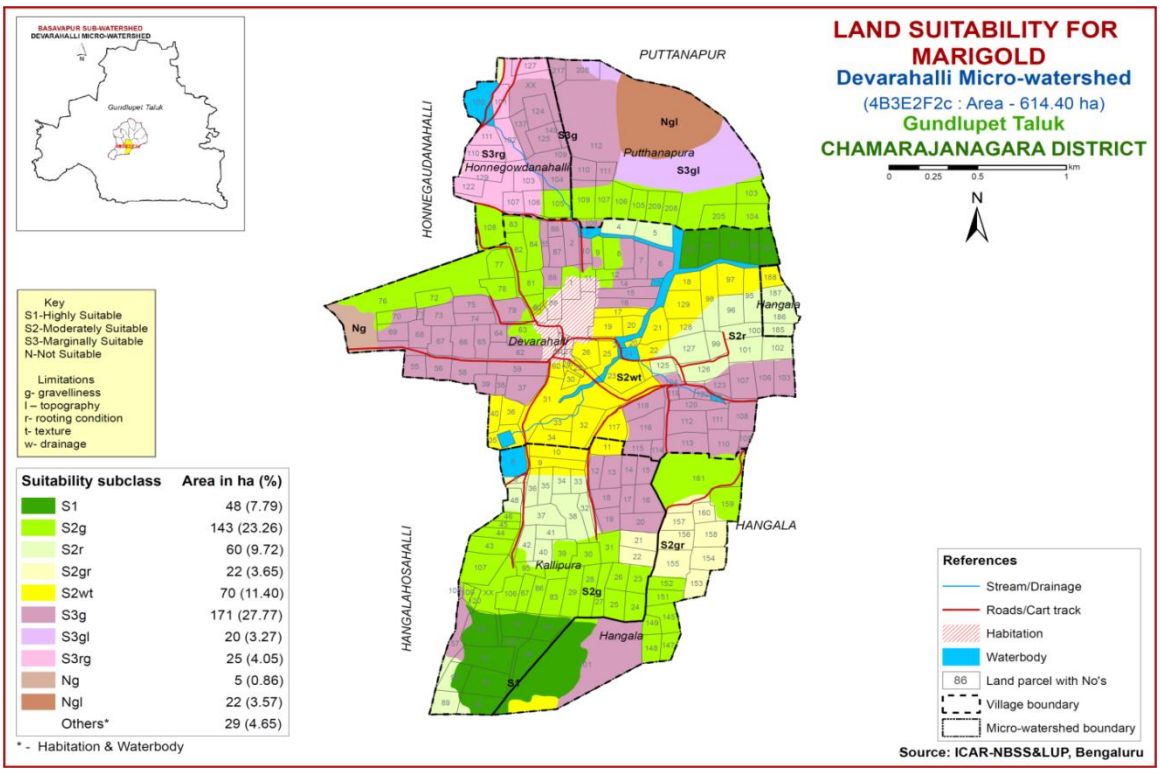


Fig. 7.25 Land Suitability map of Marigold

7.26 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 for growing chrysanthemum (Table 7.18) 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 is given in Figure 7.26.

A small area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing chrysanthemum. They have minor or no limitations for growing chrysanthemum and are distributed in the northeastern part of the microwatershed. A major area of about 349 ha (57%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in all parts of the microwatershed. They have minor limitations of gravelliness, texture, drainage and rooting depth. Marginally suitable (Class S3) lands cover an area of about 196 ha (32%) and occur in the southwestern, eastern, western, northwestern, northeastern and northern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and topography. An area of about 27 ha (4%) is not suitable (Class N) for growing chrysanthemum and occur in the western and northeastern part of the microwatershed. They have severe limitations of gravelliness and topography.

Table 7.18 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	

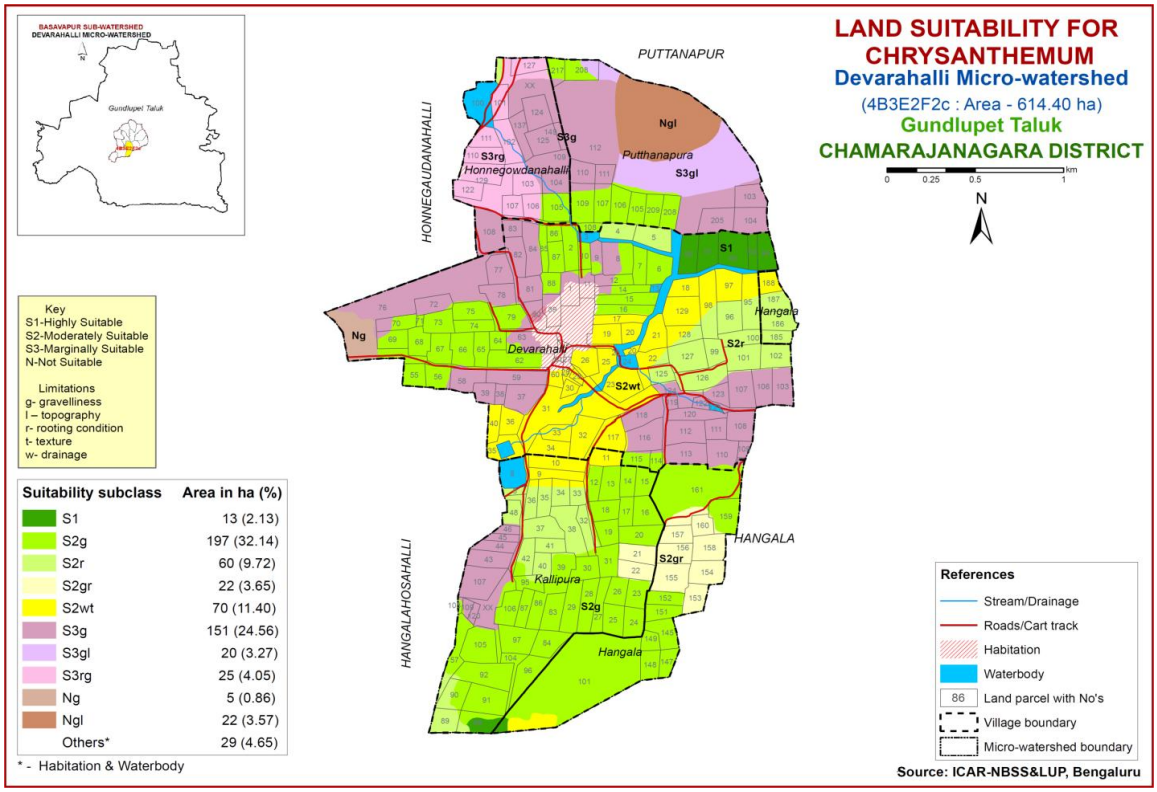


Fig. 7.26 Land Suitability map of Chrysanthemum

7.27 Land Suitability for Turmeric (*Curcuma longa*)

Turmeric is the most important spice crop grown in an area of 1.39 lakh ha in almost all the districts of the State. The crop requirements (Table 7.19) for growing turmeric were matched with the soil-site (Table 7.1) characteristics and a land suitability map for growing turmeric was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatersheds is given in Figure 7.27.

An area of about 13 ha (2%) in the microwatershed has soils that are highly suitable (Class S1) for growing turmeric. They have minor or no limitations for growing turmeric and are distributed in the northeastern part of the microwatershed. An area of about 191 ha (31%) is moderately suitable (Class S2) for growing turmeric and are distributed in the southern, southeastern, central and eastern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Marginally suitable (Class S3) lands cover maximum area of about 354 ha (58%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth, gravelliness, drainage, texture and topography. An area of about 27 ha (4%) is not suitable (Class N) for growing turmeric and occur in the western and northeastern part of the microwatershed. They have severe limitations of gravelliness and topography.

Table 7.19 Land suitability criteria for Turmeric

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	20-27 33-37	10-19 38-40	<10 >40
Soil aeration	Soil drainage	class	Well drained	Mod. well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l, cl, scl, sl	Sc, sic, sicl	C(40-60%), ls	Stony heavy clay>60%
	pH	1:2.5				
	Available nutrient status (NPK)	Fertility rating class	high	medium	low	
Rooting conditions	Soil depth	Cm	>75	50-75	25-50	<25
Erosion	Slope	%	<3	3-8	8-15	>15mm

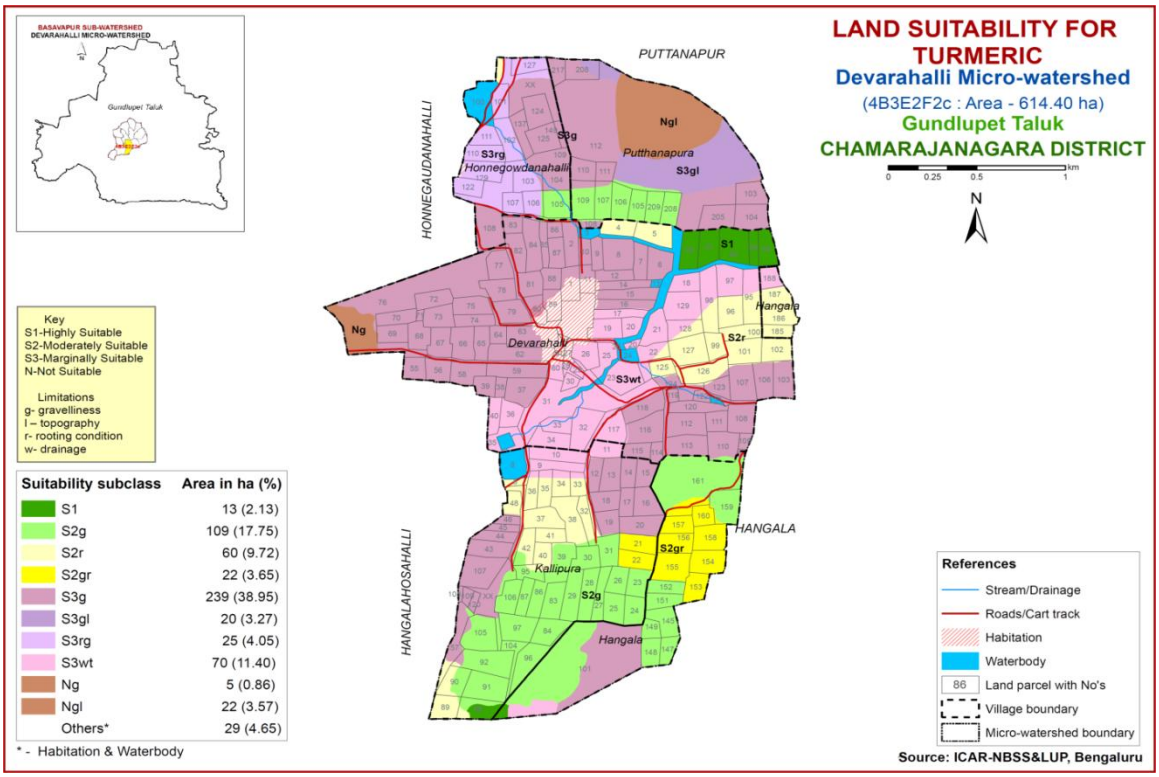


Fig. 7.27 Land Suitability map of Turmeric

7.28 Land Management Units (LMUs)

The 35 soil map units identified in the microwatershed have been regrouped into 8 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig.7.28) has been prepared. These Land Management Units are expected to behave similarly for a given level of management.

The map units that have been grouped into 8 land management units along with brief description of soil and site characteristics are given below.

LMUs	Soil map units	Soil and site characteristics
1	BMBiA1g1, BMBmA1, BMBmB1, BMBmB1g1	Very deep lowlands clay soil with slopes of 0-3% , gravelly to extremely gravelly (15-35%) and slight erosion
2	HGHmB1, HGHhB1	Very deep red clayey soils with slopes of 1-3% and slight erosion
3	KLPcB1g1, MDHcB1g1	Deep gravelly clay soils with slopes of 1-3%, gravelly (15-35 %) and slight erosion
4	GPRhB1g1, KNGhB1, KNGbB1g1,KNGmA1g1, KNGhB1g2, KNGcB1g2, KNGcC2g2	Moderatelly deep gravelly red clay soils with slopes of 0-5%, gravelly to very gravelly (15-60%) and slight to moderate erosion
5	DRHhB1g1,DRHmB1g1, DRHbB1g2, DRHbC2g1 HPRhB1g1, HPRmB1g1	Moderatelly shallow gravelly red clay soils with slopes of 1-5%, gravelly (15-35%) and slight to moderate erosion
6	MGHhB1g1,MGHhC2g2 MGHhB2g1,MGHmB1g1 MGHbB1g2, MGHhC3g2 MGHcB1g2, MGHcC2 MGHcC2g1,	Moderatelly shallow gravelly red loam soils with slopes of 1-5%, gravelly to very gravelly (15-60%) and slight to severe erosion
7	MGHhD3g2,MGHcD3g3 HDRiC2g3,HDRcC2g2	Shallow to moderately shallow gravelly red clay soils with slopes of 5-10%, very gravelly to extremely gravelly (35-60%) and moderate to severe erosion
8	SPRhF3g2R3	Sandy loam soShallow gravelly red clay soils of mounds with slopes of 15-25%, gravelly to very gravelly (15-60%), very rocky (25-50%) and severe erosion

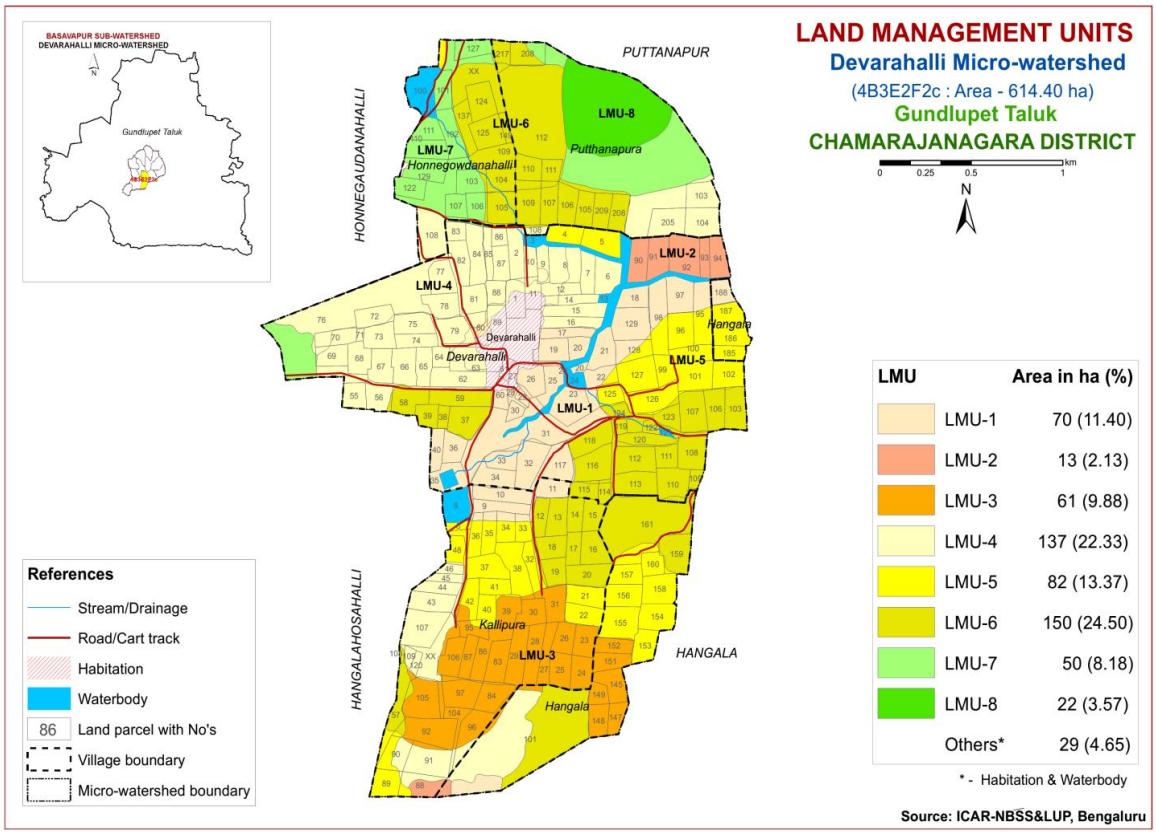


Fig. 7.28 Land Management Units Map- Devarahalli Microwatershed

7.29 Proposed Crop Plan for Devarahalli Microwatershed

After assessing the land suitability for the 27 crops, the proposed crop plan has been prepared for the 8 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 27 crops. The resultant proposed crop plan is presented below in Table 7.20

Table 7.20 Proposed Crop Plan for Devarahalli Microwatershed

LMU No	Mapping Units	Survey Number	Field Crops/Forestry	Suitable Horticulture Crops under Irrigation	Horticulture Crops with suitable Interventions	Suitable Interventions
LMU1	1, 2, 3, 4 (70 ha) (>150 cm) Very deep, Lowland clay soils	Devarahalli: 17,18,19,20,21,22,23,25, 26 28,29,30,31,32,33,34,35, 36 40,60,97,98,117,128,129 Hangala: 188 Hungaladha Hosahalli: 9,10,11	Cotton, Sorghum, Sunflower, Redgram, Sugarcane **Multiple crop rotation:** Reg gram+Fodder Sorghum Pulses+ Sorghum	Beetroot, Banana, Lime, Tomato, Beans, Bhendi	**Flower crops:** Marigold, Chrysanthemum **Perennial components:** Custard apple, Amla, Lime **Annual vegetables:** Chillies, Bhendi	Drip Irrigation, Mulching, crop suitable conservation practices
LMU 2	12, 13 (13 ha) (>150 cm) Very deep, red clayey soils	Devarahalli: 90,91,92,93,94 Hungaladha Hosahalli: 88	Maize, Sorghum, Sunflower, Redgram, Sugarcane **Multiple crop rotation:** Redgram+Maize Redgram+Groundnut Pulses+Ragi Pulses+Sorghum	Turmeric, Banana, Lime, Tomato, Beans, Bhendi	**Perennial components:** Mango, Sapota, Lime **Flower crops:** Marigold, Chrysanthemum **Annual vegetables:** Chillies, Bhendi	Drip irrigation, Mulching, crop suitable conservation practices
LMU 3	16, 23 (61 ha) (100-150 cm) Deep, gravelly clay soils	Hangala:145,147, 148,149,151,152 Hungaladha Hosahalli: 23,24,25,26,27,28,29,30,	Maize, Sorghum, Cotton, Sunflower, Redgram	Tomato, Beetroot, Potato, Mango, Banana, Beans,	**Perennial components:** Mango, Sapota, Lime **Flower crops:**	Drip irrigation, Mulching, crop suitable conservation

		31, 39,83,84,86, 87, 92,95,96,97, 104, 105, 106	**Multiple crop rotation:** Redgram+Maize Redgram+Groundnut Pulses+Sorghum	Bhendi, Turmeric	Marigold, Chrysanthemum **Annual vegetables:** Chillies, Bhendi	practices
LMU 4	9, 17, 18, 19, 20, 21, 22 (137 ha) (75-100 cm) Moderately deep, gravelly red clay soils	Devarahalli: 2,6,7,8,9,10,12,14,15,16, 55, 56,62,63,64,65, 66,67,68,69, 70,71, 72, 73, 74,75,76,77,78, 79,80,81,82,83,84,85,86, 87, 88 Honnegowdanahalli: 108 Hungaladha Hosahalli: 43,44,45,46,90,91,107,109, 120,XX Putthanapura: 103,104,108,205	Maize, Sorghum, Ground nut, Ragi, Sunflower Pulses+Sorghum	Fieldbean, Tomato, Beetroot, Onion, Banana, Turmeric	**Perennial components:** Sapota, Guava **Flower crops:** Marigold, Chrysanthemum **Annual vegetables:** Chillies, Bhendi	Drip irrigation, Mulching, Crop suitable conservation practices
LMU 5	5, 6, 7, 8, 14, 15 (82 ha) (50-75 cm) Moderately shallow, gravelly red clay soils	Devarahalli: 4,5,95,96,99,100,101,102,125,126,127_MAJARE_ANKANATHAPURA Hangala:153,154,155,156,157,158,160,185, 186,187 Hungaladha Hosahalli: 8,21,22,32,33,34,35,36,37,38,40,41,42,48,89	Ragi, Groundnut, Maize, Sorghum, Pulses+Sorghum	Fieldbean, Tomato, Beetroot, Onion, Banana, Turmeric	Custard apple, Ber, Aonla **Vegetables:** Clusterbean, Bhendi **Flower crops:** Marigold, Chrysanthemum, Gillardia	Drip irrigation, Mulching, Crop suitable conservation practices
LMU 6	24, 25, 26, 27, 29, 30, 31, 32, 34 (150 ha) (50-75 cm)	Devarahalli: 37,38,39,58,59,103,106,107,108,109,110,111,112,113,114,115,116,118,119,120,122, 123,124	Groundnut, Ragi, Horsegram	Custard apple, Amla	Custard apple, Amla, Drumstick, Fig	Drip irrigation, Mulching, Crop suitable conservation practices

	Moderately shallow, gravelly red loam soils	Hangala: 101,159,161 Honnegowdanahalli: 104,105,124,125,137, 149,XX Hungaladha Hosahalli: 12,13,14,15,16,17,18,19, 20, 57,108 Putthanapura:105,106, 107,109,110,111,208,209, 217				
LMU 7	10, 11, 28, 33 (50 ha) (25-75 cm) Shallow to moderately shallow, gravelly red clay soils (Marginal lands)	Honnegowdanahalli: 101,102,103,106,107,109 , 110,111,122, 127,129	Groundnut, Horsegram	Custard apple, Amla	Custard apple, Ber	Drip irrigation, Mulching, Crop suitable conservation practices
LMU 8	35 (21 ha) (25-50 cm) Shallow, gravelly red clay soils of mounds slopes	Putthanapura: 112	**Silviculture:** Acacia auriculiformis, Glyricidia, Agave, simaruba, Cassia sp. **Grasses:** Styloxanthus hamata, Styloxanthus Scabra, Khus grass.	Custard apple, Amla	Custard apple, Amla	Drip irrigation, Mulching, Crop suitable conservation practices

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 characterististics of a healthy soil are

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

Characteristics of Devarahalli Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of MGH (171 ha), KNG (120 ha), BMB (58 ha), DRH (51 ha), MDH (43 ha), HPR (31 ha), HDR (30 ha), SPR (22 ha), GPR (17 ha), KLP (17 ha) and HGH (13 ha).
- As per land capability classification, nearly 92 per cent area falls under arable land category (Class II, III and IV). The major limitations identified in the arable lands are soil, wetness and erosion.
- On the basis of soil reaction, about 104 ha (17%) area is moderately alkaline (pH 7.8-8.4) and about 126 ha (21%) under slightly alkaline (pH 7.3-7.8). Maximum area of

about 229 ha (37%) is under neutral (pH 6.5-7.3) and a very minor area of about 15 ha (2%) under strongly acid (pH 5-5.5). An area of about 79 ha (13%) is under slighty acid (pH 6.0-6.5) followed by moderately acid (pH 5.5-6.0) reaction covering an area of about 33 ha (5%).

Soil Health Management

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

Alkaline soils

(Slightly alkaline to moderately alkaline soils)

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

Neutral soils

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

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

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. Out of total 614 ha area in the microwatershed, an area of 162 ha is suffering from moderate and severe erosion. These areas need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health. Major area of 424 ha is relatively a stable terrain with slight erosion.

Dissemination of information and communicate 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 younger farmers.

Inputs for Net Planning and Interventions needed

Net planning in IWMP is focusing on preparation of Soil and Water Conservation Plans for each plot or farm.

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

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

- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.

- **Surface soil texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.

- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey

number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in the microwatershed.

- **Organic Carbon:** The OC content is medium (0.5-0.75%) in about 228 ha (37%) area, it is low (<0.5%) in 338 ha (55%) and high (>0.75%) in 20 ha (3%) area. 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 566 ha area where OC is low to medium. For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.

- **Available Phosphorus**: In 112 ha (18%) area, the available phosphorus is high (>57 kg/ha) and 300 ha (49%) area low (<23 kg/ha) in available phosphorus. Hence for all the crops, 25% additional P-needs to be applied. It is medium (23-57 kg/ha) in 174 ha (29 %) area.

- **Available Potassium:** Available potassium is medium in 232 ha (38%), low in 107 ha (17%) and high in 247 ha (40%) area of the microwatershed. Hence, in all these plots, when available potassium is low and medium, an additional 25 % potassium may be applied for all crops.

- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. It is low in 415 ha (68%) area of the microwatershed and medium in 171 ha (28%).These areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

- **Available iron:** It is deficient in an area of 125 ha (20%) in the microwatershed. To manage iron deficiency, iron sulphate @ 25kg /ha needs to be applied for 2-3 years. It is sufficient in the rest of 460 ha (75 %) area in the microwatershed.

- **Available Zinc:** It is deficient in an area of 471 ha (77%) in the microwatershed. To manage zinc deficiency, application of zinc sulphate @25kg/ha is to be applied. It is sufficient in the 114 ha (19 %) area in the microwatershed.

- **Soil alkalinity:** The microwatershed has 230 ha area where the soils are slightly to moderatly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

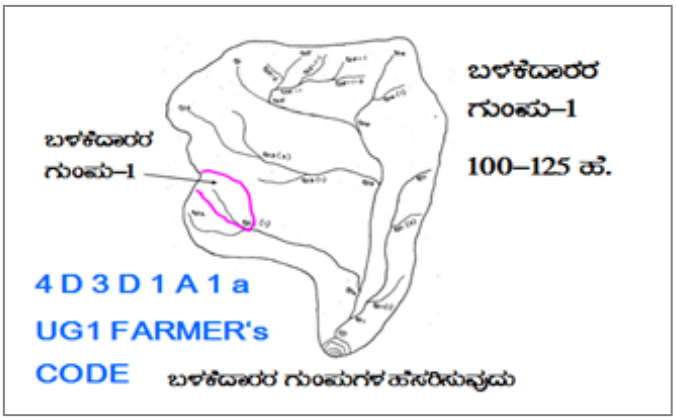
Land Suitability for various crops: Areas that are highly, moderately and marginally suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and 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 Devarahalli 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 maps
- Rainfall map
- Hydrology
- Water Resources
- Socio-economic data
- Contour plan with existing features- Network of waterways, pothissa boundaries, cut up/ minor terraces etc.
- Cadastral map (1:7920 scale)
- Satellite imagery (1:7920 scale)



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

Steps for Survey and Preparation of Treatment Plan

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

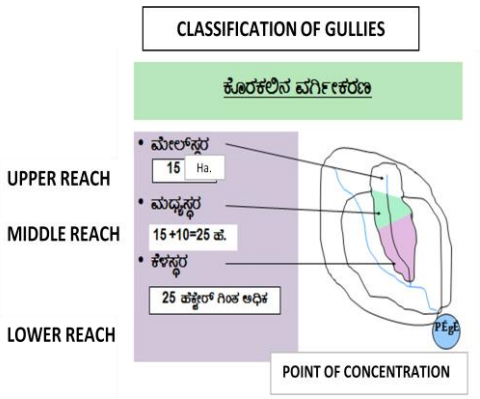
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

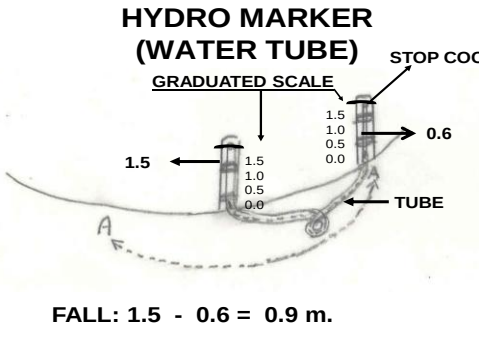
9.1.1 Arable Land Treatment

A. BUNDING

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

Measurement of Land Slope

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



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

Slope per centage	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 grassbelts/ partitions, the bunds are aligned and lengths are measured.

Section of the Bund

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

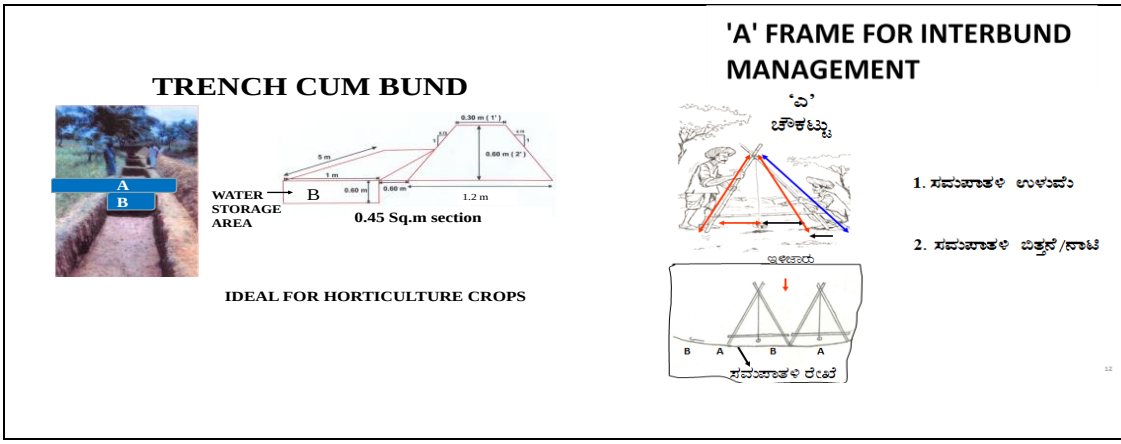
Recommended bund section

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

Formation of Trench cum Bund

Dimensions of the borrow Pits/ Ttrenches to be excavated (Machinery are decided considering the Bund section).

Details of Borrow Pit dimensions are given below.



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

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

B. Water ways

a) Existing water ways are marked on the cadastral map (1:10000 scale). Their dimensions have to be recorded.

b) Considering the Contour plan of the MWS, additional water ways/ modernization of the existing ones can be thought of.

c) The design details are given in the Manual.

C. Farm ponds

Water ways and catchment will give an indication on the size of the 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 into 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/ concerned authorities, Contour Trench, Staggered Trench, Crescent Bund, Boulder Bund or Pebble Bunds 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 in water budgeting and quality of water in the wells and site suitability.
e) Detailed Levelling Survey using Dumpy Level / Total Station has to be carried out to arrive at site-specific designs as shown in the Manual.
f) The location of ground water recharge structures are decided by examining the lineaments and fracture zones from geological maps.
g) Rainfall intensity data of the nearest Rain gauge station is considered for Hydrologic Designs.
h) Silt load to the Storage/Recharge structures is reduced by providing vegetative, boulder and earthen checks in the natural water course. Location and design details are 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 are selected based on the slope per cent, severity of erosion, amount of rainfall, land use and soil type. The different kinds of conservation structures recommended are

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. Major area of about 526 ha (86%) requires trench cum bunding, a small area of about 18 ha (3%) requires bunding/strengthening of exiting bunds and an area of about 42 ha (6%) requires terracing.

The conservation plan prepared may be presented to all the stakeholders including farmers and after including their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

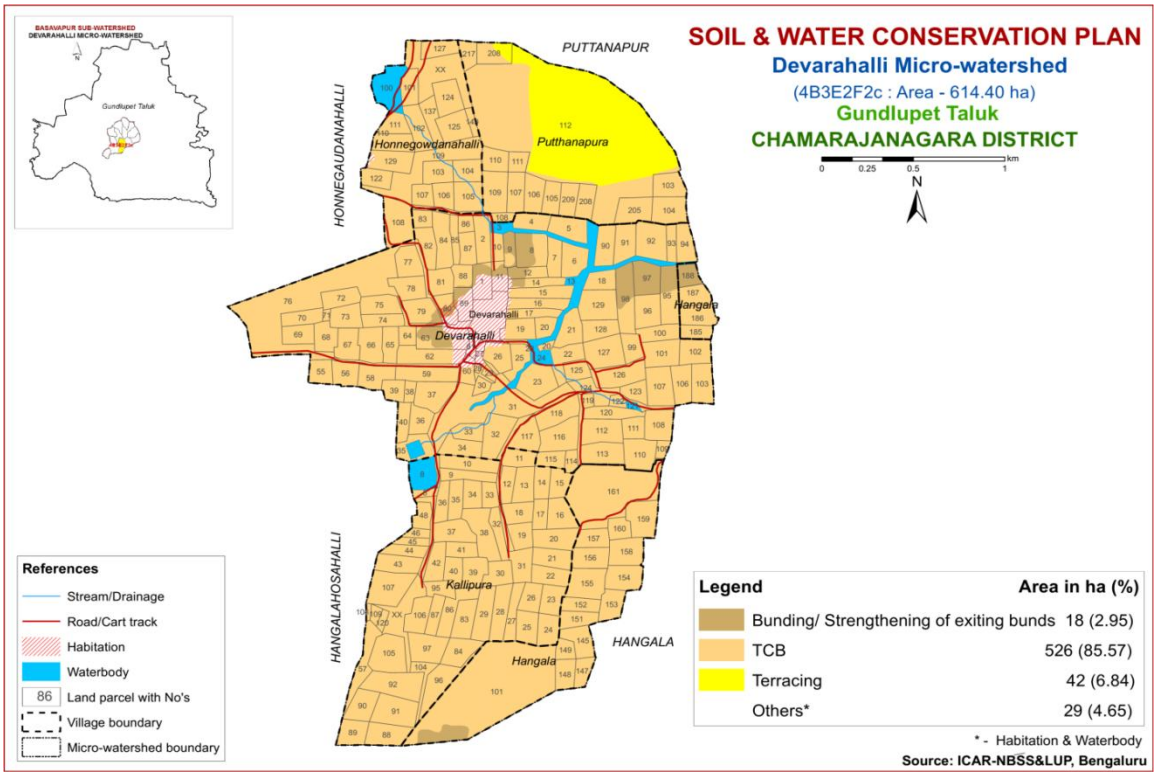


Fig. 9.1 Soil and Water Conservation Plan map of Devarahalli Microwatershed

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 and VII) and also the lands that are not suitable or marginally suitable for growing annual and perennial crops. The methods of planting these trees are given below.

It is recommended to open pits during the 1st week of March along the contour and heap the dugout soil on the lower side of the slope in order to harness the flowing water and facilitate weathering of soil in the pit. Exposure of soil in the pit also prevents spread of pests and diseases due to scorching sun rays. The pits should be filled with mixture of soil and organic manure during the second week of April and be 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 and temperature is listed below; water logged areas are recommended to be planted with species like Neral (*Sizyzium cumini*) and Bamboos. Dry areas are to be planted with species like Honge, Bevu, and Seetaphal *etc*.

Dry Deciduous Species			Temp (°C)	Rainfall (mm)
1.	Bevu	*Azadiracta indica*	21–32	400 –1,200
2.	Tapasi	*Holoptelia integrifolia*	20-30	500 - 1000
3.	Seetaphal	*Anona Squamosa*	20-40	400 - 1000
4.	Honge	*Pongamia pinnata*	20 -50	500–2,500
5.	Kamara	*Hardwikia binata*	25 -35	400 - 1000
6.	Bage	*Albezzia lebbek*	20 - 45	500 - 1000
7.	Ficus	*Ficus bengalensis*	20 - 50	500–2,500
8.	Sisso	*Dalbargia Sissoo*	20 - 50	500 -2000
9.	Ailanthus	*Ailanthus excelsa*	20 - 50	500 - 1000
10.	Hale	*Wrightia tinctoria*	25 - 45	500 - 1000
11.	Uded	*Steriospermum chelanoides*	25 - 45	500 -2000
12.	Dhupa	*Boswella Serrata*	20 - 40	500 - 2000
13.	Nelli	*Emblica Officinalis*	20 - 50	500 -1500
14.	Honne	*Pterocarpus marsupium*	20 - 40	500 - 2000

Moist Deciduous Species			Temp (°C)	Rainfall (mm)
15.	Teak	*Tectona grandis*	20 - 50	500-5000
16.	Nandi	*Legarstroemia lanceolata*	20 - 40	500 - 4000
17.	Honne	*Pterocarpus marsupium*	20 - 40	500 - 3000
18.	Mathi	*Terminalia alata*	20 -50	500 - 2000
19.	Shivane	*Gmelina arboria*	20 -50	500 -2000
20.	Kindal	*T.Paniculata*	20 - 40	500 - 1500
21.	Beete	*Dalbargia latifolia*	20 - 40	500 - 1500
22.	Tare	*T. belerica*	20 - 40	500 - 2000
23.	Bamboo	*Bambusa arundinasia*	20 - 40	500 - 2500
24.	Bamboo	*Dendrocalamus strictus*	20 – 40	500 – 2500
25.	Muthuga	*Butea monosperma*	20 - 40	400 - 1500
26.	Hippe	*Madhuca latifolia*	20 - 40	500 - 2000
27.	Sandal	*Santalum album*	20 - 50	400 - 1000
28.	Nelli	*Emblica officinalis*	20 - 40	500 - 2000
29.	Nerale	*Sizyzium cumini*	20 - 40	500 - 2000
30.	Dhaman	*Grevia tilifolia*	20 - 40	500 - 2000
31.	Kaval	*Careya arborea*	20 - 40	500 - 2000
32.	Harada	*Terminalia chebula*	20 - 40	500 - 2000

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Appendix I

Devarahalli Microwatershed

Soil Phase Information

Village	Survey No.	Area (ha)	Land MU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Devarahalli	1	2.14	Others	Others	Others	Others	Others	Others	Others	Sorghum (Sg)	Not Available	Others	Others
Devarahalli	2	2.23	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIs	TCB
Devarahalli	3	0.73	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Devarahalli	4	1.8	LMU-5	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Farm pond	IIs	TCB
Devarahalli	5	2.54	LMU-5	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIs	TCB
Devarahalli	6	2.4	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Banana+Coconut (Ba+CN)	Not Available	IIs	TCB
Devarahalli	7	1.67	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Devarahalli	8	3.28	LMU-4	Moderately deep (75-100 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Banana (Ba)	1 Bore well	IIs	Bunding/ Strengthening of exiting bunds
Devarahalli	9	1.28	LMU-4	Moderately deep (75-100 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Fieldbean (Fb)	Not Available	IIs	Bunding/ Strengthening of exiting bunds
Devarahalli	10	1.11	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Devarahalli	11	1.42	Others	Others	Others	Others	Others	Others	Others	Fieldbean (Fb)	Not Available	Others	Others
Devarahalli	12	1.39	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	Not Available	IIs	TCB
Devarahalli	13	0.27	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Devarahalli	14	1.57	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	Not Available	IIs	TCB
Devarahalli	15	2.28	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	TCB
Devarahalli	16	1.99	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	TCB
Devarahalli	17	1.52	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIw	TCB
Devarahalli	18	1.71	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Banana (Ba)	1 Bore well	IIw	TCB
Devarahalli	19	2.12	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	20	1.6	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB

Village	Survey No.	Area (ha)	Land MU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Devarahalli	21	2.35	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	22	2.33	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Farm pond,2 Bore well	IIw	TCB
Devarahalli	23	3.23	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIw	TCB
Devarahalli	24	0.88	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Devarahalli	25	1.71	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	26	2.1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	27	0.62	Others	Others	Others	Others	Others	Others	Others	Horsegram (Hg)	Not Available	Others	Others
Devarahalli	28	0.17	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	29	0.43	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	30	0.7	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	31	11.47	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Scrub land (Sl)	Not Available	IIw	TCB
Devarahalli	32	3.32	LMU-1	Very deep (>150 cm)	Clay	Gravelly (15-35%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIw	TCB
Devarahalli	33	1.55	LMU-1	Very deep (>150 cm)	Clay	Gravelly (15-35%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIw	TCB
Devarahalli	34	2.21	LMU-1	Very deep (>150 cm)	Clay	Gravelly (15-35%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIw	TCB
Devarahalli	35	1.84	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	36	1.78	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	1 Bore well	IIw	TCB
Devarahalli	37	2.99	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	1 Bore well	IIIs	TCB
Devarahalli	38	0.72	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	39	1.4	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	40	1.5	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIw	TCB
Devarahalli	55	1.69	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	56	1.94	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB

Village	Survey No.	Area (ha)	Land MU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Devarahalli	58	2.28	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	Not Available	IIIs	TCB
Devarahalli	59	2.76	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Bore well	IIIs	TCB
Devarahalli	60	1.24	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Scrub land (Sl)	1 Bore well	IIw	TCB
Devarahalli	61	0.24	Others	Others	Others	Others	Others	Others	Others	NA	Not Available	Others	Others
Devarahalli	62	3.2	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Farm pond	IIs	TCB
Devarahalli	63	3.55	LMU-4	Moderately deep (75-100 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Nearly level (0-1%)	Slight	Turmeric (Tu)	1 Bore well	IIs	Bunding/ Strengthening of exiting bunds
Devarahalli	64	1.03	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Bore well	IIs	TCB
Devarahalli	65	1.72	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	66	2.52	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	67	2.18	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	68	1.95	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	69	1.86	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Devarahalli	70	1.78	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	71	0.26	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	72	1.97	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	73	2.14	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	74	1.64	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Bore well,1 Farm pond	IIs	TCB
Devarahalli	75	2.24	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram+Redgram (Hg+Rg)	Not Available	IIs	TCB
Devarahalli	76	20.31	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram+Redgram (Hg+Rg)	Not Available	IIs	TCB
Devarahalli	77	2.27	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Devarahalli	78	2.21	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB

Village	Survey No.	Area (ha)	Land MU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Devarahalli	79	2.4	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Devarahalli	80	1.48	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Devarahalli	81	2.02	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	82	2.03	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	83	1.07	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Devarahalli	84	2.82	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	85	1.17	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Devarahalli	86	0.8	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIs	TCB
Devarahalli	87	1.64	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Devarahalli	88	1.35	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Devarahalli	89	1.8	Others	Others	Others	Others	Others	Others	Others	Redgram (Rg)	Not Available	Others	Others
Devarahalli	90	2.3	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Banana (Ba)	1 Bore well	IIs	TCB
Devarahalli	91	2.38	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	92	3.4	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	1 Bore well	IIs	TCB
Devarahalli	93	1.16	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower (Sf)	1 Bore well	IIs	TCB
Devarahalli	94	2.03	LMU-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	Not Available	IIs	TCB
Devarahalli	95	3.28	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Banana+Tomato (Ba+Tm)	1 Bore well not working,1 Bore well	IIs	TCB
Devarahalli	96	2.57	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Devarahalli	97	2.64	LMU-1	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Very High (>200 mm/m)	Nearly level (0-1%)	Slight	Sorghum (Sg)	1 Bore well	IIw	Bunding/ Strengthening of exiting bunds
Devarahalli	98	3.66	LMU-1	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Very High (>200 mm/m)	Nearly level (0-1%)	Slight	Horsegram+Sorghum (Hg+Sg)	Not Available	IIw	Bunding/ Strengthening of exiting bunds
Devarahalli	99	1.58	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB

Village	Survey No.	Area (ha)	Land MU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Devarahalli	100	1.94	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Tomato (Tm)	2 Bore well	IIs	TCB
Devarahalli	101	2.88	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Tomato (Tm)	Not Available	IIs	TCB
Devarahalli	102	2.41	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Bore well	IIs	TCB
Devarahalli	103	2.58	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Bore well	IIIs	TCB
Devarahalli	106	2.3	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	107	3.12	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Tomato (Tm)	2 Bore well	IIIs	TCB
Devarahalli	108	2.64	LMU-6	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	109	0.63	LMU-6	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	110	2.97	LMU-6	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIIs	TCB
Devarahalli	111	1.46	LMU-6	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIIs	TCB
Devarahalli	112	3.05	LMU-6	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIIs	TCB
Devarahalli	113	2.86	LMU-6	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIIs	TCB
Devarahalli	114	0.84	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	115	1.41	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	116	3.26	LMU-6	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	117	2.39	LMU-1	Very deep (>150 cm)	Clay	Gravelly (15-35%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIw	TCB
Devarahalli	118	2.77	LMU-6	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIIs	TCB

Village	Survey No.	Area (ha)	Land MU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Devarahalli	119	0.5	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIIs	TCB
Devarahalli	120	2.01	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIIs	TCB
Devarahalli	121	0.27	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Devarahalli	122	0.57	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIIs	TCB
Devarahalli	123	1.4	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIIs	TCB
Devarahalli	124	2.12	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Devarahalli	125	1.45	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIs	TCB
Devarahalli	126	3.41	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Devarahalli	127	3.45	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	1 Farm pond,1 Bore well	IIs	TCB
Devarahalli	128	2.06	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	2 Bore well	IIw	TCB
Devarahalli	129	3.44	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	Not Available	IIw	TCB
Hangala	101	26.82	LMU-6	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram+Feildbean (Hg+Fb)	Not Available	IIIs	TCB
Hangala	145	2.27	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hangala	147	1.41	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hangala	148	1.8	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hangala	149	1.12	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hangala	151	1.75	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Farm pond	IIIs	TCB
Hangala	152	1.63	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Banana (Ba)	Not Available	IIIs	TCB
Hangala	153	2.08	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB

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Hangala	154	2.73	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hangala	155	3.33	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hangala	156	2.36	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hangala	157	1.84	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hangala	158	2.81	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hangala	159	3.19	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Coconut (CN)	Not Available	IIIes	TCB
Hangala	160	1.42	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hangala	161	13.38	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Horsegram+Redgram (Hg+Rg)	Not Available	IIIes	TCB
Hangala	185	1.37	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIs	TCB
Hangala	186	2.21	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	1 Bore well	IIs	TCB
Hangala	187	1.87	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIs	TCB
Hangala	188	1.41	LMU-1	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Very High (>200 mm/m)	Nearly level (0-1%)	Slight	Sorghum (Sg)	Not Available	IIw	Bunding/ Strengthening of exiting bunds
Honnegowdanahalli	100	3.53	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Honnegowdanahalli	101	1.83	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Banana (Ba)	1 Bore well	IVes	TCB
Honnegowdanahalli	102	2.61	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IVes	TCB
Honnegowdanahalli	103	2.05	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IVes	TCB
Honnegowdanahalli	104	1.96	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Sorghum (Sg)	Not Available	IIIes	TCB

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Honnegowdanahalli	105	2.58	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Sorghum (Sg)	1 Farm pond,1 Bore well	IIIes	TCB
Honnegowdanahalli	106	1.62	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Fieldbean (Fb)	Not Available	IVes	TCB
Honnegowdanahalli	107	1.4	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IVes	TCB
Honnegowdanahalli	108	3.86	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Honnegowdanahalli	109	6.63	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IVes	TCB
Honnegowdanahalli	110	2.2	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	1 Bore well	IVes	TCB
Honnegowdanahalli	111	1.64	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	1 Bore well	IVes	TCB
Honnegowdanahalli	122	1.69	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IVes	TCB
Honnegowdanahalli	124	2.61	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram+Redgram (Hg+Rg)	Not Available	IIIes	TCB
Honnegowdanahalli	125	2.56	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Turmeric (Tu)	2 Bore well	IIIes	TCB
Honnegowdanahalli	127	1.81	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Sorghum (Sg)	Not Available	IVes	TCB
Honnegowdanahalli	129	2.72	LMU-7	Shallow (25-50 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Turmeric (Tu)	Not Available	IVes	TCB
Honnegowdanahalli	137	1.87	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Honnegowdanahalli	149	0.64	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	NA	Not Available	IIIes	TCB
Hungaladha Hosahalli	8	1	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Hungaladha Hosahalli	8_TANK	2.47	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Hungaladha Hosahalli	9	1.78	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIw	TCB
Hungaladha Hosahalli	10	2.45	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIw	TCB
Hungaladha Hosahalli	11	1.74	LMU-1	Very deep (>150 cm)	Clay	Gravelly (15-35%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIw	TCB
Hungaladha Hosahalli	12	1.49	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIIs	TCB

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Hungaladha Hosahalli	13	2.18	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	14	1.55	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIIs	TCB
Hungaladha Hosahalli	15	1.74	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	16	2.4	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram+Coconut (Hg+CN)	Not Available	IIIs	TCB
Hungaladha Hosahalli	17	1.35	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Bore well	IIIs	TCB
Hungaladha Hosahalli	18	1.87	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIIs	TCB
Hungaladha Hosahalli	19	1.76	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIIs	TCB
Hungaladha Hosahalli	20	2.69	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	21	2.22	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	22	2.07	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	23	1.98	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well not working	IIIs	TCB
Hungaladha Hosahalli	24	2.02	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	25	2.12	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	26	1.76	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	27	1.9	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum+Coconut (Sg+CN)	Not Available	IIIs	TCB
Hungaladha Hosahalli	28	2.65	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	1 Bore well	IIIs	TCB
Hungaladha Hosahalli	29	2.82	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	30	2	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIIs	TCB
Hungaladha Hosahalli	31	2.13	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Potato (Po)	1 Bore well	IIIs	TCB

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Hungaladha Hosahalli	32	1.59	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	33	1.24	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	34	1.61	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	35	1.73	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIs	TCB
Hungaladha Hosahalli	36	1.52	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	37	2.57	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	38	3.53	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut (Ar)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	39	2.14	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum+Fieldbean (Sg+Fb)	Not Available	IIIs	TCB
Hungaladha Hosahalli	40	1.51	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	41	1.47	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	Not Available	IIs	TCB
Hungaladha Hosahalli	42	2.03	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	43	2.37	LMU-4	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	44	1.46	LMU-4	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	45	0.81	LMU-4	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	46	0.68	LMU-4	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	48	1.36	LMU-5	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric (Tu)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	57	2.82	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IIIes	TCB

Village	Survey No.	Area (ha)	Land MU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Hungaladha Hosahalli	83	2.38	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	84	2.44	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	86	2.55	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Turmeric+Horsegram (Tu+Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	87	1.5	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	88	2.69	LMU-2	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very High (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	TCB
Hungaladha Hosahalli	89	2.13	LMU-5	Moderately shallow (50-75 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Gently sloping (3-5%)	Moderate	Mango (Mn)	Not Available	IIes	TCB
Hungaladha Hosahalli	90	2.43	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	TCB
Hungaladha Hosahalli	91	3.69	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	1 Bore well	IIs	TCB
Hungaladha Hosahalli	92	4.16	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram+Feildbean (Hg+Fb)	Not Available	IIs	TCB
Hungaladha Hosahalli	95	1.38	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sorghum (Sg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	96	3.25	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fieldbean (Fb)	Not Available	IIs	TCB
Hungaladha Hosahalli	97	3.06	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	104	1.29	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	105	3.78	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	106	2.24	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIIs	TCB
Hungaladha Hosahalli	107	3.92	LMU-4	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	108	0.24	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IIIes	TCB
Hungaladha Hosahalli	109	0.52	LMU-4	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Hungaladha Hosahalli	120	0.47	LMU-4	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Horsegram (Hg)	Not Available	IIs	TCB
Putthanapura	103	2.24	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IIIes	TCB
Putthanapura	104	2.85	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Sorghum (Sg)	2 Bore well	IIIes	TCB
Putthanapura	105	1.73	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Brinjal (Br)	1 Bore well	IIIes	TCB

Village	Survey No.	Area (ha)	Land MU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Putthanapura	106	2.18	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Brinjal (Br)	Not Available	IIIes	TCB
Putthanapura	107	2.15	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Beans (Be)	2 Bore well	IIIes	TCB
Putthanapura	108	0.65	LMU-4	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIs	TCB
Putthanapura	109	3.14	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Horsegram (Hg)	Not Available	IIIes	TCB
Putthanapura	110	1.84	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IIIes	TCB
Putthanapura	111	1.2	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	1 Bore well	IIIes	TCB
Putthanapura	112	62.26	LMU-8	Shallow (25-50 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very Strongly sloping (15-25%)	Severe	Horsegram (Hg)	1 Bore well	VIes	Terracing
Putthanapura	205	2.71	LMU-4	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Horsegram (Hg)	Not Available	IIIes	TCB
Putthanapura	208	4.15	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Sorghum (Sg)	Not Available	IIIes	TCB
Putthanapura	209	1.76	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Horsegram (Hg)	Not Available	IIIes	TCB
Putthanapura	217	1.33	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Sorghum (Sg)	Not Available	IIIes	TCB

Appendix II

Devarahalli Microwatershed

Soil Fertility Information

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Devarahalli	1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	3	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	4	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	5	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	6	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	7	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	8	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 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)
Devarahalli	9	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	10	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	11	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	12	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	13	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	14	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	15	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	16	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	17	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	18	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	19	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	20	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	21	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	22	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	23	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Devarahalli	24	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	25	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	26	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	27	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	28	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	29	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	30	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	31	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	32	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	33	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	34	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	35	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	36	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	37	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	38	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	39	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	40	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	55	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	56	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	58	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	59	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	60	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	61	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	62	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	63	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Devarahalli	64	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	65	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	66	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	67	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	68	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	69	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	70	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	71	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	72	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	73	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	74	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	75	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	76	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	77	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	78	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 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)
Devarahalli	79	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 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)
Devarahalli	80	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 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)
Devarahalli	81	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 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)
Devarahalli	82	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	83	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	84	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	85	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	86	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	87	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Devarahalli	88	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	89	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	90	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	91	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	92	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	93	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	94	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	95	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	96	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	97	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	98	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	99	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	100	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	101	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	102	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 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)
Devarahalli	103	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 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)
Devarahalli	106	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 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)
Devarahalli	107	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 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)
Devarahalli	108	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	109	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	110	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)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	111	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	112	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	113	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Devarahalli	114	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	115	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	116	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	117	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	118	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Devarahalli	119	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	120	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	121	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	122	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	123	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	124	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	125	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	126	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	127	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	128	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Devarahalli	129	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hangala	101	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	145	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	147	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	148	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	149	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	151	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 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)
Hangala	152	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)
Hangala	153	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hangala	154	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)
Hangala	155	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)
Hangala	156	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)
Hangala	157	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)
Hangala	158	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)
Hangala	159	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	160	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)
Hangala	161	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	185	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (<0.5 %)	High (>57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	186	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	187	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hangala	188	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	100	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Honnegowdanahalli	101	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	102	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	103	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	104	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	105	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	106	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	107	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	108	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	109	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	110	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	111	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Honnegowdanahalli	122	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	124	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	125	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	127	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	129	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	137	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honnegowdanahalli	149	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	8	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	8_TANK	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hungaladha Hosahalli	9	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	10	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	11	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	12	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	13	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	14	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	15	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	16	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	17	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	18	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	19	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hungaladha Hosahalli	20	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	21	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	22	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	23	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hungaladha Hosahalli	24	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	25	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	26	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	27	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	29	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)
Hungaladha Hosahalli	30	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hungaladha Hosahalli	31	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hungaladha Hosahalli	32	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hungaladha Hosahalli	33	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	34	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	35	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	36	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	37	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 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)
Hungaladha Hosahalli	38	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hungaladha Hosahalli	39	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hungaladha Hosahalli	40	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	Low (< 145 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)
Hungaladha Hosahalli	41	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 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)
Hungaladha Hosahalli	42	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	Low (< 145 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)
Hungaladha Hosahalli	43	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	44	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	45	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	46	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	48	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hungaladha Hosahalli	57	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	83	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)
Hungaladha Hosahalli	84	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	86	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)
Hungaladha Hosahalli	87	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	88	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	89	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	90	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	91	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	92	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	95	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (>57 kg/ha)	Low (< 145 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)
Hungaladha Hosahalli	96	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	97	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 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)
Hungaladha Hosahalli	104	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	105	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	106	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Low (< 145 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)
Hungaladha Hosahalli	107	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	108	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	109	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hungaladha Hosahalli	120	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	103	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	104	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	105	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	106	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Putthanapura	107	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	108	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	109	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	110	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	111	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	112	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	205	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	208	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	209	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Putthanapura	217	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (< 10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Appendix III

Devarahalli Microwatershed

Soil Suitability Information

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Devarahalli	1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Devarahalli	2	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	3	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
Devarahalli	4	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	5	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	6	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	7	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	8	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	9	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	10	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	11	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
Devarahalli	12	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	13	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
Devarahalli	14	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	15	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	16	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	17	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	18	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	19	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	20	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	21	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Devarahalli	22	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	23	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	24	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
Devarahalli	25	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	26	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	27	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
Devarahalli	28	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	29	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	30	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	31	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	32	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	33	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	34	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	35	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	36	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	37	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	38	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	39	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	40	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	55	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	56	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	58	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	59	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	60	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Devarahalli	61	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
Devarahalli	62	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	63	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	64	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	65	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	66	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	67	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	68	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	69	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	70	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	71	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	72	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	73	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	74	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	75	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	76	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	77	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	78	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	79	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	80	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	81	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	82	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	83	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	84	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	85	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Devarahalli	86	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	87	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	88	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Devarahalli	89	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
Devarahalli	90	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1
Devarahalli	91	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1
Devarahalli	92	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1
Devarahalli	93	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1
Devarahalli	94	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1
Devarahalli	95	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	96	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	97	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3 wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2 wt	S2w	S2w	S3wt	S3wt	S3 wt	S2 wt
Devarahalli	98	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3 wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2 wt	S2w	S2w	S3wt	S3wt	S3 wt	S2 wt
Devarahalli	99	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	100	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	101	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	102	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	103	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	106	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	107	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	108	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	109	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	110	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	111	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	112	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Devarahalli	113	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	114	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Devarahalli	115	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Devarahalli	116	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	117	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	118	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	119	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	120	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	121	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
Devarahalli	122	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	123	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	124	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Devarahalli	125	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	126	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	127	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Devarahalli	128	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Devarahalli	129	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Hangala	101	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hangala	145	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hangala	147	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hangala	148	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hangala	149	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hangala	151	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hangala	152	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hangala	153	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Hangala	154	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr
Hangala	155	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr
Hangala	156	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr
Hangala	157	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr
Hangala	158	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr
Hangala	159	S3g	S3g	S2g	S3g	S2g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g
Hangala	160	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr
Hangala	161	S3g	S3g	S2g	S3g	S2g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g
Hangala	185	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hangala	186	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hangala	187	S2r	S2r	S3r	S2rt	S3r	S2r	S3r	Nr	S3r	S3r	S3r	S3r	S3r	S3r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hangala	188	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Honnegowdanahalli	100	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
Honnegowdanahalli	101	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	102	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	103	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	104	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Honnegowdanahalli	105	S3g	S3g	S2g	S3g	S3g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g
Honnegowdanahalli	106	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	107	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	108	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Honnegowdanahalli	109	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	110	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	111	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	122	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	124	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Honnegowdanahalli	125	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Honnegowdanahalli	127	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	129	S3r	S3r	Nr	S3r	Nr	S3r	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	Nrg	S3rg	S3rg	Nrg	S3rg	S3rg	S3r	Nr	S3rg	S3rg	S3rg	S3r	S3rg	S3r
Honnegowdanahalli	137	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Honnegowdanahalli	149	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	8	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	8_TANK	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
Hungaladha Hosahalli	9	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Hungaladha Hosahalli	10	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Hungaladha Hosahalli	11	S1	S3wt	S2w	S3wt	S2w	S2wt	S3wt	S3wt	S3wt	S3wt	S2wt	S2w	S2w	Nwt	S2w	S2w	S2wt	S2wt	S2wt	S1	S2wt	S2w	S2w	S3wt	S3wt	S3wt	S2wt
Hungaladha Hosahalli	12	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	13	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	14	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	15	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	16	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	17	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	18	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	19	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	20	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	21	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr
Hungaladha Hosahalli	22	S2gr	S2gr	S3gr	S2gr	S3gr	S2gr	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Hungaladha Hosahalli	23	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	24	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	25	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	26	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	27	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	28	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	29	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	30	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	31	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	32	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	33	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	34	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	35	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	36	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	37	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	38	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	39	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	40	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	41	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	42	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	43	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	44	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	45	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	46	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	48	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	57	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	83	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Hungaladha Hosahalli	84	S1	S1	S1	S2t	S2gt	S2g	S1	S2r	S1	S1	S2r	S1	S1	S1	S1	S1	S2r	S1	S2g	S2t	S2g	S1	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	86	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	87	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	88	S2t	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S3t	S1	S1	S1	S1	S1	S1	S1
Hungaladha Hosahalli	89	S2r	S2r	S2r	S2r	S3r	S2r	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S2r
Hungaladha Hosahalli	90	S1	S1	S1	S1	S2gt	S2g	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S1	S2g	S2t	S2g	S1	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	91	S1	S1	S1	S1	S2gt	S2g	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S1	S2g	S2t	S2g	S1	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	92	S1	S1	S1	S2t	S2gt	S2g	S1	S2r	S1	S1	S2r	S1	S1	S1	S1	S1	S2r	S1	S2g	S2t	S2g	S1	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	95	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	96	S1	S1	S1	S2t	S2gt	S2g	S1	S2r	S1	S1	S2r	S1	S1	S1	S1	S1	S2r	S1	S2g	S2t	S2g	S1	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	97	S1	S1	S1	S2t	S2gt	S2g	S1	S2r	S1	S1	S2r	S1	S1	S1	S1	S1	S2r	S1	S2g	S2t	S2g	S1	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	104	S1	S1	S1	S2t	S2gt	S2g	S1	S2r	S1	S1	S2r	S1	S1	S1	S1	S1	S2r	S1	S2g	S2t	S2g	S1	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	105	S1	S1	S1	S2t	S2gt	S2g	S1	S2r	S1	S1	S2r	S1	S1	S1	S1	S1	S2r	S1	S2g	S2t	S2g	S1	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	106	S2g	S2g	S2g	S2g	S3g	S2g	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2gr	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Hungaladha Hosahalli	107	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	108	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	109	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Hungaladha Hosahalli	120	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Putthanapura	103	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Putthanapura	104	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Putthanapura	105	S3g	S3g	S2g	S3g	S3g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g
Putthanapura	106	S3g	S3g	S2g	S3g	S3g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g
Putthanapura	107	S3g	S3g	S2g	S3g	S3g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g
Putthanapura	108	S3g	S2g	S2g	S3g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S2g	S2g	S3g	S3g	S3g	S3g
Putthanapura	109	S3g	S3g	S2g	S3g	S3g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g

Village	Survey No.	Sorgham	Maize	Groundnut	Sunflower	Cotton	Onion	Guava	Mango	Sapota	Jackfruit	Jamun	Musambi	Lime	Cashew	Custard-apple	Amla	Tamarind	Marigold	Chrysanthemum	Redgram	Banana	Horsegram	Field-bean	Turmeric	Beetroot	Potato	Beans
Putthanapura	110	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Putthanapura	111	S3g	S3g	S2g	S3g	S3gr	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Putthanapura	112	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl	Ngl
Putthanapura	205	S3g	S3g	S2g	S2g	S3g	S3g	S2gr	S3gr	S2gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S2gr	S3gr	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g
Putthanapura	208	S3g	S3g	S2g	S3g	S3g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g
Putthanapura	209	S3g	S3g	S2g	S3g	S3g	S2g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S2g	S2g	S3rg	S3g	S2g	S2g	S2g	S2g	S2g	S2g
Putthanapura	217	S3g	S3g	S3g	S3gr	S3g	S3g	S3gr	Nrg	S3gr	S3gr	S3gr	S3gr	S3gr	S3gr	S2gr	S2gr	S3gr	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

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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: *Devarahalli micro-watershed (Basavapur sub-watershed, Gundlupet taluk, Chamarajanagar district) is located in between $11^0 43'$ – $11^0 45'$ North latitudes and $76^0 36'$ – $76^0 39'$ East longitudes, covering an area of about 550 ha. The micro-watershed is bounded by Puttanapur, Honnegaudanahalli, Hangala and Hosahalli villages, with length of growing period (LGP) of 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 for each watershed.*

Results: *The socio-economic outputs for the Devarahalli micro-watershed (Basavapur sub-watershed, Gundlupet taluk, Chamarajanagar district) are presented here.*

Social Indicators

- *Male and female ratio is 51.1 to 48.9 per cent to the total sample population.*
- *Younger age 18 to 50 years group of population is around 53.2 per cent to the total population.*
- *Literacy population is around 97.9 per cent.*
- *Social groups belong to other backward caste (OBC) is around 88.9 per cent.*
- *Wood is the source of energy for a cooking among 77.8 per cent.*
- *About 66.7 per cent of households have a yashaswini health card.*
- *Around (11.1 %) farm households are having MGNREGA card for rural employments.*
- *Dependence on ration cards for food grains through public distribution system is around 95.2 per cent.*
- *Swach bharath program providing closed toilet facilities among all the sample households.*

Economic Indicators

- *The average land holding is 0.85 ha indicates that majority of farm households are belong to marginal and small farmers. The dry land account for 73.3 % and irrigated land is 26.7 % of total cultivated land of the sample farmers.*
- *Agriculture is the main occupation among 31.9 per cent and agriculture is the main and non agriculture labour is subsidiary occupation for 38.3 per cent of sample households.*

- *The average value of domestic assets is around Rs.14769 per household. Mobile and television are popular mass media communication.*
- *The average value of farm assets is around Rs.10265 per household, about 33.3 per cent of sample farmers own plough and sprayer (38.1 %).*
- *The average value of livestock is around Rs.32500 per household; about 50 per cent of household are having livestock.*
- *The average per capita food consumption is around 626.3 grams (1292.8 kilo calories) against national institute of nutrition (NIN) recommendation at 827 gram. Around 88.8 per cent of sample households are consuming less than the NIN recommendation.*
- *The annual average income is around Rs. 52769 per household. About 33.3 per cent of farm households are below poverty line.*
- *The per capita monthly average expenditure is around Rs.1046.*

Environmental Indicators-Ecosystem Service

- *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.710 per ha/year. The total cost of annual soil nutrients is around Rs. 352025 per year for the total area of 614.4 ha.*
- *The average value of ecosystem service for food grain production is around Rs. 31227/ha/year. Per hectare food grain production services is maximum in turmeric (Rs. 134323) followed by maize (Rs. 21552), ragi (Rs. 13774), red gram (Rs. 13099), sorghum (Rs. 2365) and horse gram (Rs. 2248).*
- *The average value of ecosystem service for fodder production is around Rs. 5946/ ha/year. Per hectare fodder production services is maximum in maize (Rs. 2470) followed by ragi (Rs. 1846), horse gram (Rs. 1482) and sorghum (Rs. 792).*
- *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 red gram (Rs. 47740) followed by turmeric (Rs. 36177), maize (Rs. 27165), sorghum (Rs. 24130), horse gram (Rs. 19007) and ragi (Rs. 16891).*

Economic Land Evaluation

- *The major cropping pattern is turmeric (26.8 %) followed by ragi (22.8 %), red gram (17.9 %), sorghum (16.6 %), maize (10.6 %) and horse gram (5.31 %).*
- *In Devarahalli micro-watershed, major soil is Hindupur (HDR) series having shallow deep cover around 27.79 % of area. On this soil farmers are presently growing maize (37.2 %) and red gram (62.8 %). Magoonahalli (MGH) soil series are having moderately shallow soil depth cover around 27.79 per cent of area the crops are horse gram (47.6 %) and ragi (52.4%), Kannigala (KNG) are having*

moderately shallow soil depth cover around 19.48 per cent the crops are ragi (39.1 %) and sorghum (60.9%). Beemanabeedu (BMB) and Honnegaudanahalli (HGH) soil series are very deep soil depth the cover around 11.41 % and 2.13 %, respectively, the crops are grown of ragi and turmeric.

- *The total cost of cultivation and benefit cost ratio (BCR) in study area for turmeric ranges between Rs. 103954/ha in BMB soil (with BCR of 3.26) and Rs. 42228/ha in HGH soil (with BCR of 2.56).*
- *In ragi the cost of cultivation range between Rs 32574/ha in BMB soil (with of 1.17) and Rs. 18236/ha in NSP soil (with BCR of 2.68).*
- *In horse gram the cost of cultivation is Rs. 31715/ha in MGH soil (with BCR of 1.12).*
- *In maize the cost of cultivation is Rs. 27354/ha in HDR soil (with BCR of 1.88).*
- *In red gram the cost of cultivation is Rs 17593/ha in HDR soil (with BCR of 1.74) and sorghum cost of cultivation is Rs. 13469/ha in KNG soil (with BCR of 1.23).*
- *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 livestock limiting application of FYM.*
- *It was observed soil quality influences on the type and intensity of land use. More fertilizer applications are deeper soils 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 maize (73.2 %), sorghum (71.8 %), ragi (52.8 to 55.8 %), horse gram (36.7 %), turmeric (0 to 36.7 %) and red gram (28.1 %).*

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 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 objectives 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 and socio-economic conditions. The project will be implemented over six years and linked with the centrally financed integrated watershed management programme.

Economic evaluations can better guide in watershed planning 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, 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

Devarahalli micro-watershed is located in Southern Dry Zone of Karnataka (Figure 1). It has a total geographical area of 1.56 M ha with 0.74 M ha under cultivation of which 0.22 M ha is irrigated. The mean elevation ranges from 450 to 900 m MSL; most part of the zone is situated at 800-900m. The major soils are red loams with pockets of black soils in Kollegal, Yalandur and T.N. Pura taluks of Mysore district. The average annual rainfall ranges from 670 to 890 mm, of which about 55 to 75 per cent is received during the kharif season. The major crops grown are rice, ragi, sugarcane, pulses and minor millets. It's represented Agro Ecological Sub Region (AESR) 8.2 having LGP 120-150 days.

Devarahalli micro-watershed (Basavapur sub-watershed, Gundlupet taluk, Chamarajanagar district) is located in between $11^0$43' – $11^0$45' North latitudes and $76^0$36' – $76^0$39' East longitudes, covering an area of about 550 ha. The micro-watershed is bounded by Puttanapur, Honnegaudanahalli, Hangala and Hosahalli 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:

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 survry. The data collected from the representative farm households were analysed using Automated Land Potential Evalution System (Figure 2).

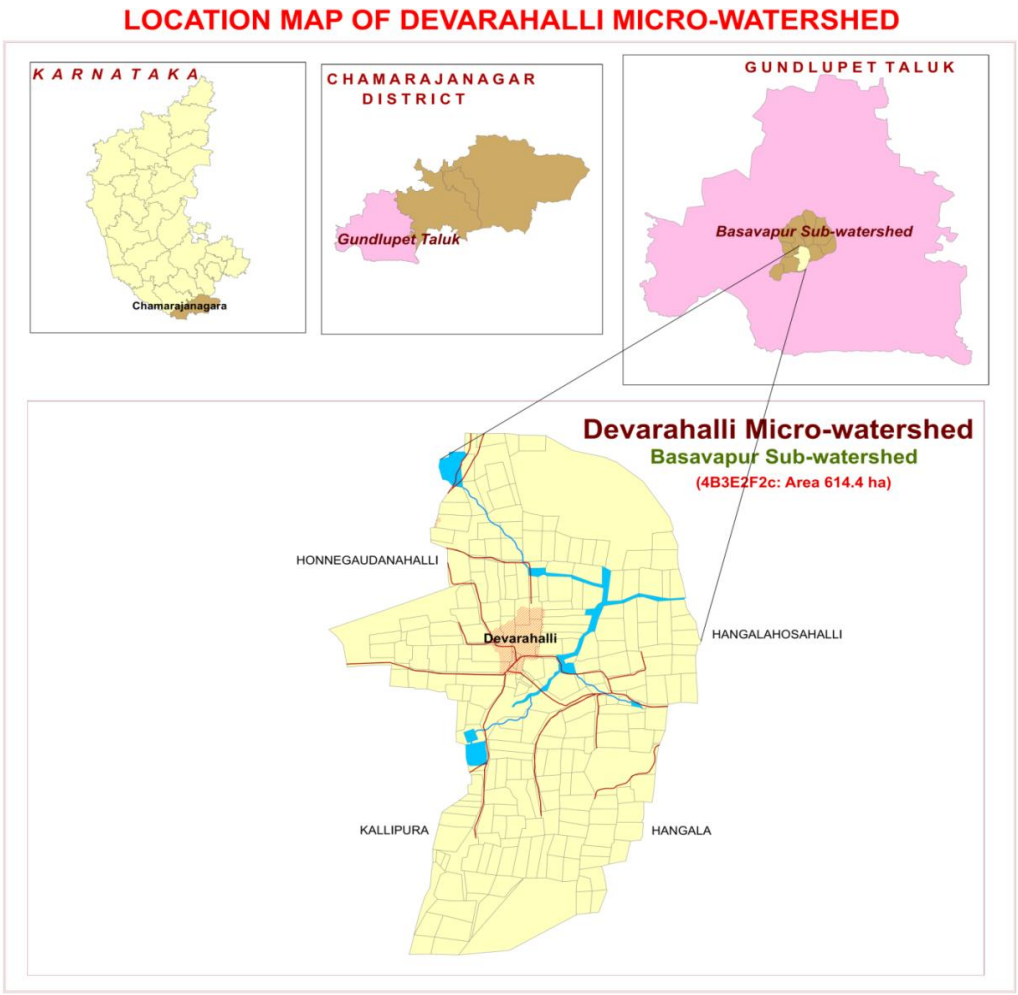
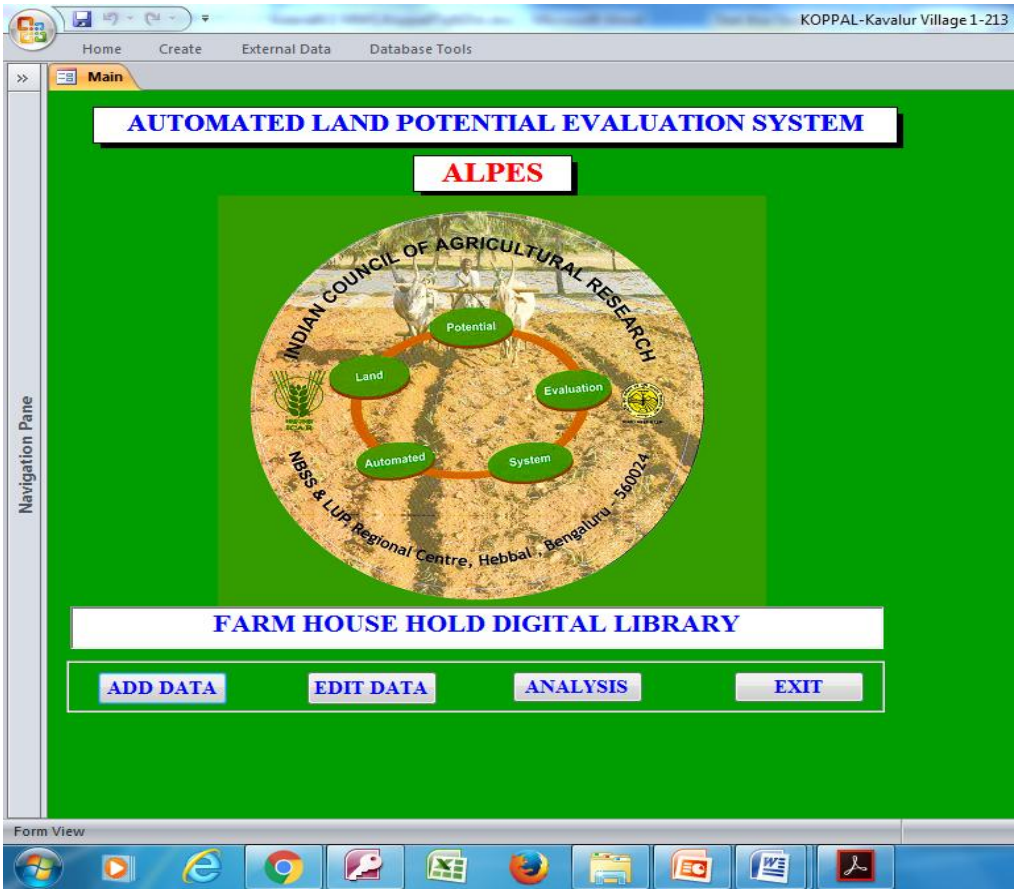


Figure 1: Location of study area

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 .



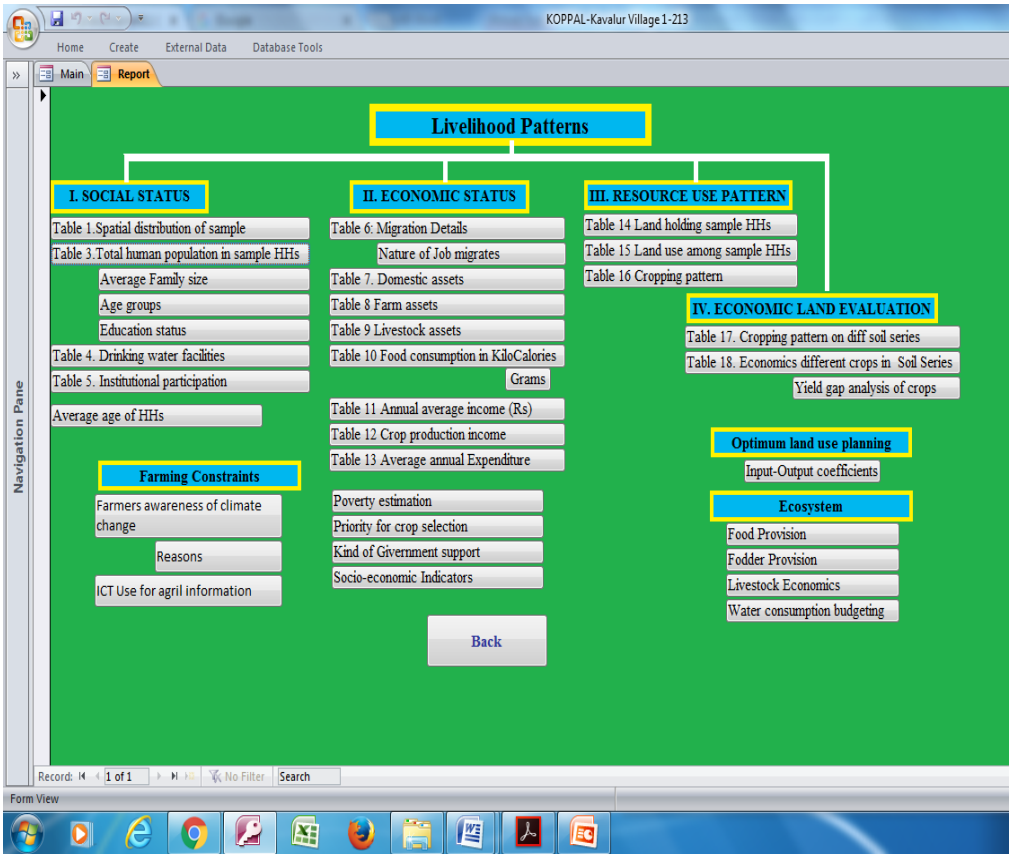


Figure 2: ALPES FRAMEWORK

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.

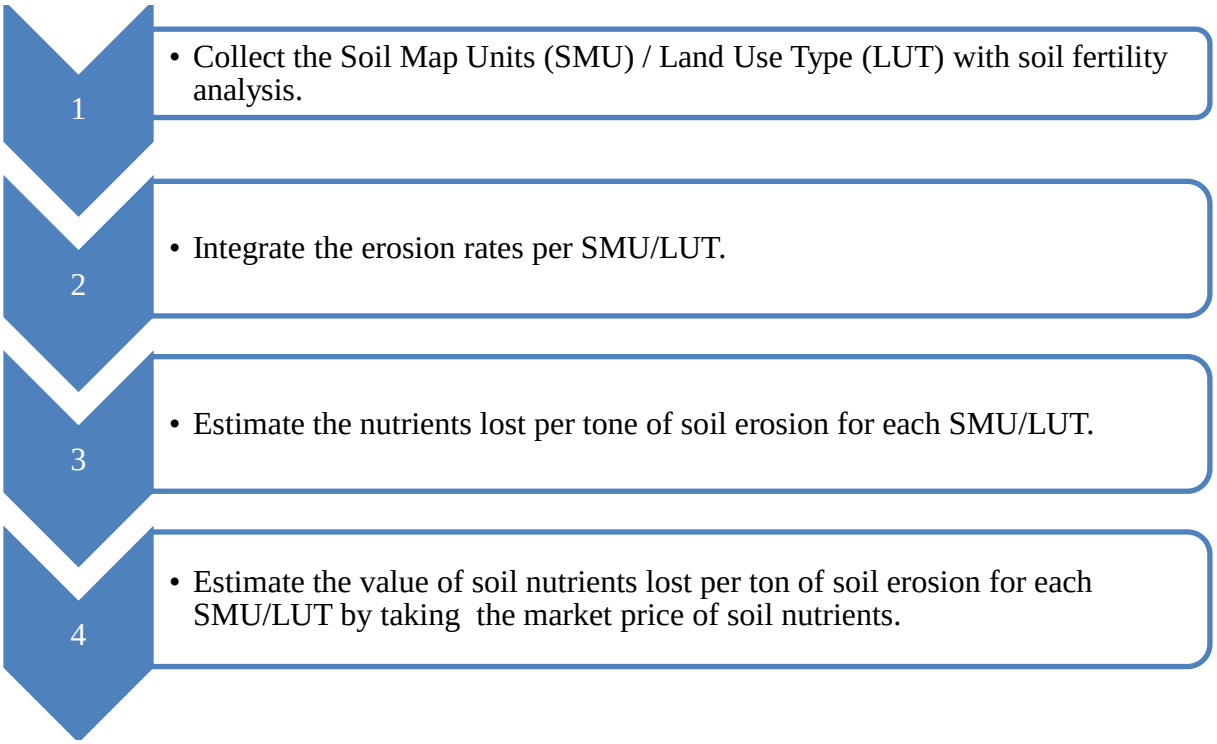
Benefit Cost Ratio = Net returns/Total cost.

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 47, out of which 51.1 per cent were males and 48.9 per cent females. Average family size of the households is 5.2. 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 (38.3 %) followed by more than 50 years (25.5%), 0 to18 years (21.3%) and 18 to 30 years (14.9 %). 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 2.1 per cent of respondents were illiterate and 97.9 per cent literate (Table 1).

Table 1: Human population among sample households in Devarahalli Microwatershed

Particulars	**Units**	**Value**
Total human population in sample HHs	Number	47.0
Male	% to total Population	51.1
Female	% to total Population	48.9
Average family size	Number	5.2
Age group		
0 to 18 years	% to total Population	21.3
18 to 30 years	% to total Population	14.9
30 to 50 years	% to total Population	38.3
>50 years	% to total Population	25.5
Average age	Age in years	41.0
Education Status		
Illiterates	% to total Population	2.1
Literates	% to total Population	97.9
Primary School (<5 class)	% to total Population	25.5
Middle School (6- 8 class)	% to total Population	19.1
High School (9- 10 class)	% to total Population	19.1
Others	% to total Population	34.0

The ethnic groups among the sample farm households found to be 88.9 per cent belonging to other backward castes (OBC) and 11.1 per cent belonging to general castes

(Table 2 and Figure 3). About 77.8 per cent of sample households are using fire wood as source of fuel for cooking. All the sample farmers are having electricity connection.

Table 2: Basic needs of sample households in Devarahalli Microwatershed

Particulars	Units	Value
Social groups		
OBC	% of Households	88.9
General	% of Households	11.1
Types of fuel use for cooking		
Fire wood	% of Households	77.8
Gas	% of Households	22.2
Energy supply for home		
Electricity	% of Households	100.0
Number of households having Health card		
Yes	% of Households	66.7
No	% of Households	33.3
MGNREGA Card		
Yes	% of Households	11.1
No	% of Households	88.9
Ration Card		
Yes	% of Households	95.2
No	% of Households	4.8
Households with toilet		
Yes	% of Households	100.0
No	% of Households	0
Drinking water facilities		
Tube Well	% of Households	88.8
Dug well	% of Households	11.1

About 66.7 per cent are sample households having health cards. Only (11.1 %) are having MNREGA job cards for employment generation. Among all farm households are having ration cards for taking food grains from public distribution system. Among all sample farm households are having toilet facilities.

The data collected on the source of drinking water in the study area is presented in Table 2. Majority of the sample respondents are having tube well source for water supply for domestic purpose (88.9 %) and 11.1 per cent was dug well.

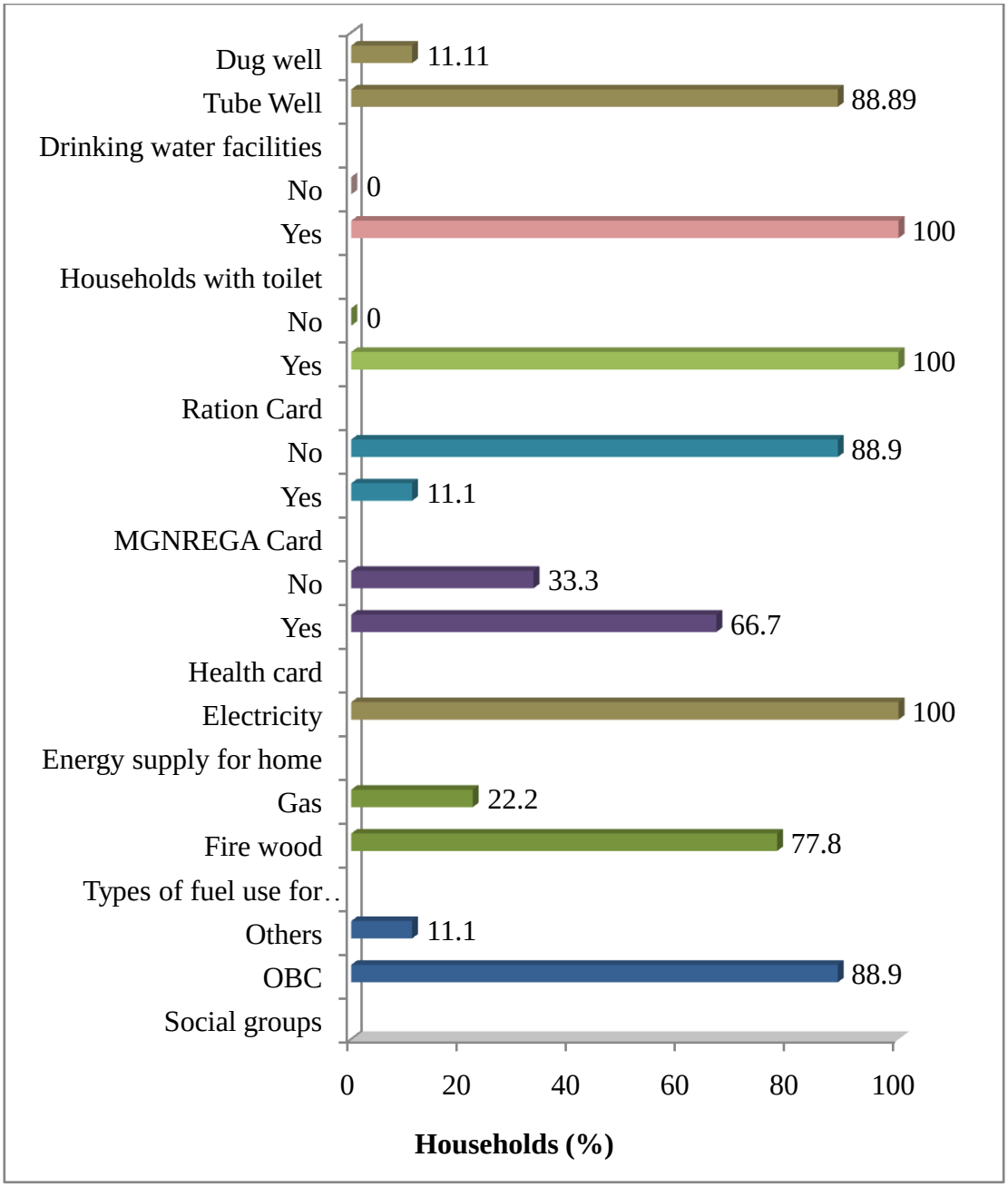


Figure 3: Basic needs of sample households in Devarahalli Microwatershed

Table 3: Occupational pattern in sample households in Devarahalli Microwatershed

Occupation		**% to total**
Main	**Subsidiary**	
Agriculture	Agriculture	31.9
	Agriculture labour	38.3
	Dairy farming	2.1
Studying		27.7
Family labour availability		**Man days/month**
Male		47.2
Female		28.8
Total		76.1

The occupational pattern (Table 3) among sample households shows that agriculture is the main occupation around 31.9 per cent of farmers followed by agriculture is the main occupation and subsidiary occupations like agricultural labour (38.3 %) and dairy farming (2.1 %).

The important assets especially with reference to domestic assets were analyzed and are given in Table 4 and Figure 4. The important domestic assets possessed by all categories of farmers are television (100 %) followed mobile phones (88.9 %), mixer/grinder (66.7 %), and motorcycle (55.6 %). The average value of domestic assets is around Rs 14769 per households.

Table 4: Domestic assets among the sample households in Devarahalli Microwatershed

Particulars	% of households	Average value in Rs
Mixer/grinder	66.7	3500
Mobile Phone	88.9	3688
Motorcycle	55.6	45000
Television	100.0	6889
Average value	14769	

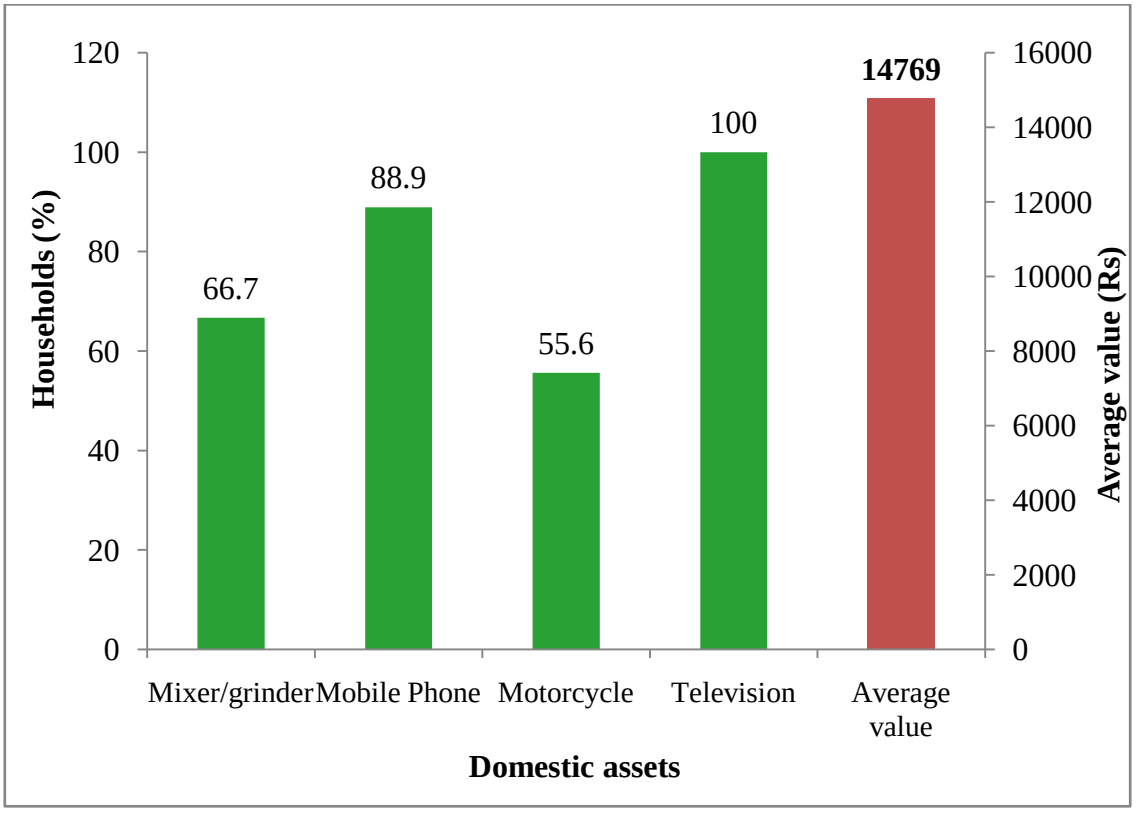


Figure 4: Domestic assets among the sample households in Devarahalli Microwatershed

The most popularly owned farm equipments were sickles, plough, cattle shed; pump sets, chaff cutter, bullock cart, sprayer and thresher. Plough and sickle were

commonly present in all the sampled farmers; these were primary implements in agriculture. The per cent of households owned weeder (55.6%), plough (33.3 %), bullock cart (33.3 %) and sprayer (33.3) was found highest among the sample farmers. The average value of farm assets is around Rs 10265 per households (Table 5 and Figure 5).

Table 5: Farm assets among samples households in Devarahalli Microwatershed

Particulars	% of households	Average value in Rs
Bullock cart	33.3	19333
Plough	33.3	16000
Sprayer	33.3	4667
Weeder	55.6	1060
Average value	10265	

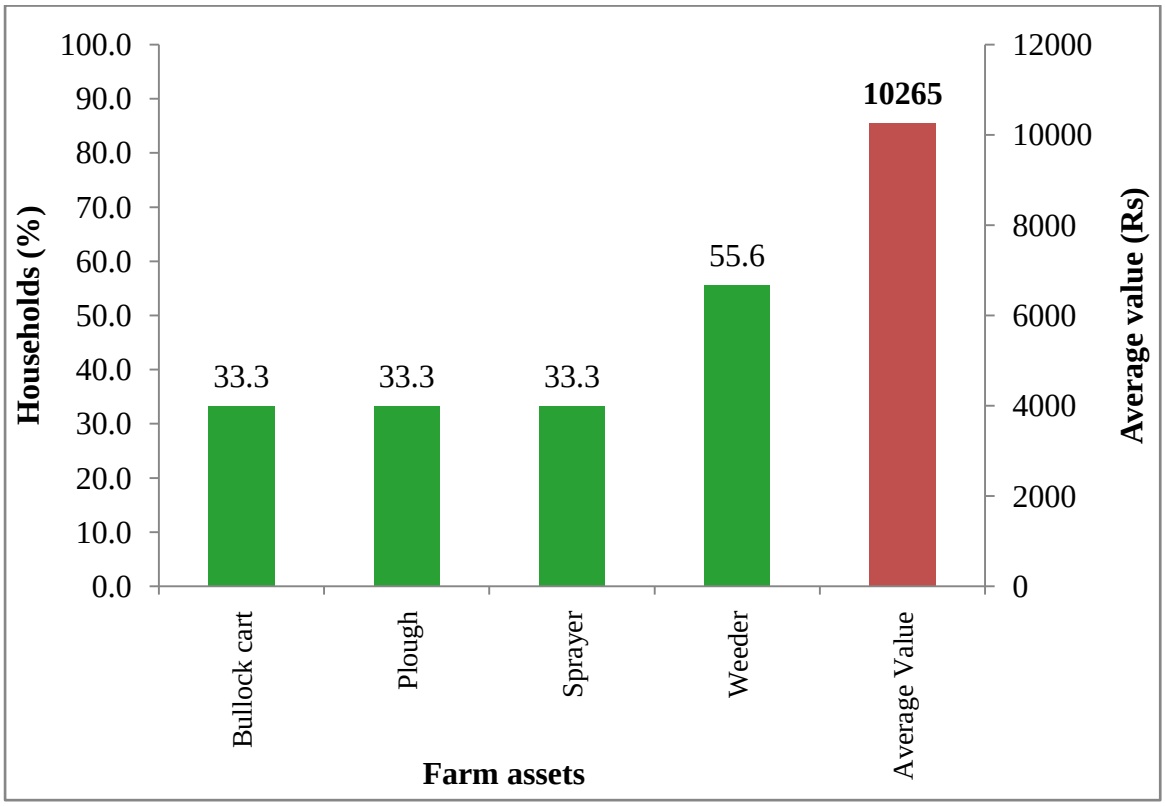


Figure5: Farm assets among samples households in Devarahalli Microwatershed

Table 6: Livestock assets among sample households in Devarahalli micro-watershed

Particulars	% of livestock population	Average value in Rs
Crossbred Dry Cow	40.0	22500
Crossbred Milching Cow	40.0	30000
Bullocks	20.0	45000
Average value	32500	

Livestock is an integral component of the conventional farming systems (Table 6 and Figure 6). The highest livestock population is crossbred dry cow were around 40 per cent followed by crossbred milching cow (40 %) and bullocks (20 %). The average livestock value was Rs 32500 per household.

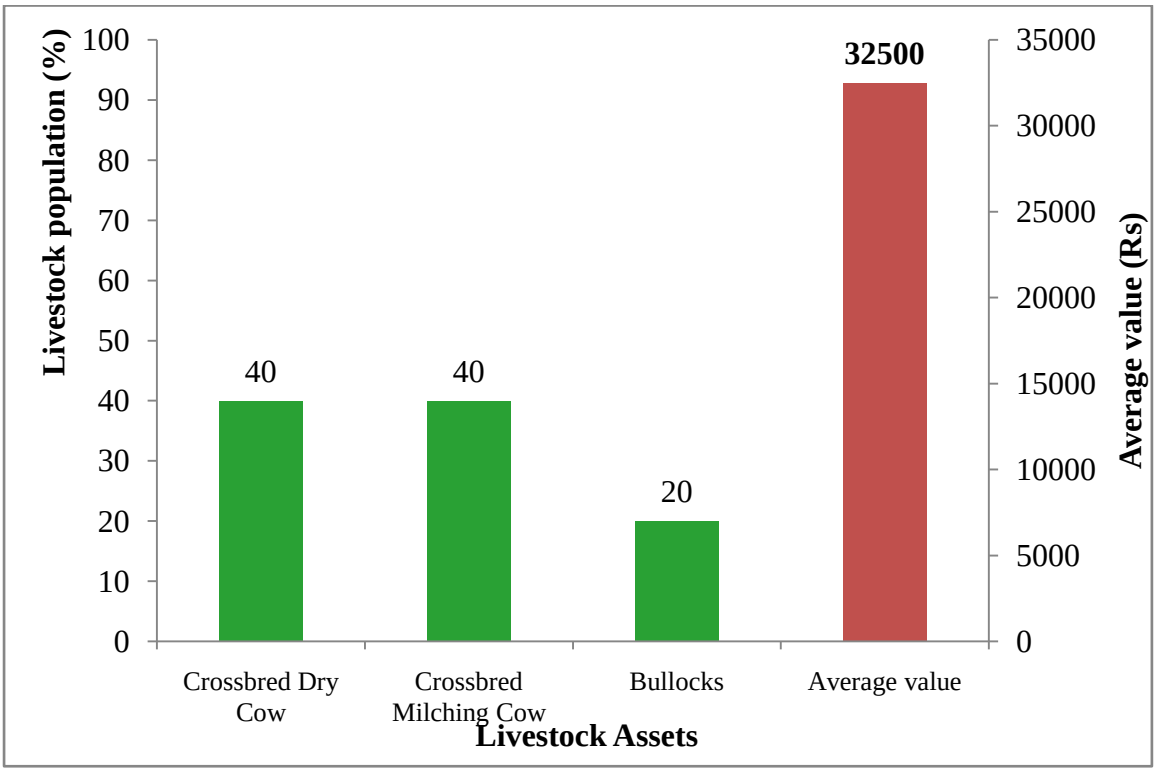


Figure 6: Livestock assets among sample households in Devarahalli micro-watershed

Average milk produced in sample households is 1500 litters/ annum. Among the farm households; maize, ragi and sorghum are the main crops for domestic food and fodder for animals. About 1942 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 Devarahalli Microwatershed

Particulars	
Name of the Livestock	**Ltr./Lactation/animal**
Crossbred Milching Cow	1500
Fodder produces	**Fodder yield (kg/ha.)**
Maize	2500
Ragi	1869
Sorghum	1602
Average fodder availability	1942
Livestock having households (%)	50.0
Livestock population (Numbers)	6

Table 8: Women empowerment of sample households in Devarahalli Microwatershed **% to Grand Total**

Particulars	Yes	No
Women participation in local organization activities	0.0	100
Women elected as panchayat member	0.0	100
Women earning for her family requirement	100	0.0
Women taking decision in her family and agriculture related activities	100	0.0

A woman participation in decision making is in this micro-watershed is presented in Table 8. About all farmer women earning for her family requirement and women taking decision in her family and agriculture related activities each.

Table 9: Per capita daily consumption of food among the sample households in Devarahalli Microwatershed

Particulars	NIN recommendation (gram/ per day/ person)	Present level of consumption (gram/ per day/ person)	Kilo Calories /day/person
Cereals	396.0	219.0	744.6
Pulses	43.0	41.1	141.0
Milk	200.0	106.8	69.4
Vegetables	143.0	134.5	32.3
Cooking Oil	31.0	28.1	160.4
Egg	0.5	83.3	125.0
Meat	14.2	13.3	20.0
Total	**827.7**	**626.3**	**1292.8**
Threshold of NIN recommendation		827 gram*	2250 Kcal*
% Below NIN		88.8	100
% Above NIN		11.1	0

Note: * day/person

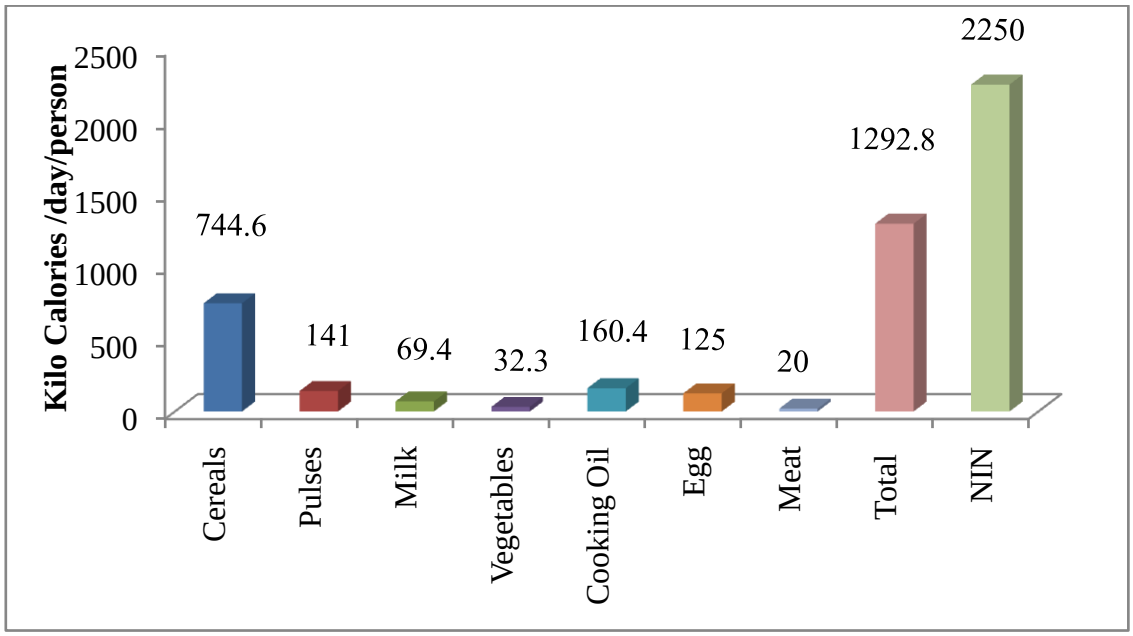


Figure 7: Per capita daily consumption of food among the sample households in Devarahalli Microwatershed

The food intake in terms of kilo calorie (kcal) per person per day was calculated and presented in the Table 9 and Figure 7. More quantity of cereals is consumed by sample farmers which accounted for 744.6 kcal per person. The other important food items consumed was pulses 141.0 kcal followed by cooking oil 160.4 kcal, milk 69.4 kcal, vegetables 32.3 kcal, egg 125.0 kcal and meat 20.0 kcal. In the sampled households, farmers were consuming less (1292.8 kcal) than NIN- recommended food requirement (2250 kcal).

Annual income of the sample HHs: The average annual household income is around Rs 52769. Major source of income to the farmers in the study area is from crop production (Rs 31259) followed by livestock (Rs. 21510). The monthly per capita income is Rs.842 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 10).

Table 10: Annual average income of HHs from various sources in Devarahalli Microwatershed

Particulars	Income *
Nonfarm income (Rs)	0 (0)
Livestock income (Rs)	21510 (22.2)
Crop Production (Rs)	31259 (100)
Total Annual Income (Rs)	***52769***
Average monthly per capita income (Rs)	842
Threshold for Poverty level (Rs 975 per month/person)	
% of households below poverty line	66.7
% of households above poverty line	33.3

* Figure in the parenthesis indicates % of Households

Table 11: Average annual expenditure of sample HHs in Devarahalli Microwatershed

Particulars	Value in Rupees	Per cent
Food	38347	58.5
Education	8889	13.6
Clothing	5000	7.6
Social functions	3889	5.9
Health	9444	14.4
Total Expenditure (Rs/year)	65569	100.0
Monthly per capita expenditure (Rs)	1046	

The average annual expenditure of farm households indicated that farmers in the study area spend highest on food (Rs. 38347) followed by education, clothing, social

function and health. 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. 1046 and about 33.3 per cent of farm households are below poverty line (Table 11 and Figure 8).

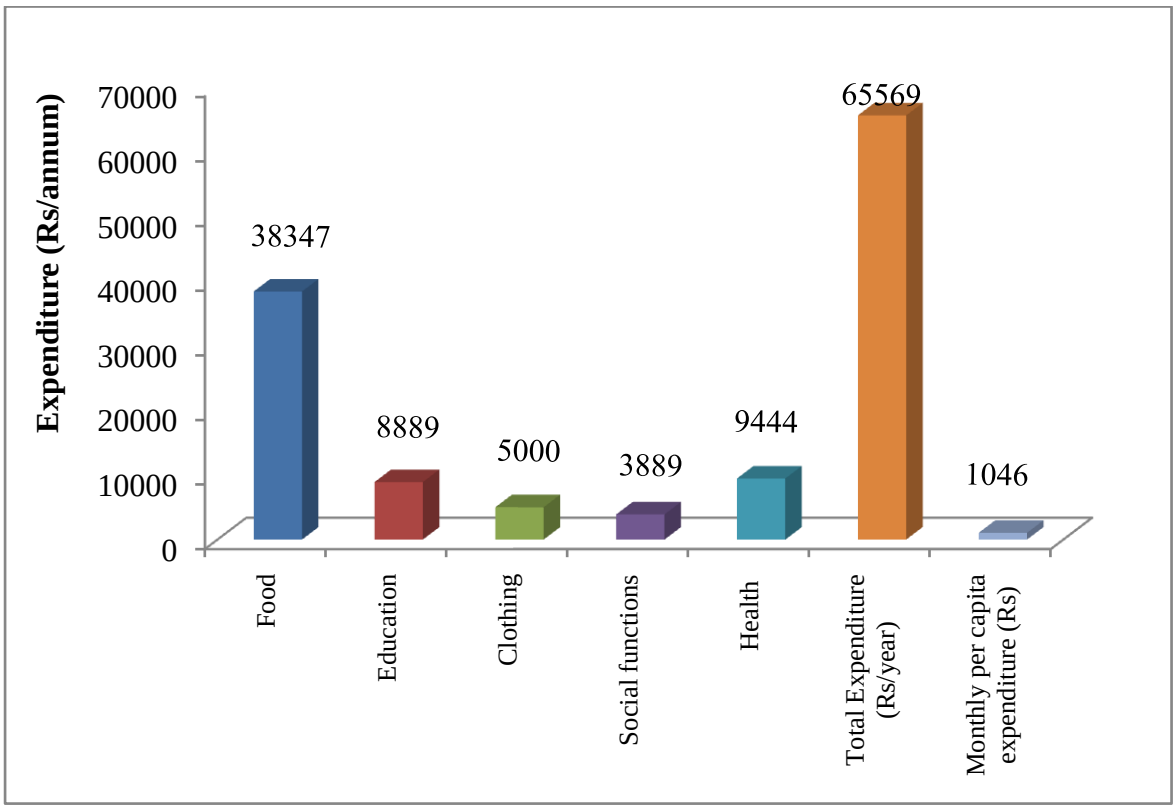


Figure 8: Average annual expenditure of sample HHs in Devarahalli Microwatershed

Land use: The total land holding in the Devarahalli micro-watershed is 7.7 ha (Table 12). Of which 5.6 ha is rain fed land and 2.0 ha is irrigated land.

Table 12: Land use among samples households in Devarahalli Microwatershed

Particulars	**Per cent**	**Area in ha**
Irrigated land	26.7	2.0
Rainfed Land	73.3	5.6
Fallow Land	0.0	0.0
Total land holding	100.0	7.7
Average land holding	0.85	

In the micro-watershed, the prevalent present land uses under perennial plants are neem trees (37.5%) followed by coconut (25.0 %), guava (18.8%) and mango (12.5) and rosewood (6.3 %) (Table 13).

Table 13: Number of trees/plants covered in sample farm households in Devarahalli Microwatershed

Particulars	Number of Plants/trees	Per cent
Coconut	4	25.0
Mango	2	12.5
Neem trees	6	37.5
Guava	3	18.8
Rosewood	1	6.3
Grand Total	16	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 by turmeric (26.8 %) followed by ragi (22.8 %), red gram (17.9 %), sorghum (16.6 %), maize (10.6 %) and horse gram (5.31%) which are taken during kharif (Table 14 and Figure 9).

Table 14: Present cropping pattern and cropping intensity in Devarahalli Microwatershed % to Grand Total

Crops	Kharif	Grand Total
Horsegram	5.3	5.31
Maize	10.6	10.6
Ragi	22.8	22.8
Redgram	17.9	17.9
Sorghum	16.6	16.6
Turmeric	26.8	26.8
Grand Total	100	100
Cropping intensity (%)	100	

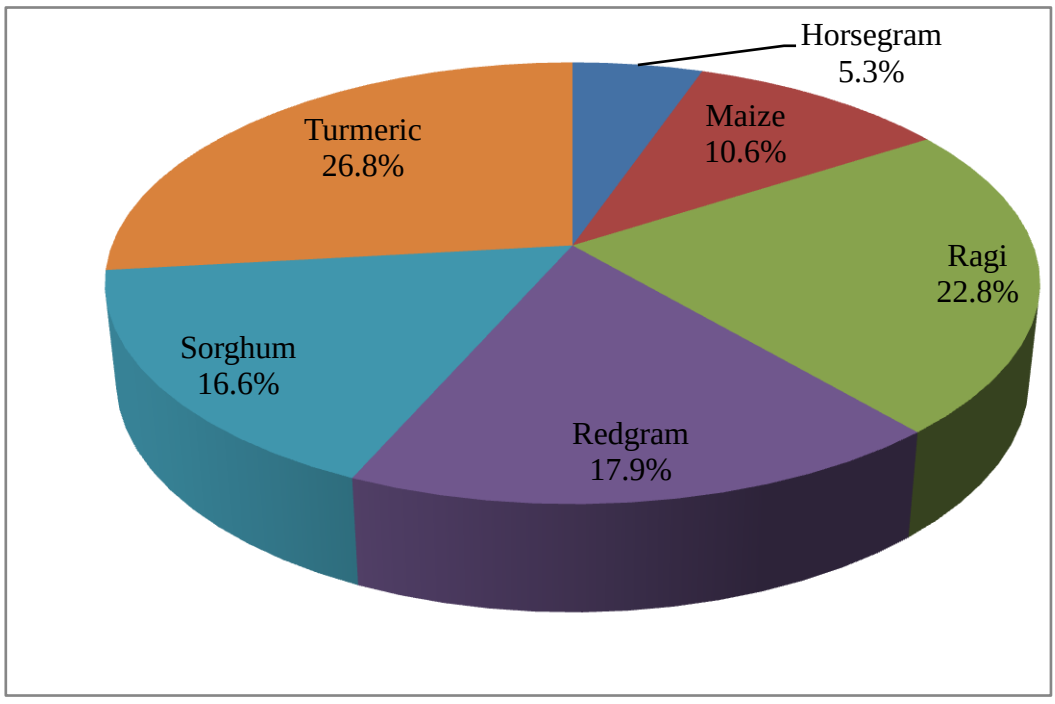


Figure 9: Present cropping pattern in Devarahalli Microwatershed

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 Devarahalli micro-watershed, 11 soil series are identified and mapped (Table 15). The distribution of major soil series are Magoonahalli 170.62ha (27.79 %) followed by Kannigala 119.71 ha (19.48 %), Beemanabeedu covering an area around 70.06 ha (11.41 %), Devarahalli 51.46 ha (8.37%), Maddinahundi 43.34 ha (7.05 %), Hullipura 30.7 ha (5 %), Hindupur 30.16 ha (4.91 %), Shivapura 21.91 ha (3.57 %), Gopalapura 17.47 ha (2.84 %), Kallipura 17.34 ha (2.82 %) and Honnegaudanahalli 13.08 ha (2.13 %).

Table 15: Distribution of soil series in Devarahalli Microwatershed

Sl. No	Soil Series	Mapping Unit Description	Area in ha (%)
1	BMB	Beemanabeedu soils are very deep (>150 cm), moderately well drained, have very dark greyish brown to dark grey and very dark brown clayey soils occurring on nearly level to very gently sloping lowlands under cultivation	70.06 (11.41)
2	DRH	Devarahalli soils are moderately shallow (50-75 cm), well drained, have dark red to reddish brown and dusky red gravelly sandy clay loam to sandy clay soils occurring on very gently to gently sloping uplands under cultivation	51.46 (8.37)
3	GPR	Gopalapura soils are moderately deep (75-100 cm), well drained, have dark brown to dark reddish brown and reddish brown gravelly sandy clay loam to sandy clay soils occurring on very gently to gently sloping uplands under cultivation	17.47 (2.84)
4	HDR	Hindupur soils are shallow (25-50 cm), well drained, have dark reddish brown to dusky red sandy clay loam to sandy clay soils occurring on very gently sloping uplands and moderately sloping mounds and ridges	30.16 (4.91)
5	HGH	Honnegaudanahalli soils are very deep (>150 cm), well drained, have very dark brown to brown and dark reddish brown sandy clay loam soils occurring on very gently sloping uplands under cultivation.	13.08 (2.13)
6	HPR	Hullipura soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark brown gravelly sandy clay loam to sandy clay soils occurring on very gently to gently sloping uplands under cultivation	30.7 (5.00)
7	KLP	Kallipura soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands under cultivation.	17.34 (2.82)
8	KNG	Kannigala soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands and strongly sloping mounds and ridges.	119.71 (19.48)
9	MDH	Maddinahundi soils are deep (100-150 cm), well drained, have dark reddish brown gravelly sandy clay soils occurring on very gently to gently sloping uplands under cultivation.	43.34 (7.05)

10	MGH	Magoonahalli soils are moderately shallow (50-75 cm), well drained, have very dark brown to dark brown gravelly sandy clay loam soils occurring on very gently sloping uplands and moderatly sloping mounds and ridges	170.62 (27.79)
11	SPR	Shivapura soils are shallow (25-50 cm), well drained, have dark reddish brown gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands and very strongly sloping hills, mounds and ridges.	21.91 (3.57)
12	Others		28.57 (4.65)

Present cropping pattern on different soil series are given in Table 16. Crops grown on Hindupur (HDR) soils are maize and red gram. Horse gram and ragi on Magoonahalli (MGH) soils is grown. Ragi and sorghum are grown on Kannigala (KNG) soils. Ragi and turmeric on Beemanabeedu (BMB) soils are grow and turmeric on Honnegaudanahalli (HGH) soils can grow.

Table 16: Cropping pattern on major soil series in Devarahalli micro-watershed

(Area in per cent)

Soil Series	Soil Depth	Crops	Dry	Irrigated	Grand Total
			Kharif		
HDR	Shallow (25-50 cm)	Maize	37.2	0.0	37.2
		Redgram	62.8	0.0	62.8
MGH	Moderately shallow (50-75 cm)	Horse gram	47.6	0.0	47.6
		Ragi	52.4	0.0	52.4
KNG	Moderately deep (75-100 cm)	Ragi	39.1	0.0	39.1
		Sorghum	60.9	0.0	60.9
BMB	Very deep (>150 cm)	Ragi	53.3	0.0	53.3
		Turmeric	0.0	46.7	46.7
HGH	Very deep (>150 cm)	Turmeric	0.0	100.0	100.0

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 17).

Table 17: Alternative land use options for different size group of farmers (Benefit Cost Ratio) in Devarahalli Microwatershed.

Soil Series	Small Farmers
HDR	Maize (1.88), Redgram (1.74)
MGH	Horsegram (1.12), Ragi (1.32)
KNG	Ragi (2.68), Sorghum (1.23)
BMB	Ragi (1.17), Turmeric (3.26)
HGH	Turmeric (2.56)

The productivity of different crops grown in Devarahalli micro-watershed under potential yield of the crops is given in Table 18.

Table 18: Economic land evaluation and bridging yield gap for different crops in Devarahalli micro-watershed

Particulars	HDR (25-50 cm)		MGH (50-75 cm)		KNG (75-100 cm)		BMB (>150 cm)		HGH (>150 cm)
	Maize	Redgram	Horsegram	Ragi	Ragi	Sorghum	Ragi	Turmeric	Turmeric
Total cost (Rs/ha)	27354	17593	31715	32267	18236	13469	32574	103954	42228
Gross Return (Rs/ha)	51376	30692	35445	42664	48783	16625	38079	338743	108063
Net returns (Rs/ha)	24022	13099	3730	10396	30546	3156	5505	234789	65834
BCR	1.88	1.74	1.12	1.32	2.68	1.23	1.17	3.26	2.56
Farmers Practices (FP)									
FYM (t/ha)	2.5	1.5	2.5	2.3	0.0	1.6	2.1	2.4	1.3
Nitrogen (kg/ha)	90.6	53.6	80.0	72.7	80.0	51.3	66.7	192.9	21.9
Phosphorus (kg/ha)	68.1	40.3	57.5	52.3	57.5	36.9	47.9	150.0	39.4
Potash (kg/ha)	10.6	6.3	0.0	0.0	0.0	0.0	0.0	40.5	48.1
Grain (Qtl/ha)	22.5	8.9	6.3	13.6	13.8	8.0	14.6	28.6	15.6
Price of Yield (Rs/Qtl)	2200	3500	5500	3000	3500	2000	2500	12000	7000
Soil test based fertilizer Recommendation (STBR)									
FYM (t/ha)	8.6	7.4	0.0	8.6	8.6	7.4	8.6	24.7	24.7
Nitrogen (kg/ha)	154.4	24.7	30.9	74.1	92.6	101.9	74.1	185.3	148.2
Phosphorus (kg/ha)	77.2	49.4	27.8	54.0	43.2	42.6	32.4	123.5	92.6
Potash (kg/ha)	32.1	18.5	24.7	44.5	33.3	29.6	33.3	185.3	185.3
Grain (Qtl/ha)	84.0	12.4	9.9	30.9	30.9	28.4	30.9	24.7	24.7
% of Adoption/yield gap (STBR-FP) / (STBR)									
FYM (%)	71.1	80.0	0.0	73.7	100.0	78.4	75.9	90.4	94.9
Nitrogen (%)	41.3	-117.1	-159.1	1.9	13.6	49.7	10.0	-4.1	85.2
Phosphorus (%)	11.7	18.4	-106.9	3.3	-33.0	13.5	-47.8	-21.5	57.5
Potash (%)	66.9	66.1	100.0	100.0	100.0	100.0	100.0	78.2	0.0
Grain (%)	73.2	28.1	36.7	55.8	55.5	71.8	52.8	-15.7	36.7
Value of yield and Fertilizer (Rs)									
Additional Cost (Rs/ha)	7738	6228	-3903	7355	8835	7260	6636	23957	30051
Additional Benefits (Rs/ha)	135256	12160	19965	51716	59938	40784	40729	-46457	63525
Net change Income (Rs/ha)	127518	5932	23868	44361	51102	33524	34093	-70414	33474

The data on cost of cultivation and benefit cost ratio (BCR) of different crops is given in Table 18. The total cost of cultivation in study area for turmeric ranges between Rs. 103954/ha in BMB soil (with BCR of 3.26) and Rs. 42228/ha in HGH soil (with BCR of 2.56), ragi range between Rs 32574/ha in BMB soil (with of 1.17) and Rs. 18236/ha in NSP soil (with BCR of 2.68), horse gram is Rs. 31715/ha in MGH soil (with BCR of 1.12), maize Rs. 27354/ha in HDR soil (with BCR of 1.88), red gram Rs 17593/ha in HDR soil (with BCR of 1.74) and sorghum cost of cultivation is Rs. 13469/ha in KNG soil (with BCR of 1.23).

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 18. 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 111554 in maize and a minimum of Rs 1985 in bajra cultivation.

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 19 and Figure 10. The average value of soil nutrient loss is around Rs 709.73 per ha/year. The total cost of annual soil nutrients is around Rs 352025 per year for the total area of 614.4 ha.

Table 19: Estimation of onsite cost of soil erosion in Devarahalli micro-watershed

Particulars	Quantity(kg)		Value (Rs)	
	Per ha	Total	Per ha	Total
Organic matter	97.4	48319	613.7	304411
Phosphorus	0.0	43	3.8	1897
Potash	1.0	538	21.7	10765
Iron	0.1	52	5.0	2512
Manganese	0.2	93	51.5	25531
Cupper	0.0	10	10.7	5336
Zinc	0.01	3	0.2	102
Sulphur	0.07	35	2.8	1389
Boron	0.00	2	0.1	84
Total	106.73	49095	709.73	352025

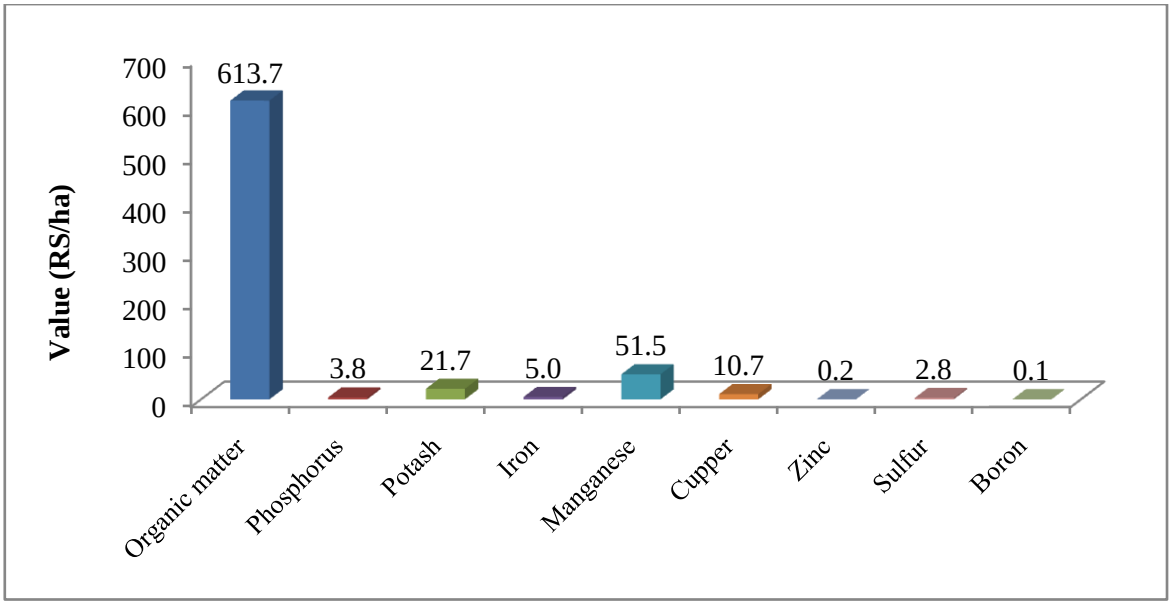


Figure 10: Estimation of onsite cost of soil erosion in Devarahalli micro-watershed

Table 20: Ecosystem services of food grain production in Devarahalli 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	Maize	0.8	22.0	2200	48906	27354	21552
	Ragi	1.7	14.0	3000	41466	27692	13774
	Sorghum	1.3	8.0	2000	15833	13469	2365
Pulses	Horsegram	0.4	6.0	5500	33963	31715	2248
	Redgram	1.4	9.0	3500	30692	17593	13099
Spice crops	Turmeric	2.0	22.0	9500	207414	73091	134323
Average value		7.6	13.5	4283	63046	31819	31227

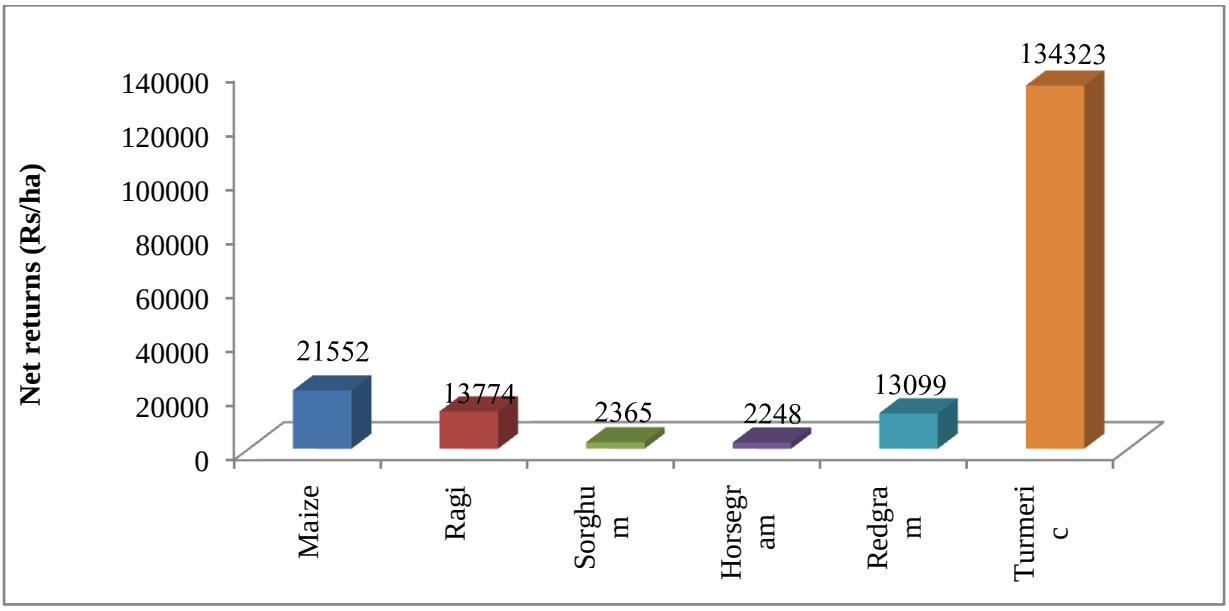


Figure 11: Ecosystem services of food grain production in Devarahalli Microwatershed

The average value of ecosystem service for fodder production is around Rs. 1648/ ha/year (Table 21). Per hectare fodder production services is maximum in maize (Rs. 2470) followed by ragi (Rs. 1846), horse gram (Rs. 1482) and sorghum (Rs. 792).

Table 21: Ecosystem services of fodder production in Devarahalli Microwatershed

Production items	Crops	Area in ha	Yield (Qtl/ha)	Price (Rs/Qtl)	Net Returns (Rs/ha)
Cereals	Maize	0.8	2.5	1000	2470
	Ragi	1.7	1.8	1000	1846
	Sorghum	1.3	0.8	1000	792
Pulses	Horse gram	0.4	2.5	600	1482
Grand Total		4.2	1.9	900	1648

Table 22: Ecosystem services of water supply in Devarahalli Microwatershed

Crops	Yield (Qtl/ha)	Virtual water (cubic meter) per ha	Value of Water (Rs/ha)	Water consumption (Cubic meters/Qtl)
Horsegram	6.2	1901	19007	308
Maize	22.2	2717	27165	122
Ragi	13.8	1689	16891	122
Redgram	8.8	4774	47740	544
Sorghum	7.9	2413	24130	305
Turmeric	21.8	3618	36177	166
Grand Total	13.45	2852	28518	261

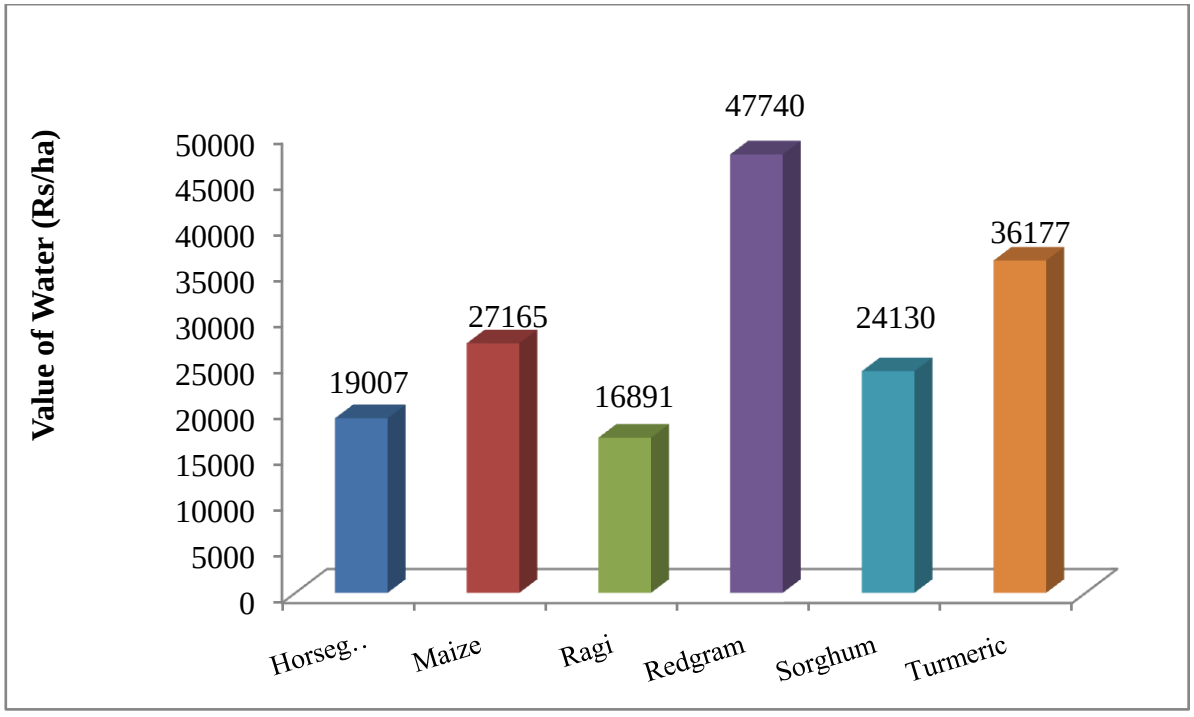


Figure 12: Ecosystem services of water supply in Devarahalli Microwatershed

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 22 and Figure 12) in red gram (Rs 47740) followed by turmeric (Rs 36177), maize (Rs 27165), sorghum (Rs 24130), horse gram (Rs 19007) and ragi (Rs 16891).

Table 23: Farming constraints related land resources of sample households in Devarahalli Microwatershed

Sl. No	Particulars	Per cent
1	Less Rainfall	100.0
2	Lack of good quality seeds	33.3
3	Non availability Fertilizers	44.4
4	High Crop Pests & Diseases	44.4
5	Animal Pests & Diseases	22.2
6	Lack of transportation	44.4
7	Lack of storage	88.9
8	Damage of crops by Wild Animals	100.0
9	Non availability of Plant Protection Chemicals	100.0
10	**Source of loan**	
	Bank	11.1
	Money Leander	66.7
	Village merchants	22.2
11	**Market for selling**	
	Regulated	11.1
	Village market	88.9
12	**Sources of Agri-Technology information**	
	Mobile	22.2
	Newspaper	77.8

The main farming constraints in Devarahalli micro-watershed to be found are less rainfall, lack of good quality seeds, Non availability Fertilizers, Lack of transportation , 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 and television. Farmers reported that they are not getting timely support/extension services from the concerned development department (Table 23).

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.