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

SIDAGANAHALLI-4 (4D4A1R1a) MICRO WATERSHED

Irakallagada Hobli, Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

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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

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

Phone : (080) 23412242, 23510350 (O)

Telefax : 080-23510350

E-Mail : nbssrcb@gmail.com

ICAR-NBSS&LUP Sujala MWS Publ.297

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PREFACE

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

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

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

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

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

ICAR-NBSS&LUP, Regional Centre, Bangalore has taken up a project sponsored by the Karnataka Watershed Development Project-II, (Sujala-III), Government of Karnataka funded by the World Bank under Component -1 Land Resource Inventry. This study was taken up to demonstrate the utility of such a database in reviewing, monitoring and evaluating all the land based watershed development programs on a scientific footing. To meet the requirements of various land use planners at grassroots level, the present study on "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of for Sidaganhalli-4 microwatershed in Koppal Taluk, and District, Karnataka" for integrated development was taken up in collaboration with the State Agricutural Universities, IISC, KSRSAC, KSNDMC as Consortia partners. The project provides detailed land resource information at cadastral level (1:7920 scale) for all the plots and socio-economic status of farm households covering thirty per cent farmers randomely selected representing landed and landless class of farmers in the micro-watershed. The project report with the accompanying maps for the microwatershed will provide required detailed database for evolving effective land use plan, alternative land use options and conservation plans for the planners, administrators, agricutural extention personnel, KVK officials, developmental departments and other land users to manage the land resources in a sustainable manner.

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

Nagpur
Date:06-08-2019

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. K.V. Niranjana	Sh. R.S. Reddy
Dr. B.A. Dhanorkar	Smt. Chaitra, S.P.
	Ms. Arpitha G.M
	Mr. Somashekar T.N
	Dr. Gopali Bardhan
	Dr. Mahendra kumar M.B
Field Work	
Sh. C. Bache Gowda	Sh. Mayur Patil
Sh. Somashekar	Sh. Arun Kumar, S.
Sh. M. Jayaramaiah	Sh. Sunil Raj
	Sh. Yogesh Kumar, B.
	Sh. Vikas, N.K.
	Sh. Arun Kumar, S.G.
	Sh. Umesh Jadiyappa Madolli
	Sh. Praveen Kumar P. Achalkar
	Sh. Veerabhadraswamy
	Sh. Vinay
	Sh. Shankarappa, K.
	Sh. Lankesh, R.S.
	Sh. Appanna B. Hattigoudar
	Sh. Maharudra
GIS Work	
Dr. S.Srinivas	Sh. A.G.Devendra Prasad
Sh. D.H.Venkatesh	Sh. Abhijith Sastry, N.S.
Smt. K.Sujatha	Smt. Shyla, B.
Smt. K.V.Archana	Smt. Swetha ,K.
Sh. N.Maddileti	Ms. Vidya, P.C.
	Sh. Deepak, M.J.
	Smt. K.Karunya Lakshmi
	Ms. Seema, K.V.

Laboratory Analysis	
Dr. M. Lalitha	Sh. Vindhya, N.G.
Smt. Arti Koyal	Ms. P. Pavanakumari, P.
Smt. Parvathy, S.	Ms. Rashmi, N.
	Ms. Leelavathy, K.U.
	Smt. Usha Kiran, G.
Socio-Economic Analysis	
Dr. S.C. Ramesh Kumar	Sh. M.K. Prakashanaik
	Ms. Karuna V. Kulkarni
	Mrs. Sowmya A.N
	Sh. Vinod R
	Sh. Basavaraja
	Sh. Vijay Kumar Lamani
	Ms. Sowmya K.B
	Mrs. Prathibha, D.G
	Sh. Rajendra,D
Soil & Water Conservation	
Sh. Sunil P. Maske	
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

Contents

Preface		
Contributors		
Executive Summary		
Chapter 1	Introduction	1
Chapter 2	Geographical Setting	3
2.1	Location and Extent	3
2.2	Geology	3
2.3	Physiography	4
2.4	Drainage	5
2.5	Climate	5
2.6	Natural Vegetation	6
2.7	Land Utilization	7
Chapter 3	Survey Methodology	11
3.1	Base maps	11
3.2	Image Interpretation for Physiography	11
3.3	Field Investigation	14
3.4	Soil mapping	16
3.5	Laboratory Characterization	17
3.6	Land management units	17
Chapter 4	The Soils	23
4.1	Soils of Granite gneiss Landscape	23
4.2	Soils of Alluvial Landscape	32
Chapter 5	Interpretation for Land Resource Management	47
5.1	Land Capability Classification	47
5.2	Soil Depth	49
5.3	Surface Soil Texture	50
5.4	Soil Gravelliness	51
5.5	Available Water Capacity	52
5.6	Soil Slope	53
5.7	Soil Erosion	54
Chapter 6	Fertility Status	57
6.1	Soil Reaction (pH)	57
6.2	Electrical Conductivity (EC)	57
6.3	Organic Carbon (OC)	57
6.4	Available Phosphorus	57
6.5	Available Potassium	57
6.6	Available Sulphur	60
6.7	Available Boron	60
6.8	Available Iron	60
6.9	Available Manganese	62
6.10	Available Copper	62

6.11	Available Zinc	62
Chapter 7	Land Suitability for Major Crops	65
7.1	Land suitability for Sorghum	65
7.2	Land suitability for Maize	66
7.3	Land suitability for Bajra	67
7.4	Land suitability for Groundnut	68
7.5	Land suitability for Sunflower	69
7.6	Land suitability for Cotton	70
7.7	Land suitability for Red gram	71
7.8	Land suitability for Bengal gram	72
7.9	Land suitability for Chilli	73
7.10	Land suitability for Tomato	74
7.11	Land suitability for Drumstick	75
7.12	Land suitability for Mulberry	76
7.13	Land suitability for Mango	77
7.14	Land suitability for Sapota	78
7.15	Land suitability for Pomegranate	79
7.16	Land suitability for Guava	80
7.17	Land Suitability for Jackfruit	81
7.18	Land Suitability for Jamun	82
7.19	Land Suitability for Musambi	83
7.20	Land Suitability for Lime	84
7.21	Land suitability for Cashew	85
7.22	Land suitability for Custard apple	86
7.23	Land suitability for Amla	87
7.24	Land suitability for Tamarind	88
7.25	Land suitability for Marigold	89
7.26	Land suitability for Chrysanthemum	90
7.27	Land suitability for Jasmine	91
7.28	Land suitability for Crossandra	92
7.29	Land management units (LMU’s)	123
7.30	Proposed Crop Plan for Sidaganhalli-4 Microwatershed	124
Chapter 8	Soil Health Management	127
Chapter 9	Soil and Water conservation Treatment Plan	133
9.1	Treatment Plan	133
9.2	Recommended Soil and Water Conservation measures	137
9.3	Greening of microwatershed	139
	References	141
	Appendix I	I
	Appendix II	VII
	Appendix III	XIII

LIST OF TABLES

2.1	Mean Monthly Rainfall, PET, ½ PET at Koppal Taluk and District	5
2.2	Land Utilization in Koppal District	7
3.1	Differentiating Characteristics used for Identifying Soil Series	16
3.2	Soil map unit description of Sidaganhalli-4 microwatershed	18
4.1	Physical and chemical characteristics of soil series identified in Sidaganhalli-4 microwatershed	34
7.1	Soil-Site Characteristics of Sidaganhalli-4 microwatershed	94
7.2	Land suitability for Sorghum	95
7.3	Land suitability for Maize	96
7.4	Land suitability for Bajra	97
7.5	Land suitability for Groundnut	98
7.6	Land suitability for Sunflower	99
7.7	Land suitability for Cotton	100
7.8	Land suitability for Red gram	101
7.9	Land suitability for Bengal gram	102
7.10	Land suitability for Chilli	103
7.11	Land suitability for Tomato	104
7.12	Land suitability for Drumstick	105
7.13	Land suitability for Mulberry	106
7.14	Land suitability for Mango	107
7.15	Land suitability for Sapota	108
7.16	Land suitability for Pomegranate	109
7.17	Land suitability for Guava	110
7.18	Land Suitability for Jackfruit	111
7.19	Land Suitability for Jamun	112
7.20	Land Suitability for Musambi	113
7.21	Land Suitability for Lime	114
7.22	Land suitability for Cashew	115
7.23	Land suitability for Custard apple	116
7.24	Land suitability for Amla	117

7.25	Land suitability for Tamarind	118
7.26	Land suitability for Marigold	119
7.27	Land suitability for Chrysanthemum	120
7.28	Land suitability for Jasmine	121
7.29	Land suitability for Crossandra	122
7.30	Proposed Crop Plan for Sidaganhalli-4 Microwatershed	125

LIST OF FIGURES

2.1	Location map of Sidaganhalli-4 Microwatershed	3
2.2a	Granite and granite gneiss rocks	4
2.2b	Alluvial rocks	4
2.3	Rainfall distribution in Koppal Taluk, Koppal District	6
2.4	Natural vegetation of Sidaganhalli-4 Microwatershed	6
2.5	Different crops and cropping systems in Sidaganhalli-4 Microwatershed	8
2.6	Current Land use – Sidaganhalli-4 Microwatershed	9
2.7	Location of Wells- Sidaganhalli-4 Microwatershed	9
3.1	Scanned and Digitized Cadastral map of Sidaganhalli-4 Microwatershed	13
3.2	Satellite image of Sidaganhalli-4 Microwatershed	13
3.3	Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Sidaganhalli-4 Microwatershed	14
3.4	Location of profiles in a transect	15
3.5	Soil phase or management units of Sidaganhalli-4 Microwatershed	21
5.1	Land Capability Classification of Sidaganhalli-4 Microwatershed	49
5.2	Soil Depth map of Sidaganhalli-4 Microwatershed	50
5.3	Surface Soil Texture map of Sidaganhalli-4 Microwatershed	51
5.4	Soil Gravelliness map of Sidaganhalli-4 Microwatershed	52
5.5	Soil Available Water Capacity map of Sidaganhalli-4 Microwatershed	53
5.6	Soil Slope map of Sidaganhalli-4 Microwatershed	54
5.7	Soil Erosion map of Sidaganhalli-4 Microwatershed	55
6.1	Soil Reaction (pH) map of Sidaganhalli-4 Microwatershed	57
6.2	Electrical Conductivity (EC) map of Sidaganhalli-4 Microwatershed	57
6.3	Soil Organic Carbon (OC) map of Sidaganhalli-4 Microwatershed	57
6.4	Soil Available Phosphorus map of Sidaganhalli-4 Microwatershed	57
6.5	Soil Available Potassium map of Sidaganhalli-4 Microwatershed	57
6.6	Soil Available Sulphur map of Sidaganhalli-4 Microwatershed	60
6.7	Soil Available Boron map of Sidaganhalli-4 Microwatershed	60
6.8	Soil Available Iron map of Sidaganhalli-4 Microwatershed	60
6.9	Soil Available Manganese map of Sidaganhalli-4 Microwatershed	62
6.10	Soil Available Copper map of Sidaganhalli-4 Microwatershed	62
6.11	Soil Available Zinc map of Sidaganhalli-4 Microwatershed	62

7.1	Land suitability for Sorghum	66
7.2	Land suitability for Maize	67
7.3	Land suitability for Bajra	68
7.4	Land suitability for Groundnut	69
7.5	Land suitability for Sunflower	70
7.6	Land suitability for Cotton	71
7.7	Land suitability for Red gram	72
7.8	Land suitability for Bengal gram	73
7.9	Land suitability for Chilli	74
7.10	Land suitability for Tomato	75
7.11	Land suitability for Drumstick	76
7.12	Land suitability for Mulberry	77
7.13	Land suitability for Mango	78
7.14	Land suitability for Sapota	79
7.15	Land suitability for Pomegranate	80
7.16	Land suitability for Guava	81
7.17	Land Suitability for Jackfruit	82
7.18	Land Suitability for Jamun	83
7.19	Land Suitability for Musambi	84
7.20	Land Suitability for Lime	85
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7.22	Land suitability for Custard apple	87
7.23	Land suitability for Amla	88
7.24	Land suitability for Tamarind	89
7.25	Land suitability for Marigold	90
7.26	Land suitability for Chrysanthemum	91
7.27	Land suitability for Jasmine	92
7.28	Land suitability for Crossandra	93
7.29	Land management units (LMU’s)	124
9.1	Drainage Line Treatment map of Sidaganhalli-4 Microwatershed	138
9.2	Soil and water conservation map of Sidaganhalli-4 Microwatershed	138

EXECUTIVE SUMMARY

The land resource inventory of Sidaganhalli-4 microwatershed was conducted using village cadastral maps and IRS satellite imagery on 1:7920 scale. The false colour composites of IRS imagery were interpreted for physiography and these physiographic delineations were used as base for mapping soils. The soils were studied in several transects and a soil map was prepared with phases of soil series as mapping units. Random checks were made all over the area outside the transects to confirm and validate the soil map unit boundaries. The soil map shows the geographic distribution and extent, characteristics, classification, behavior and use potentials of the soils in the microwatershed.

The present study covers an area of 531 ha in Koppal taluk and district, Karnataka. The climate is semiarid and categorized as drought - prone with an average annual rainfall of 662 mm, of which about 424 mm is received during south –west monsoon, 161 mm during north-east and the remaining 77 mm during the rest of the year. An area of 99 per cent is covered by soils and one per cent is by habitation. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 14 soil series and 28 soil phases (management units) and 7 Land management units.*
- *The length of crop growing period is <90 days and starts from 2nd week of August to 2nd week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 28 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area is suitable for agriculture.*
- *About 18 per cent of the soils are shallow to moderately shallow (25-75 cm), 60 per cent of the soils are moderately deep to deep (75-150 cm) and 18 per cent soils are very deep (>150 cm).*
- *About 31 per cent area has loamy soils and 65 per cent area has clay soils.*
- *About 18 per cent area has non-gravelly (<15% gravel) soils and 78 per cent has gravelly to very gravelly (15-60%) soils).*
- *About 64 per cent area is very low to low (<50-100 mm/m), 22 per cent area has medium (101-150 mm/m) and 10 per cent area is very high (>200 mm/m) in available water capacity.*
- *About 10 per cent area has nearly level (0-1%) lands and 86 per cent area has very gently sloping (1-3%) lands.*
- *About 28 per cent area is slight eroded (e1) and 68 per cent area is moderately eroded (e2) lands.*

- *About 7 per cent area is slightly acid (pH 6.0-6.5), 65 per cent is neutral (pH 6.5-7.3) and 24 per cent area is slightly alkaline (pH 7.3-7.8) to moderately alkaline (pH 7.8-8.4) in soil reaction.*
- *Entire area is non saline (<2 dsm^{-1}) in electrical conductivity (EC).*
- *Organic carbon is medium (0.5-0.75%) in 34 per cent area and high (>0.75%) in 62 per cent area.*
- *About 8 per cent area is medium (23-57 kg/ha) and 88 per cent area is high (>57 kg/ha) in available phosphorus.*
- *About 17 per cent area is low (<145 kg/ha), medium (145-337 kg/ha) in 61 per cent area and 18 per cent area is high (>337 kg/ha) in available potassium.*
- *About 2 per cent medium (10-20 ppm) and 94 per cent high (>20 ppm) in available sulphur.*
- *Available boron is low (<0.5 ppm) in about 9 per cent are, medium (0.5-1.0 ppm) in 55 per cent area and high (>1.0 ppm) in 32 per cent area.*
- *Available iron sufficient (>4.5 ppm) in the entire area.*
- *Available zinc is sufficient (>0.6 ppm) in the entire area.*
- *Available copper and manganese are sufficient in all the soils.*
- *The land suitability for 28 major crops grown in the microwatershed were assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*7 (1)*	*300 (57)*		*Pomegranate*	*2*	*321 (61)*
Maize	*2*	*306 (58)*		*Guava*	*2*	*271 (51)*
Bajra	*131 (25)*	*278 (52)*		*Jackfruit*	*2*	*271 (51)*
Groundnut	*131 (25)*	*226 (43)*		*Jamun*	*-*	*309 (58)*
Sunflower	*7 (1)*	*246 (46)*		*Musambi*	*7 (1)*	*302 (57)*
Cotton	*6 (1)*	*289 (54)*		*Lime*	*7 (1)*	*302 (57)*
Red gram	*2*	*239 (45)*		*Cashew*	*-*	*171 (32)*
Bengalgram	*38 (7)*	*288 (54)*		*Custard apple*	*137 (26)*	*363 (68)*
Chilli	*2*	*261 (49)*		*Amla*	*137 (26)*	*363 (68)*
Tomato	*2*	*261 (49)*		*Tamarind*	*-*	*223 (42)*
Drumstick	*2*	*328 (62)*		*Marigold*	*2*	*306 (58)*
Mulberry	*117 (22)*	*302 (57)*		*Chrysanthemum*	*2*	*306 (58)*
Mango	*-*	*187 (35)*		*Jasmine*	*2*	*255 (48)*
Sapota	*2*	*271 (51)*		*Crossandra*	*2*	*242 (46)*

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 7 identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and other horticulture crops.

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

Chapter 1

INTRODUCTION

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

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

In this critical juncture, the challenge before us is not only to increase the productivity per unit area which is steadily declining and showing a fatigue syndrome, but also to prevent or at least reduce the severity of degradation. If the situation is not reversed at the earliest, then the sustainability of the already fragile crop production system and the overall ecosystem will be badly affected in the state.

The continued neglect and unscientific use of the resources for a long time has led to the situation observed at present in the state. It is a known fact and established beyond doubt by many studies in the past that the cause for all kinds of degradation is the neglect and irrational use of the land resources. Hence, there is urgent need to generate a detailed site-specific farm level database on various land resources for all the villages/watersheds in a time bound manner that would help to protect the valuable soil and land resources and also to stabilize the farm production.

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

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

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

The land resource inventory aims to provide site specific database for Sidaganhalli-4 microwatershed in Koppal Taluk, Koppal District, Karnataka state for the Karnataka Watershed Development Department. The database was generated by using cadastral map of the village as a base along with high resolution IRS LISS IV and Cartosat-1 merged satellite imagery. Later, an attempt will be made to uplink this LRI data generated at 1:7920 scale under Sujala-III Project to the proposed Landscape Ecological Units (LEUs) map.

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

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Sidaganhalli-4 Microwatershed is located in the central part of northern Karnataka in Koppal Taluk, Koppal District, Karnataka State (Fig.2.1). It comprises parts of Myadhaneri, Shidaganahalli, Hiresoolikeri and Chilakamukki villages. It lies between $15^0$31' – $15^0$32' North latitudes and $76^0$13' – $76^0$15' East longitudes and covers an area of 531 ha. It is about 27 km southwest of Koppal town and is surrounded by Myadhaneri village on the north, Chilakamukki on the south, Hiresoolikeri on the east and Shidaganahalli village on the western side of the microwatershed.

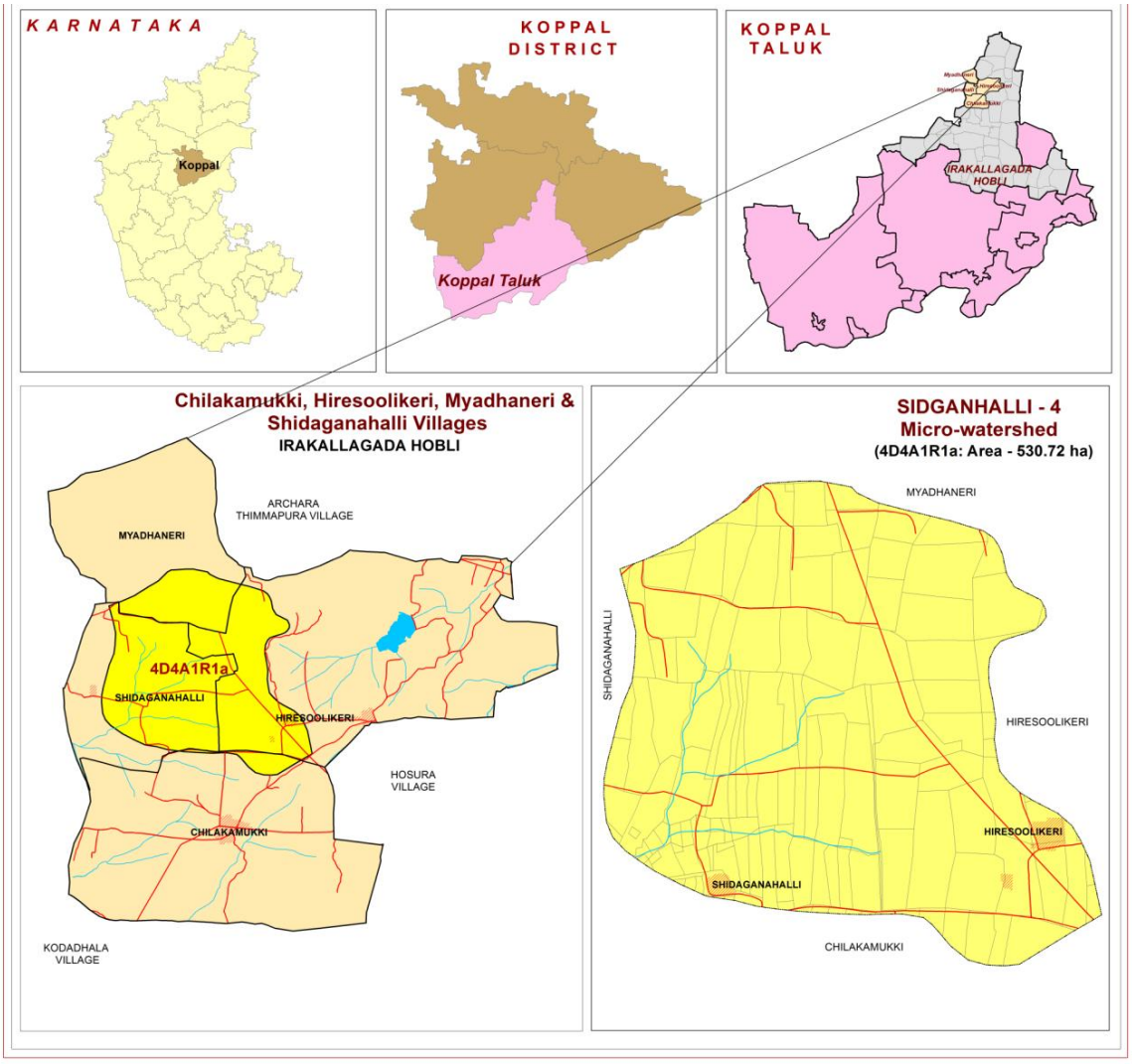


Fig.2.1 Location map of Sidaganhalli-4 Microwatershed

2.2 Geology

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

gray granite gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in Sidaganhalli-4 village. The soil thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2 Granite and granite gneiss rocks

Fig.2.2 b Alluvium

2.3 Physiography

Physiographically, the area has been identified as Granite gneiss and Alluvial landscapes based on geology. The microwatershed area has been further divided into

mounds/ridges, summits, side slopes and very gently sloping uplands and nearly level plains based on slope and its relief features. The elevation ranges from 597-615 m in the gently sloping uplands. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

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

2.5 Climate

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

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

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

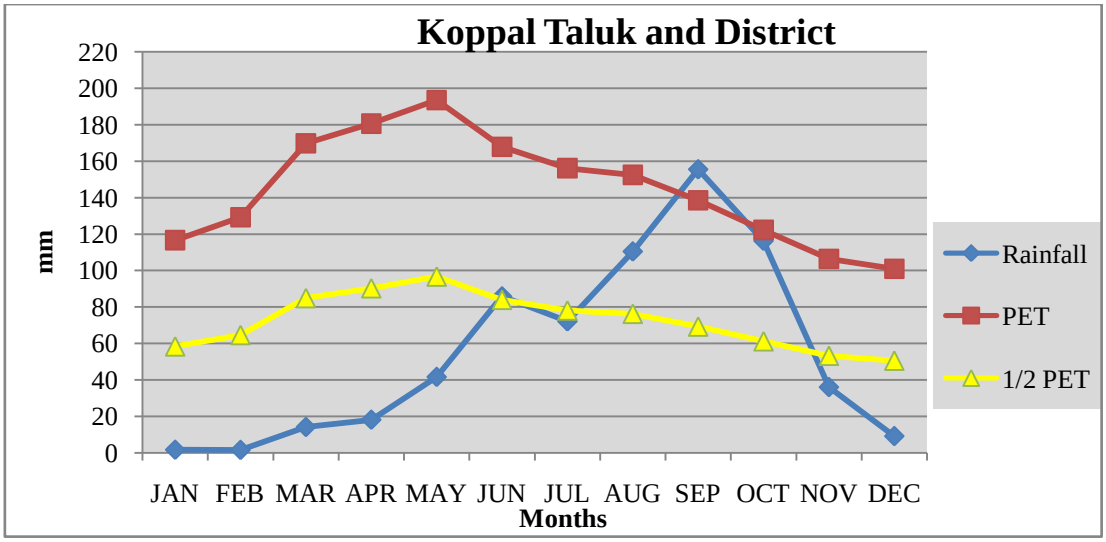


Fig. 2.3 Rainfall distribution in Koppal Taluk and District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Sidaganhalli-4 microwatershed

2.7 Land Utilization

About 91 per cent area (Table 2.2) in Koppal district is cultivated at present and about 17 per cent of the area is sown more than once. An area of about 3 per cent is currently barren. Forests occupy a small area of about 5 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are maize, sorghum, red gram, groundnut, mango, chilli, tomato, marigold (Fig 2.5). While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Sidaganhalli-4 Microwatershed is presented in Fig.2.6. Simultaneously, enumeration of existing wells (bore wells and open wells) and other soil and water conservation structures in the microwatershed is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells in Sidaganhalli-4 Microwatershed is given Fig.2.7.

Table 2.2 Land Utilization in Koppal District

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

Fig.2.5 Different crops and cropping systems in Sidaganhalli-4 Microwatershed

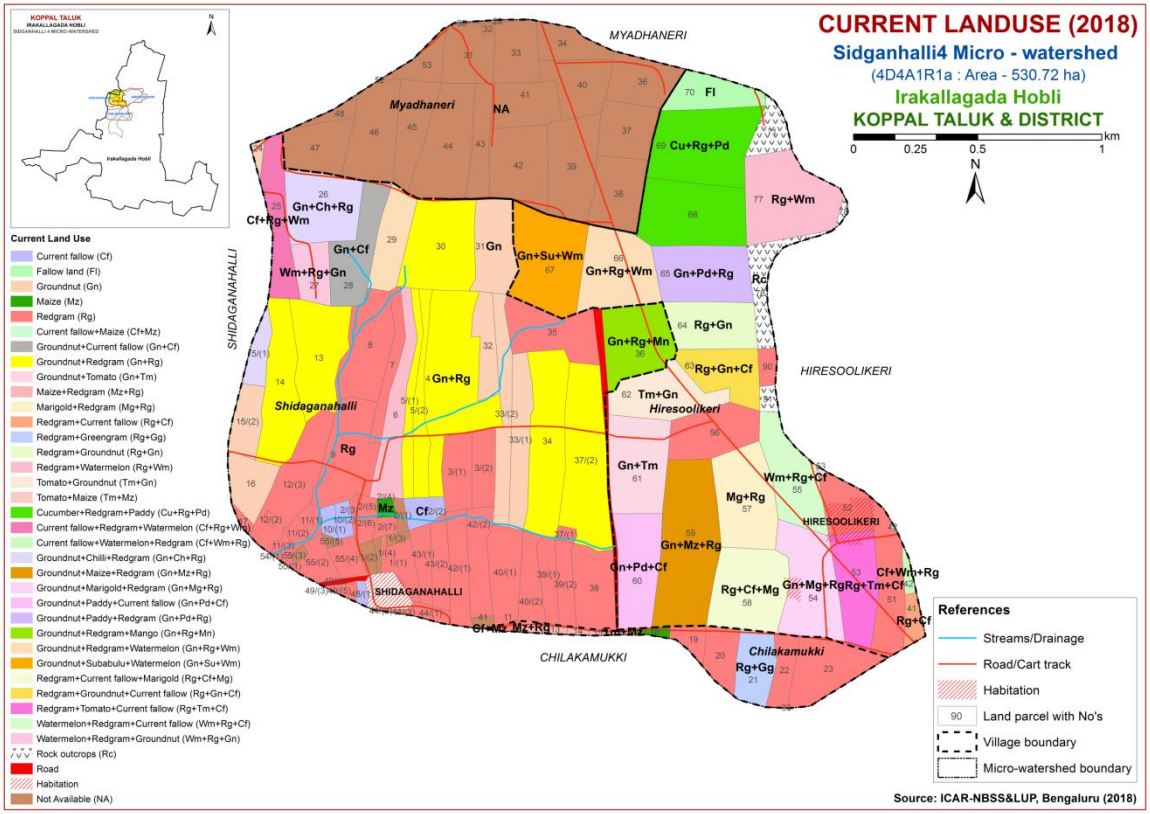


Fig.2.6 Current Land Use – Sidaganhalli-4 Microwatershed

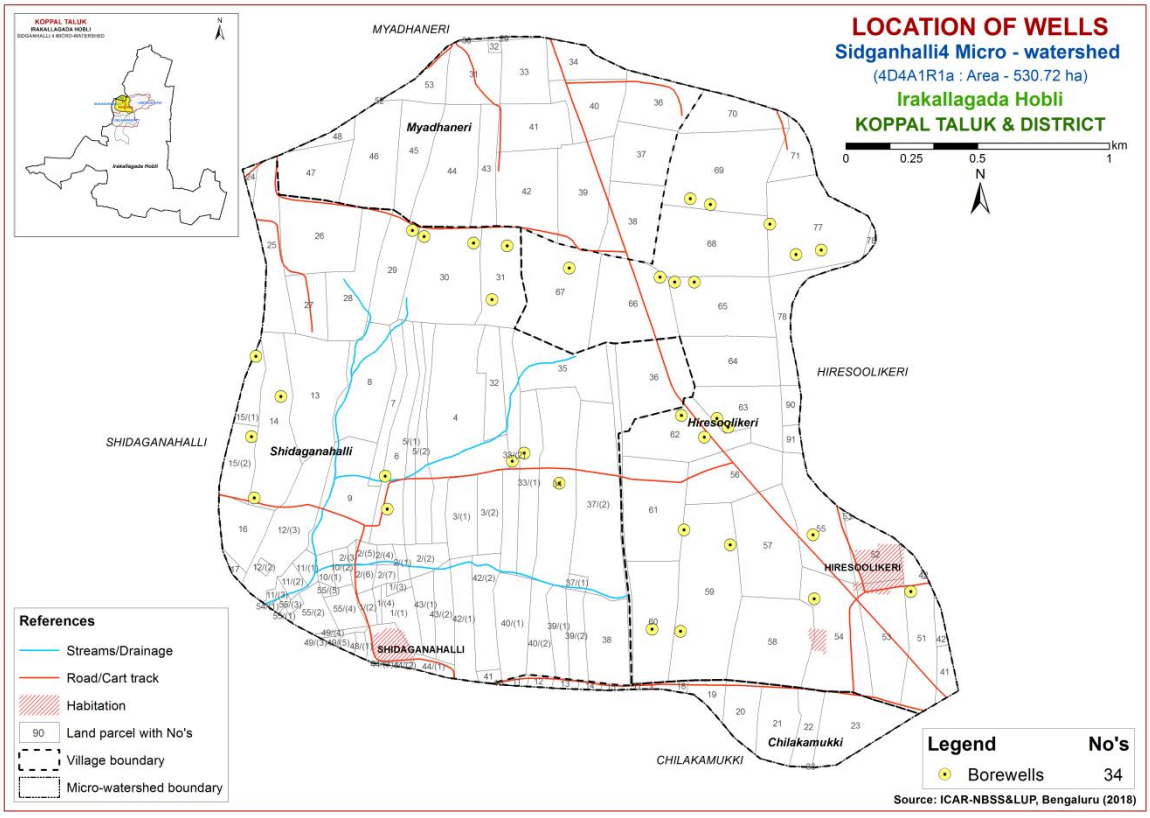


Fig.2.7 Location of wells– Sidaganhalli-4 Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly for a given level of management. This was achieved in Sidaganhalli-4 Microwatershed by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site characteristics (slope, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units and showing their extent and geographic distribution on the microwatershed cadastral map. The detailed soil survey at 1:7920 scale was carried out in 531 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

interpretation units based on image characteristics. The image interpretation legend for Physiography is given below.

Image Interpretation Legend for Physiography

G- Granite gneiss landscape

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

DSe Alluvial landscape

DSe 1 Summit

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

DSe 2 Very gently sloping

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

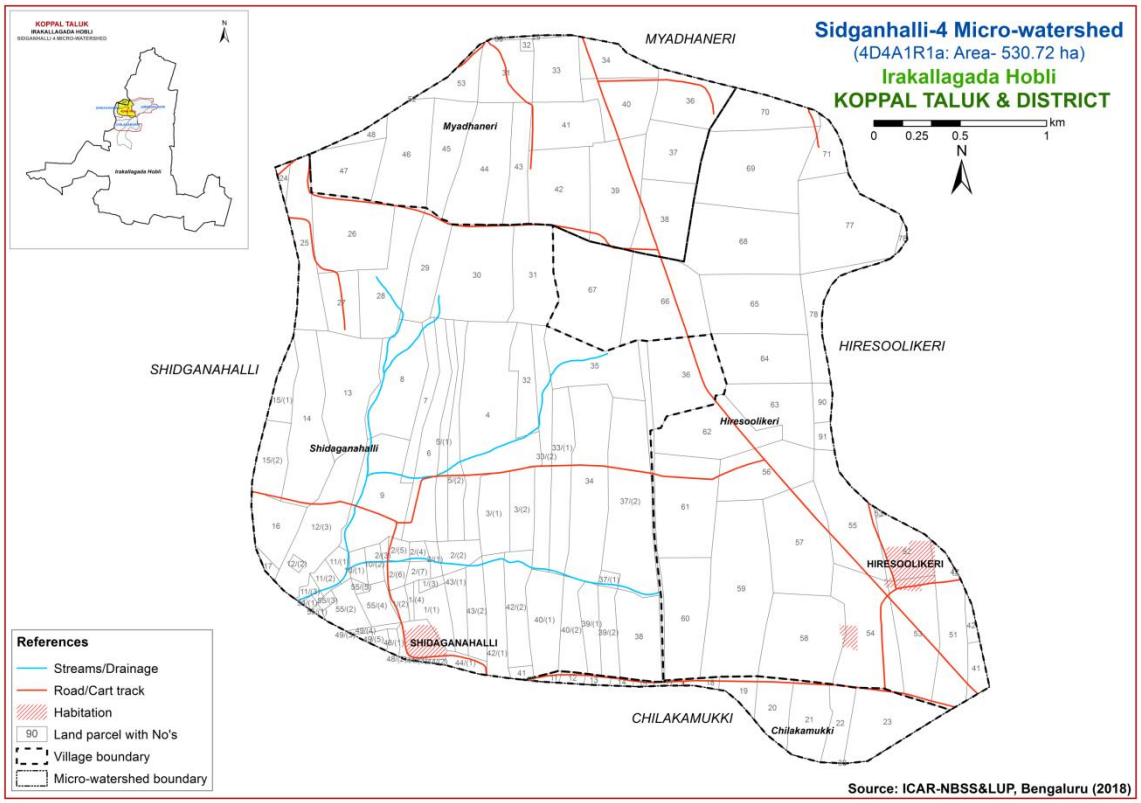


Fig 3.1 Scanned and Digitized Cadastral map of Sidaganhalli-4 Microwatershed

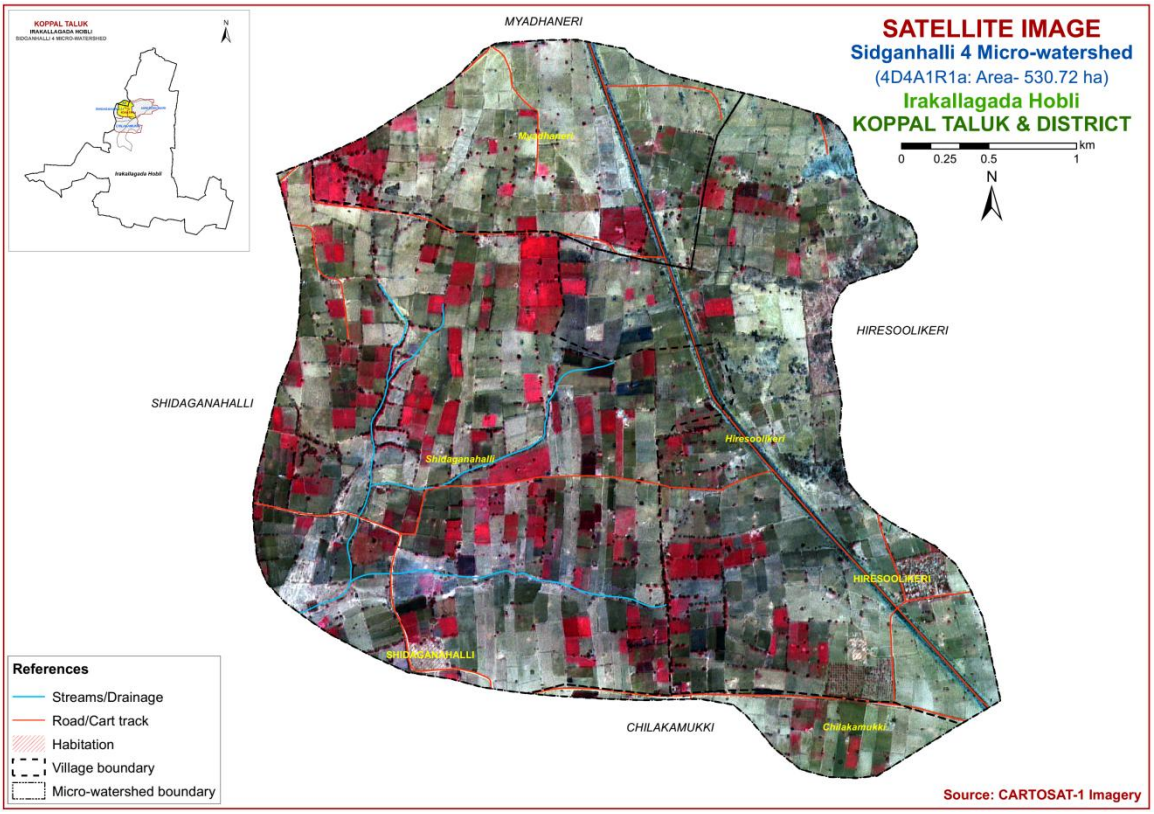


Fig.3.2 Satellite Image of Sidaganhalli-4 Microwatershed

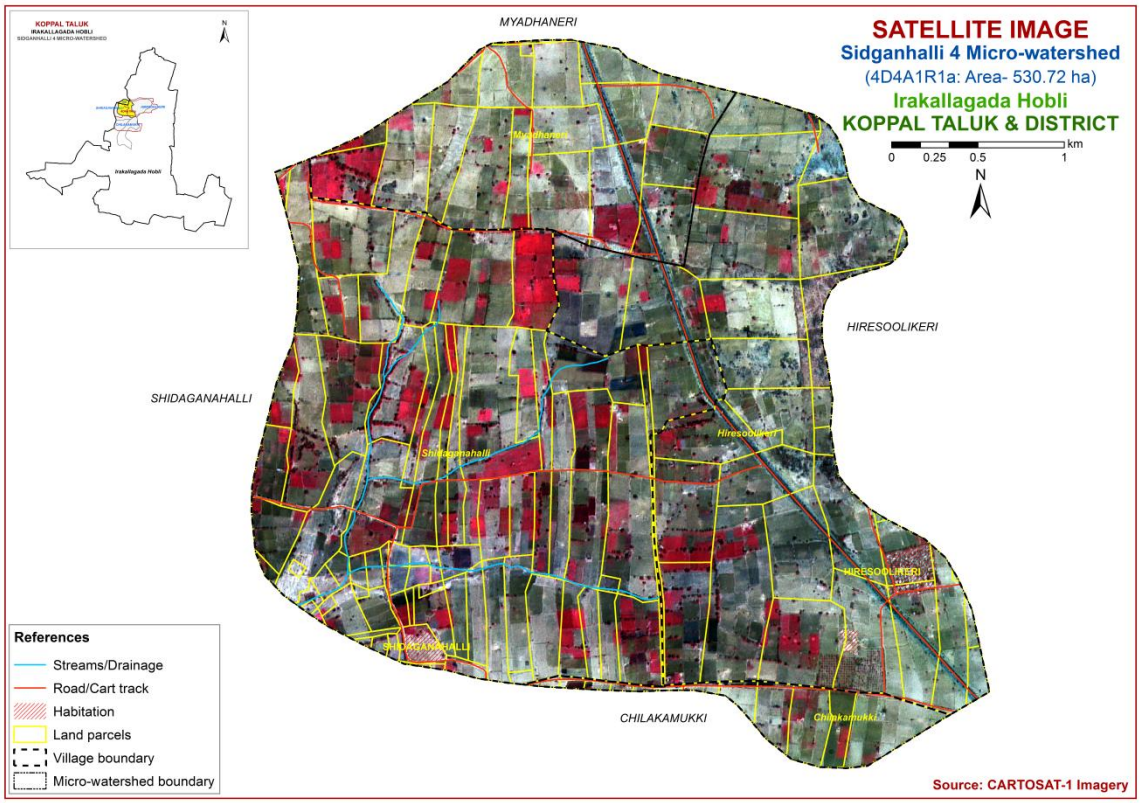


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Sidaganhalli-4 Microwatershed

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 uplands and plains was carried out. Based on the variability observed on the surface, transects (Fig 3.4) were selected across the slope covering all the landform units in the microwatershed (Natarajan and Dipak Sarkar, 2010).

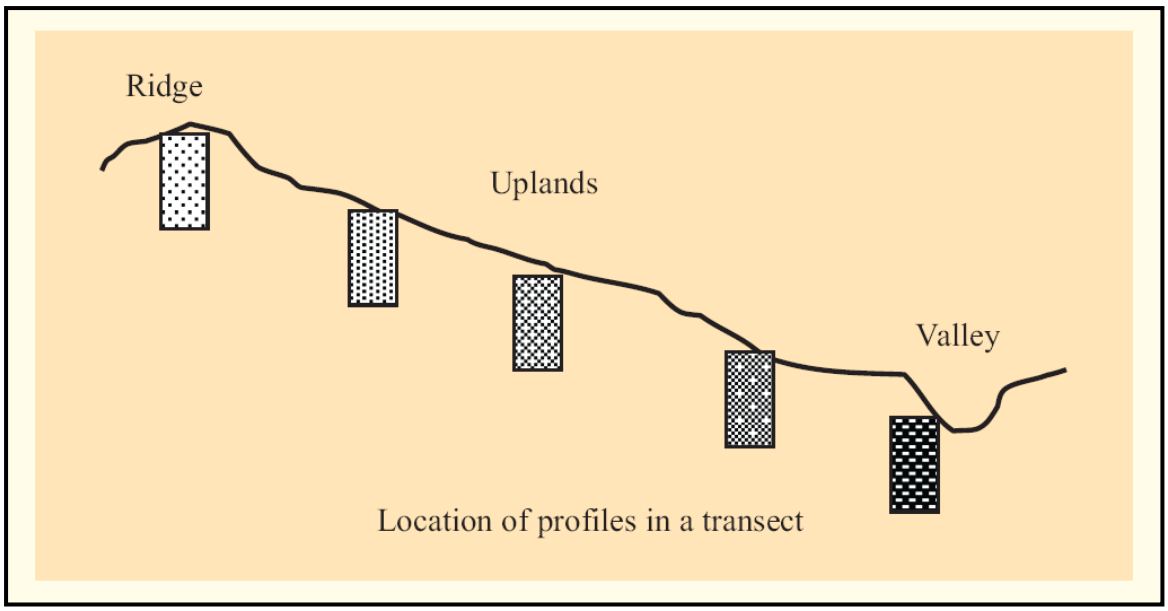


Fig: 3.4. Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, calcareousness, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 14 soil series were identified in Sidaganhalli-4 Microwatershed.

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

Sl. No	Soil Series	Depth (cm)	Colour (moist)	Texture	Gravel (%)	Horizon sequence	Calcareo-usness
Soils of granite gneiss Landscape							
1	Harve (HRV)	25-50	2.5YR3/4,3/6 5YR3/3,4/4,3/4	gscl	>35	Ap-Bt-Cr-	-
2	Hatti (HTI)	50-75	5 YR 3/3, 3/4,	gsc	15-35	Ap-Bt-Cr	-
3	Kutegoudanahundi (KGH)	50-75	7.5YR3/2,3/3,3/4	gscl	15-35	Ap-Bt-Cr	
4	Lakkur (LKR)	50-75	2.5YR 2.5/3, 2.5/4, 3/4, 3/6	gsc	40-60	Ap-Bt-Bc-Cr	
5	Mukhadahalli (MKH)	50-75	5YR3/3,3/4,4/3, 5/4,6/6 2.5YR3/4	gsc	>35	Ap-Bt-Cr	
6	Bidanagere (BDG)	75-100	5YR3/3,3/4,4/3,5/4 2.5YR3/4, 3/6	gc	35-60	Ap-Bt-Cr	
7	Gollarahatti (GHT)	75-100	2.5YR3/4,3/6, 4/4,4/6	gscl	15-35	Ap-Bt-Cr	
8	Hooradhahalli (HDH)	75-100	2.5YR2.5/4,3/4, 3/6	gsc-gc	>35	Ap-Bt-Cr	
9	Mornal (MNL)	100-150	5YR 3/4, 2.5 YR 3/4, 4/6	gsc	15-35	Ap-Bt-Cr	
10	Nagalapur (NGP)	100-150	5YR2.5/2,3/2, 2.5YR3/6,4/6	gsc	>35	Ap-Bt-Cr	
11	Niduvalalu (NDL)	>150	2.5YR2.5/3,2.5/4, 3/3,4/6	gsc	>35	Ap-Bt	
12	Kavalakkeri (KLR)	>150	10YR2/1,3/1, 3/2 7.5YR2.5/1,3/2	sc	-	Ap-Bw	e-es
13	Thimmasandra (TSD)	>150	10YR2/12/2,3/1, 3/2,4/1, 4/2,4/3	c	-	Ap-Bw	
Soils of Alluvial Landscape							
14	Kavalur (KVR)	100-150	10 YR 2/2, 3/1, 3/2, 3/3, 4/4	c		Ap-Bss-Bck-Cr	es-ev

3.4 Soil Mapping

The area under each soil series was further separated into soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management. The soil mapping units are shown on the map (Fig.3.5) in the form of symbols. During the survey many soil profile pits, few minipits and a few auger bores representing different landforms occurring in the microwatershed were studied. In addition to the profile study, spot observations in the form of minipits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map. The soil map shows the geographic distribution and area extent of 28 mapping units representing 14 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 28 phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

3.5 Laboratory Characterization

Soil samples for each series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2018 from Sidaganhalli-4 farmer's fields (42 samples) for fertility status (major and micronutrients) at 320 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatershed.

3.6 Land management units (LMUs)

The 28 soil phases identified and mapped in the microwatershed were regrouped into 7 Land management units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land management units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been choosen for identification and delineation of LMUs. For Sidaganhalli-4 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.

Table 3.2 Soil map unit description of Sidaganhalli-4 Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss landscape				
	HRV	Harve soils are shallow (25-50 cm), well drained, dark red to dark reddish brown, red gravelly loamy soils occurring on nearly level to gently sloping uplands under cultivation		**10 (1.89)**
465		HRVcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	10 (1.89)
	HTI	Hatti soils are moderately shallow (50-75 cm), well drained, have dark reddish brown gravelly red sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation		**10 (1.92)**
101		HTIiB2g1	Sandy clay surface, slope1-3%, moderate erosion, gravelly (15-35%)	10 (1.92)
	KGH	Kutegoudanahundi soils are moderately shallow (50-75 cm), well drained, have brown to dark brown gravelly red sandy clay loam soils occurring on very gently to gently sloping uplands under cultivation		**20 (3.82)**
65		KGHcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	13 (2.5)
69		KGHhB2g1	Sandy clay loam surface, moderate erosion, gravelly (15-35%)	7 (1.32)
	LKR	Lakkur soils are moderately shallow (50-75 cm), well drained, have dark reddish brown to dark red, red gravelly sandy clay soils occurring on very gently to moderately sloping uplands under cultivation		**31 (5.82)**
43		LKRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	9 (1.7)
452		LKRhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	12 (2.29)
54		LKRiB2g1	Sandy clay surface, slope1-3%, moderate erosion, gravelly (15-35%)	10 (1.83)
	MKH	Mukhadahalli soils are moderately shallow (50-75 cm), well drained, have dark brown to reddish brown gravelly red sandy clay soils occurring on gently very gently to gently sloping uplands under cultivation		**24 (4.57)**
76		MKHcB2	Sandy loam surface, slope 1-3%, moderate erosion	3 (0.53)
85		MKHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	10 (1.93)
90		MKHiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	11 (2.11)
	BDG	Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly red clay soils occurring on nearly level to gently sloping uplands		**15 (2.8)**

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
		under cultivation		
180		BDGcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	15 (2.8)
	GHT	Gollarahatti soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red gravelly sandy clay loam soils occurring on nearly level very gently sloping uplands under cultivation		**29 (5.34)**
145		GHTiB1g1	Sandy clay surface, slope1-3%, slight erosion, gravelly (15-35%)	15 (2.73)
146		GHTiB1g2	Sandy clay surface, slope 1-3%, slight erosion, very gravelly (35-60%)	14 (2.61)
	HDH	Hooradhahalli soils are moderately deep (75-100 cm), well drained, dark red to dark reddish brown, red gravelly sandy clay to clay soils occurring on nearly level to moderately sloping uplands under cultivation		**69 (13.04)**
123		HDHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	10 (1.92)
126		HDHiB1g1	Sandy clay surface, slope1-3%, slight erosion, gravelly (15-35%)	8 (1.55)
128		HDHiB2g1	Sandy clay surface, slope1-3%, moderate erosion, gravelly (15-35%)	51 (9.57)
123		HDHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	10 (1.92)
126		HDHiB1g1	Sandy clay surface, slope1-3%, slight erosion, gravelly (15-35%)	8 (1.55)
	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**117 (22.01)**
204		MNLcB2	Sandy loam surface, slope 1-3%, moderate erosion	2 (0.33)
207		MNLiB1g1	Sandy clay surface, slope1-3%, slight erosion, gravelly (15-35%)	25 (4.68)
209		MNLiB2g1	Sandy clay surface, slope1-3%, moderate erosion, gravelly (15-35%)	90 (17.0)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay soils occurring on nearly level to gently sloping uplands under cultivation		**76 (14.33)**
251		NGPcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	71 (13.37)
263		NGPiB1g1	Sandy clay surface, slope1-3%, slight erosion, gravelly (15-35%)	5 (0.96)
	NDL	Niduvalalu soils are very deep (>150 cm), well drained, have red to dark reddish brown red gravelly sandy clay		**58 (10.92)**

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
		soils occurring on nearly level to very gently sloping uplands under cultivation		
299		NDLiB1g1	Sandy clay surface, slope1-3%, slight erosion, gravelly (15-35%)	18 (3.44)
300		NDLiB2	Sandy clay surface, slope1-3%, moderate erosion	40 (7.48)
	KLR	Kavalakkeri soils are very deep soils (>150 cm), moderately well drained, have black to dark reddish brown sandy clay soil occurring on nearly level to very gently sloping low lands under cultivation		**6 (1.07)**
473		KLRmA1	Clay surface, slope 0-1%, slight erosion	6 (1.07)
	TSD	Thimmasandra soils are very deep (>150 cm), moderately well drained, have very dark brown to very dark grayish brown, clay soils occurring on nearly level to very gently sloping lowlands under cultivation		**32 (6.13)**
444		TSDiA1	Sandy clay surface, slope 0-1%, slight erosion	24 (4.6)
446		TSDmA1	Clay surface, slope 0-1%, slight erosion	8 (1.53)
Soils of alluvial Landscape				
	KVR	Kavalur soils are deep (100-150 cm), moderately well drained, have dark yellowish brown to very dark grayish brown, calcareous black clay soils occurring on nearly level to very gently sloping plains under cultivation		**12 (2.33)**
386		KVRmA1	Clay surface, slope 0-1%, slight erosion	12 (2.33)
999		Rock outcrops	Rock lands, both massive & bouldery with little or no soil	**16 (3.02)**
1000		Others	Habitation	**5 (0.98)**

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

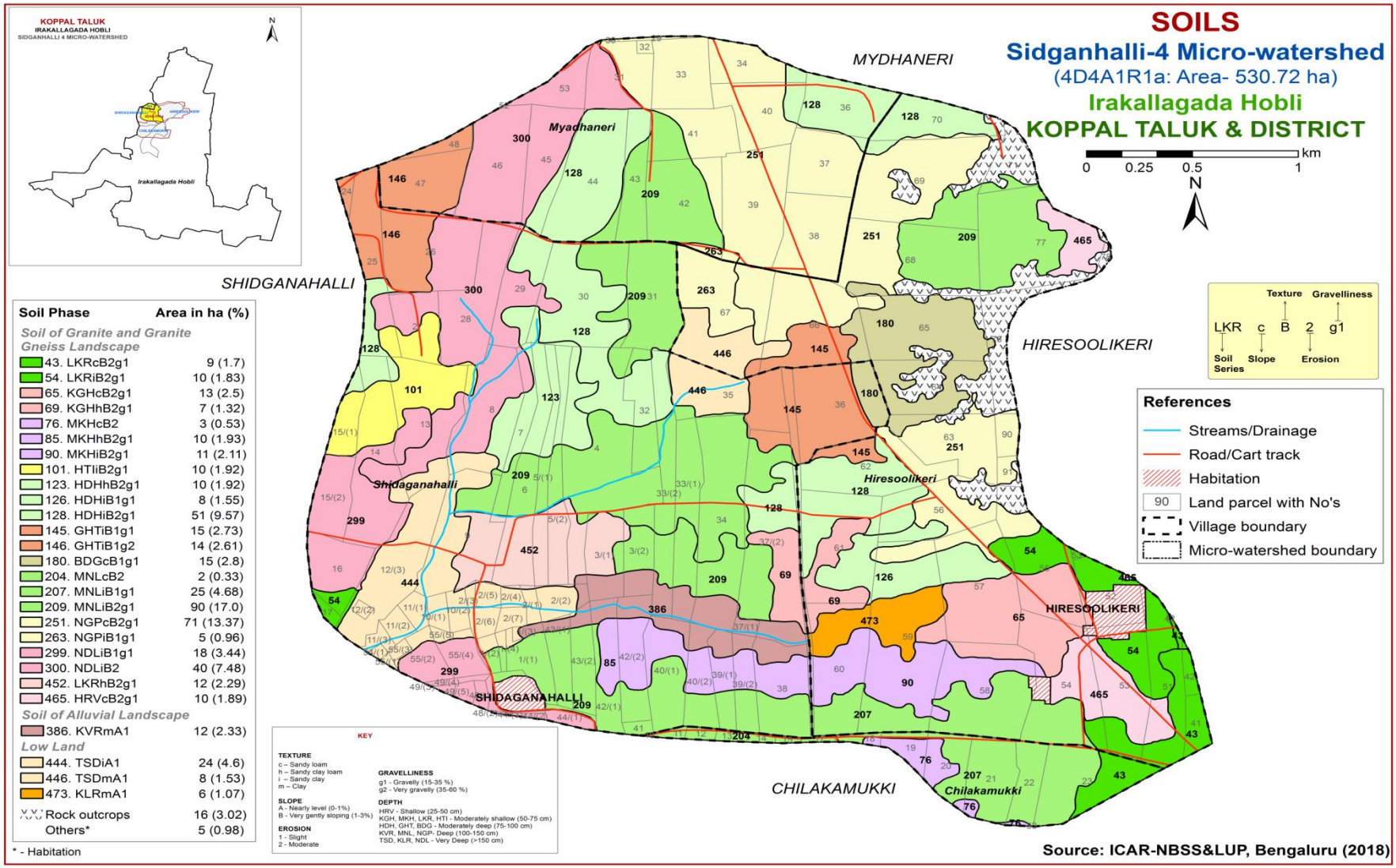


Fig 3.5 Soil Phase or Management Units-Sidaganhalli-4 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Sidaganhalli-4 Microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluvial landscapes based on geology. In all, 14 soil series are identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by the parent material, climate, time and relief.

A brief description of each of the 14 soil series identified followed by 28 soil phases (management units) mapped (Fig. 3.5) are furnished below. The physical and chemical characteristics of soil series identified in Sidaganhalli-4 microwatershed is given in Table 4.1 along with soil classification. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Granite gneiss landscape

In this landscape, 13 soil series were identified and mapped. Of these, Mornal (MNL) 117 ha (22%), Nagalapura (NGP) 76 ha (14%), Hooradhalli (HDH) 69 ha (13%) area and other series occur in a small area. The brief description of series along with the soil phases identified and mapped is given below.

4.1.1 Harve (HRV) Series: Harve soils are shallow (25-50 cm), well drained, have reddish brown to dark red gravelly sandy clay loam soils. They have developed from weathered granite gneiss and occur on very gently to moderately sloping uplands. The Harve series has been classified as a member of the loamy-skeletal, mixed isohyperthermic family of (Paralithic) Rhodustalfs.

The thickness of the solum ranges from 28 to 48 cm. The thickness of A-horizon ranges from 12 to 17 cm. Its colour is in 5YR and 2.5 YR hue with value 3 to 4 and chroma 4 to 6. The texture varies from loamy sand to sandy loam with 20 to 60 per cent gravel. The thickness of B-horizon ranges from 16 to 32 cm. Its colour is in 2.5 YR and 5 YR hue with value 3 to 4 and chroma 4 to 6. Its texture is sandy clay loam with gravel content of more than 35 per cent. The available water capacity is very low (<50mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Harve (HRV) Series

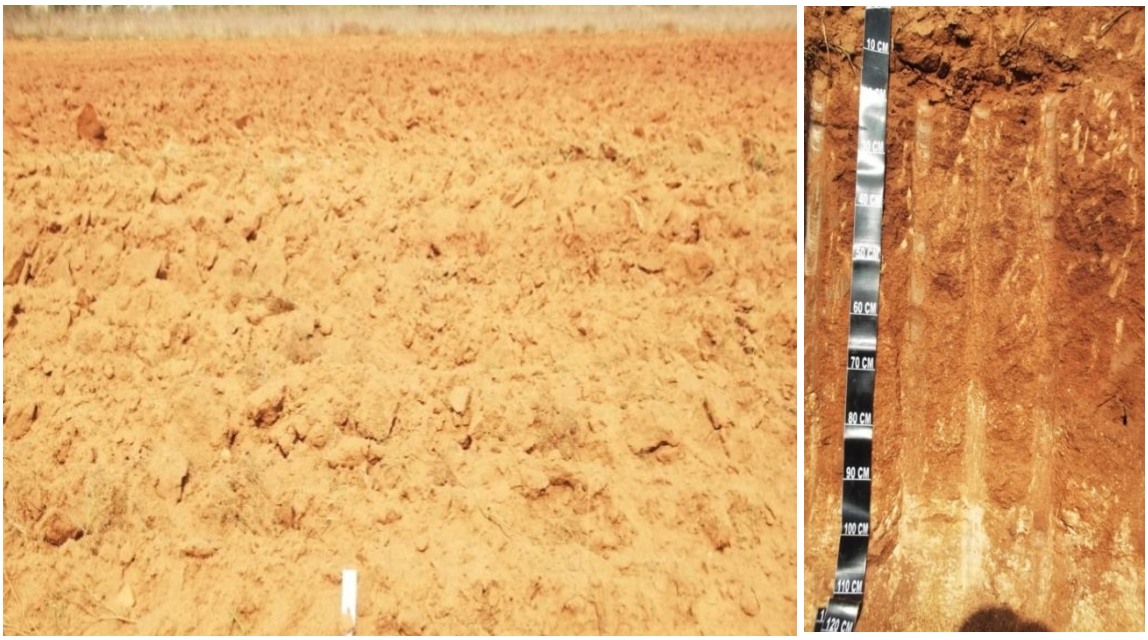
4.1.2 Hatti (HTI) Series: Hatti soils are moderately shallow (50-75 cm), well drained, have dark reddish brown red gravelly sandy clay soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Hatti series has been classified as a member of the fine, mixed, isohyperthermic, family of Typic Paleustalfs.

The thickness of the solum ranges from 57 to 74 cm. The thickness of A horizon ranges from 16 to 20 cm. Its colour is in 5 YR hue with value and chroma 3 to 4. The texture varies from sandy loam to sandy clay loam and sandy clay with 15 to 60 per cent gravel. The thickness of B horizon ranges from 45 to 56 cm. Its colour is in 5 YR hue with value 3 and chroma 3 to 4. Texture is sandy clay with 15 to 35 per cent gravel. The available water capacity is low (50-100 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Hatti (HTI) Series

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

The thickness of the solum ranges from 50 to 74 cm. The thickness of A horizon ranges from 12 to 22 cm. Its colour is in 7.5 YR and 10 YR hue with value and chroma 3 to 4. The texture varies from loamy sand to sandy loam with 15 to 30 per cent gravel. The thickness of B horizon ranges from 40 to 62 cm. Its colour is in 7.5 YR hue with value and chroma 3 to 4. Its texture is sandy clay loam with gravel content of 15 to 35 per cent. The available water capacity is medium (100-150 mm/m). Two soil phases were identified and mapped.



Landscape and soil profile characteristics of Kutegoudanahundi (KGH) Series

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

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

Landscape and soil profile characteristics of Lakkur (LKR) Series

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

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

Landscape and soil profile characteristics of Mukhadahalli (MKH) Series

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

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

Landscape Soil Profile Characteristics of Bidanagere (BDG) Series

4.1.7 Gollarahatti (GHT) Series: Gollarahatti soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Gollarahatti series has been classified as a member of the fine loamy, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 78 to 98 cm. The thickness of A-horizon ranges from 12 to 18cm. Its colour is in 5 YR and 2.5 YR hue with value 3 to 4 and chroma 4 to 6. Texture varies from loamy sand to sandy clay with 15 to 35 per cent gravel. The thickness of B horizon ranges from 66 to 81cm. Its colour is in 2.5 YR hue with value 3 to 4 and chroma 4 to 6. Texture is sandy clay loam with 15 to 35 per cent gravel. The available water capacity is medium (100-150 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Gollarahatti (GHT) Series

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

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

Landscape and soil profile characteristics of Hooradhahalli (HDH) Series

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

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

Landscape and soil profile characteristics of Mornal (MNL) Series

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

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

Landscape Soil Profile Characteristics of Nagalapur (NGP) Series

4.1.11 Niduvalalu (NDL) Series: Niduvalalu soils are very deep (>150 cm), well drained, have dark red and dark reddish brown sandy clay soils. They have developed from weathered granite gneiss and occur on nearly level to very gently sloping uplands under cultivation. Niduvalalu series has been classified as a member of the clayey – skeletal, mixed isohyperthermic family of Rhodic Paleustalfs.

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

Landscape Soil Profile Characteristics of Niduvalalu (NDL) Series

4.1.12 Kavalakkeri (KLR) Series: Kavalakkeri soils are very deep (>150 cm), moderately well drained, black to very dark brown calcareous cracking sandy clay soils. They have developed from weathered granite gneiss and occur on nearly level to very gently sloping lowlands under cultivation. Kavalakkeri series has been classified as a member of the fine, mixed, isohyperthermic (calc) Fluventic Haplustepts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 18 to 29 cm. Its colour is in 7.5 and 10YR hue with value 3 to 4 and chroma 2 to 4. The texture is sandy clay. The thickness of B horizon ranges from 131-155 cm. Its colour is in 7.5YR and 10 YR hue with value 2 to 4 and chroma 1 to 4. Its texture is sandy clay to clay. The available water capacity is very high (>200mm/). Only one soil phase was identified and mapped.

Landscape and Soil Profile characteristics of Kavalakkeri (KLR) Series

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

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

Landscape and soil profile characteristics of Thimmasandra (TSD) Series

4.2 Soils of Alluvial landscape

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

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

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

Landscape and soil profile characteristics of Kavalur (KVR) series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Sidaganhalli-4 Microwatershed

Series Name: Harve (HRV) **Pedon:** R-10

Location: $15^0$25'11.63"N, $76^0$22'03.65"E Jabbaragudda village, Koppal Taluk and District

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Loamy-skeletal, mixed, isohyperthermic (Paralithic) Rhodustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-15	Ap	65.64	9.07	25.28	29.04	12.99	9.00	3.48	11.15	50	scl	12.87	4.81
15-29	Bt1	56.13	7.75	36.12	27.81	11.43	7.21	1.44	8.24	60	sc	15.69	6.24
29-47	Bt2	63.42	6.53	30.05	32.38	13.93	7.48	5.74	3.89	60	scl	15.41	9.29

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-15	6.05	-	-	0.21	0.93	-	8.89	1.96	0.50	0.08	11.43	11.24	0.44	100.00	0.73
15-29	5.99	-	-	0.15	0.29	-	9.72	2.75	0.51	0.09	13.07	12.71	0.35	100.00	0.74
29-47	6.07	-	-	0.11	0.38	-	9.35	2.47	0.49	0.06	12.36	12.71	0.42	97.29	0.44

Contd...

Series Name: Hatti (HTI), **Pedon:** R-20

Location: $15^0$21'45"N, $76^0$03'06" E Lakshmapura village Koppal Taluk and District

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-16	Ap	65.33	12.19	22.48	13.79	11.32	13.37	18.31	8.54	15-20	scl	16.83	5.49
16-41	Bt1	41.54	14.04	44.42	6.47	6.26	9.50	13.36	5.95	15-20	c	27.26	16.64
41-64	Bt2	48.71	8.48	42.81	26.06	7.55	5.38	6.31	3.41	55-60	sc	27.22	12.63

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-16	7.11			0.109	0.92		21.06	8.23	0.39	0.06	29.74	20.19	0.89	100	0.30
16-41	7.54			0.220	0.92		21.93	8.47	0.23	0.27	30.90	31.31	0.70	99	0.85
41-64	7.82			0.168	0.55		19.43	7.09	0.31	0.47	27.30	26.57	0.62	100	1.77

Contd...

Soil Series: Lakkur (LKR), **Pedon:** RM-8.

Location: $15^0$04'26.3"N, $75^0$37'84.1"E, (4D4A3I1f), Belhatti village, Shirahatti taluk, Gadag distrtict

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

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

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

Contd...

Series Name: Mukahadahalli (MKH), **Pedon:** R-11

Location: $15^0$22'05.4"N, $76^0$04'10.3"E, Halageri village, Koppal Taluk and District

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey-skeletal, mixed, isohyperthermic Typic Haplustalfs

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

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

Contd...

Series: Bidanagere (BDG), **Pedon**: RM-3

Location: $13^0$22'11"N, $76^0$38'03"E, (4D3D8G1a), Tharabenahalli village, Chikkanayakanahalli Taluk, Tumakuru District.

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Rhodic, Paleustalfs

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

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

Contd

Soil Series: Gollarahatti (GHT), **Pedon:** RM-2

Location: $50^0$04'88.8"N, $75^0$37'65.2"E, (4D4A3I1f), Belhatti village, Shirahatti taluk, Gadag district.

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine- loamy, mixed, isohyperthermic Typic Rhodustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-26	Ap	83.22	5.74	11.05	9.71	11.73	16.68	27.10	16.58	30	ls	-	-
26-63	Bt1	55.91	13.36	30.73	13.05	9.66	11.10	14.29	7.81	20	scl	-	-
63-84	Bt2	57.17	11.38	31.45	10.53	10.11	12.28	13.83	10.42	20	scl	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-26	5.70	-	-	0.06	0.20	0.00	1.50	0.60	0.09	0.13	2.32	3.17	0.29	73.00	4.10
26-63	6.26	-	-	0.04	0.24	0.00	7.35	1.55	0.09	0.17	9.15	9.89	0.32	93.00	1.72
63-84	6.50	-	-	0.05	0.20	0.47	-	-	0.09	0.21	0.30	10.18	0.32	100.00	2.06

Contd...

Soil Series: Hooradhahalli (HDH), **Pedon:** RM-69

Location: $13^0$24'31"N, $76^0$33'41"E, (4D3D8G2d), Hesarahalli village, Chikkanayakanahalli taluk, Tumukura district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Rhodic Paleustalfs

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

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

Contd...

Series Name: Mornal (MNL), **Pedon:** R-12

Location: $15^0$22'75"N, $76^0$05'16.1" Halageri village, Koppal Taluk and District

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

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-17	7.89	-	-	0.137	0.33	0.00	4.92	3.35	0.35	0.45	9.07	9.01	0.67	100	5.04
17-31	8.19	-	-	0.31	0.45	0.00	7.24	5.16	0.16	0.15	12.70	13.57	0.35	94	1.12
31-56	8.2	-	-	0.414	0.53	0.00	6.49	5.32	0.11	0.13	12.05	18.55	0.41	65	0.71
56-104	8.64	-	-	0.422	0.37	0.00	6.21	4.64	0.16	0.14	11.15	15.16	0.42	74	0.95
104-126	8.71	-	-	0.436	0.2	0.00	7.06	6.31	0.09	0.33	13.79	14.52	0.44	95	2.31

Contd...

Series Name: Nagalapur (NGP), **Pedon :**R-10

Location: $15^0$26’38.0”N, $76^0$10’27.0” E Budashettynala village, Koppal Taluk and District

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey- skeletal, mixed, isohyperthermic Typic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-16	Ap	78.43	6.36	15.21	25.23	18.82	14.04	13.22	7.12	30	sl	9.32	5.56
16-38	Bt1	46.97	8.53	44.51	14.33	12.34	7.43	6.80	6.07	30	sc	18.70	13.79
38-58	Bt2	51.92	7.48	40.60	20.98	10.07	7.37	7.48	6.02	40	sc	17.93	13.75
58-81	Bt3	54.05	7.18	38.77	27.07	10.58	5.91	5.81	4.67	50	sc	17.92	11.87
81-104	Bt4	59.03	8.93	32.04	21.88	13.11	8.88	8.05	7.12	50	scl	16.63	10.55
104-126	BC	62.35	9.26	28.40	21.19	14.51	9.88	8.13	8.64	60	scl	15.03	10.06

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-16	6.77	-	-	0.09	0.82	-	3.52	2.14	0.18	0.03	5.87	7.10	0.47	82.70	0.46
16-38	6.89	-	-	0.06	0.57	-	9.35	3.85	0.10	0.21	13.50	14.70	0.33	91.87	1.40
38-58	6.80	-	-	0.06	0.52	-	8.76	3.42	0.10	0.26	12.55	14.20	0.35	88.35	1.85
58-81	6.84	-	-	0.06	0.32	-	7.67	2.77	0.10	0.58	11.12	12.90	0.33	86.18	4.48
81-104	6.86	-	-	0.05	0.20	-	6.97	2.07	0.09	0.95	10.07	11.90	0.37	84.59	7.95
104-126	6.70	-	-	0.07	0.10	-	5.53	1.77	0.07	0.73	8.09	9.40	0.33	86.09	7.77

Contd...

Series Name: Niduvalalu (NDL), **Pedon:** R-20
Location: $15^0$12'78.8"N, $75^0$57'44.0" E Raghunathanahalli village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey –skeletal, mixed isohyperthermic Rhodic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-16	Ap	79.83	7.02	13.15	9.36	11.02	19.54	28.59	11.33	35-40	sl	14.30	5.17
16-31	Bt1	54.75	10.89	34.36	12.81	7.47	12.17	11.95	10.35	55-60	scl	24.67	14.17
31-44	Bt2	44.64	2.31	53.06	17.06	8.48	7.19	8.05	3.86	65-70	c	30.02	17.19
44-79	Bt3	47.28	2.50	50.21	24.17	8.20	6.07	5.96	2.88	65-70	sc	27.19	14.87
79-107	Bt4	47.79	8.17	44.04	13.38	5.72	11.11	11.87	5.72	60-65	sc	25.96	14.23
107-140	Bt5	46.16	3.57	50.27	21.75	7.57	6.40	6.72	3.73	60-65	sc	27.28	15.13
140-180	Bt6	49.47	3.94	46.59	22.49	8.21	6.29	7.78	4.69	65-70	sc	27.56	14.76

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

Contd...

Series Name: Kavalakeri (KLR), **Pedon :** R-5
Location: $15^0$27'55.2"N, $76^0$15'48.0" E Kenchanadoni village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic (calc) Fluventic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-21	Ap	41.67	28.70	29.62	6.62	10.58	5.70	8.00	10.76	-	cl	22.02	15.06
21-40	Bw1	32.23	29.16	38.61	3.76	4.03	3.04	8.24	13.16	-	cl	26.28	19.49
40-70	Bw2	37.41	26.13	36.46	7.52	6.25	4.62	8.61	10.42	-	cl	26.65	18.87
70-106	Bw3	46.43	18.15	35.42	13.93	14.29	5.98	5.98	6.25	-	sc	22.83	17.66
106-137	Bw4	55.64	12.91	31.45	10.59	8.16	12.67	11.46	12.76	-	scl	24.04	12.85
137-162	Bw5	47.16	16.68	36.16	2.88	4.80	5.68	17.12	16.68	-	sc	30.46	16.24

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-21	7.11	-	-	0.33	0.82	8.84	-	-	0.10	0.67	-	19.50	0.66	100.00	3.42
21-40	7.50	-	-	0.32	0.40	6.63	-	-	0.15	0.99	-	23.20	0.60	100.00	4.26
40-70	7.68	-	-	0.33	0.34	8.19	-	-	0.09	1.18	-	21.90	0.60	100.00	5.38
70-106	7.82	-	-	0.23	0.42	6.50	-	-	0.07	1.36	-	21.80	0.62	100.00	6.23
106-137	7.86	-	-	0.23	0.32	3.57	-	-	0.08	0.95	-	17.30	0.55	100.00	5.47
137-162	7.75	-	-	0.31	0.38	3.90	-	-	0.09	1.01	-	22.10	0.61	100.00	4.55

Contd...

Soil Series: Thimmasandra (TSD), **Pedon:** R-14

Location: 11°55'64.2"N, 76°51'82.9" E, (4B3A5K3b), Somanapura village, Chamarajanagara taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification**: Fine, mixed, isohyperthermic Typic Haplustepts

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-19	8.46	-	-	0.175	1.01	4.45	-	-	1.91	0.18		36.61	0.59	100	0.19
19-33	8.65	-	-	0.16	0.81	6.41	-	-	0.77	0.39		23.98	0.59	100	0.64
33-58	8.94	-	-	0.26	0.56	6.90	-	-	0.82	2.24		33.59	0.54	100	2.67
58-83	9.13	-	-	0.335	0.4	8.01	-	-	0.30	1.01		36.72	0.58	100	1.10
83-95	9.05	-	-	0.412	0.36	4.58	-	-	0.76	4.17		38.88	0.57	100	4.30
95-116	8.96	-	-	0.4	0.28	4.21	-	-	0.96	4.02		43.63	0.69	100	3.68

Contd...

Series Name: Kavalura (KVR), **Pedon:** A2/RM-9

Location: $15^0$18'86.8"N, $75^0$56'56.3"E, Kavalura village, Koppal Taluk and District

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, smectitic, isohyperthermic (Calc) Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-24	Ap	36.18	17.80	46.02	7.04	7.47	6.62	9.28	5.76	10	c	28.20	18.75
24-50	Bss1	38.79	15.36	45.85	6.25	6.25	9.70	10.67	5.93	05	c	27.16	18.81
50-85	Bss2	36.80	14.66	48.54	9.63	8.23	7.03	7.58	4.33	<5	c	30.16	22.17
85-124	Bss3	22.66	17.24	60.09	4.18	3.85	5.28	5.06	4.29	<5	c	40.34	31.42

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-24	8.4	-	-	0.265	0.2	8.04	-	-	0.97	0.65		43.25	0.94		0.60
24-50	9.27	-	-	0.23	0.37	8.04	-	-	0.31	3.21		41.66	0.91		3.08
50-85	9.44	-	-	0.297	0.41	8.64	-	-	0.35	6.43		43.99	0.91		5.85
85-124	9.37	-	-	0.46	0.41	11.40	-	-	0.42	7.99		51.09	0.85		6.26

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

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

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

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

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

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

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

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

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

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

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

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

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

The land capability subclasses are recognised based on the dominant limitations observed within a given land capability class. The subclasses are designated by adding a lower case letter like 'e', 'w', 's', or 'c' to the class numeral. The subclass "e" indicates that the main hazard is risk of erosion, "w" indicates drainage or wetness as a limitation for plant growth, "s" indicates shallow soil depth, coarse or heavy textures, calcareousness, salinity/alkali 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 identified in grouping the soil map units. They are stony or rocky (0), erosion hazard (slope, erosion) (1), coarse texture (sand, loamy sand, sandy loam) (2), fine texture (cracking clay, silty clay) (3), slowly permeable subsoil (4), coarse underlying material (5), salinity/alkali (6), stagnation, overflow, high ground water table (7), soil depth (8) and fertility problems (9). The capability units thus identified have similar soil and land characteristics that respond similarly to a given level of management. The soils of the microwatershed have been classified up to land capability subclass level.

The 28 soil map units identified in the Sidaganhalli-4 microwatershed are grouped under 2 Land capability classes and 6 land capability subclasses (Fig. 5.1). Entire area is suitable for agriculture. Major area of about 372 ha (70%) has good lands (Class II) with moderate problems of soil, wetness and erosion and about 137 ha (26%) has moderately good lands (Class III) with severe limitations of soil and erosion, 16 ha (3%) area is under rock outcrops 5 ha (1%) is under is under habitation.

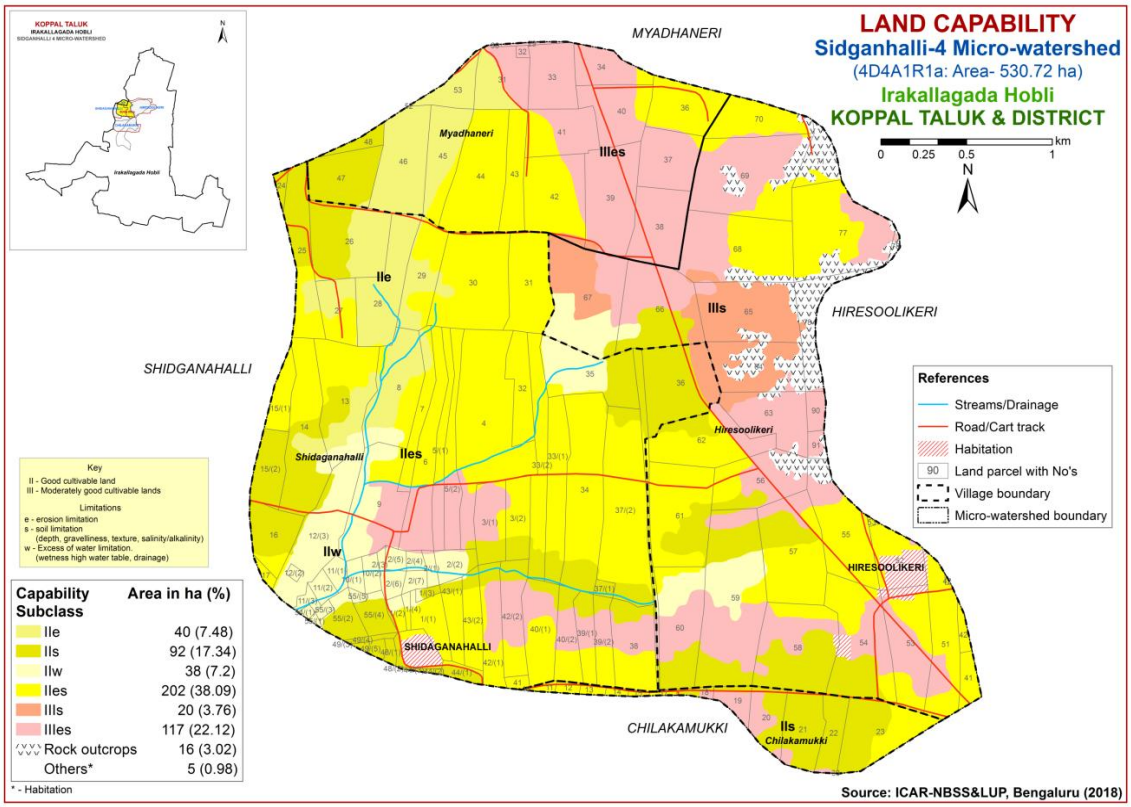


Fig. 5.1 Land Capability map of Sidaganhalli-4 Microwatershed

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 (Fig. 5.2).

An area of about 96 ha (18%) is under shallow to moderately shallow (25-75 cm) soils and are distributed in the southern and southwestern part of the microwatershed. Moderately deep (75-100 cm) and deep (100-150 cm) soils occupy a major area of about 317 ha (60%) and occur in the major part of the microwatershed and very deep (>150 cm) soils occupy an area of 96 ha (18%) and occur in the western part of the microwatershed. The most productive lands cover about 301 ha (57%) where all climatically adopted long duration crops be grown. The problem soils cover about 10 ha (2%) area where only short duration crops can be grown and the probability of crop failure is high.

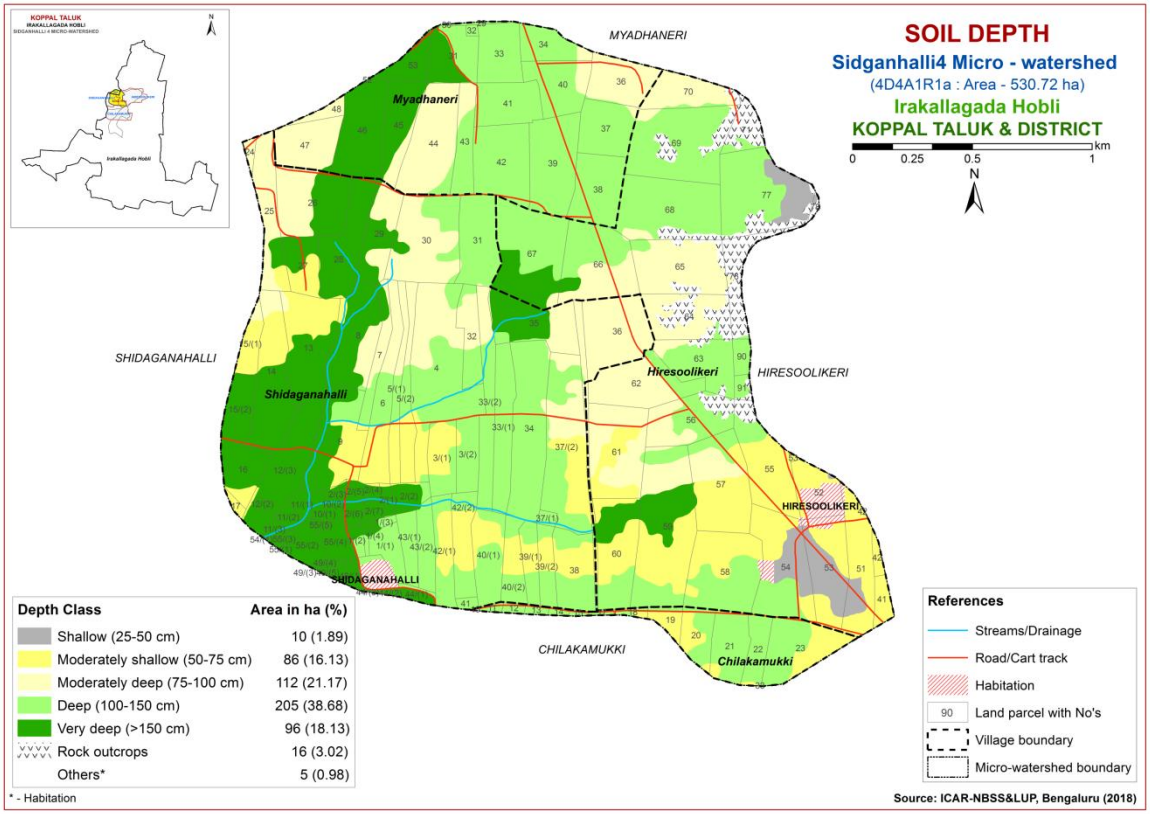


Fig. 5.2 Soil Depth map of Sidaganhalli-4 Microwatershed

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 showing sandy, loamy and clayey at the surface was generated. The area extent and their geographical distribution in the microwatershed is shown in Fig.5.3.

About 163 ha (31%) area has loamy soils and occur in the northeastern and southwestern part and major area of about 347 ha (65%) has clayey texture at the surface and occur in all parts of the microwatershed.

About 347 ha (65%) soils are productive lands (Fig. 5.3) 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 in clayey soils.

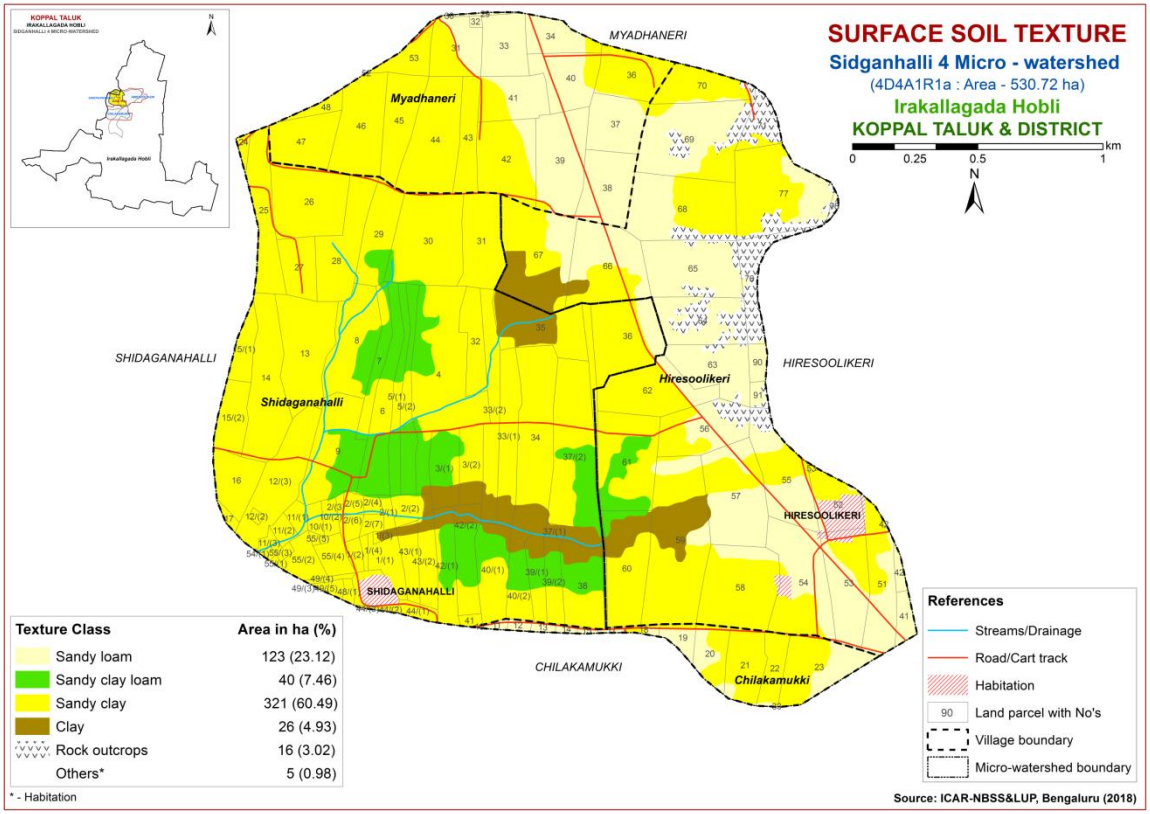


Fig. 5.3 Surface Soil Texture map of Sidaganhalli-4 Microwatershed

5.4 Soil Gravelliness

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

An area of about 95 ha (18%) has non gravelly (<15%) soils and occur in the western part and major area of about 415 ha (78%) has gravelly to very gravelly (15-60%) soils and occur in all parts of the microwatershed.

An area of about 95 ha (18%) are most productive lands with respect to gravelliness. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem lands cover about 14 ha (3%) that are very gravelly where only medium or short duration crops can be grown.

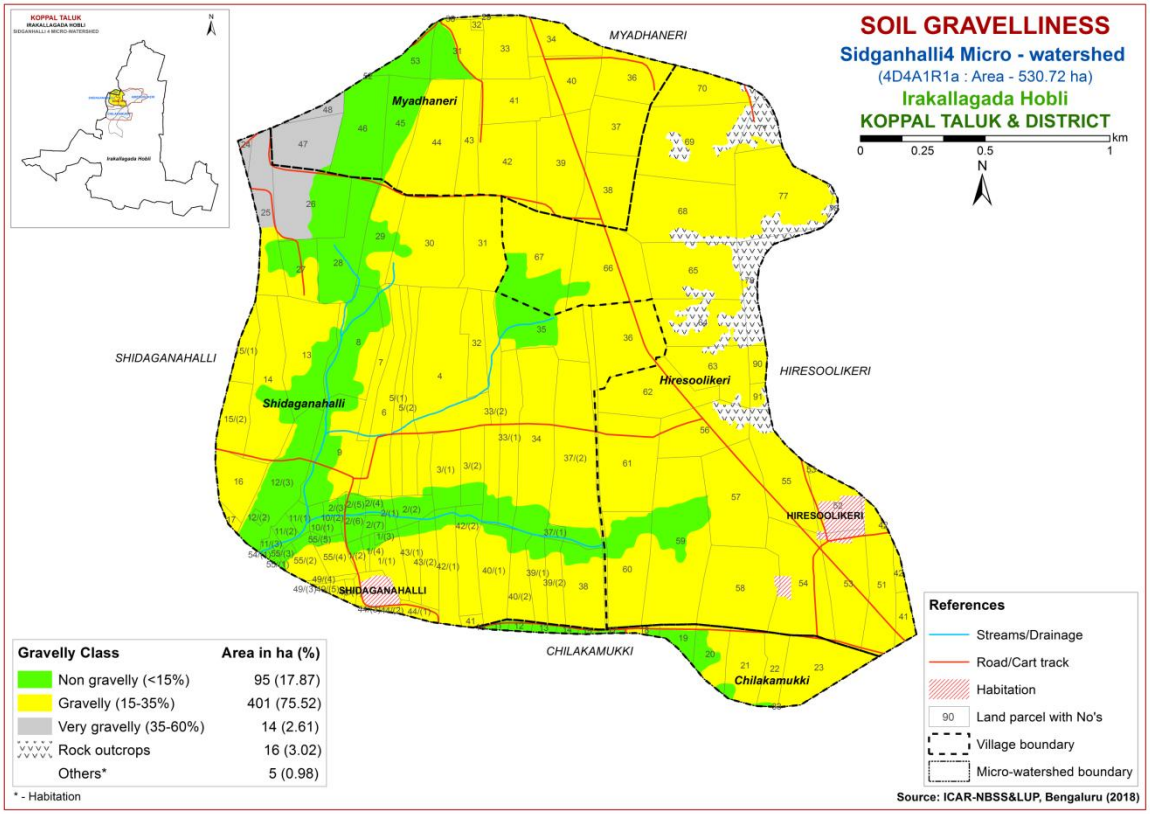


Fig. 5.4 Soil Gravelliness map of Sidaganhalli-4 Microwatershed

5.5 Available Water Capacity

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

An area of about 342 ha (64%) is very low to low (<50-100 mm) and occur in major part of the microwatershed. An area of about 117 ha (22%) is medium (101-150 mm/m) in available water capacity and occur in the central and southern part of the microwatershed and an area of about 51 ha (10%) is very high (>200 mm/m) and occur in the southern and central part.

An area of about 149 ha (28%) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. An area of about 51 ha (10%) has soils that have very high potential (>200 mm/m) with regard to available water capacity where all climatically adapted long duration crops can be grown successfully.

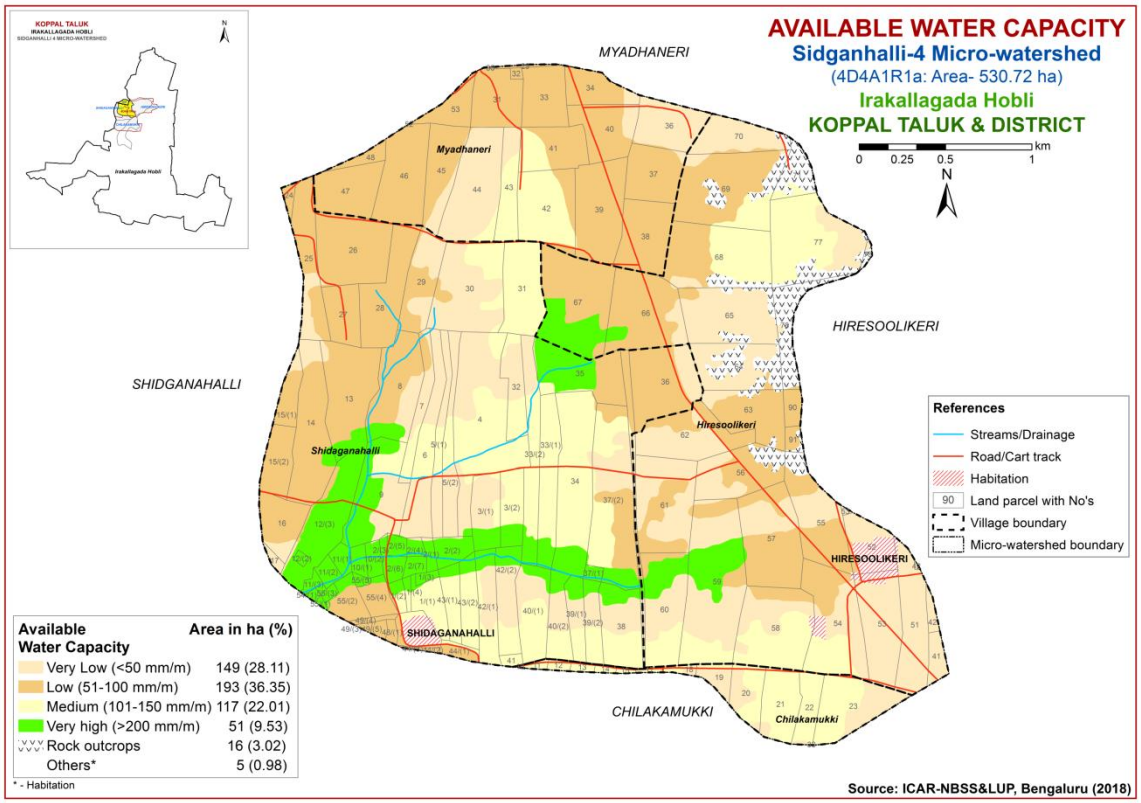


Fig. 5.5 Soil Available Water Capacity map of Sidaganhalli-4 Microwatershed

5.6 Soil Slope

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

About 51 ha (10%) area is under nearly level (0-1%) lands and occur in the central and southern part of the microwatershed and major area of 459 ha (86%) falls under very gently sloping (1-3% slope) lands. In all these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures and gently sloping (3-5%) lands occur in very minor area.

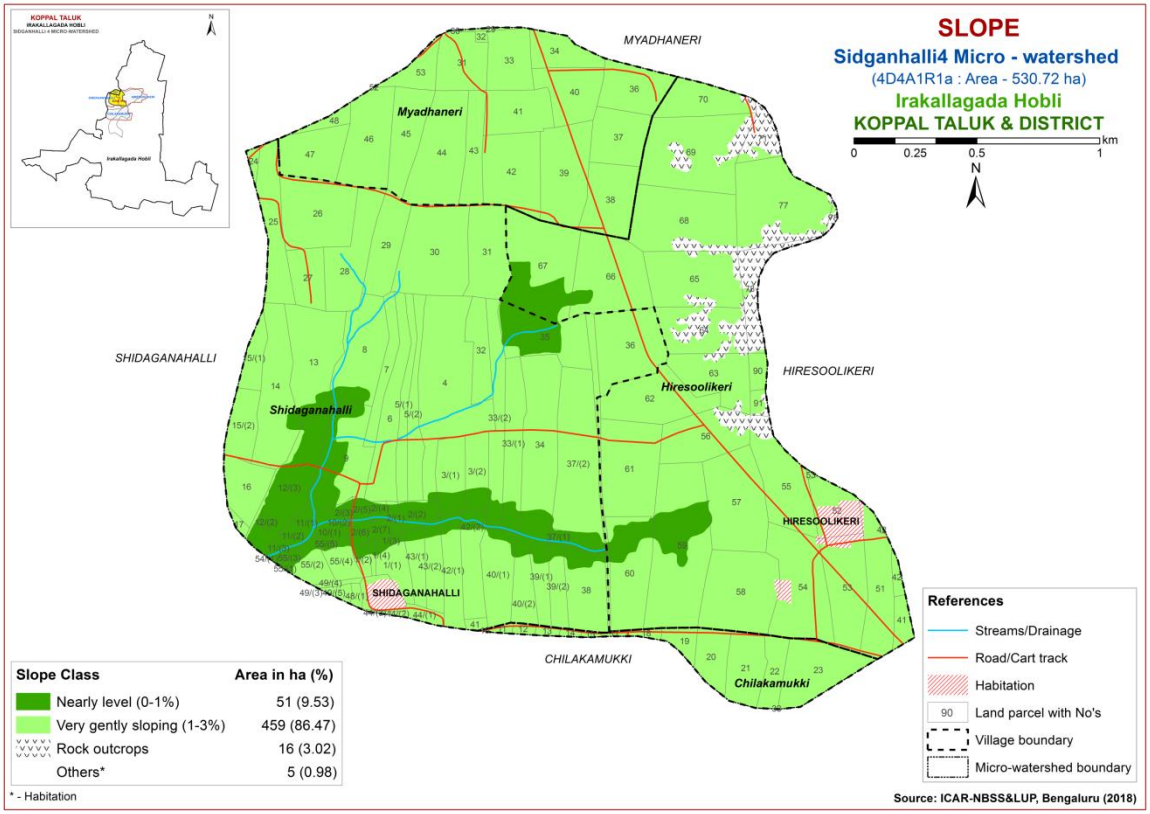


Fig. 5.6 Soil Slope map of Sidaganhalli-4 Microwatershed

5.7 Soil Erosion

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

About 150 ha (28%) area is slightly eroded (e1 class) and occur in the central, western and southern part of the microwatershed and major area of about 359 ha (68%) has soils that are moderately eroded (e2 class) and are problematic and need appropriate soil and water conservation and other land development measures.

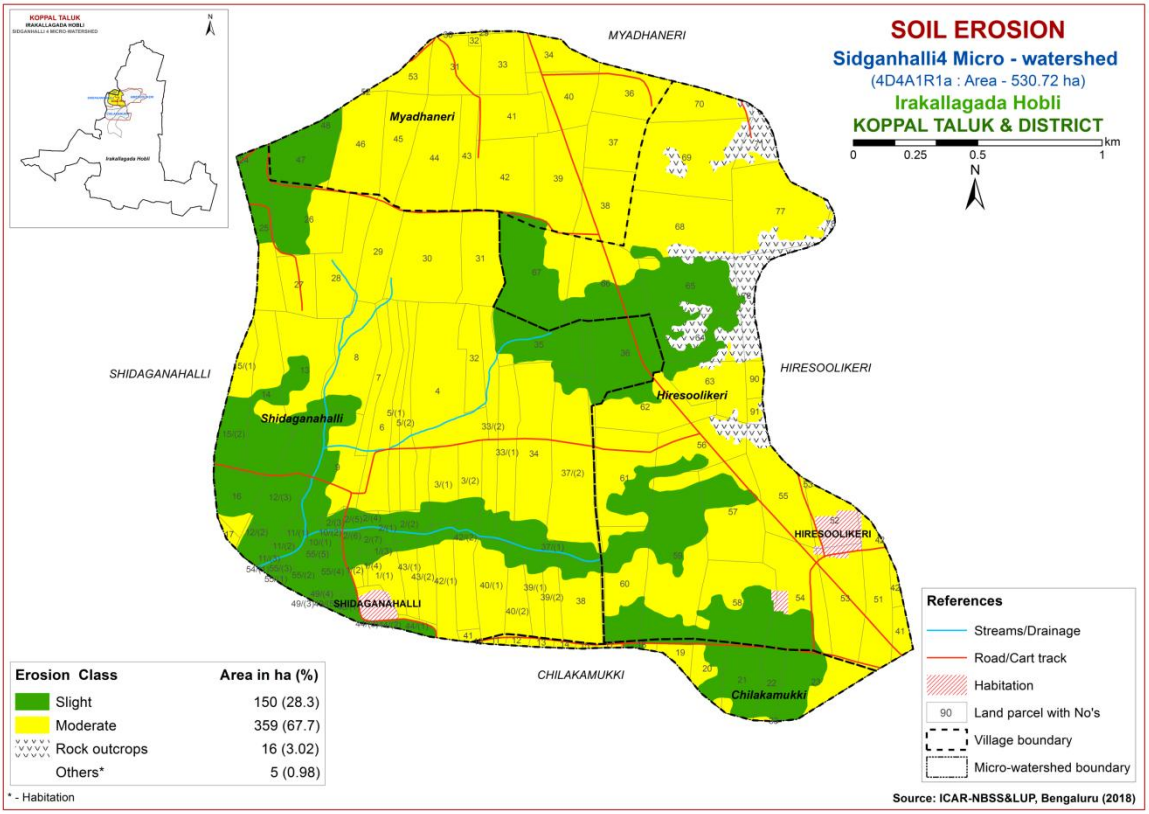


Fig. 5.7 Soil Erosion map of Sidaganhalli-4 Microwatershed

Chapter 6

FERTILITY STATUS

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

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

6.1 Soil Reaction (pH)

The soil analysis of the Sidaganhalli-4 microwatershed for soil reaction (pH) showed that small area of about 36 ha (7%) is slightly acid (pH 6.0-6.5) and occur in the southern and northern part, major area of about 347 ha (65%) is under neutral (pH 6.5-7.3). About 126 ha (24%) area is slightly to moderately alkaline (pH 7.3- 8.4) and occur in the northern 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} and as such the soils are non saline (Fig 6.2.)

6.3 Organic Carbon (OC)

The soil organic carbon content (an index of available Nitrogen) of the microwatershed is medium (0.5-0.75%) in an area of 181 ha (34%) and occur in the northeastern and southeastern part of the microwatershed and major area of about 328 ha (62%) is high (>0.75%) in organic carbon and is distributed in the southwestern and western part of the microwatershed. (Fig.6.3).

6.4 Available Phosphorus

An area of about 44 ha (8%) is medium (23-57 kg/ha) and occur in the northern part and high (57 kg/ha) in major area of 466 ha (88%) in the microwatershed (Fig 6.4).

6.5 Available Potassium

An area of 90 ha (17%) is low (<145 kg/ha) in available potassium and occur in the southeastern part, medium (145-337 kg/ha) in area of 325 ha (61%) and occur in

major part and High (>337 kg/ha) in an area of 94 ha (18%) and occur in the central and northern part of the microwatershed (Fig.6.5).

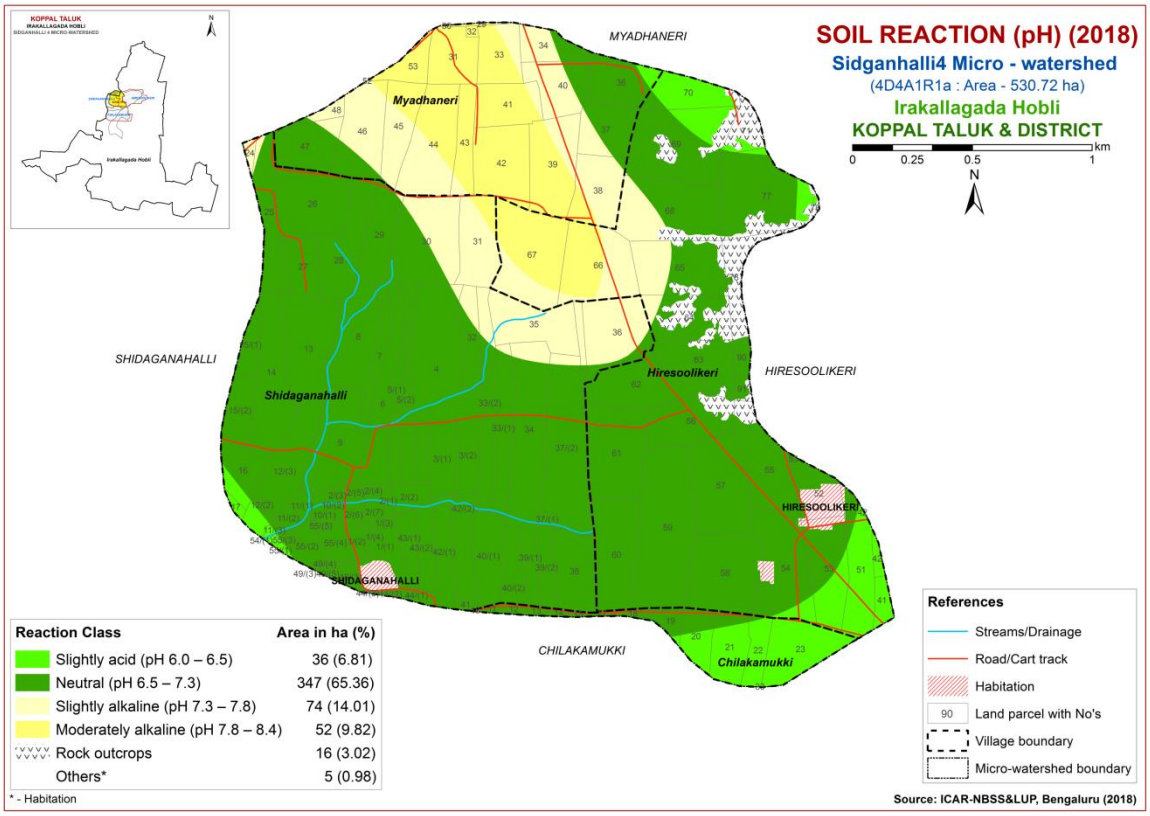


Fig.6.1 Soil Reaction (pH) map of Sidaganhalli-4 Microwatershed

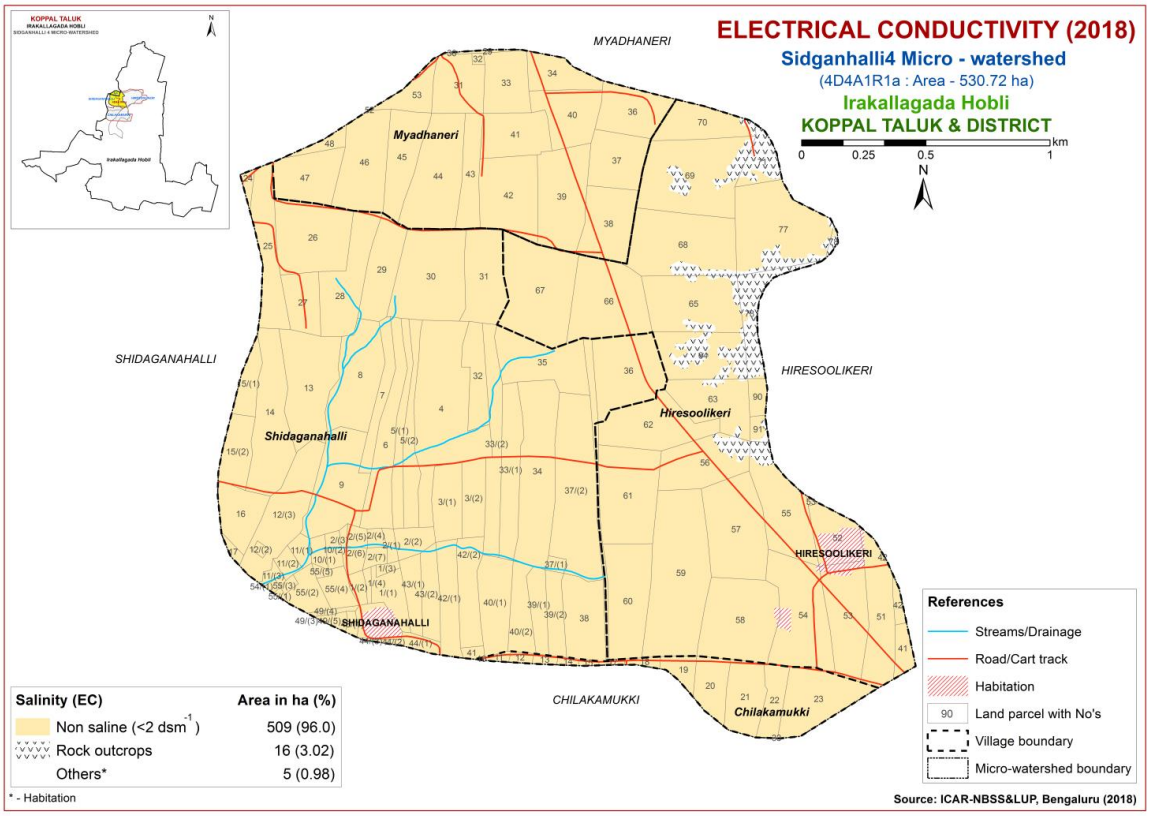


Fig.6.2 Electrical Conductivity (EC) map of Sidaganhalli-4 Microwatershed

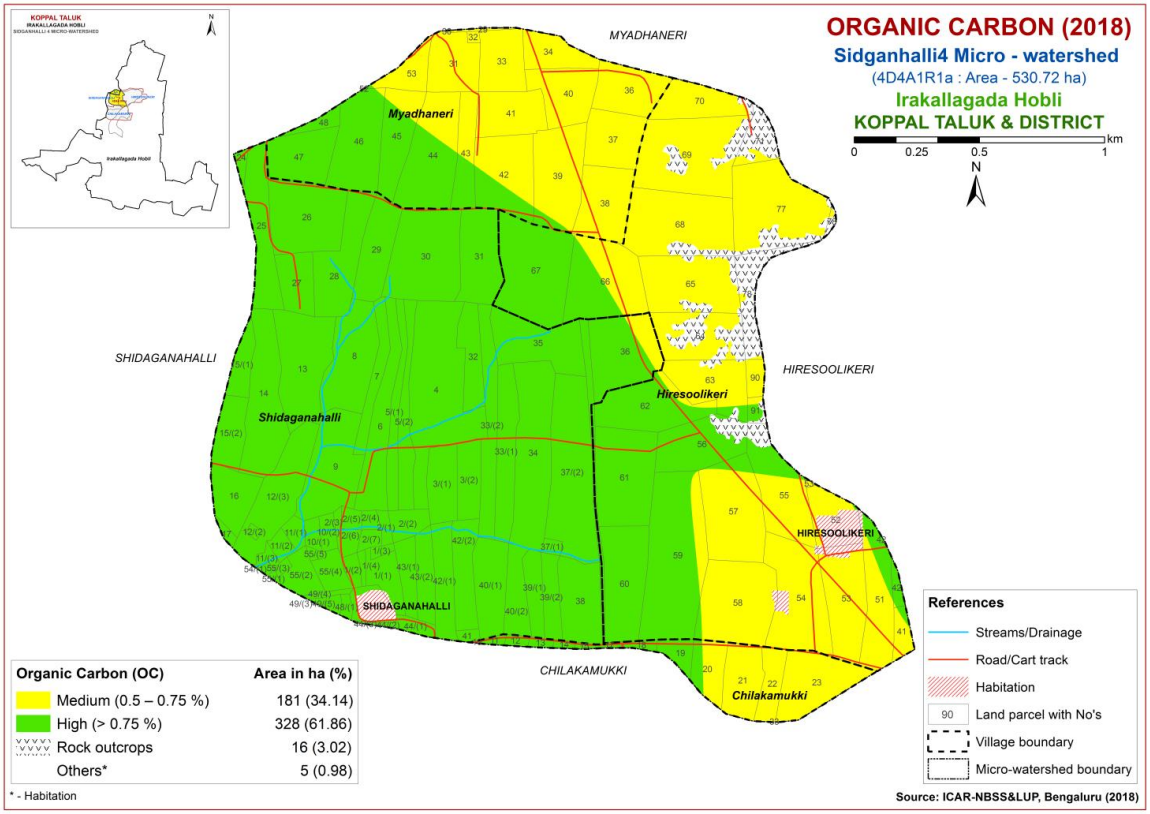


Fig.6.3 Soil Organic Carbon map of Sidaganhalli-4 Microwatershed

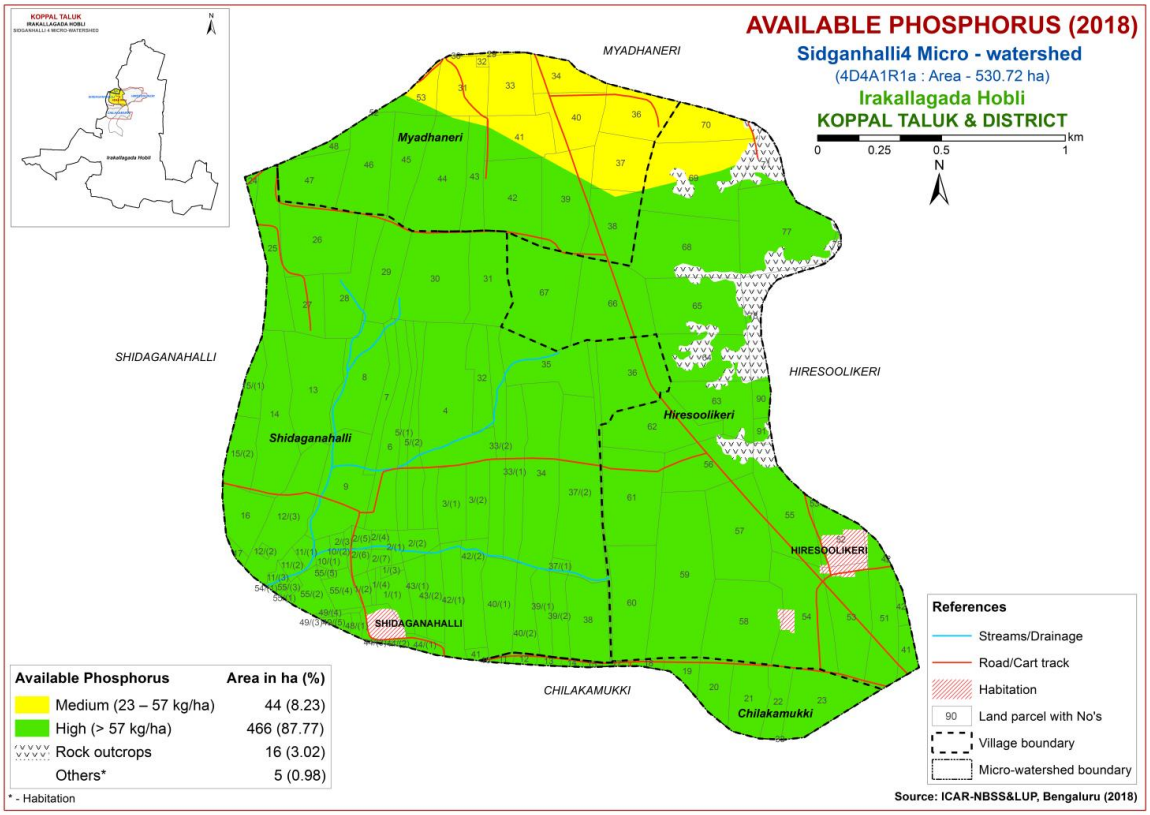


Fig.6.4 Soil Available Phosphors map of Sidaganhalli-4 Microwatershed

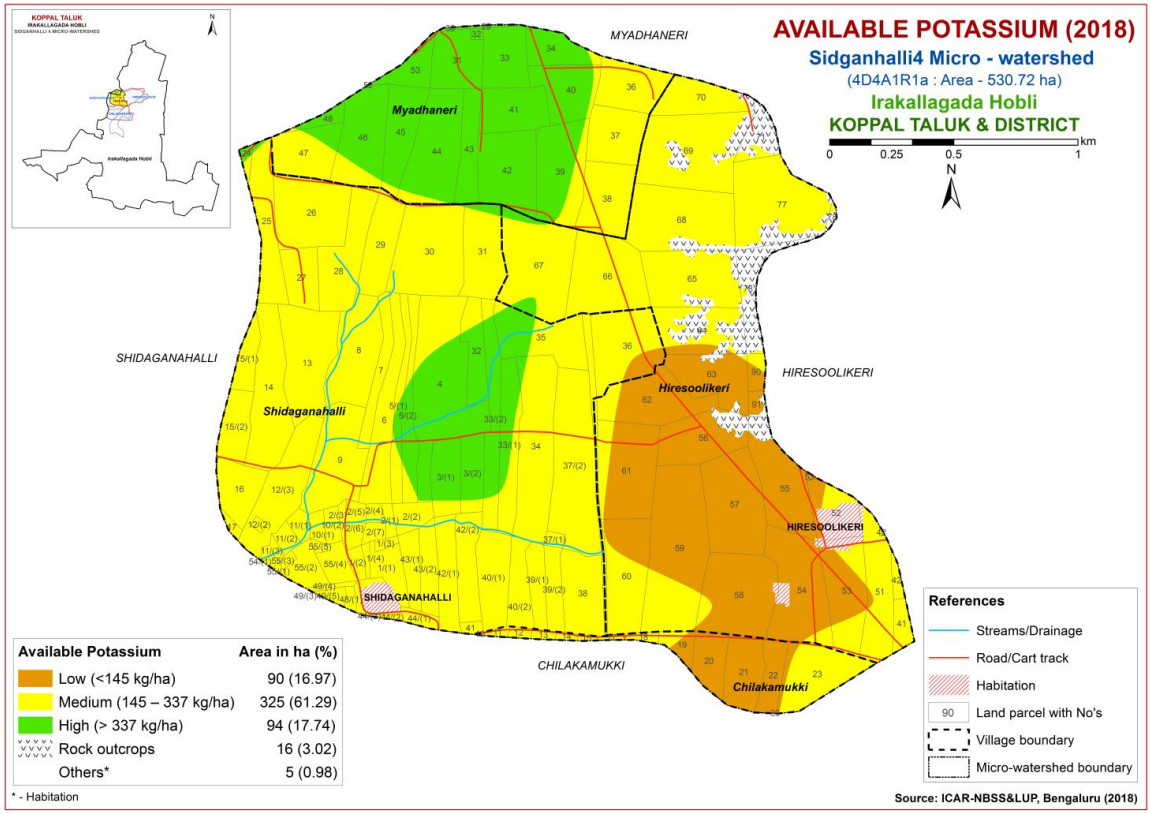


Fig.6.5 Soil Available Potassium map of Sidaganhalli-4 Microwatershed

6.6 Available Sulphur

Available sulphur is medium in small area of about 10 ha (2%) and occur in the northern part and high (>20 ppm) in major area of 499 ha (94%) and occur in all parts of the microwatershed (Fig.6.6).

6.7 Available Boron

Available boron content is low (<0.5 ppm) in small area of 48 ha (9%) in the microwatershed and is distributed in eastern part of the microwatershed and an area of about 293 ha (55%) is medium (0.5-1.0 ppm) in available boron and is distributed in the central, southern and northern part of the microwatershed (Fig.6.7). These areas need to be applied with sodium borate @ 10kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency. High (>1.0 ppm) in 169 ha (32%) area and occur in the western part.

6.8 Available Iron

Available iron is sufficient (>4.5 ppm) in the entire microwatershed area (Fig 6.8).

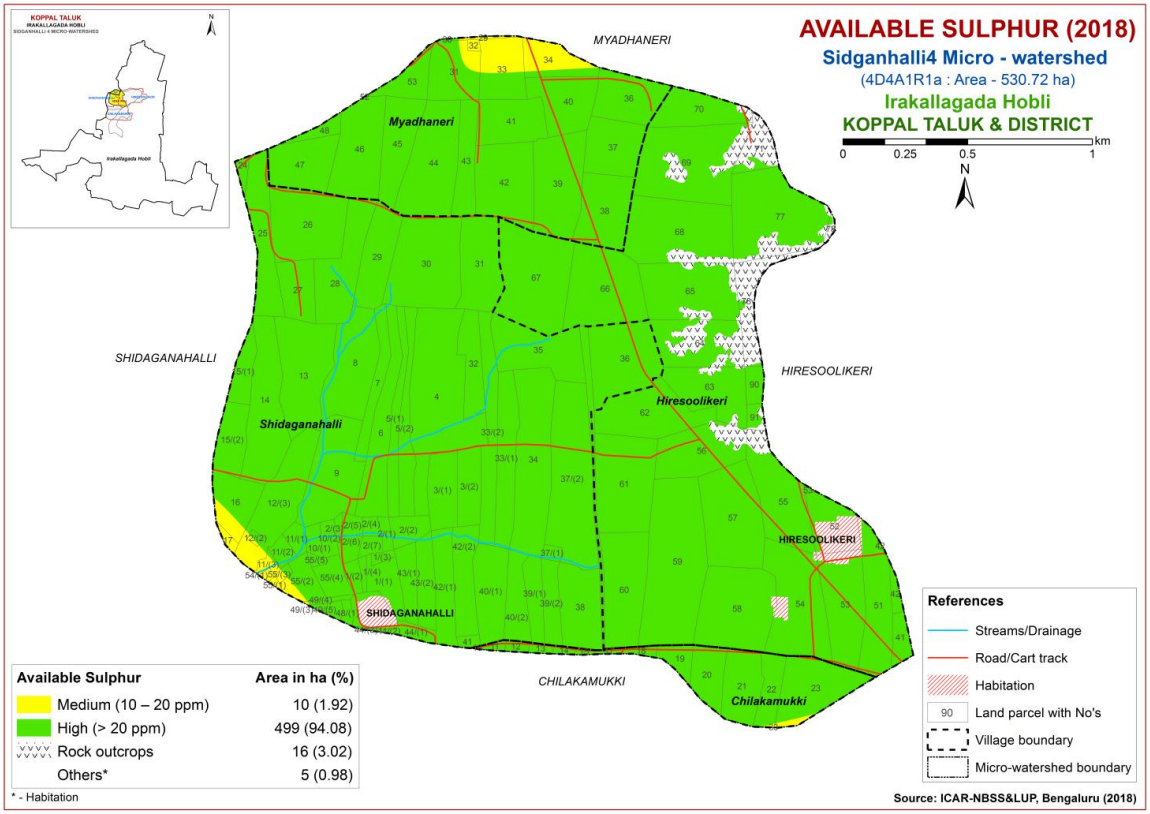


Fig.6.6 Soil Available Sulphur map of Sidaganhalli-4 Microwatershed

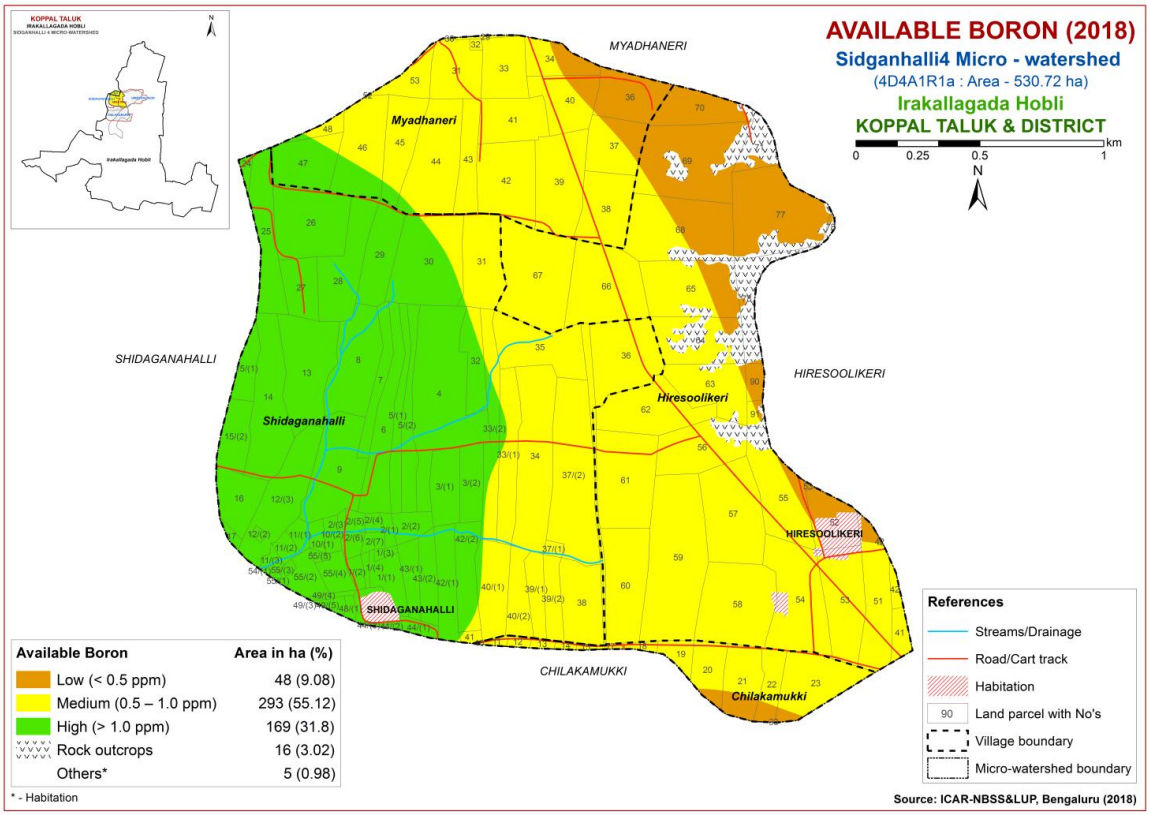


Fig.6.7 Soil Available Boron map of Sidaganhalli-4 Microwatershed

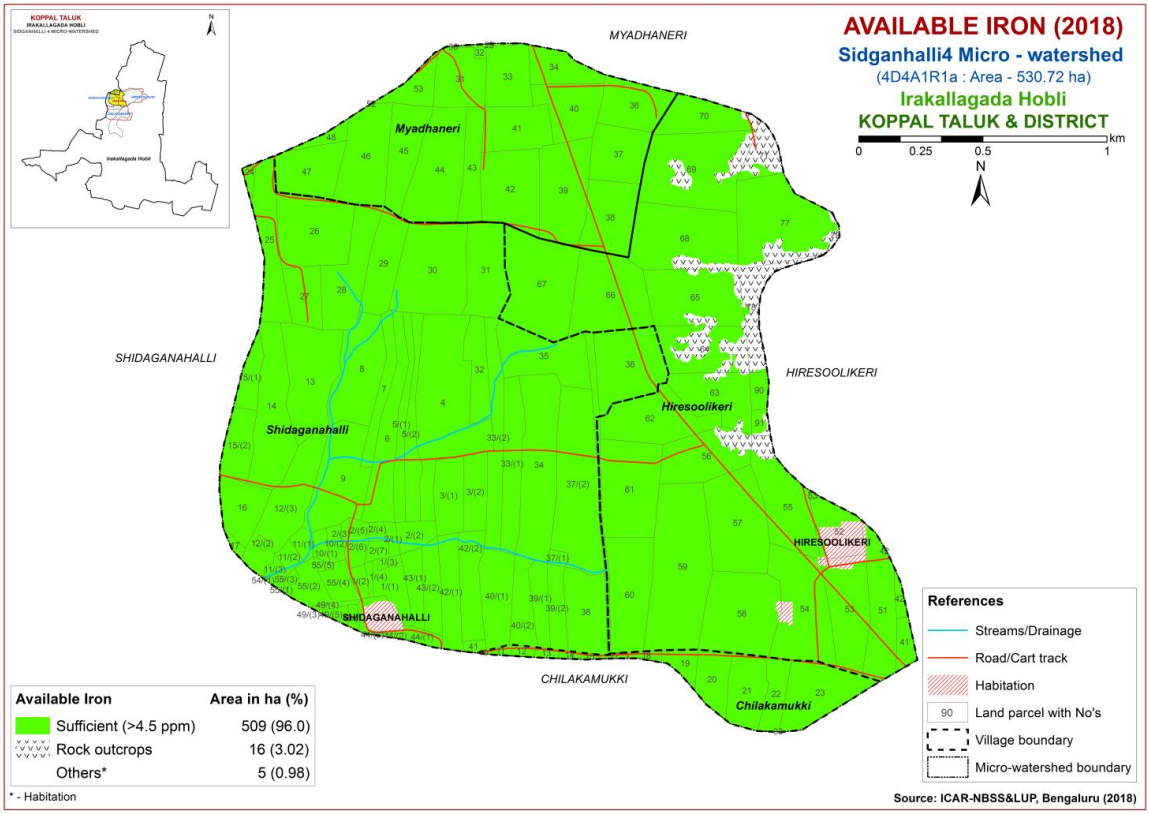


Fig.6.8 Soil Available Iron map of Sidaganhalli-4 Microwatershed

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc is sufficient (>0.6 ppm) in the entire microwatershed area Fig 6.11).

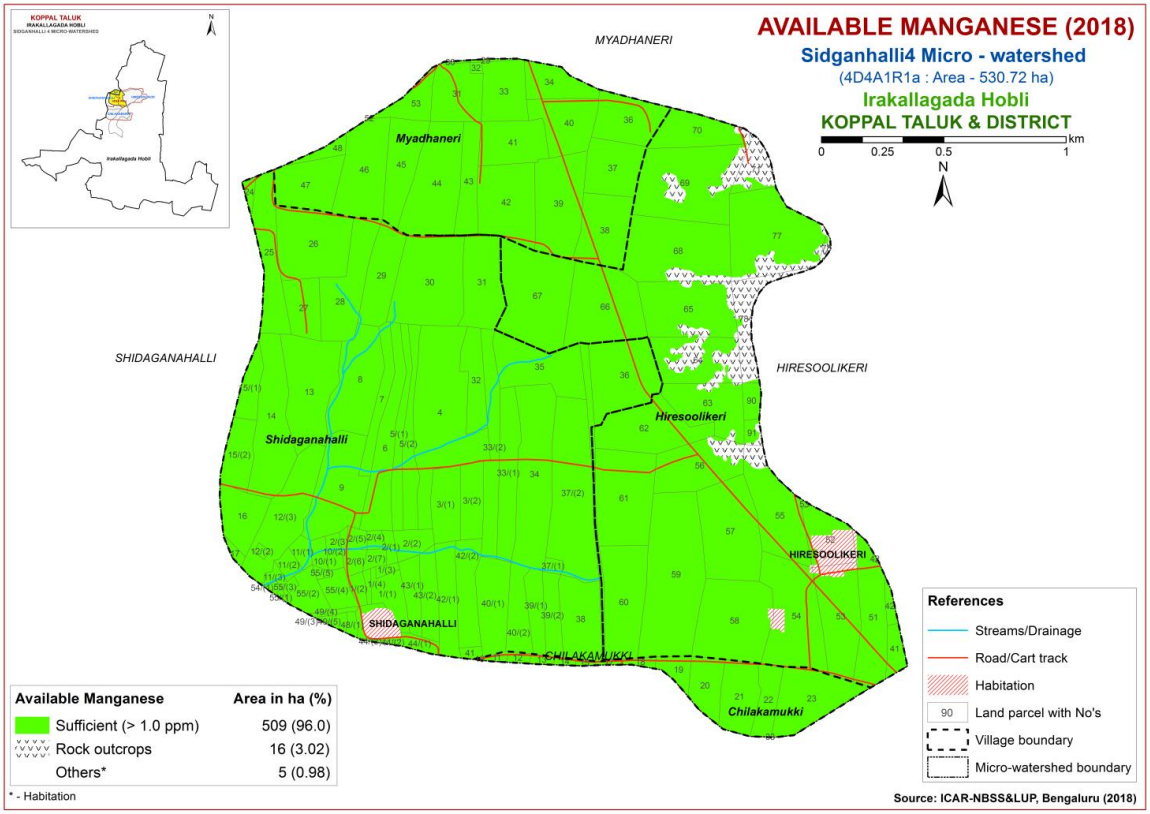


Fig.6.9 Soil Available Manganese map of Sidaganhalli-4 Microwatershed

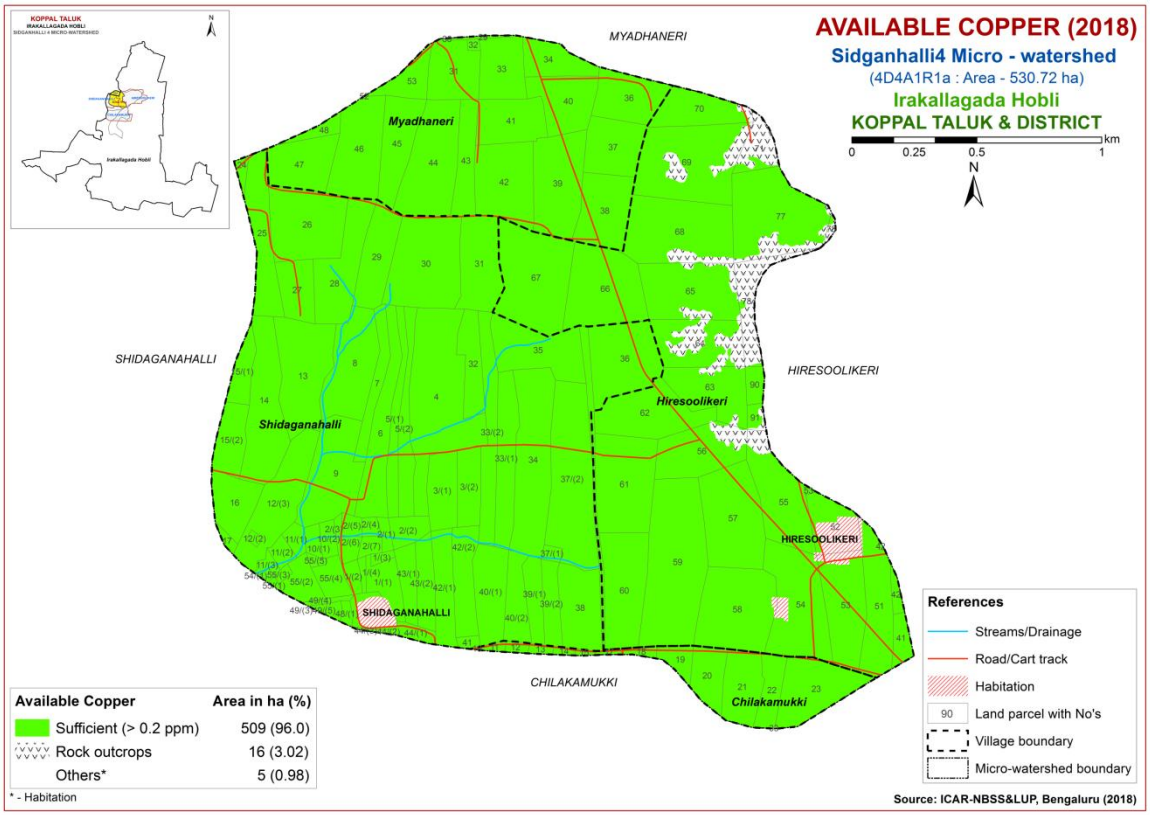


Fig.6.10 Soil Available Copper map of Sidaganhalli-4 Microwatershed

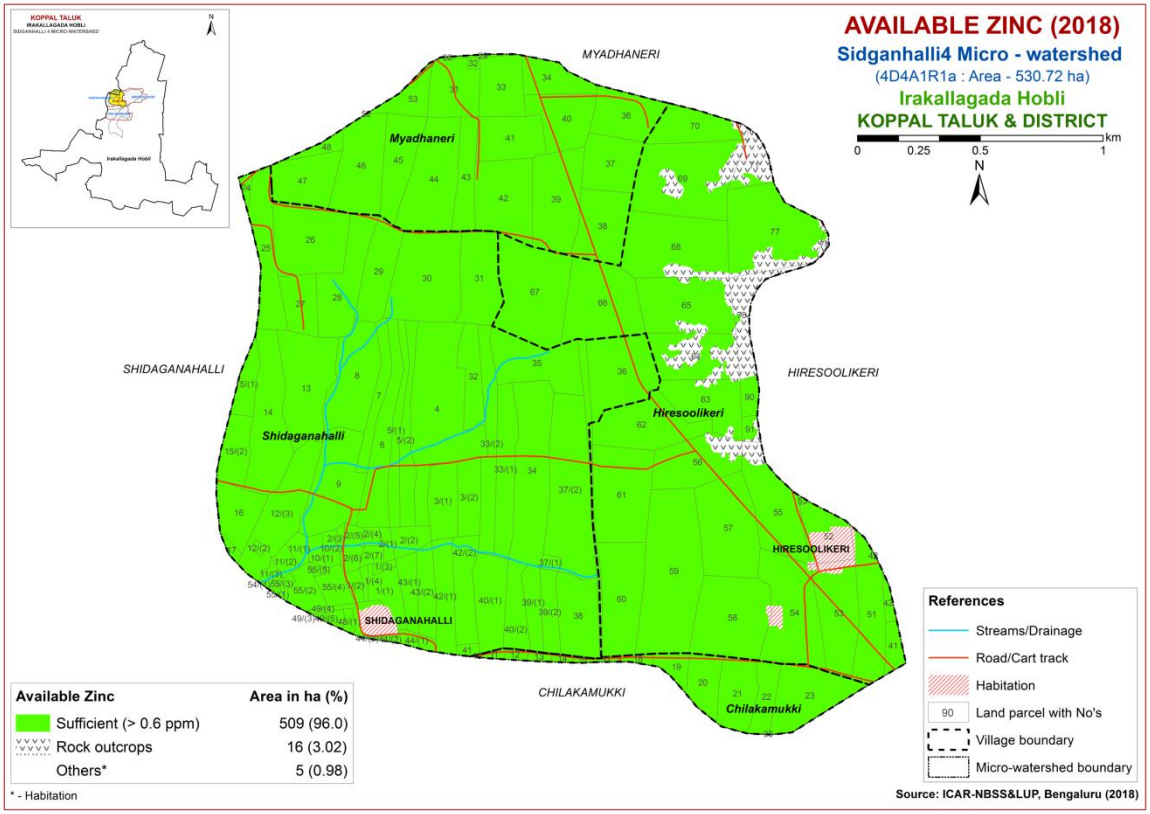


Fig.6.11 Soil Available Zinc map of Sidaganhalli-4 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Sidaganhalli-4 Microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The soil and land characteristics (Table 7.1) were matched with the crop requirements (Tables 7.2 to 7.29) to arrive at the crop suitability. The soil and land characteristics table and crop requirements tables are given at the end. In FAO land suitability classification, two orders are recognized. Order S- Suitable and Order N- Not suitable. The orders have Classes, subclasses and units. Order-S has three classes, Class S1- Highly Suitable, Class S2- Moderately Suitable and Class S3- Marginally Suitable. Order N has two classes, N1- Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3, N1 and N2 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'z' for calcareousness and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

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

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

Sorghum is one of the major food crop grown in Karnataka in an area of 10.47 lakh ha in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad, Bellary, Chitradurga, Mysore and Chamarajnagar districts. The crop requirements for growing sorghum (Table 7.2) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land a 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.

Small area of 7 ha (1%) is highly suitable (Class S1) for growing sorghum and occur in the southern part of the microwatershed. Major area of about 300 ha (57%) is moderately suitable (Class S2) for growing sorghum and are distributed in the southern,

western and central part of the microwatershed. They have minor limitations of calcareousness, gravelliness, wetness and rooting depth. An area of about 201 ha (38%) is marginally suitable (Class S3) with severe limitations of rooting depth and gravelliness and occur in the northeastern and southeastern of the microwatershed.

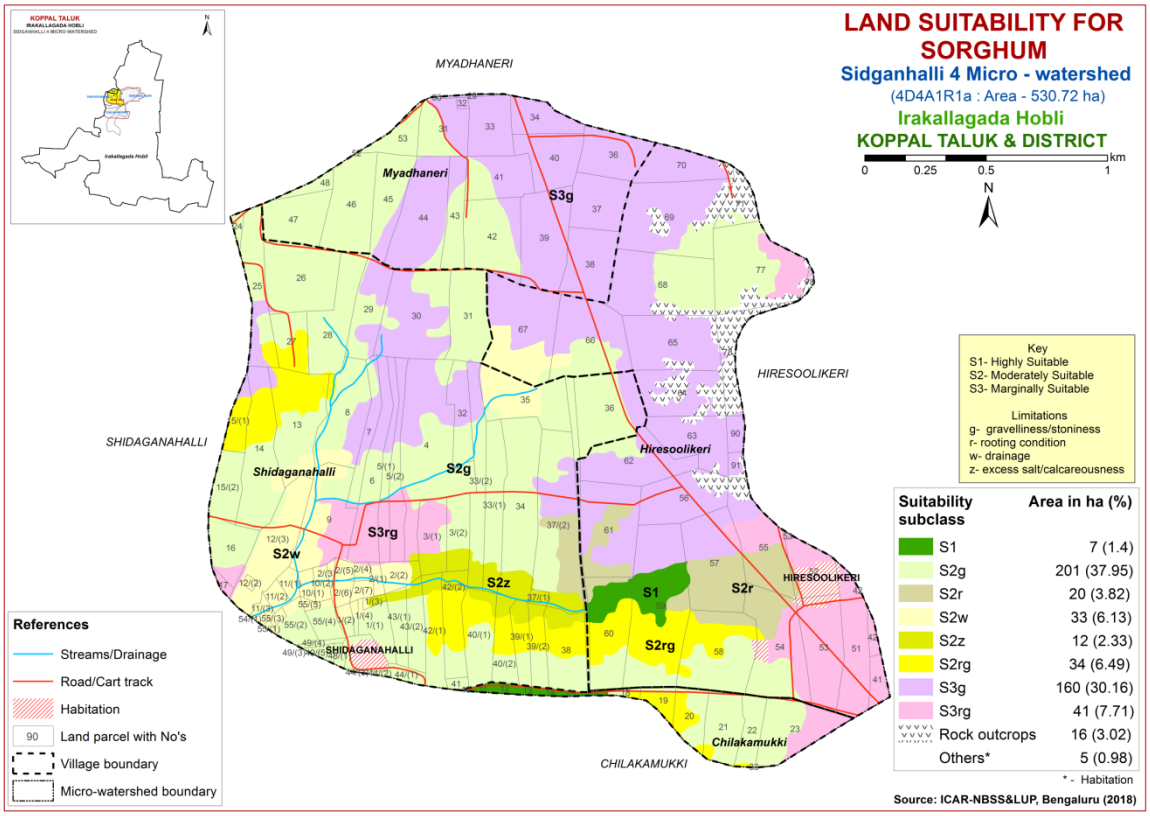


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

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

Very small area of about 2 ha is highly suitable (Class S1) for growing Maize and occur in the southern part of the microwatershed. Major area of about 306 ha (58%) is moderately suitable (Class S2) for growing maize and are distributed in the northern and southern part of the microwatershed. They have minor limitations of calcareousness, gravelliness, texture and rooting depth. An area of about 201 ha (38%) is marginally suitable (Class S3) with severe limitations of rooting depth and gravelliness and occur in the northeastern and southeastern part of the microwatershed.

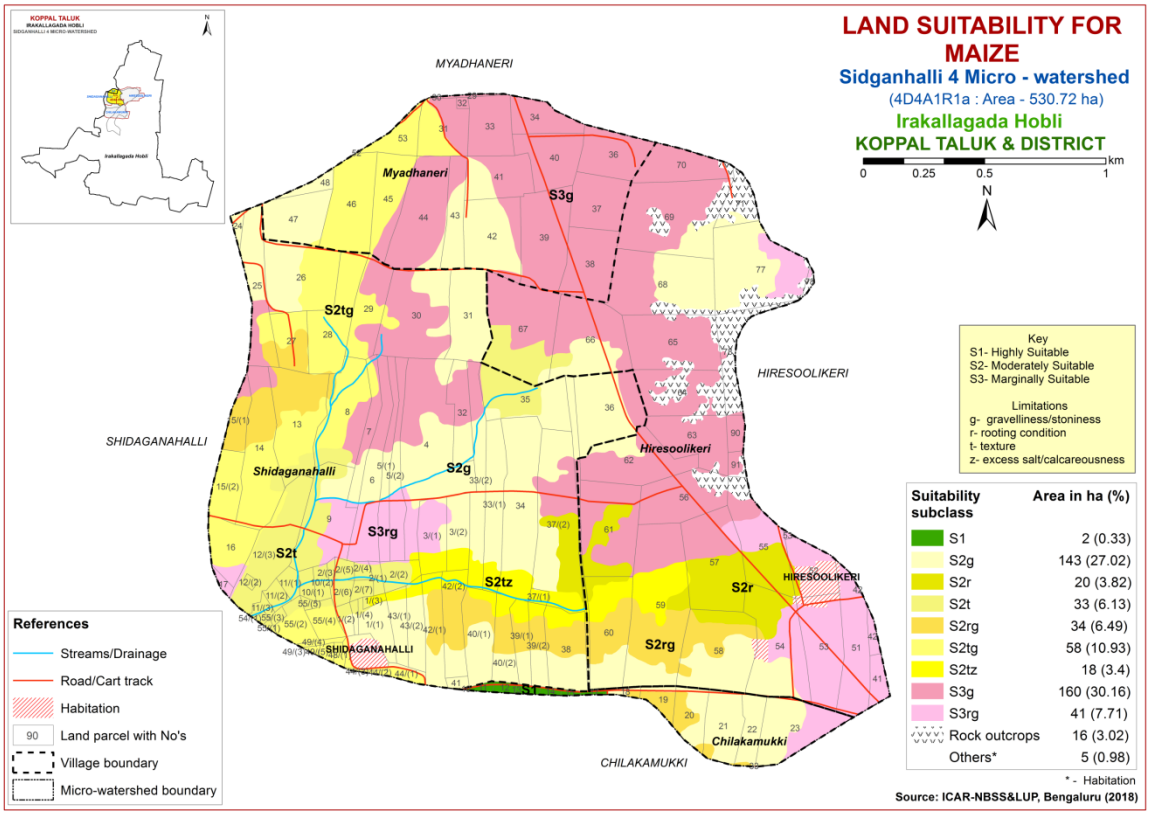


Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

About 131 ha (25%) area is highly suitable (Class S1) for growing bajra and occur in the central and southern part. Major area of 278 ha (52%) is moderately suitable (Class S2) with minor limitations of texture, rooting depth, gravelliness and calcareousness and occur in all parts of the microwatershed. An area of 101 ha (19%) is marginally suitable (Class S3) for growing bajra with moderate limitations of rooting depth and gravelliness and occur in the northeastern and eastern part of the microwatershed.

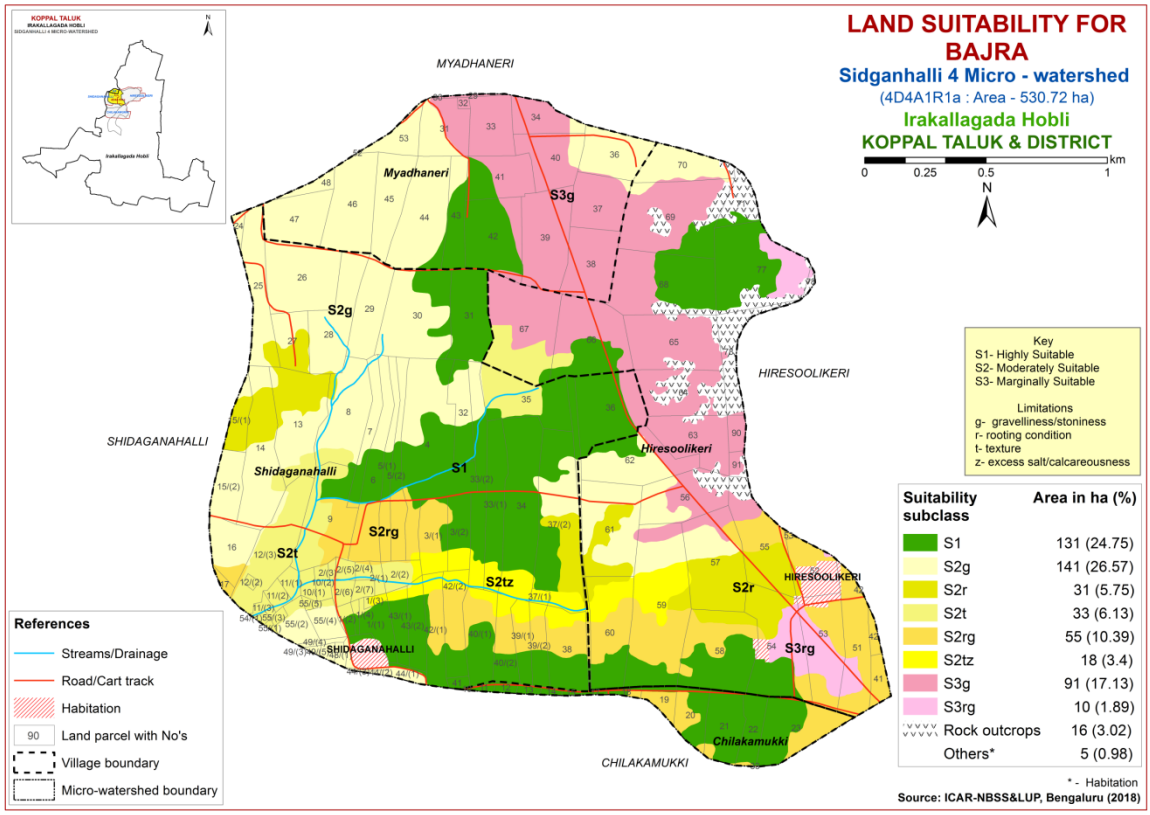


Fig. 7.3 Land Suitability map of Bajra

7.4 Land Suitability for Groundnut (*Arachis hypogaea*)

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

About 131 ha (25%) area is highly suitable (Class S1) for growing groundnut and occur in the northern, central and southern part, Major area of 226 ha (43%) is moderately suitable (Class S2) with minor limitations of rooting depth and gravelliness occur in major part of the microwatershed. An area of 153 ha (29%) is marginally suitable (Class S3) for growing groundnut with moderate limitations of texture, rooting depth, wetness, calcareousness and gravelliness and occur in the western, southern and central part of the microwatershed.

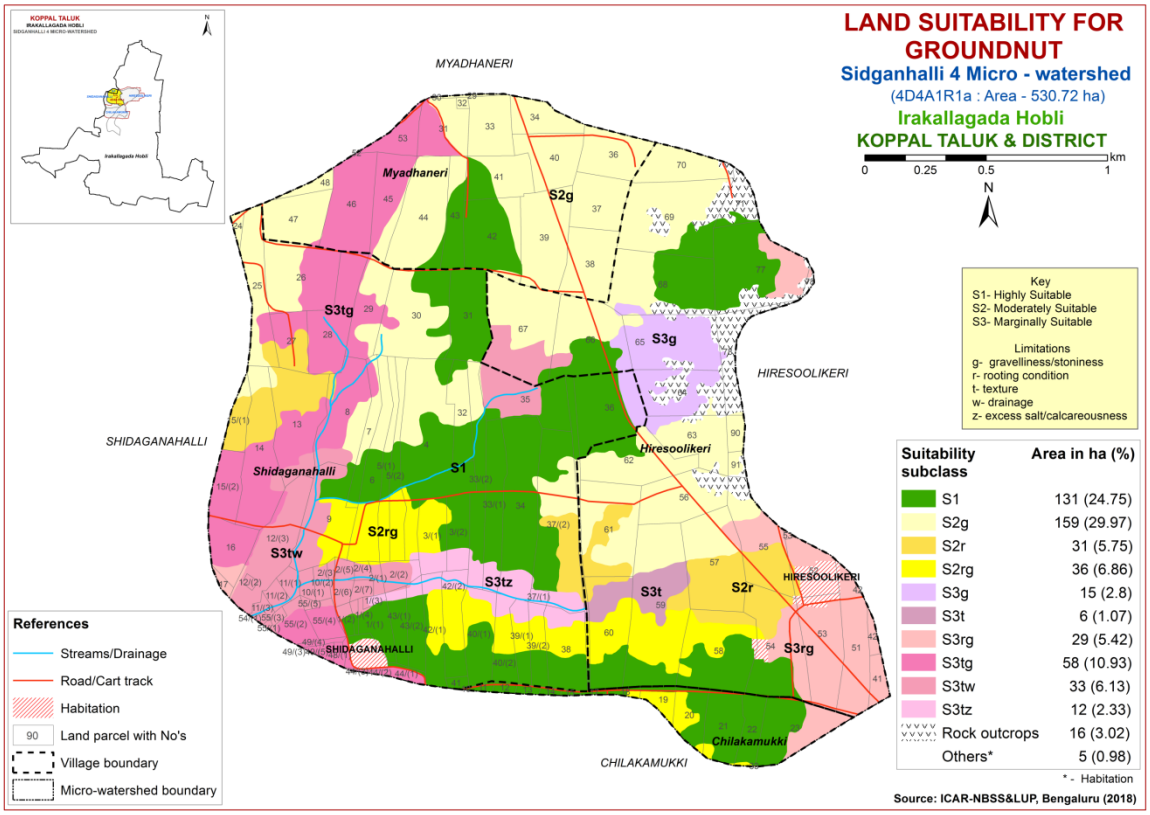


Fig. 7.4 Land Suitability map of Groundnut

7.5 Land Suitability for Sunflower (*Helianthus annus*)

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

Very minor area of 7 ha (1%) is highly suitable (Class S1) for growing sunflower and are distributed in the southern part. An area of about 246 ha (46%) is moderately suitable (Class S2) and is distributed in the central, northern, western and southern part of the microwatershed with minor limitations of gravelliness, rooting depth, wetness and calcareousness. Major area of about 246 ha (46%) is marginally suitable (Class S3) for growing sunflower and occur in the southeastern and northeastern part of the microwatershed with moderate limitations of gravelliness and rooting depth and an area of about 10 ha (2%) is currently not suitable (Class N1) for growing sunflower with severe limitations of rooting depth and gravelliness and occur in the eastern part of the microwatershed.

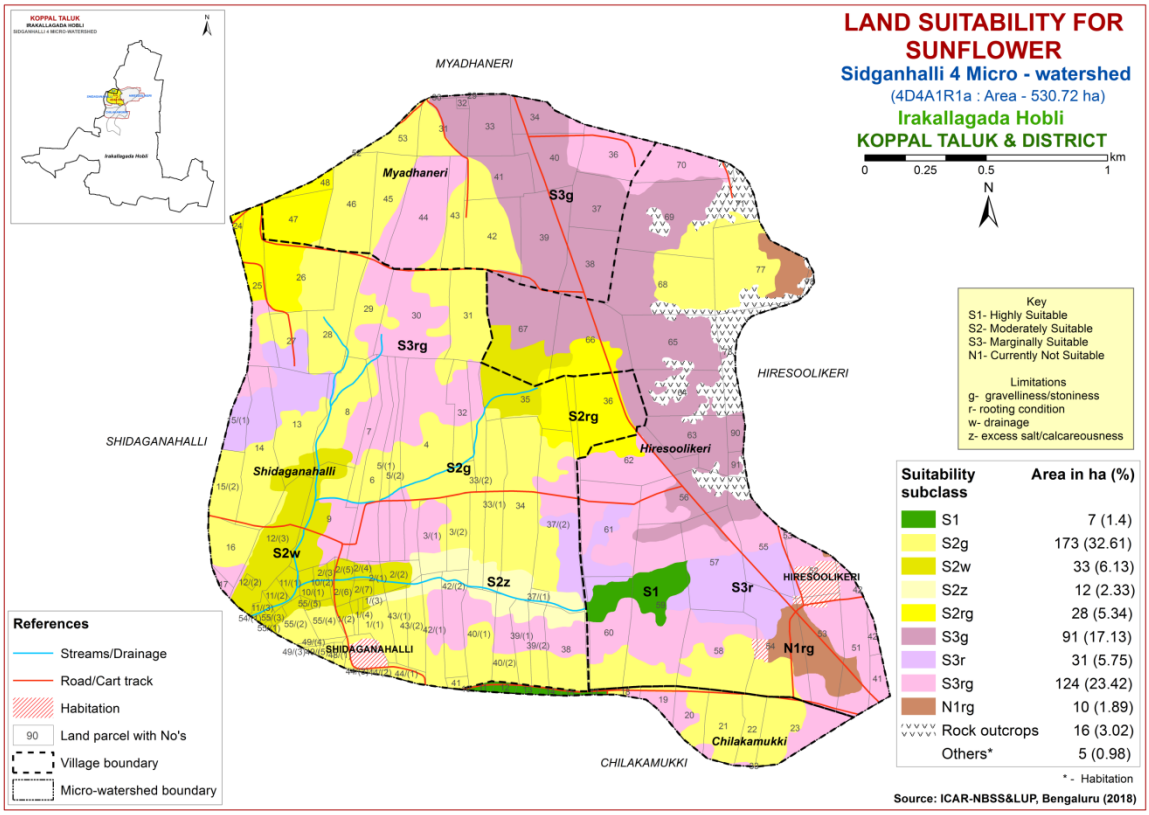


Fig. 7.5 Land Suitability map of Sunflower

7.6 Land Suitability for Cotton (*Gossypium hirsutum*)

Cotton is one of the most important fibre crop grown in the state in about 8.75 lakh ha area in Raichur, Dharwad, Belgaum, Kalaburgi, Bijapur, Bidar, Bellary, Chitradurga and Chamarajnagar districts. The crop requirements for growing cotton (Table 7.7) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cotton was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.7.

Very minor area of about 6 ha (1%) is highly (Class S1) suitable for growing cotton and occur in the southern part of the microwatershed. An area of about 289 ha (54%) is moderately suitable (Class S2) for growing cotton and are distributed in the major part of the microwatershed with minor limitations of gravelliness, texture, wetness, calcareousness and rooting depth. An area of 214 ha (40%) is marginally suitable (Class S3) for cotton with moderate limitations of rooting depth, texture and gravelliness occur in the western part of the microwatershed.

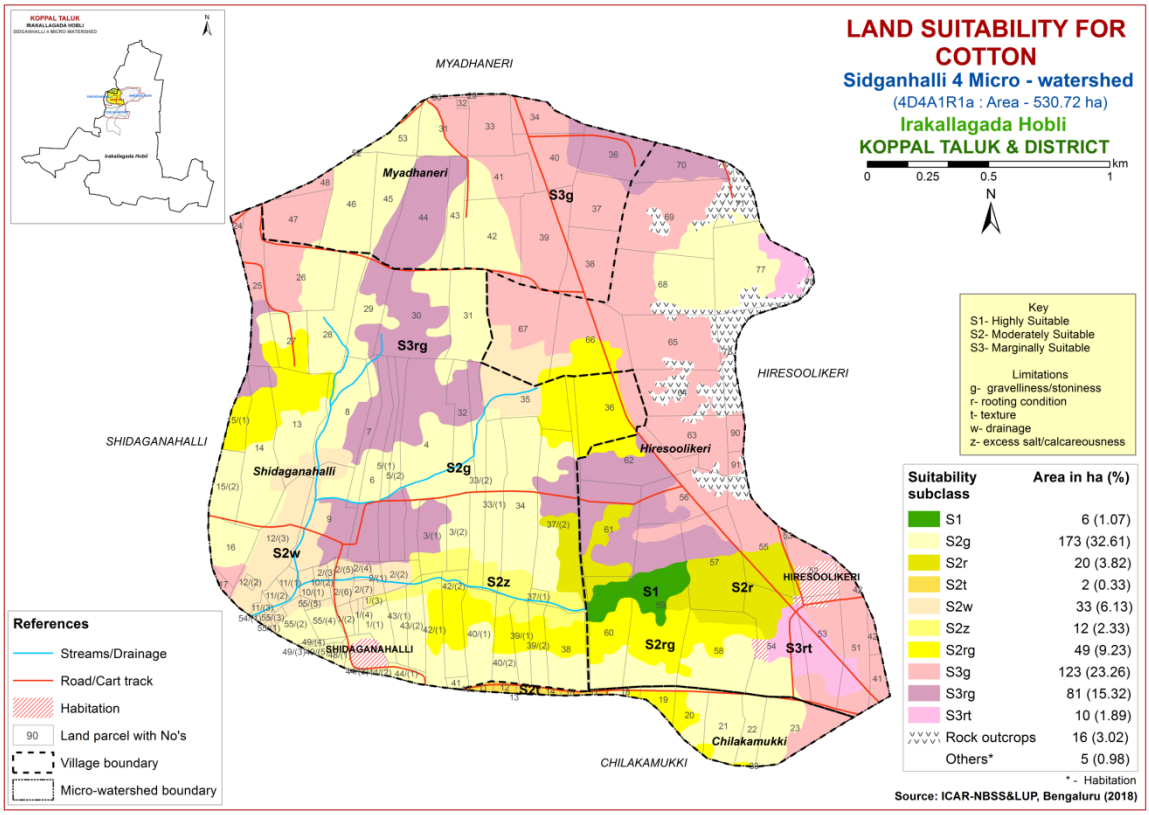


Fig. 7.6 Land Suitability map of Cotton

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

Red gram is one of the major pulse crop grown in an area of 7.28 lakh ha mainly in northern Karnataka in Bijapur, Kalaburgi, Raichur, Bidar, Belgaum, Dharwad and Bellary districts. The crop requirements for growing red gram (Table 7.7) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing red gram was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.7.

Minor area of about 2 ha is highly suitable (Class S1) for growing red gram and occur in the southern part of the microwatershed. About 239 ha (45%) area is moderately suitable (Class S2) for growing red gram. They have minor limitations of texture, rooting depth, wetness and gravelliness and occur in the northern, southern and central part of the microwatershed. Major area of about 260 ha (49%) is marginally suitable (Class S3) for growing red gram with moderate limitations of gravelliness, rooting depth and are distributed in major part of the microwatershed. Small area of about 10 ha (2%) is currently not suitable (Class N1) for growing red gram with severe limitations of rooting depth and gravelliness and occur in the eastern part of the microwatershed.

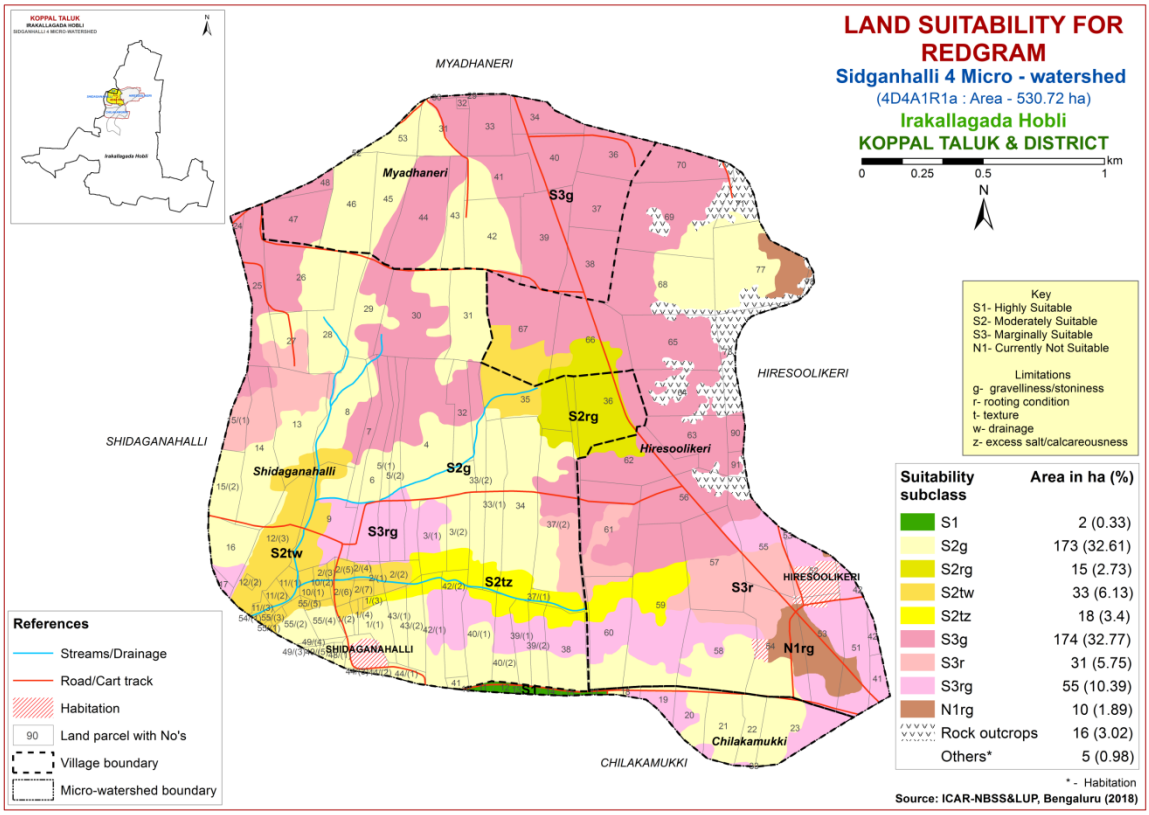


Fig. 7.7 Land Suitability map of Red gram

7.8 Land Suitability for Bengal gram (*Cicer aerativum*)

Bengal gram is one of the most important pulse crop grown in about 9.39 lakh ha area in Bijapur, Raichur, Kalaburgi, Dharwad, Belgaum and Bellary districts. The crop requirements for growing Bengal gram (Table 7.9) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Bengal gram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.8.

An area of about 38 ha (7%) is highly suitable (Class S1) for growing Bengal gram and are distributed in the southern and central part of the microwatershed. Major area of about 288 ha (54%) is moderately suitable (Class S2) for growing Bengal gram and are distributed in the southern and northern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture and calcareousness. An area of about 184 ha (35%) is marginally suitable (Class S3) for growing Bengal gram with moderate limitations of rooting depth, gravelliness and texture and occur in the northern and eastern part of the microwatershed.

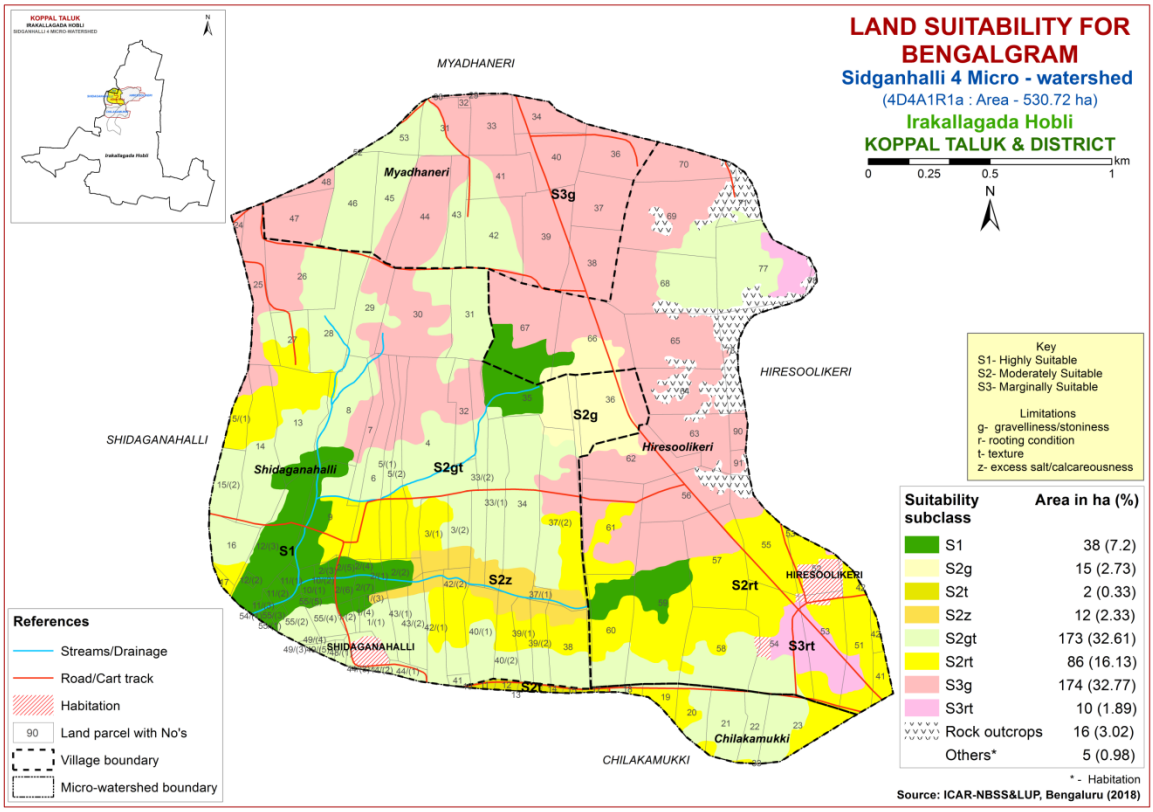


Fig. 7.8 Land Suitability map of Bengal gram

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

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

Very small area of about 2 ha is highly suitable (Class S1) for growing Chilli and are distributed in the southern part of the microwatershed. Major area of about 261 ha (49%) is moderately suitable (Class S2) for growing Chilli and are distributed in the southern, central, western and northern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture and wetness. An area of about 246 ha (46%) is marginally suitable (Class S3) for growing Chilli with moderate limitations of rooting depth, wetness, gravelliness, calcareousness and texture and occur in all parts of the microwatershed.

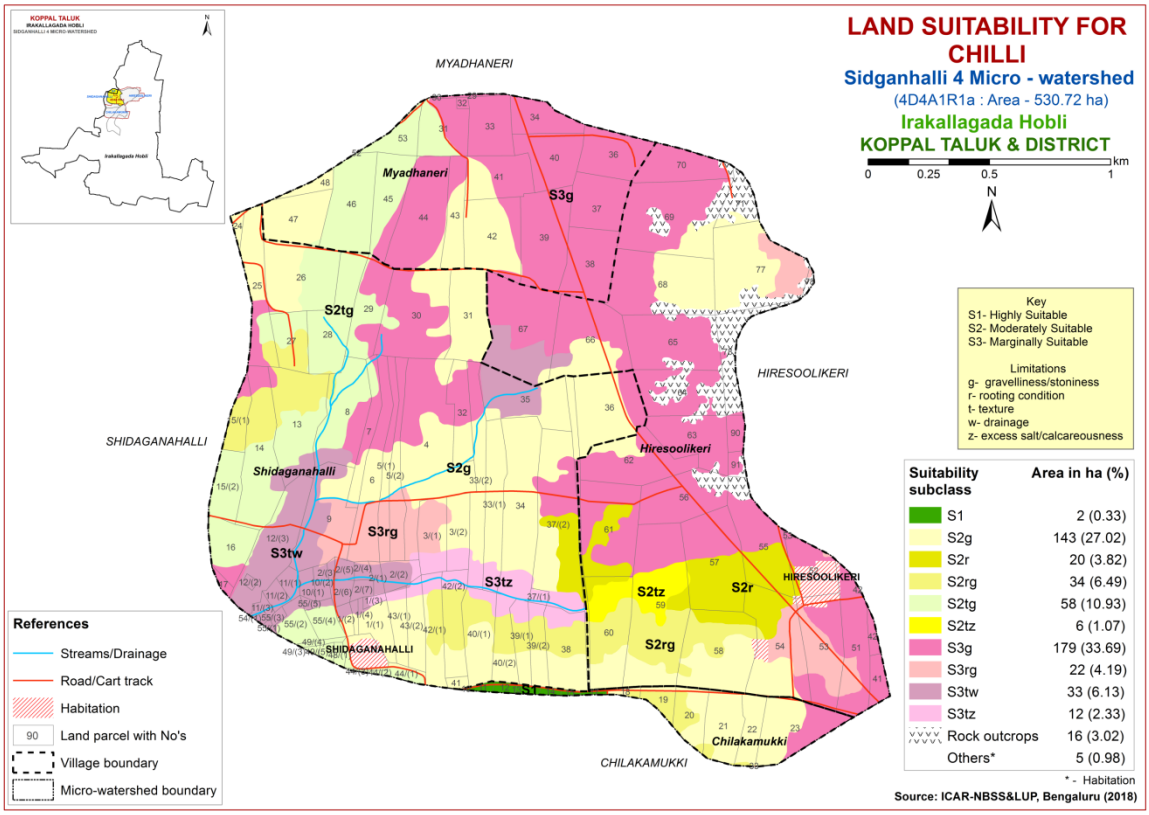


Fig. 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato (*Solanum lycopersicum*)

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

Very small area of about 2 ha is highly suitable (Class S1) for growing tomato and are distributed in the southern part of the microwatershed. An area of about 261 ha (49%) is moderately suitable (Class S2) for growing tomato and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture and wetness. An area of about 246 ha (46%) is marginally suitable (Class S3) for growing tomato with moderate limitations of rooting depth, wetness, gravelliness, calcareousness and texture and occur in the eastern part of the microwatershed.

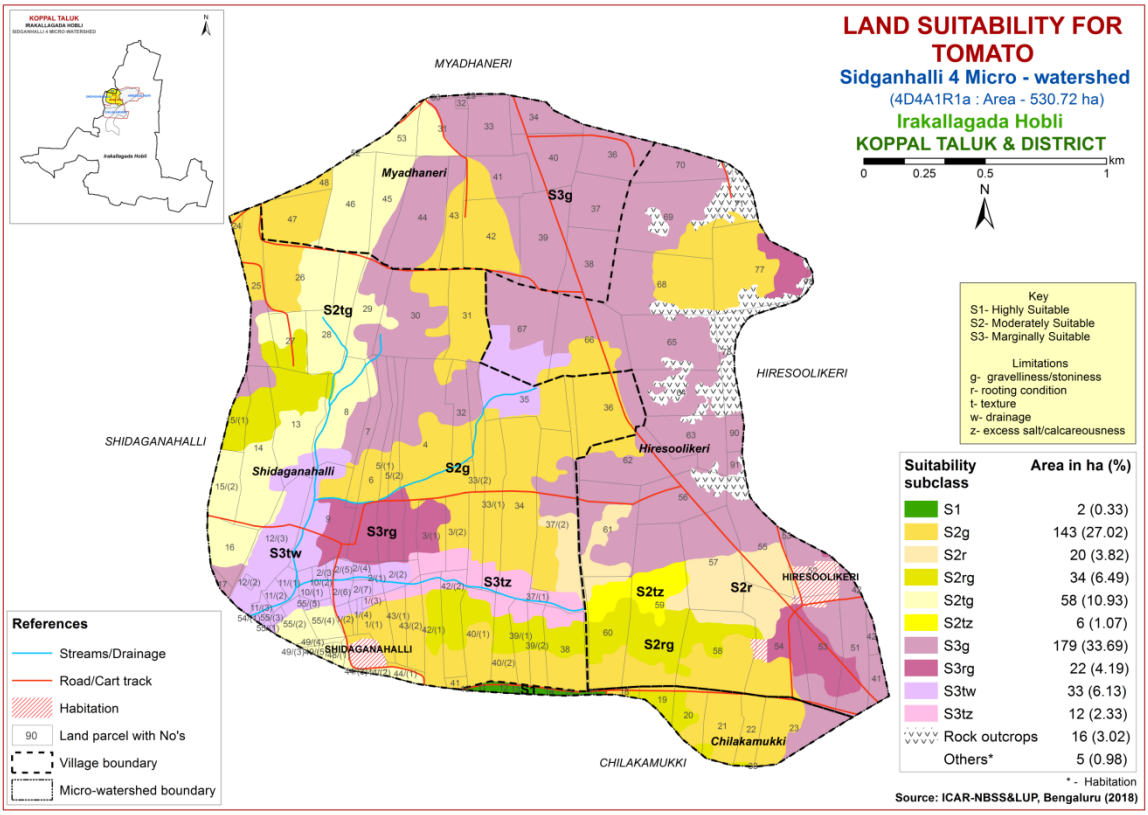


Fig. 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Drumstick (*Moringa oleifera)*

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

About 2 ha area has highly (Class S1) suitable lands for growing drumstick and occur in the southern part of the microwatershed. Major area of 328 ha (62%) is moderately (Class S2) suitable for growing drumstick with minor limitations of texture, rooting depth, gravelliness, wetness and calcareousness and distributed in the northern, central and southern part of the microwatershed. An area of about 170 ha (32%) is marginally suitable (Class S3) for growing drumstick with moderate limitations of rooting depth and gravelliness and occur in major part of the microwatershed. An area of about 10 ha (2%) is currently not suitable (Class N1) for growing drumstick with severe limitations of rooting depth and gravelliness and occur in the eastern part of the microwatershed.

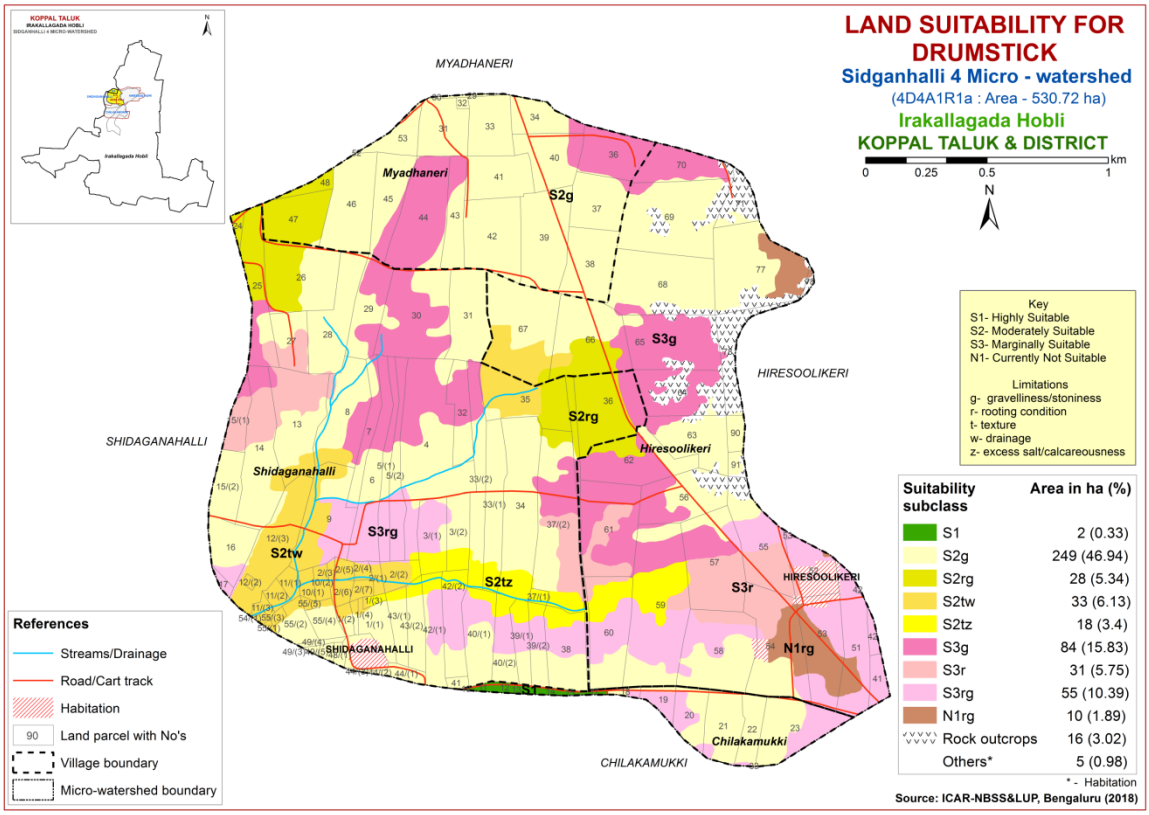


Fig. 7.11 Land Suitability map of Drumstick

7.12 Land Suitability for Mulberry (*Morus nigra*)

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

Small area of 117 ha (22%) is highly suitable for growing mulberry and occur in the southern and central part. Major area of 302 ha (57%) is moderately (Class S2) suitable for growing mulberry with minor limitations of texture, rooting depth, gravelliness, wetness and calcareousness and distributed in major part of the microwatershed. An area of about 81 ha (15%) is marginally suitable (Class S3) for growing mulberry with moderate limitations of rooting depth, gravelliness, calcareousness and texture and occur in the southern part of the microwatershed and an area of about 10 ha (2%) is currently not suitable (Class N1) for growing mulberry with severe limitations of rooting depth and gravelliness and occur in the eastern part of the microwatershed.

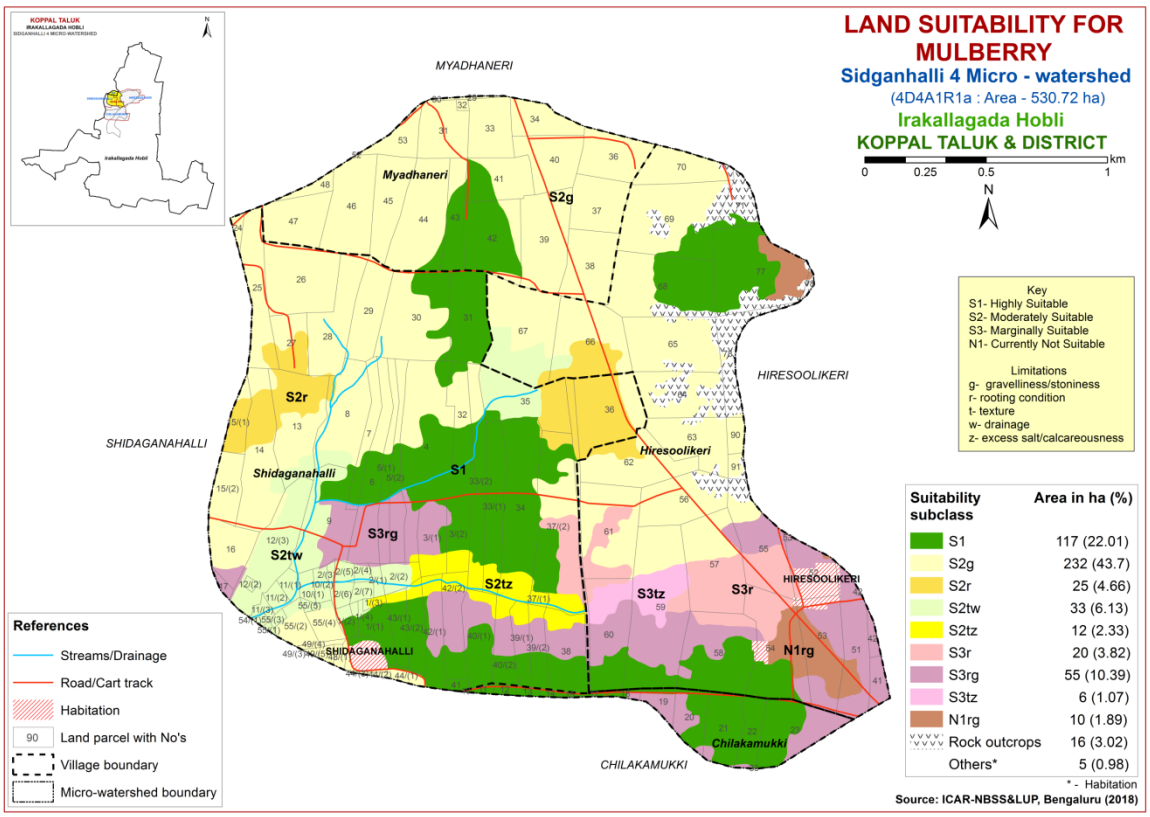


Fig. 7.12 Land Suitability map of Mulberry

7.13 Land Suitability for Mango (*Mangifera indica*)

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

There are no highly (Class S1) suitable lands. About 187 ha (35%) area is moderately suitable (Class S2) for growing mango with minor limitations of rooting depth, calcareousness and gravelliness and occur in the southern and central part of the microwatershed. Marginally suitable (Class S3) lands cover a major area of about 228 ha (43%) and occur in the major part of the microwatershed. They have moderate limitations of texture, gravelliness, rooting depth, wetness and calcareousness and an area of about 96 ha (18%) is currently not suitable (Class N1) for growing mango and occur in the eastern part of the microwatershed with severe limitations of gravelliness and rooting depth.

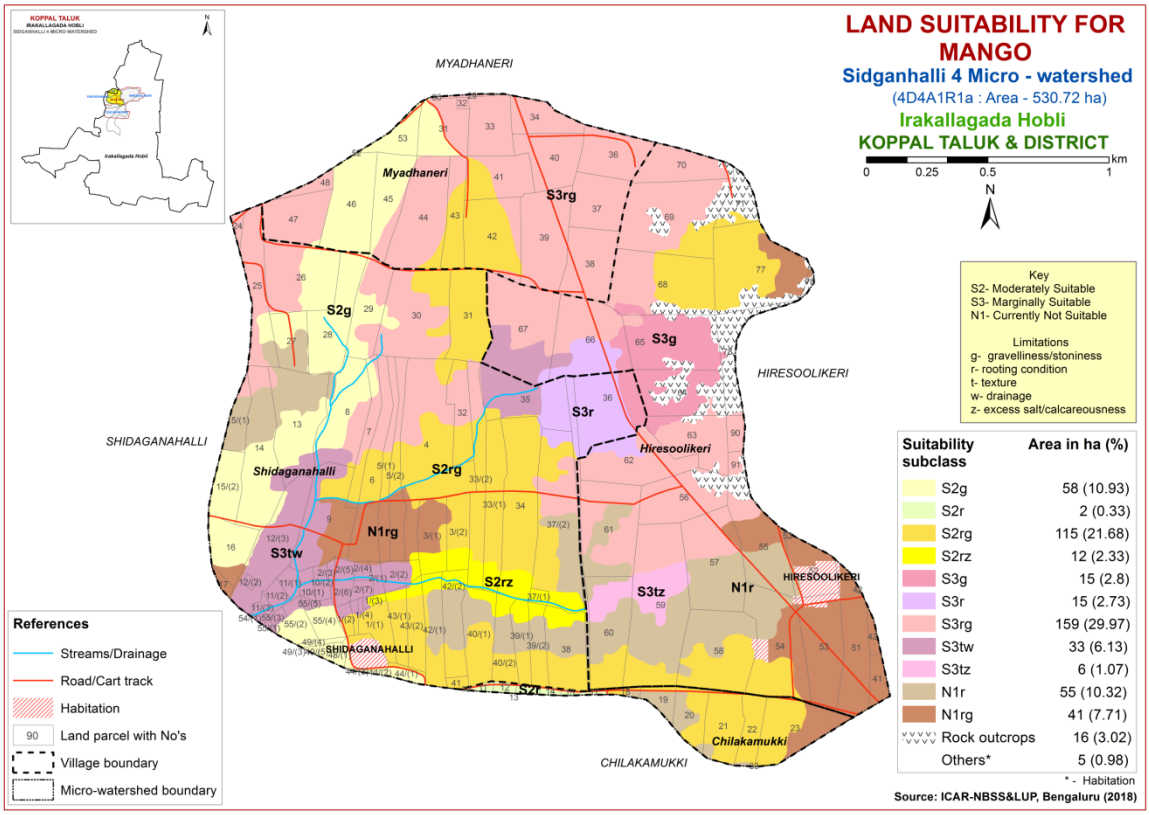


Fig. 7.13 Land Suitability map of Mango

7.14 Land Suitability for Sapota (*Manilkara zapota*)

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

Small area of 2 ha has highly (Class S1) suitable and occur in the southern part. About 271 ha (51%) area is moderately suitable (Class S2) for growing sapota with minor limitations of rooting depth and gravelliness and occur in major part of the microwatershed. Marginally suitable (Class S3) lands cover a major area of about 137 ha (43%) and occur in the northern, western and eastern part of the microwatershed. They have moderate limitations of texture, gravelliness, rooting depth, wetness and calcareousness and an area of about 10 ha (2%) is currently not suitable (Class N1) for growing sapota and occur in the northern and southern part of the microwatershed with severe limitations of gravelliness and rooting depth.

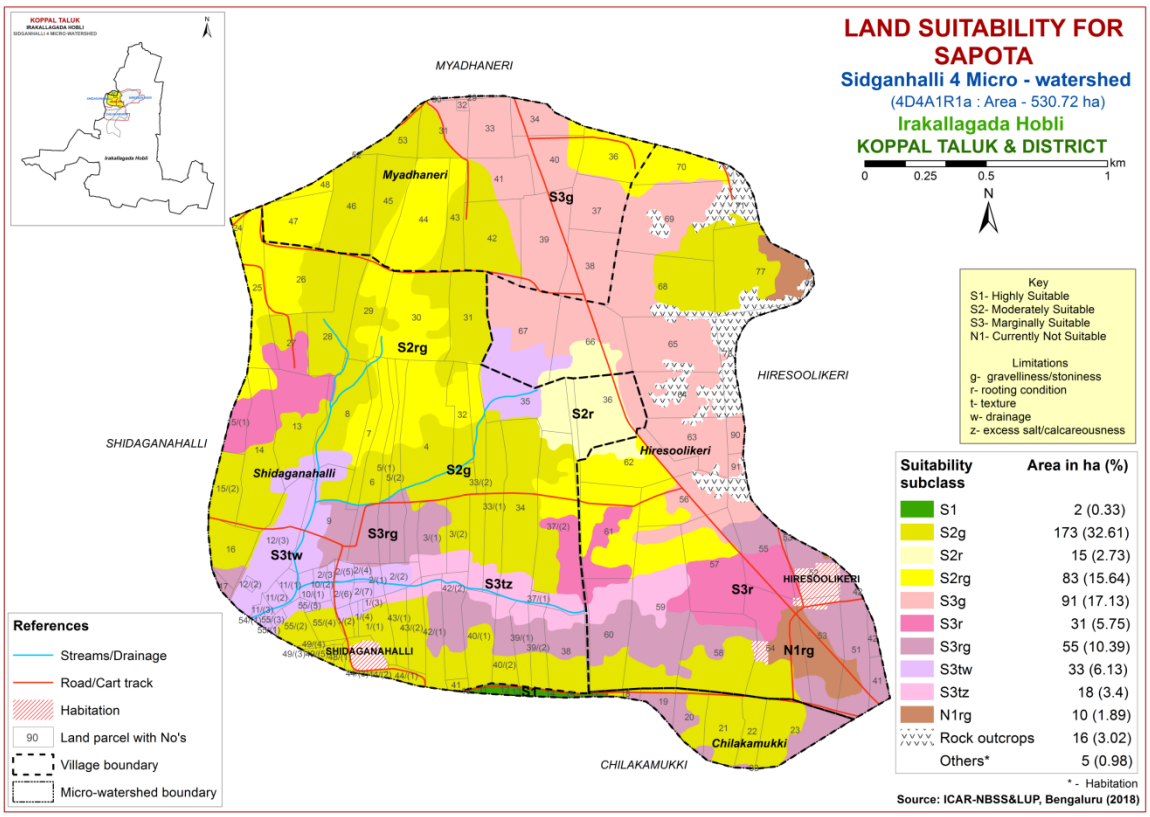


Fig. 7.14 Land Suitability map of Sapota

7.15 Land Suitability for Pomegranate (*Punica granatum*)

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

Very minor area of 2 ha (<1%) has highly (Class S1) suitable lands and occur in the southern part. About 321 ha (61%) area is moderately suitable (Class S2) for growing pomegranate with minor limitations of rooting depth, texture, wetness, calcareousness and gravelliness and occur in major part of the microwatershed. Marginally suitable (Class S3) lands cover an area of about 177 ha (33%) and occur in the eastern part of the microwatershed. They have moderate limitations of gravelliness and rooting depth. An area of about 10 ha (2%) is currently not suitable (Class N1) for growing pomegranate and occur in the eastern part of the microwatershed with severe limitations of gravelliness and rooting depth.

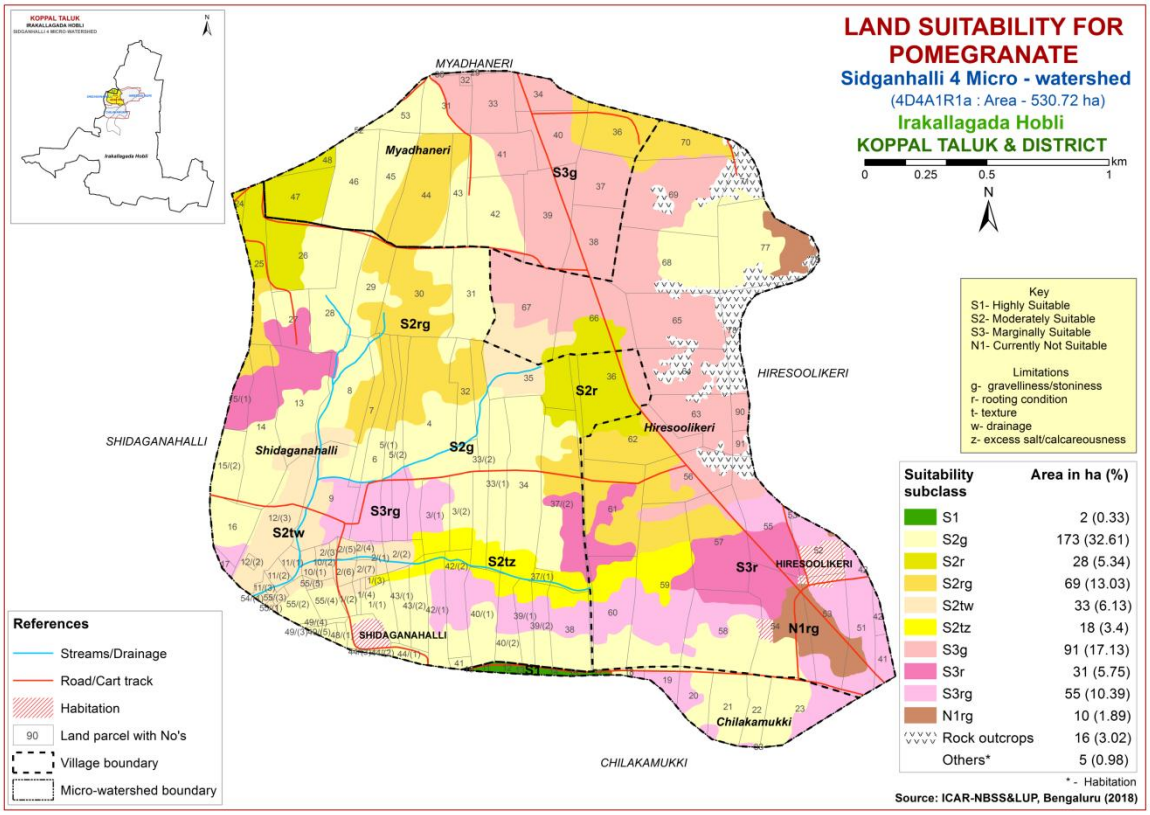


Fig. 7.15 Land Suitability map of Pomegranate

7.16 Land Suitability for Guava (*Psidium guajava*)

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

Very minor area of about 2 ha is highly suitable (Class S1) for guava and occur in the southern part of the microwatershed. An area of 271 ha (51%) is moderately suitable (Class S2) with minor limitations of gravelliness, texture and rooting depth. And occur in the western part. Major area of 278 ha (43%) is marginally (Class S3) suitable for growing guava with moderate limitations of texture, rooting depth, wetness and calcareousness and occur in the major part of the microwatershed and small area of about 10 ha (2%) is currently not suitable (Class N1) for growing guava with severe limitations of rooting depth and gravelliness and occur in the eastern part of the microwatershed.

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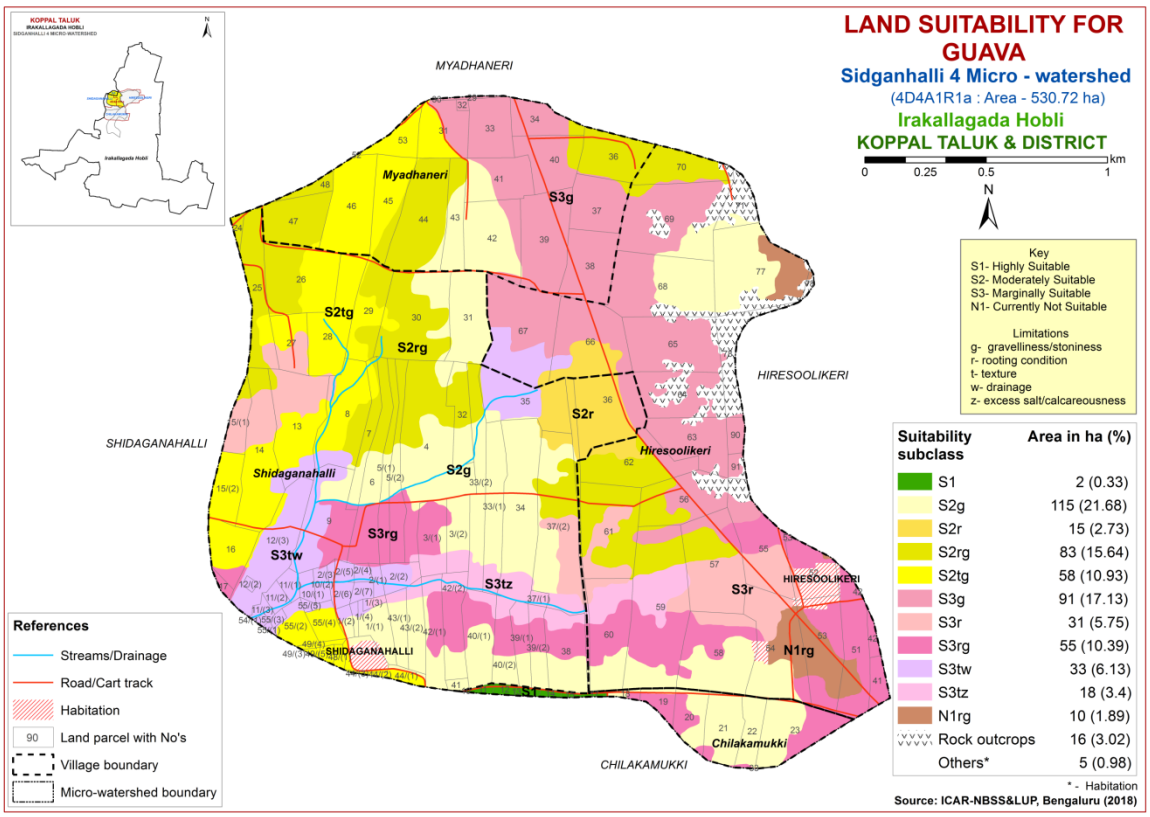

Fig. 7.16 Land Suitability map of Guava

7.17 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

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

Avery minor area of about 2 ha is highly suitable (Class S1) for jackfruit and occur in southern part of the microwatershed. Major area of 271 ha (51%) is moderately suitable (Class S2) with minor limitations of gravelliness and rooting depth and occur in major part of the microwatershed. An area of 228 ha (43%) is marginally (Class S3) suitable for growing jackfruit with moderate limitations of rooting depth texture, wetness, gravelliness and calcareousness and occur in the southern, eastern and central part of the microwatershed and an area of about 10 ha (2%) is currently not suitable (Class N1) for growing jackfruit with severe limitations of rooting depth and gravelliness and occur in the eastern part of the microwatershed.

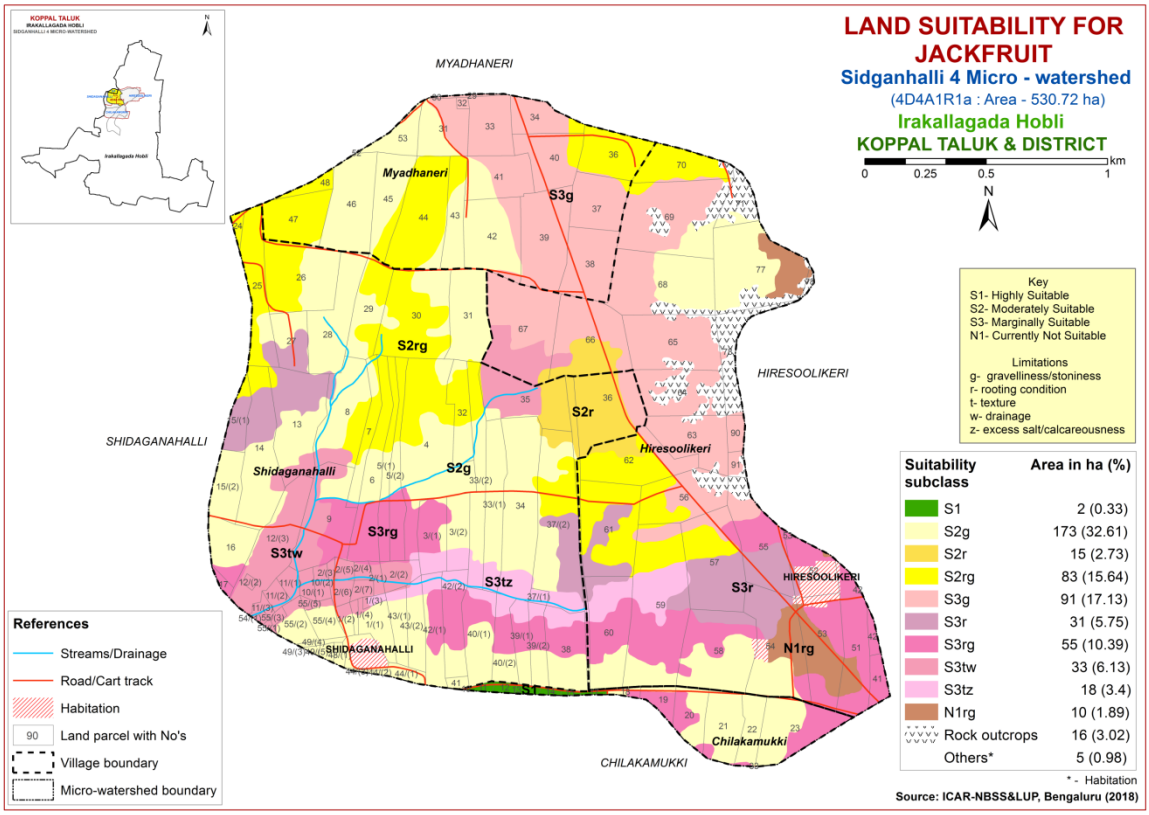

Fig. 7.17 Land Suitability map of Jackfruit

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 (Table 7.19) for growing jamun were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jamun was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.18.

An area of 309 ha (58%) is moderately suitable (Class S2) for growing jamun with minor limitations of texture, rooting depth, wetness and gravelliness and occur in the major part of the microwatershed. Marginally suitable (Class S3) lands cover a major area of about 191 ha (36%) and occur in the eastern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness and an area of about 10 ha (2%) is currently not suitable (Class N1) for growing jamun with severe limitations of rooting depth and gravelliness occur and in the eastern part of the microwatershed.

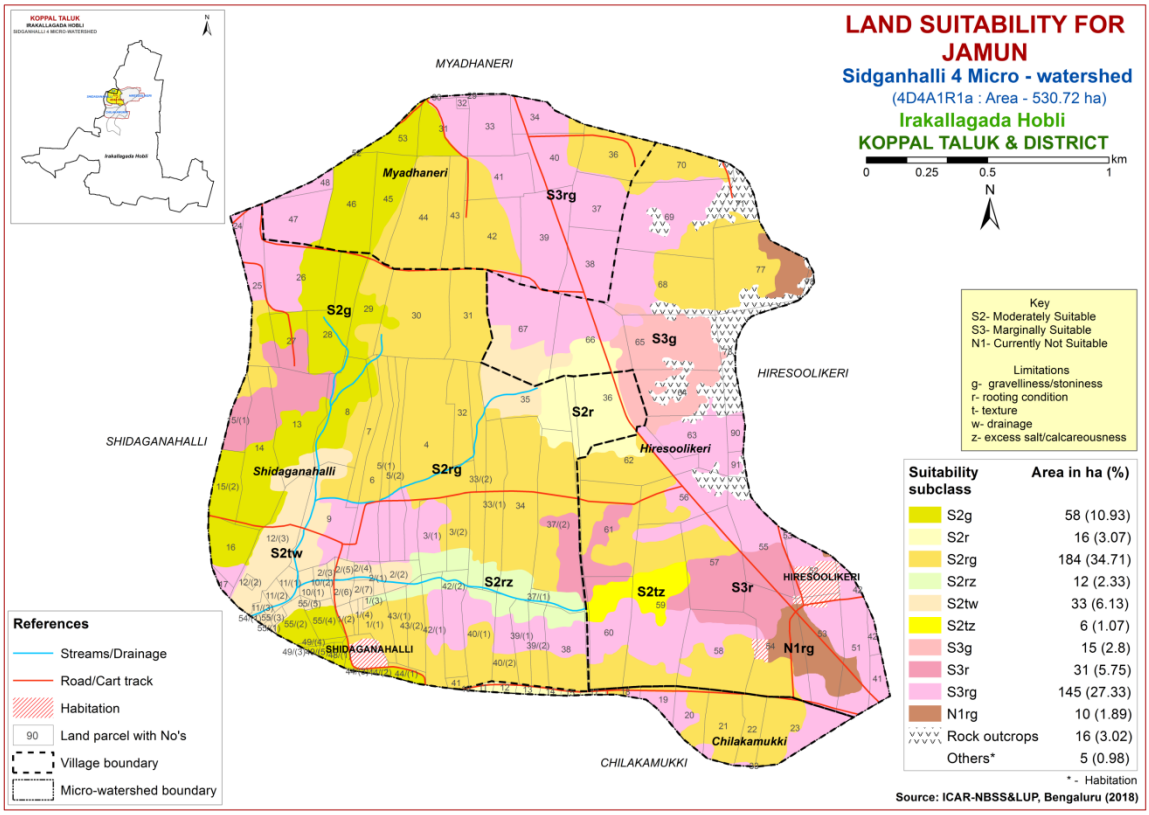

Fig. 7.18 Land Suitability map of Jamun

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the most important fruit crop grown in an area of 5446 ha in almost all the districts of the state. The crop requirements (Table 7.20) for growing musambi were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing musambi was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.16.

Very small area of about 7 ha (1%) is highly suitable (Class S1) for growing musambi and occur in the southern part of the microwatershed. Major area of about 302 ha (57%) is moderately suitable (Class S2) for growing musambi with minor limitations of gravelliness, rooting depth, gravelliness, wetness and calcareousness and occur in the major part of the microwatershed. Marginally suitable (Class S3) lands cover a major area of about 191 ha (36%) and occur in the northeastern and southeastern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness and an area of about 10 ha (2%) is currently not suitable (Class N1) for growing musambi with severe limitations of rooting depth and gravelliness and occur in the eastern and northern part of the microwatershed.

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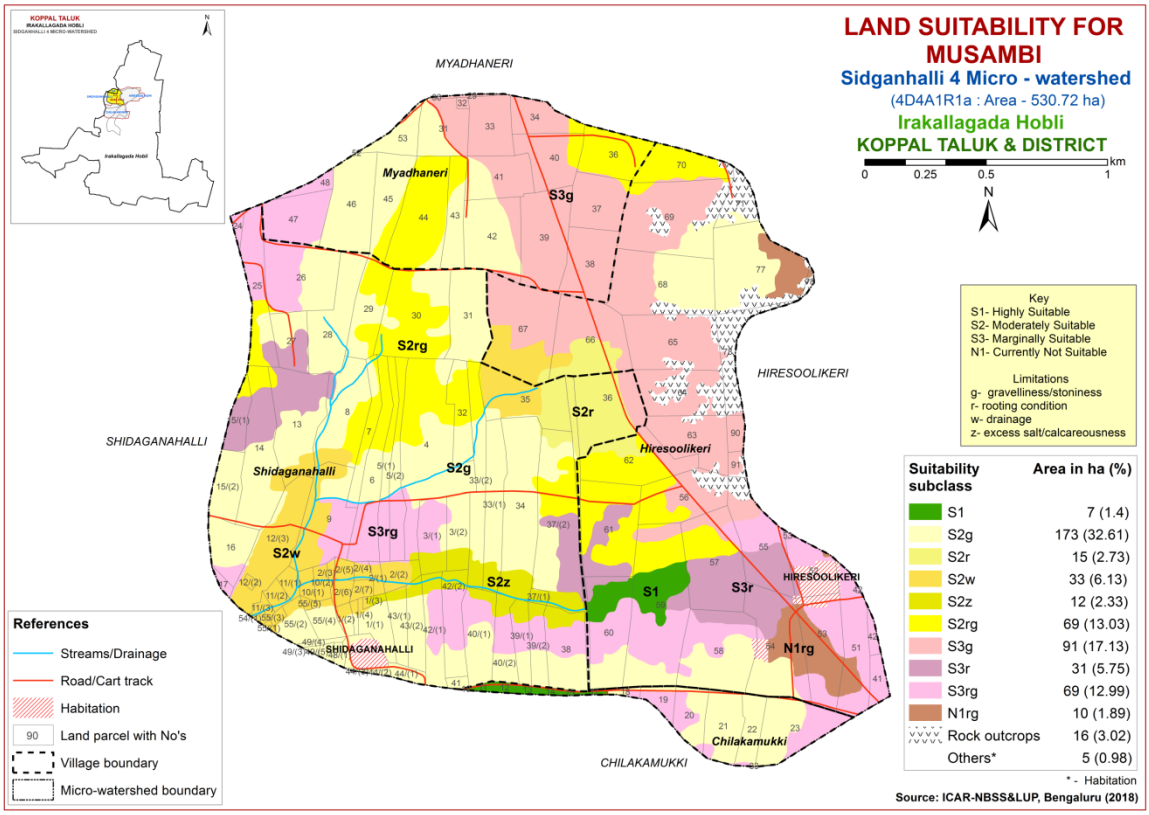


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 11752 ha in almost all the districts of the State. The crop requirements (Table 7.21) for growing lime (Table 7.15) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.17.

Very small area of about 7 ha (1%) is highly suitable (Class S1) for growing lime and occur in the southern part of the microwatershed. Major area of about 302 ha (57%) is moderately suitable (Class S2) for growing lime with minor limitations of gravelliness, rooting depth, gravelliness, wetness and calcareousness and occur in the major part of the microwatershed. Marginally suitable (Class S3) lands cover a major area of about 191 ha (36%) and occur in the northeastern and southeastern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness and an area of about 10 ha (2%) is currently not suitable (Class N1) for growing lime with severe limitations of rooting depth and gravelliness and occur in the eastern and northern part of the microwatershed

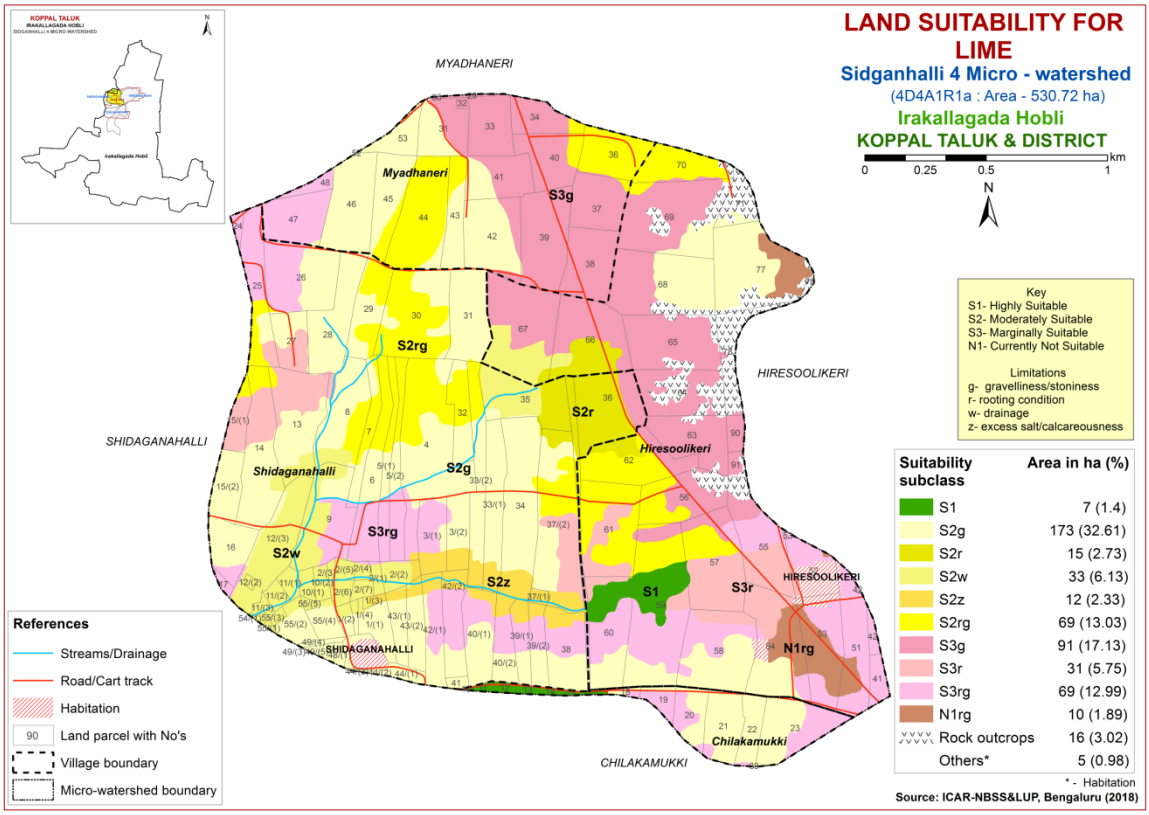


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

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

About 171 ha (32%) is moderately suitable (Class S2) for growing cashew with minor limitations of gravelliness, texture and rooting depth and occur in the western, southern and central part of the microwatershed. Marginally suitable (Class S3) lands cover a major area of about 162 ha (30%) and occur in the western and southwestern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness and major area of about 178 ha (33%) is currently not suitable (Class N1) for growing cashew with severe limitations of rooting depth, texture, calcareousness, wetness and gravelliness and occur in the southern, central and northern part of the microwatershed

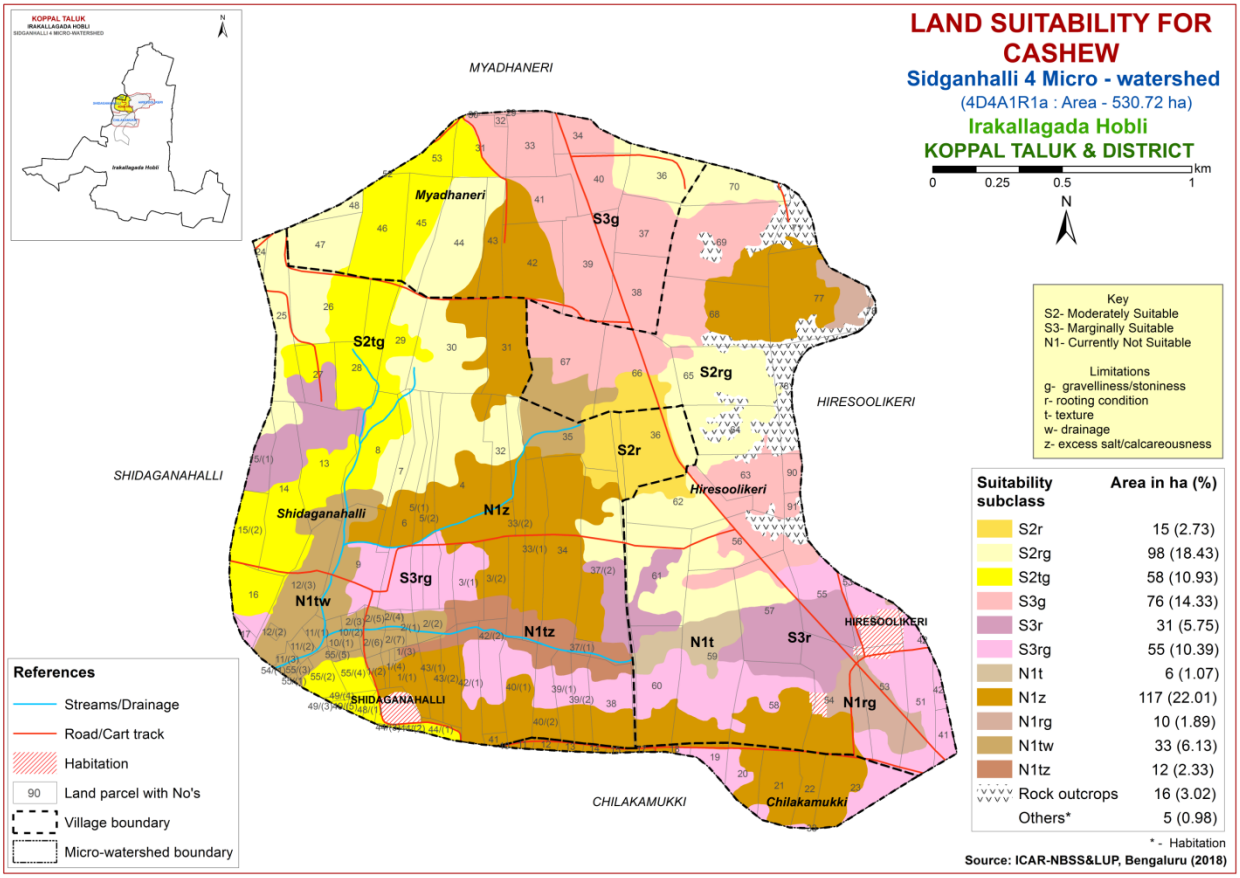


Fig. 7.21 Land Suitability map of Cashew

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

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

An area of about 137 ha (26%) area is highly suitable (Class S1) for growing custard apple and occur in the northern, central and southern part of the microwatershed. Major area of about 363 ha (68%) is moderately suitable (Class S2) for growing custard apple with minor limitations of rooting depth, gravelliness, wetness and calcareousness and occur in all parts of the microwatershed and an area of 10 ha (2%) is marginally suitable (Class S3) for custard apple with moderate limitations of rooting depth and gravelliness and occur in the eastern part of the microwatershed.

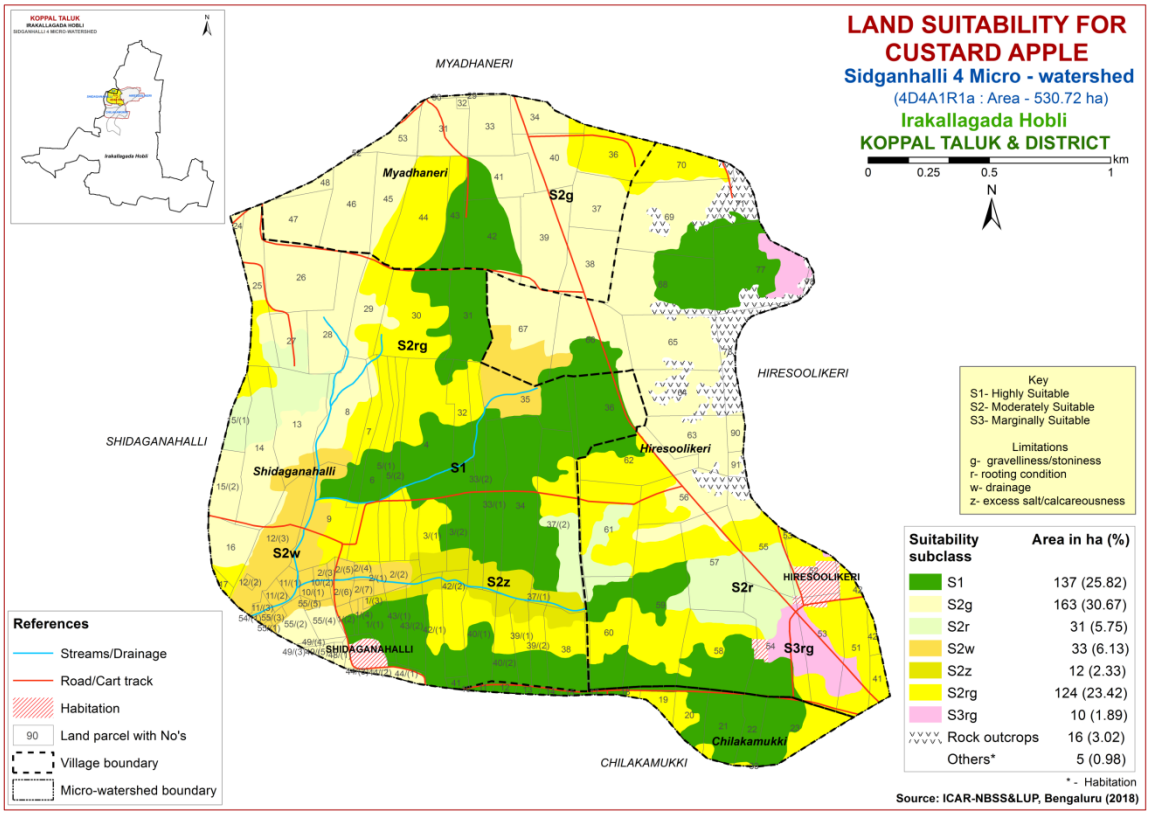


Fig. 7.22 Land Suitability map of Custard Apple

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

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

An area of about 137 ha (26%) area is highly suitable (Class S1) for growing amla and occur in the northern, central and southern part of the microwatershed. Major area of about 363 ha (68%) is moderately suitable (Class S2) for growing amla with minor limitations of rooting depth, gravelliness, wetness and calcareousness and occur in all parts of the microwatershed and an area of 10 ha (2%) is marginally suitable (Class S3) for amla with moderate limitations of rooting depth and gravelliness and occur in the eastern part of the microwatershed.

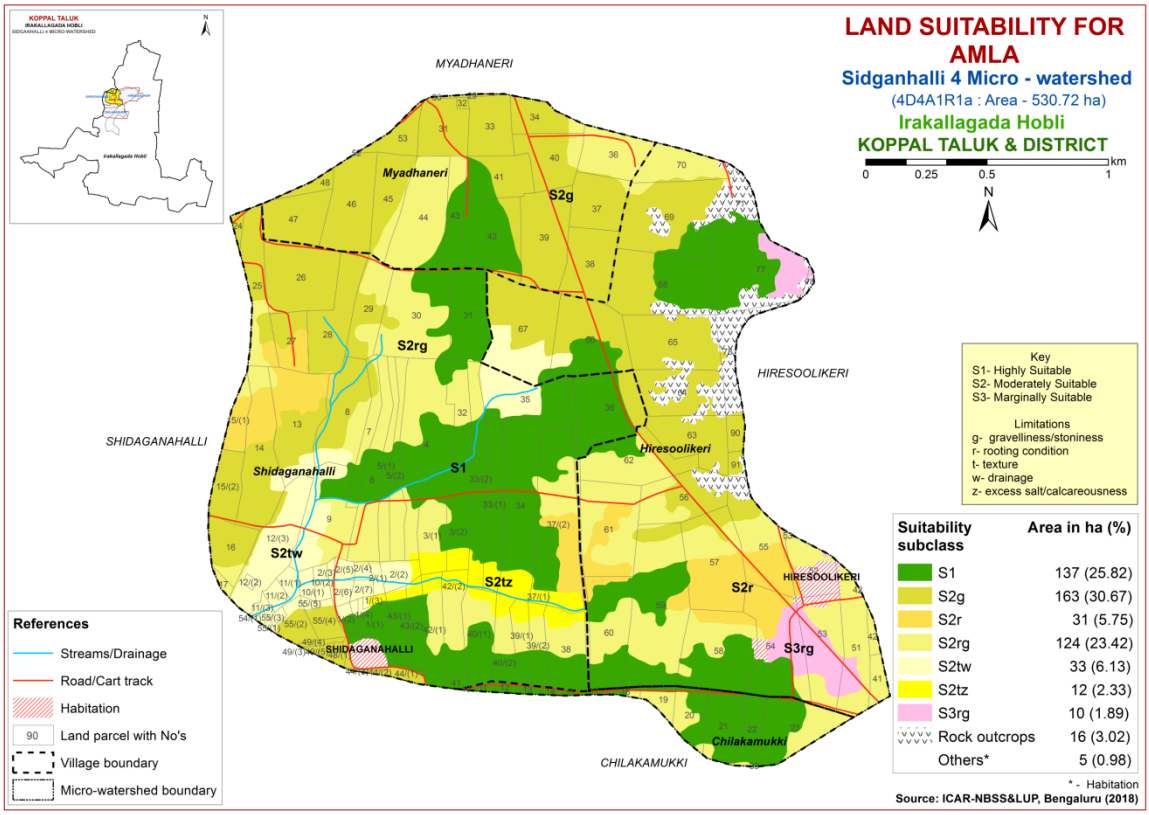


Fig. 7.23 Land Suitability map of Amla

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

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

Major area of about 223 ha (42%) is moderately suitable (Class S2) for growing tamarind with minor limitations of rooting depth, gravelliness, wetness and texture and occur in the northern, central and southern part of the microwatershed. Marginally suitable (Class S3) lands cover a small area of 189 ha (36%) and occur in the eastern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness and an area of about 96 ha (18%) is currently not suitable (Class N1) for growing tamarind and are distributed in the eastern and southern part of the microwatershed. They have severe limitations of rooting depth and gravelliness.

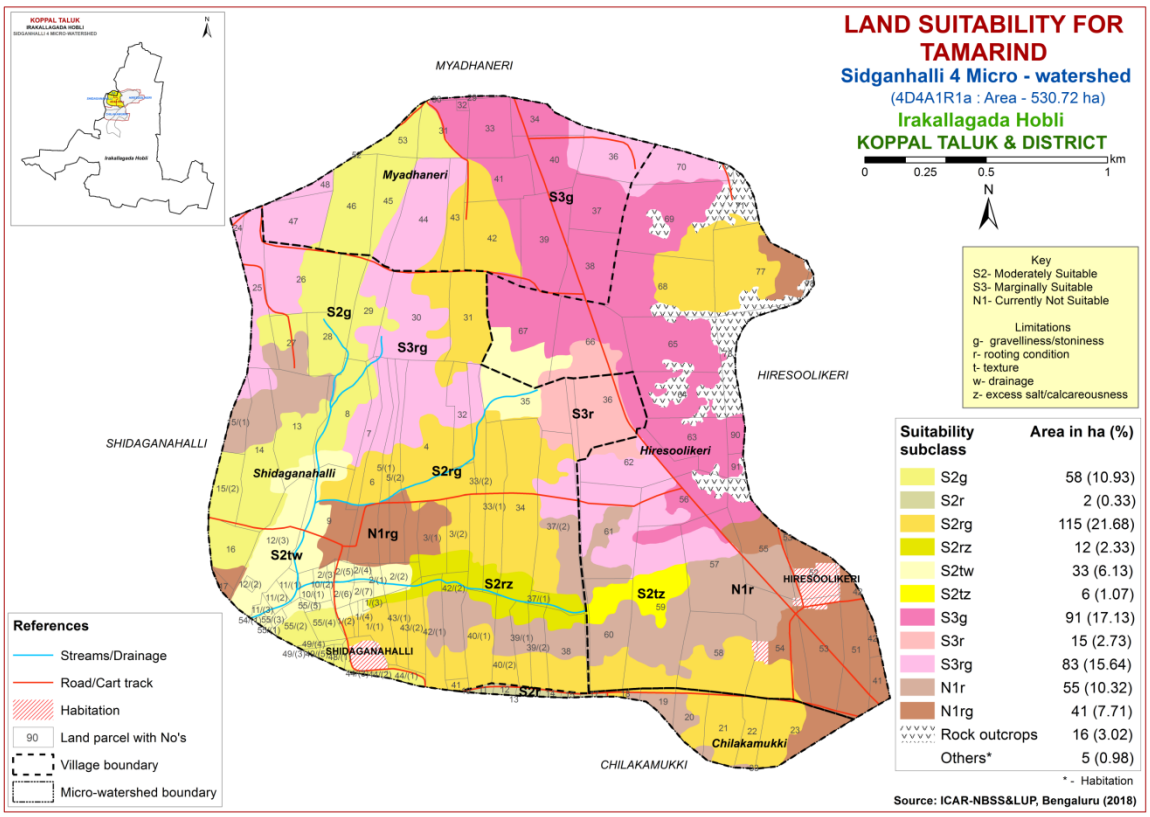


Fig. 7.24 Land Suitability map of Tamarind

7.25 Land Suitability for Marigold (*Tagetes erecta*)

Marigold is one of the most important flower crop grown in an area of 9108 ha in almost all the districts of the state. The crop requirements (Table 7.26) for growing marigold were matched with the soil-site characteristics (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.

Very minor area of about 2 ha is highly suitable (Class S1) for growing marigold and occur in the southern part. Major area of about 306 ha (58%) is moderately suitable (Class S2) for growing marigold with minor limitations of rooting depth, gravelliness, texture, wetness and calcareousness and occur in all parts of the microwatershed and an area of 201 ha (38%) is marginally suitable (Class S3) for marigold with moderate limitations of gravelliness and rooting depth and occur in the eastern part of the microwatershed.

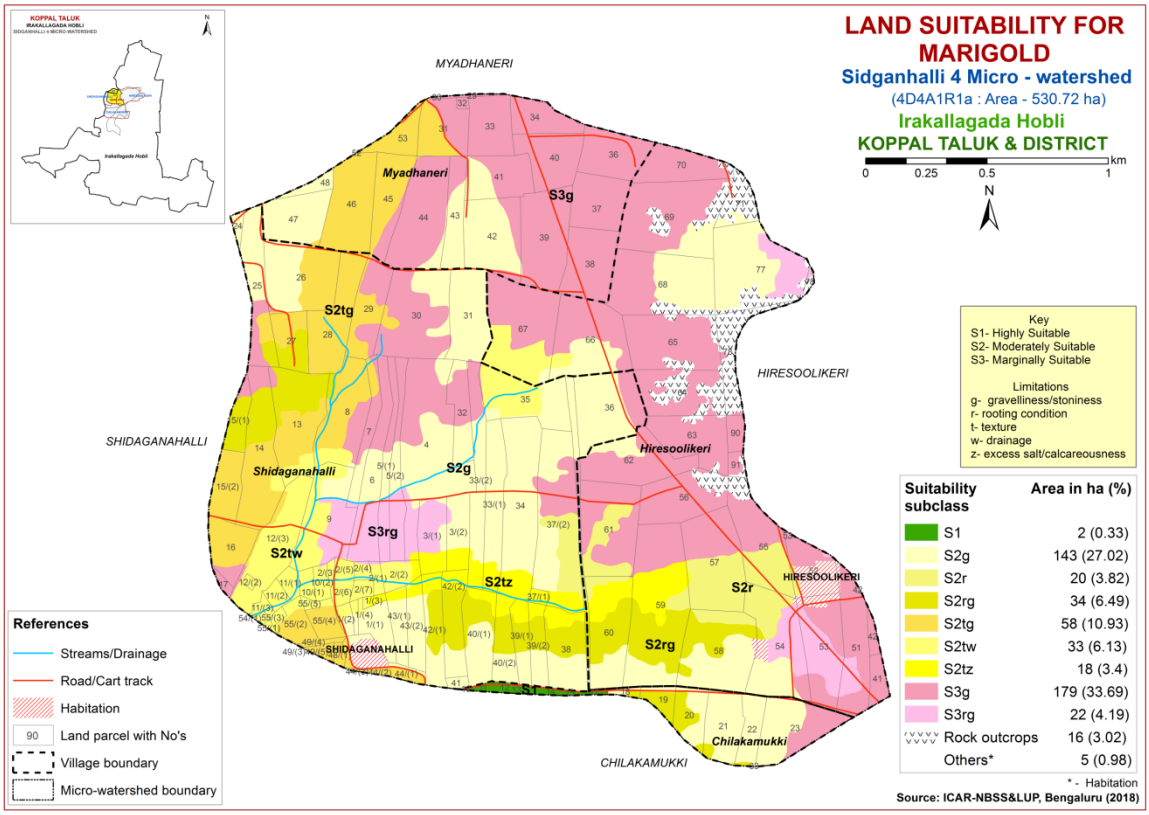


Fig. 7.25 Land Suitability map of Marigold

7.26 Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

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

Very minor area of about 2 ha is highly suitable (Class S1) for growing Chrysanthemum and occur in the southern part. Major area of about 306 ha (58%) is moderately suitable (Class S2) for growing Chrysanthemum with minor limitations of rooting depth, gravelliness, texture, wetness and calcareousness and occur in all parts of the microwatershed and an area of 201 ha (38%) is marginally suitable (Class S3) for marigold with moderate limitations of gravelliness and rooting depth and occur in the eastern part of the microwatershed.

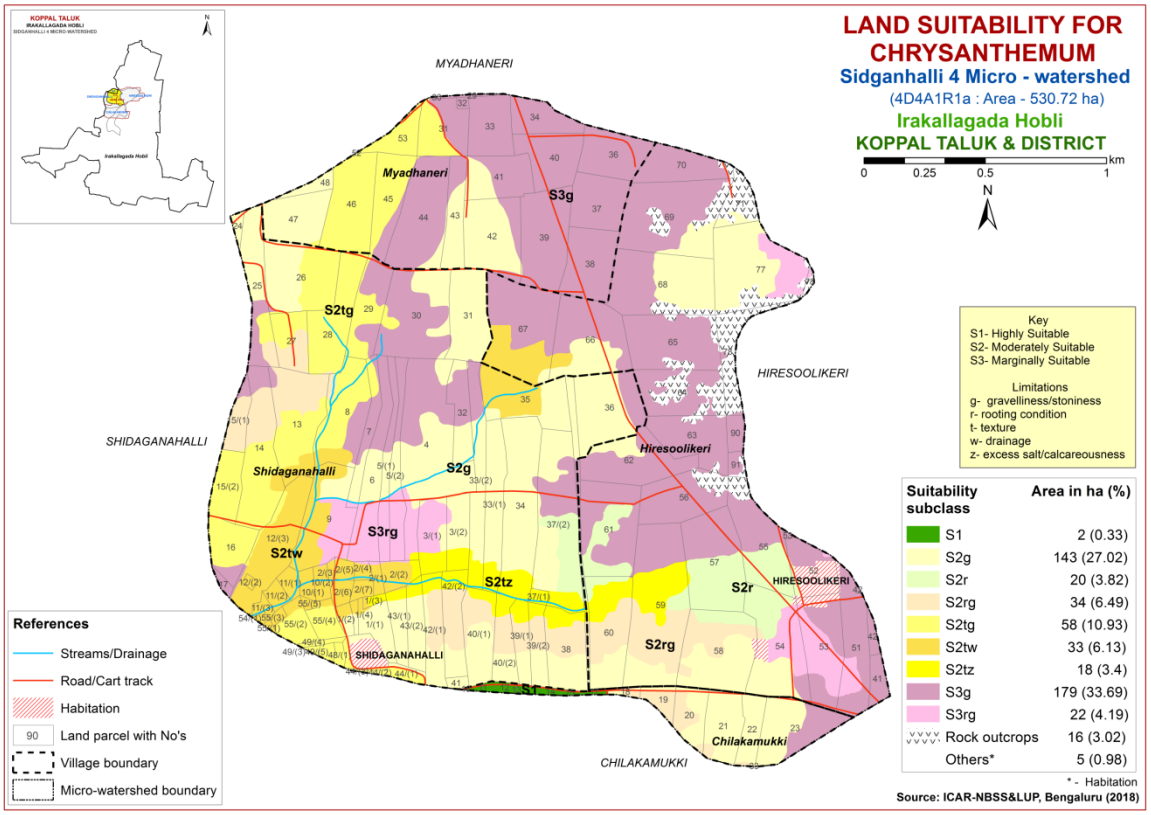


Fig. 7.26 Land Suitability map of Chrysanthemum

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

Jasmine is one of the most important flower crop grown in an area of 803 ha in almost all the districts of the State. The crop requirements (Table 7.28) for growing jasmine were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jasmine was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.27.

Small area of about 2 ha is highly suitable (Class S1) for growing jasmine and occur in the southern part. An area of about 255 ha (48%) is moderately suitable (Class S2) for growing jasmine with minor limitations of rooting depth, gravelliness and texture and occur in the northern, southern and central part of the microwatershed and an area of 252 ha (47%) is marginally suitable (Class S3) for jasmine with moderate limitations of texture, gravelliness, wetness, calcareousness and rooting depth and occur in all parts of the microwatershed.

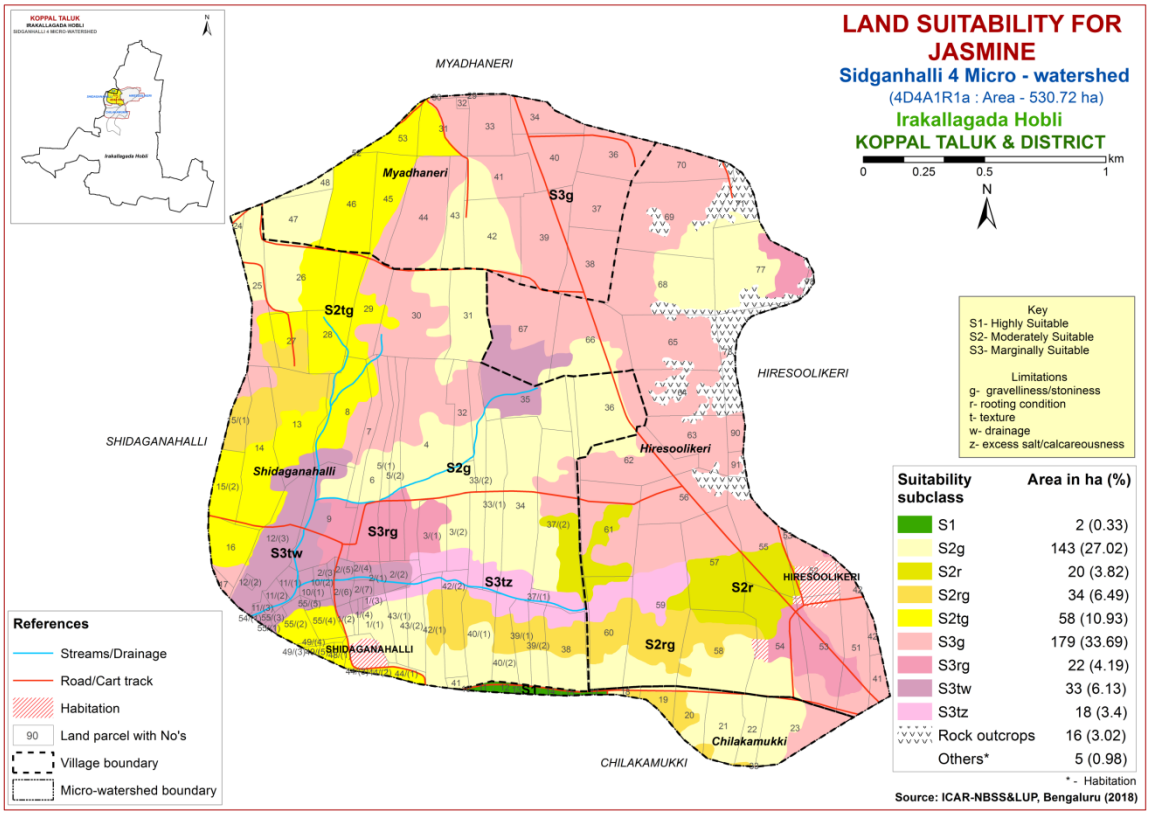


Fig. 7.27 Land Suitability map of Jasmine

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

Crossandra is one of the most important flower crop grown in an all the districts of the state. The crop requirements (Table 7.29) for growing crossandra were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing crossandra was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.27.

Small area of about 2 ha is highly suitable (Class S1) for growing crossandra and occur in the southern part. An area of about 242 ha (46%) is moderately suitable (Class S2) for growing crossandra with minor limitations of rooting depth, gravelliness and texture and occur in the northern and central part of the microwatershed and major area of 266 ha (50%) is marginally suitable (Class S3) for crossandra with moderate limitations of texture, gravelliness, wetness and rooting depth and occur in all parts of the microwatershed

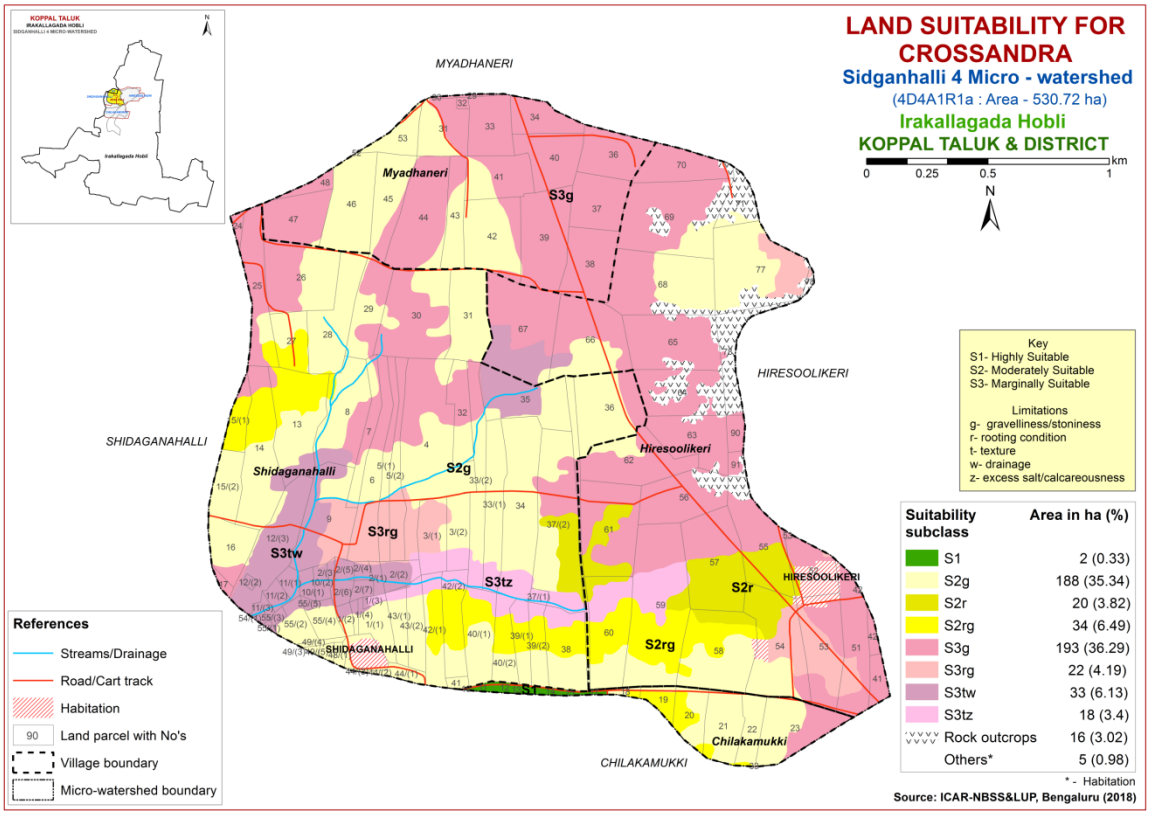


Fig. 7.28 Land Suitability map of Crossandra

Table 7.1 Soil-Site Characteristics of Sidaganhalli-4 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 (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface								
HRVcB2g1	662	<90	WD	25-50	sl	gscl	15-35	35-60	<50	1-3	moderate	6.05	0.21	0.73	11.24	100
HTIiB2g1	662	<90	WD	50-75	sc	gsc	15-35	15-35	51-100	1-3	moderate	7.11	0.109	0.30	20.19	100
KGHcB2g1	662	<90	WD	50-75	sl	gsc	15-35	15-35	100-150	1-3	moderate	6.66	0.089	0.93	8.22	100
KGHhB2g1	662	<90	WD	50-75	scl	gsc	15-35	15-35	100-150	1-3	moderate	6.66	0.089	0.93	8.22	100
LKRcB2g1	662	<90	WD	50-75	sl	gsc	15-35	35-60	<50	1-3	moderate	8.18	0.30	4.51	12.19	100
LKRhB2g1	662	<90	WD	50-75	scl	gsc	15-35	35-60	<50	1-3	moderate	8.18	0.30	4.51	12.19	100
LKRiB2g1	662	<90	WD	50-75	sc	gsc	15-35	35-60	<50	1-3	moderate	8.18	0.30	4.51	12.19	100
MKHcB2	662	<90	WD	50-75	sl	gsc	-	35-60	<50	1-3	moderate	7.38	0.09	1.49	14.89	93
MKHhB2g1	662	<90	WD	50-75	scl	gsc	15-35	35-60	<50	1-3	moderate	7.38	0.09	1.49	14.89	93
MKHiB2g1	662	<90	WD	50-75	sc	gsc	15-35	35-60	<50	1-3	moderate	7.38	0.09	1.49	14.89	93
BDGcB1g1	662	<90	WD	75-100	sl	gc	15-35	35-60	51-100	1-3	Slight	6.24	0.06	0.35	3.76	52.5
GHTiB1g1	662	<90	WD	75-100	sc	gscl	15-35	15-35	51-100	1-3	Slight	5.70	0.06	4.10	3.17	73.0
GHTiB1g2	662	<90	WD	75-100	sc	gscl	35-60	15-35	51-100	1-3	Slight	5.70	0.06	4.10	3.17	73.0
HDHhB2g1	662	<90	WD	75-100	scl	gsc-gc	15-35	35-60	51-100	1-3	moderate	6.54	0.07	7.11	3.84	84.7
HDHiB1g1	662	<90	WD	75-100	sc	gsc-gc	15-35	35-60	51-100	1-3	slight	6.54	0.07	7.11	3.84	84.7
HDHiB2g1	662	<90	WD	75-100	sc	gsc-gc	15-35	35-60	51-100	1-3	moderate	6.54	0.07	7.11	3.84	84.7
MNLcB2	662	<90	WD	100-150	sl	gsc	-	15-35	101-150	1-3	moderate	7.89	0.13	5.04	9.01	100
MNLiB1g1	662	<90	WD	100-150	sc	gsc	15-35	15-35	101-150	1-3	slight	7.89	0.13	5.04	9.01	100
MNLiB2g1	662	<90	WD	100-150	sc	gsc	15-35	15-35	101-150	1-3	moderate	7.89	0.13	5.04	9.01	100
NGPcB2g1	662	<90	WD	100-150	sl	gsc	15-35	35-60	51-100	1-3	moderate	6.77	0.09	1.40	7.10	82.7
NGPiB1g1	662	<90	WD	100-150	sc	gsc	15-35	35-60	51-100	1-3	slight	6.77	0.09	1.40	7.10	82.7
NDLiB1g1	662	<90	WD	>150	sc	gsc	15-35	35-60	51-100	1-3	Slight	7.84	0.28	5.16	27.36	100
NDLiB2	662	<90	WD	>150	sc	gsc	-	35-60	51-100	1-3	Moderate	7.84	0.28	5.16	27.36	100
KLRmA1	662	<90	MWD	>150	c	sc	-	-	>200	0-1	slight	7.50	0.32	4.26	23.20	100
TSDiA1	662	<90	MWD	>150	sc	c	-	-	>200	0-1	slight	8.46	0.17	0.19	36.61	100
TSDmA1	662	<90	MWD	>150	c	c	-	-	>200	0-1	slight	8.46	0.17	0.19	36.61	100
KVRmA1	662	<90	MWD	100-150	c	c	-	-	>200	0-1	slight	8.4	0.26	0.60	43.25	-

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

Table 7.2 Land suitability criteria for Sorghum

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

Table 7.3 Land suitability criteria for Maize

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

Table 7.4 Land suitability criteria for Bajra

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

Table 7.5 Land suitability criteria for Groundnut

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

Table 7.6 Land suitability criteria for Sunflower

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

Table 7.7 Land suitability criteria for Cotton

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

Table 7.8 Land suitability criteria for Red gram

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

Table 7.9 Land suitability criteria for Bengal gram

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

Table 7.10 Land suitability criteria for Chilli

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

Table 7.11 Land suitability criteria for Tomato

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

Table 7.12 Land suitability criteria for Drumstick

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

Table 7.13 Land suitability criteria for Mulberry

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

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

Table 7.14 Land suitability criteria for Mango

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

Table 7.15 Land suitability criteria for Sapota

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

Table 7.16 Land suitability criteria for Pomegranate

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

Table 7.17 Land suitability criteria for Guava

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

Table 7.18 Land suitability criteria for Jackfruit

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

Table 7.19 Land suitability criteria for Jamun

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

Table 7.20 Land suitability criteria for Musambi

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

Table 7.21 Land suitability criteria for Lime

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

Table 7.22 Land suitability criteria for Cashew

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

Table 7.23 Land suitability criteria for Custard apple

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

Table 7.24 Land suitability criteria for Amla

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

Table 7.25 Land suitability criteria for Tamarind

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

Table 7.26 Land suitability criteria for Marigold

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

Table 7.27 Land suitability criteria for Chrysanthemum

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

Table 7.28 Land suitability criteria for Jasmine (irrigated)

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

7.29 Land suitability criteria for Crossandra

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

7.29 Land management Units (LMUs)

The 28 soil map units identified in Sidaganhalli-4 microwatershed have been grouped into 7 Land management Units (LMUs) for the purpose of preparing a Proposed Crop Plan. Land management units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land management unit map (Fig.7.29) has been generated. These Land management Units are expected to behave similarly for a given level of management.

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

LMUs	Mapping unit	Soil and site characteristics
1	444.TSDiA1 446.TSDmA1 473.KLRmA1	Very deep, calcareous sandy clay to clay lowland soils with slopes of 0-1%, slight erosion
2	386.KVRmA1	Deep, black calcareous clay soils with slopes of 0-1%, slight erosion
3	123.HDHhB2g1 126.HDHiB1g1 128.HDHiB2g1 180.BDGcB1g1 251.NGPcB2g1 263.NGPiB1g1 299.NDLiB1g1 300.NDLiB2	Moderately deep to very deep, red gravelly sandy clay to clay soils with slopes of 1-3%, gravelly (15-35%)
4	145.GHTiB1g1 146.GHTiB1g2 204.MNLcB2 207.MNLiB1g1 209.MNLiB2g1	Moderately deep to deep, red gravelly sandy clay to sandy clay loam soils with slopes of 1-3%, slight to moderate erosion, gravelly to very gravelly (15-60%)
5	65.KGHcB2g1 69.KGHhB2g1 101.HTIiB2g1	Moderately shallow, red sandy clay to sandy clay loam soils with slopes of 1-3%, moderate erosion, gravelly (15-35%)
6	43.LKRcB2g1 54.LKRiB2g1 76.MKHcB2 85.MKHhB2g1 90.MKHiB2g1 452.LKRhB2g1	Moderately shallow, red gravelly sandy clay soils with slopes of 1-3%, moderate erosion, gravelly (15-35%)
7	465.HRVcB2g1	Shallow, red gravelly loamy soils with slopes of 1-3%, moderate erosion, gravelly (15-35%)

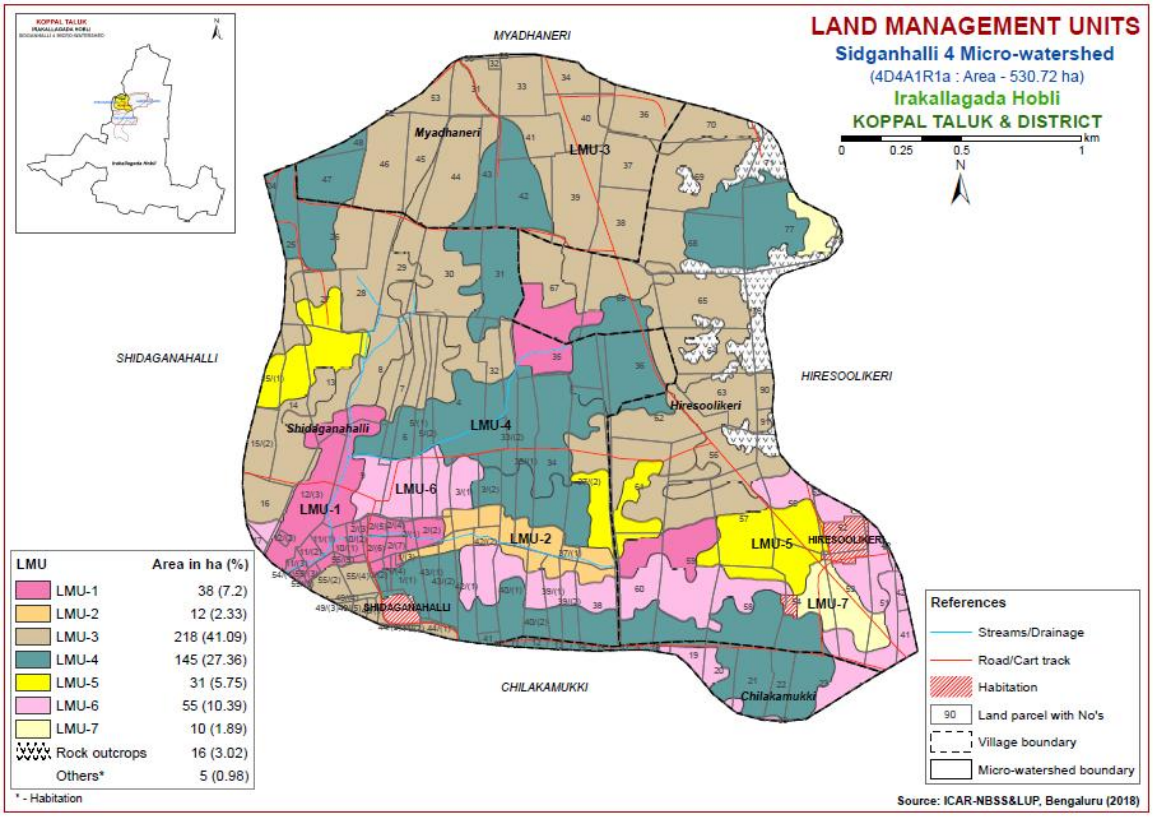


Fig 7.29 Land management Unit map of Sidaganhalli-4 microwatershed

7.30 Proposed Crop Plan for Sidaganhalli-4 Microwatershed

After assessing the land suitability for the 28 crops, the proposed crop plan has been prepared for the 7 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 28 crops. The resultant proposed crop plan is presented in Table 7.30

Table 7.30 Proposed Crop Plan for Sidaganhalli-4 Microwatershed

LMU	Soil Map Units	Survey Number	Field Crops	Horticulture Crops	Suitable Interventions
1	444.TSDiA1 446.TSDmA1 473.KLRmA1 Very deep, calcareous sandy clay to clay lowland soils	**Shidaganahalli :** 1/(4),10/(1),10/(2),11/(1),11/(2),11/(3),12/(2),12/(3),2/(1),2/(2),2/(3),2/(4),2/(5),2/(6),2/(7),35,54/(1), 55/(1),55/(3),55/(5),9	Paddy, Maize, Sugarcane, Cotton	**Fruit crops:** Custard Apple, Amla **Vegetable crops:** Brinjal, Tomato, Chillies, Drumstick, Bhendi, Coriander, leafy vegetables **Flower crops:** Marigold, Chrysanthemum, Jasmine	Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practises
2	386.KVRmA1 Deep, black calcareous clay soils	**Shidaganahalli :** 1/(3),37/(1)	Maize, Sorghum, Sunflower, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Sapota, Pomegranate, Jamun, Lime, Musambi, Tamarind, Amla, Custard apple **Vegetables:** Drumstick, Chilli, Coriander, Tomato, Bhendi **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practises
3	123.HDHhB2g1 126.HDHiB1g1 128.HDHiB2g1 180.BDGcB1g1 251.NGPcB2g1 263.NGPiB1g1 299.NDLiB1g1 300.NDLiB2 Moderately deep to very deep, red gravelly sandy clay to clay soils	**Hiresoolikeri :** 56,61,62,63,64,65,66,67, 69,70,90,91 Myadneri 67 **Shidaganahalli:** 7,8,14,15/(2),16,27,28,29,30,32,44/(1),44/(2),44/(3),48/(1),48/(2),49/(3),49/(4),49/(5),55/(2),55/(4)	Sorghum, Groundnut, Red gram, Bajra, Horse gram, Castor	**Fruit crops:** Musambi, Lime, Jamun, Jackfruit Amla, Custard apple, Tamarind **Vegetable crops:** Drumstick, Curry leaves	Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc)
4	145.GHTiB1g1 146.GHTiB1g2 204.MNLcB2	**Chilakamukki :** 10,11,12,13,14,15,17,18,20,21,22,23,33	Maize, Sorghum, Sunflower, Bajra, Finger millet,	**Fruit crops:** Pomegranate, Guava, Sapota, Jackfruit, Tamarind, Lime, Musambi,	Drip irrigation, mulching, suitable soil and water conservation

LMU	Soil Map Units	Survey Number	Field Crops	Horticulture Crops	Suitable Interventions
	207.MNLiB1g1 209.MNLiB2g1 Moderately deep to deep, red gravelly sandy clay to sandy clay loam soils	**Hiresoolikeri :** 54,58,68,77 Myadneri 31 **Shidaganahalli :** 1/(1),1/(2),3/(2),4,24,25, 26, 31,33/(1),33/(2),34,36,3 7/(2),38,39/(2),40/(1),40 /(2),41, 43/(1),43/(2)	Groundnut, Redgram, Cowpea, Field bean, Castor	Amla, Custard apple **Vegetable crops:** Drumstick, Tomato, Chilli, Brinjal, Onion, Curry leaves **Flower crops:** Marigold, Chrysanthemum, Jasmine	practises (Crescent Bunding with Catch Pit etc)
5	65.KGHcB2g1 69.KGHhB2g1 101.HTIiB2g1 Moderately shallow, red sandy clay to sandy clay loam soils	**Hiresoolikeri :** 55,57 **Shidaganahalli :** 13,15/(1)	Sorghum, Groundnut, Bajra, Green gram, Black gram, Cowpea, Horse gram, Castor,	**Fruit crops:** Lime, Musambi, Amla, Custard apple, Cashew **Flower crops:** Marigold, Chrysanthemum	Drip irrigation, Mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
6	43.LKRcB2g1 54.LKRiB2g1 76.MKHcB2 85.MKHhB2g1 90.MKHiB2g1 452.LKRhB2g1 Moderately shallow, red gravelly sandy clay soils	**Chilakamukki :** 19 **Hiresoolikeri :** 41,42,51,59,60 **Shidaganahalli :** 3/(1), 5/(1),5/(2),6,17, 39/(1),42/(1), 42/(2),	Sorghum, Groundnut, Bajra, Castor	**Fruit crops:** Lime, Musambi, Amla, Cashew, Custard apple,	Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc)
7	465.HRVcB2g1 Shallow, red gravelly loamy soils	**Hiresoolikeri :** 51,52,53,54,77,78	Green gram, Black gram, Horse gram	**Agri-Silvi-Pasture:** Custard apple, Amla, Hybrid Napier, *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

Soil health is basic to plant health and plant health is basic to human 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 Sidaganhalli-4 Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of Mornal (MNL) 117 ha (22%), Nagalapura (NGP) 76 ha (14%), Hoordhahalli (HDH) 69 ha (13%), Niduavalalu (NDL) 58 ha (11%) and other series in a small area.
- As per land capability classification, 372 ha (70%) area in the microwatershed falls under arable land category (Class II) with moderate limitations of soil, wetness and erosion, 137 ha (26%) area is under moderately good lands (Class III) with severe limitations of soil and erosion.

- On the basis of soil reaction, small area of about 36 ha (7%) area is slightly acid (pH 6.0-6.5), major area of 347 ha (65%) is neutral in reaction and 126 ha (24%) area is slightly to moderately alkaline (pH 7.3-8.4).

Soil Health Management

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

Acid soils

Slightly acid soils cover about 36 ha area in the microwatershed.

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

Liming materials:

1. $CaCO_3$ (Calcium Carbonate).
2. Dolomite [Ca Mg $(Co_3)_2$]
3. Quick lime (Cao)
4. Slaked lime [Ca $(OH)_2$]

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

Neutral soils

Neutral soils cover about 347 ha area in the microwatershed.

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.

Alkaline soils

(Slightly alkaline to moderately alkaline soils cover about 126 ha area in the microwatershed.

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 ZnSO4 – 12.5 kg/ha (once in three years).
5. Application of Boron – 5 kg/ha (once in three years).

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. Major area of about 359 ha (68%) is suffering from moderate erosion. These areas need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning in IWMP is focusing on preparation of

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

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

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

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Sidaganhalli-4 Microwatershed.
- **Organic Carbon:** The OC content is medium (0.5-0.75%) in an area of about 181 ha (34%). These areas needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping and high (>0.75%) in 328 ha (62%) area.
- **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 181 ha (34%) where OC is medium (0.5-0.75%). 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**: About 44 ha (8%) area is medium (23-57 kg/ha) in available phosphorus. Hence for all crops, 25% additional P-needs to be applied high (>57 kg/ha) in 466 ha (88%) area.
- **Available Potassium:** Available potassium is low (<145 kg/ha) in 90 ha (17%), medium (145-337 kg/ha) in 325 ha (61%) area and high (>337 kg/ha) in 94 ha (18%) area of the microwatershed.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. Available sulphur medium in an area of about 10 ha (2%) in the microwatershed. These areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected. High (>20 ppm) in 499 ha (94%) area.
- **Available Boron:** An area of about 48 ha (9%) is low (<0.5 ppm) in available boron and an area of 293 ha (55%) is medium (05 -1.0 ppm) in available boron content. These areas need to be applied with sodium borate @ 10kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency. High (>1.0 ppm) in 169 ha (32%) area.
- **Available Iron:** It is sufficient (>4.5 ppm) in entire area.
- Available manganese and copper are sufficient in the entire area of the microwatershed.
- **Available Zinc:** It is sufficient (>0.6 ppm) in the entire area of the microwatershed.

- **Soil Alkalinity:** About126 ha (24%) area in the microwatershed has soils that are strongly alkaline to very strongly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

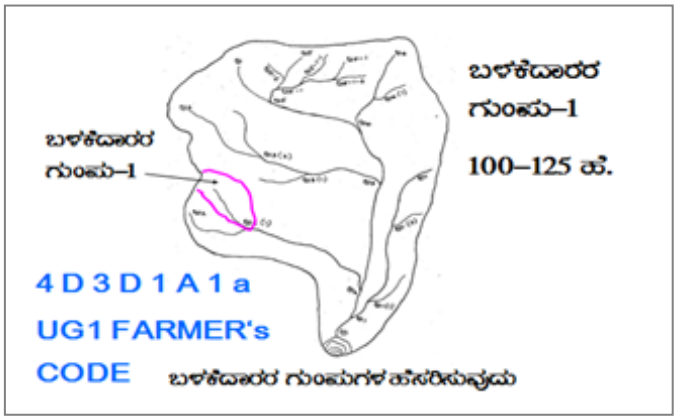
Land Suitability for various crops: Areas that are highly, moderately and marginally suitable and not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content,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

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Sidaganhalli-4 Microwatershed, the land resource inventory database generated under Sujala-III project has been transformed as information through series of interpretative (thematic) maps using soil phase map as a base. The various thematic maps (1:7920 scale) generated were

- Soil depth
- Surface soil texture
- Available water capacity
- Soil slope
- Soil gravelliness
- Land capability
- Present land use and land cover
- Crop suitability maps
- Rainfall map
- Hydrology
- Water Resources
- Socio-economic data



- Contour plan with existing features- network of waterways, pothissa boundaries, cut up/ minor terraces etc.
- Cadastral map (1:7920 scale)
- Satellite imagery (1:7920 scale)

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

Steps for Survey and Preparation of Treatment Plan

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

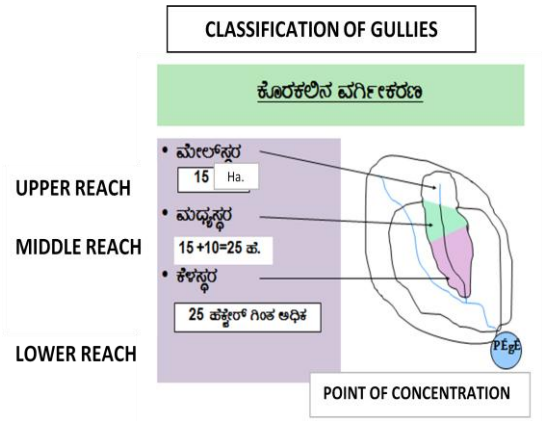
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

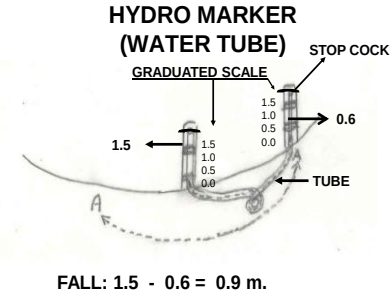
9.1.1 Arable Land Treatment

A. BUNDING

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

Measurement of Land Slope

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



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

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

Note: i) The above intervals are maximum.

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

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

Section of the Bund

Bund section is decided considering the soil texture class and gravelliness class (bg0 .....b= loamy sand, g0 = <15% gravel). The recommended sections for different soils are given below.

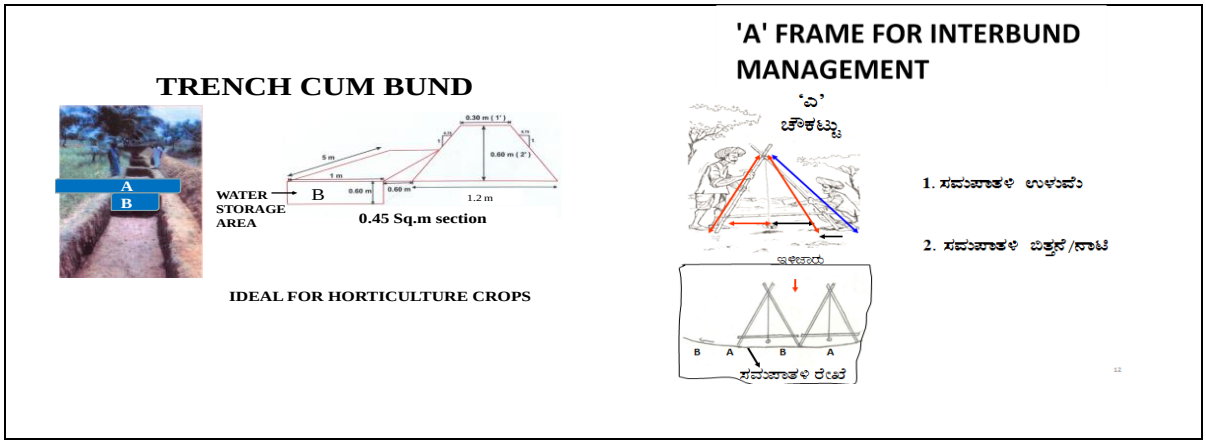
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below



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

Bund section	Bund length	Earth quantity	Pit				Berm (pit to pit)	Soil depth Class
m2	m	m3	L(m)	W(m)	D(m)	Quantity (m3)	m	
0.375	6	2.25	5.85	0.85	0.45	2.24	0.15	Shallow
0.45	6	2.7	5.4	1.2	0.43	2.79	0.6	Shallow
0.45	6	2.7	5	0.85	0.65	2.76	1	Moderately Shallow
0.54	5.6	3.02	5.5	0.85	0.7	3.27	0.1	Moderately shallow
0.54	5.5	2.97	5	1.2	0.5	3	0.5	Shallow
0.72	6.2	4.46	6	1.2	0.7	5.04	0.2	Moderately shallow
0.72	5.2	3.74	5.1	0.85	0.9	3.9	0.1	Moderately deep

B. Waterways

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

a) The cadastral map has to be updated as regards the network of drainge lines (gullies/ *nalas/ hallas*) and existing structures are marked to the scale and storage capacity of the existing water bodies are documented (Fig 9.1)
b) The drainage line will be demarcated into Upper Reach, Middle Reach and Lower Reach.
c) Considering the Catchment, *Nala* bed and bank conditions, suitable structures are decided.
d) Number of storage structures (Check dam/ *Nala* bund/ Percolation tank) will be decided considering the commitments and available runoff in water budgeting and quality of water in the wells and site suitability.
e) Detailed Leveling Survey using Dumpy Level / Total Station has to be carried out to arrive at the site-specific designs as shown in the Manual.
f) The location of ground water recharge structures are decided by examining the lineaments and fracture zones from geological maps.
g) Rainfall intensity data of the nearest Rain Gauge Station is considered for Hydrologic Designs.
h) Silt load to the Storage/Recharge Structures is reduced by providing vegetative, boulder and earthen checks in the natural water course. Location and design details are given in the Manual.

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.2) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. About 459 ha (86%) area needs trench cum bunding and 51 ha (10%) area needs strengthening of existing bunds/bunding. The conservation plan prepared may be presented to all the stakeholders including farmers and after considering their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

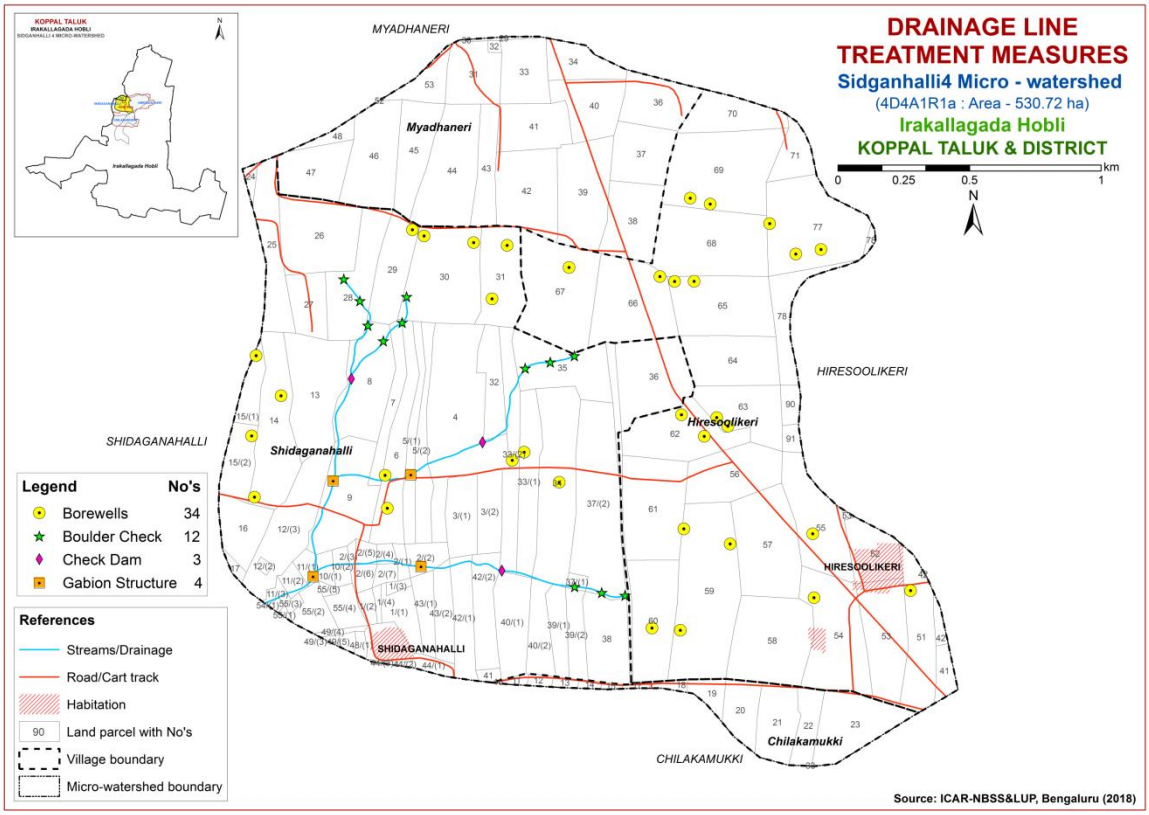


Fig. 9.1 Drainage Line Treatment map of Sidaganhalli-4 Microwatershed

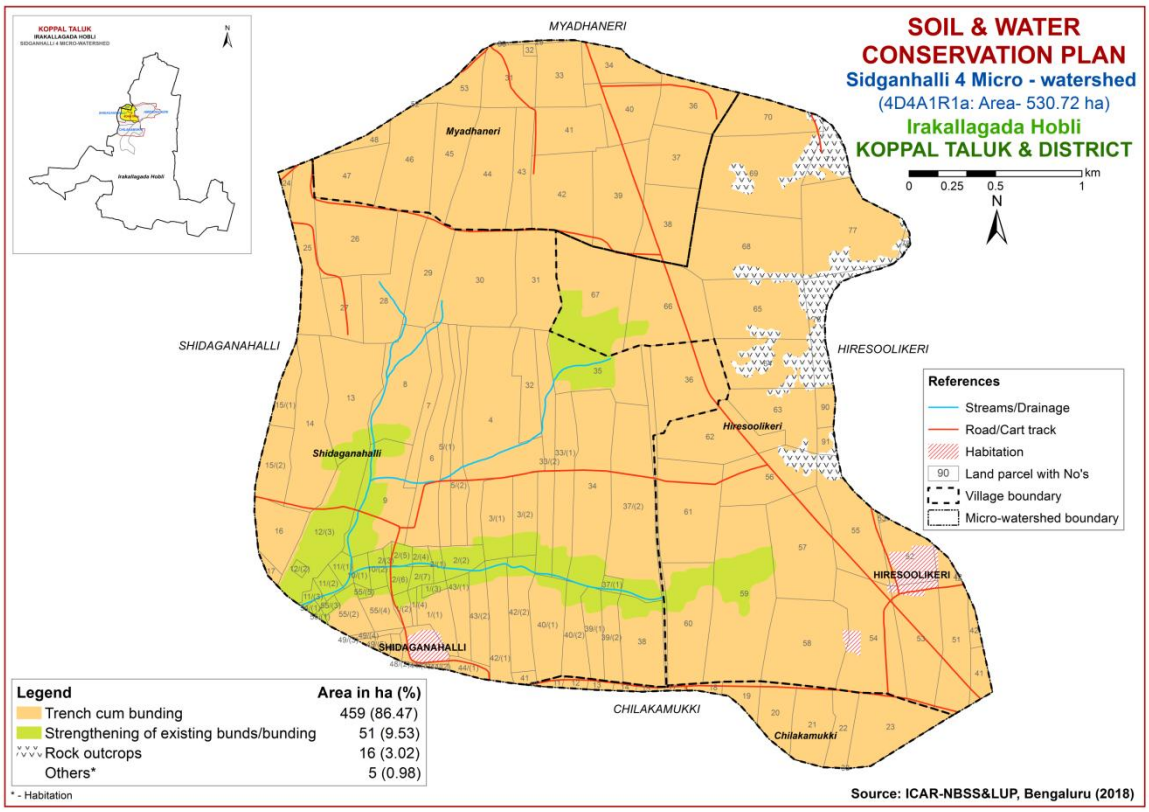


Fig. 9.2 Soil and Water Conservation Plan map of Sidaganhalli-4 Microwatershed

9.3 Greening of Microwatershed

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

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

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

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

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Appendix I

Sidaganhalli-4 (1R1a) Microwatershed

Soil Phase Information

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Chilakamukki	10	0.02	MNLcB2	LMU-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Maize (Cf+Mz)	Not Available	IIes	TCB
Chilakamukki	11	0.32	MNLcB2	LMU-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Chilakamukki	12	0.4	MNLcB2	LMU-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIes	TCB
Chilakamukki	13	0.37	MNLcB2	LMU-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIes	TCB
Chilakamukki	14	0.27	MNLcB2	LMU-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIes	TCB
Chilakamukki	15	0.18	MNLcB2	LMU-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIes	TCB
Chilakamukki	17	0.2	MNLcB2	LMU-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Tomato+Maize (Tm+Mz)	Not Available	IIes	TCB
Chilakamukki	18	0.48	MNLiB1g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	TCB
Chilakamukki	19	1.39	MKHcB2	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Chilakamukki	20	2.99	MNLiB1g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Chilakamukki	21	4.29	MNLiB1g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Greengram (Rg+Gg)	Not Available	IIs	TCB
Chilakamukki	22	2.49	MNLiB1g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Chilakamukki	23	6.47	MNLiB1g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Chilakamukki	33	0.01	MNLiB1g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Hiresoolikeri	41	1.33	LKRcB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Current fallow (Rg+Cf)	Not Available	IIes	TCB
Hiresoolikeri	42	0.66	LKRcB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Watermelon+Redgram (Cf+Wm+Rg)	Not Available	IIes	TCB
Hiresoolikeri	51	6.34	LKRcB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	1 Borewells	IIes	TCB
Hiresoolikeri	52	3.94	Habitation	Others	Others	Others	Others	Others	Others	Others	Redgram (Rg)	Not Available	Others	Others
Hiresoolikeri	53	7.17	HRVcB2g1	LMU-7	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Tomato+Current fallow (Rg+Tm+Cf)	Not Available	IIIes	TCB
Hiresoolikeri	54	9.55	MNLiB1g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut+Marigold+Redgram (Gn+Mg+Rg)	1 Borewells	IIs	TCB
Hiresoolikeri	55	7.37	KGHcB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Watermelon+Redgram+Current fallow (Wm+Rg+Cf)	1 Borewells	IIes	TCB

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Hiresoolikeri	56	6.45	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Hiresoolikeri	57	9.2	KGHcB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Marigold+Redgram (Mg+Rg)	Not Available	IIes	TCB
Hiresoolikeri	58	9.53	MNLiB1g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Current fallow+Marigold (Rg+Cf+Mg)	Not Available	IIs	TCB
Hiresoolikeri	59	14.79	MKHiB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Maize+Redgram (Gn+Mz+Rg)	3 Borewells	IIIes	TCB
Hiresoolikeri	60	7.61	MKHiB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Paddy+Current fallow (Gn+Pd+Cf)	1 Borewells	IIIes	TCB
Hiresoolikeri	61	8.96	HDHiB2g1	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Tomato (Gn+Tm)	Not Available	IIes	TCB
Hiresoolikeri	62	7.11	HDHiB2g1	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Tomato+Groundnut (Tm+Gn)	2 Borewells	IIes	TCB
Hiresoolikeri	63	5.76	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut+Current fallow (Rg+Gn+Cf)	2 Borewells	IIIes	TCB
Hiresoolikeri	64	6.57	BDGcB1g1	LMU-3	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Groundnut (Rg+Gn)	Not Available	IIIs	TCB
Hiresoolikeri	65	8.55	BDGcB1g1	LMU-3	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut+Paddy+Redgram (Gn+Pd+Rg)	2 Borewells	IIIs	TCB
Hiresoolikeri	66	8.97	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram+Watermelon (Gn+Rg+Wm)	1 Borewells	IIIes	TCB
Hiresoolikeri	67	10.86	NGPiB1g1	LMU-3	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut+Subabulu+Watermelon (Gn+Su+Wm)	1 Borewells	IIIs	TCB
Hiresoolikeri	68	10.63	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cucumber+Redgram+Paddy (Cu+Rg+Pd)	Not Available	IIes	TCB
Hiresoolikeri	69	12	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cucumber+Redgram+Paddy (Cu+Rg+Pd)	2 Borewells	IIIes	TCB
Hiresoolikeri	70	4.47	HDHiB2g1	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	TCB
Hiresoolikeri	71	2.51	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro (Rc)	Not Available	Ro	Ro
Hiresoolikeri	77	11.26	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Watermelon (Rg+Wm)	3 Borewells	IIes	TCB
Hiresoolikeri	78	3.91	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro (Rc)	Not Available	Ro	Ro
Hiresoolikeri	90	1.06	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Hiresoolikeri	91	0.72	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Ro (Rc)	Not Available	IIIes	TCB
Myadhaneri	29	0.23	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	30	0.04	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Myadhaneri	31	4.63	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIe	TCB
Myadhaneri	32	0.22	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	33	4.43	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	34	3.31	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	36	4.89	HDHiB2g1	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Myadhaneri	37	4.89	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	38	5.83	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	39	7.82	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	40	5.09	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	41	4.77	NGPcB2g1	LMU-3	Deep (100-150 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Myadhaneri	42	7.28	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Myadhaneri	43	3.54	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Myadhaneri	44	8.84	HDHiB2g1	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Myadhaneri	45	5.08	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIe	TCB
Myadhaneri	46	7.25	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIe	TCB
Myadhaneri	47	5.06	GHTiB1g2	LMU-4	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Myadhaneri	48	0.98	GHTiB1g2	LMU-4	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Myadhaneri	52	0.0001	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIe	TCB
Myadhaneri	53	2.44	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIe	TCB
Shidaganahalli	1/(1)	2.39	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	1/(2)	0.74	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Shidaganahalli	1/(3)	0.37	KVRmA1	LMU-2	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIs	Graded bunding
Shidaganahalli	1/(4)	0.34	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIw	Graded bunding
Shidaganahalli	2/(1)	0.58	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIw	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Shidaganahalli	2/(2)	1.65	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Current fallow (Cf)	Not Available	IIw	Graded bunding
Shidaganahalli	2/(3)	0.39	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	2/(4)	0.52	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIw	Graded bunding
Shidaganahalli	2/(5)	0.67	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	2/(6)	0.74	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	2/(7)	0.66	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	3/(1)	3.55	LKRhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Shidaganahalli	3/(2)	2.92	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	4	14.29	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	TCB
Shidaganahalli	5/(1)	2.97	LKRhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIIes	TCB
Shidaganahalli	5/(2)	3.64	LKRhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIIes	TCB
Shidaganahalli	6	6.14	LKRhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Watermelon (Rg+Wm)	2 Borewells	IIIes	TCB
Shidaganahalli	7	2.75	HDHhB2g1	LMU-3	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	8	7.46	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIe	TCB
Shidaganahalli	9	8.06	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	10/(1)	0.76	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Current fallow (Cf)	Not Available	IIw	Graded bunding
Shidaganahalli	10/(2)	0.89	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Current fallow (Cf)	Not Available	IIw	Graded bunding
Shidaganahalli	11/(1)	0.85	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	11/(2)	0.81	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	11/(3)	0.53	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	12/(2)	0.24	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	12/(3)	7.38	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	13	8.47	HTIiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	TCB
Shidaganahalli	14	8.47	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut+Redgram (Gn+Rg)	2 Borewells	IIs	TCB

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Shidaganahalli	15/(1)	2.08	HTIiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Chilli+Redgram (Gn+Ch+Rg)	1 Borewells	IIes	TCB
Shidaganahalli	15/(2)	3.21	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut (Gn)	1 Borewells	IIs	TCB
Shidaganahalli	16	3.78	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut (Gn)	Not Available	IIs	TCB
Shidaganahalli	17	0.39	LKRiB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	24	0.48	GHTiB1g2	LMU-4	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut (Gn)	Not Available	IIs	TCB
Shidaganahalli	25	5.73	GHTiB1g2	LMU-4	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Redgram+Watermelon (Cf+Rg+Wm)	Not Available	IIs	TCB
Shidaganahalli	26	8.17	GHTiB1g2	LMU-4	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut+Chilli+Redgram (Gn+Ch+Rg)	Not Available	IIs	TCB
Shidaganahalli	27	3.29	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Watermelon+Redgram+Groundnut (Wm+Rg+Gn)	Not Available	IIe	TCB
Shidaganahalli	28	6.56	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Current fallow (Gn+Cf)	Not Available	IIe	TCB
Shidaganahalli	29	4.9	NDLiB2	LMU-3	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram+Watermelon (Gn+Rg+Wm)	1 Borewells	IIe	TCB
Shidaganahalli	30	9.99	HDHiB2g1	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	2 Borewells	IIes	TCB
Shidaganahalli	31	6	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	2 Borewells	IIes	TCB
Shidaganahalli	32	3.3	HDHiB2g1	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	TCB
Shidaganahalli	33/(1)	5.29	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	1 Borewells	IIes	TCB
Shidaganahalli	33/(2)	5.24	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	1 Borewells	IIes	TCB
Shidaganahalli	34	10.5	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	1 Borewells	IIes	TCB
Shidaganahalli	35	6.66	TSDmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	36	7.66	GHTiB1g1	LMU-4	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Groundnut+Redgram+Mango (Gn+Rg+Mn)	Not Available	IIs	TCB
Shidaganahalli	37/(1)	0.43	KVRmA1	LMU-2	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Shidaganahalli	37/(2)	12.08	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	TCB
Shidaganahalli	38	5.37	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	39/(1)	2.25	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Shidaganahalli	39/(2)	2.3	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Shidaganahalli	40/(1)	4.77	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	40/(2)	2.98	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	41	0.42	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Shidaganahalli	42/(1)	3.66	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Shidaganahalli	42/(2)	3.92	MKHhB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Shidaganahalli	43/(1)	2.06	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	43/(2)	2.61	MNLiB2g1	LMU-4	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Shidaganahalli	44/(1)	0.92	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	44/(2)	0.11	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	44/(3)	0.06	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	48/(1)	0.41	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow (Cf)	Not Available	IIs	TCB
Shidaganahalli	48/(2)	0.03	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	49/(3)	0	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	49/(4)	0.16	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	49/(5)	0.4	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	54/(1)	0.19	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	55/(1)	0.14	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIw	Graded bunding
Shidaganahalli	55/(2)	2.07	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	55/(3)	0.28	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIw	Graded bunding
Shidaganahalli	55/(4)	1.72	NDLiB1g1	LMU-3	Very deep (>150 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	TCB
Shidaganahalli	55/(5)	0.25	TSDiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIw	Graded bunding

TCB-Trench cum Bunding, Ro-Ro

Appendix II

Sidaganhalli-4 (1R1a) Microwatershed

Soil Fertility Information

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Chilakamukki	10	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	11	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	12	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	13	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	14	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	15	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	17	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	18	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	19	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	20	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	21	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	22	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	23	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Chilakamukki	33	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	41	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	42	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	51	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	52	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hiresoolikeri	53	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	54	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	55	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hiresoolikeri	56	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	57	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	58	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	59	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	60	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	61	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	62	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	63	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	64	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	65	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	66	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	67	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	68	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	69	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)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	70	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	71	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hiresoolikeri	77	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	78	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hiresoolikeri	90	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hiresoolikeri	91	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	29	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)
Myadhaneri	30	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	31	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	32	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)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Myadhaneri	33	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)
Myadhaneri	34	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)	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)
Myadhaneri	36	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	37	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	38	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	39	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	40	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	41	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	42	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	43	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	44	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	45	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	46	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	47	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	48	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	52	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Myadhaneri	53	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	1/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	1/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	1/(3)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	1/(4)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	2/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	2/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Shidaganahalli	2/(3)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	2/(4)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	2/(5)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	2/(6)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	2/(7)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	3/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	3/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	4	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	5/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	5/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	6	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	7	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	8	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	9	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	10/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	10/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	11/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	11/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	11/(3)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	12/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	12/(3)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	13	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	14	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Shidaganahalli	15/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	15/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	16	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	17	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	24	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	25	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	26	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	27	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	28	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	29	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	30	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	31	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	32	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	33/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	33/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	34	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	35	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	36	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	37/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	37/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	38	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	39/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	39/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Shidaganahalli	40/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	40/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	41	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	42/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	42/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	43/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	43/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	44/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	44/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	44/(3)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	48/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	48/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	49/(3)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	49/(4)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	49/(5)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	54/(1)	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	55/(1)	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	55/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	55/(3)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	55/(4)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Shidaganahalli	55/(5)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Appendix III

Sidaganhalli-4 (1R1a) Microwatershed

Soil Suitability Information

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Chilakamukki	10	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Chilakamukki	11	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Chilakamukki	12	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Chilakamukki	13	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Chilakamukki	14	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Chilakamukki	15	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Chilakamukki	17	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Chilakamukki	18	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Chilakamukki	19	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Chilakamukki	20	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Chilakamukki	21	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Chilakamukki	22	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Chilakamukki	23	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Chilakamukki	33	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Hiresoolikeri	41	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3g	S3g	S3rg	S3rg	S3g
Hiresoolikeri	42	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3g	S3g	S3rg	S3rg	S3g
Hiresoolikeri	51	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3g	S3g	S3rg	S3rg	S3g
Hiresoolikeri	52	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hiresoolikeri	53	N1rg	S3rg	N1rg	S3rg	N1rg	S3rt	N1rg	N1rg	S3rt	N1rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3r	S3r	S3rg	N1rg	N1rg	S3r

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Hiresooli keri	54	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Hiresooli keri	55	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hiresooli keri	56	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hiresooli keri	57	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hiresooli keri	58	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Hiresooli keri	59	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Hiresooli keri	60	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Hiresooli keri	61	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hiresooli keri	62	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hiresooli keri	63	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hiresooli keri	64	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hiresooli keri	65	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hiresooli keri	66	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hiresooli keri	67	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hiresooli keri	68	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Hiresooli keri	69	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hiresooli keri	70	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hiresooli keri	71	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hiresooli keri	77	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Hiresooli keri	78	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hiresooli keri	90	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hiresooli keri	91	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Myadhaneri	29	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	30	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	31	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Myadhaneri	32	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	33	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	34	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	36	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Myadhaneri	37	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	38	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	39	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	40	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	41	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Myadhaneri	42	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Myadhaneri	43	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Myadhaneri	44	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Myadhaneri	45	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Myadhaneri	46	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Myadhaneri	47	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S3rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S3rg	S2g	S2g	S2g	S2g	S2g	S2r	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Myadhaneri	48	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S3rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S3rg	S2g	S2g	S2g	S2g	S2g	S2r	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Myadhaneri	52	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Myadhaneri	53	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	1/(1)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Shidaganahalli	1/(2)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	1/(3)	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Shidaganahalli	1/(4)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	2/(1)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	2/(2)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	2/(3)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	2/(4)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	2/(5)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	2/(6)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	2/(7)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	3/(1)	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3g	S3g	S3rg	S3rg	S3rg	S3g
Shidaganahalli	3/(2)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	4	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	5/(1)	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3g	S3g	S3rg	S3rg	S3rg	S3g
Shidaganahalli	5/(2)	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3g	S3g	S3rg	S3rg	S3rg	S3g
Shidaganahalli	6	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3g	S3g	S3rg	S3rg	S3rg	S3g
Shidaganahalli	7	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Shidaganahalli	8	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	9	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	10/(1)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	10/(2)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	11/(1)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Shidagan ahalli	11/ (2)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidagan ahalli	11/ (3)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidagan ahalli	12/ (2)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidagan ahalli	12/ (3)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidagan ahalli	13	N1r	S2rg	S3r	S2rg	S3r	S2rg	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rt	S2r	S2rg	S3r	S2r	S2rt
Shidagan ahalli	14	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidagan ahalli	15/ (1)	N1r	S2rg	S3r	S2rg	S3r	S2rg	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2rg	S2rg	S2rg	S2rg	S3r	S2r	S2rg	S2rt	S2r	S2rg	S3r	S2r	S2rt
Shidagan ahalli	15/ (2)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidagan ahalli	16	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidagan ahalli	17	N1rg	S3rg	S3rg	S3rg	S3rg	S3g	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3g	S3g	S3g	S3g	S3rg	S2rg	S3g	S3g	S3g	S3g	S3rg	S3rg	S3g
Shidagan ahalli	24	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S3rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S3rg	S2g	S2g	S2g	S2g	S2g	S2r	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Shidagan ahalli	25	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S3rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S3rg	S2g	S2g	S2g	S2g	S2g	S2r	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Shidagan ahalli	26	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S3rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S3rg	S2g	S2g	S2g	S2g	S2g	S2r	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Shidagan ahalli	27	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidagan ahalli	28	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidagan ahalli	29	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidagan ahalli	30	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Shidagan ahalli	31	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidagan ahalli	32	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Shidagan ahalli	33/ (1)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidagan ahalli	33/ (2)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidagan ahalli	34	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Shidaganahalli	35	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidaganahalli	36	S3r	S2g	S2r	S2g	S2r	S2rg	S3r	S2r	S2g	S2rg	S2rg	S1	S2r	S1	S2r	S2r	S2r	S1	S2g	S2g	S2g	S2g	S2r	S1	S2g	S1	S1	S2g	S2rg	S2r	S1
Shidaganahalli	37/(1)	S2rz	S2tz	S3tz	S2z	S3tz	S2z	S2rz	S2z	S2z	S2z	S2tz	S2tz	S3tz	S2z	N1tz	S2rz	S2z	S3tz	S3tz	S3tz	S2tz	S2tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz	S2tz	S2tz	S3tz
Shidaganahalli	37/(2)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	38	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	39/(1)	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Shidaganahalli	39/(2)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	40/(1)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	40/(2)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	41	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	42/(1)	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Shidaganahalli	42/(2)	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Shidaganahalli	43/(1)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	43/(2)	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Shidaganahalli	44/(1)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	44/(2)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	44/(3)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	48/(1)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	48/(2)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	49/(3)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	49/(4)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidaganahalli	49/(5)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Shidagan ahalli	54/ (1)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidagan ahalli	55/ (1)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidagan ahalli	55/ (2)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidagan ahalli	55/ (3)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw
Shidagan ahalli	55/ (4)	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2gt	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S1	S1	S2g	S2g	S2g	S1
Shidagan ahalli	55/ (5)	S3tw	S2t	S3tw	S2w	S3tw	S2w	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S3tw	S3tw	S2tw	S2tw	S2tw	S2t	S3tw	S2tw	S2tw	S3tw	S2tw	S2tw	S2tw

Ro-Rock outcrops

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

1.	Findings of the socio-economic survey	1-4
2.	Introduction	5
3	Methodology	7-8
4	Salient features of the survey	9-27
5	Summary	29-33

LIST OF TABLES

1	Households sampled for socio economic survey	9
2	Population characteristics	9
3	Age wise classification of household members	9
4	Education level of household members	10
5	Occupation of household heads	10
6	Occupation of family members	10
7	Institutional participation of household members	11
8	Type of house owned by households	11
9	Durable assets owned by households	11
10	Average value of durable assets owned by households	12
11	Farm implements owned by households	12
12	Average value of farm implements	12
13	Livestock possession by households	13
14	Average labour availability	13
15	Adequacy of hired labour	13
16	Distribution of land (ha)	14
17	Average land value (Rs./ha)	14
18	Status of bore wells	14
19	Source of irrigation	14
20	Depth of water(Avg in meters)	15
21	Irrigated area (ha)	15
22	Cropping pattern	15
23	Cropping intensity	15
24.a	Cost of cultivation of Maize	16
24.b	Cost of cultivation of Paddy	17
24.c	Cost of cultivation of Groundnut	18
24.d	Cost of cultivation of Chilly	19
24.e	Cost of cultivation of Bajra	20
24.f	Cost of cultivation of Tomato	21
25	Adequacy of fodder	22
26	Annual gross income	22

27	Average annual expenditure	22
28	Horticultural species grown	22
29	Forest species grown	23
30	Average additional investment capacity	23
31	Source of funds for additional investment	23
32	Marketing of the agricultural produce	24
33	Marketing channels used for sale of agricultural produce	24
34	Mode of transport of agricultural produce	24
35	Incidence of soil and water erosion problems	24
36	Interest shown towards soil testing	25
37	Usage pattern of fuel for domestic use	25
38	Source of drinking water	25
39	Source of light	25
40	Existence of sanitary toilet facility	25
41	Possession of public distribution system (PDS) card	26
42	Participation in NREGA programme	26
43	Adequacy of food items	26
45	Response on market surplus of food items	27
46	Farming constraints experienced	27

Chapter 1

FINDINGS OF THE SOCIO-ECONOMIC SURVEY

- *The survey was conducted in Sidganhalli-4 micro-watershed is located at $15^0$32'39.975'' to 15^0 31'16.547''North and 76^0 15' 9.616'' to $76^0$13'41.174'' East covering an area of about 448.03 ha coming Chilakamukki village of Koppal taluk.*
- *Socio-economic analysis indicated that, out of the total sample of 35 respondents 5 (14.29%) were landless, 7 (20 %) were marginal, 10 (28.57%) were small farmers, 6 (17.14%) were semi medium farmers and 7 (20%) medium farmers.*
- *The population characteristics of households indicated that, there were 94 (59.87%) men and 63 (40.13%) women among the sampled households. The average family size of landless farmers' was 4, marginal farmers' was 4.4, small farmers' was 3.7, semi medium farmers' was 5.1 and medium farmers were 5. 4.*
- *Majority of the respondents 40 (23.12%) people were in 0-15 years of age, 67 (38.73%) were in 16-35 years of age36 (22.93%) people were in 0-15 years of age, 63 (40.13%) were in 16-35 years of age, 42 (26.75%) were in 36-60 years of age and 16 (10.19%) were above 61 years of age.*
- *Education level of the sample households indicated that, majority there were 37.58 per cent illiterates, 28.66 per cent of them had primary school, 3.18 per cent of them had Middle school education, 10.19 per cent of them had high school, 11.46 per cent of them had PUC, 0.64 per cent of them had diploma and ITI, 3.82 per cent of them had degree and 1.27 per cent of them had masters education.*
- *About, 31.43 per cent of household heads were practicing agriculture and 62.86 per cent of the household heads were agricultural laborers.*
- *Agriculture was the major occupation for 28.66 per cent of the household members, 36.94 per cent were agricultural laborers, 1.91 per cent was private service, 29.3 per cent student and 2.55 per cent were children.*
- *The household possess, 0.64 per cent of the population in the micro watershed has participated in self help group and 99.36 per cent of the population in the micro watershed has not participated in local institutions.*
- *In the study area, 71.43 per cent of the households possess katcha house.*
- *The durable assets owned by the households showed that, 68.57 per cent of the households possess TV, 17.14 per cent of the households possess mixer/grinder, 5.71 per cent of the households possess bicycle, 45.71 per cent of the household's posses motor cycle, 2.86 per cent of the households possess tempo and landline phone and 91.43 per cent of the households possess mobile phones.*
- *Farm implements owned by the households indicated that, 2.86 per cent each of the households possess bullock cart, 5.71 per cent each of the households possess plough and sprayer, 8.57 per cent of the households possess sprinkler, 28.57 per cent of the households possess weeder and 17.14 per cent of the households possess Harvester.*

- *Regarding livestock possession by the households, 17.14 per cent of the households possess bullocks, 2.86 per cent of the households possess crossbreed cow and buffalo.*
- *The average own labour men available in the micro watershed was 1.59, average own labour (women) available was 4.76, average hired labour (men) available was 9.03 and average hired labour (women) available was 7.83.*
- *Out of the total land holding of the sample respondents 12.44 ha (24.86%) of dry land and 37.62 ha (75.14%) of irrigated land.*
- *Marginal farmers possess 3.74 ha (80.09%) of dry land and 0.93 ha (19.91%) of irrigated land.*
- *Small farmers possess 8.7 ha (72.15%) of dry land and 3.36 ha (27.85%) of irrigated land. Semi medium farmers possess 8.64 ha (100%) of irrigated land.*
- *Medium farmers possess 24.69 ha (100%) of irrigated land.*
- *There were 18 functioning and 10 functioning bore wells in the micro watershed. Bore well was the major irrigation source in the micro water shed for 54.29 per cent of the farmers.*
- *The major crops have grown maize (27.29 ha), bajra (8.54 ha) groundnut (8.09 ha), sajje (0.81 ha), chilly, paddy, tomato and watermelon (0.4 ha). The cropping intensity in Sidganhalli-4 Micro-watershed was found to be 60.74 per cent.*
- *The per hectare cost of cultivation for Maize, paddy groundnut, chilly, Bajra and Tomato was Rs. 34059.21, 94011.08, 40626.26, 71551.81, 30854.22 and 65441.56 with benefit cost ratio of 1:1.22, 1:1.36, 1:1.97, 1:3.18, 1:0.95 and 1:0.6 respectively.*
- *Further, 20 per cent of the households opined that dry fodder and green fodder was adequate.*
- *The average annual gross income was Rs. 15,800 for landless, for marginal farmers it was Rs. 55,285.71, for small farmers it was Rs. 70,700, semi medium farmers it was Rs. 170,000 and medium farmers it was Rs. 195,714.29.*
- *The average annual expenditure is Rs. 24,350.88. For landless it was Rs. 2,040, for marginal farmers it was Rs. 6,102.04, for small farmers it was Rs. 4,470, for semi medium farmers it was Rs. 97,111.11 and for medium farmers it was Rs. 24,571.43.*
- *Sampled households have planted 49 coconut and 3 mango trees in their field to cultivate horticultural crops.*
- *Households have planted 13 1 teak and 57 neem trees in their field to cultivate forest species.*
- *Households have an average investment capacity of Rs. 2,228.57 for land development, Rs. 428.57 for irrigation facility, Rs. 1,628.57 for improved crop production and Rs.1, 771.43 for improved livestock management.*
- *Source of funds for additional investment is concerned; loan from bank was the source of additional investment for 22.86 per cent for land development, 2.86 per*

cent for irrigation facility and 2.86 per cent for improved crop production and improved livestock management.

- *Own funds were the source of additional investment for 8.57 per cent for land development and 5.71 per cent for improved crop production and improved livestock management.*
- *Regarding marketing channels, 11.43 per cent of the farmers sold their produce to agent/traders, 102.86 per cent of the farmers sold their produce to local/village merchant and 5.71 per cent of the farmers sold their produce to regulated market.*
- *Further, 117.14 per cent of the households have used tractor and 2.86 per cent of the households used truck as a mode of transportation.*
- *Majority of the households 54.29 per cent have incidence of soil and water erosion problems.*
- *The household possess, (54.29 %) were interested towards soil testing.*
- *The households possess 88.57 per cent of the households used fire wood and 11.43 per cent of the household's LPG as a source of fuel.*
- *Piped supply was the major source of drinking water for 68.57 per cent, 28.57 per cent of the households used bore well and 2.86 per cent of the households used lake/tank well in the micro watershed.*
- *Electricity was the major source of light for 100 per cent of the households.*
- *In the study area, 40 per cent of the households possess sanitary toilet facility.*
- *Regarding possession of PDS card, 97.14 per cent of the sampled households possessed BPL cards and 2.86 per cent of the households possessed had no PDS cards.*
- *Cereals were adequate for 100 per cent of the households, pulses were adequate for 74.29 per cent, oilseeds were adequate for 11.43 per cent, vegetables were adequate for 88.57 per cent, fruits were adequate for 2.86 per cent, milk and egg were adequate for 97.14 per cent and meat were adequate for 91.43 per cent of the households.*
- *Pulses were inadequate for 25.71 per cent of the households, oilseed were inadequate for 80 per cent, vegetables were inadequate for 11.43 per cent, fruits were inadequate for 71.43 per cent, milk were inadequate for 2.86 per cent, and meat were inadequate for 5.71 per cent of the households.*
- *Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil was the constraint experienced by 62.86 per cent of the households, wild animal menace on farm field (45.71%), frequent incidence of pest and diseases (40%), Inadequacy of irrigation water (25.71 %), high cost of fertilizer and plant protection chemicals (65.71%), high rate of interest on credit (31.43%), Low price for the agricultural commodities (48.57%), lack of marketing facilities in the area (54.29%), inadequate extension service (2.86%), Lack of*

transport for safe transport of the Agril produce to the market (8.57%), less rainfall (28.57%) and Source of Agri-technology information (2.86%).

Chapter 2

INTRODUCTION

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

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

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

Scope and importance of survey

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

Chapter 3

METHODOLOGY

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

1. Description of the study area

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

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

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

2. Locale of the survey and description of the micro-watershed

The study was conducted in Sidganhalli-4 micro-watershed is located at $15^0$32’39.975’’ to 15^0 31’16.547’’North and 76^0 15’ 9.616’’ to $76^0$13’41.174’’ East covering an area of about 448.03 ha coming Chilakamukki Villages of Koppal taluk.

3. Selection of the respondents for the study

The micro-watershed is marked with 320 square meters grids. One farmer from every alternate grid in the micro-watershed was selected for the study and interviewed for socio-economic data. Totally 35 households were interviewed for the survey.

4. The parameters considered for socio-economic survey of households

Two forms of data were collected from the micro-watershed which includes primary data from the farm households and secondary data about the villages under the micro-watershed jurisdiction.

The following parameters were considered for the primary data collection about the socio-economic data of the households, (1) Demographic information, (2) Farm and durable assets owned by households, (3) Livestock possession, (4) Labour availability, (5) Level of migration in the village, Land holding, (7) Cropping pattern, (8) Source of irrigation, (9) Borrowing status, (10) Cost of cultivation of major crops, (11) Economics of subsidiary activities, (12) Fodder availability, (13) Family annual income from different sources, (14) Horticulture and forestry species grown, (15) Additional investment capacity, (16) Marketing practices, (17) Status of soil and water conservation structure, (18) Access to basic needs and (19) Constraints and suggestion.

The following parameters were considered for the secondary data regarding the villages under the micro-watershed jurisdiction, (1) Number of villages in each micro-watershed jurisdiction, (2) Village wise number of households, (3) Geographical area of the villages, (4) Cultivable are a including rainfed and irrigated, (5) Number and type of house in each village, (6) Human and livestock population, (7) Facilities in the village such as roads, transport facility for conveyance, drinking water supply, street light and (8) Community based organizations in the villages.

5. Development of interview schedule and data collection

Taking into the consideration the objectives of the survey, an interview schedule was prepared after thorough consultation with the experts in the field of social sciences. A comprehensive interview schedule covering all the major parameters for measuring the socio-economic situation was developed.

6. Tools used to analyze the data

The statistical components such as frequency and percentage were used to analyze the data.

Abbreviations used in the report

LL=Landless
MF=Marginal Farmers
SF=Small farmers
SMF=Semi medium farmers
MDF=Medium farmers
LF=Large Farmers

Chapter 4

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Sidganhalli-4 Micro-watershed is presented in Table 1 and it indicated that 35 farmers were sampled in micro-watershed among them 5 (14.29%) were landless, 7 (20 %) were marginal, 10 (28.57%) were small farmers, 6 (17.14%) were semi medium farmers and 7 (20%) medium farmers.

Table 1: Households sampled for socio economic survey in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	14.29	7	20	10	28.57	6	17.14	7	20	35	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Sidganhalli-4 Micro-watershed is presented in Table 2. The data indicated that there were 94 (59.87%) men and 63 (40.13%) women among the sampled households. The average family size of landless farmers' was 4, marginal farmers' was 4.4, small farmers' was 3.7, semi medium farmers' was 5.1 and medium farmers were 5. 4.

Table 2: Population characteristics in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (20)		MF (31)		SF (37)		SMF (31)		MDF (38)		All (157)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	13	65	18	58.06	20	54.05	21	67.74	22	57.89	94	59.87
2	Women	7	35	13	41.94	17	45.95	10	32.26	16	42.11	63	40.13
Total		20	100	31	100	37	100	31	100	38	100	157	100
Average		4		4.4		3.7		5.1		5.4		4.4	

Age wise classification of population: The age wise classification of household members in Sidganhalli-4 Micro-watershed is presented in Table 3. The data indicated that, 36 (22.93%) people were in 0-15 years of age, 63 (40.13%) were in 16-35 years of age, 42 (26.75%) were in 36-60 years of age and 16 (10.19%) were above 61 years of age.

Table 3: Age wise classification of household members in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (20)		MF (31)		SF (37)		SMF (31)		MDF (38)		All (157)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	0	0	10	32.26	8	21.62	10	32.26	8	21.05	36	22.93
2	16-35 years of age	10	50	10	32.26	14	37.84	13	41.94	16	42.11	63	40.13
3	36-60 years of age	8	40	7	22.58	9	24.32	7	22.58	11	28.95	42	26.75
4	> 61 years	2	10	4	12.90	6	16.22	1	3.23	3	7.89	16	10.19
Total		20	100	31	100	37	100	31	100	38	100	157	100

Education level of household members: Education level of household members in Sidganhalli-4 Micro-watershed is presented in Table 4. The results indicated that had

37.58 per cent illiterates, 28.66 per cent of them had primary school, 3.18 per cent of them had Middle school education, 10.19 per cent of them had high school, 11.46 per cent of them had PUC, 0.64 per cent of them had diploma and ITI, 3.82 per cent of them had degree and 1.27 per cent of them had masters education.

Table 4. Education level of household members in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (20)		MF (31)		SF (37)		SMF (31)		MDF (38)		All (157)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	6	30	12	38.71	15	40.54	14	45.16	12	31.58	59	37.58
2	Primary School	3	15	9	29.03	13	35.14	7	22.58	13	34.21	45	28.66
3	Middle School	0	0	2	6.45	0	0	2	6.45	1	2.63	5	3.18
4	High School	1	5	4	12.90	2	5.41	5	16.13	4	10.53	16	10.19
5	PUC	6	30	2	6.45	6	16.22	2	6.45	2	5.26	18	11.46
6	Diploma	0	0	0	0	0	0	0	0	1	2.63	1	0.64
7	ITI	0	0	0	0	0	0	1	3.23	0	0	1	0.64
8	Degree	2	10	0	0	1	2.70	0	0	3	7.89	6	3.82
9	Masters	2	10	0	0	0	0	0	0	0	0	2	1.27
10	Others	0	0	2	6.45	0	0	0	0	2	5.26	4	2.55
Total		20	100	31	100	37	100	31	100	38	100	157	100

Occupation of household heads: The data regarding the occupation of the household heads in Sidganhalli-4 Micro-watershed is presented in Table 5. The results indicate that, 31.43 per cent of household heads were practicing agriculture and 62.86 per cent of the household heads were agricultural laborers.

Table 5: Occupation of household heads in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	3	42.86	1	10	2	33.33	5	71.43	11	31.43
2	Agricultural Labour	5	100	4	57.14	8	80	4	66.67	1	14.29	22	62.86
Total		5	100	7	100	9	100	6	100	6	100	33	100

Occupation of the household members: The data regarding the occupation of the household members in Sidganhalli-4 Micro-watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 28.66 per cent of the household members, 36.94 per cent were agricultural laborers, 1.91 per cent were private service, 29.3 per cent student and 2.55 per cent were children.

Table 6: Occupation of family members in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (20)		MF (31)		SF (37)		SMF (31)		MDF (38)		All (157)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	11	35.48	2	5.41	9	29.03	23	60.53	45	28.66
2	Agricultural Labour	14	70	9	29.03	22	59.46	10	32.26	3	7.89	58	36.94
3	Private Service	3	15	0	0	0	0	0	0	0	0	3	1.91
4	Student	2	10	9	29.03	13	35.14	12	38.71	10	26.32	46	29.30
5	Others	1	5	0	0	0	0	0	0	0	0	1	0.64
6	Children	0	0	2	6.45	0	0	0	0	2	5.26	4	2.55
Total		20	100	31	100	37	100	31	100	38	100	157	100

Institutional participation of the household members: The data regarding the institutional participation of the household members in Sidganhalli-4 Micro-watershed is presented in Table 7. The results show that, 0.64 per cent of the population in the micro watershed has participated in self help group, 99.36 per cent of the population in the micro watershed has not participated in local institutions.

Table 7. Institutional Participation of household members in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (20)		MF (31)		SF (37)		SMF (31)		MDF (38)		All (157)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Self Help Group	0	0	0	0	0	0	0	0	1	2.63	1	0.64
2	No Participation	20	100	31	100	37	100	31	100	37	97.37	156	99.36
Total		20	100	31	100	37	100	31	100	38	100	157	100

Type of house owned: The data regarding the type of house owned by the households in Sidganhalli-4 Micro-watershed is presented in Table 8. The results indicate that 71.43 per cent of the households possess katcha house.

Table 8. Type of house owned by households in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Katcha	5	100	5	71.43	9	90	4	66.67	2	28.57	25	71.43
Total		5	100	5	100	9	100	4	100	2	100	25	100

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Sidganhalli-4 Micro-watershed is presented in Table 9. The results show that 68.57 per cent of the households possess TV, 17.14 per cent of the households possess mixer/grinder, 5.71 per cent of the households possess bicycle, 45.71 per cent of the household's posses motor cycle, 2.86 per cent of the households possess tempo and landline phone and 91.43 per cent of the households possess mobile phones.

Table 9. Durable Assets owned by households in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	4	80	5	71.43	8	80	3	50	4	57.14	24	68.57
2	Mixer/Grinder	2	40	1	14.29	0	0	0	0	3	42.86	6	17.14
3	Bicycle	0	0	1	14.29	1	10	0	0	0	0	2	5.71
4	Motor Cycle	3	60	4	57.14	3	30	1	16.67	5	71.43	16	45.71
5	Tempo	0	0	0	0	0	0	1	16.67	0	0	1	2.86
6	Landline Phone	0	0	0	0	1	10	0	0	0	0	1	2.86
7	Mobile Phone	5	100	5	71.43	9	90	6	100	7	100	32	91.43

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Sidganhalli-4 Micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 8,708, mixer/grinder was Rs. 1,916, bicycle was Rs. 2,000, motor cycle was Rs.47,312, tempo was Rs.300,000, landline was Rs. 2,000 and mobile phone was Rs. 3,189.

Table 10. Average value of durable assets owned by households in Sidganhalli-4 Micro-watershed

Average value (Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Television	9,250	8,400	8,750	9,000	8,250	8,708
2	Mixer/Grinder	2,000	2,000	0	0	1,833	1,916
3	Bicycle	0	2,000	2,000	0	0	2,000
4	Motor Cycle	51,666	52,500	60,666	48,000	32,400	47,312
5	Tempo	0	0	0	300,000	0	300,000
6	Landline Phone	0	0	2,000	0	0	2,000
7	Mobile Phone	2,875	3,700	3,277	3,500	2,775	3,189

Farm Implements owned: The data regarding the farm implements owned by the households in Sidganhalli-4 Micro-watershed is presented in Table 11. About 2.86 per cent each of the households possess bullock cart, 5.71 per cent each of the households possess plough and sprayer, 8.57 per cent of the households possess sprinkler, 28.57 per cent of the households possess weeder and 17.14 per cent of the households possess Harvester.

Table 11. Farm Implements owned by households in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	0	0	0	0	0	0	1	14.29	1	2.86
2	Plough	0	0	0	0	0	0	1	16.67	1	14.29	2	5.71
3	Sprayer	0	0	0	0	0	0	2	33.33	0	0	2	5.71
4	Sprinkler	0	0	0	0	0	0	2	33.33	1	14.29	3	8.57
5	Weeder	1	20	3	42.86	2	20	2	33.33	2	28.57	10	28.57
6	Harvester	0	0	0	0	3	30	1	16.67	2	28.57	6	17.14
7	Blank	4	80	4	57.14	5	50	3	50	4	57.14	20	57.14

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Sidganhalli-4 Micro-watershed is presented in Table 12. The results show that the average value of bullock cart was Rs. 50,000, plough was Rs. 1,033, sprayer was Rs. 3,000, sprinkler was Rs. 1,200, weeder was Rs. 103 and the average value of harvester was Rs. 119.

Table 12. Average value of farm implements owned by households in Sidganhalli-4 Micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Bullock Cart	0	0	0	0	50,000	50,000
2	Plough	0	0	0	1,500	800	1,033
3	Sprayer	0	0	0	3,000	0	3,000
4	Sprinkler	0	0	0	4,000	500	1,200
5	Weeder	50	100	80	160	100	103
6	Harvester	0	0	54	125	233	119

Livestock possession by the households: The data regarding the Livestock possession by the households in Sidganhalli-4 Micro-watershed is presented in Table 13. The results

indicate that, 17.14 per cent of the households possess bullocks, 2.86 per cent of the households possess crossbreed cow and buffalo.

Table 13. Livestock possession by households in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	1	14.29	0	0	2	33.33	3	42.86	6	17.14
2	Crossbred cow	0	0	0	0	0	0	0	0	1	14.29	1	2.86
3	Buffalo	0	0	0	0	0	0	1	16.67	0	0	1	2.86
4	blank	5	100	6	85.71	10	100	3	50	4	57.14	28	80

Average Labour availability: The data regarding the average labour availability in Sidganhalli-4 Micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.59, average own labour (women) available was 4.76, average hired labour (men) available was 9.03 and average hired labour (women) available was 7.83.

In case of marginal farmers, average own labour men available was 1.71, average own labour (women) was 1.29, average hired labour (men) was 8 and average hired labour (women) available was 7.29. In case of small farmers, average own labour men available was 1, average own labour (women) was 11.2, average hired labour (men) was 8.6 and average hired labour (women) available was 7.1. In case of semi medium farmers, average own labour men available was 2.17, average own labour (women) was 1.17, average hired labour (men) was 10 and average hired labour (women) available was 8.33. In case of medium farmers, average own labour men available in the micro watershed was 1.83, average own labour (women) available was 1.67, average hired labour (men) available was 10 and average hired labour (women) available was 9.17.

Table 14. Average Labour availability in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Hired labour Female	0	7.29	7.10	8.33	9.17	7.83
2	Own Labour Female	0	1.29	11.20	1.17	1.67	4.76
3	Own labour Male	0	1.71	1	2.17	1.83	1.59
4	Hired labour Male	0	8	8.60	10	10	9.03

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Sidganhalli-4 Micro-watershed is presented in Table 15. The results indicate that, 80 per cent of the households opined that the hired labour was adequate and 2.86 per cent of the households opined that the hired labour was inadequate.

Table 15. Adequacy of Hired Labour in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0	7	100	10	100	6	100	5	71.43	28	80
2	Inadequate	0	0	0	0	0	0	0	0	1	14.29	1	2.86

Distribution of land (ha): The data regarding the distribution of land (ha) in Sidganhalli-4 Micro-watershed is presented in Table 16. The results indicate that, households of the Sidganhalli-4 Micro watershed possess 12.44 ha (24.86%) of dry land and 37.62 ha (75.14%) of irrigated land. Marginal farmers possess 3.74 ha (80.09%) of dry land and 0.93 ha (19.91%) of irrigated land. Small farmers possess 8.7 ha (72.15%) of dry land and 3.36 ha (27.85%) of irrigated land. Semi medium farmers possess 8.64 ha (100%) of irrigated land. Medium farmers possess 24.69 ha (100%) of irrigated land.

Table 16. Distribution of land (Ha) in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	0	0	3.74	80.09	8.70	72.15	0	0	0	0	12.44	24.86
2	Irrigated	0	0	0.93	19.91	3.36	27.85	8.64	100	24.69	100	37.62	75.14
Total		0	100	4.67	100	12.06	100	8.64	100	24.69	100	50.07	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Sidganhalli-4 Micro-watershed is presented in Table 17. The results indicate that, the average value of dry land was Rs. 353,430.89 and the average value of irrigated land was Rs. 228,507.02. In case of marginal famers, the average land value was Rs. 560,756.76 for dry land and the average value was Rs. 859,130.41. In case of small famers, the average land value was Rs. 264,232.56 for dry land and the average value was Rs. 595,180.73. In case of semi medium famers, the average land value was Rs. 289,091.76 for irrigated. In case of medium famers, the average land value was Rs. 133,623.15 for irrigated land.

Table 17. Average land value (Rs./ha) in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Dry	0	560,756.76	264,232.56	0	0	353,430.89
2	Irrigated	0	859,130.41	595,180.73	289,091.76	133,623.15	228,507.02

Status of bore wells: The data regarding the status of bore wells in Sidganhalli-4 Micro-watershed is presented in Table 18. The results indicate that, there were 18 functioning and 10 functioning bore wells in the micro watershed.

Table 18. Status of bore wells in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	De-functioning	0	1	1	0	8	10
2	Functioning	0	2	4	4	9	19

Source of irrigation: The data regarding the source of irrigation in Sidganhalli-4 Micro-watershed is presented in Table 19. The results indicate that, bore well was the major irrigation source in the micro water shed for 54.29 per cent of the farmers.

Table 19. Source of irrigation in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	2	28.57	4	40	4	66.67	9	128.57	19	54.29

Depth of Water (Avg. in meters): The data regarding the depth of water in Sidganhalli-4 Micro-watershed is presented in Table 20. The results indicate that, the depth of bore well was found to be 54.08 meters.

Table 20. Depth of water (Avg in meters) in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Bore Well	0	30.48	42.67	71.12	118	54.08

Irrigated Area (ha): The data regarding the irrigated area (ha) in Sidganhalli-4 Micro-watershed is presented in Table 21. The results indicate that, marginal, small and semi medium farmers had an irrigated area of 1.26 ha, 3.36 ha and 5.81 ha respectively.

Table 21. Irrigated Area (ha) in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)
1	Kharif	0	0.85	3.36	5.81	16.60
2	Rabi	0	0.40	0	0	2.43
Total		0	1.26	3.36	5.81	19.03

Cropping pattern: The data regarding the cropping pattern in Sidganhalli-4 Micro-watershed is presented in Table 22. The results indicate that, farmers have grown maize (27.29 ha), bajra (8.54 ha) groundnut (8.09 ha), sajje (0.81 ha), chilly, paddy, tomato and watermelon (0.4 ha).

Table 22. Cropping pattern in Sidganhalli-4 Micro-watershed (Area in ha)

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Kharif - Maize	0	4.15	8.42	5	9.72	27.29
2	Kharif - Bajra	0	0.45	2.83	1.62	1.62	6.52
3	Rabi - Groundnut	0	0.4	0	1.62	2.43	4.45
4	Kharif - Groundnut	0	0	0.81	0	2.83	3.64
5	Kharif - bajra	0	0	0	0	2.02	2.02
6	Kharif - Sajje	0	0	0	0.81	0	0.81
7	Kharif - Chilly	0	0	0	0.4	0	0.4
8	Kharif - Paddy	0	0	0	0	0.4	0.4
9	Kharif - Tomato	0	0	0	0.4	0	0.4
10	Kharif - Water melon	0	0	0	0.4	0	0.4
Total		0	5	12.06	10.27	19.03	46.36

Cropping intensity: The data regarding the cropping intensity in Sidganhalli-4 Micro-watershed is presented in Table 23. The results indicate that, the cropping intensity in Sidganhalli-4 Micro-watershed was found to be 60.74 per cent.

Table 23. Cropping intensity (%) in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Cropping Intensity	0	100	100	64.43	43.93	60.74

Cost of cultivation of Maize: The data regarding the cost of cultivation of Maize in Sidganhalli-4 Micro-watershed is presented in Table 24.a. The results indicate that, the total cost of cultivation for Maize was Rs. 34059.21. The gross income realized by the farmers was Rs. 41539.81. The net income from Maize cultivation was Rs. 7480.60. Thus the benefit cost ratio was found to be 1:1.22.

Table 24.a. Cost of Cultivation of Maize in Sidganhalli-4 Micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	30.23	5376.79	15.79
2	Bullock		Pairs/day	1.90	1163.37	3.42
3	Tractor		Hours	2.37	1853.08	5.44
4	Machinery		Hours	0.07	61.75	0.18
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	47.53	5637.44	16.55
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	1.81	787.42	2.31
8	Fertilizer + micronutrients		Quintal	9.21	7520.28	22.08
9	Pesticides (PPC)		Kgs / liters	1.08	1064.46	3.13
10	Irrigation		Number	7.77	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	30.93	0.09
14	Land revenue and Taxes			0	2.73	0.01
II	**Cost B1**					
16	Interest on working capital				1801.28	5.29
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				25299.53	74.28
III	**Cost B2**					
18	Rental Value of Land				389.33	1.14
19	**Cost B2 = (Cost B1 + Rental value)**				25688.87	75.42
IV	**Cost C1**					
20	Family Human Labour			25.55	5272.93	15.48
21	**Cost C1 = (Cost B2 + Family Labour)**				30961.80	90.91
V	**Cost C2**					
22	Risk Premium				1.12	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				30962.92	90.91
VI	**Cost C3**					
24	Managerial Cost				3096.29	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				34059.21	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		33.88	36654.20	
		b) Main Crop Sales Price (Rs.)			1082	
	By Product	e) Main Product (q)		10.18	4885.61	
		f) Main Crop Sales Price (Rs.)			480	
b.	Gross Income (Rs.)				41539.81	
c.	Net Income (Rs.)				7480.60	
d.	Cost per Quintal (Rs./q.)				1005.40	
e.	Benefit Cost Ratio (BC Ratio)				1:1.22	

Cost of Cultivation of Paddy: The data regarding the cost of cultivation of Paddy in Sidganhalli-4 Micro-watershed is presented in Table 24.b. The results indicate that, the total cost of cultivation for Paddy was Rs. 94011.08. The gross income realized by the farmers was Rs. 128193. The net income from Paddy cultivation was Rs. 34181.92. Thus the benefit cost ratio was found to be 1:1.36.

Table 24.b. Cost of Cultivation of Paddy in Sidganhalli-4 Micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	44.46	10621	11.30
2	Bullock		Pairs/day	2.47	1482	1.58
3	Tractor		Hours	7.41	7410	7.88
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	61.75	9262.50	9.85
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	37.05	22230	23.65
8	Fertilizer + micronutrients		Quintal	14.82	10769.20	11.46
9	Pesticides (PPC)		Kgs / liters	0	0	0
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	2796.04	2.97
14	Land revenue and Taxes			0	2.47	0
II	**Cost B1**					
16	Interest on working capital				5071.40	5.39
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				69644.61	74.08
III	**Cost B2**					
18	Rental Value of Land				1000	1.06
19	**Cost B2 = (Cost B1 + Rental value)**				70644.61	75.14
IV	**Cost C1**					
20	Family Human Labour			66.69	14820	15.76
21	**Cost C1 = (Cost B2 + Family Labour)**				85464.61	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				85464.61	90.91
VI	**Cost C3**					
24	Managerial Cost				8546.46	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				94011.08	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		83.98	121771	
		b) Main Crop Sales Price (Rs.)			1450	
	By Product	e) Main Product (q)		4.94	6422	
		f) Main Crop Sales Price (Rs.)			1300	
b.	Gross Income (Rs.)				128193	
c.	Net Income (Rs.)				34181.92	
d.	Cost per Quintal (Rs./q.)				1119.45	
e.	Benefit Cost Ratio (BC Ratio)				1:1.36	

Cost of cultivation of Groundnut: The data regarding the cost of cultivation of Groundnut in Sidganhalli-4 Micro-watershed is presented in Table 24.c. The results indicate that, the total cost of cultivation for Groundnut was Rs. 40626.26. The gross income realized by the farmers was Rs. 80017.08. The net income from Groundnut cultivation was Rs. 39390.82. Thus the benefit cost ratio was found to be 1:1.97.

Table 24.c. Cost of Cultivation of Groundnut in Sidganhalli-4 Micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	24.64	4268.69	10.51
2	Bullock		Pairs/day	1.71	1093.86	2.69
3	Tractor		Hours	1.85	1323.21	3.26
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	147.02	13232.14	32.57
7	FYM		Quintal	1.65	1119.73	2.76
8	Fertilizer + micronutrients		Quintal	7.94	6688.41	16.46
9	Pesticides (PPC)		Kgs / liters	1.17	1104.64	2.72
10	Irrigation		Number	8.61	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	16.06	0.04
14	Land revenue and Taxes			0	1.78	0
II	**Cost B1**					
16	Interest on working capital				2657.51	6.54
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				31506.04	77.55
III	**Cost B2**					
18	Rental Value of Land				388.89	0.96
19	**Cost B2 = (Cost B1 + Rental value)**				31894.92	78.51
IV	**Cost C1**					
20	Family Human Labour			25.76	5037.04	12.40
21	**Cost C1 = (Cost B2 + Family Labour)**				36931.96	90.91
V	**Cost C2**					
22	Risk Premium				1	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				36932.96	90.91
VI	**Cost C3**					
24	Managerial Cost				3693.30	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				40626.26	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		22.70	77830.20	
		b) Main Crop Sales Price (Rs.)			3428.57	
	By Product	e) Main Product (q)		4.03	2186.87	
		f) Main Crop Sales Price (Rs.)			542.86	
b.	Gross Income (Rs.)				80017.08	
c.	Net Income (Rs.)				39390.82	
d.	Cost per Quintal (Rs./q.)				1789.67	
e.	Benefit Cost Ratio (BC Ratio)				1:1.97	

Cost of cultivation of Chilly: The data regarding the cost of cultivation of Chilly in Sidganhalli-4 Micro-watershed is presented in Table 24.d. The results indicate that, the total cost of cultivation for Chilly was Rs. 71551.81. The gross income realized by the farmers was Rs. 227240. The net income from Chilly cultivation was Rs. 155688.19. Thus the benefit cost ratio was found to be 1:3.18.

Table 24.d. Cost of Cultivation of Chilly in Sidganhalli-4 Micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	32.11	6792.50	9.49
2	Bullock		Pairs/day	4.94	4940	6.90
3	Tractor		Hours	2.47	2470	3.45
4	Machinery		Hours	4.94	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	12.35	3087.50	4.32
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	2.47	2470	3.45
8	Fertilizer + micronutrients		Quintal	17.29	12597	17.61
9	Pesticides (PPC)		Kgs / liters	2.47	2470	3.45
10	Irrigation		Number	7.41	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	439.66	0.61
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				2474.94	3.46
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				37741.60	52.75
III	**Cost B2**					
18	Rental Value of Land				1000	1.40
19	**Cost B2 = (Cost B1 + Rental value)**				38741.60	54.14
IV	**Cost C1**					
20	Family Human Labour			108.68	26305.50	36.76
21	**Cost C1 = (Cost B2 + Family Labour)**				65047.10	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				65047.10	90.91
VI	**Cost C3**					
24	Managerial Cost				6504.71	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				71551.81	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		98.80	227240	
		b) Main Crop Sales Price (Rs.)			2300	
b.	Gross Income (Rs.)				227240	
c.	Net Income (Rs.)				155688.19	
d.	Cost per Quintal (Rs./q.)				724.21	
e.	Benefit Cost Ratio (BC Ratio)				1:3.18	

Cost of cultivation of Bajra: The data regarding the cost of cultivation of Bajra in Sidganhalli-4 Micro-watershed is presented in Table 24.e. The results indicate that, the total cost of cultivation for Bajra was Rs. 30854.22. The gross income realized by the farmers was Rs. 29312.81. The net income from Bajra cultivation was Rs. -1541.42. Thus the benefit cost ratio was found to be 1:0.95.

Table 24.e. Cost of Cultivation of Bajra in Sidganhalli-4 Micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	32.10	5475.92	17.75
2	Bullock		Pairs/day	1.34	790.72	2.56
3	Tractor		Hours	3.46	2771.53	8.98
4	Machinery		Hours	1.03	821.19	2.66
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	32.84	3133.21	10.15
7	FYM		Quintal	2.46	492.50	1.60
8	Fertilizer + micronutrients		Quintal	7.86	6407.30	20.77
9	Pesticides (PPC)		Kgs / liters	1.18	1183.54	3.84
10	Irrigation		Number	3.24	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	2.98	0.01
14	Land revenue and Taxes			0	3.18	0.01
II	**Cost B1**					
16	Interest on working capital				1346.12	4.36
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				22428.20	72.69
III	**Cost B2**					
18	Rental Value of Land				285.71	0.93
19	**Cost B2 = (Cost B1 + Rental value)**				22713.91	73.62
IV	**Cost C1**					
20	Family Human Labour			27.99	5334.24	17.29
21	**Cost C1 = (Cost B2 + Family Labour)**				28048.15	90.91
V	**Cost C2**					
22	Risk Premium				1.14	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				28049.29	90.91
VI	**Cost C3**					
24	Managerial Cost				2804.93	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				30854.22	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		22.44	25008.86	
		b) Main Crop Sales Price (Rs.)			1114.29	
	By Product	e) Main Product (q)		12.55	4303.94	
		f) Main Crop Sales Price (Rs.)			342.86	
b.	Gross Income (Rs.)				29312.81	
c.	Net Income (Rs.)				-1541.42	
d.	Cost per Quintal (Rs./q.)				1374.73	
e.	Benefit Cost Ratio (BC Ratio)				1:0.95	

Cost of cultivation of Tomato: The data regarding the cost of cultivation of Tomato in Sidganhalli-4 Micro-watershed is presented in Table 24.f. The results indicate that, the total cost of cultivation for Tomato was Rs. 65441.56. The gross income realized by the farmers was Rs. 39520. The net income from Tomato cultivation was Rs. -25921.56. Thus the benefit cost ratio was found to be 1:0.6.

Table 24.f. Cost of Cultivation of Tomato in Sidganhalli-4 Micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	44.46	9262.50	14.15
2	Bullock		Pairs/day	2.47	2470	3.77
3	Tractor		Hours	0	0	0
4	Machinery		Hours	4.94	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	1.24	1235	1.89
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	2.47	2470	3.77
8	Fertilizer + micronutrients		Quintal	14.82	12350	18.87
9	Pesticides (PPC)		Kgs / liters	2.47	2470	3.77
10	Irrigation		Number	2.47	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	439.66	0.67
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				2223	3.40
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				32920.16	50.30
III	**Cost B2**					
18	Rental Value of Land				266.67	0.41
19	**Cost B2 = (Cost B1 + Rental value)**				33186.83	50.71
IV	**Cost C1**					
20	Family Human Labour			108.68	26305.50	40.20
21	**Cost C1 = (Cost B2 + Family Labour)**				59492.33	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				59492.33	90.91
VI	**Cost C3**					
24	Managerial Cost				5949.23	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				65441.56	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		19.76	39520	
		b) Main Crop Sales Price (Rs.)			2000	
b.	Gross Income (Rs.)				39520	
c.	Net Income (Rs.)				-25921.56	
d.	Cost per Quintal (Rs./q.)				3311.82	
e.	Benefit Cost Ratio (BC Ratio)				1:0.6	

Adequacy of fodder: The data regarding the adequacy of fodder in Sidganhalli-4 Micro-watershed is presented in Table 25. The results indicate that, 20 per cent of the households opined that dry fodder and green fodder was adequate.

Table 25. Adequacy of fodder in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	1	14.29	0	0	3	50	3	42.86	7	20
2	Adequate-Green Fodder	0	0	1	14.29	0	0	3	50	3	42.86	7	20

Annual gross income: The data regarding the annual gross income in Sidganhalli-4 Micro-watershed is presented in Table 26. The results indicate that the annual gross income was Rs. 15,800 for landless, for marginal farmers it was Rs. 55,285.71, for small farmers it was Rs. 70,700, semi medium farmers it was Rs. 170,000 and medium farmers it was Rs. 195,714.29.

Table 26. Annual gross income in Sidganhalli-4 Micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Wage	15,800	3,571.43	0	7,166.67	13,571.43	6,914.29
2	Agriculture	0	51,714.29	70,700	162,333.33	106,142.86	79,600
3	Dairy Farm	0	0	0	500	76,000	15,285.71
Income(Rs.)		15,800	55,285.71	70,700	170,000	195,714.29	101,800

Average annual expenditure: The data regarding the average annual expenditure in Sidganhalli-4 Micro-watershed is presented in Table 27. The results indicate that the average annual expenditure is Rs. 24,350.88. For landless it was Rs. 2,040, for marginal farmers it was Rs. 6,102.04, for small farmers it was Rs. 4,470, for semi medium farmers it was Rs. 97,111.11 and for medium farmers it was Rs. 24,571.43.

Table 27. Average annual expenditure in Sidganhalli-4 Micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Wage	10,200	10,000	0	7,500	32,000	4,000
2	Agriculture	0	32,714.29	44,700	574,166.67	60,000	129,742.86
3	Dairy Farm	0	0	0	1,000	80,000	2,314.29
Total		10,200	42,714.29	44,700	582,666.67	172,000	852,280.95
Average		2,040	6,102.04	4,470	97,111.11	24,571.43	24,350.88

Horticulture species grown: The data regarding horticulture species grown in Sidganhalli-4 Micro-watershed is presented in Table 28. The results indicate that, households have planted 49 coconut and 3 mango trees in their field.

Table 28: Horticulture species grown in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL(5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	1	0	4	0	1	0	43	0	49	0
2	Mango	0	0	1	0	2	0	0	0	0	0	3	0

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

Forest species grown: The data regarding forest species grown in Sidganhalli-4 Micro-watershed is presented in Table 29. The results indicate that, households have planted 1 teak and 57 neem trees in their field.

Table 29: Forest species grown in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Teak	0	0	1	0	0	0	0	0	0	0	1	0
2	Neem	0	0	2	0	14	0	4	0	37	0	57	0

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

Average Additional investment capacity: The data regarding average additional investment capacity in Sidganhalli-4 Micro-watershed is presented in Table 30. The results indicated that, households have an average investment capacity of Rs. 2,228.57 for land development, Rs. 428.57 for irrigation facility, Rs. 1,628.57 for improved crop production and Rs.1,771.43 for improved livestock management.

Table 30: Average additional investment capacity in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (10)	SMF (6)	MDF (7)	All (35)
1	Land development	0	3,428.57	2,100	3,333.33	1,857.14	2,228.57
2	Irrigation facility	0	0	0	0	2,142.86	428.57
3	Improved crop production	0	2,285.71	1,500	2,500	1,571.43	1,628.57
4	Improved livestock management	0	2,714.29	1,400	2,666.67	1,857.14	1,771.43

Source of additional investment: The data regarding source of funds for additional investment in Sidganhalli-4 Micro-watershed is presented in Table 31. The results indicated that loan from bank was the source of additional investment for 22.86 per cent for land development, 2.86 per cent for irrigation facility and 2.86 per cent for improved crop production and improved livestock management. Own funds were the source of additional investment for 8.57 per cent for land development and 5.71 per cent for improved crop production and improved livestock management.

Table 31: Source of funds for additional investment capacity in Sidganhalli-4 micro –watershed

Sl. No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Loan from bank	8	22.86	1	2.86	9	25.71	9	25.71
2	Own funds	3	8.57	0	0.0	2	5.71	2	5.71

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Sidganhalli-4 Micro-watershed is presented in Table 32. The results indicated that, bajra was sold to the extent of 94.15 per cent, chilly, groundnut, paddy and tomato was sold to the extent of 100 per cent and maize was sold to extent of 95.69 per cent.

Table 32. Marketing of the agricultural produce in Sidganhalli-4 Micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	188.0	11.0	177.0	94.15	1114.29
2	Chilly	40.0	0.0	40.0	100.0	2300.0
3	Groundnut	157.0	-13.0	170.0	100.0	3428.57
4	Maize	905.0	39.0	866.0	95.69	1082.0
5	Paddy	34.0	0.0	34.0	100.0	1450.0
6	Tomato	8.0	0.0	8.0	100.0	2000.0

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Sidganhalli-4 Micro-watershed is presented in Table 33. The results indicated that, about 11.43 per cent of the farmers sold their produce to agent/traders, 102.86 per cent of the farmers sold their produce to local/village merchant and 5.71 per cent of the farmers sold their produce to regulated market.

Table 33. Marketing Channels used for sale of agricultural produce in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agent/Traders	0	0	1	14.29	1	10	0	0	2	28.57	4	11.43
2	Local/village Merchant	0	0	7	100	9	90	10	166.67	10	142.86	36	102.86
3	Regulated Market	0	0	0	0	0	0	0	0	2	28.57	2	5.71

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Sidganhalli-4 Micro-watershed is presented in Table 34. The results indicated that, 117.14 per cent of the households have used tractor and 2.86 per cent of the households used truck as a mode of transportation.

Table 34. Mode of transport of agricultural produce in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Tractor	0	0	8	114.29	10	100	10	166.67	13	185.71	41	117.14
2	Truck	0	0	0	0	0	0	0	0	1	14.29	1	2.86

Incidence of soil and water erosion problems: The data regarding incidence of incidence of soil and water erosion problems in Sidganhalli-4 Micro-watershed is presented in Table 35. The results indicated that, 54.29 per cent have incidence of soil and water erosion problems.

Table 35. Incidence of soil and water erosion problems in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL(5)		MF (7)		SF(10)		SMF(6)		MDF(7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	5	71.43	9	90	3	50	2	28.57	19	54.29

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Sidganhalli-4 Micro-watershed is presented in Table 36. The results indicated that, 54.29 per cent have shown interest in soil test.

Table 36. Interest shown towards soil testing in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	5	71.43	8	80	4	66.67	2	28.57	19	54.29

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Sidganhalli-4 Micro-watershed is presented in Table 37. The results indicated that, 88.57 per cent of the households used fire wood and 11.43 per cent of the household's LPG as a source of fuel.

Table 37. Usage pattern of fuel for domestic use in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	4	80	7	100	7	70	6	100	7	100	31	88.57
2	LPG	1	20	0	0	3	30	0	0	0	0	4	11.43

Source of drinking water: The data regarding source of drinking water in Sidganhalli-4 Micro-watershed is presented in Table 38. The results indicated that, piped supply was the major source of drinking water for 68.57 per cent, 28.57 per cent of the households used bore well and 2.86 per cent of the households used lake/tank well in the micro watershed.

Table 38. Source of drinking water in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	4	80	5	71.43	9	90	4	66.67	2	28.57	24	68.57
2	Bore Well	0	0	2	28.57	1	10	2	33.33	5	71.43	10	28.57
3	Lake/ Tank	1	20	0	0	0	0	0	0	0	0	1	2.86

Source of light: The data regarding source of light in Sidganhalli-4 Micro-watershed is presented in Table 39. The results indicated that, Electricity was the major source of light for 100 per cent of the households in Micro-watershed.

Table 39. Source of light in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100	7	100	10	100	6	100	7	100	35	100

Table 40. Existence of Sanitary toilet facility in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	5	100	5	71.43	2	20	1	16.67	1	14.29	14	40

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facility in Sidganhalli-4 Micro-watershed is presented in Table 40. The results indicated that, 40 per cent of the households possess sanitary toilet facility.

Possession of PDS card: The data regarding possession of PDS card in Sidganhalli-4 Micro-watershed is presented in Table 41. The results indicated that, 97.14 per cent of the sampled households possessed BPL cards and 2.86 per cent of the households possessed had no PDS cards.

Table 41. Possession of PDS card in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100	6	85.71	10	100	6	100	7	100	34	97.14
2	Not Possessed	0	0	1	14.29	0	0	0	0	0	0	1	2.86

Participation in NREGA program: The data regarding participation in NREGA programme in Sidganhalli-4 Micro-watershed is presented in Table 42. The results indicated that, 68.57 per cent of the households participated in NREGA programme.

Table 42. Participation in NREGA programme in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	5	100	5	71.43	6	60	5	83.33	3	42.86	24	68.57

Adequacy of food items: The data regarding adequacy of food items in Sidganhalli-4 Micro-watershed is presented in Table 43. The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 74.29 per cent, oilseeds were adequate for 11.43 per cent, vegetables were adequate for 88.57 per cent, fruits were adequate for 2.86 per cent, milk and egg were adequate for 97.14 per cent and meat were adequate for 91.43 per cent of the households.

Table 43. Adequacy of food items in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	5	100	7	100	10	100	6	100	7	100	35	100
2	Pulses	4	80	6	85.71	7	70	4	66.67	5	71.43	26	74.29
3	Oilseed	0	0	2	28.57	0	0	0	0	2	28.57	4	11.43
4	Vegetables	5	100	7	100	10	100	5	83.33	4	57.14	31	88.57
5	Fruits	0	0	0	0	1	10	0	0	0	0	1	2.86
6	Milk	5	100	7	100	10	100	5	83.33	7	100	34	97.14
7	Egg	5	100	7	100	10	100	6	100	6	85.71	34	97.14
8	Meat	5	100	7	100	10	100	4	66.67	6	85.71	32	91.43

Response on Inadequacy of food items: The data regarding inadequacy of food items in Sidganhalli-4 Micro-watershed is presented in Table 44. The results indicated that, pulses were inadequate for 25.71 per cent of the households, oilseed were inadequate for 80 per cent, vegetables were inadequate for 11.43 per cent, fruits were inadequate for 71.43 per cent, milk were inadequate for 2.86 per cent, and meat were inadequate for 5.71 per cent of the households.

Table 44. Response on Inadequacy of food items in Sidganhalli-4 Micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (10)		SMF (6)		MDF (7)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Pulses	1	20	1	14.29	3	30	2	33.33	2	28.57	9	25.71
2	Oilseed	5	100	5	71.43	10	100	4	66.67	4	57.14	28	80
3	Vegetables	0	0	0	0	0	0	1	16.67	3	42.86	4	11.43
4	Fruits	5	100	5	71.43	8	80	5	83.33	2	28.57	25	71.43
5	Milk	0	0	0	0	0	0	1	16.67	0	0	1	2.86
6	Meat	0	0	0	0	0	0	2	33.33	0	0	2	5.71

Farming constraints: The data regarding farming constraints experienced by households in Sidganhalli-4 Micro-watershed is presented in Table 45. The results indicated that, lower fertility status of the soil was the constraint experienced by 62.86 per cent of the households, wild animal menace on farm field (45.71%), frequent incidence of pest and diseases (40%), Inadequacy of irrigation water (25.71 %), high cost of fertilizer and plant protection chemicals (65.71%), high rate of interest on credit (31.43%), Low price for the agricultural commodities (48.57%), lack of marketing facilities in the area (54.29%), inadequate extension service (2.86%), Lack of transport for safe transport of the Agril produce to the market (8.57%), less rainfall (28.57%) and Source of Agri-technology information (2.86%).

Table 45. Farming constraints Experienced in Sidganhalli-4 Micro-watershed

Sl. No.	Particulars	MF (7)		SF10)		SMF(6)		MDF(7)		All (35)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	5	71.43	10	100	4	66.67	3	42.86	22	62.86
2	Wild animal menace on farm field	4	57.14	4	40	2	33.33	6	85.71	16	45.71
3	Frequent incidence of pest and diseases	3	42.86	6	60	4	66.67	1	14.29	14	40
4	Inadequacy of irrigation water	0	0	3	30	4	66.67	2	28.57	9	25.71
5	High cost of Fertilizers and plant protection chemicals	6	85.71	10	100	3	50	4	57.14	23	65.71
6	High rate of interest on credit	4	57.14	4	40	2	33.33	1	14.29	11	31.43
7	Low price for the agricultural commodities	5	71.43	6	60	4	66.67	2	28.57	17	48.57
8	Lack of marketing facilities in the area	5	71.43	7	70	4	66.67	3	42.86	19	54.29
9	Inadequate extension services	0	0	1	10	0	0	0	0	1	2.86
10	Lack of transport for safe transport of the Agril produce to the market.	1	14.29	0	0	1	16.67	1	14.29	3	8.57
11	Less rainfall	2	28.57	1	10	2	33.33	5	71.43	10	28.57
12	Source of Agri-technology information	0	0	1	10	0	0	0	0	1	2.86

Chapter 5

SUMMARY AND IMPLICATIONS

In order to assess the socio-economic condition of the farmers in the watershed 35 households located in the micro watershed were interviewed for the survey. The survey was conducted is located at $15^0$32'39.975'' to 15^0 31'16.547''North and 76^0 15' 9.616'' to $76^0$13'41.174'' East covering an area of about 448.03 ha coming Chilakamukki villages of Koppal taluk.

Socio-economic analysis indicated that, out of the total sample of 35 respondents 5 (14.29%) were landless, 7 (20 %) were marginal, 10 (28.57%) were small farmers, 6 (17.14%) were semi medium farmers and 7 (20%) medium farmers. The population characteristics of households indicated that, there were 94 (59.87%) men and 63 (40.13%) women among the sampled households. The average family size of landless farmers' was 4, marginal farmers' was 4.4, small farmers' was 3.7, semi medium farmers' was 5.1 and medium farmers were 5. 4. Majority of the respondents 40 (23.12%) people were in 0-15 years of age, 67 (38.73%) were in 16-35 years of age36 (22.93%) people were in 0-15 years of age, 63 (40.13%) were in 16-35 years of age, 42 (26.75%) were in 36-60 years of age and 16 (10.19%) were above 61 years of age.

Education level of the sample households indicated that, majority there were 37.58 per cent illiterates, 28.66 per cent of them had primary school, 3.18 per cent of them had Middle school education, 10.19 per cent of them had high school, 11.46 per cent of them had PUC, 0.64 per cent of them had diploma and ITI, 3.82 per cent of them had degree and 1.27 per cent of them had masters education. About, 31.43 per cent of household heads were practicing agriculture and 62.86 per cent of the household heads were agricultural laborers.

Agriculture was the major occupation for 28.66 per cent of the household members, 36.94 per cent were agricultural laborers, 1.91 per cent were private service, 29.3 per cent student and 2.55 per cent were children. The household possess, 0.64 per cent of the population in the micro watershed has participated in self help group and 99.36 per cent of the population in the micro watershed has not participated in local institutions.

In the study area, 71.43 per cent of the households possess katcha house. The durable assets owned by the households showed that, 68.57 per cent of the households possess TV, 17.14 per cent of the households possess mixer/grinder, 5.71 per cent of the households possess bicycle, 45.71 per cent of the household's posses motor cycle, 2.86 per cent of the households possess tempo and landline phone and 91.43 per cent of the households possess mobile phones. Farm implements owned by the households indicated that, 2.86 per cent each of the households possess bullock cart, 5.71 per cent each of the households possess plough and sprayer, 8.57 per cent of the households possess sprinkler, 28.57 per cent of the households possess weeder and 17.14 per cent of the households

possess Harvester. Regarding livestock possession by the households, 17.14 per cent of the households possess bullocks, 2.86 per cent of the households possess crossbreed cow and buffalo.

The average own labour men available in the micro watershed was 1.59, average own labour (women) available was 4.76, average hired labour (men) available was 9.03 and average hired labour (women) available was 7.83.

Out of the total land holding of the sample respondents 12.44 ha (24.86%) of dry land and 37.62 ha (75.14%) of irrigated land. Marginal farmers possess 3.74 ha (80.09%) of dry land and 0.93 ha (19.91%) of irrigated land. Small farmers possess 8.7 ha (72.15%) of dry land and 3.36 ha (27.85%) of irrigated land. Semi medium farmers possess 8.64 ha (100%) of irrigated land. Medium farmers possess 24.69 ha (100%) of irrigated land. There were 18 functioning and 10 functioning bore wells in the micro watershed. Bore well was the major irrigation source in the micro water shed for 54.29 per cent of the farmers. The major crops have grown maize (27.29 ha), bajra (8.54 ha) groundnut (8.09 ha), sajje (0.81 ha), chilly, paddy, tomato and watermelon (0.4 ha). The cropping intensity in Sidganhalli-4 Micro-watershed was found to be 60.74 per cent.

The per hectare cost of cultivation for Maize, paddy groundnut, chilly, Bajra and Tomato was Rs. 34059.21, 94011.08, 40626.26, 71551.81, 30854.22 and 65441.56 with benefit cost ratio of 1:1.22, 1:1.36, 1:1.97, 1:3.18, 1:0.95 and 1:0.6 respectively.

Further, 20 per cent of the households opined that dry fodder and green fodder was adequate.

The average annual gross income was Rs. 15,800 for landless, for marginal farmers it was Rs. 55,285.71, for small farmers it was Rs. 70,700, semi medium farmers it was Rs. 170,000 and medium farmers it was Rs. 195,714.29. The average annual expenditure is Rs. 24,350.88. For landless it was Rs. 2,040, for marginal farmers it was Rs. 6,102.04, for small farmers it was Rs. 4,470, for semi medium farmers it was Rs. 97,111.11 and for medium farmers it was Rs. 24,571.43.

Sampled households have planted 49 coconut and 3 mango trees in their field to cultivate horticultural crops. Households have planted 13 1 teak and 57 neem trees in their field to cultivate forest species.

Households have an average investment capacity of Rs. 2,228.57 for land development, Rs. 428.57 for irrigation facility, Rs. 1,628.57 for improved crop production and Rs.1,771.43 for improved livestock management. Source of funds for additional investment is concerned; loan from bank was the source of additional investment for 22.86 per cent for land development, 2.86 per cent for irrigation facility and 2.86 per cent for improved crop production and improved livestock management. Own funds were the source of additional investment for 8.57 per cent for land development and 5.71 per cent for improved crop production and improved livestock management.

Regarding marketing channels, 11.43 per cent of the farmers sold their produce to agent/traders, 102.86 per cent of the farmers sold their produce to local/village merchant and 5.71 per cent of the farmers sold their produce to regulated market. Further, 117.14 per cent of the households have used tractor and 2.86 per cent of the households used truck as a mode of transportation.

Majority of the households 54.29 per cent have incidence of soil and water erosion problems. The household possess, (54.29 %) were interested towards soil testing. The households possess, 88.57 per cent of the households used fire wood and 11.43 per cent of the household's LPG as a source of fuel. Piped supply was the major source of drinking water for 68.57 per cent, 28.57 per cent of the households used bore well and 2.86 per cent of the households used lake/tank well in the micro watershed. Electricity was the major source of light for 100 per cent of the households. In the study area, 40 per cent of the households possess sanitary toilet facility.

Regarding possession of PDS card, 97.14 per cent of the sampled households possessed BPL cards and 2.86 per cent of the households possessed had no PDS cards. Cereals were adequate for 100 per cent of the households, pulses were adequate for 74.29 per cent, oilseeds were adequate for 11.43 per cent, vegetables were adequate for 88.57 per cent, fruits were adequate for 2.86 per cent, milk and egg were adequate for 97.14 per cent and meat were adequate for 91.43 per cent of the households. Pulses were inadequate for 25.71 per cent of the households, oilseed were inadequate for 80 per cent, vegetables were inadequate for 11.43 per cent, fruits were inadequate for 71.43 per cent, milk were inadequate for 2.86 per cent, and meat were inadequate for 5.71 per cent of the households.

Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil was the constraint experienced by 62.86 per cent of the households, wild animal menace on farm field (45.71%), frequent incidence of pest and diseases (40%), Inadequacy of irrigation water (25.71 %), high cost of fertilizer and plant protection chemicals (65.71%), high rate of interest on credit (31.43%), Low price for the agricultural commodities (48.57%), lack of marketing facilities in the area (54.29%), inadequate extension service (2.86%), Lack of transport for safe transport of the Agril produce to the market (8.57%), less rainfall (28.57%) and Source of Agri-technology information (2.86%).

Implications of the survey

- ✓ Result indicated that, there were 37.58 per cent were illiterate hence; extension methodologies such as demonstration, street play, drama, video shows will be effective in dissemination of the technologies in the micro watershed.
- ✓ The data indicate that, 71.43 per cent of the households possess Katcha house. Hence, the development department while implementing the watershed plan should

focus on agriculture to enhance the productivity of major crops in the area to increase the income of the farmers.

- ✓ Results indicated that the local institutional participation of the household members in the micro watershed is minimal hence, activities like membership campaign, awareness creation about the benefits of membership in local institutions and strengths of organized groups must be conveyed.
- ✓ Majority of the households in the watershed have experience in use of mobile phones, and television hence, these mass media can be effectively utilized for transfer of technology as well as for information dissemination.
- ✓ The farm machinery/implement possession in the micro watershed was found to be minimum the reasons may lack of knowledge or lack of financial ability which can be addressed through training on use of different farm implements, providing information on different sources of finance for purchase of farm implements.
- ✓ The possession of livestock such as crossbred cow found is less hence, farmers must be made aware of the benefits of crossbred cow in increased milk production.
- ✓ The possession of livestock such as sheep, goat and poultry was found to be low hence, farmers may be informed the role of subsidiary enterprises in enhancing the income and information on financial support for subsidiary activities.
- ✓ The data indicate that, job/work was the reason for all the migrants hence, farmers may be trained on profitable agriculture or self employment such has animal husbandry, plate making, sheep rearing, goat rearing, rabbit rearing with suitable information on sources of financial support.
- ✓ The results indicate that there was a change in quality of life due to migration hence; the developmental departments should take actions to arrest migration and to improve the quality of the life in rural areas.
- ✓ Households possess 12.44 ha (24.86%) of dry land and 37.62 ha (75.14%) of irrigated land hence, the availability of the dry land agricultural technologies such as short duration crops, high yielding drought resistance crop varieties, drip irrigation technology and subsidy information will be helpful for the farmers to enhance the productivity of land and as well as farmers income.
- ✓ Bore well was source of irrigation for 54.29 per cent of the households. Hence, in order to increase the area under irrigation as well as to increase the water use efficiency farmers may trained on drip irrigation and provides the information on subsidy for drip irrigation equipment's along with the information on different agencies which provides the financial assistance for drip irrigation.
- ✓ Farmers have grown horticulture species, 49 coconut and 3 mango trees in their field and forest species have planted 1 teak and 57 neem trees in their field. Hence, production technologies related to these crops can be made available to the farmers for better adoption.

- ✓ The cropping intensity in the micro watershed was found to be (60.74 %) hence; care must be taken by the implementing agency to bring uncultivated land into cultivation through suitable measures.
- ✓ Many of the household members have borrowed loan from cooperative banks which has higher rate of interest hence, farmers may be sensitized on the different sources of credit with lesser interest rate such SHGs etc.
- ✓ The results indicated the non availability of both green and dry fodder throughout the year hence, fodder development activities can be taken up in the micro watershed. The average annual gross income was Rs. 15,800 for landless, for marginal farmers it was Rs. 55,285.71, for small farmers it was Rs. 70,700, semi medium farmers it was Rs. 170,000 and medium farmers it was Rs. 195,714.29.
- ✓ Agriculture was found to be the major source of income for households hence; the development activities should focus on productivity enhancement, marketing arrangements and agricultural technology dissemination to have a direct impact on the farmers.
- ✓ The cultivation of forest species is found minimal hence; information and production technology related to agro-forestry and integrated farming system.
- ✓ The data indicated that, 54.29 per cent of the households have interest in soil testing hence, farmers must be provided with the information on various institutions which are involved in soil testing for the benefit of the farmers.
- ✓ Except summer ploughing the adoption of other soil and water conservation structures is minimum hence, the farmers in the micro watershed should be sensitized on the use of different conservation structures for soil water conservation.
- ✓ Cereals and pulses found be adequate for per cent of the households respectively hence, farm households and the farm women must be trained on importance of balanced nutrition and role of vegetable, milk, egg, meat in balanced diet.
- ✓ Lower fertility status of the soil was the constraint experienced by 62.86 per cent of the households, wild animal menace on farm field (45.71%), frequent incidence of pest and diseases (40%), Inadequacy of irrigation water (25.71 %), high cost of fertilizer and plant protection chemicals (65.71%), high rate of interest on credit (31.43%), Low price for the agricultural commodities (48.57%), lack of marketing facilities in the area (54.29%), inadequate extension service (2.86%), Lack of transport for safe transport of the Agril produce to the market (8.57%), less rainfall (28.57%) and Source of Agri-technology information (2.86%) were the major farming constraints experienced hence, these constraints must be addressed immediately for the welfare of the farmers. Awareness to be created among the farmers to approach nearest KVKs/RSKs and other developmental departments for technical and for subsidized inputs and utilize the well established regulated markets, approaching the contract firms, direct markets to avoid the involvement of middlemen.