हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद
Agrisearch with a human touch

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

ALLANAGAR (4D3A9C3b) MICRO WATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

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

Citation: Rajendra Hegde, Ramesh Kumar, S.C., K.V. Niranjana, S. Srinivas, M.Lalitha, B.A. Dhanorkar, R.S. Reddy and S.K. Singh (2018). "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of Allanagar (4D3A9C3b) Microwatershed, Koppal Taluk and District, Karnataka", ICAR-NBSS&LUP Sujala MWS Publ.123, ICAR – NBSS & LUP, RC, Bangalore. p.101 & 35.

TO OBTAIN COPIES,

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

Amaravati Road, NAGPUR - 440 033, India

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

Telefax : 0712-2522534

E-Mail : director@nbsslup.ernet.in

Website URL : nbsslup.in

Or

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

Phone : (080) 23412242, 23510350 (O)

Telefax : 080-23510350

E-Mail : nbssrcb@gmail.com

ICAR-NBSS&LUP Sujala MWS Publ.123

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

ALLANAGAR (4D3A9C3b) MICRO WATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

Sujala-III

World Bank funded Project

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

WATERSHED DEVELOPMENT DEPARTMENT, GOVT. OF KARNATAKA, BANGALORE

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 Allanagara 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:25-11-2018

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	Sh. Venkata Giriyappa
	Dr. Gopali Bardhan
	Smt. Chaitra, S.P.
	Dr. Gayathri, B.
	Dr. Savitha, H.R.
	Sh. Nagendra, B.R.
	Sh. Somashekar T.N
	Ms. Arpitha, G.M.
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	Sh. Nagendra Babu Kolukondu
Smt. K. V. Archana	Sh. Avinash
Sh. N. Maddileti	Sh. Amar Suputhra, S.
	Sh. Deepak M.J.
	Sh. Madappaswamy
	Smt. K. Karunya Lakshmi
	Ms. Seema, K.V.
	Ms. Ramireddy Lakshmi Silpa
	Ms. Bhanu Rekha, T.
	Ms. Rajata Bhat
	Ms. Shruthi
	Ms. Suman, S.

Laboratory Analysis	
Dr. M. Lalitha	Ms. Thara, V.R.
Smt. Arti Koyal	Ms. Roopa, G.
Smt. Parvathy, S.	Ms. Vindhya, N.G.
	Ms. Shwetha N.K.
	Ms. Pavana Kumari, P.
	Ms. Leelavathy, K.U.
	Ms. Rashmi, N.
	Ms. Padmaja, S.
	Ms. Veena, M.
	Ms. Chaithrashree B
	Ms. Shwetha N
Socio-economic Analysis	
Dr. Ramesh Kumar, S.C.	Sh. M.K. Prakashanaik,
	Dr. Shridevi. R. Kanabargi
	Ms. Shraddha Hegde
	Sh. Vinod R
	Sh. Basavaraj
	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	16
3.6	Land Management Units	18
Chapter 4	The Soils	21
4.1	Soils of Granite gneiss	21
4.2	Alluvial Landscape	25
Chapter 5	Interpretation for Land Resource Management	31
5.1	Land Capability Classification	31
5.2	Soil Depth	33
5.3	Surface Soil Texture	34
5.4	Soil Gravelliness	35
5.5	Available Water Capacity	36
5.6	Soil Slope	37
5.7	Soil Erosion	38
Chapter 6	Fertility Status	41
6.1	Soil Reaction (pH)	41
6.2	Electrical Conductivity (EC)	41
6.3	Organic Carbon (OC)	41
6.4	Available Phosphorus	43
6.5	Available Potassium	43
6.6	Available Sulphur	43
6.7	Available Boron	44
6.8	Available Iron	44
6.9	Available Manganese	44
6.10	Available Copper	44

6.11	Available Zinc	48
Chapter 7	Land Suitability for Major Crops	49
7.1	Land suitability for Sorghum	49
7.2	Land suitability for Maize	51
7.3	Land suitability for Bajra	52
7.4	Land suitability for Red gram	53
7.5	Land suitability for Bengalgram	55
7.6	Land suitability for Groundnut	56
7.7	Land suitability for Sunflower	57
7.8	Land suitability for Cotton	58
7.9	Land suitability for Chilli	59
7.10	Land suitability for Tomato	61
7.11	Land suitability for Drumstick	62
7.12	Land suitability for Mulberry	63
7.13	Land suitability for Mango	64
7.14	Land Suitability for Sapota	66
7.15	Land suitability for Pomegranate	67
7.16	Land suitability for Guava	68
7.17	Land Suitability for Jackfruit	70
7.18	Land Suitability for Jamun	71
7.19	Land Suitability for Musambi	72
7.20	Land Suitability for Lime	74
7.21	Land Suitability for Cashew	75
7.22	Land Suitability for Custard apple	76
7.23	Land suitability for Amla	77
7.24	Land suitability for Tamarind	78
7.25	Land suitability for Marigold	80
7.26	Land suitability for Chrysanthemum	81
7.27	Land suitability for Jasmine	82
7.28	Land Management Units (LMU)	84
7.29	Proposed Crop Plan	85
Chapter 8	Soil Health Management	87
Chapter 9	Soil and Water conservation Treatment Plan	93
9.1	Treatment Plan	94
9.2	Recommended Soil and Water Conservation measures	97
9.3	Greening of microwatershed	98
	References	101
	Appendix I	I-IV
	Appendix II	V-VIII
	Appendix III	IX-XII

LIST OF TABLES

2.1	Mean Monthly Rainfall, PET, 1/2 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 Allanagara microwatershed	17
4.1	Physical and chemical characteristics of soil series identified in Allanagara microwatershed	27
7.1	Soil-Site Characteristics of Allanagara microwatershed	50
7.2	Land suitability for Sorghum	51
7.3	Land suitability for Maize	52
7.4	Land suitability for Redgram	54
7.5	Land suitability for Bengalgram	55
7.6	Land suitability for Groundnut	56
7.7	Land suitability for Sunflower	58
7.8	Land suitability for Cotton	59
7.9	Land suitability for Chilli	60
7.10	Land suitability for Tomato	61
7.11	Land suitability for Drumstick	62
7.12	Land suitability for Mulberry	64
7.13	Land suitability for Mango	65
7.14	Land Suitability for Sapota	66
7.15	Land suitability for Pomegranate	68
7.16	Land suitability for Guava	69
7.17	Land Suitability for Jackfruit	70
7.18	Land Suitability for Jamun	71
7.19	Land Suitability for Musambi	73
7.20	Land Suitability for Lime	74
7.21	Land Suitability for Cashew	75
7.22	Land Suitability for Custrad Apple	77
7.23	Land Suitability for Amla	78
7.24	Land Suitability for Tamarind	79

7.25	Land Suitability for Marigold	80
7.26	Land Suitability for Chrysanthemum	82
7.27	Land suitability for Jasmine	83
7.20	Proposed Crop Plan for Allanagara Microwatershed	86

LIST OF FIGURES

2.1	Location map of Allanagara Microwatershed	3
2.2a	Granites	4
2.2b	Alluvial rocks	4
2.3	Rainfall distribution in Koppal Taluk, Koppal District	6
2.4	Natural vegetation of Allanagara microwatershed	6
2.5	Different crops and cropping systems in Allanagara Microwatershed	8
2.6	Current Land use – Allanagara Microwatershed	10
2.7	Location of Wells- Allanagara Microwatershed	10
3.1	Scanned and Digitized Cadastral map of Allanagara Microwatershed	13
3.2	Satellite image of Allanagara Microwatershed	13
3.3	Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Allanagara Microwatershed	14
3.4	Location of profiles in a transect	15
3.5	Soil phase or management units of Allanagara Microwatershed	19
5.1	Land Capability Classification of Allanagara Microwatershed	32
5.2	Soil Depth map of Allanagara Microwatershed	34
5.3	Surface Soil Texture map of Allanagara Microwatershed	35
5.4	Soil Gravelliness map of AllanagaraMicrowatershed	36
5.5	Soil Available Water Capacity map of Allanagara Microwatershed	37
5.6	Soil Slope map of Allanagara Microwatershed	38
5.7	Soil Erosion map of Allanagara Microwatershed	39
6.1	Soil Reaction (pH) map of Allanagara Microwatershed	42
6.2	Electrical Conductivity (EC) map of Allanagara Microwatershed	42
6.3	Soil Organic Carbon (OC) map of Allanagara Microwatershed	43
6.4	Soil Available Phosphorus map of Allanagara Microwatershed	44
6.5	Soil Available Potassium map of Allanagara Microwatershed	45
6.6	Soil Available Sulphur map of Allanagara Microwatershed	45
6.7	Soil Available Boron map of Allanagara Microwatershed	46
6.8	Soil Available Iron map of Allanagara Microwatershed	46
6.9	Soil Available Manganese map of Allanagara Microwatershed	47
6.10	Soil Available Copper map of Allanagara Microwatershed	47
6.11	Soil Available Zinc map of Allanagara Microwatershed	48

7.1	Land suitability for Sorghum	51
7.2	Land suitability for Maize	52
7.3	Land suitability for Bajra	53
7.4	Land suitability for Redgram	54
7.5	Land suitability for Bengal gram	56
7.6	Land suitability for Groundnut	57
7.7	Land suitability for Sunflower	58
7.8	Land suitability for Cotton	59
7.9	Land suitability for Chilli	60
7.10	Land suitability for Tomato	61
7.11	Land suitability for Drumstick	62
7.12	Land suitability for Mulberry	64
7.13	Land suitability for Mango	65
7.14	Land suitability for Sapota	67
7.15	Land suitability for Pomegranate	68
7.16	Land Suitability for Guava	69
7.17	Land Suitability for Jackfruit	71
7.18	Land Suitability for Jamun	72
7.19	Land Suitability for Musambi	73
7.20	Land Suitability for Lime	75
7.21	Land Suitability for Cashew	76
7.22	Land Suitability for Custard apple	77
7.23	Land suitability for Amla	78
7.24	Land suitability for Tamarind	79
7.25	Land suitability for Marigold	81
7.26	Land suitability for Chrysanthemum	82
7.27	Land suitability for Jasmine	83
7.28	Land Management Units map of Allanagara microwatershed	84
9.1	Soil and water conservation map of Allanagara Microwatershed	98

EXECUTIVE SUMMARY

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

The present study covers an area of 578 ha in Koppal taluk and district, Karnataka. The climate is semiarid and categorized as drought - prone with an average annual rainfall of 662 mm, of which about 424 mm is received during south –west monsoon, 161 mm during north-east and the remaining 77 mm during the rest of the year. An area of about 75 per cent is covered by soils, 20 per cent mining/industrial, two per cent by rock outcrops and three per cent waterbodies, settlements and others. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 7 soil series and 19 soil phases (management units) and 3 Land Management Units .*
- *The length of crop growing period is about <90 days and starts from 2nd week of August to 2nd week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 250 m grid interval.*
- *Land suitability for growing 27 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 17 per cent of the soils are moderately shallow (50-75 cm), 41 per cent of the soils are moderately deep (75-100 cm), about 17 per cent are deep soils (100-150 cm) and 1 per cent area has very deep (>150 cm) soils.*
- *About 2 per cent area has clayey soils at the surface and 73 per cent loamy soils.*
- *About 5 per cent of the area has non-gravelly (<15%) soils, 44 per cent gravelly soils (15-35 % gravel), 24 per cent very gravelly (35- 60% gravel) and 3 per cent extremely gravelly (60-80% gravel) soils.*
- *About 57 per cent are very low (<50 mm/m) and 18 per cent low (51-100 mm/m) available water capacity.*

- *About 42 per cent area has very gently sloping (1-3%) and 33 per cent area has gently sloping (3-5%) lands.*
- *An area of about 16 per cent has soils that are slightly eroded (e1), 38 per cent moderately eroded (e2) and 21 per cent severely eroded (e3) lands.*
- *An area of about 4 per cent has soils that are moderately to slightly acid (pH 5.5-6.5), 25 per cent soils are neutral (pH 6.5-7.3) and 46 per cent are slightly to moderately alkaline (pH 7.3 to 8.4).*
- *The Electrical Conductivity (EC) of the soils are <2 dS m^{-1} (non-saline) covering 69 per cent area, 2 per cent are low (2-4 dS m^{-1}), 3 per cent soils are medium (4-8 dS m^{-1}) and <1 per cent soils are high to very high (8-16 dS m^{-1}) indicating that they are saline in nature.*
- *Organic carbon is low (<0.5%) in about 7 per cent, 30 per cent of the soils are medium (0.5-0.75%) and 38 per cent of the soils are high (>0.75%) in organic carbon.*
- *Available phosphorus is low (<23 kg/ha) in about 14 per cent, medium (23-57 kg/ha) in about 37 per cent and high (>57 kg/ha) in 25 per cent area of the microwatershed.*
- *About 13 per cent of the soils are low (<145 kg/ha), medium (145-337 kg/ha) in 50 per cent and 12 per cent of the soils are high (>337 kg/ha) in available potassium content.*
- *Available sulphur is low (<10 ppm) in about 32 per cent, medium (10-20 ppm) in 14 per cent and about 30 per cent area is high (>20 ppm).*
- *Available boron is low (0.5 ppm) in about 72 per cent area, 3 per cent area is medium (0.5-1.0 ppm) and high (>1.0 ppm) in about <1 per cent.*
- *Available iron is sufficient (>4.5 ppm) in the entire area.*
- *Available zinc is deficient (<0.6 ppm) in 14 per cent and sufficient (>0.6 ppm) in about 61 per cent area.*
- *Available manganese and copper are sufficient in all the soils.*
- *The land suitability for 27 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	-	*103 (18)*		*Pomegranate*	-	*217 (37)*
Maize	-	*103 (18)*		*Guava*	-	*217 (37)*
Bajra	-	*313 (54)*		*Jackfruit*	-	*217 (37)*
Red gram	-	*7 (1)*		*Jamun*	-	*217 (37)*
Bengalgram	-	*103 (18)*		*Musambi*	-	*217 (37)*
Groundnut	-	*360 (62)*		*Lime*	-	*217 (37)*
Sunflower	-	*7 (1)*		*Cashew*	-	*242 (42)*
Cotton	-	*103 (18)*		*Custard apple*	-	*417 (72)*
Chilli	-	*103 (18)*		*Amla*	-	*417 (72)*
Tomato	-	*103 (18)*		*Tamarind*	-	*23 (4)*
Drumstick	-	*86 (15)*		*Marigold*	-	*103 (18)*
Mulbery	-	*321 (56)*		*Chrysanthemum*	-	*103 (18)*
Mango	-	*7 (1)*		*Jasmine*	-	*103 (18)*
Sapota	-	*217 (37)*				

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 3 identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and horticulture crops that helps in maintaining productivity and ecological balance in the microwatershed.

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

Chapter 1

INTRODUCTION

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

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

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

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

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

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

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

The land resource inventory aims to provide site specific database for Allanagara 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 Allanagara Microwatershed is located in the central part of northern Karnataka in Koppal Taluk, Koppal District, Karnataka State (Fig. 2.1). It comprises of Basapura, Ginagera, Kanakapura, Allanagara and Halavarthi villages. It lies between $15^0$19' – $15^0$20' North latitudes and $76^0$13' – $75^0$15' East longitudes and covers an area of 578 ha. It is surrounded by Basapura, Ginagera villages on north, Halavarthi in the west, Hirebaganala in the south and Kanakapura village on the eastern side.

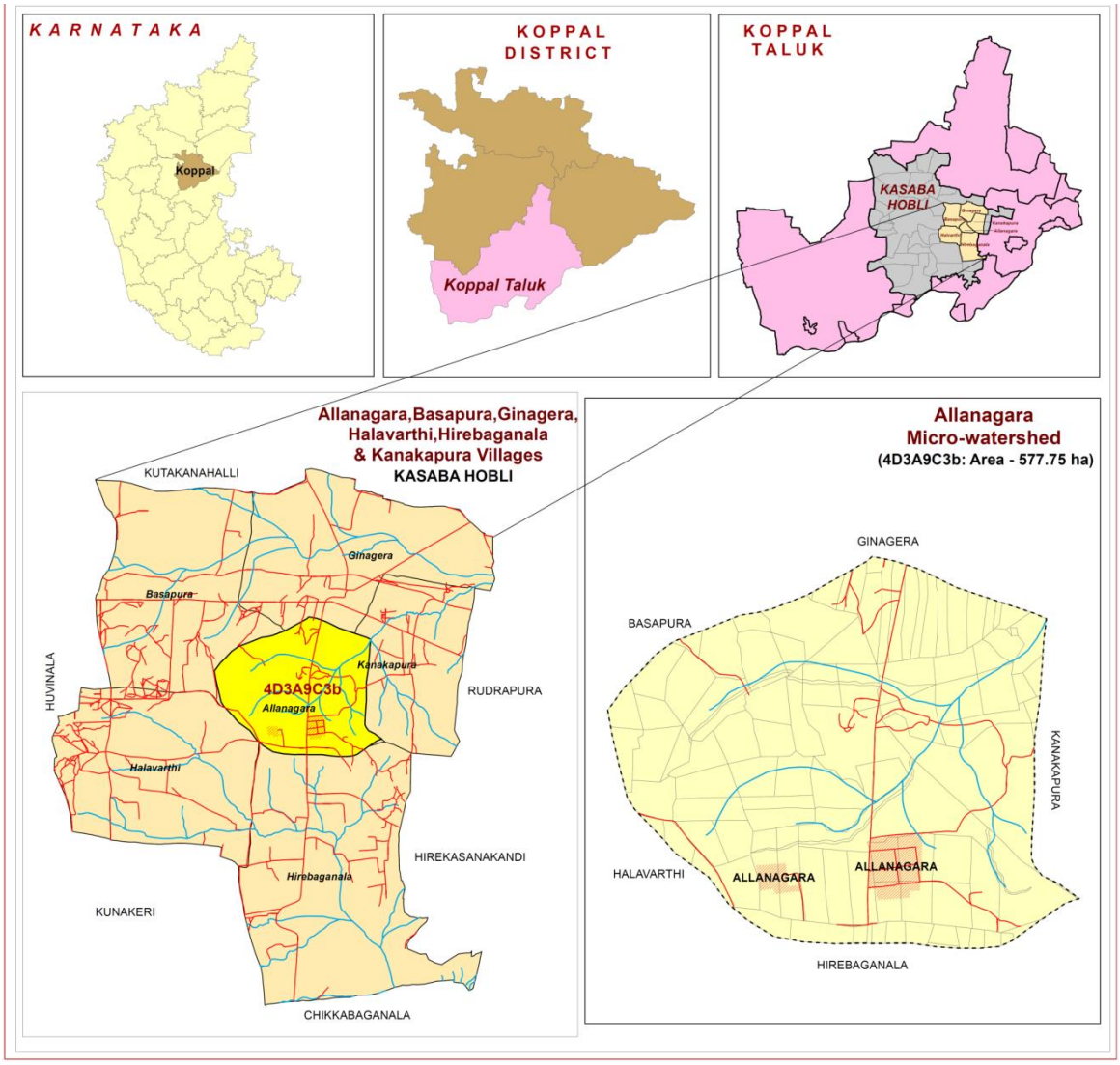


Fig. 2.1 Location map of Allanagara Microwatershed

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 village. The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig. 2.2a Granite and granite gneiss rocks

Fig. 2.2b 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 520 to 554 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 an average annual rainfall of 662 mm (Table 2.1). 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 takes place during the rest of the year. The winter season is from December to February. During April and May, the temperatures reach up to 45 °C and in December and January, the temperatures will go down to 16 °C. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo Transpiration (PET) is 145 mm and varies from a low of 101 mm in December and 193 mm in the month of May. The PET is always higher than precipitation in all the months except in the month of September. Generally, the Length of crop Growing Period (LGP) is <90 days and starts from 2nd week of August to 2nd week of November.

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

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

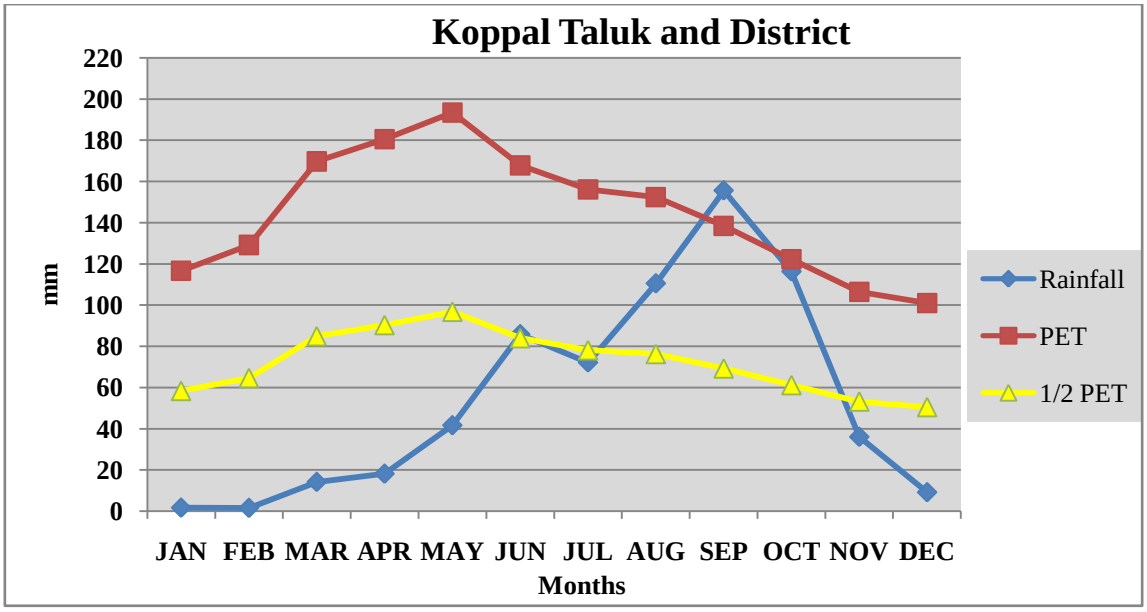


Fig. 2.3 Rainfall distribution in Koppal Taluk and District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Allanagara microwatershed

2.7 Land Utilization

About 91 per cent area (Table 2.2) in Koppal district is cultivated at present and about 16 per cent of the area is sown more than once. The cropping intensity is 118 per cent. An area of about 3 per cent is currently barren. Forests occupy a small area of about 5 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, bajra, cotton, safflower, sunflower, red gram, horse gram, onion, mulberry, pomegranate, sugarcane, bengalgram and groundnut (Fig 2.5). While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Allanagara 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, soil conservation structures and other water bodies in Allanagara 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 (a) Different crops and cropping systems in Allanagara Microwatershed

Fig. 2.5 (b) Different crops and cropping systems in Allanagara Microwatershed

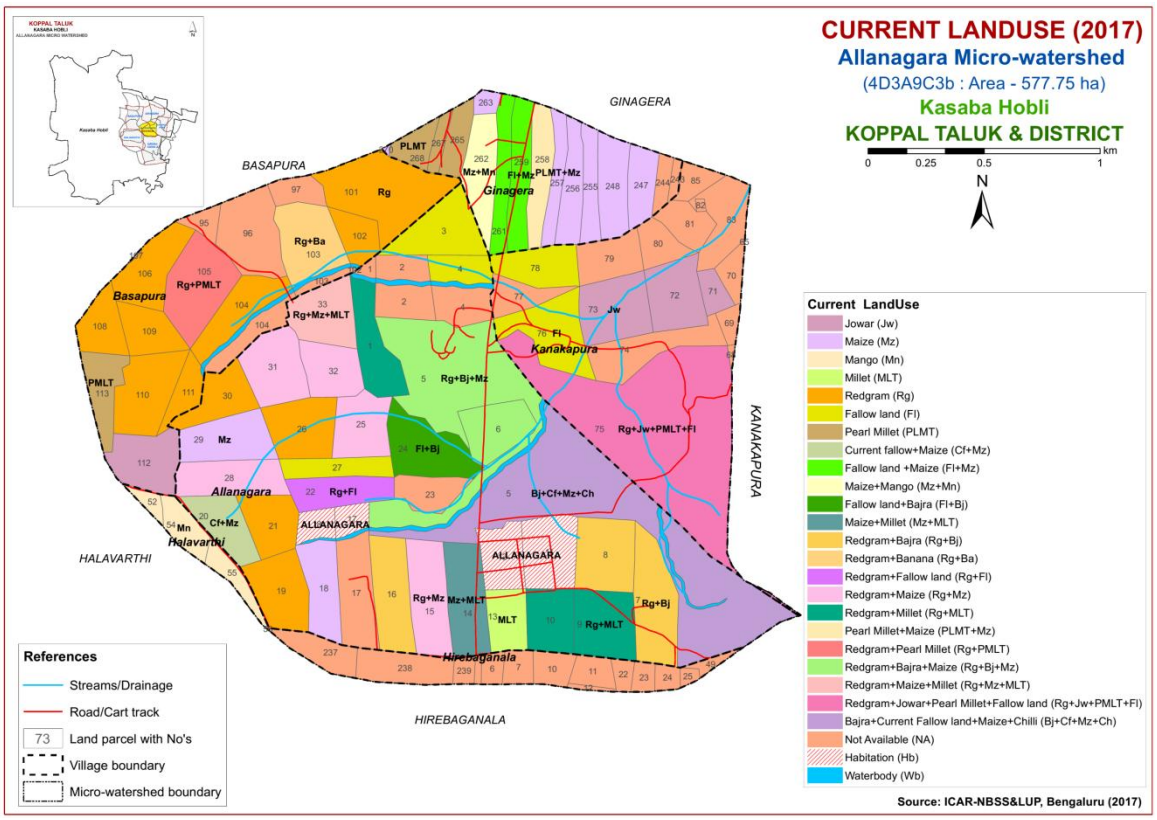


Fig. 2.6 Current Land Use – Allanagara Microwatershed

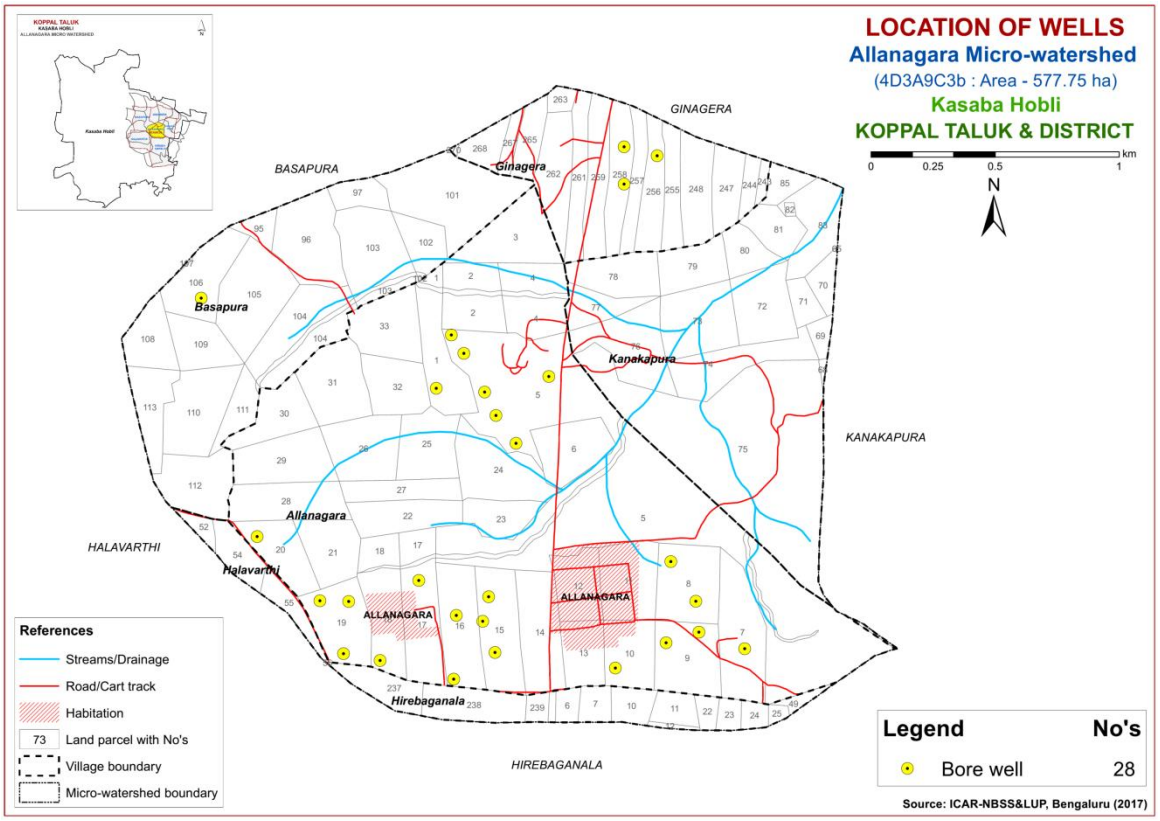


Fig. 2.7 Location of wells -Allanagara Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly to a given level of management. This was achieved in Allanagara microwatershed by the detailed study of all the soil characteristics (depth, texture, color, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site (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 578 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

Image Interpretation Legend for Physiography

G- Granite gneiss landscape

G1 Hills/ Ridges/ Mounds

G11 Summits

G12 Side slopes

G121 Side slopes with dark grey tones

G2 Uplands

G21 Summits

G22 Gently sloping uplands

G221 Gently sloping uplands, yellowish green (eroded)

G222 Gently sloping uplands, yellowish white (severely eroded)

G23 Very gently sloping uplands

G231 Very gently sloping uplands, yellowish green

G232 Very gently sloping uplands, medium green and pink

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

G234 Very gently sloping uplands, medium greenish grey

G235 Very gently sloping uplands, yellowish white (eroded)

G236 Very gently sloping uplands, dark green

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

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

DSe Alluvial landscape

DSe 1 Summit

DSe 11 Nearly level Summit with dark grey tone

DSe 12 Nearly level Summit with medium grey tone

DSe 13 Nearly level Summit with whitish grey tone

DSe 14 Nearly level Summit with whitish tone (Calcareousness)

DSe 15 Nearly level Summit with pinkish grey tone

DSe 16 Nearly level Summit with medium pink tone

DSe 17 Nearly level Summit with bluish white tone

DSe 18 Nearly level Summit with greenish grey tone

DSe 2 Very 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

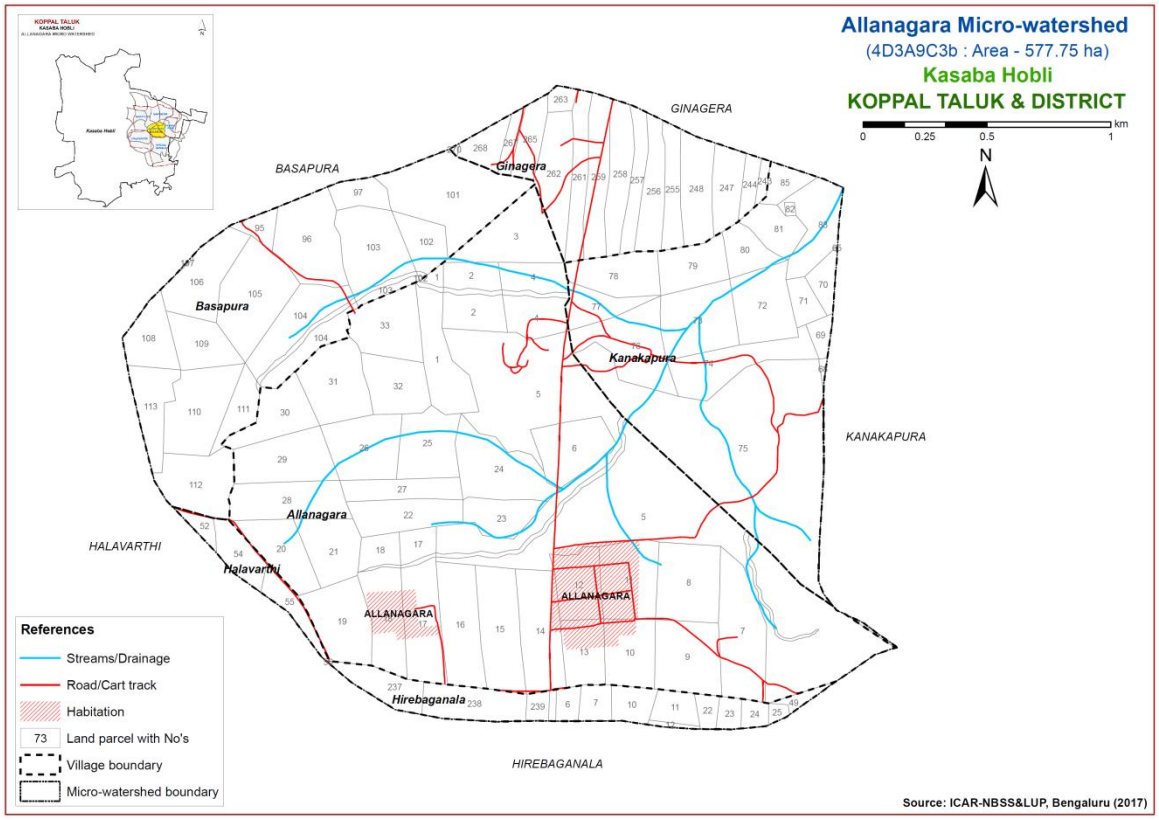


Fig. 3.1 Scanned and Digitized Cadastral map of Allanagara Microwatershed

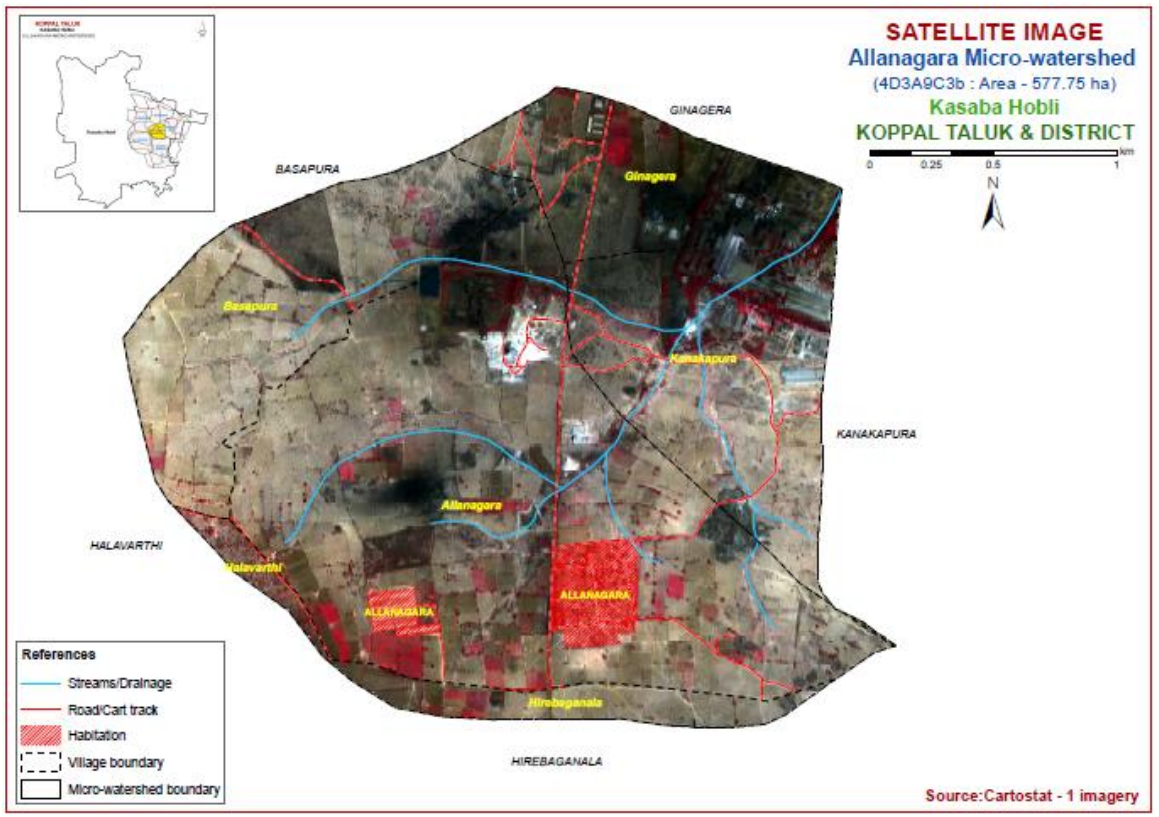


Fig. 3.2 Satellite Image of Allanagara Microwatershed

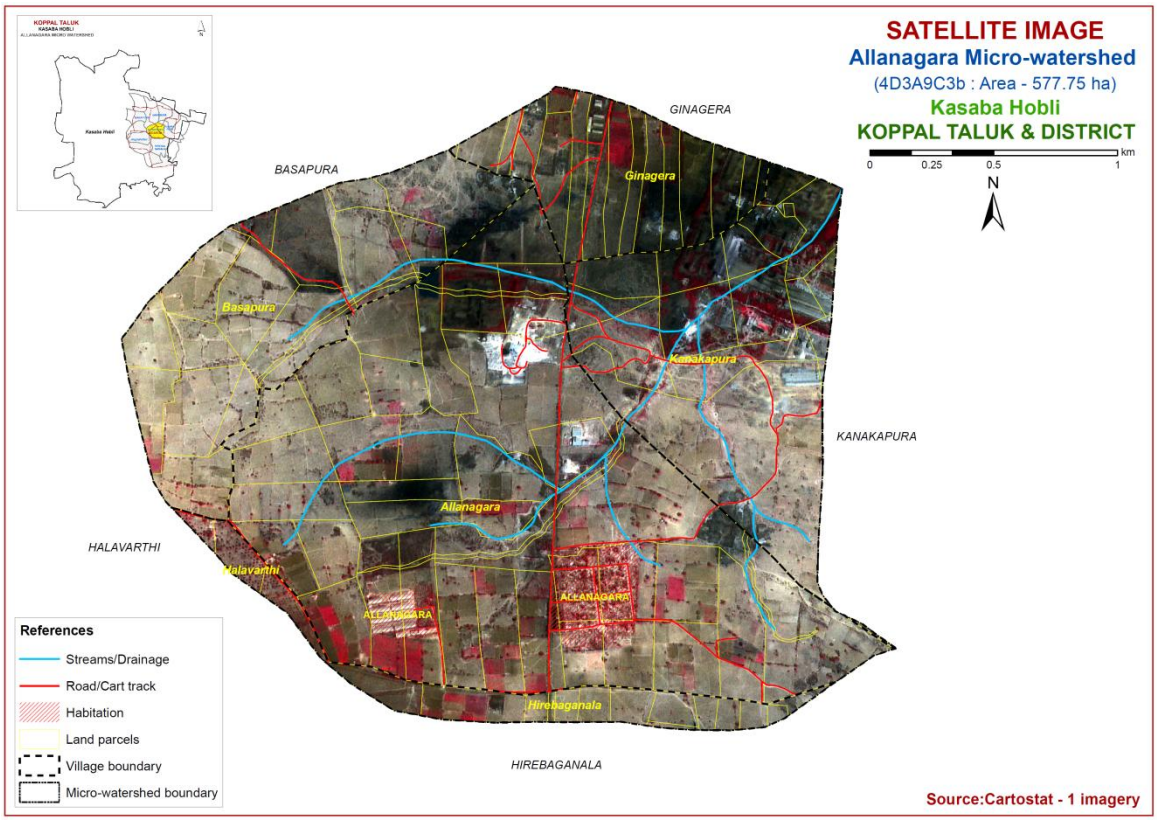


Fig. 3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Allanagara Microwatershed

3.3 Field Investigation

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

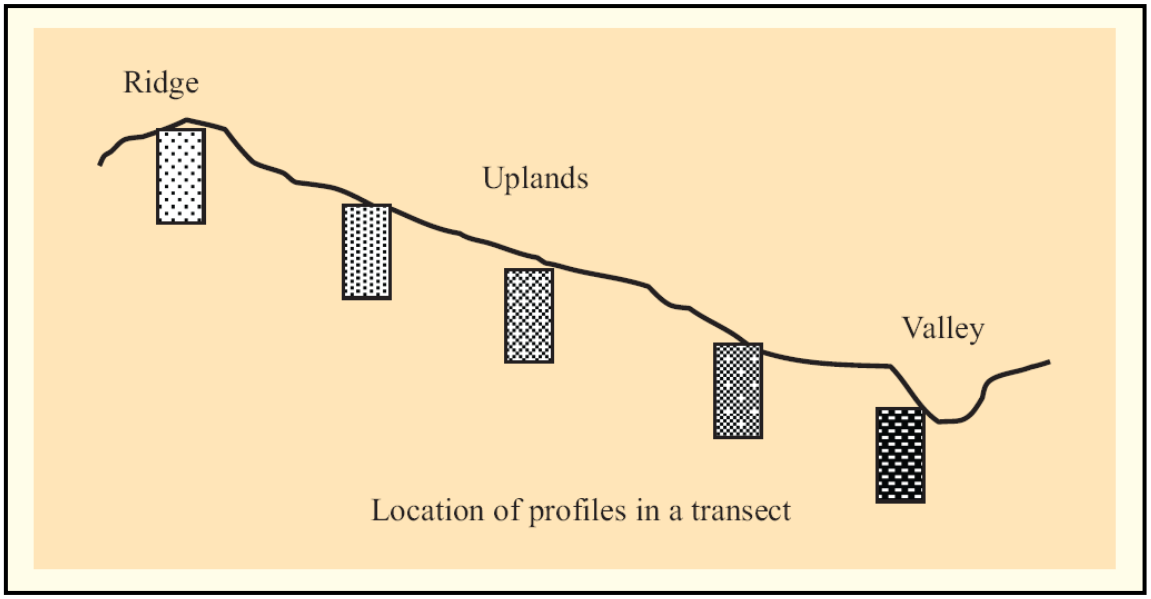


Fig. 3.4 Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, color, kind of horizon and horizon sequence, amount and nature of gravel present, calcareousness, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 7 soil series were identified in Allanagara Microwatershed.

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

Soils of Granite gneiss Landscape							
Sl. No	**Soil Series**	**Depth (cm)**	**Colour (moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcareo-usness**
1	Mukhadahalli (MKH)	50-75	5YR3/3,3/4,4/3, 5/4,6/6 2.5YR3/4	gscl	>35	Ap-Bt-Cr	-
2	Hooradhahalli (HDH)	75-100	2.5YR2.5/4,3/4, 3/6	gsc-gc	>35	Ap-Bt-Cr	-
3	Bidanagere (BDG)	75-100	5YR3/3,3/4,4/3,5/4 2.5YR3/4	gc	35-60	Ap-Bt-Cr	-
4	Balapur(BPR)	100-150	2.5YR2.5/4,3/4	gsc-gc	>35	Ap-Bt-Cr	-
5	Nagalapur (NGP)	100-150	5YR2.5/2,3/2, 2.5YR3/6,4/6	gsc-gc	>35	Ap-Bt-Cr	-
6	Niduvalalu (NDL)	>150	2.5YR2.5/3,2.5/4, 3/3,4/6	gsc	>35	Ap-Bt	-
	Soils of Alluvial Landscape						
7	Kyasalapura (KSP)	50-75	5YR 3/2, 3/3, 3/4	gscl-gsc	15-35	Ap-Bt-Ck	e-es

3.4 Soil Mapping

The area under each soil series was further separated into 19 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 of 19 mapping units representing 7 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2. The soil phase map (management units) shows the distribution of 19 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 soil series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2017 from Allanagara farmer's fields (59 samples) for fertility status (major and micronutrients) at 250 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using kriging method for the microwatershed.

Table 3.2 Soil map unit description of Allanagara Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss landscape				
	MKH	Mukhadahalli soils are moderately shallow (50-75 cm), well drained, have dark brown to reddish brown gravelly red sandy clay loam soils occurring on very gently to gently sloping uplands under cultivation		**71 (12.33)**
77		MKHcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	26 (4.46)
79		MKHcC2g2	Sandy loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%)	19 (3.28)
80		MKHcC3g2	Sandy loam surface, slope 3-5%, severe erosion, very gravelly (35-60%)	23 (4.04)
87		MKHhC2g1	Sandy clay loam surface, slope 3-5%, moderate erosion, gravelly (15-35%)	3 (0.55)
	HDH	Hooradhahalli soils are moderately deep (75-100 cm), well drained, red to dark red and reddish brown gravelly sandy clay to gravelly clay soils occurring on very gently sloping to gently sloping uplands under cultivation		**210 (36.35)**
110		HDHcB2	Sandy loam surface, slope 1-3%, moderate erosion	0.03(0.01)
111		HDHcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	18 (3.12)
114		HDHcC2g2	Sandy loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%)	21 (3.6)
116		HDHcC3g1	Sandy loam surface, slope 3-5%, severe erosion, gravelly (15-35%)	84 (14.55)
120		HDHhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	75 (12.99)
127		HDHiB2	Sandy clay surface, slope 1-3%, moderate erosion	12(2.08)
	BDG	Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly clay soils occurring on very gently to gently sloping uplands under cultivation		**25 (4.41)**
183		BDGcC2g2	Sandy loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%)	25 (4.41)
	BPR	Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation		**87 (14.93)**
225		BPRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	4 (0.64)
226		BPRcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	50 (8.62)
231		BPRhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	16 (2.8)
234		BPRhC3g3	Sandy clay loam surface, slope 3-5%, severe erosion, extremely gravelly (60-80%)	17 (2.87)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on very gently sloping uplands under cultivation		**10 (1.67)**

257		NGPhB1	Sandy clay loam surface, slope 1-3%, slight erosion	10 (1.67)
	NDL	Niduvalalu soils are very deep (>150 cm), well drained, have red to dark reddish brown red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**7 (1.14)**
294		NDLhB1	Sandy clay loam surface, slope 1-3%, slight erosion	7 (1.14)
Soils of Alluvial landscape				
	KSP	Kyasalapura soils are moderately shallow (50-75 cm), well drained, have dark reddish brown, calcareous red gravelly sandy clay loam to sandy clay soils occurring on very gently sloping plains under cultivation		**25 (4.4)**
318		KSPcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	12 (2.13)
320		KSPhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	13 (2.27)
994	Miscellaneous lands	Mining for road metal and ballast		**116 (20.02)**
999		Rock lands, both massive and bouldary		**10 (1.69)**
1000	Others	Habitation		**18 (3.05)**

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

3.6 Land Management Units

The 19 soil phases identified and mapped in the microwatershed were regrouped into 3 Land Management Units (LUC's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LUC's) based on the management needs. One or more than one soil site characteristic having influence on the management have been chosen for identification and delineation of LUCs. For Allanagara Microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope, erosion and gravel content have been considered for defining LUCs. The Land Management Units are expected to behave similarly for a given level of management.

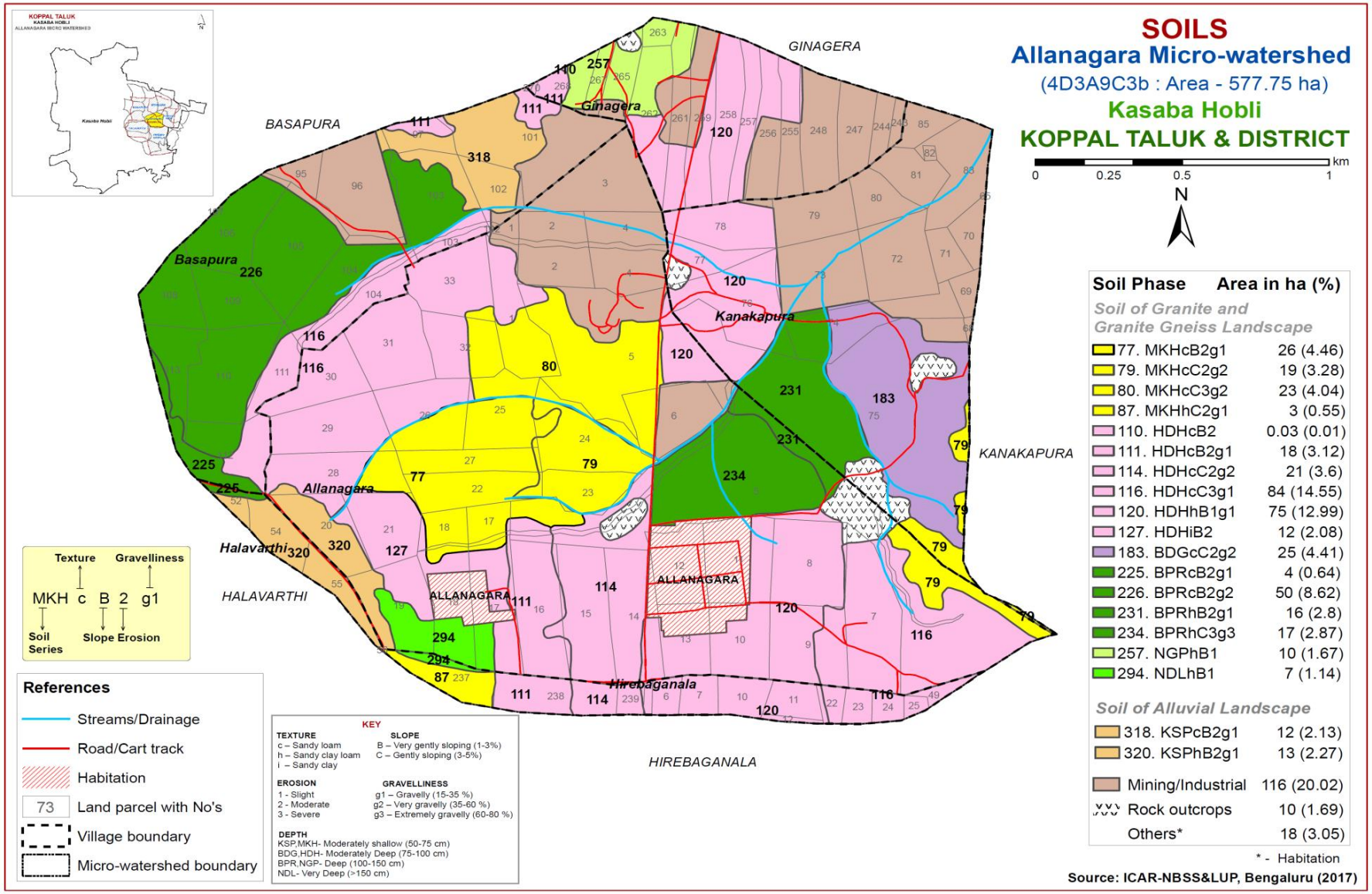


Fig 3.5 Soil Phase or Management Units-Allanagara Microwatershed

Chapter 4

THE SOILS

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

A brief description of each of the 7 soil series identified followed by 19 soil phases (management units) mapped under each series (Fig. 3.4) are furnished below. The physical and chemical characteristics of soil series identified in Allanagara microwatershed are given in Table 4.1. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Granite and granite gneiss landscape

In this landscape, 6 soil series are identified and mapped. Of these, Hooradhahalli (HDH) series occupies maximum area of 210 ha (36%), Balapur (BPR) 87 ha (15%), Mukhadahalli (MKH) 71 ha (12%), Bidanagere (BDG) 25 ha (4%), Nagalapur (NGP) 10 ha (2%) and Niduvalalu (NDL) 7 ha (1%). The brief description of each soil series along with the soil phases identified and mapped is given below.

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

The thickness of the solum ranges from 51 to 72 cm. The thickness of A horizon ranges from 12 to 17 cm. Its colour is in 5 YR and 7.5 YR hue with value 3 to 4 and chroma 2 to 4. The texture varies from loamy sand to sandy loam with 20 to 45 per cent gravel. The thickness of B horizon ranges from 40 to 68 cm. Its colour is in 2.5 YR and 5 YR hue with value and chroma 3 to 6. Texture is sandy clay loam to sandy clay with 35 to 50 per cent gravel. The available water capacity is low (50-100 mm/m). Four phases were identified and mapped.

Landscape and soil profile characteristics of Mukhadahalli (MKH) Series

4.1.2 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). Seven phases were identified and mapped.

Landscape and soil profile characteristics of Hooradhahalli (HDH) Series

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

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

Landscape and soil Profile Characteristics of Bidanagere (BDG) Series

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

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

Landscape and soil Profile Characteristics of Balapur (BPR) Series

4.1.5 Nagalapur (NGP) Series: Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The thickness of the solum ranges from 105 to 145 cm. The thickness of A-horizon ranges from 14 to 20 cm. Its colour is in 7.5 YR hue with value and chroma 3 to 4. The texture ranges from sandy loam to sandy clay with 10 to 50 per cent gravel. The thickness of B horizon ranges from 90 to 128 cm. Its colour is in 2.5 YR, 5 YR and 7.5 YR hue with value 3 to 5 and chroma 3 to 6. Texture is sandy clay to clay with 35 to 80 per cent gravel. The available water capacity is low (51-100 mm/m). Only one phase was identified and mapped.

Landscape and soil Profile Characteristics of Nagalapur (NGP) Series

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

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

Landscape and soil Profile Characteristics of Niduvalalu (NDL) Series

4.2 Soils of Alluvial landscape

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

4.2.1 Kyasalapura (KSP) Series: Kyasalapura soils are moderately shallow (50-75cm), well drained, have dark reddish brown gravelly sandy clay loam to sandy clay soils. They are developed from alluvium and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 53 to 75 cm. The thickness of A-horizon ranges from 17 to 23 cm. Its colour is in 2.5YR, 5 YR and 7.5 YR hue with value 3 to 5 and chroma 2 to 4. The texture varies from sandy clay loam to sand clay with 15 to 30 per cent gravel. The thickness of B-horizon varies from 33 to 55 cm. Its colour is in 2.5 YR and 5 YR hue with value 3 and chroma 2 to 4. Texture is sandy clay to clay with 15 to 35 per cent gravel. The available water capacity is very low (<50 mm/m). Two phases were identified and mapped.

Landscape and soil profile characteristics of Kyasalapura (KSP) Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Allanagara microwatershed

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

Series Name: Hooradhahalli (HDH), Pedon: RM-10
Location: $15^0$22'13"N, $76^0$18'36"E, Kerehalli 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
0-20	Ap	78.62	6.53	14.85	16.63	19.11	15.91	16.74	10.23	10	sl	8.95	5.15
20-30	Bt1	41.23	6.49	52.27	16.88	7.58	5.74	6.06	4.98	30	c	21.79	17.23
30-50	Bt2	39.62	8.61	51.77	17.90	7.84	4.98	4.98	3.92	50	c	23.49	17.84
50-80	Bt3	47.38	8.02	44.60	24.95	8.60	5.24	4.72	3.88	50	sc	22.13	15.62

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	7.55	-	-	0.152	0.97	2.52	4.64	3.02	0.20	0.03	7.90	7.59	0.51	104	0.44
20-30	8.59	-	-	0.219	0.54	3.24	12.47	5.21	0.14	1.36	19.18	17.93	0.34	107	7.57
30-50	8.47	-	-	0.309	0.62	3.48	12.14	4.90	0.16	1.77	18.96	20.90	0.40	91	8.46
50-80	8.4	-	-	0.322	0.38	3.12	10.22	3.97	0.15	1.82	16.16	16.50	0.37	98	11.06

Series: Bidanagere (BDG), **Pedon**: RM-3
Location: $13^0$22'11"N, $76^0$38'03"E, (4D3D8G1a), Tharabenahalli village, Chikkanayakanahalli taluk, Tumkur 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

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

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

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

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The 19 soil map units identified in the Allanagara microwatershed are grouped under three land capability classes and five land capability subclasses (Fig. 5.1).

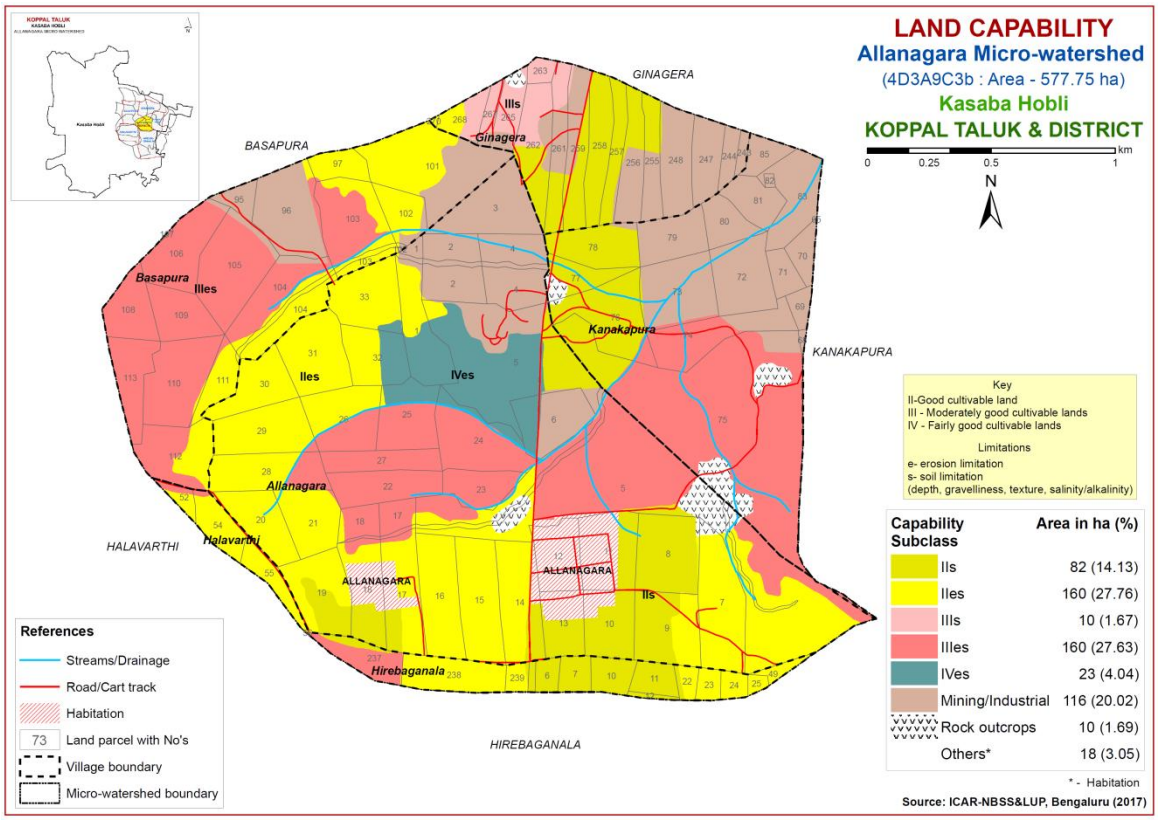


Fig. 5.1 Land Capability map of Allanagara Microwatershed

An area of 435 ha (75%) is suitable for agriculture. An area of 242 ha (42%) is good cultivable lands (Class II) that have minor limitations and require moderate conservation practices and are distributed in the southern, western, northern and central part of the microwatershed. Moderately good cultivable lands (Class III) cover an area of 170 ha (29%) and are distributed in the western, southwestern, northern, central and eastern part of the microwatershed with moderate problems of erosion and soil. Fairly good lands (Class IV) cover an area of 4 per cent and are distributed in the central part of the microwatershed with very severe limitations of soil and erosion, however 20 percent land cover as mining/industrial. The other miscellaneous areas cover about 2 per cent that have very severe limitations that preclude them for any crop productivity, but well suited for wildlife, recreation and installation of wind mills.

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).

Moderately shallow (50-75 cm) soils occupy an area of 97 ha (17%) and are distributed in the northern, southwestern, central and south-eastern part of the microwatershed. Moderately deep soils (75-100 cm) occupy an area of 235 ha (41%) and occur in the major part of the microwatershed. Deep (100-150 cm) to very deep (>150 cm) soils cover an area of 103 ha (18%) and are distributed in the southwestern, western, central and northern parts of the microwatershed.

The most problem lands with an area of about 97 ha (17%) having moderately shallow (50-75 cm) rooting depth. They are suitable for growing short duration agricultural crops but well suited for pasture, forestry or other recreational purposes. The most productive lands cover about 103 ha (18%) where all climatically adopted long duration crops be grown.

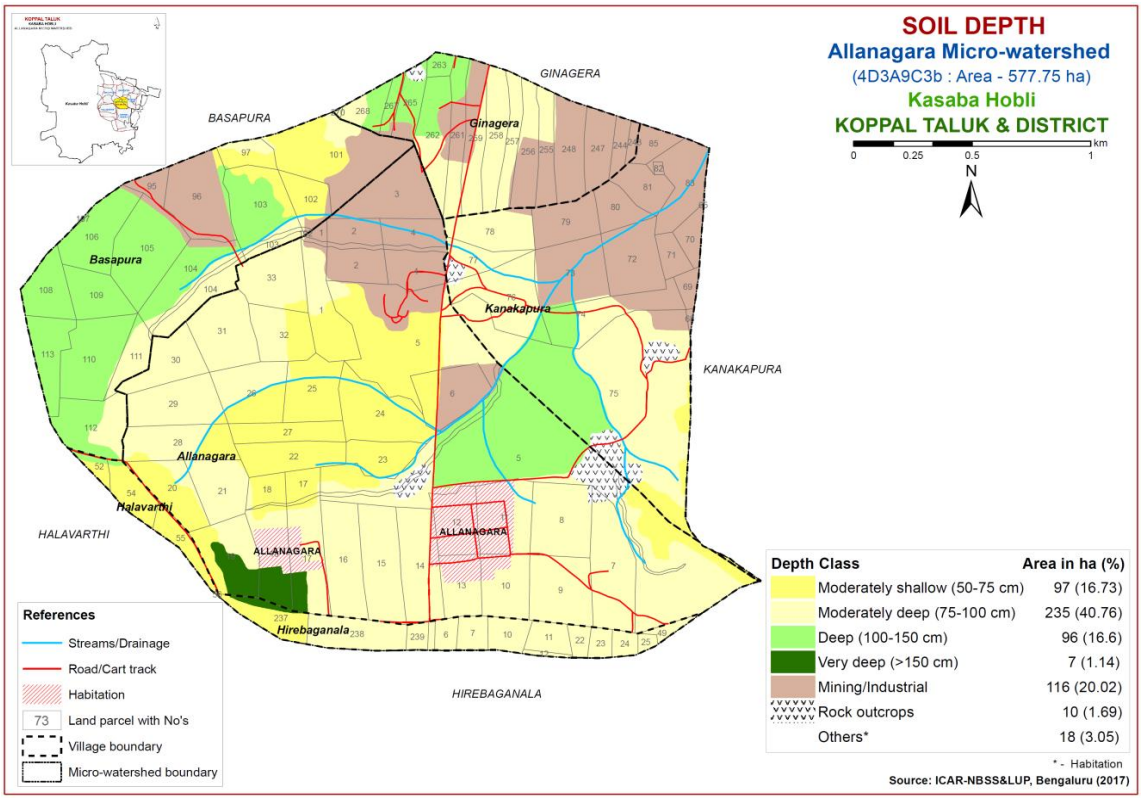


Fig. 5.2 Soil Depth map of Allanagara Microwatershed

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.

An area of about 422 ha (73%) has soils that are loamy at the surface. They are distributed in the major part of the microwatershed. An area of 12 ha (2%) has clayey soils at the surface and are distributed in the central, northern, northeastern and northwestern part of the microwatershed (Fig. 5.3).

The most productive lands (2%) with respect to surface soil texture are the clayey soils that have high potential for soil-water retention and availability, and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other most productive lands (73%) are loamy soils which also have high potential for AWC, nutrient availability but have no drainage or other physical problems.

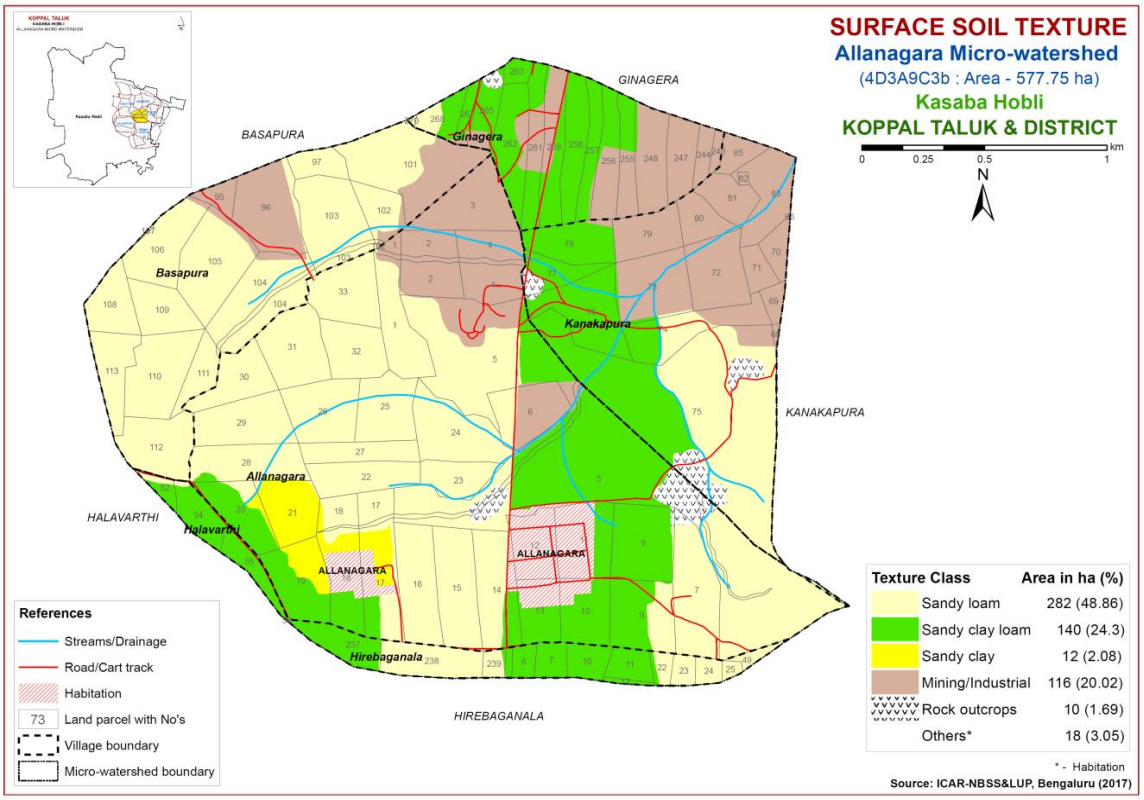


Fig. 5.3 Surface Soil Texture map of Allanagara Microwatershed

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 soils that are non-gravelly (<15% gravel) cover an area of about 28 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of 251 ha (44%) is covered by gravelly (15-35% gravel) soils and are distributed in the major part of the microwatershed. About 138 ha (24%) has soils that are very gravelly (35-60% gravel) and are distributed in the central part of the microwatershed (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 5%. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem soils that are gravelly (15-35%) and very gravelly (35-60%) cover 155 ha where only short duration crops can be grown.

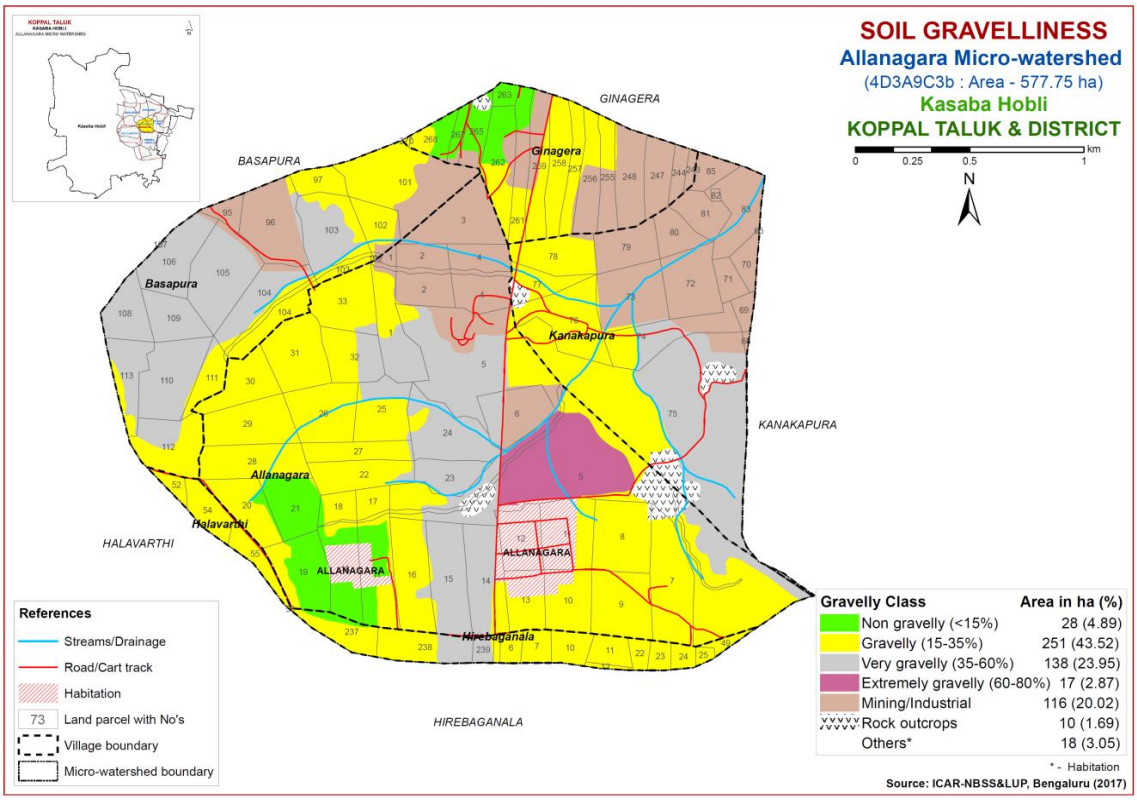


Fig. 5.4 Soil Gravelliness map of Allanagara Microwatershed

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).

Major area of about 332 ha (57%) are very low (<50 mm/m) in available water capacity and are distributed in all parts of the microwatershed. An area of about 103 ha (18%) has soils that are low (51-100 mm/m) in available water capacity and are distributed in the northern, western, central and southwestern part of the microwatershed.

An area of about 435 ha (75%) 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.

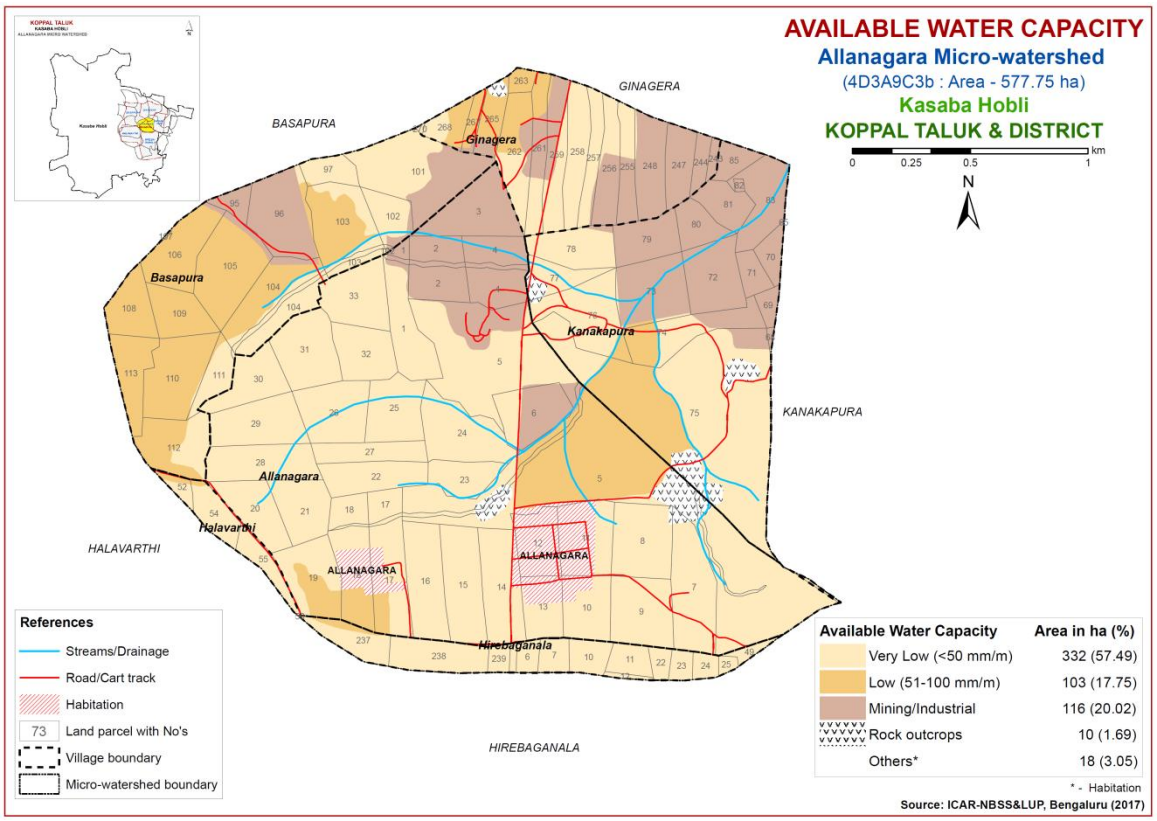


Fig. 5.5 Soil Available Water Capacity map of Allanagara Microwatershed

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).

Major area of about 242 ha (42%) falls under very gently sloping (1-3% slope) lands and are distributed in the major part of the microwatershed. About 192 ha (33%) are gently sloping (3-5%) and are distributed in the central, southern, eastern and south-eastern parts of the microwatershed. In these gently sloping lands areas, all climatically adapted annual and perennial crops can be grown with appropriate soil and water conservation and other land development measures.

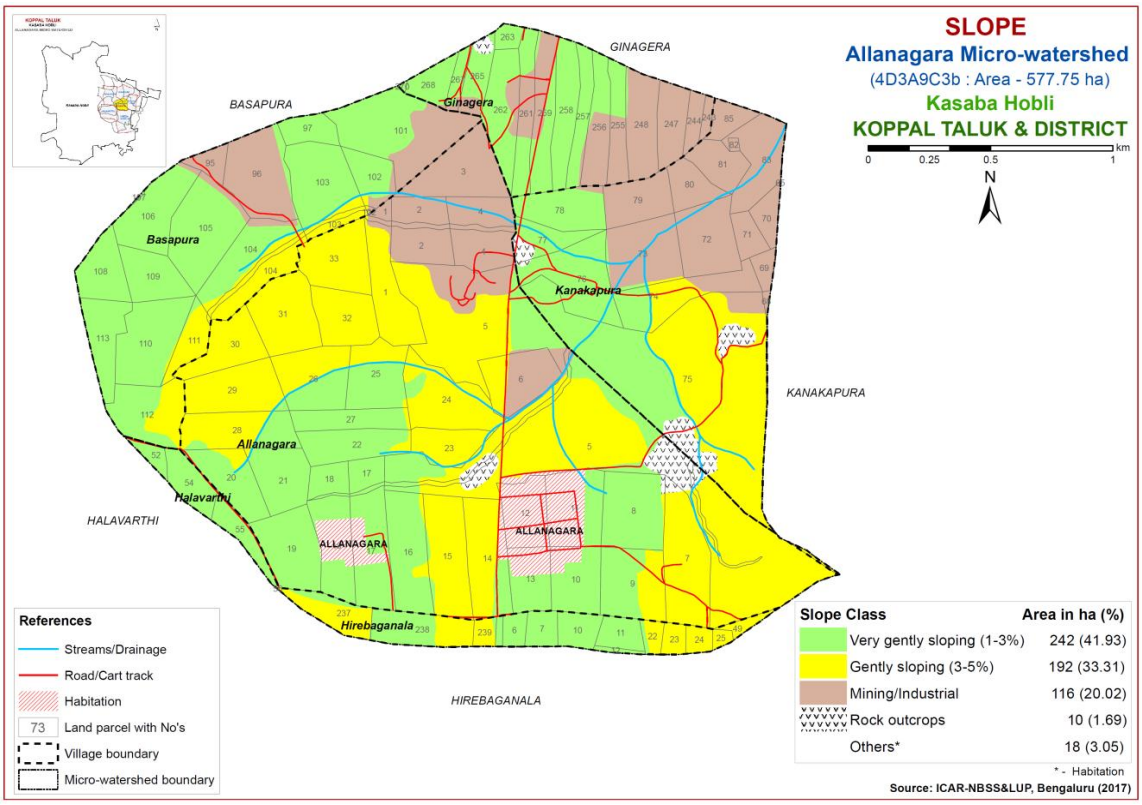


Fig. 5.6 Soil Slope map of Allanagara Microwatershed

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.

Soils that are slightly eroded (e1 Class) occupy an area of about 91 ha (16%) and are distributed in the southern, south-eastern and northern part of the microwatershed. Moderately eroded (e2 Class) soils cover an area of 219 ha (38%) and are distributed in the western, southwestern, central, northwestern and south-eastern part of the microwatershed. About 124 ha (21%) area is severely eroded (e3 Class) and are distributed in the central and south-eastern parts of the microwatershed.

An area of about 343 ha (59%) in the microwatershed is problematic because of moderate erosion. These areas need soil and water conservation and other land development measures for restoring the soil health.

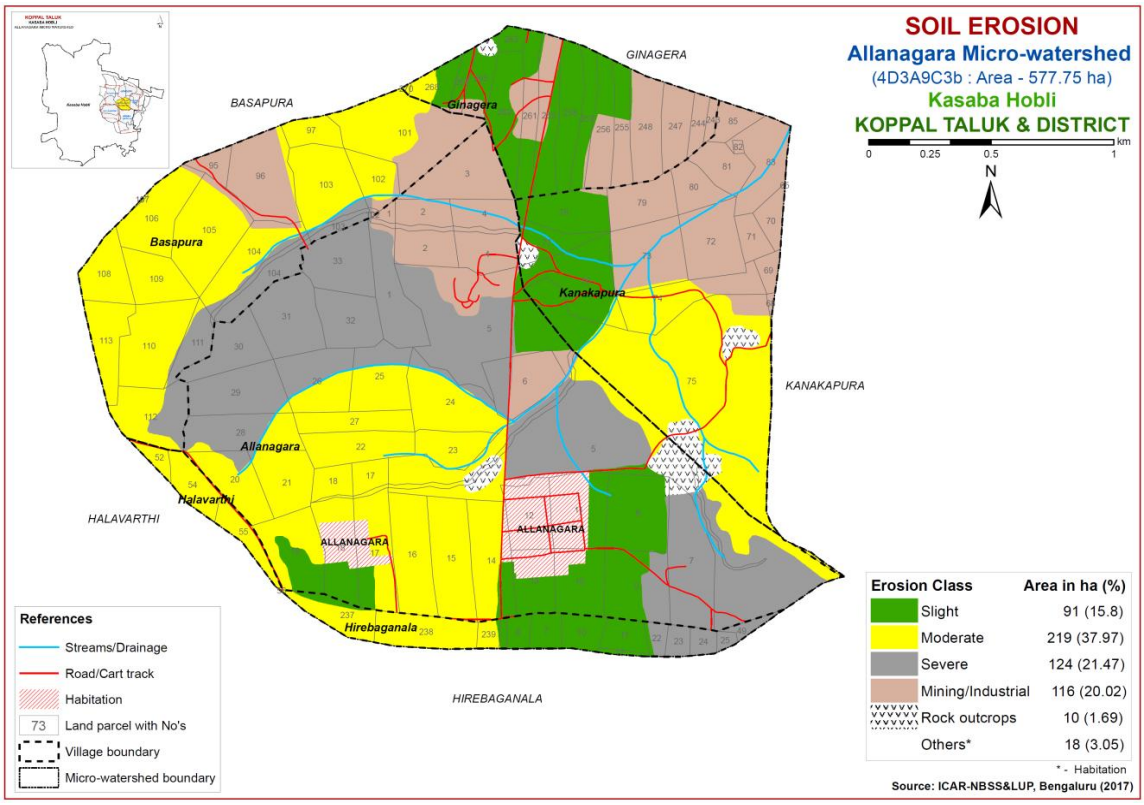


Fig. 5.7 Soil Erosion map of Allanagara Microwatershed

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 250 m grid interval) all over the microwatershed through land resource inventory in the year 2017 were analysed for pH, EC, organic carbon, available phosphorus and potassium and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

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

6.1 Soil Reaction (pH)

The soil analysis of the Allanagara microwatershed for soil reaction (pH) showed that an area of 24 ha (4%) is moderately to slightly acid (pH 5.5-6.5) and are distributed in the western and south-eastern parts of the microwatershed. An area of 142 ha (25%) is neutral (pH 6.5-7.3) and are distributed in the western, northwestern and south-eastern parts of the microwatershed. Slightly to moderately alkaline (pH 7.3-8.4) soils occupy 265 ha (46%) and are distributed in the major part of the microwatershed (Fig. 6.1).

6.2 Electrical Conductivity (EC)

The Electrical Conductivity of the soils is under non-saline (<2 dS m^{-1}) covering an major area of 400 ha (69%) and are distributed in all parts of the microwatershed. An area of 14 ha (2%) is low (2-4 dS m^{-1}), 16 ha (3%) is medium (4-8 dS m^{-1}) in electrical conductivity and are distributed in the northeastern part of the microwatershed. High (8-12 dS m^{-1}) to very high (12-16 dS m^{-1}) EC soils occupy about 5 ha (1%) and is distributed in the northeastern part of the microwatershed (Fig. 6.2).

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is low (<0.5%) covering an area of 42 ha (7%) and is distributed in the south-eastern, eastern and northern part of the microwatershed. An area of 171 ha (30%) is medium (0.5-0.75%) in organic carbon content and is distributed in the major part of the microwatershed. High (>0.75%) organic carbon cover a major area of 221 ha (38%) and is distributed in all parts of the microwatershed (Fig. 6.3).

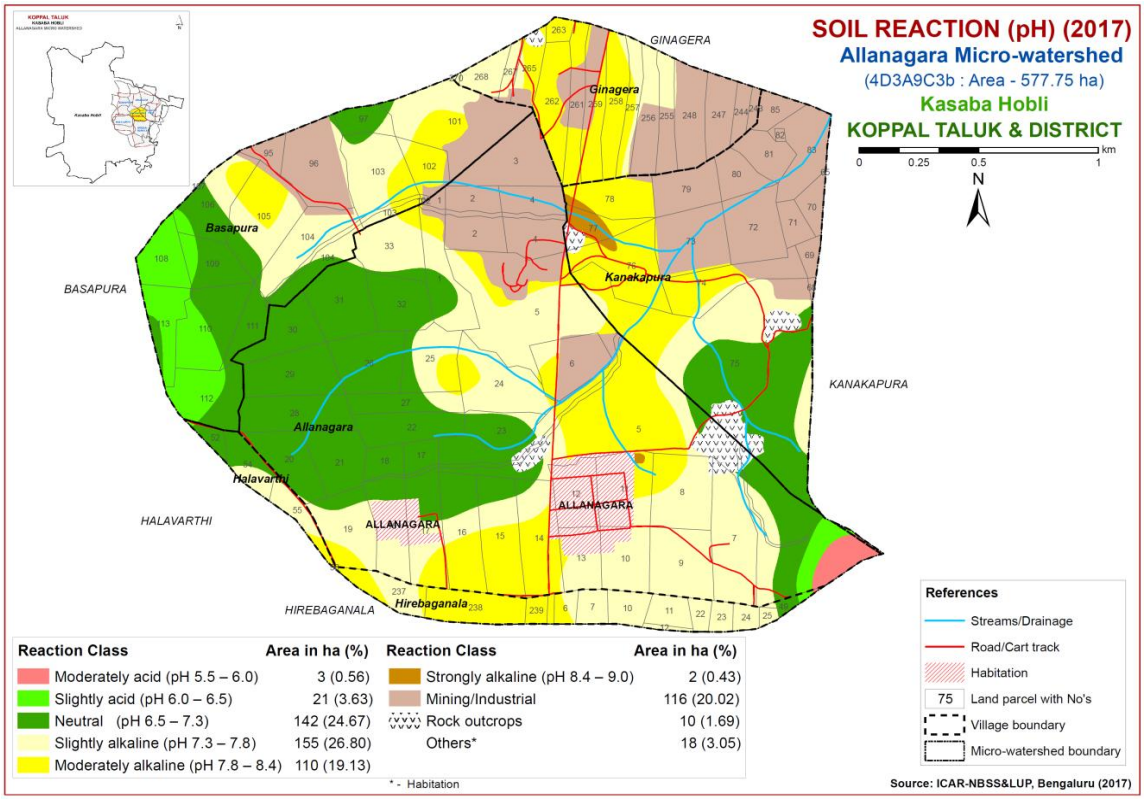


Fig. 6.1 Soil Reaction (pH) map of Allanagara Microwatershed

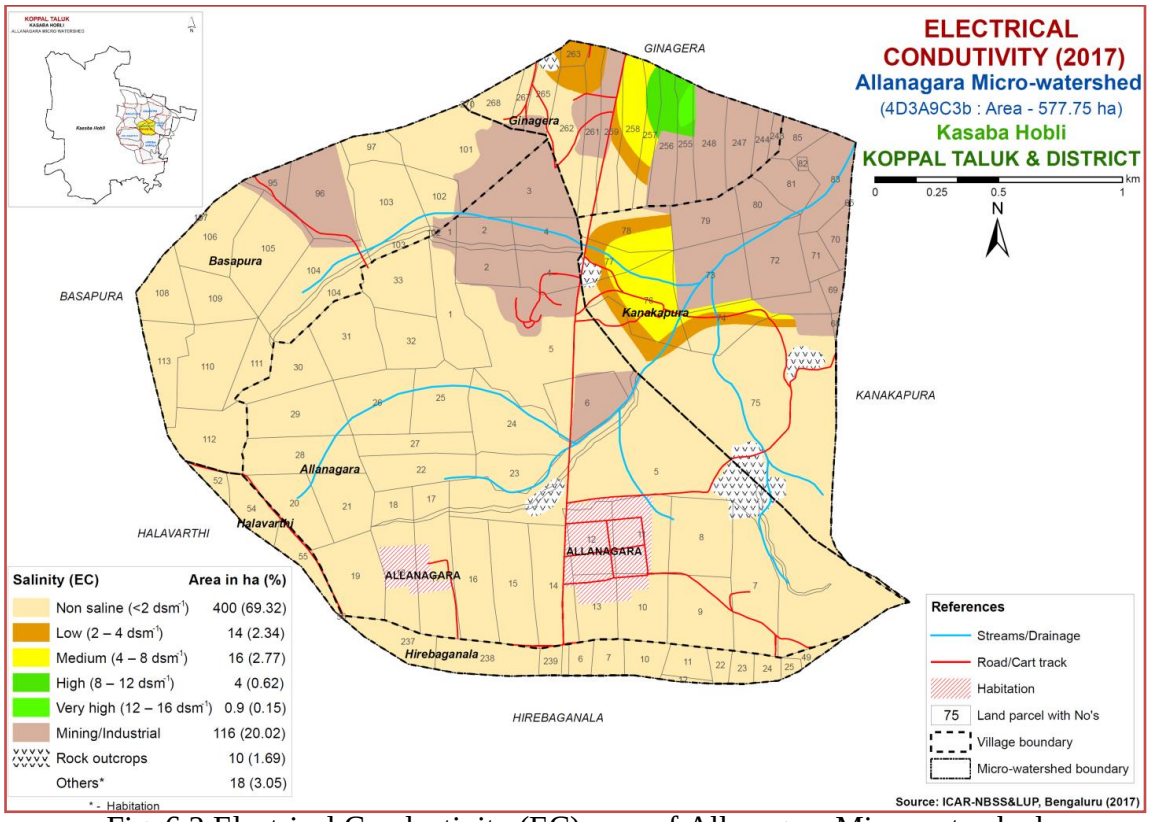


Fig. 6.2 Electrical Conductivity (EC) map of Allanagara Microwatershed

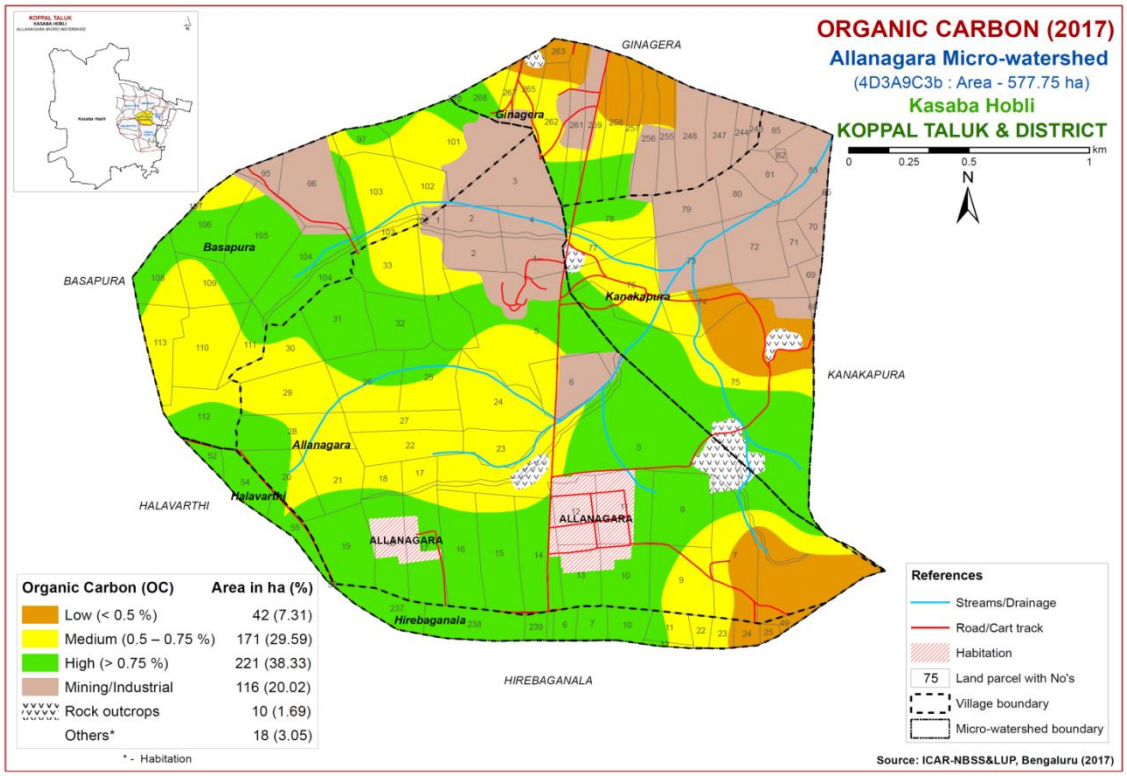


Fig. 6.3 Soil Organic Carbon map of Allanagara Microwatershed

6.4 Available Phosphorus

An area of about 80 ha (14%) is low (<23 kg/ha) in available phosphorus and is distributed in the southern, central, northern and eastern part of the microwatershed. Major area of about 211 ha (37%) is medium (23-57 kg/ha) and is distributed in the major part of the microwatershed. An area of 143 ha (25%) is high (>57 kg/ha) in available phosphorus content and are distributed in the southwestern, northwestern, northern and south-eastern parts of the microwatershed (Fig. 6.4).

6.5 Available Potassium

An area of 74 ha (13%) is low (<145 kg/ha) in available potassium content and are distributed in the western, northwestern, eastern and south-eastern part of the microwatershed. Major area of about 289 ha (50 %) is medium (145-337 kg/ha) and are distributed in all parts of the microwatershed. High (>337 kg/ha) in available potassium content occupy an area of 71 ha (12%) and are distributed in the southwestern, northwestern, south-eastern and central part of the microwatershed (Fig. 6.5).

6.6 Available Sulphur

Soils that are low available sulphur content (<10 ppm) cover an area of 185 ha (32%) and are distributed in the central, south-eastern, southwestern and northern part of the microwatershed. An area of 78 ha (14%) is medium (10-20 ppm) in available sulphur content and are distributed in the northwestern, northern, central and south-eastern part of the microwatershed. An area of about 171 ha (30%) is high (>20 ppm) in available sulphur content and are distributed in the northwestern, northern, south-eastern, central and eastern part of the microwatershed (Fig. 6.6). The areas that are low and medium in

available sulphur need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Available boron content is low (<0.5 ppm) in an area of 413 ha (72%) and are distributed in all part of the microwatershed. An area of about 17 ha (3%) is medium (0.5-1.0 ppm) in available boron and are distributed in the northwestern and northern part of the microwatershed. High (>1.0 ppm) in available boron occupy an area of about 3 ha (1%) in the northern part of the microwatershed (Fig. 6.7).

6.8 Available Iron

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

6.9 Available Manganese

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

6.10 Available Copper

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

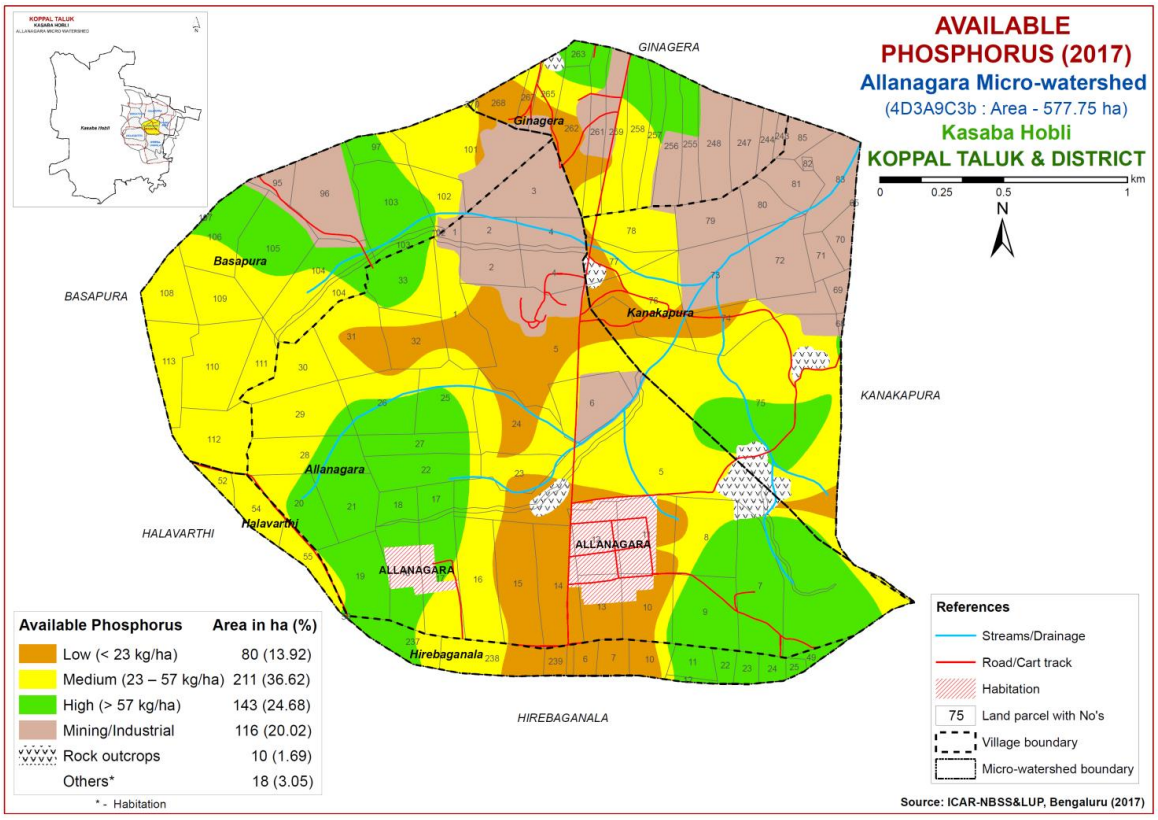


Fig. 6.4 Soil Available Phosphorus map of Allanagara Microwatershed

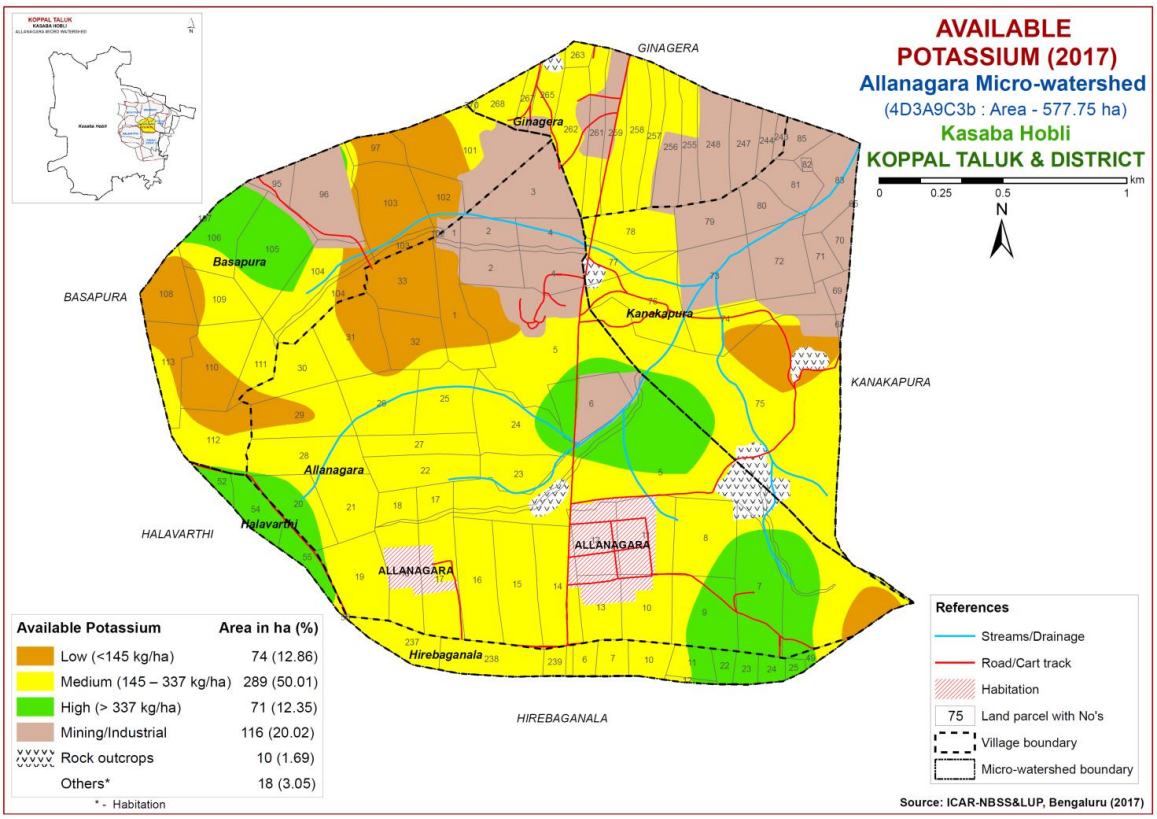


Fig. 6.5 Soil Available Potassium map of Allanagara Microwatershed

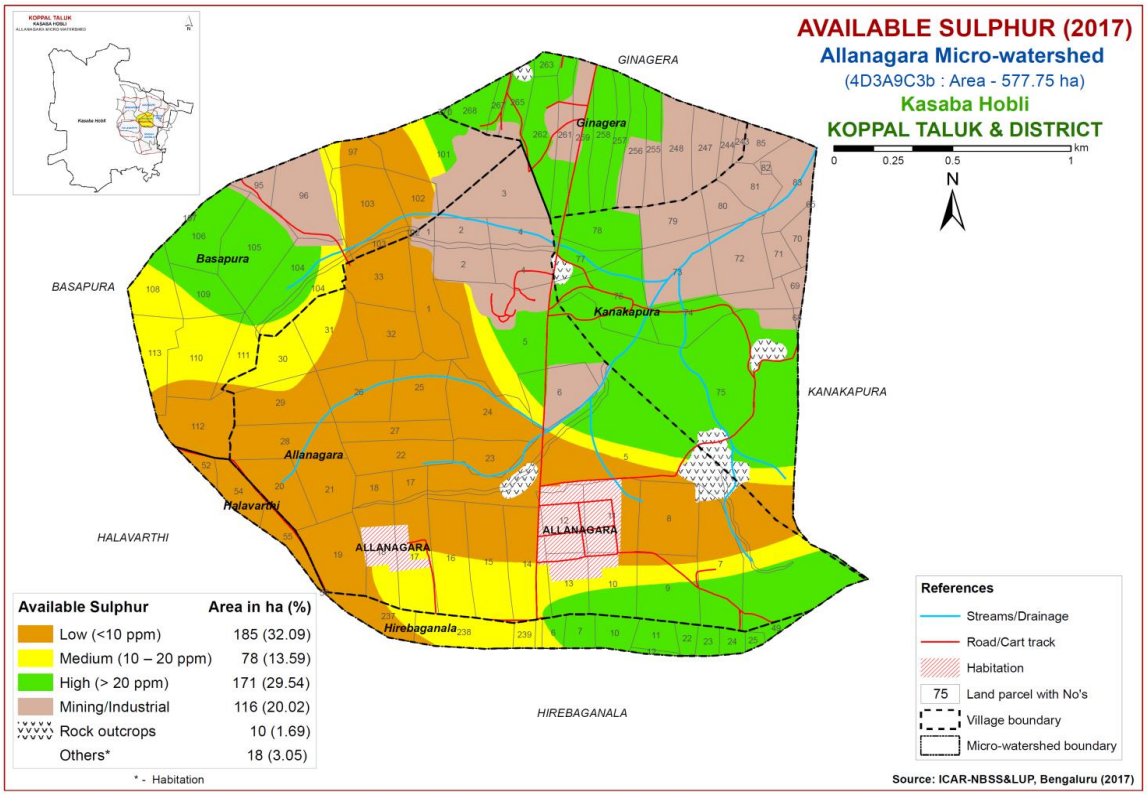


Fig. 6.6 Soil Available Sulphur map of Allanagara Microwatershed

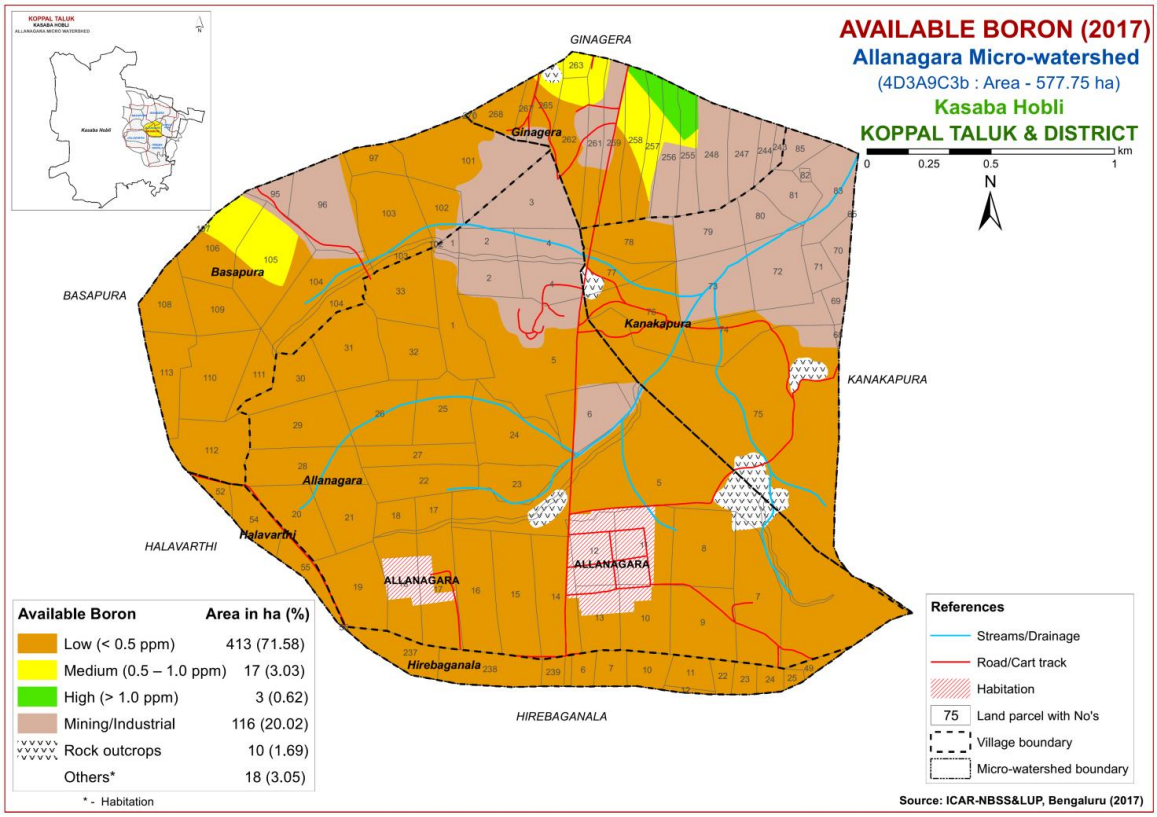


Fig. 6.7 Soil Available Boron map of Allanagara Microwatershed

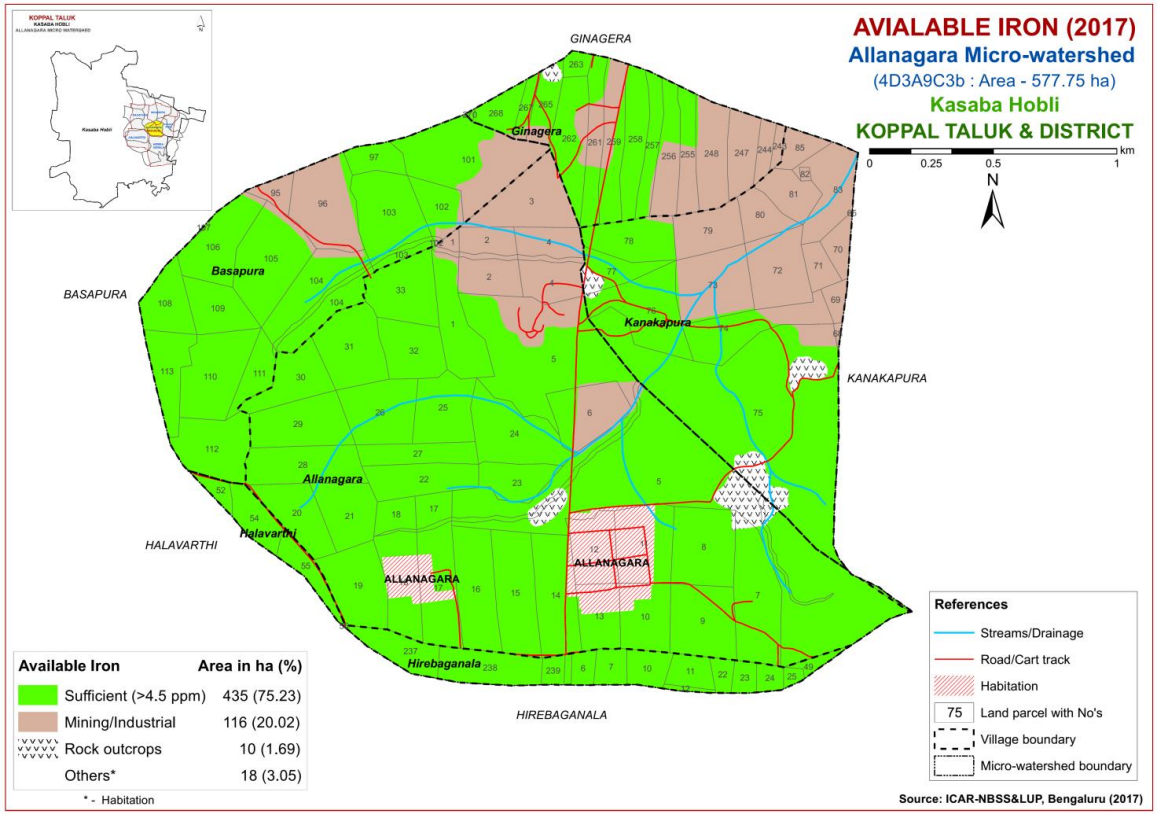


Fig. 6.8 Soil Available Iron map of Allanagara Microwatershed

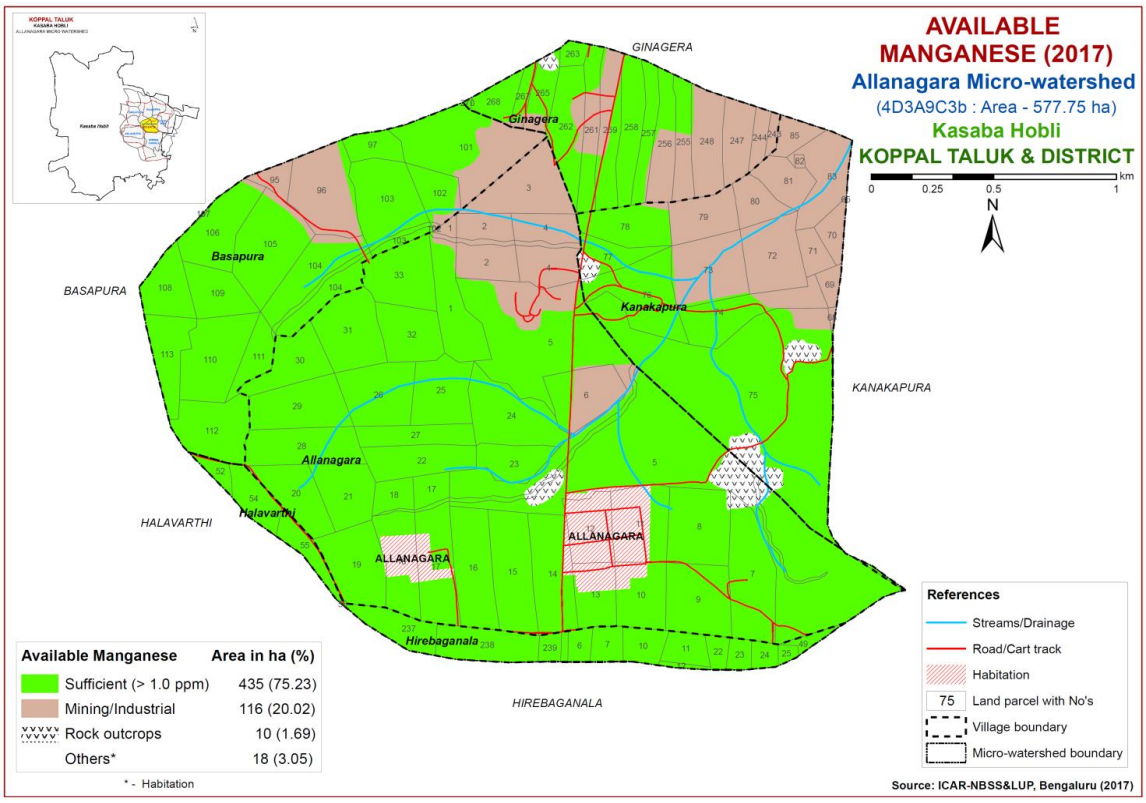


Fig. 6.9 Soil Available Manganese map of Allanagara Microwatershed

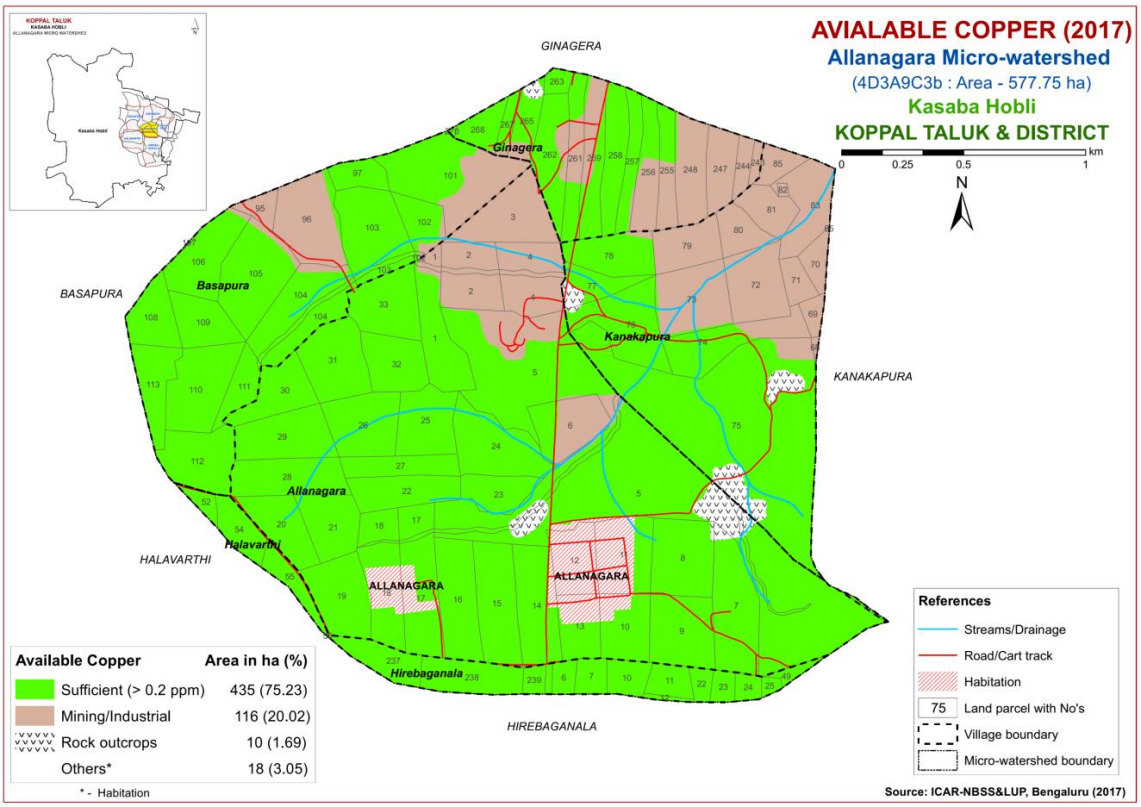


Fig. 6.10 Soil Available Copper map of Allanagara Microwatershed

6.11 Available Zinc

Available zinc content is sufficient (>0.6 ppm) in an area of 351 ha (61 %) and deficient (<0.6 ppm) in 83 ha (14%) area in the microwatershed (Fig. 6.11).

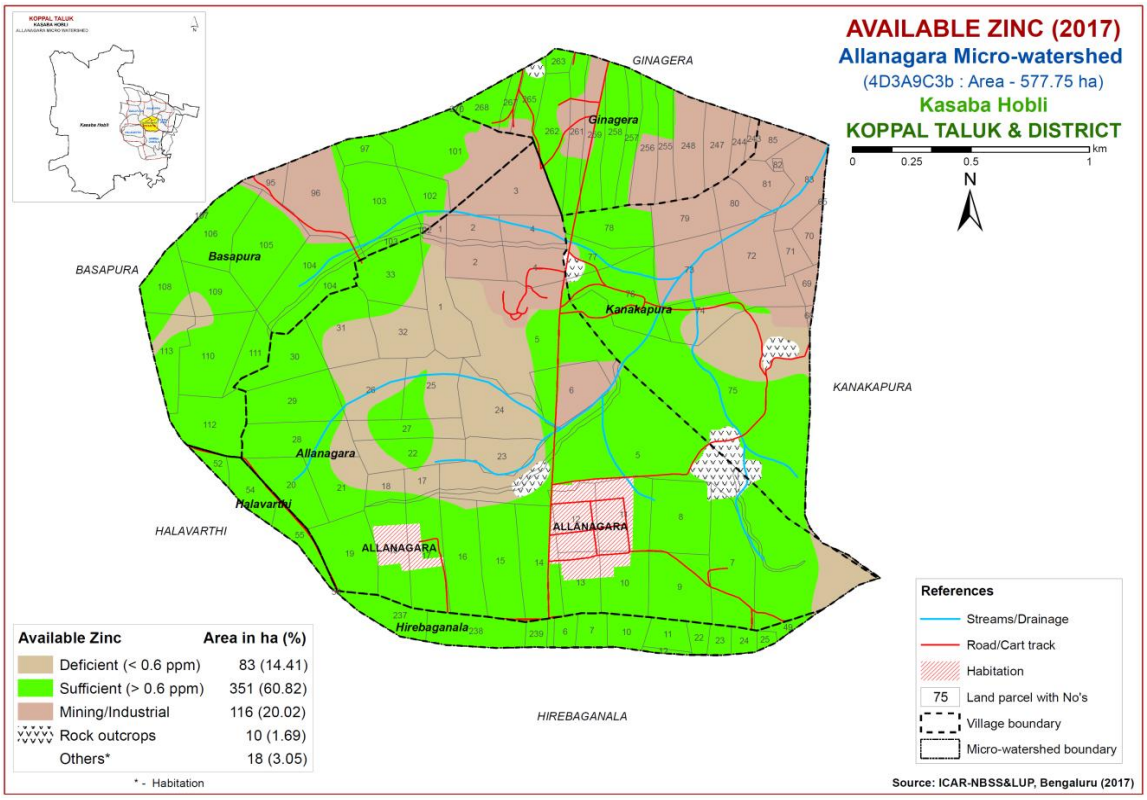


Fig. 6.11 Soil Available Zinc map of Allanagara Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Allanagara Microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3-Marginally Suitable. Order N has two Classes, N1-Currently not Suitable and N2-Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3, N1 and N2 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'z' for calcareousness 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 27 major annual and perennial crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

There are no highly suitable (Class S1) lands for growing sorghum. An area of about 103 ha (18%) is moderately suitable (Class S2) for growing sorghum and are distributed in the southwestern, northwestern, central and south-eastern part of the microwatershed. They have minor limitations of gravelliness, rooting condition and

Table 7.1 Soil-Site Characteristics of Allanagara Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC	ESP	CEC [Cmol (p^+) kg^{-1}]	BS (%)
					Surface	Sub-surface	Surface	Sub-surface								
MKHcB2g1	662	90	WD	50-75	sl	scl	15-35	35-50	50-100	1-3	Moderate	7.38	0.09	1.49	14.84	93
MKHcC2g2	662	90	WD	50-75	sl	scl	35-60	35-50	50-100	3-5	Moderate	7.38	0.09	1.49	14.84	93
MKHcC3g2	662	90	WD	50-75	sl	scl	35-60	35-50	51-100	3-5	Severe	7.38	0.09	1.49	14.84	93
MKHhC2g1	662	90	WD	50-75	scl	scl	15-35	35-50	50-100	3-5	Moderate	7.38	0.09	1.49	14.84	93
HDHcB2	662	90	WD	75-100	sl	sc, c	-	35-50	50-100	1-3	Moderate	7.55	0.15	0.44	7.59	104
HDHcB2g1	662	90	WD	75-100	sl	sc, c	15-35	35-50	50-100	1-3	Moderate	7.55	0.15	0.44	7.59	104
HDHcC2g2	662	90	WD	75-100	sl	sc, c	35-60	35-50	50-100	3-5	Moderate	7.55	0.15	0.44	7.59	104
HDHcC3g1	662	90	WD	75-100	sl	sc, c	15-35	35-50	50-100	3-5	Severe	7.55	0.15	0.44	7.59	104
HDHhB1g1	662	90	WD	75-100	scl	sc, c	15-35	35-50	50-100	1-3	Slight	7.55	0.15	0.44	7.59	104
HDHiB2	662	90	WD	75-100	sc	sc, c	-	35-50	50-100	1-3	Moderate	7.55	0.15	0.44	7.59	104
BDGcC2g2	662	90	WD	75-100	sl	c	35-60	35-60	<50	3-5	Moderate	6.24	0.06	0.35	3.75	52.6
BPRcB2g1	662	90	WD	100-150	sl	sc, c	15-35	35-50	51-100	1-3	Moderate	6.64	0.03	0.51	5.45	63.4
BPRcB2g2	662	90	WD	100-150	sl	sc, c	35-60	35-50	51-100	1-3	Moderate	6.64	0.03	0.51	5.45	63.4
BPRhB2g1	662	90	WD	100-150	scl	sc, c	15-35	35-50	51-100	1-3	Moderate	6.64	0.03	0.51	5.45	63.4
BPRhC3g3	662	90	WD	100-150	scl	sc, c	60-80	35-50	51-100	3-5	Severe	6.64	0.03	0.51	5.45	63.4
NGPhB1	662	90	WD	100-150	scl	sc, c	-	35-80	51-100	1-3	Slight	-	-	-	-	-
NDLhB1	662	90	WD	>150	scl	sc	-	20-75	50-100	1-3	Slight	-	-	-	-	-
KSPcB2g1	662	90	WD	50-75	sl	scl, sc	15-35	15-35	<50	1-3	Moderate	-	-	-	-	-
KSPhB2g1	662	90	WD	50-75	scl	scl, sc	15-35	15-35	<50	1-3	Moderate	-	-	-	-	-

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

calcareousness. Maximum area of about 315 ha (54%) is marginally suitable (Class S3) for growing sorghum and are distributed in the major part of the microwatershed with moderate limitation of gravelliness. Not suitable (Class N1) lands occupy an area of 17 ha (3%) and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

Table 7.2 Crop suitability criteria for Sorghum

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

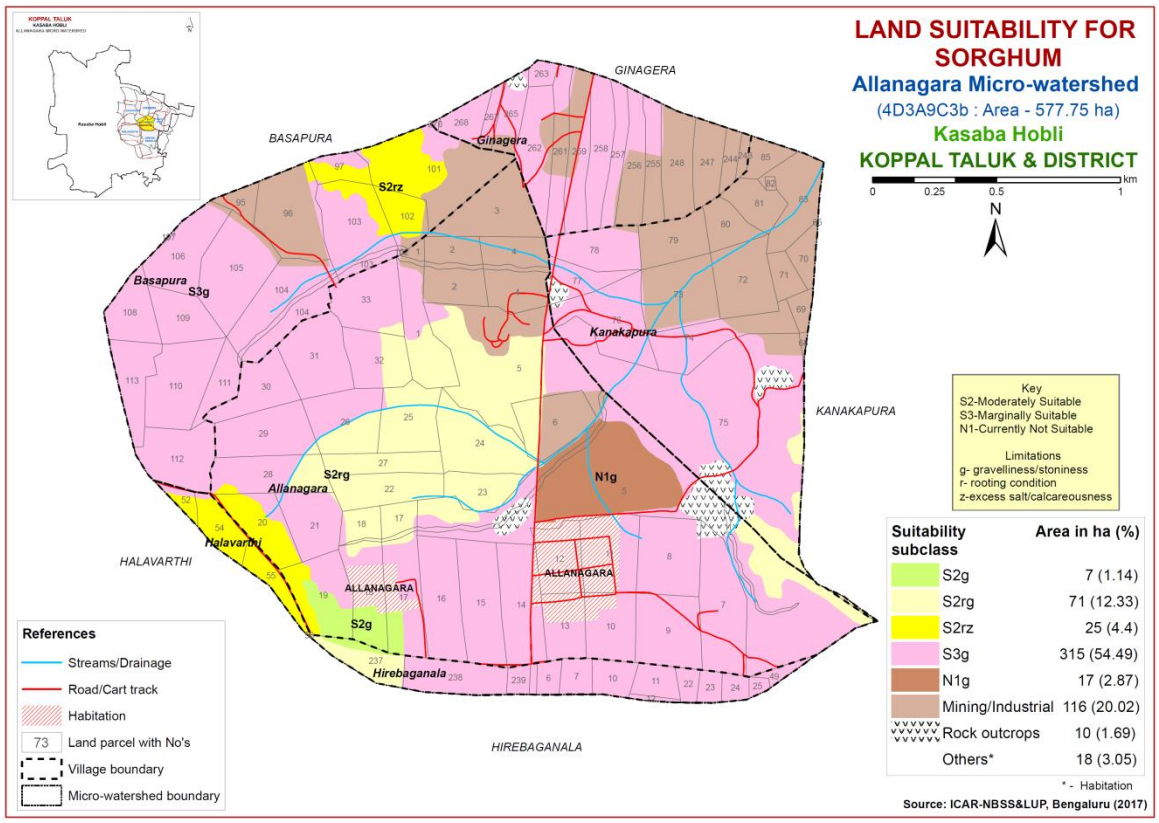


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

Maize is one of the most important food crop grown in an area of 13.37 lakh ha in almost all the districts of the State. The crop requirements 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.

Table 7.3 Crop suitability criteria for Maize

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

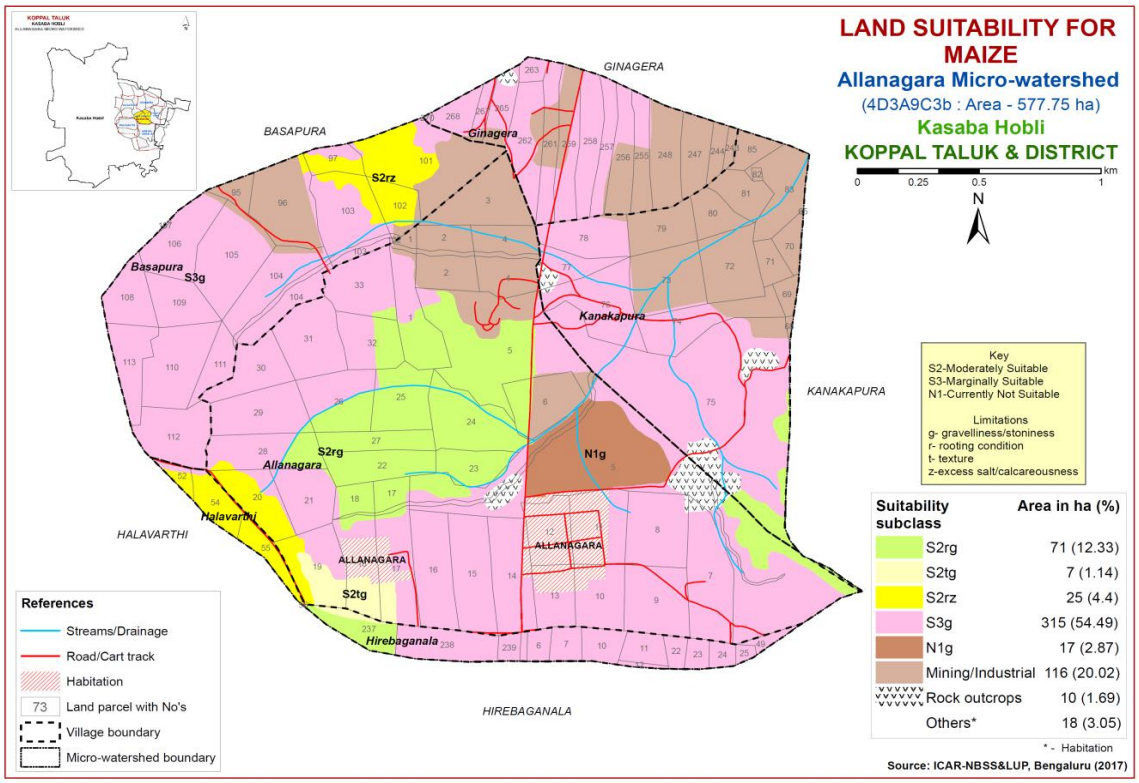


Fig. 7.2 Land Suitability map of Maize

There are no highly suitable (Class S1) lands for growing maize. Moderately suitable (Class S2) lands cover an area of 103 ha (18%) for growing maize and are distributed in the southwestern, northern, central and south-eastern part of the microwatershed with minor limitations of gravelliness, rooting condition and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of 315 ha

(54%) and are distributed in all parts of the microwatershed. They have moderate limitation of gravelliness. An area of about 17 ha (3%) is not suitable (Class N1) and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

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 of the Karnataka state. The crop requirements for growing bajra were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing bajra was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.3.

There are no highly suitable (Class S1) lands for growing maize. Moderately suitable lands occupy an area of 313 ha (54%) and are distributed in all parts of the microwatershed with minor limitations of gravelliness, rooting condition, calcareousness. Marginally suitable (Class S3) lands cover a maximum area of 121 ha (21%) and are distributed in the western, northern and eastern part of the microwatershed. They have moderate limitation of gravelliness.

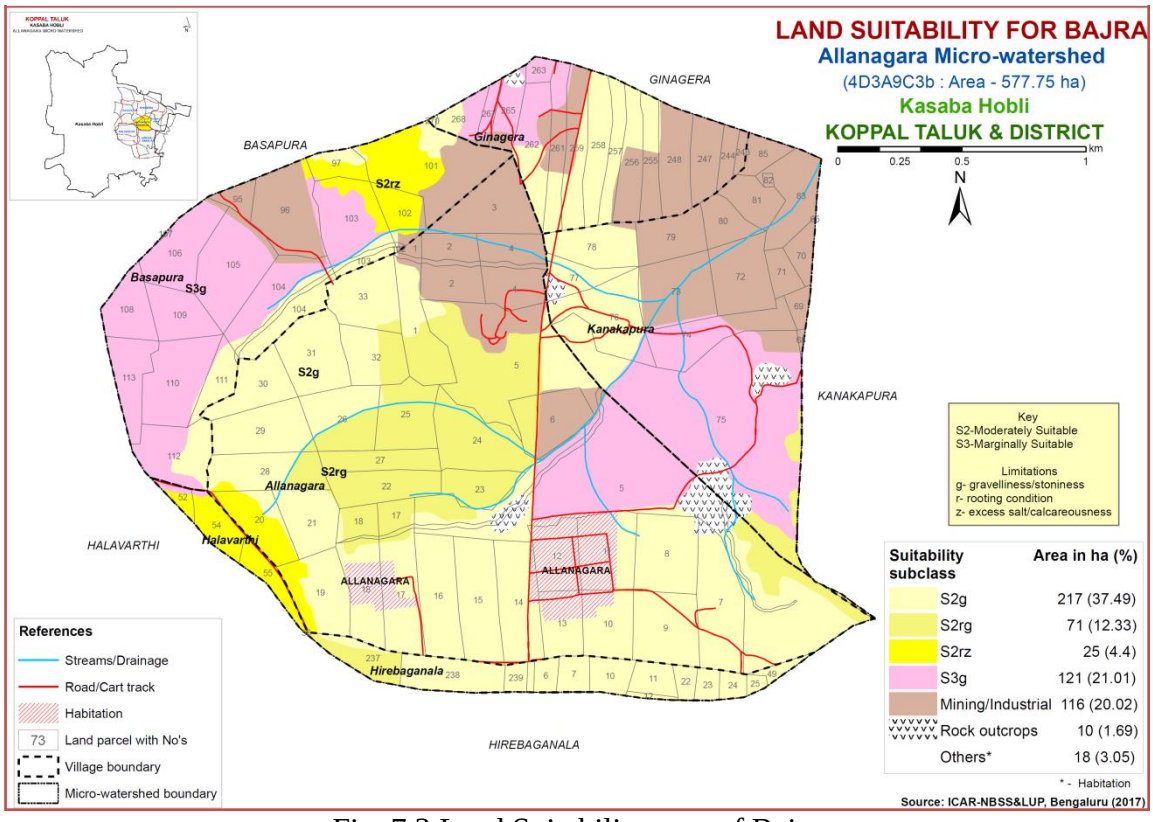


Fig. 7.3 Land Suitability map of Bajra

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

Redgram is one of the most important pulse crop grown in an area of 7.28 lakh ha in almost all the districts of the State. The crop requirements for growing redgram (Table 7.4) were matched with the soil-site characteristics (Table 7.1) and a land suitability map

for growing redgram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.4.

Table 7.4 Land suitability criteria for Red gram

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

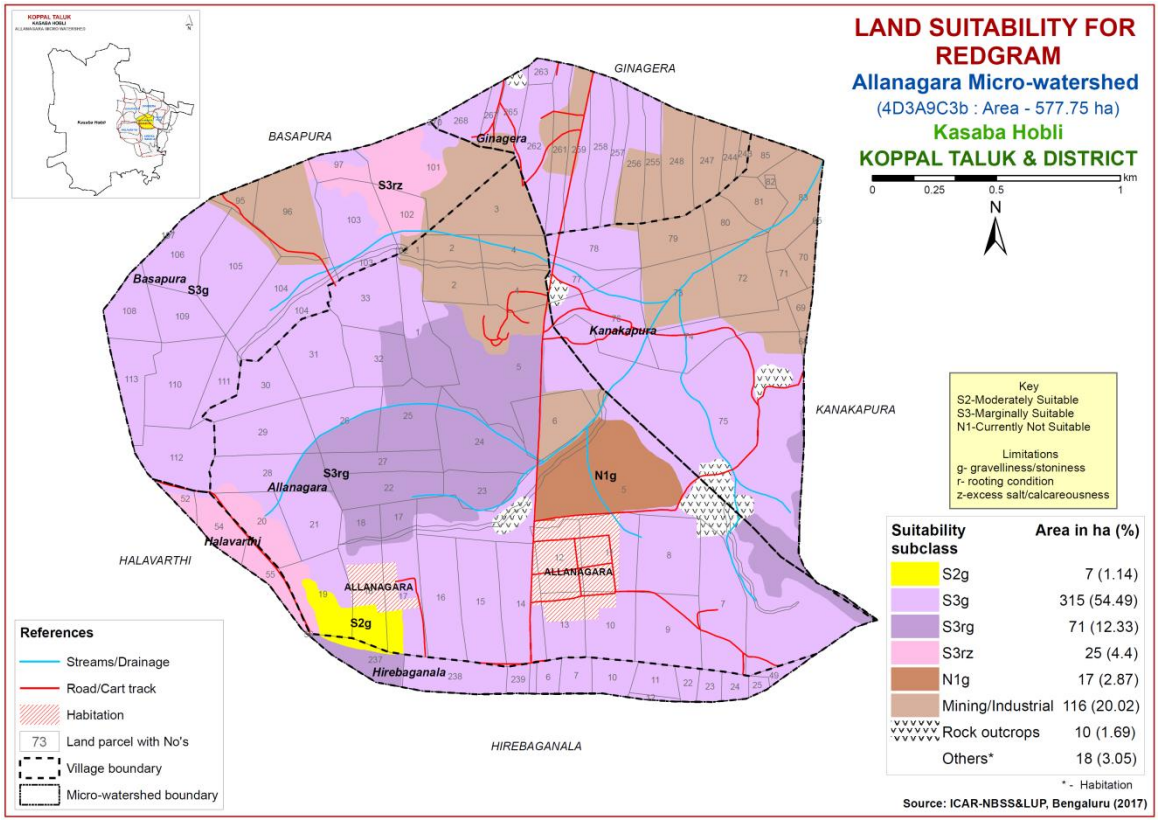


Fig. 7.4 Land Suitability map of Redgram

There are no highly suitable (Class S1) lands for growing redgram. Moderately suitable lands occupy an area of about 7 ha (1%) and are distributed in the southwestern part of the microwatershed with minor limitation of gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 411 ha (71%) and are distributed in all parts of the microwatershed. They have moderate limitations of gravelliness, rooting

condition and calcareousness. Not suitable (Class N1) lands cover an area of about 17 ha (3%) for growing redgram and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

7.5 Land Suitability for Bengalgram (*Cicer arietinum*)

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

There are no highly suitable (Class S1) lands for growing bengalgram. Moderately suitable lands occupy an area of 103 ha (18%) and are distributed in the central, southwestern, south-eastern and northern part of the microwatershed with minor limitations of gravelliness, texture, rooting condition and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 315 ha (54%) and are distributed in all parts of the microwatershed. They have moderate limitation of gravelliness. Not suitable (Class N1) lands cover an area of about 17 ha (3%) for growing bengalgram and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

Table 7.5 Crop suitability criteria for Bengalgram

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

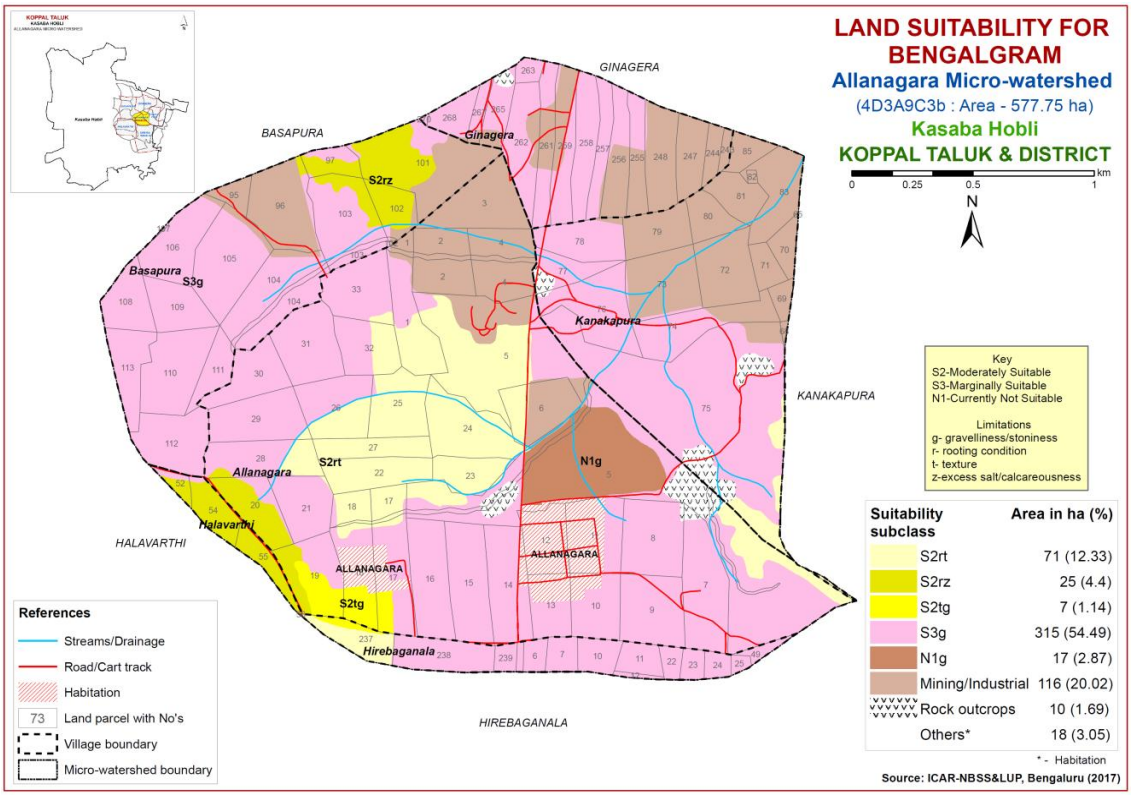


Fig. 7.5 Land Suitability map of Bengalgram

7.6 Land Suitability for Groundnut (*Arachis hypogaea*)

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

Table 7.6 Crop suitability criteria for Groundnut

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

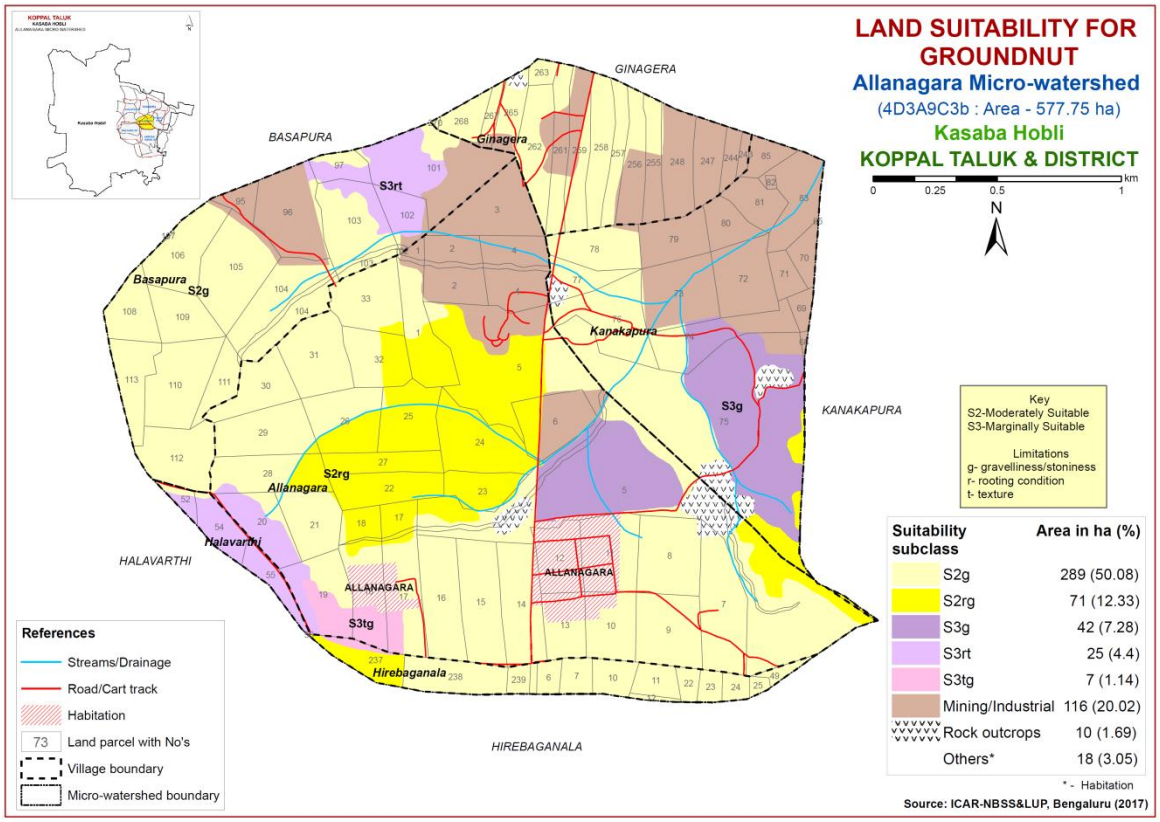


Fig. 7.6 Land Suitability map of Groundnut

There are no highly suitable (Class S1) lands for growing groundnut. Moderately suitable (Class S2) lands cover a major area of 360 ha (62%) and are distributed in all parts of the microwatershed. They have minor limitations of rooting depth and calcareousness. An area of about 74 ha (13%) is marginally suitable (Class S3) for groundnut and are distributed in the southwestern, northern, central and eastern part of the microwatershed. They have moderate limitations of gravelliness, rooting condition and texture.

7.7 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is one of the most important oilseed crop grown in an area of 3.56 lakh ha in the State in all the districts. The crop requirements for growing sunflower (Table 7.7) 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 are given in Figure 7.7.

There are no highly suitable (Class S1) lands for growing sunflower. An area of 7 ha (1%) is moderately suitable (Class S2) for growing sunflower and is distributed in the major part of the microwatershed. They have minor limitation of gravelliness. An area of about 411 ha (71%) is marginally suitable (Class S3) for growing sunflower with moderate limitations of texture, rooting condition and gravelliness. Not suitable (Class N1) lands cover an area of 17 ha (3%) and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

Table 7.7 Crop suitability criteria for Sunflower

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

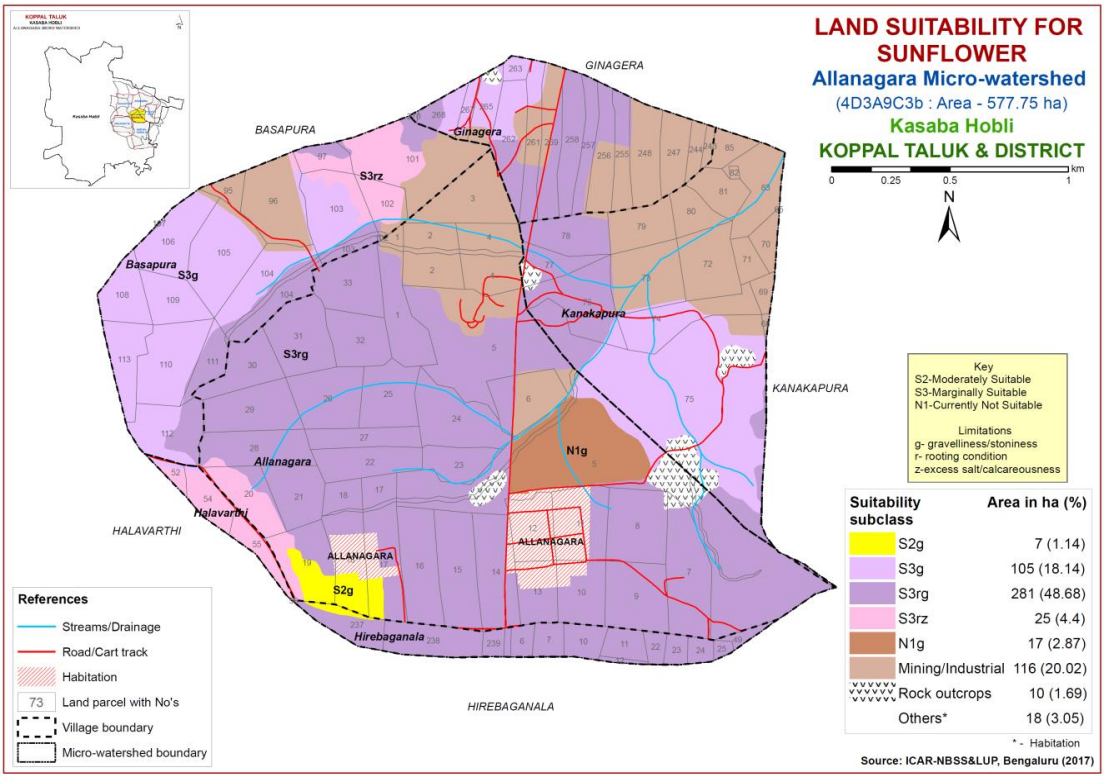


Fig. 7.7 Land Suitability map of Sunflower

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

Cotton is one of the most important fibre crop grown in the State in about 8.75 lakh ha area in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and Chamarajanagar districts. The crop requirements for growing cotton (Table 7.8) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cotton was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.8.

Table 7.8 Crop suitability criteria for Cotton

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

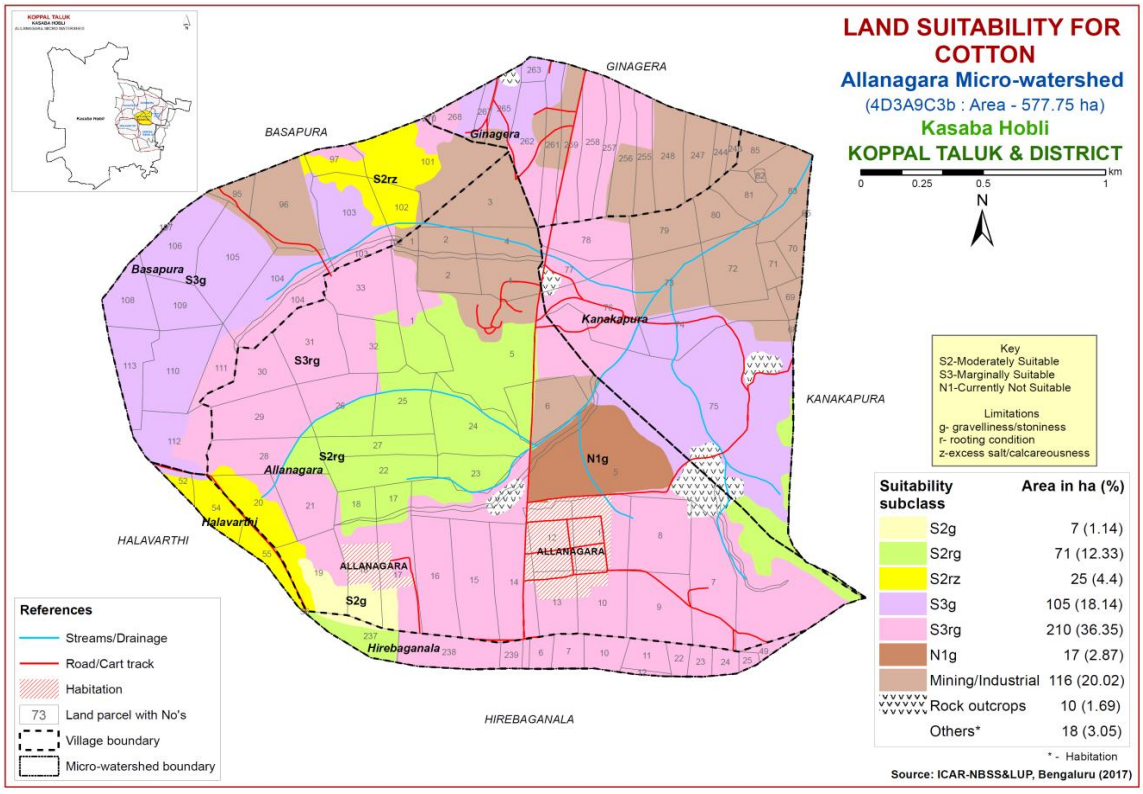


Fig. 7.8 Land Suitability map of Cotton

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

Chilli is one of the most important commercial crops grown in an area of 0.89 lakh ha in all the districts of Karnataka State. The crop requirements for growing chilli (Table 7.9) 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.

Table 7.9 Crop suitability criteria for Chilli

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

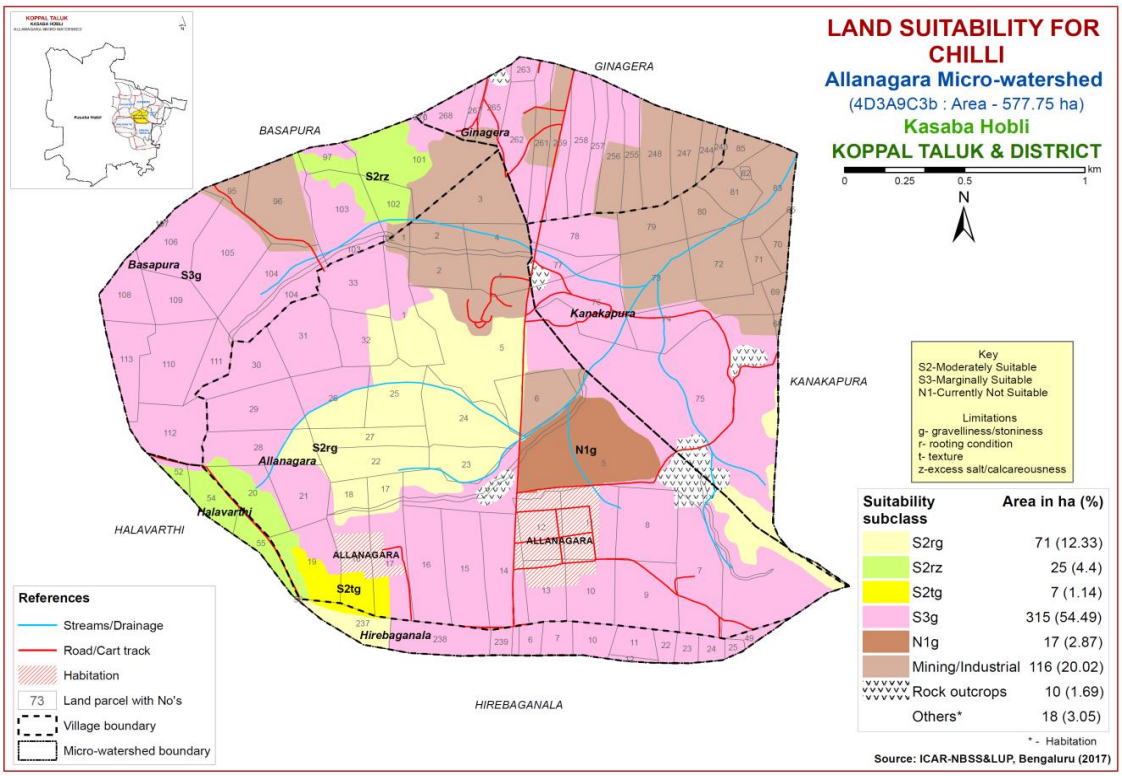


Fig. 7.9 Land Suitability map of Chilli

There are no highly suitable (Class S1) lands for growing Chilli. Moderately suitable (Class S2) lands occupy an area of about 103 ha (18%) and are distributed in the southwestern, central, south-eastern and northern parts of the microwatershed. They have minor limitations of rooting condition, texture, gravelliness and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 315 ha (54%) and are distributed in all parts of the microwatershed. They have moderate limitation of gravelliness. Not suitable (Class N1) lands cover an area of about 17 ha (3%) and are distributed in the central part of the microwatershed with severe limitation of gravelliness

7.10 Land Suitability for Tomato (*Solanum lycopersicum*)

Tomato is one of the most important vegetable crops grown in an area of 0.65 lakh ha in almost all the districts of the State. The crop requirements (Table 7.10) 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.

There are no highly suitable (Class S1) lands for growing tomato. An area of about 103 ha (18%) is moderately suitable (Class S2) and are distributed in the northern, central, southwestern and south-eastern parts of the microwatershed with minor limitations of rooting condition, gravelliness, texture and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 315 ha (54%) and occur in the major part of the microwatershed.

They have moderate limitation of gravelliness. An area of about 17 ha (3%) is not suitable (Class N1) and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

Table 7.10 Crop suitability criteria for Tomato

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

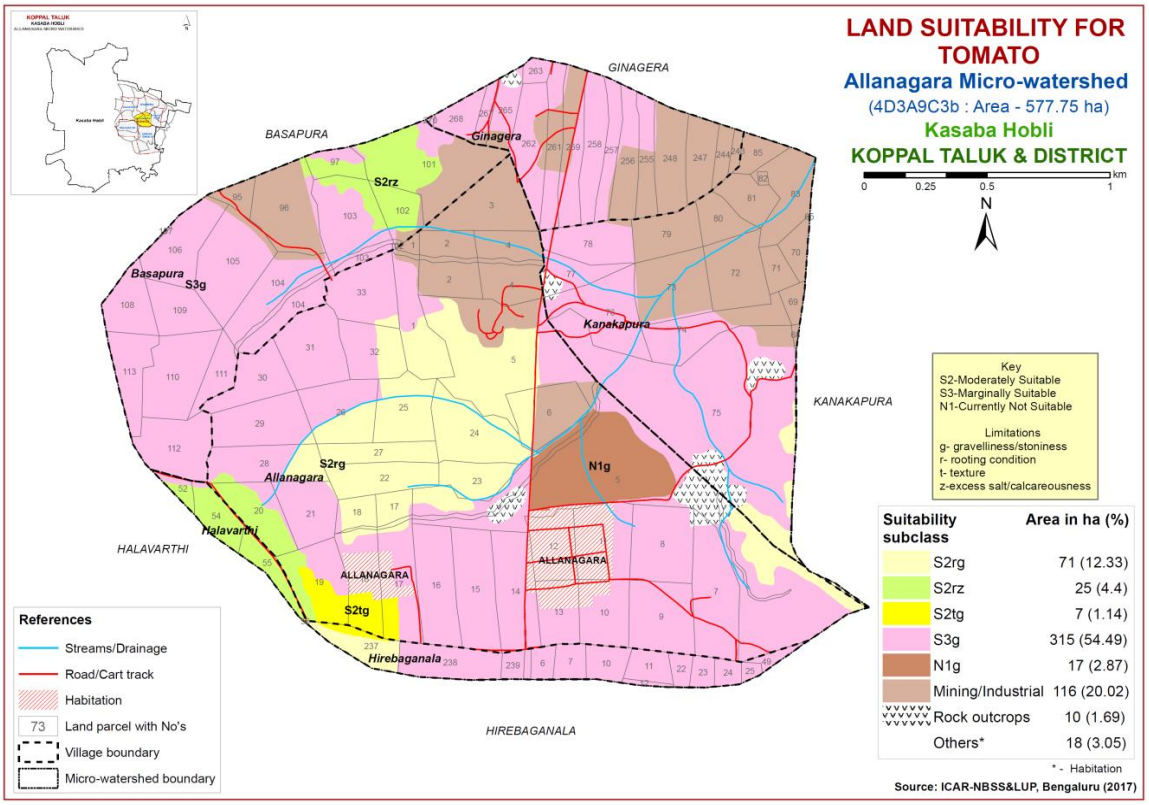


Fig. 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Drumstick (*Moringa oleifera)*

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

Table 7.11 Land suitability criteria for Drumstick

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

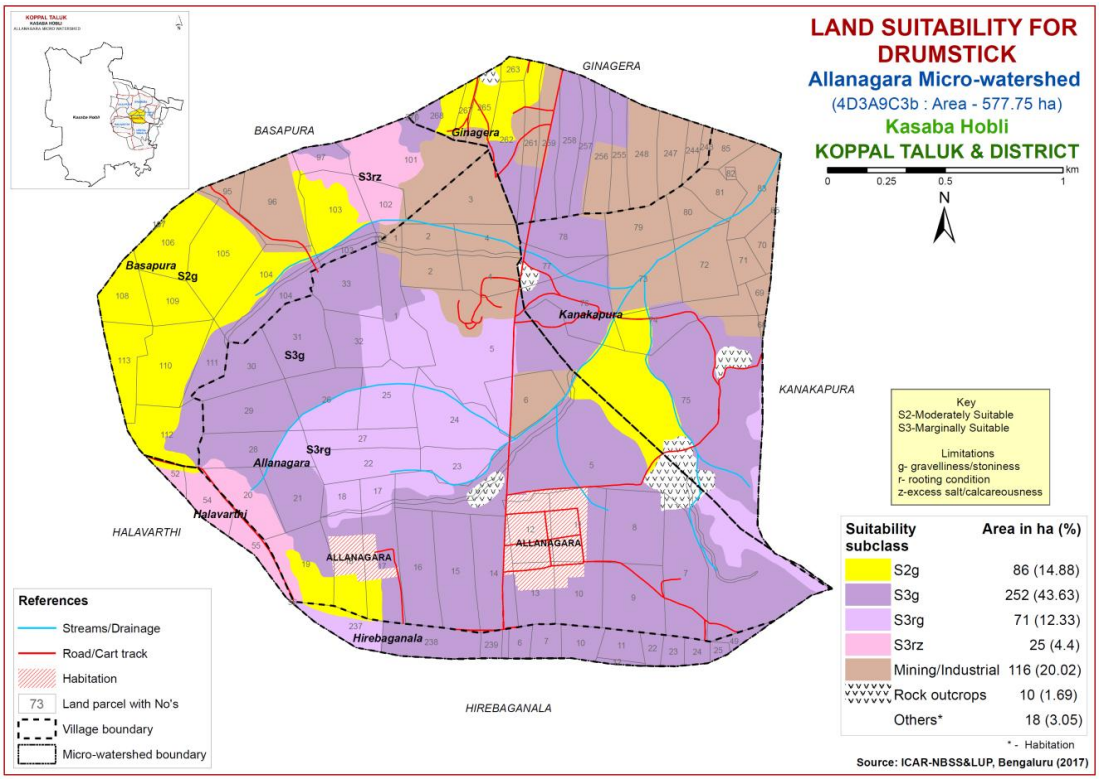


Fig. 7.11 Land Suitability map of Drumstick

There are no highly suitable (Class S1) lands for growing drumstick. Moderately suitable (Class S2) lands occupy an area of 86 ha (15%) and are distributed in the western, northern, southwestern and eastern part of the microwatershed. They have minor limitation of gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 348 ha (60%) and are distributed in the major part of the microwatershed. They have moderate limitations of rooting condition, gravelliness and calcareousness.

7.12 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is one of 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 7.12) 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.

There are no highly suitable (Class S1) lands for growing mulberry. Moderately suitable (Class S2) lands occupy a maximum area of 321 ha (56%) and are distributed in all parts of the microwatershed. They have minor limitation of gravelliness. Marginally suitable (Class S3) lands cover an area of 113 ha (20%) and occur in the southwestern, central, south-eastern and northern part of the microwatershed. They have moderate limitations of rooting condition, gravelliness and calcareousness.

Table 7.12 Land suitability criteria for Mulberry

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

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

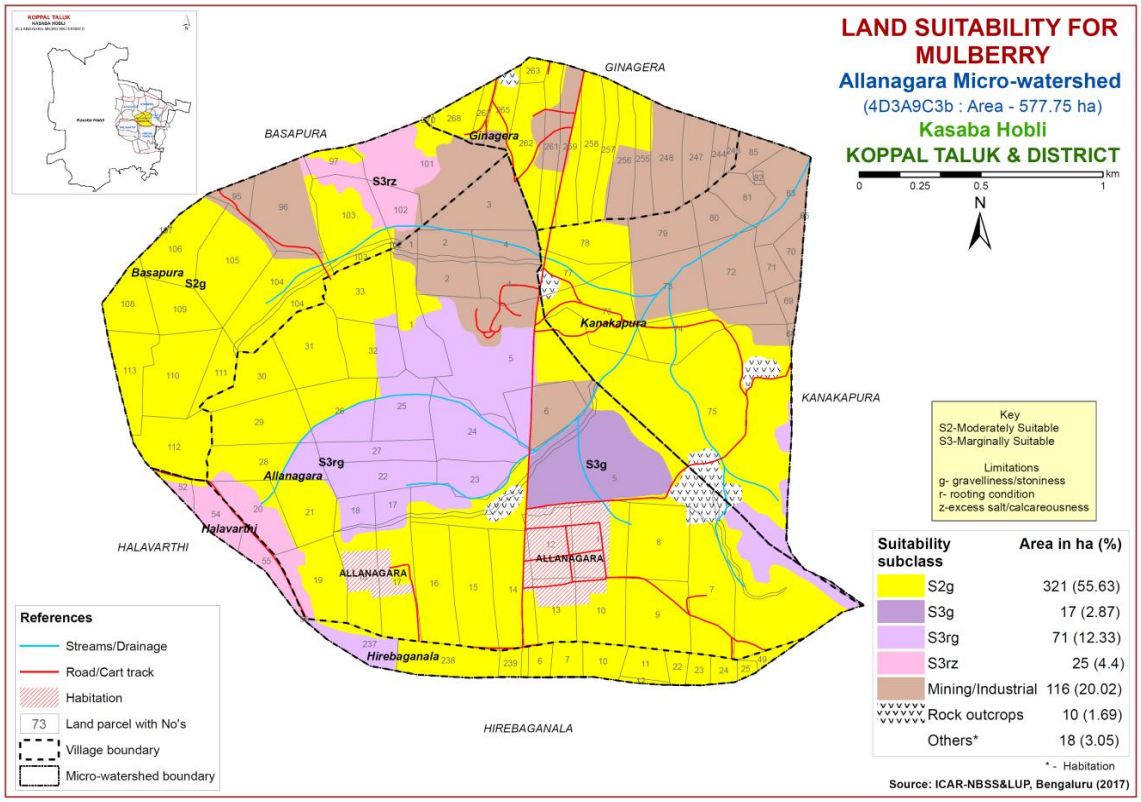


Fig. 7.12 Land Suitability map of Mulberry

7.13 Land Suitability for Mango (*Mangifera indica*)

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

Table 7.13 Crop suitability criteria for Mango

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

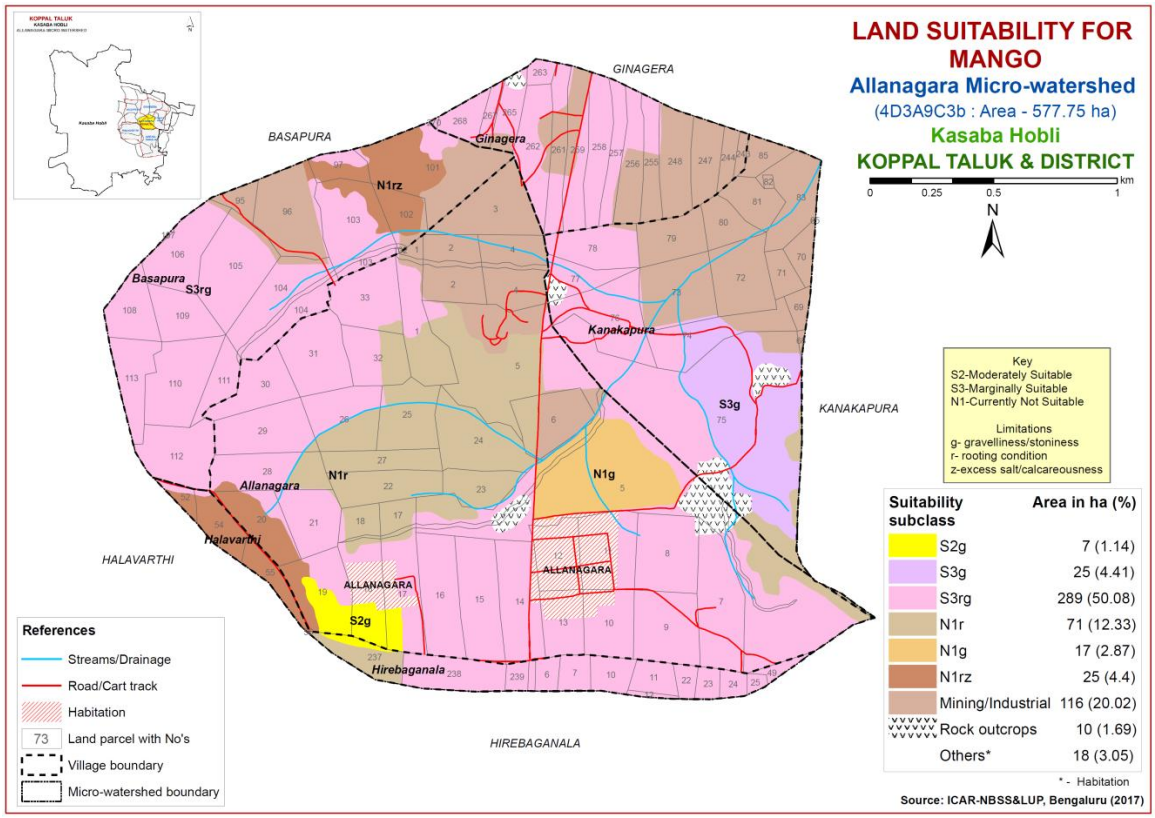


Fig. 7.13 Land Suitability map of Mango

There are no highly suitable (Class S1) lands for growing mango. An area of 7 ha (1%) is moderately suitable (Class S2) and is distributed in the southwestern part of the microwatershed. They have minor limitation of gravelliness. Marginally suitable (Class S3) lands cover a maximum area of 314 ha (54%) and occur in all parts of the

microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of 113 ha (20%) is not suitable (Class N1) for growing mango and occur in the western, central, northern, northeastern, northwestern and south-eastern part of the microwatershed with severe limitations of gravelliness, rooting condition and calcareousness.

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 7.14) 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.

There are no highly suitable (Class S1) lands for growing sapota. An area of 217 ha (37%) is moderately suitable (Class S2) for growing sapota and are distributed in the southern, western and northern part of the microwatershed. Marginally suitable (Class S3) lands cover a maximum area of 201 ha (35%) and occur in the western, southwestern, northwestern, central and eastern part of the microwatershed.

They have moderate limitations of rooting condition, gravelliness and calcareousness. An area of 17 ha (3%) is not suitable (Class N1) for growing sapota and occur in the central part of the microwatershed with severe limitation of gravelliness.

Table 7.14 Crop suitability criteria for Sapota

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

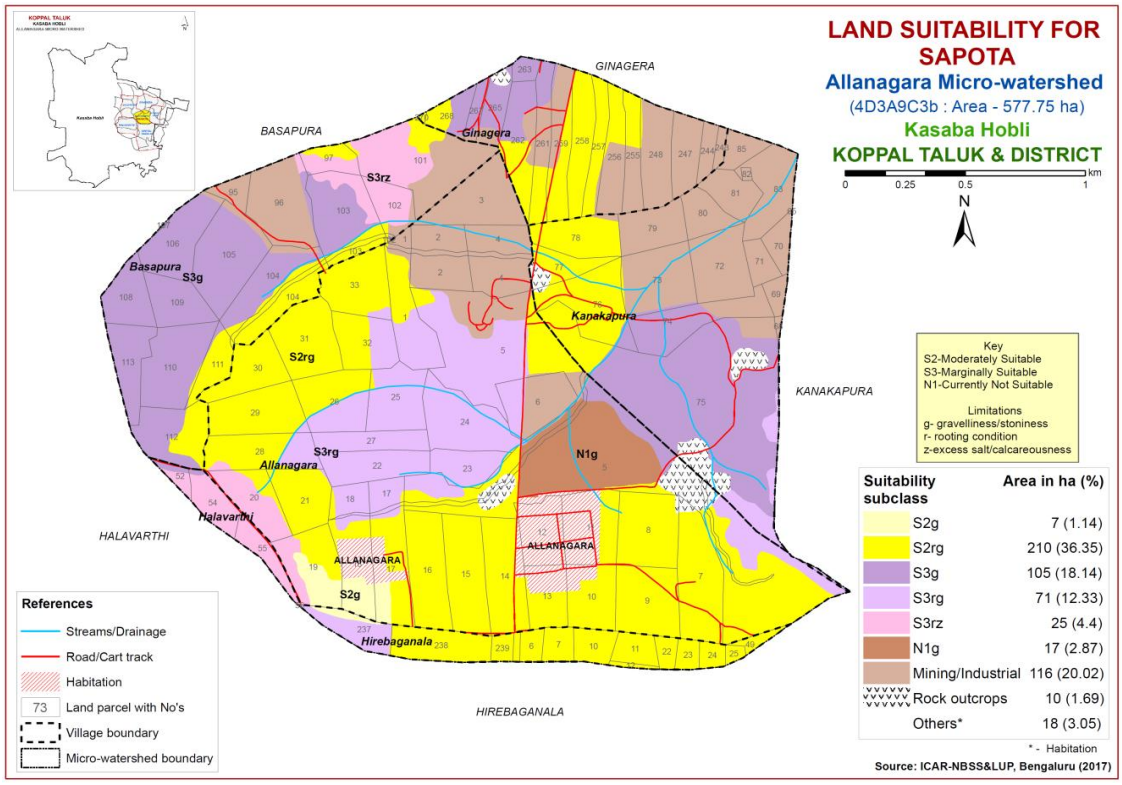


Fig. 7.14 Land Suitability map of Sapota

7.15 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the commercially grown fruit crop in an area of about 18488 ha in Karnataka mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing pomegranate (Table 7.15) 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.

There are no highly suitable (Class S1) lands for growing pomegranate. Moderately suitable (Class S2) lands occupy an area of 217 ha (37%) and are distributed in the southern, western and northern part of the microwatershed. They have minor limitations of rooting condition and gravelliness. An area of 201 ha (35%) is marginally suitable (Class S3) for growing pomegranate and are distributed in the central, western, southwestern, northwestern and eastern part of the microwatershed. They have moderate limitations of rooting condition, gravelliness and calcareousness. An area of 17 ha (3%) is not suitable (Class N1) for growing pomegranate and are distributed in the central part of the microwatershed with severe limitation of gravelliness

Table 7.15 Crop suitability criteria for Pomegranate

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

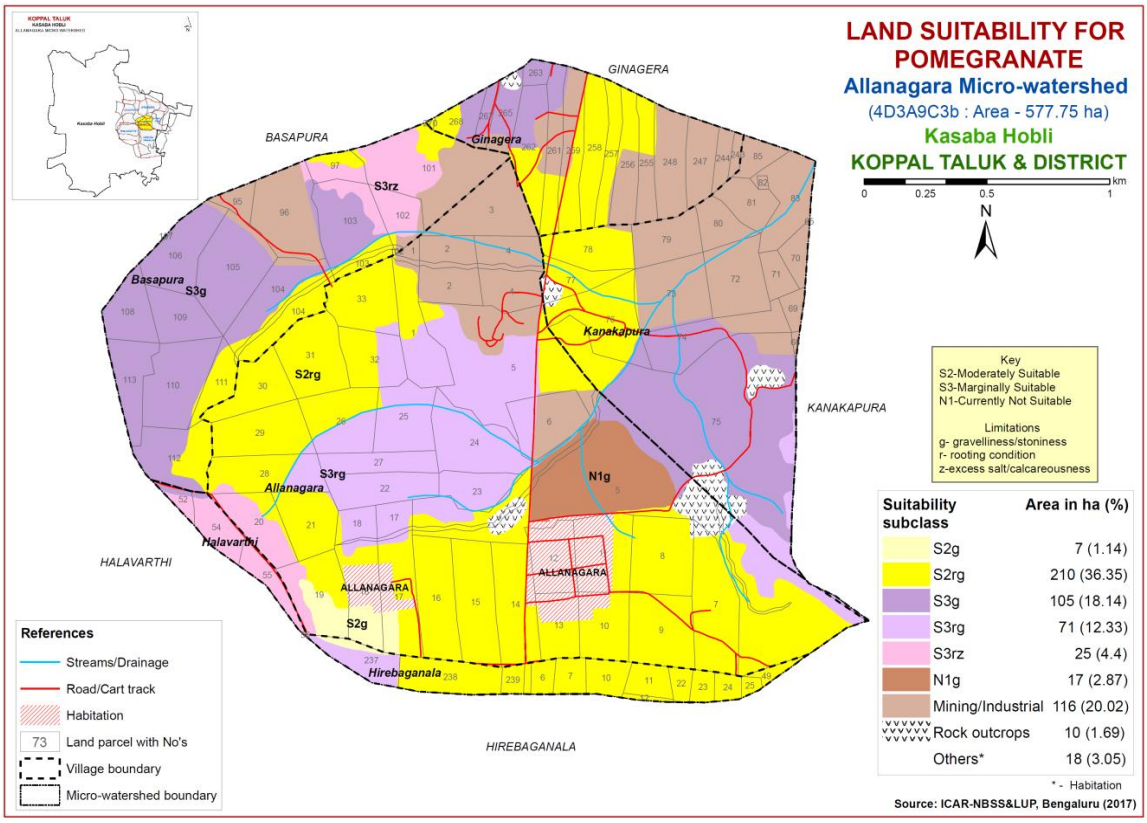


Fig. 7.15 Land Suitability map of Pomegranate

7.16 Land Suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in an area of about 0.64 lakh ha in almost all the districts of the State. The crop requirements (Table 7.16) 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.

Table 7.16 Crop suitability criteria for Guava

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

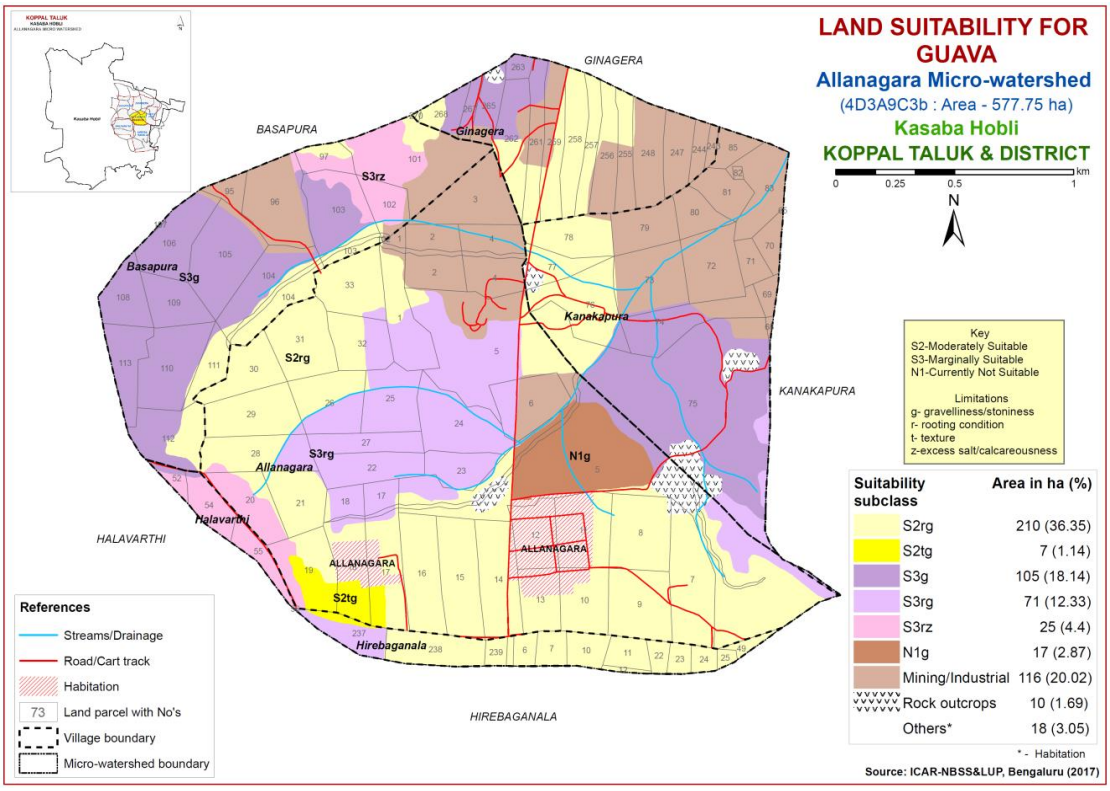


Fig. 7.16 Land Suitability map of Guava

There are no highly suitable (Class S1) lands for growing guava. An area of 217 ha (37%) is moderately suitable (Class S2) for growing guava and are distributed in the southern, western and northern part of the microwatershed. They have minor limitations

of rooting condition, texture and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of 201 ha (35%) and occur in the western, central, eastern, northwestern and southwestern part of the microwatershed. They have moderate limitations of gravelliness, texture and calcareousness. An area of about 17 ha (3%) area is not suitable (Class N1) for growing guava and occur in the central part of the microwatershed with severe limitation of gravelliness.

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 for growing jackfruit (Table 7.17) 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.

There are no highly suitable (Class S1) lands for growing jackfruit. An area of 217 ha (37%) is moderately suitable (Class S2) and are distributed in the southern, western and northern part of the microwatershed with minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of 201 ha (35%) and are distributed in the central, western, northwestern, southwestern and eastern part of the microwatershed. They have moderate limitations of rooting condition, gravelliness and calcareousness. An area of 17 ha (3%) is not suitable (Class N1) for growing jackfruit and occur in the central part of the microwatershed with severe limitation of gravelliness.

Table 7.17 Crop suitability criteria for Jackfruit

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

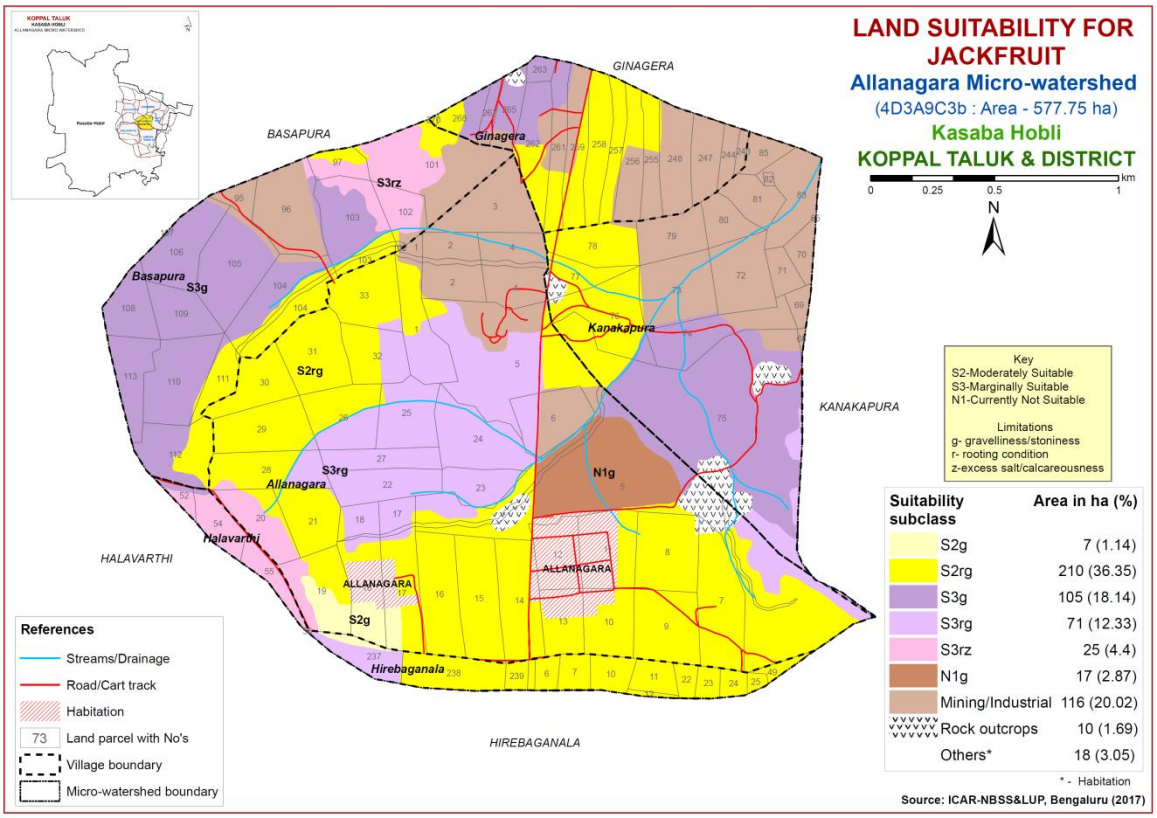


Fig. 7.17 Land Suitability map of Jackfruit

7.18 Land Suitability for Jamun (*Syzygium cumini*)

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

Table 7.18 Crop suitability criteria for Jamun

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

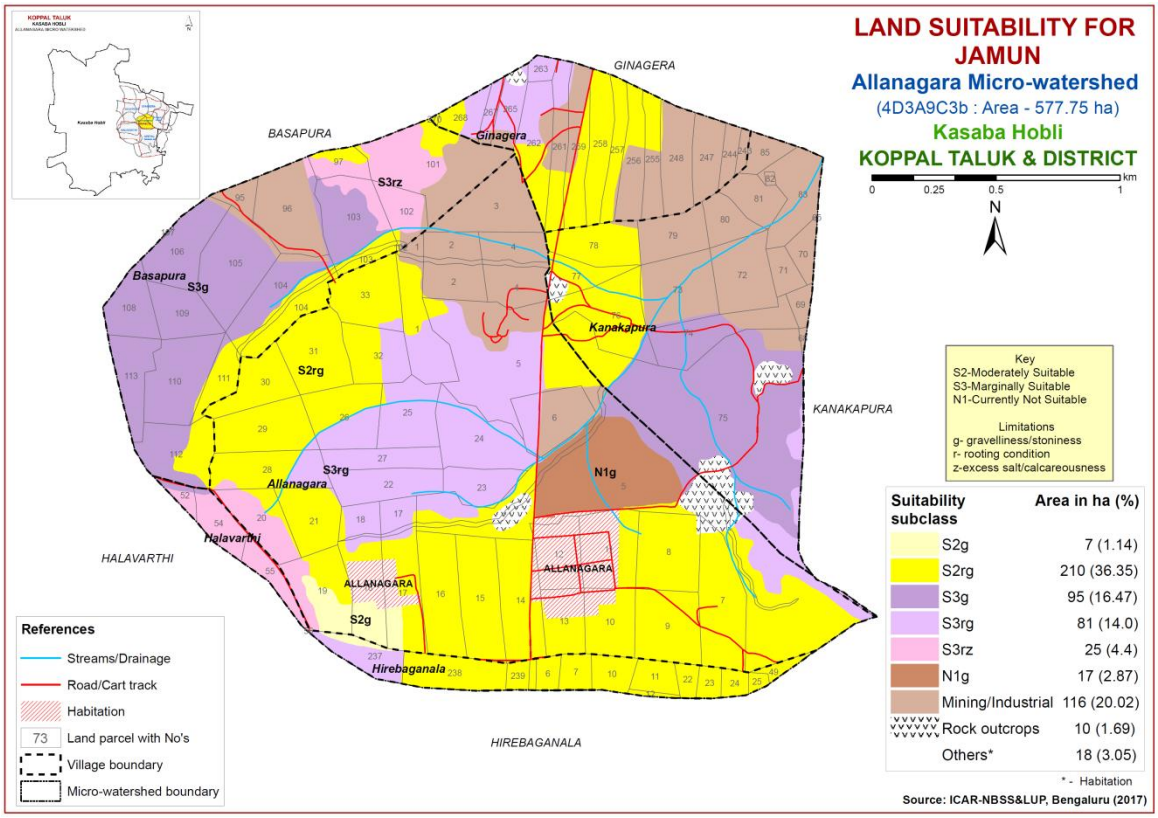


Fig. 7.18 Land Suitability map of Jamun

There are no highly suitable (Class S1) lands for growing jamun. An area of 217 ha (37%) is moderately suitable (Class S2) and occur in the southern, western and northern part of the microwatershed. They have minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 201 ha (35%) and are distributed in the major part of the microwatershed with moderate limitations of rooting condition, calcareousness and gravelliness. An area of 17 ha (3%) is not suitable (Class N1) for growing jamun and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

7.19 Land Suitability for Musambi (*Citrus limetta*)

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

There are no highly suitable (Class S1) lands for growing musambi. An area of 217 ha (37%) is moderately suitable (Class S2) for growing musambi and are distributed in the southern, western and northern part of the microwatershed. They have minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands occur in an area of 201 ha (35%) for growing musambi and are distributed in the major part of the microwatershed with moderate limitations of rooting condition, gravelliness and calcareousness. An area of 17 ha (3%) is not suitable (Class N1) for growing

musambi and are distributed in the southern and central part of the microwatershed. They have severe limitation of gravelliness.

Table 7.19 Crop suitability criteria for Musambi

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

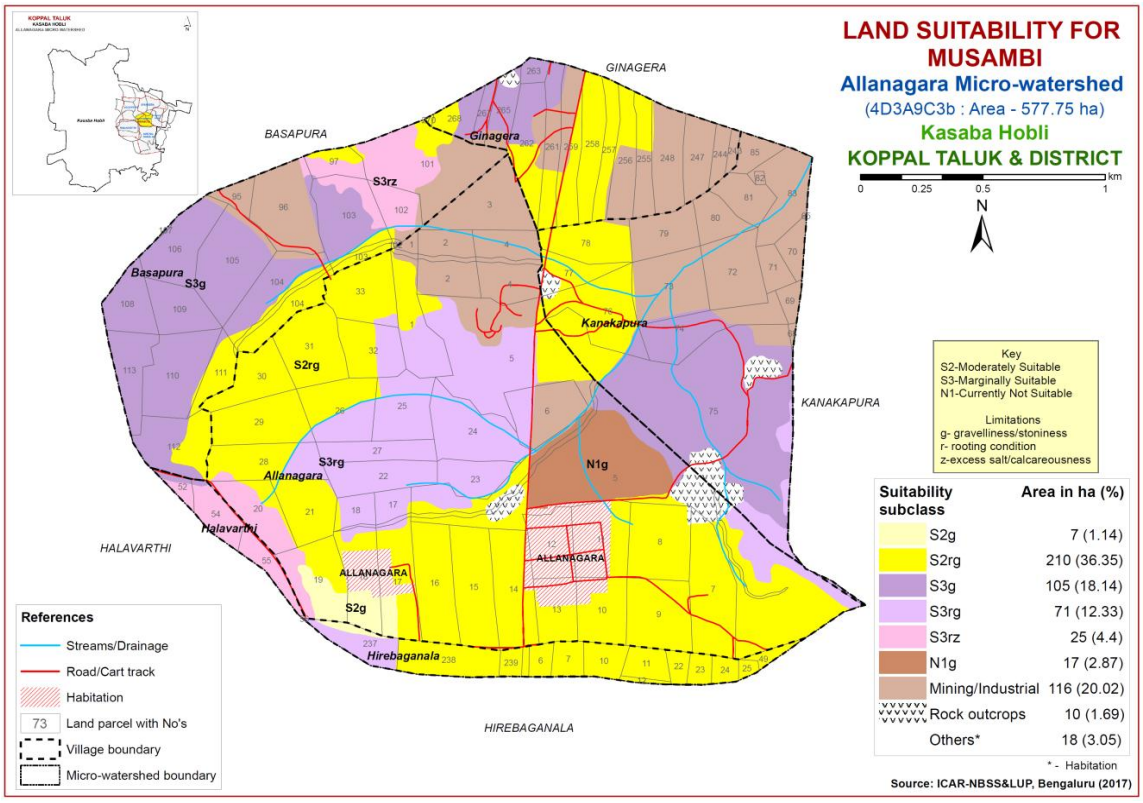


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

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

There are no highly suitable (Class S1) lands for growing lime. An area of 217 ha (37%) is moderately suitable (Class S2) and are distributed in the southern, western and northern part of the microwatershed. They have minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands occur in an area of 201 ha (35%) for growing lime and distributed in the central, western, southwestern, northwestern and eastern part of the microwatershed with moderate limitations of rooting condition, gravelliness and calcareousness. An area of 17 ha (3%) is not suitable (Class N1) for growing lime with severe limitations of gravelliness and are distributed in the central part of the microwatershed.

Table 7.20 Crop suitability criteria for Lime

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	28-30	31-35 24-27	36-40 20-23	>40 <20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imp.drained	Poorly	Very poorly
Nutrient availability	Texture	Class	scl, l, sicl, cl, s	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.4 7.6-8.0	4.0-5.4 8.1-8.5	<4.0 >8.5
	$CaCO_3$ in root zone	%	Non calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

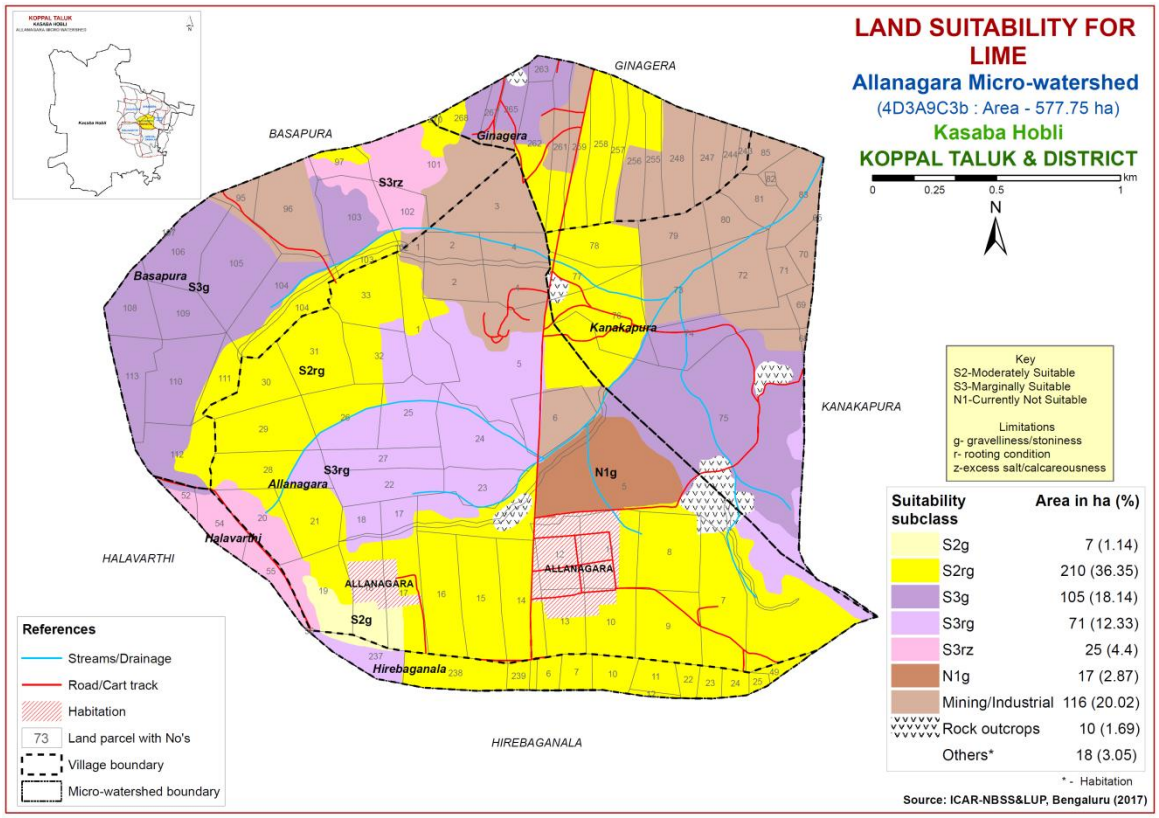


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important nut crop grown in an area of 1.24 lakh ha in almost all the districts of the State. The crop requirements for growing cashew (Table 7.21) 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.

Table 7.21 Crop suitability criteria for Cashew

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

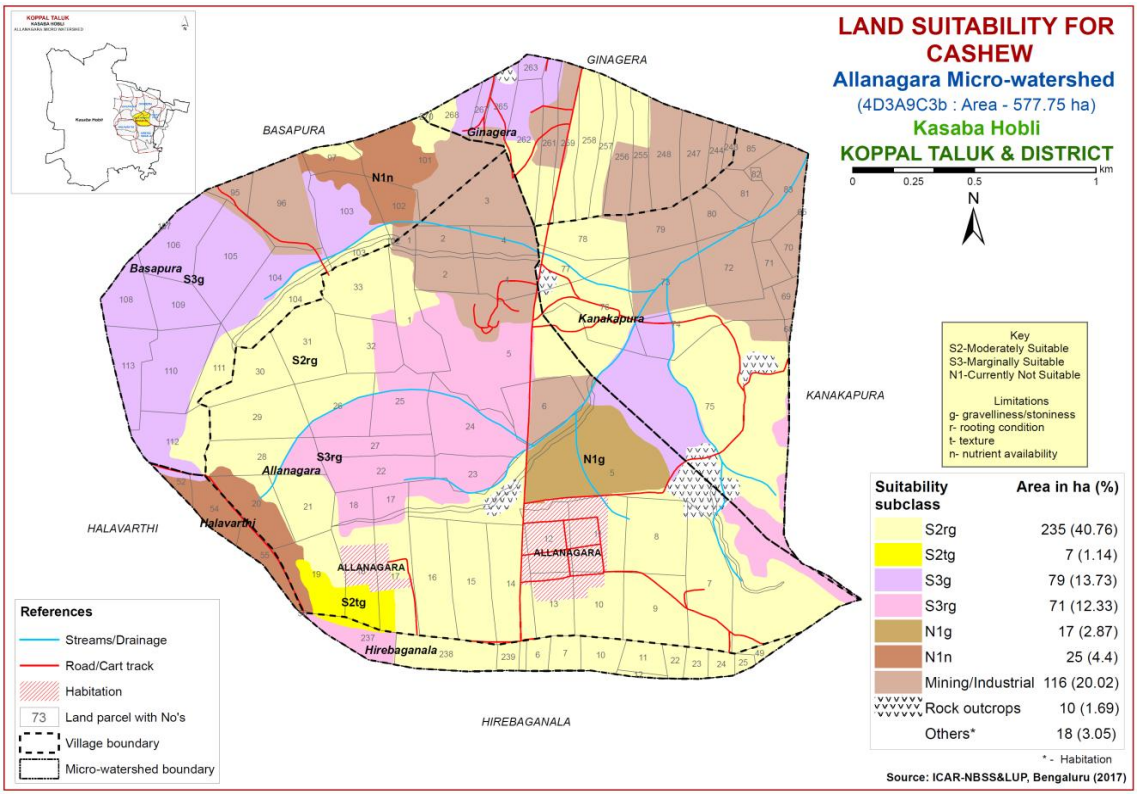


Fig. 7.21 Land Suitability map of Cashew

There are no highly suitable (Class S1) lands for growing cashew. An area of about 242 ha (42%) is moderately suitable (Class S2) and occur in the southern, western, eastern and northern part of the microwatershed. They have minor limitations of rooting condition, texture and gravelliness. Marginally suitable (Class S3) lands occur in an area of 150 ha (26%) for growing cashew and are distributed in the central, western, northwestern and south-eastern part of the microwatershed with moderate limitations of rooting condition and gravelliness. An area of about 42 ha (7%) is not suitable (Class N1) for growing cashew with severe limitations of nutrient availability and gravelliness. They are distributed in the central, northwestern and southwestern part of the microwatershed.

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

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing custard apple (Table 7.22) 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.

There are no highly suitable (Class S1) lands for growing custard apple. Major area of 417 ha (72%) is moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of gravelliness, rooting condition and calcareousness. An area of 17 ha (3%) is marginally suitable (Class S3) for growing custard apple and are distributed in the central part of the microwatershed with moderate limitation of gravelliness.

Table 7.22 Land suitability criteria for Custard apple

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

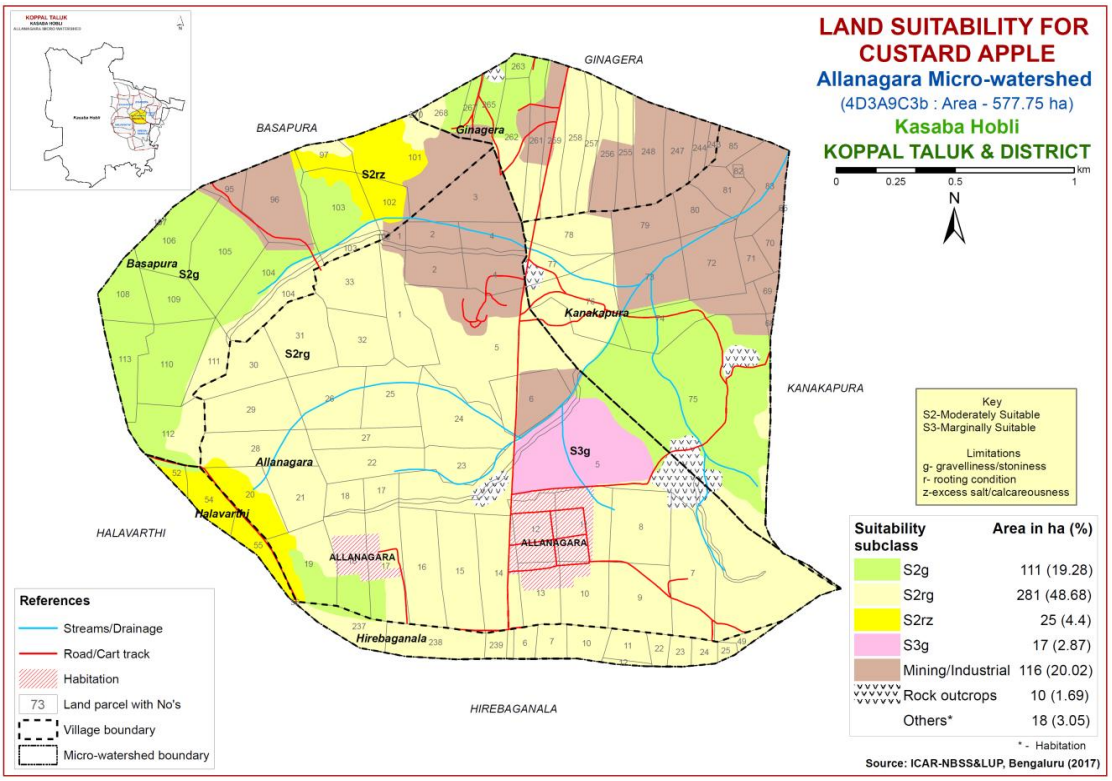


Fig. 7.22 Land Suitability map of Custard Apple

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the most important fruit and medicinal crop grown in 151 ha area and distributed in almost all the districts of the State. The crop requirements for growing amla (Table 7.23) 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.

There are no highly suitable (Class S1) lands for growing amla. Major area of 417 ha (72%) has soils that are moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of rooting condition, gravelliness and

calcareousness. The marginally suitable (Class S3) lands cover an area of 17 ha (3%) and occur in the central part of the microwatershed with moderate limitation of gravelliness.

Table 7.23 Crop suitability criteria for Amla

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

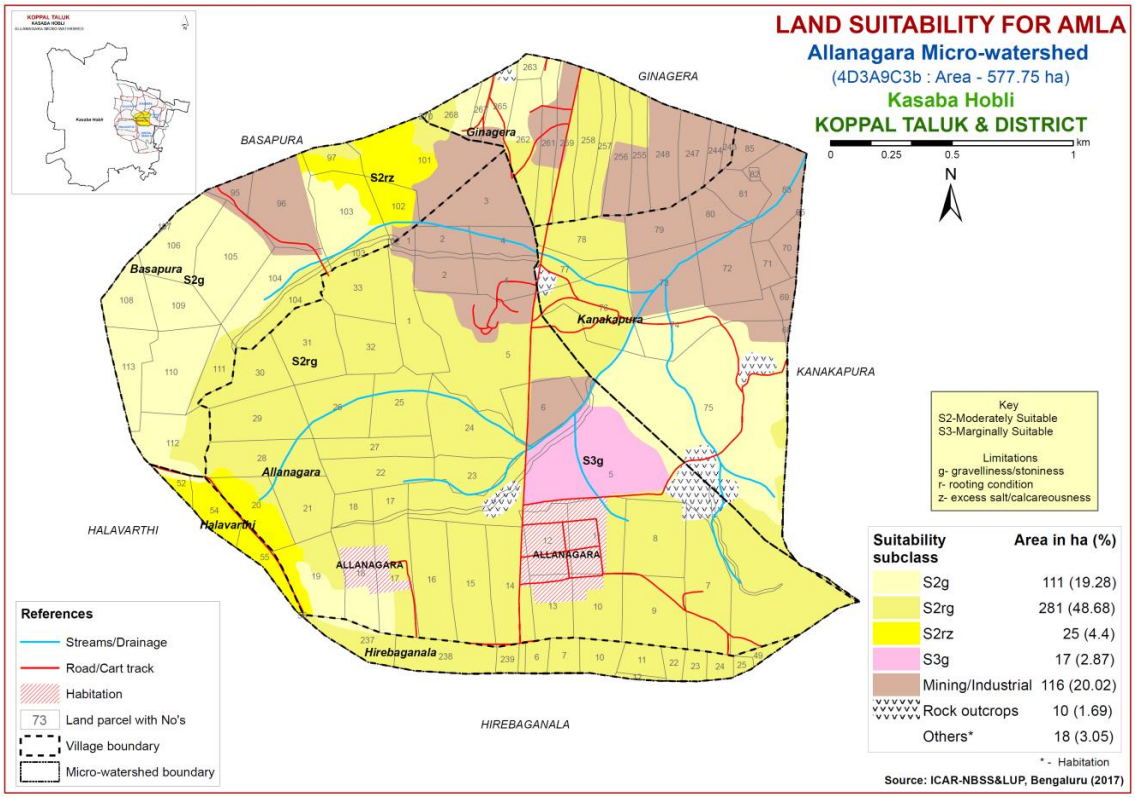


Fig. 7.23 Land Suitability map of Amla

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 for growing tamarind (Table 7.24) 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.

There are no highly suitable lands (Class S1) for growing tamarind. An area of 23 ha (4%) is moderately suitable (Class S2) and occur in the eastern and southwestern part of the microwatershed. They have minor limitations of rooting condition and gravelliness. Major area of 299 ha (52%) is marginally suitable (Class S3) and occur in all parts of the microwatershed. They have moderate limitations of rooting condition and gravelliness. An area of 113 ha (20%) is not suitable (Class N1) for growing tamarind and are distributed in the central, northwestern, southwestern and south-eastern part of the microwatershed with severe limitations of gravelliness, rooting condition and calcareousness.

Table 7.24 Crop suitability criteria for Tamarind

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

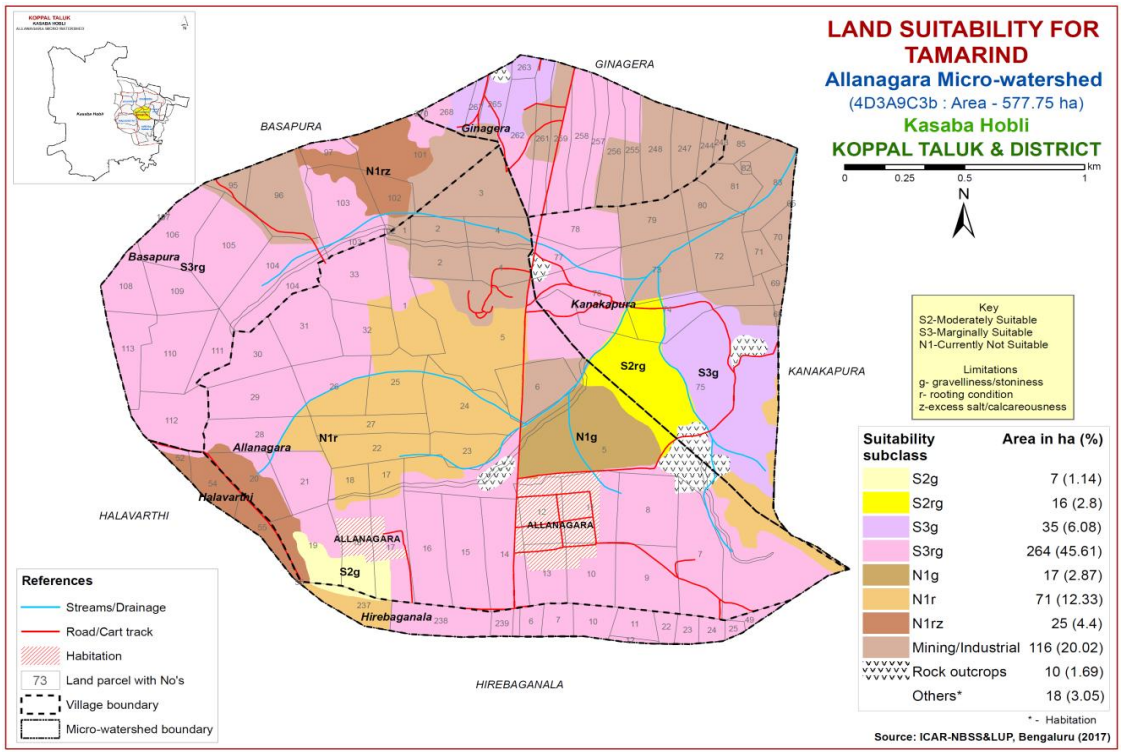


Fig. 7.24 Land Suitability map of Tamarind

7.25 Land Suitability for Marigold (*Tagetes erecta*)

Marigold is one of the most important flower crop grown in an area of 1858 ha in almost all the districts of the State. The crop requirements for growing marigold (Table 7.25) 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.

There are no highly suitable lands (Class S1) for growing marigold. Maximum area of 103 ha (18%) is moderately suitable (Class S2) for growing marigold and occur in the southwestern, northwestern, central and south-eastern part of the microwatershed. They have minor limitations of rooting condition, texture, gravelliness and calcareousness. Major area of 315 ha (54%) is marginally suitable (Class S3) for growing marigold and occur in all parts of the microwatershed. They have moderate limitation of gravelliness. An area of about 17 ha (3%) is not suitable (Class N1) for growing marigold and are distributed in the central part of the microwatershed with severe limitations of gravelliness.

Table 7.25 Crop suitability criteria for Marigold

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

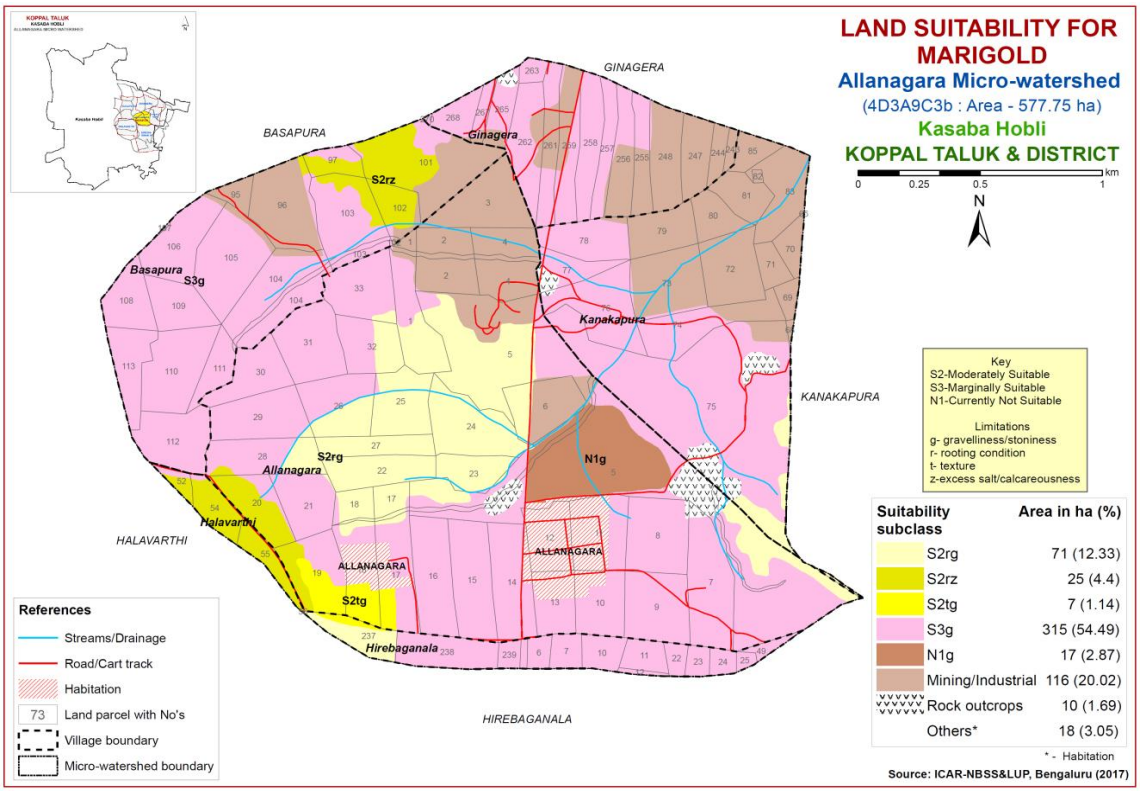


Fig. 7.25 Land Suitability map of Marigold

7.26 Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

Chrysanthemum is one of the most important flower crop grown in an area of 4978 ha in almost all the districts of the State. The crop requirements for growing chrysanthemum (Table 7.26) 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.

There are no highly suitable lands (Class S1) for growing chrysanthemum. An area of 103 ha (18%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in the northern, central, southwestern and south-eastern part of the microwatershed. They have minor limitations of rooting condition, calcareousness, gravelliness and texture. Major area of 315 ha (54%) is marginally suitable (Class S3) for growing chrysanthemum and occur in all parts of the microwatershed. They have moderate limitation of gravelliness. An area of about 17 ha (3%) is not suitable (Class N1) for growing chrysanthemum and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

Table 7.26 Crop suitability criteria for Chrysanthemum

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

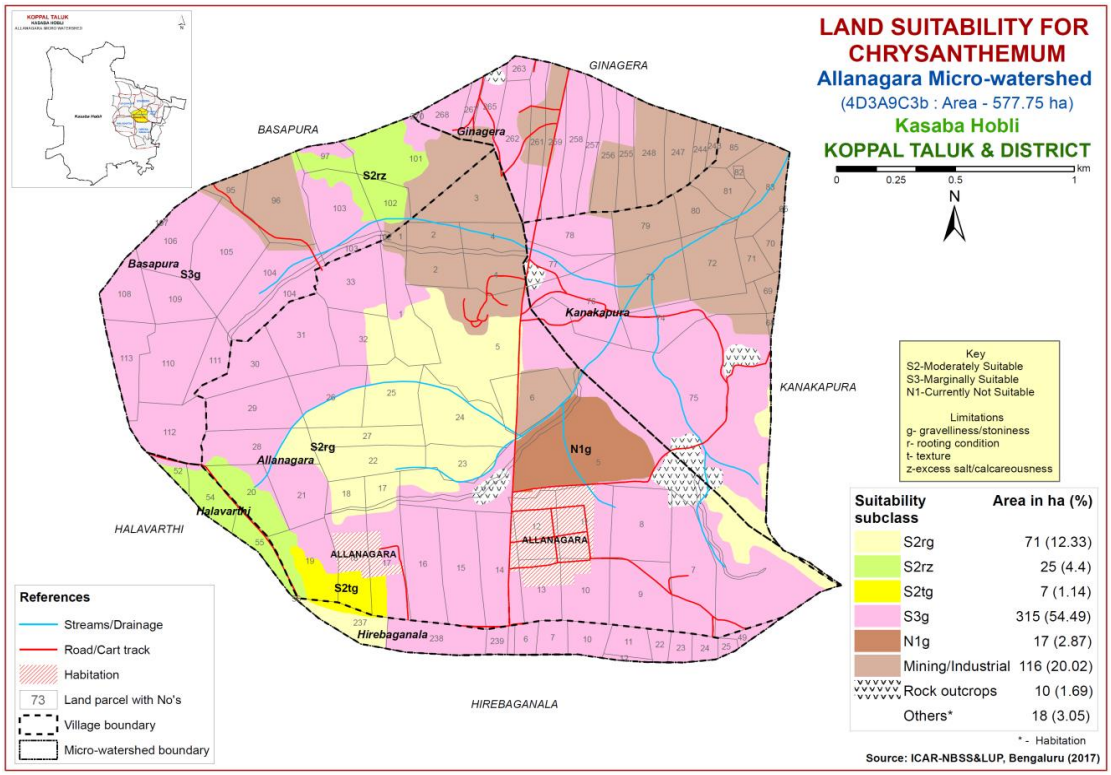


Fig. 7.26 Land Suitability map of Chrysanthemum

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

Jasmine is one of the most important flower crop grown in an area of 6146 ha in almost all the districts of the State. The crop requirements (Table 7.27) 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.

Table 7.27 Crop suitability criteria for jasmine (irrigated)

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

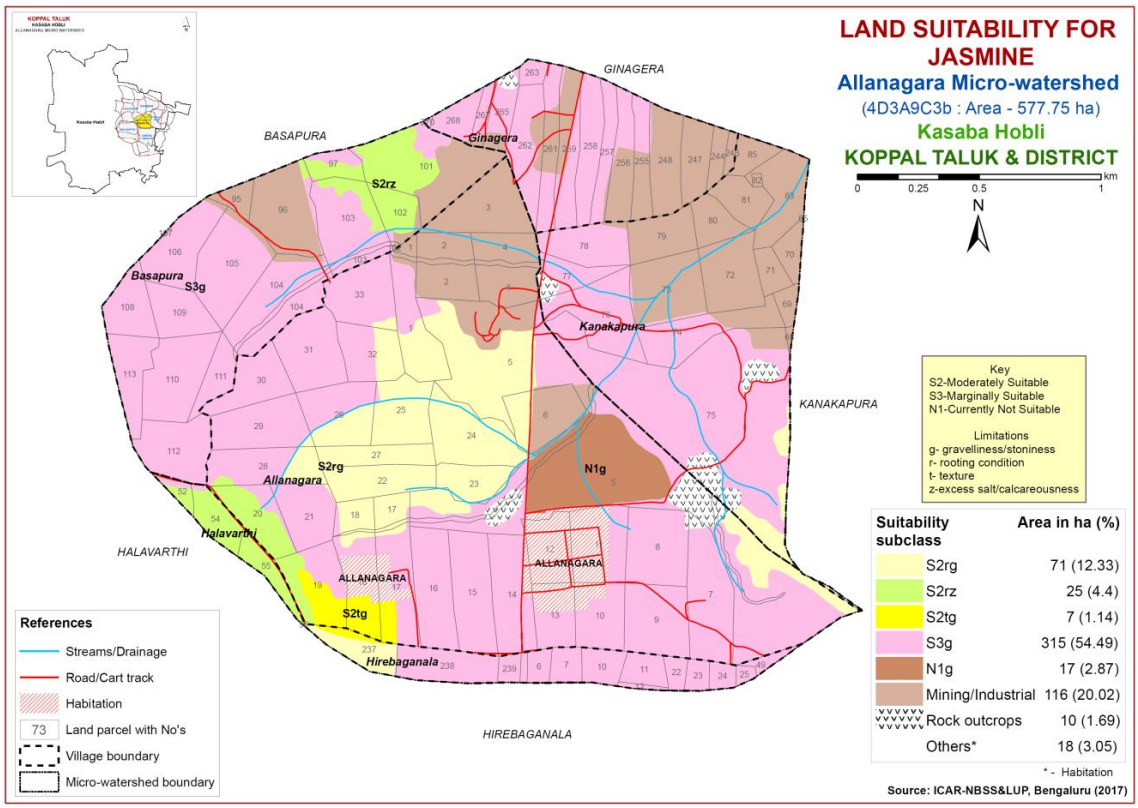


Fig. 7.27 Land Suitability map of Jasmine

There are no highly suitable lands (Class S1) for growing jasmine. An area of 103 ha (18%) is moderately suitable (Class S2) for growing jasmine and occur in the central, southwestern, northern and northeastern part of the microwatershed. They have minor limitations of rooting condition, texture, gravelliness and calcareousness. Major area of 315 ha (54%) is marginally suitable (Class S3) for growing jasmine and are distributed in all parts of the microwatershed. They have moderate limitation of gravelliness. An area of

17 ha (3%) is not suitable (Class N1) for growing jasmine and are distributed in the central part of the microwatershed with severe limitation of gravelliness.

7.28 Land Management Units (LMU)

The 19 soil map units identified in Allanagara microwatershed have been grouped into 3 Land Management Units (LMU) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig. 7.28) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

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

LMU No.	Soil map unit number	Mapping unit	Soil and site characteristics
1	110,111, 114, 116,120 127, 183, 225, 226, 231, 234, 257, 294	HDHcB2,HDHcB2g1 HDHcC2g2,HDHcC3g1 HDHhB1g1,HDHiB2 BDGcC2g2, BPRcB2g1 BPRcB2g2, BPRhB2g1 BPRC3g3, NGPhB1,NDLhB1	Moderately deep to very deep, red gravelly sandy clay to sandy clay loam soils
2	77,79, 80, 87	MKHcB2g1, MKHcC2g2 MKHcC3g2, MKHhC2g1	Moderately shallow, gravelly red loamy soils
3	318, 320	KSPcB2g1, KSPhB2g1	Moderately shallow, red calcareous sandy clay to sandy clay loam soils

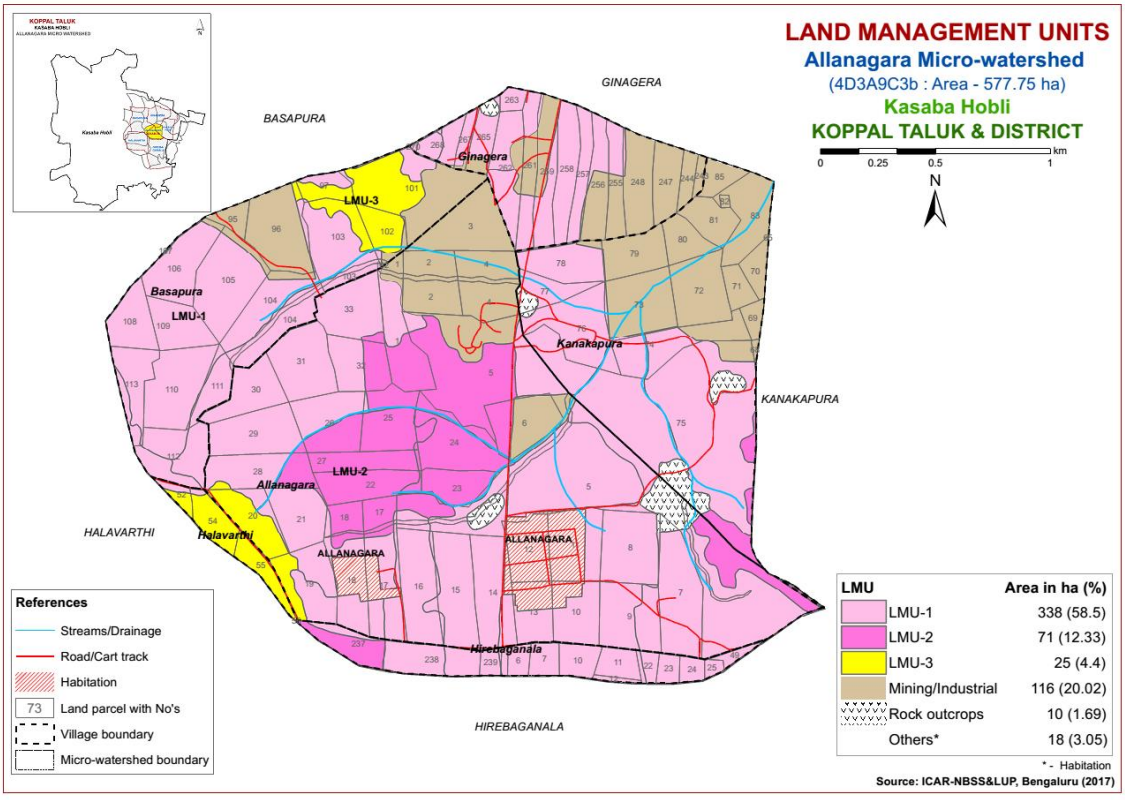


Fig 7.28 Land Management Units map of Allanagara microwatershed

7.29 Proposed Crop Plan for Allanagara Microwatershed

After assessing the land suitability for the 27 crops, the proposed crop plan has been prepared for the 3 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 27 crops. The resultant proposed crop plan is presented in Table 7.29.

Table 7.29 Proposed Crop Plan for Allanagara Microwatershed

LMU	Soil Map Units	Survey Number	Soil characters	Field Crops	Horticulture Crops	Suitable Interventions
LMU 1	110. HDHcB2 111. HDHcB2g1 114. HDHcC2g2 116.HDHcC3g1 120.HDHhB1g1 127.HDHiB2 183.BDGcC2g2 225.BPRcB2g1 226.BPRcB2g2 231.BPRhB2g1 234. BPRC3g3 257.NGPhB1 294.NDLhB1	**Allanagara:** 5,7,8,9,10,13,14,15,16,17,19, 21,26,28,29,30,31,32,33 **Basapura:** 103,104,105,106,107,108,109, 110, 111, 112,113 **Ginagera:** 257,258,259,262,263,265,267, 268,270 **Hirebaganala :** 6,7,10,11,12,22,23, 24,25, 49, 238,239 **Kanakapura:** 74,75,76,77,78	Moderately deep to very deep, red gravelly sandy clay to sandy clay loam soils	Groundnut, Redgram, Bajra, Horsegram, Castor	**Fruit crops:** Lime, Musambi, Jackfruit, Jamun, Amla, Cashew, Custard apple **Vegetables:** Drumstick	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
LMU 2	77. MKHcB2g1 79. MKHcC2g2 80. MKHcC3g2 87. MKHhC2g1	**Allanagara:** 1,22,23,24,25,27 **Hirebaganala :** 237	Moderately shallow, gravelly red loamy soils	Sorghum, Groundnut, Bajra, Castor	**Fruit crops:** Amla, Cashew, Custard apple	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
LMU 3	318. KSPcB2g1 320. KSPhB2g1	**Allanagara:** 20 **Basapura:** 97,101,102 **Halavarthi :** 52,54,55,56	Moderately shallow, red calcareous sandy clay to sandy clay loam soils	Bajra, Horsegram, Castor	**Fruit crops:** Lime, Musambi, Amla, Custard apple **Flowers:** Marigold, Chrysanthemum	Drip irrigation, Mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Allanagara Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of Hooradhahalli (HDH) series occupying maximum area of 210 ha (36%), Balapur (BPR) 87 ha (15%), Mukhadahalli (MKH) 71 ha (12%), Bidanagere (BDG) 25 ha (4%), Nagalapur (NGP) 10 ha (2%), Niduvalalu (NDL) 7 ha (1%) and Kyasalapura (KSP) 25 ha (4%).
- As per land capability classification, entire area in the microwatershed falls under arable land category (Class II, III & IV). The major limitations identified in the arable lands were soil and erosion.

- On the basis of soil reaction, an area of about 142 ha (25%) is neutral (pH 6.5-7.3), 265 ha (56%) is slightly to moderately alkaline (pH 7.3-8.4) and about 24 ha (4%) is under moderately to slightly acid (pH 5.5-6.5) in the microwatershed.

Soil Health Management

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

Acid soils

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

Liming materials:

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

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

Alkaline soils

(Slightly alkaline to very moderately alkaline soils)

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

Neutral soils

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

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

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. Out of total 578 ha area in the microwatershed, an area of about 343 ha

(60%) is suffering from moderate to severe 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 (Saturation plan) in IWMP is focusing on preparation of

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

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

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

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Allanagara Microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is medium (0.5-0.75%) in an area of 171 ha (30%), low (<0.5%) in 42 ha (7%) and high (>0.75%) in 221 ha (38%). The areas that are low and medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops costs Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be supplemented by 25% in addition to the recommended level in 213 ha area where OC is low and medium. For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus:** An area of about 80 ha (14%) is low (<23 kg/ha) and 211 ha (37%) is medium (23-57 kg/ha) in available phosphorus. Hence for all the crops, 25% additional P-needs to be applied.
- **Available Potassium:** Available potassium is medium (145-337 kg/ha) in an area of 289 ha (50%) and 74 ha (13%) is low (<145 kg/ha) in the microwatershed. For all crops, additional 25 % potassium may be applied in areas where it is low and medium. It is high in 71 ha (12%) area of the microwatershed.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. Available sulphur is low (<10 ppm) in 185 ha (32%), medium (10-20 ppm) in 78 ha (14%) 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. It is high in 171 ha (30%) area of the microwatershed.
- **Available Boron:** Major area of about 413 ha (72%) is low (<0.5 ppm) in available boron. An area of 17 ha (3%) is medium (0.5-1.0 ppm) in available boron content. These areas need to be applied with sodium borate @ 10 kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency.
- **Available iron:** It is sufficient in the entire area of the microwatershed.
- **Available manganese:** Entire area in the microwatershed is sufficient in available manganese.
- **Available copper:** Entire area is sufficient in available copper in the microwatershed.

- **Available Zinc:** It is deficient (<0.6 ppm) in 83 ha (14%) and sufficient (>0.6 ppm) in 351 ha (61%) area in the microwatershed. Application of zinc sulphate @ 25kg/ha is to be followed in areas that are deficient in available zinc.
- **Soil acidity:** The microwatershed has 24 ha (4%) area with soils that are slightly to moderately acid. These areas need application of lime (Calcium Carbonate).
- **Soil alkalinity:** The microwatershed has 267 ha (46%) soils that are slightly to moderately alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

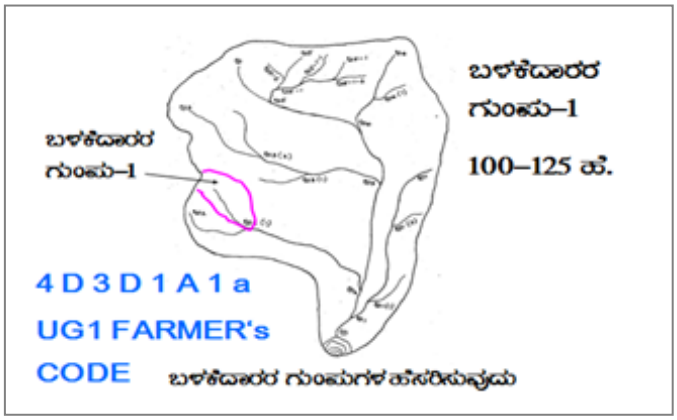
Land suitability for various crops: Areas that are highly, moderately and marginally suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

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

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



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

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

Steps for Survey and Preparation of Treatment Plan

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

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

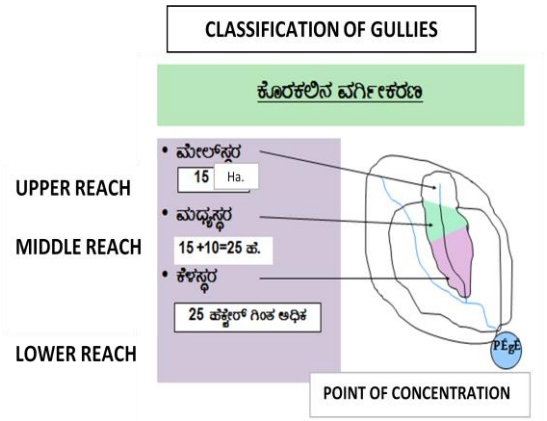
9.1 Treatment Plan

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

9.1.1 Arable Land Treatment

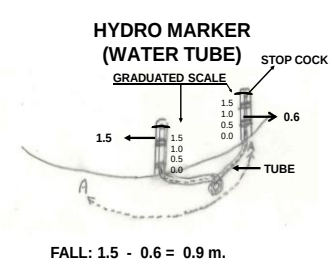
A. BUNDING

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



Measurement of Land Slope

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



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

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

Note: i) The above intervals are maximum.

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

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

Section of the Bund

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

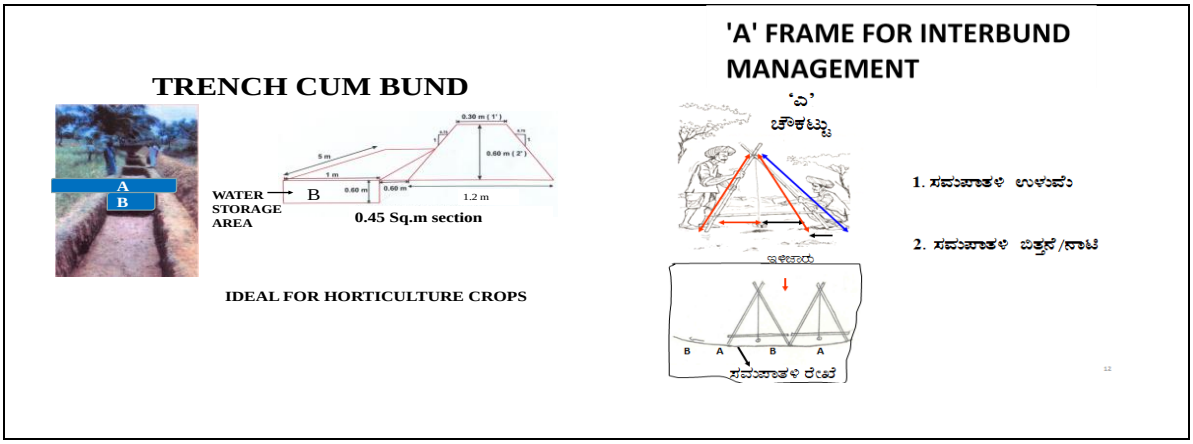
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below



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

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

B. Waterways

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. Entire area of 435 ha (75%) requires Trench cum Bunding in the microwatershed. The conservation plan prepared may be presented to all the stakeholders including farmers and after including their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

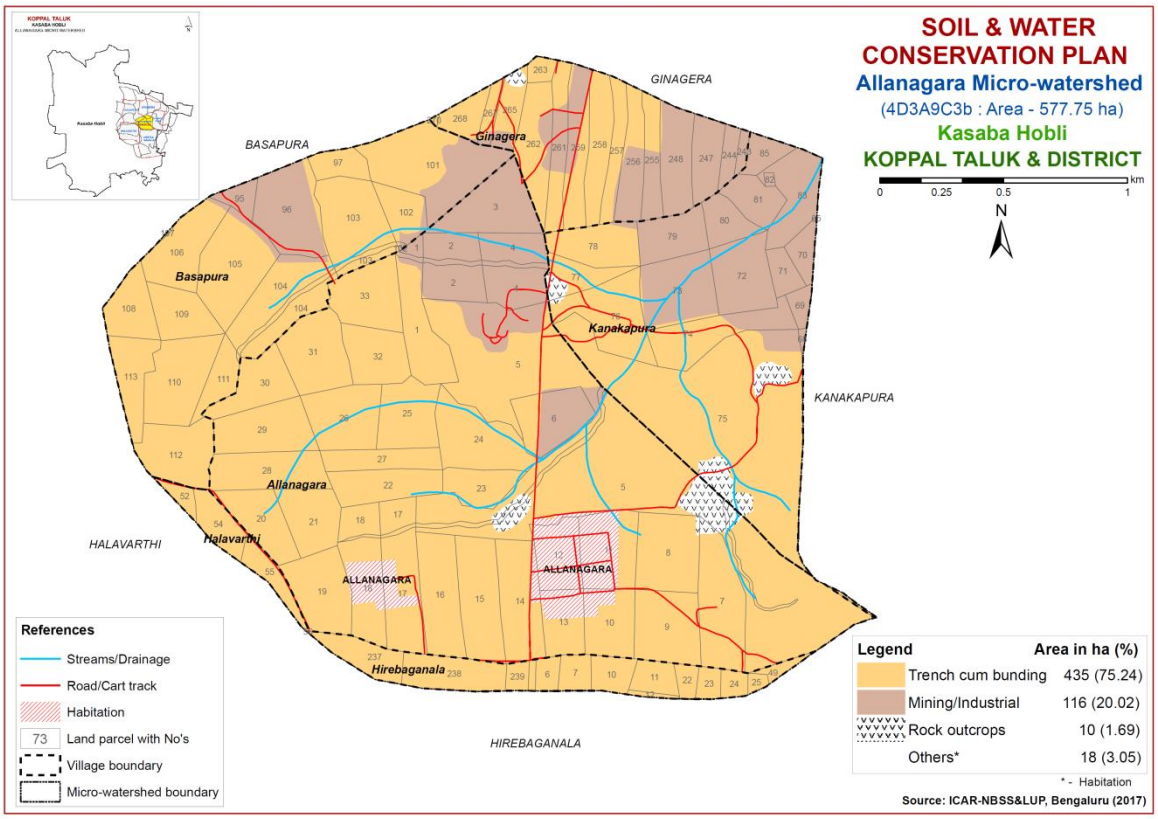


Fig. 9.1 Soil and Water Conservation Plan map of Allanagara Microwatershed

9.3 Greening of Microwatershed

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

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

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

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

References

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

Appendix I

Allanagara Microwatershed

Soil Phase Information

Village	Sy No.	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Allanagara	1	7	MKHcC3g2	LUC-2	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram+Millet (Rg+MLT)	1 Bore well	IVes	TCB
Allanagara	2	6.14	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Allanagara	3	7.66	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Fallow land (Fl)	Not Available	Mining	Mining
Allanagara	4	7.08	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Allanagara	5	68.43	BPRhC3g3	LUC-1	Deep (100-150 cm)	Sandy clay loam	Extremely gravelly (60-80%)	Low (51-100 mm/m)	Gently sloping (3-5%)	Severe	Bajra+Fallow land +Current Fallow+ Maize+Chilli (Bj+Mz+Fl+Cf+Ch)	6 Bore well	IIIes	TCB
Allanagara	6	6.22	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Redgram+Bajra+ Maize (Rg+Bj+Mz)	Not Available	Mining	Mining
Allanagara	7	9.31	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram+Bajra (Rg+Bj)	1 Bore well	IIes	TCB
Allanagara	8	7.86	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Bajra (Rg+Bj)	2 Bore well	IIs	TCB
Allanagara	9	7.56	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Millet (Rg+MLT)	2 Bore well	IIs	TCB
Allanagara	10	5.54	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Millet (Rg+MLT)	1 Bore well	IIs	TCB
Allanagara	11	7.09	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation (Hb)	Not Available	Others	Others
Allanagara	12	5.02	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation (Hb)	Not Available	Others	Others
Allanagara	13	4.46	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Millet (MLT)	Not Available	IIs	TCB
Allanagara	14	7.97	HDHcC2g2	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Maize+Millet (Mz+MLT)	Not Available	IIes	TCB
Allanagara	15	8.08	HDHcC2g2	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram+Maize (Rg+Mz)	3 Bore well	IIes	TCB
Allanagara	16	7.72	HDHcB2g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Bajra (Rg+Bj)	2 Bore well	IIes	TCB
Allanagara	17	8.99	HDHcB2g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	1 Bore well	IIes	TCB
Allanagara	18	8.15	Habitation	Others	Others	Others	Others	Others	Others	Others	Maize (Mz)	1 Bore well	Others	Others
Allanagara	19	7.17	NDLhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	3 Bore well	IIs	TCB
Allanagara	20	5.49	KSPhB2g1	LUC-3	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+ Maize (Cf+Mz)	1 Bore well	IIes	TCB
Allanagara	21	5.45	HDHiB2	LUC-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Allanagara	22	5.52	MKHcB2g1	LUC-2	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Fallow land (Rg+Fl)	Not Available	IIIes	TCB
Allanagara	23	3.91	MKHcC2g2	LUC-2	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Allanagara	24	8.25	MKHcC2g2	LUC-2	Moderately shallow (50-75 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Fallow land+ Bajra (Fl+Bj)	Not Available	IIIes	TCB

Village	Sy No.	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Allanagara	25	6.28	MKHcB2g1	LUC-2	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIIes	TCB
Allanagara	26	7.1	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram (Rg)	Not Available	IIes	TCB
Allanagara	27	4.03	MKHcB2g1	LUC-2	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIIes	TCB
Allanagara	28	7.03	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram+Maize (Rg+Mz)	Not Available	IIes	TCB
Allanagara	29	7.2	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Maize (Mz)	Not Available	IIes	TCB
Allanagara	30	5.33	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram (Rg)	Not Available	IIes	TCB
Allanagara	31	7.47	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram+Maize (Rg+Mz)	Not Available	IIes	TCB
Allanagara	32	5.48	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram+Maize (Rg+Mz)	Not Available	IIes	TCB
Allanagara	33	6.78	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram+Maize+ Millet (Rg+Mz+MLT)	Not Available	IIes	TCB
Basapura	95	1.57	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Basapura	96	8.56	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Basapura	97	2.52	KSPcB2g1	LUC-3	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Basapura	101	13.27	KSPcB2g1	LUC-3	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Basapura	102	3.43	KSPcB2g1	LUC-3	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Basapura	103	8.76	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Banana (Rg+Ba)	Not Available	IIIes	TCB
Basapura	104	9.36	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Basapura	105	9.64	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Pearl Millet (Rg+PMLT)	Not Available	IIIes	TCB
Basapura	106	6.77	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	1 Bore well	IIIes	TCB
Basapura	107	0.06	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Basapura	108	4.55	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Basapura	109	4.63	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Basapura	110	8.21	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	TCB
Basapura	111	2.93	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Redgram (Rg)	Not Available	IIes	TCB
Basapura	112	6.93	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Jowar (Jw)	Not Available	IIes	TCB
Basapura	113	4.84	BPRcB2g2	LUC-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Pearl Millet (PLMT)	Not Available	IIIes	TCB
Ginagera	243	0.67	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining

Village	Sy No.	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Ginagera	244	1.47	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Ginagera	247	3.85	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Maize (Mz)	Not Available	Mining	Mining
Ginagera	248	5.57	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Maize (Mz)	Not Available	Mining	Mining
Ginagera	255	3.52	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Maize (Mz)	Not Available	Mining	Mining
Ginagera	256	4.62	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Maize (Mz)	1 Bore well	Mining	Mining
Ginagera	257	3.28	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	TCB
Ginagera	258	5.2	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Pearl Millet+ Maize (PLMT+Mz)	2 Bore well	IIs	TCB
Ginagera	259	5.68	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land +Maize (Fl+Mz)	Not Available	IIs	TCB
Ginagera	261	4.43	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Fallow land +Maize (Fl+Mz)	Not Available	Mining	Mining
Ginagera	262	6.18	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Mango (Mz+Mn)	Not Available	IIs	TCB
Ginagera	263	1.03	NGPhB1	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	TCB
Ginagera	265	3.06	NGPhB1	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Pearl Millet (PLMT)	Not Available	IIIs	TCB
Ginagera	267	1.35	NGPhB1	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Pearl Millet (PLMT)	Not Available	IIIs	TCB
Ginagera	268	2.59	NGPhB1	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Pearl Millet (PLMT)	Not Available	IIIs	TCB
Ginagera	270	0.1	HDHcB2g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	TCB
Halavarthi	52	1.16	KSPhB2g1	LUC-3	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIes	TCB
Halavarthi	54	3.32	KSPhB2g1	LUC-3	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIes	TCB
Halavarthi	55	2.66	KSPhB2g1	LUC-3	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIes	TCB
Halavarthi	56	0.01	KSPhB2g1	LUC-3	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Mango (Mn)	Not Available	IIes	TCB
Hirebaganala	6	1.29	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Hirebaganala	7	1.88	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Hirebaganala	10	2.41	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Hirebaganala	11	2.27	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Hirebaganala	12	0.37	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Hirebaganala	22	1.13	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Not Available (NA)	Not Available	IIes	TCB
Hirebaganala	23	1.23	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Not Available (NA)	Not Available	IIes	TCB

Village	Sy No.	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Hirebaganala	24	1.16	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Not Available (NA)	Not Available	IIes	TCB
Hirebaganala	25	0.54	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Not Available (NA)	Not Available	IIes	TCB
Hirebaganala	49	0.84	HDHcC3g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Not Available (NA)	Not Available	IIes	TCB
Hirebaganala	237	3.92	MKHhC2g1	LUC-2	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Hirebaganala	238	5.43	HDHcB2g1	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Hirebaganala	239	1.05	HDHcC2g2	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Kanakapura	65	0	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	68	0.21	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	69	1.2	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	70	1.91	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	71	1.95	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Jowar (Jw)	Not Available	Mining	Mining
Kanakapura	72	6.78	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Jowar (Jw)	Not Available	Mining	Mining
Kanakapura	73	7.94	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Jowar (Jw)	Not Available	Mining	Mining
Kanakapura	74	7.24	BDGcC2g2	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Not Available (NA)	Not Available	IIIes	TCB
Kanakapura	75	45.1	BDGcC2g2	LUC-1	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram+Jowar+ Pearl Millet+ Fallow land (Rg+ Jw+PMLT+Fl)	Not Available	IIIes	TCB
Kanakapura	76	8.44	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIs	TCB
Kanakapura	77	3.38	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	TCB
Kanakapura	78	5.62	HDHhB1g1	LUC-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIs	TCB
Kanakapura	79	4.85	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	80	3.14	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	81	3.46	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	82	0.22	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	83	6.08	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining
Kanakapura	85	2.04	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Not Available (NA)	Not Available	Mining	Mining

Appendix II

Allanagara Microwatershed
Soil Fertility Information

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Allanagara	1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Allanagara	2	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Allanagara	3	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Allanagara	4	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Allanagara	5	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 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)
Allanagara	6	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Allanagara	7	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 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)
Allanagara	8	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	9	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 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)
Allanagara	10	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Allanagara	11	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Allanagara	12	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Allanagara	13	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Others	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	14	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	15	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	16	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	17	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	18	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Allanagara	19	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	20	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	21	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	22	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Allanagara	23	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Allanagara	24	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Allanagara	25	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Allanagara	26	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Allanagara	27	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	28	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	29	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	30	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Allanagara	31	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Allanagara	32	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Allanagara	33	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Basapura	95	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Basapura	96	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Basapura	97	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Basapura	101	Mining	Non saline (<2 dsm)	Mining	Medium (23 – 57 kg/ha)	Mining	Mining	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Basapura	102	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Basapura	103	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Basapura	104	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 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)
Basapura	105	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)
Basapura	106	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 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)
Basapura	107	Neutral (pH 6.5 – 7.3)	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)
Basapura	108	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 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)
Basapura	109	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)
Basapura	110	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 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)
Basapura	111	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Basapura	112	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Basapura	113	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ginagera	243	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Ginagera	244	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Ginagera	247	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Ginagera	248	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Ginagera	255	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Ginagera	256	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Ginagera	257	Slightly alkaline (pH 7.3 – 7.8)	High (8 – 12 dsm)	Low (< 0.5 %)	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)
Ginagera	258	Moderately alkaline (pH 7.8 – 8.4)	Medium (4 – 8 dsm)	Low (< 0.5 %)	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)
Ginagera	259	Moderately alkaline (pH 7.8 – 8.4)	Mining	Mining	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)
Ginagera	261	Moderately alkaline (pH 7.8 – 8.4)	Mining	Mining	Mining	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Mining	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ginagera	262	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ginagera	263	Moderately alkaline (pH 7.8 – 8.4)	Low (2 – 4 dsm)	Low (< 0.5 %)	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)
Ginagera	265	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ginagera	267	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ginagera	268	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Ginagera	270	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 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)
Halavarthi	52	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halavarthi	54	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halavarthi	55	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halavarthi	56	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hirebaganala	6	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Hirebaganala	7	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Hirebaganala	10	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 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)
Hirebaganala	11	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 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)
Hirebaganala	12	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)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hirebaganala	22	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 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)
Hirebaganala	23	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 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)
Hirebaganala	24	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 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)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hirebaganala	25	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 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)
Hirebaganala	49	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	High (> 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)
Hirebaganala	237	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hirebaganala	238	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hirebaganala	239	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kanakapura	65	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	68	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	69	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	70	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	71	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	72	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	73	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	74	Moderately alkaline (pH 7.8 – 8.4)	Ia	Low (< 0.5 %)	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)	Deficient (< 0.6 ppm)
Kanakapura	75	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 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)
Kanakapura	76	Moderately alkaline (pH 7.8 – 8.4)	Medium (4 – 8 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)
Kanakapura	77	Strongly alkaline (pH 8.4 – 9.0)	Medium (4 – 8 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)
Kanakapura	78	Moderately alkaline (pH 7.8 – 8.4)	Low (2 – 4 dsm)	High (> 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)
Kanakapura	79	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	80	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	81	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	82	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	83	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Kanakapura	85	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining

Appendix III

Allanagara Microwatershed

Soil Suitability Information

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengal gram	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crossandra	Drumstick	Mulberry
Allanagara	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	S2rg	S3rg	S3rg
Allanagara	2	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Allanagara	3	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Allanagara	4	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Allanagara	5	N1g	N1g	N1g	N1g	N1g	N1g	N1g	N1g	N1g	N1g	N1g	S3g	N1g	S3g	N1g	N1g	N1g	S3g	N1g	N1g	N1g	N1g	N1g	S3g	N1g	N1g	S3g	S3g
Allanagara	6	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Allanagara	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	S2g
Allanagara	8	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	9	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	10	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	11	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Allanagara	12	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
Allanagara	13	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	14	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	15	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	16	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	17	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	18	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
Allanagara	19	S2g	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g	S2tg	S2g	S2g	S2g	S2g	S2g	S2tg	S2g	S2g	S3tg	S2tg	S2tg	S2tg	S2tg	S2g	S2g	S2tg	S2g	S2g	S2g
Allanagara	20	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1n	S3rz	S3rz	S3rt	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S3rz
Allanagara	21	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	22	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Allanagara	23	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Allanagara	24	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Allanagara	25	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Allanagara	26	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	27	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengal gram	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crossandra	Drumstick	Mulberry
Allanagara	28	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	29	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	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	S2g
Allanagara	31	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	32	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Allanagara	33	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Basapura	95	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Basapura	96	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Basapura	97	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1n	S3rz	S3rz	S3rt	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S3rz
Basapura	101	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1n	S3rz	S3rz	S3rt	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S3rz
Basapura	102	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1n	S3rz	S3rz	S3rt	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S3rz
Basapura	103	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Basapura	104	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Basapura	105	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Basapura	106	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Basapura	107	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Basapura	108	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Basapura	109	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Basapura	110	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Basapura	111	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Basapura	112	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Basapura	113	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Ginagera	243	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Ginagera	244	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Ginagera	247	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Ginagera	248	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Ginagera	255	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Ginagera	256	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Ginagera	257	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Ginagera	258	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengal gram	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crossandra	Drumstick	Mulberry
Ginagera	259	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Ginagera	261	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Ginagera	262	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Ginagera	263	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Ginagera	265	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Ginagera	267	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Ginagera	268	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Ginagera	270	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Halavarthi	52	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1n	S3rz	S3rz	S3rt	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S3rz
Halavarthi	54	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1n	S3rz	S3rz	S3rt	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S3rz
Halavarthi	55	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1n	S3rz	S3rz	S3rt	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S3rz
Halavarthi	56	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1n	S3rz	S3rz	S3rt	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S3rz
Hirebaganala	6	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	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	S2g
Hirebaganala	10	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	11	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	12	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	22	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	23	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	24	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	25	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	49	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	237	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S2rg	S3rg	S3rg
Hirebaganala	238	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hirebaganala	239	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Kanakapura	65	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	68	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	69	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	70	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	71	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA

Village	Sy No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengal gram	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crossandra	Drumstick	Mulberry
Kanakapura	72	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	73	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	74	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kanakapura	75	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kanakapura	76	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	S2g
Kanakapura	77	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	S2g
Kanakapura	78	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S2g
Kanakapura	79	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	80	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	81	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	82	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	83	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
Kanakapura	85	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA

***IA – Mining/ Industrial Area**

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

1.	Salient findings of the survey	1-4
2.	Introduction	5
3	Methodology	6
4	Salient features of the survey	7-29
5	Summary	30-35

LIST OF TABLES

1	Households sampled for socio economic survey	7
2	Population characteristics	7
3	Age wise classification of household members	7
4	Education level of household members	8
5	Occupation of household heads	8
6	Occupation of family members	9
7	Institutional participation of household members	9
8	Type of house owned by households	9
9	Durable assets owned by households	9
10	Average value of durable assets	10
11	Farm implements owned by households	10
12	Average value of farm implements owned by households	11
13	Livestock possession by households	11
14	Average labour availability	12
15	Adequacy of hired labour	12
16	Distribution of land (ha)	12
17	Average land value (Rs./ha)	13
18	Status of bore wells	13
19	Source of irrigation	13
20	Depth of water (Avg in meters)	13
21	Irrigated area (ha)	13
22	Cropping pattern	14
23	Cropping intensity	14
24	Cost of cultivation of Maize	15
25	Cost of cultivation of Bajra	16
26	Cost of cultivation of Sunflower	17
27	Cost of cultivation of Redgram	18
28	Cost of cultivation of Sesamum	19
29	Cost of cultivation of Horse gram	20
30	Cost of cultivation of Bengal gram	21
31	Cost of cultivation of Cowpea	22
32	Cost of cultivation of Sorghum	23
33	Fodder availability	24
34	Adequacy of fodder	24
35	Average annual gross income	24
36	Average annual expenditure	25
37	Horticulture species grown	25

38	Forest species grown	25
39	Marketing of the agricultural produce	26
40	Marketing channels used for sale of agricultural produce	26
41	Mode of transport of agricultural produce	26
42	Usage pattern of fuel for domestic use	27
43	Source of drinking water	27
44	Source of light	27
45	Existence of sanitary toilet facility	27
46	Possession of public distribution system(PDS) card	27
47	Participation in NREGA programme	28
48	Adequacy of food items	28
49	Response on inadequacy of food items	29
50	Response on market surplus of food items	29
51	Farming constraints experienced	29

Chapter 1

SALIENT FINDINGS OF THE SURVEY

- *The data indicated that there were 107 (52.45%) men and 97 (47.55%) were women among the sampled households. The average family size of marginal farmers was 5.3, small farmer was 6.6, semi medium farmer was 7.75, medium farmers were 5.5 and for large farmers it was 6.2.*
- *The data indicated that 36 (17.65%) people were in 0-15 years of age, 105 (51.47%) were in 16-35 years of age, 44 (21.57 %) were in 36-60 years of age and 19 (9.31%) were above 61 years of age.*
- *The results indicated that Allanagara had 38.73 per cent illiterates, 2.94 per cent were functional literates, 24.51 per cent of the people had primary school education, 2.94 per cent of them had middle school education, 12.75 per cent of them had high school education, 7.84 per cent of them had PUC education, 4.41 per cent of them had degree education and 2.94 had studied ITI.*
- *The results indicate that, 97.97 per cent of the households were practicing agriculture and 3.03 per cent of the household heads had household industry.*
- *The results indicate that agriculture was the major occupation for 32.84 per cent of the household members, 26.47 per cent were agricultural labourers, 24.02 per cent were students, 4.90 per cent were children, 2.45 per cent had household industry and another 2.45 per cent were in private service.*
- *In the micro watershed 100 per cent of the population has not participated in any local institution.*
- *The results indicate that 72.73 per cent of the households possess Katcha house and 27.27 per cent of them possess semi pucca house. About 100.00 per cent of the households possess TV, 18.18 per cent of the households possess Mixer grinder, 54.55 per cent of the households possess bicycle, 87.88 per cent of the households possess motor cycle, 100 per cent of the households possess mobile phones and 3.03 per cent of the households possess auto.*
- *The average value of television was Rs.6170, mixer grinder was Rs.3000, bicycle was Rs.3138, motor cycle was Rs. 36103, auto was Rs. 55000 and mobile phone was Rs.1695.*
- *About 12.12 per cent of the households possess plough, 12.12 per cent of them possess bullock cart, 12.12 per cent of the households possess sprayer, 27.27 per cent of the households possess weeder, and 3.03 per cent of the households possess tractor, chaff cutter and power tiller.*
- *The average value of plough was Rs.3250, bullock cart was Rs.21250, sprayer was Rs.3250, power tiller was Rs.200000, tractor was Rs.500000, chaff cutter was Rs.2000 and weeder was Rs.75.*
- *The results indicate that, 12.12 per cent of the households possess bullocks, 30.30 per cent of the households possess local cow, 3.03 per cent of the households possess*

crossbred cows, 6.06 per cent of the households possess buffalo and 3.03 per cent of the households possess goat.

- *The results indicate that, average own labour men available in the micro watershed was 1.97, average own labour (women) available was 1.76, average hired labour (men) available was 3.03 and average hired labour (women) available was 2.88.*
- *The results indicate that, 30.30 per cent of the household opined that hired labour was adequate and 69.70 per cent of the households opined that hired labour was inadequate. About 43.75 per cent of the marginal farmers, 28.75 per cent of small, 12.50 per cent of semi medium and 0 medium farmers have opined that the hired labour was adequate.*
- *The results indicate that, households of the Allanagara micro watershed possess 43.21 ha (93.72%) of dry land and 2.89 ha (6.28%) of irrigated land. Marginal farmers possess 11.04 ha (100%) of dry land. Small farmers possess 11.49 ha (100%) of dry land. Semi medium farmers possess 12.58 ha (81.30%) of dry land and 2.89 ha (18.70%) of irrigated land. Medium farmers possess 8.09 ha (100%) of dry land.*
- *The average value of dry land was Rs. 414095.72 and average value of irrigated land was Rs.759999. In case of marginal famers, the average land value was Rs. 905093 for dry land and. In case of small famers, the average land value was Rs. 313098 for dry land. In case of semi medium famers, the average land value was Rs. 278153 for dry land and Rs. 759999 for irrigated land. In case of medium famers, the average land value was Rs. 98800 for dry land.*
- *The results indicate that, there were 3 functioning bore wells in the micro watershed. Bore well was the major irrigation source in the micro water shed which was possessed by semi medium farmers. The depth of bore well was found to be 10.62 meters.*
- *The results indicate that, marginal farmers had 2.56 ha, small farmers had 2.43 ha, semi medium farmers had 14.15 ha, medium farmers had 6.07 ha and large farmers had 2.83 ha of irrigated area.*
- *The results indicate that, farmers have grown Maize (24.57 ha), Bajra (12.61 ha), Sunflower (4.59 ha), Redgram (1.62 ha), Sesamum (1.3 ha), Horsegram (1.21 ha), Bengal gram (0.88 ha), Cowpea (0.81 ha) and Sorghum (0.81 ha).*
- *Marginal farmers have grown maize, bajra, sesamum and bengal gram. Small farmers have grown maize, bajra, sunflower, redgram and sesamum. Semi medium farmers have grown maize, bajra, sunflower, horsegram, sorghum and cow pea. Medium farmers have grown maize, bajra and sunflower.*
- *The cropping intensity in Allanagara micro watershed was found to be 71.57 per cent. In case of Marginal farmers it was 100 per cent, for small farmers it was 62.84 per cent, in case of semi medium farmers it was 64.63 per cent, and medium farmers had cropping intensity of 66.67 per cent.*

- *The results indicate that, the total cost of cultivation for maize was Rs. 34060.54. The gross income realized by the farmers was Rs. 40950.39. The net income from maize cultivation was Rs. 40950.39, thus the benefit cost ratio was found to be 1:1.2.*
- *The total cost of cultivation for bajra was Rs. 32405.93. The gross income realized by the farmers was Rs. 23088.86. The net income from bajra cultivation was Rs.-9317.07. Thus the benefit cost ratio was found to be 1:0.71.*
- *The total cost of cultivation for sunflower was Rs. 22855.53. The gross income realized by the farmers was Rs. 44613.03. The net income from sunflower cultivation was Rs. 21757.50, thus the benefit cost ratio was found to be 1:1.95.*
- *The total cost of cultivation for redgram was Rs. 18952.48. The gross income realized by the farmers was Rs. 38285. The net income from redgram cultivation was Rs. 19332.52. Thus the benefit cost ratio was found to be 1:2.02.*
- *The total cost of cultivation for sesamum was Rs. 38628.92. The gross income realized by the farmers was Rs. 28458.41. The net income from sesamum cultivation was Rs. -10170.51. Thus the benefit cost ratio was found to be 1:0.74.*
- *The total cost of cultivation for horsegram was Rs. 16968.62. The gross income realized by the farmers was Rs. 19924.67. The net income from horsegram cultivation was Rs. 2956.05. Thus the benefit cost ratio was found to be 1:1.17.*
- *The total cost of cultivation for bengal gram was Rs. 42991.61. The gross income realized by the farmers was Rs. 56969.35. The net income from bengal gram cultivation was Rs. 13977.74. Thus the benefit cost ratio was found to be 1:1.33.*
- *The total cost of cultivation for cowpea was Rs. 25594.48. The gross income realized by the farmers was Rs. 14820.00. The net income from cowpea cultivation was Rs. -10774.48. Thus the benefit cost ratio was found to be 1:0.58.*
- *The total cost of cultivation for sorghum was Rs. 25766.74. The gross income realized by the farmers was Rs. 18525.00. The net income from sorghum cultivation was Rs. -7241.74. Thus the benefit cost ratio was found to be 1:0.72.*
- *The results indicate that, 47 tonnes of dry fodder available among the sampled households and it is available 120 days in a year. About 28 tonnes of green fodder available among the households and it is available for 76 days in a year.*
- *About 12.12 per cent of the households opined that dry fodder was adequate which includes 18.75 per cent of marginal farmers and 14.29 per cent of small farmers. Around 42.42 per cent of the households opined that green fodder was adequate. The data revealed that 30.30 per cent of the farmers opined that dry fodder is inadequate.*
- *The results indicate that the average annual gross income is Rs.81619. For marginal farmers it was Rs 71786, for small farmers it was Rs.134977, for semi medium farmers it was Rs.58125 and for medium farmers it was Rs.67500.*
- *The average annual expenditure is Rs. 8,193.66. For marginal farmers it was Rs 3,934.03, for small farmers it was Rs. 23,367.35, for semi medium farmers it was Rs. 2,109.38 and for medium farmers it was Rs. 13,500.*

- *The results indicated that, bajra, Bengal gram, cowpea, horsegram, sorghum, redgram, sesamum and sunflower were sold to the extent of 100 per cent.*
- *Around 36.36 per cent of the households have sold their produce to agents/traders, 78.79 per cent of the households have sold their produce in regulated markets and 21.21 per cent of the households have sold their produce in cooperative marketing society.*
- *The results indicated that 9.09 per cent of the households have carried head load, 18.18 per cent have used cart and 109.09 per cent have used truck as a mode of transport for their agricultural produce.*
- *The results indicated that, 3.03 per cent of the households used dung cake as a source of fuel, 93.94 per cent used fire wood and another 3.03 per cent of the households used LPG.*
- *Piped supply was the major source for drinking water for 27.27 per cent of the households and bore well was the major source for 72.73 per cent of the households.*
- *Electricity was the major source of light for 100 per cent of the households in micro watershed.*
- *Around 39.39 per cent of the households possess sanitary toilet i.e. 12.50 per cent of the marginal, 100 per cent of the small, 25 per cent of the semi medium, 100 per cent of the medium farmers had sanitary toilet facility.*
- *The results indicated that, 54.55 per cent of the sampled households possessed BPL card and 39.39 per cent possessed APL card. Around 45.45 per cent of the households participated in NREGA programme which included 37.50 percent of the marginal, 100 per cent of the small, 12.50 per cent of the semi medium and 50 percent of the medium farmers.*
- *The results indicated that, cereals were adequate for 96.97 per cent of the households, pulses were adequate for 12.12 per cent of the households, oilseeds were adequate for 3.03 per cent of the households, vegetables were adequate for 27.27 per cent of the households, fruits were adequate for 24.24 per cent of the households, milk was adequate for 57.58 per cent of the households, eggs were adequate for 27.27 per cent of the households and meat was adequate for 12.12 per cent of the households.*
- *Oilseeds and vegetables were market surplus for 72.73 per cent and 60.61 per cent of the households respectively.*
- *The results indicated that, lower fertility status of the soil was the constraint experienced by 14.71 per cent of the households, wild animal menace on farm field (32.35%), frequent incidence of pest and diseases (44.12%), inadequacy of irrigation water (8.82%), high cost of Fertilizers and plant protection chemicals (38.24%), high rate of interest on credit (14.71%), low price for the agricultural commodities (14.71%), lack of marketing facilities in the area (17.65%), inadequate extension services (20.59%), lack of transport for safe transport of the agricultural produce to the market (29.41%).*

Chapter 2

INTRODUCTION

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

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

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

Scope and importance of survey

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

Chapter 3

METHODOLOGY

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

Description of the study area

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

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

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

Description of the micro watershed

Allanagara micro-watershed (Ginigera sub-watershed, Koppal Taluk and District) is located at North latitude 150 24’ 29.032” and 150 23’ 23.905” and East longitude 760 8’ 34.754” and 760 6’ 11.804” covering an area of 577.95 ha and spread across Allanagar, Kanakapura, Halavarathi and Basapura villages.

Methodology followed in assessing socio-economic status of households

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 33 households located in the micro watershed were interviewed for the survey.

Chapter 3

SALIENT FEATURES OF THE SURVEY

This chapter deals with systematic presentation of results of the survey. Keeping in view the objectives, the salient features of the survey are presented under the following headings.

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Allanagara micro watershed is presented in Table 1 and it indicated that 33 farmers were sampled in Allanagara micro watershed among them 16 (48.48%) were marginal farmers, 7 (21.21%) were small farmers, 8 (24.24%) were semi medium farmers and 2 (6.06%) were medium farmers.

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

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Farmers	16	48.48	7	21.21	8	24.24	2	6.06	33	100.00

Population characteristics: The population characteristics of households sampled for socio-economic survey in Allanagara micro watershed is presented in Table 2. The data indicated that there were 107 (52.45%) men and 97 (47.55%) were women among the sampled households. The average family size of marginal farmers was 5.3, small farmer was 6.6, semi medium farmer was 7.75, medium farmers were 5.5 and for large farmers it was 6.2.

Table 2. Population characteristics of Allanagara micro-watershed

Sl.No.	Particulars	MF (85)		SF (46)		SMF (62)		MDF (11)		All (204)	
		N	%	N	%	N	%	N	%	N	%
1	Male	42	49.41	26	56.52	35	56.45	4	36.36	107	52.45
2	Female	43	50.59	20	43.48	27	43.55	7	63.64	97	47.55
Total		85	100	46	100	62	100	11	100	204	100
Average		5.3		6.6		7.75		5.5		6.2	

Age wise classification of population: The age wise classification of household members in Allanagara micro watershed is presented in Table 3. The data indicated that 36 (17.65%) people were in 0-15 years of age, 105 (51.47%) were in 16-35 years of age, 44 (21.57 %) were in 36-60 years of age and 19 (9.31%) were above 61 years of age.

Table 3: Age wise classification of household members in Allanagara micro watershed

Sl.No.	Particulars	MF (85)		SF (46)		SMF (62)		MDF (11)		All (204)	
		N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	16	18.82	6	13.04	12	19.35	2	18.18	36	17.65
2	16-35 years of age	43	50.59	27	58.70	30	48.39	5	45.45	105	51.47
3	36-60 years of age	18	21.18	9	19.57	13	20.97	4	36.36	44	21.57
4	> 61 years	8	9.41	4	8.70	7	11.29	0	0.00	19	9.31
Total		85	100.00	46	100.00	62	100.00	11	100.00	204	100.00

Education level of household members: Education level of household members in Allanagara micro watershed is presented in Table 4. The results indicated that the Allanagara had 38.73 per cent illiterates, 2.94 per cent were functional literates, 24.51 per cent of the people had primary school education, 2.94 per cent of them had middle school education, 12.75 per cent of them had high school education, 7.84 per cent of them had PUC education, 4.41 per cent of them had degree education and 2.94 had studied ITI.

Table 4. Education level of household members in Allanagara micro watershed

Sl.No.	Particulars	MF (85)		SF (46)		SMF (62)		MDF (11)		All (204)	
		N	%	N	%	N	%	N	%	N	%
1	Illiterate	28	32.94	20	43.48	26	41.94	5	45.45	79	38.73
2	Functional Literate	1	1.18	3	6.52	1	1.61	1	9.09	6	2.94
3	Primary School	19	22.35	11	23.91	17	27.42	3	27.27	50	24.51
4	Middle School	3	3.53	2	4.35	1	1.61	0	0.00	6	2.94
5	High School	16	18.82	3	6.52	6	9.68	1	9.09	26	12.75
6	PUC	7	8.24	4	8.70	5	8.06	0	0.00	16	7.84
7	Diploma	1	1.18	0	0.00	0	0.00	0	0.00	1	0.49
8	ITI	3	3.53	1	2.17	2	3.23	0	0.00	6	2.94
9	Degree	2	2.35	2	4.35	4	6.45	1	9.09	9	4.41
10	Others	5	5.88	0	0.00	0	0.00	0	0.00	5	2.45
Total		85	100.00	46	100.00	62	100.00	11	100.00	204	100.00

Occupation of household heads: The data regarding the occupation of the household heads in Allanagara micro watershed is presented in Table 5. The results indicate that, 96.97 per cent of households practicing agriculture and 3.03 per cent of the household heads had household industry.

Table 5: Occupation of household heads in Allanagara micro watershed

Sl. No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Agriculture	16	100.00	7	100.00	7	87.50	2	100.00	32	96.97
2	Household industry	0	0.00	0	0.00	1	12.50	0	0.00	1	3.03
Total		16	100.00	7	100.00	8	100.00	2	100.00	33	100.00

Occupation of the household members: The data regarding the occupation of the household members in Allanagara micro watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 32.84 per cent of the household members, 26.47 per cent were agricultural labourers, 24.02 per cent were students, 4.90 per cent were children, 2.45 per cent had household industry and another 2.45 per cent were in private service.

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

Table 6: Occupation of family members in Allanagara micro watershed

Sl.No.	Particulars	MF (85)		SF (46)		SMF (62)		MDF (11)		All (204)	
		N	%	N	%	N	%	N	%	N	%
1	Agriculture	33	38.82	18	39.13	14	22.58	2	18.18	67	32.84
2	Agricultural Labour	16	18.82	12	26.09	20	32.26	6	54.55	54	26.47
3	Household industry	3	3.53	1	2.17	1	1.61	0	0.00	5	2.45
4	Private Service	2	2.35	2	4.35	0	0.00	1	9.09	5	2.45
5	Student	20	23.53	8	17.39	20	32.26	1	9.09	49	24.02
6	Housewife	5	5.88	3	6.52	6	9.68	0	0.00	14	6.86
7	Children	6	7.06	2	4.35	1	1.61	1	9.09	10	4.90
Total		85	100.00	46	100.00	62	100.00	11	100.00	204	100.00

Table 7. Institutional Participation of household members in Allanagara micro watershed

Sl.No.	Particulars	MF (85)		SF (46)		SMF (62)		MDF (11)		All (204)	
		N	%	N	%	N	%	N	%	N	%
1	No Participation	85	100.00	46	100.00	62	100.00	11	100.00	204	100.00
Total		85	100.00	46	100.00	62	100.00	11	100.00	204	100.00

Type of house owned: The data regarding the type of house owned by the households in Allanagara micro watershed is presented in Table 8. The results indicate that 72.73 per cent of the households possess Katcha house and 27.27 per cent of them possess semi pucca house.

Table 8. Type of house owned by households in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Katcha	9	56.25	6	85.71	7	87.50	2	100.00	24	72.73
2	Semi pacca	7	43.75	1	14.29	1	12.50	0	0.00	9	27.27
Total		16	100.00	7	100.00	8	100.00	2	100.00	33	100.00

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Allanagara micro watershed is presented in Table 9. The results shows that 100.00 per cent of the households possess TV, 18.18 per cent of the households possess Mixer grinder, 54.55 per cent of the households possess bicycle, 87.88 per cent of the households possess motor cycle, 100 per cent of the households possess mobile phones and 3.03 per cent of the households possess auto.

Table 9. Durable Assets owned by households in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Television	16	100.00	7	100.00	8	100.00	2	100.00	34	100.00
2	Mixer/Grinder	5	31.25	1	14.29	0	0.00	0	0.00	6	18.18
3	Bicycle	10	62.50	2	28.57	6	75.00	0	0.00	18	54.55
4	Motor Cycle	13	81.25	7	100.00	7	87.50	2	100.00	29	87.88
5	Auto	0	0.00	1	14.29	0	0.00	0	0.00	1	3.03
6	Mobile Phone	16	100.00	7	100.00	8	100.00	2	100.00	33	100.00

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Allanagara micro watershed is presented in Table 10. The results shows that the average value of television was Rs.6170, mixer grinder was Rs.3000, bicycle was Rs.3138, motor cycle was Rs. 36103, auto was Rs. 55000 and mobile phone was Rs.1695.

Table 10. Average value of durable assets owned by households in Allanagara micro watershed (Avg value in Rs)

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	All (33)
1	Television	5,694.00	7,000.00	6,250.00	7,000.00	6,170.00
2	Mixer/Grinder	3,200.00	2,000.00	0.00	0.00	3,000.00
3	Bicycle	3,200.00	4,500.00	2,583.00	0.00	3,138.00
4	Motor Cycle	30,769.00	39,571.00	40,000.00	45,000.00	36,103.00
5	Auto	0.00	55,000.00	0.00	0.00	55,000.00
6	Mobile Phone	1,695.00	1,714.00	1,588.00	1,500.00	1,659.00

Farm Implements owned: The data regarding the farm implements owned by the households in Allanagara micro watershed is presented in Table 11. About 12.12 per cent of the households possess plough, 12.12 per cent of them possess bullock cart, 12.12 per cent of the households possess sprayer, 27.27 per cent of the households possess weeder, and 3.03 per cent of the households possess tractor, chaff cutter and power tiller.

Table 11. Farm Implements owned by households in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	1	6.25	2	28.57	1	12.50	0	0.00	4	12.12
2	Plough	1	6.25	2	28.57	1	12.50	0	0.00	4	12.12
3	Power Tiller	0	0.00	0	0.00	1	12.50	0	0.00	1	3.03
4	Tractor	0	0.00	0	0.00	1	12.50	0	0.00	1	3.03
5	Sprayer	1	6.25	1	14.29	1	12.50	1	50.00	4	12.12
6	Weeder	6	37.50	3	42.86	0	0.00	0	0.00	9	27.27
7	Chaff Cutter	0	0.00	1	14.29	0	0.00	0	0.00	1	3.03
8	Blank	10	62.50	4	57.14	6	75.00	1	50.00	21	63.64

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Allanagara micro watershed is presented in Table 12. The results show that the average value of plough was Rs.3250, bullock cart was Rs.21250, sprayer was Rs.3250, power tiller was Rs.200000, tractor was Rs.500000, chaff cutter was Rs.2000 and weeder was Rs.75.

Livestock possession by the households: The data regarding the Livestock possession by the households in Allanagara micro watershed is presented in Table 13. The results indicate that, 12.12 per cent of the households possess bullocks, 30.30 per cent of the households possess local cow, 3.03 per cent of the households possess crossbred cows, 6.06 per cent of the households possess buffalo and 3.03 per cent of the households possess goat.

Table 12. Average value of farm implements owned by households in Allanagara micro watershed (Avg value in Rs)

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	All (33)
1	Bullock Cart	25,000.00	25,000.00	10,000.00	0.00	21,250.00
2	Plough	4,000.00	3,000.00	3,000.00	0.00	3,250.00
3	Power Tiller	0.00	0.00	200,000.00	0.00	200,000.00
4	Tractor	0.00	0.00	500,000.00	0.00	500,000.00
5	Sprayer	3,000.00	3,000.00	4,000.00	3,000.00	3,250.00
6	Weeder	87.00	44.00	0.00	0.00	75.00
7	Chaff Cutter	0.00	2,000.00	0.00	0.00	2,000.00

In case of marginal farmers, 25 per cent of the households possess local cow and 6.25 per cent of the households possess bullock, crossbred cow, buffalo and goat. In case of small farmers, 42.86 per cent of the households possess bullock, 28.57 per cent possess local cow. In case of semi medium farmers, 37.50 per cent of the households possess local cow, 12.50 per cent possess buffalo. Among medium farmers 50 per cent of the households possessed local cow and 50 per cent of them did not possess any livestock.

Table 13. Livestock possession by households in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Bullock	1	6.25	3	42.86	0	0.00	0	0.00	4	12.12
2	Local cow	4	25.00	2	28.57	3	37.50	1	50.00	10	30.30
3	Crossbred cow	1	6.25	0	0.00	0	0.00	0	0.00	1	3.03
4	Buffalo	1	6.25	0	0.00	1	12.50	0	0.00	2	6.06
5	Goat	1	6.25	0	0.00	0	0.00	0	0.00	1	3.03
6	blank	9	56.25	4	57.14	5	62.50	1	50.00	19	57.58

Average Labour availability: The data regarding the average labour availability in Allanagara micro watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.97, average own labour (women) available was 1.76, average hired labour (men) available was 3.03 and average hired labour (women) available was 2.88.

In case of marginal farmers, average own labour men available was 1.69, average own labour (women) was 1.63, average hired labour (men) was 4 and average hired labour (women) available was 3.25. In case of small farmers, average own labour men available was 2.29, average own labour (women) was 2.29, average hired labour (men) was 3.29 and average hired labour (women) available was 3.71. In case of semi medium farmers, average own labour men available was 2.38, average own labour (women) was 1.88, average hired labour (men) was 1.25 and average hired labour (women) available was 1.50. In case of medium farmers, average own labour men available was 1.50, average own labour (women) was 0.50, average hired labour (men) was 1.50 and average hired labour (women) available was 2.50.

Table 14. Average Labour availability in Allanagara micro watershed

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	All (33)
		N	N	N	N	N
1	Own labour Male	1.69	2.29	2.38	1.50	1.97
2	Own Labour Female	1.63	2.29	1.88	0.50	1.76
3	Hired labour Male	4.00	3.29	1.25	1.50	3.03
4	Hired labour Female	3.25	3.71	1.50	2.50	2.88

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Allanagara micro watershed is presented in Table 15. The results indicate that, 30.30 per cent of the household opined that hired labour was adequate and 69.70 per cent of the households opined that hired labour was inadequate. About 43.75 per cent of the marginal farmers, 28.75 per cent of small, 12.50 per cent of semi medium and 0 medium farmers have opined that the hired labour was adequate.

Table 15. Adequacy of Hired Labour in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Adequate	7	43.75	2	28.57	1	12.50	0	0.00	10	30.30
2	Inadequate	9	56.25	5	71.43	7	87.50	2	100.00	23	69.70

Distribution of land (ha): The data regarding the distribution of land (ha) in Allanagara micro watershed is presented in Table 16. The results indicate that, households of the Allanagara micro watershed possess 43.21 ha (93.72%) of dry land and 2.89 ha (6.28%) of irrigated land. Marginal farmers possess 11.04 ha (100%) of dry land. Small farmers possess 11.49 ha (100%) of dry land. Semi medium farmers possess 12.58 ha (81.30%) of dry land and 2.89 ha (18.70%) of irrigated land. Medium farmers possess 8.09 ha (100%) of dry land.

Table 16. Distribution of land (Ha) in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	11.04	100	11.49	100	12.58	81.30	8.09	100	43.21	93.72
2	Irrigated	0.00	0.00	0.00	0.00	2.89	18.70	0.00	0.00	2.89	6.28
Total		11.04	100	11.49	100.	15.47	100	8.09	100	46.10	100

Average land value (Rs/ha): The data regarding the average land value (Rs/ha) in Allanagara micro watershed is presented in Table 17. The results indicate that, the average value of dry land was Rs. 414095.72 and average value of irrigated land was Rs.759999. In case of marginal famers, the average land value was Rs. 905093 for dry land and. In case of small famers, the average land value was Rs. 313098 for dry land. In case of semi medium famers, the average land value was Rs. 278153 for dry land and Rs. 759999 for irrigated land. In case of medium famers, the average land value was Rs. 98800 for dry land.

Table 17. Average land value (Rs/ha) in Allanagara micro watershed

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	All (33)
		N	N	N	N	N
1	Dry	905,093.43	313,098.59	278,153.15	98,800.00	414,095.72
2	Irrigated	0.00	0.00	759,999.99	0.00	759,999.99

Status of bore wells: The data regarding the status of bore wells in Allanagara micro watershed is presented in Table 18. The results indicate that, there were 3 functioning bore wells in the micro watershed.

Table 18. Status of bore wells in Allanagara micro watershed

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	All (33)
		N	N	N	N	N
1	De-functioning	0	0	0	0	0
2	Functioning	0	0	3	0	3

Source of irrigation: The data regarding the source of irrigation in Allanagara micro watershed is presented in Table 19. The results indicate that, bore well was the major irrigation source in the micro water shed which was possessed by semi medium farmers.

Table 19. Source of irrigation in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0.00	0	0.00	3	37.50	0	0.00	3	9.09

Depth of water (Avg in meters): The data regarding the irrigated area (ha) in Allanagara micro watershed is presented in Table 20. The results indicate that, the depth of bore well was found to be 10.62 meters.

Table 20. Depth of water (Avg in meters) in Allanagara micro watershed

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	All (33)
		N	N	N	N	N
1	Bore Well	0.00	0.00	43.82	0.00	10.62

Irrigated Area (ha): The data regarding the irrigated area (ha) in Allanagara micro watershed is presented in Table 21. The results indicate that, marginal farmers had 2.56 ha, small farmers had 2.43 ha, semi medium farmers had 14.15 ha, medium farmers had 6.07 ha and large farmers had 2.83 ha of irrigated area.

Table 21. Irrigated Area (ha) in Allanagara micro watershed

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	LF (0)	All (33)
1	Kharif	0.00	0.00	2.89	0.00	0.00	2.89
Total		0.00	0.00	2.89	0.00	0.00	2.89

Cropping pattern: The data regarding the cropping pattern in Allanagara micro watershed is presented in Table 22. The results indicate that, farmers have grown Maize

(24.57 ha), Bajra (12.61 ha), Sunflower (4.59 ha), Redgram (1.62 ha), Sesamum (1.3 ha), Horsegram (1.21 ha), Bengal gram (0.88 ha), Cowpea (0.81 ha) and Sorghum (0.81 ha). Marginal farmers have grown maize, bajra, sesamum and bengal gram. Small farmers have grown maize, bajra, sunflower, redgram and sesamum. Semi medium farmers have grown maize, bajra, sunflower, horsegram, sorghum and cow pea. Medium farmers have grown maize, bajra and sunflower.

Table 22. Cropping pattern in Allanagara micro watershed (Area in ha.)

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	LF (0)	All (33)
1	Kharif - Maize	8.08	4.22	8.23	4.05	0	24.57
2	Kharif - Bajra	3.62	3.24	3.72	2.02	0	12.61
3	Kharif - Sunflower	0	1.76	0.81	2.02	0	4.59
4	Kharif - Red gram (togari)	0	1.62	0	0	0	1.62
5	Kharif - Sesamum (yellu)	0.9	0.4	0	0	0	1.3
6	Rabi - Horse gram	0	0	1.21	0	0	1.21
7	Kharif - Bengal gram	0.88	0	0	0	0	0.88
8	Kharif - Cow pea	0	0	0.81	0	0	0.81
9	Kharif - Sorghum	0	0	0.81	0	0	0.81
Total		13.48	11.24	15.6	8.1	0	48.41

Cropping intensity: The data regarding the cropping intensity in Allanagara micro watershed is presented in Table 23. The results indicate that, the cropping intensity in Allanagara micro watershed was found to be 71.57 per cent. In case of Marginal farmers it was 100 per cent, for small farmers it was 62.84 per cent, in case of semi medium farmers it was 64.63 per cent, and medium farmers had cropping intensity of 66.67 per cent.

Table 23. Cropping intensity (%) in Allanagara micro watershed

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	LF (0)	All (33)
1	Cropping Intensity	100.00	62.84	64.63	66.67	0.00	71.57

Cost of Cultivation of Maize: The data regarding the cost of cultivation of maize in Allanagara micro watershed is presented in Table 24. The results indicate that, the total cost of cultivation for maize was Rs. 34060.54. The gross income realized by the farmers was Rs. 40950.39. The net income from maize cultivation was Rs. 40950.39, thus the benefit cost ratio was found to be 1:1.2.

Table 24. Cost of Cultivation of Maize in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	48.80	9118.55	26.77
2	Bullock		Pairs/day	4.01	2323.61	6.82
3	Tractor		Hours	2.59	1933.51	5.68
4	Machinery		Hours	1.33	816.99	2.40
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	12.37	1491.44	4.38
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	6.62	1598.15	4.69
8	Fertilizer + micronutrients		Quintal	4.72	5972.39	17.53
9	Pesticides (PPC)		Kgs / liters	1.06	767.30	2.25
10	Irrigation		Number	3.73	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	977.16	2.87
14	Land revenue and Taxes			0.00	0.52	0.00
II	**Cost B1**					
16	Interest on working capital				1180.49	3.47
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				26180.10	76.86
III	**Cost B2**					
18	Rental Value of Land				181.67	0.53
19	**Cost B2 = (Cost B1 + Rental value)**				26361.77	77.40
IV	**Cost C1**					
20	Family Human Labour			22.40	4594.21	13.49
21	**Cost C1 = (Cost B2 + Family Labour)**				30955.98	90.89
V	**Cost C2**					
22	Risk Premium				8.15	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**				30964.13	90.91
VI	**Cost C3**					
24	Managerial Cost				3096.41	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				34060.54	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		14.21	39294.03	
		b) Main Crop Sales Price (Rs.)			2765.79	
	By Product	e) Main Product (q)		2.46	1656.36	
		f) Main Crop Sales Price (Rs.)			673.68	
b.	Gross Income (Rs.)				40950.39	
c.	Net Income (Rs.)				6889.85	
d.	Cost per Quintal (Rs./q.)				2397.42	
e.	Benefit Cost Ratio (BC Ratio)				1:1.2	

Cost of cultivation of Bajra: The data regarding the cost of cultivation of bajra in Allanagara micro watershed is presented in Table 25. The results indicate that, the total cost of cultivation for bajra was Rs. 32405.93. The gross income realized by the farmers was Rs. 23088.86. The net income from bajra cultivation was Rs.- 9317.07. Thus the benefit cost ratio was found to be 1:0.71.

Table 25. Cost of Cultivation of Bajra in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	54.30	8603.08	26.55
2	Bullock		Pairs/day	2.60	1501.39	4.63
3	Tractor		Hours	2.50	1850.29	5.71
4	Machinery		Hours	0.78	476.13	1.47
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	7.85	570.96	1.76
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.56	859.16	2.65
8	Fertilizer + micronutrients		Quintal	5.81	7015.61	21.65
9	Pesticides (PPC)		Kgs / liters	1.52	1220.97	3.77
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	1100.12	3.39
14	Land revenue and Taxes			0.00	0.98	0.00
II	**Cost B1**					
16	Interest on working capital				1160.86	3.58
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				24359.54	75.17
III	**Cost B2**					
18	Rental Value of Land				220.83	0.68
19	**Cost B2 = (Cost B1 + Rental value)**				24580.38	75.85
IV	**Cost C1**					
20	Family Human Labour			24.72	4872.37	15.04
21	**Cost C1 = (Cost B2 + Family Labour)**				29452.75	90.89
V	**Cost C2**					
22	Risk Premium				7.19	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**				29459.93	90.91
VI	**Cost C3**					
24	Managerial Cost				2945.99	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				32405.93	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		14.52	21512.04	
		b) Main Crop Sales Price (Rs.)			1481.25	
	By Product	e) Main Product (q)		2.43	1576.82	
		f) Main Crop Sales Price (Rs.)			650.00	
b.	Gross Income (Rs.)				23088.86	
c.	Net Income (Rs.)				-9317.07	
d.	Cost per Quintal (Rs./q.)				2231.37	
e.	Benefit Cost Ratio (BC Ratio)				1:0.71	

Cost of Cultivation of Sunflower: The data regarding the cost of cultivation of sunflower in Allanagara micro watershed is presented in Table 26. The results indicate that, the total cost of cultivation for sunflower was Rs. 22855.53. The gross income realized by the farmers was Rs. 44613.03. The net income from sunflower cultivation was Rs. 21757.50, thus the benefit cost ratio was found to be 1:1.95.

Table 26. Cost of Cultivation of Sunflower in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	41.59	6671.88	29.19
2	Bullock		Pairs/day	1.97	1111.29	4.86
3	Tractor		Hours	1.70	1253.59	5.48
4	Machinery		Hours	1.18	725.60	3.17
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	5.60	1144.22	5.01
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	3.05	609.95	2.67
8	Fertilizer + micronutrients		Quintal	2.92	3507.86	15.35
9	Pesticides (PPC)		Kgs / liters	0.77	439.93	1.92
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	25.82	0.11
14	Land revenue and Taxes			0.00	1.10	0.00
II	**Cost B1**					
16	Interest on working capital				685.08	3.00
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				16176.32	70.78
III	**Cost B2**					
18	Rental Value of Land				211.11	0.92
19	**Cost B2 = (Cost B1 + Rental value)**				16387.43	71.70
IV	**Cost C1**					
20	Family Human Labour			21.83	4383.32	19.18
21	**Cost C1 = (Cost B2 + Family Labour)**				20770.75	90.88
V	**Cost C2**					
22	Risk Premium				7.00	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**				20777.75	90.91
VI	**Cost C3**					
24	Managerial Cost				2077.78	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				22855.53	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		13.38	44613.03	
		b) Main Crop Sales Price (Rs.)			3333.33	
b.	Gross Income (Rs.)				44613.03	
c.	Net Income (Rs.)				21757.50	
d.	Cost per Quintal (Rs./q.)				1707.69	
e.	Benefit Cost Ratio (BC Ratio)				1:1.95	

Cost of Cultivation of Redgram: The data regarding the cost of cultivation of redgram in Allanagara micro watershed is presented in Table 27. The results indicate that, the total cost of cultivation for redgram was Rs. 18952.48. The gross income realized by the farmers was Rs. 38285. The net income from redgram cultivation was Rs. 19332.52. Thus the benefit cost ratio was found to be 1:2.02.

Table 27. Cost of Cultivation of Redgram in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	22.23	3890.25	20.53
2	Bullock		Pairs/day	0.62	339.63	1.79
3	Tractor		Hours	2.47	1852.50	9.77
4	Machinery		Hours	1.24	741.00	3.91
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	6.18	741.00	3.91
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	1.24	247.00	1.30
8	Fertilizer + micronutrients		Quintal	3.71	5928.00	31.28
9	Pesticides (PPC)		Kgs / liters	0.62	617.50	3.26
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	0.01	0.00
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				905.22	4.78
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				15262.11	80.53
III	**Cost B2**					
18	Rental Value of Land				166.67	0.88
19	**Cost B2 = (Cost B1 + Rental value)**				15428.77	81.41
IV	**Cost C1**					
20	Family Human Labour			8.65	1790.75	9.45
21	**Cost C1 = (Cost B2 + Family Labour)**				17219.52	90.86
V	**Cost C2**					
22	Risk Premium				10.00	0.05
23	**Cost C2 = (Cost C1 + Risk Premium)**				17229.52	90.91
VI	**Cost C3**					
24	Managerial Cost				1722.95	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				18952.48	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		12.35	38285.00	
		b) Main Crop Sales Price (Rs.)			3100.00	
b.	Gross Income (Rs.)				38285.00	
c.	Net Income (Rs.)				19332.52	
d.	Cost per Quintal (Rs./q.)				1534.61	
e.	Benefit Cost Ratio (BC Ratio)				1:2.02	

Cost of cultivation of Sesamum: The data regarding the cost of cultivation of sesamum in Allanagara micro watershed is presented in Table 28. The results indicate that, the total cost of cultivation for sesamum was Rs. 38628.92. The gross income realized by the farmers was Rs. 28458.41. The net income from sesamum cultivation was Rs. -10170.51. Thus the benefit cost ratio was found to be 1:0.74.

Table 28. Cost of Cultivation of Sesamum in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	53.25	6622.27	17.14
2	Bullock		Pairs/day	3.46	2076.14	5.37
3	Tractor		Hours	2.47	1729.00	4.48
4	Machinery		Hours	1.24	864.50	2.24
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	8.96	1371.30	3.55
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	49.40	9880.00	25.58
8	Fertilizer + micronutrients		Quintal	3.03	2643.57	6.84
9	Pesticides (PPC)		Kgs/ltrss	2.47	1976.00	5.12
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	4.48	0.01
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				1904.62	4.93
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				29075.16	75.27
III	**Cost B2**					
18	Rental Value of Land				333.33	0.86
19	**Cost B2 = (Cost B1 + Rental value)**				29408.49	76.13
IV	**Cost C1**					
20	Family Human Labour			34.47	5707.70	14.78
21	**Cost C1 = (Cost B2 + Family Labour)**				35116.20	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				35117.20	90.91
VI	**Cost C3**					
24	Managerial Cost				3511.72	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				38628.92	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		5.81	28458.41	
		b) Main Crop Sales Price (Rs.)			4900.00	
b.	Gross Income (Rs.)				28458.41	
c.	Net Income (Rs.)				-10170.51	
d.	Cost per Quintal (Rs./q.)				6651.17	
e.	Benefit Cost Ratio (BC Ratio)				1:0.74	

Cost of cultivation of Horsegram: The data regarding the cost of cultivation of horsegram in Allanagara micro watershed is presented in Table 29. The results indicate that, the total cost of cultivation for horsegram was Rs. 16968.62. The gross income realized by the farmers was Rs. 19924.67. The net income from horsegram cultivation was Rs. 2956.05. Thus the benefit cost ratio was found to be 1:1.17.

Table 29. Cost of Cultivation of Horsegram in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	38.70	6874.83	40.51
2	Bullock		Pairs/day	0.82	452.83	2.67
3	Tractor		Hours	2.47	1852.50	10.92
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	8.23	782.17	4.61
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	0.82	823.33	4.85
8	Fertilizer + micronutrients		Quintal	2.47	1482.00	8.73
9	Pesticides (PPC)		Kgs / liters	0.82	823.33	4.85
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	0.02	0.00
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				470.50	2.77
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				13561.52	79.92
III	**Cost B2**					
18	Rental Value of Land				166.67	0.98
19	**Cost B2 = (Cost B1 + Rental value)**				13728.18	80.90
IV	**Cost C1**					
20	Family Human Labour			7.41	1687.83	9.95
21	**Cost C1 = (Cost B2 + Family Labour)**				15416.02	90.85
V	**Cost C2**					
22	Risk Premium				10.00	0.06
23	**Cost C2 = (Cost C1 + Risk Premium)**				15426.02	90.91
VI	**Cost C3**					
24	Managerial Cost				1542.60	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				16968.62	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		5.76	17290.00	
		b) Main Crop Sales Price (Rs.)			3000.00	
	By Product	e) Main Product (q)		3.29	2634.67	
		f) Main Crop Sales Price (Rs.)			800.00	
b.	Gross Income (Rs.)				19924.67	
c.	Net Income (Rs.)				2956.05	
d.	Cost per Quintal (Rs./q.)				2944.24	
e.	Benefit Cost Ratio (BC Ratio)				1:1.17	

Cost of cultivation of Bengal gram: The data regarding the cost of cultivation of bengal gram in Allanagara micro watershed is presented in Table 30. The results indicate that, the total cost of cultivation for bengal gram was Rs. 42991.61. The gross income realized by the farmers was Rs. 56969.35. The net income from bengal gram cultivation was Rs. 13977.74. Thus the benefit cost ratio was found to be 1:1.33.

Table 30. Cost of Cultivation of Bengal gram in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	77.40	11894.70	27.67
2	Bullock		Pairs/day	2.28	1365.90	3.18
3	Tractor		Hours	3.41	2390.32	5.56
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	91.06	10927.19	25.42
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	0.00	0.00	0.00
8	Fertilizer + micronutrients		Quintal	3.41	2879.77	6.70
9	Pesticides (PPC)		Kgs / liters	1.14	910.60	2.12
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	9.11	0.02
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				1766.23	4.11
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				32147.10	74.78
III	**Cost B2**					
18	Rental Value of Land				333.33	0.78
19	**Cost B2 = (Cost B1 + Rental value)**				32480.44	75.55
IV	**Cost C1**					
20	Family Human Labour			36.42	6601.84	15.36
21	**Cost C1 = (Cost B2 + Family Labour)**				39082.28	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				39083.28	90.91
VI	**Cost C3**					
24	Managerial Cost				3908.33	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				42991.61	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		14.80	56969.35	
		b) Main Crop Sales Price (Rs.)			3850.00	
b.	Gross Income (Rs.)				56969.35	
c.	Net Income (Rs.)				13977.74	
d.	Cost per Quintal (Rs./q.)				2905.38	
e.	Benefit Cost Ratio (BC Ratio)				1:1.33	

Cost of cultivation of Cowpea: The data regarding the cost of cultivation of cowpea in Allanagara micro watershed is presented in Table 31. The results indicate that, the total cost of cultivation for cowpea was Rs. 25594.48. The gross income realized by the farmers was Rs. 14820.00. The net income from cowpea cultivation was Rs. -10774.48. Thus the benefit cost ratio was found to be 1:0.58.

Table 31. Cost of Cultivation of Cowpea in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	38.29	6854.25	26.78
2	Bullock		Pairs/day	1.24	679.25	2.65
3	Tractor		Hours	2.47	1852.50	7.24
4	Machinery		Hours	1.24	741.00	2.90
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	4.94	444.60	1.74
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.47	494.00	1.93
8	Fertilizer + micronutrients		Quintal	4.94	6916.00	27.02
9	Pesticides (PPC)		Kgs / liters	0.00	0.00	0.00
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	0.02	0.00
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				943.75	3.69
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				18925.38	73.94
III	**Cost B2**					
18	Rental Value of Land				133.33	0.52
19	**Cost B2 = (Cost B1 + Rental value)**				19058.71	74.46
IV	**Cost C1**					
20	Family Human Labour			19.76	4199.00	16.41
21	**Cost C1 = (Cost B2 + Family Labour)**				23257.71	90.87
V	**Cost C2**					
22	Risk Premium				10.00	0.04
23	**Cost C2 = (Cost C1 + Risk Premium)**				23267.71	90.91
VI	**Cost C3**					
24	Managerial Cost				2326.77	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				25594.48	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		4.94	14820.00	
		b) Main Crop Sales Price (Rs.)			3000.00	
b.	Gross Income (Rs.)				14820.00	
c.	Net Income (Rs.)				-10774.48	
d.	Cost per Quintal (Rs./q.)				5181.07	
e.	Benefit Cost Ratio (BC Ratio)				1:0.58	

Cost of cultivation of Sorghum: The data regarding the cost of cultivation of sorghum in Allanagara micro watershed is presented in Table 32. The results indicate that, the total cost of cultivation for sorghum was Rs. 25766.74. The gross income realized by the farmers was Rs. 18525.00. The net income from sorghum cultivation was Rs. -7241.74. Thus the benefit cost ratio was found to be 1:0.72.

Table 32. Cost of Cultivation of Sorghum in Allanagara micro watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	53.11	8953.75	34.75
2	Bullock		Pairs/day	2.47	1358.50	5.27
3	Tractor		Hours	2.47	1852.50	7.19
4	Machinery		Hours	2.47	1482.00	5.75
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	6.18	494.00	1.92
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.47	2470.00	9.59
8	Fertilizer + micronutrients		Quintal	2.47	3211.00	12.46
9	Pesticides (PPC)		Kgs / liters	0.00	0.00	0.00
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	0.02	0.00
14	Land revenue and Taxes			0.00	0.00	0.00
II	**Cost B1**					
16	Interest on working capital				742.20	2.88
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				20563.97	79.81
III	**Cost B2**					
18	Rental Value of Land				133.33	0.52
19	**Cost B2 = (Cost B1 + Rental value)**				20697.31	80.33
IV	**Cost C1**					
20	Family Human Labour			12.35	2717.00	10.54
21	**Cost C1 = (Cost B2 + Family Labour)**				23414.31	90.87
V	**Cost C2**					
22	Risk Premium				10.00	0.04
23	**Cost C2 = (Cost C1 + Risk Premium)**				23424.31	90.91
VI	**Cost C3**					
24	Managerial Cost				2342.43	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				25766.74	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		6.18	18525.00	
		b) Main Crop Sales Price (Rs.)			3000.00	
b.	Gross Income (Rs.)				18525.00	
c.	Net Income (Rs.)				-7241.74	
d.	Cost per Quintal (Rs./q.)				4172.75	
e.	Benefit Cost Ratio (BC Ratio)				1:0.72	

Fodder availability: The data regarding the fodder available in Allanagara micro watershed is presented in Table 33. The results indicate that, 47 tones of dry fodder available among the sampled households and it is available 120 days in a year. About 28 tonnes of green fodder available among the households and it is available for 76 days in a year.

Table 33. Fodder available in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		Q (t)	D (days)	Q (t)	D (days)	Q (t)	D (days)	Q (t)	D (days)	Q (t)	D (days)
1	Dry Fodder	52	61	28	64	30	67	10	90	120	47
2	Green Fodder	36	41	18	41	17	37	5	50	76	28

Adequacy of fodder: The data regarding the adequacy of fodder in Allanagara micro watershed is presented in Table 34. The results indicate that, 12.12 per cent of the households opined that dry fodder was adequate which includes 18.75 per cent of marginal farmers and 14.29 per cent of small farmers. Around 42.42 per cent of the households opined that green fodder was adequate. The data revealed that 30.30 per cent of the farmers opined that dry fodder is inadequate.

Table 34. Adequacy of fodder in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	3	18.75	1	14.29	0	0.00	0	0.00	4	12.12
2	Inadequate-Dry Fodder	4	25.00	2	28.57	3	37.50	1	50.00	10	30.30
3	Adequate-Green Fodder	7	43.75	3	42.86	3	37.50	1	50.00	14	42.42

Average annual gross income: The data regarding the average annual gross income in Allanagara micro watershed is presented in Table 35. The results indicate that the average annual gross income is Rs.81619. For marginal farmers it was Rs 71786, for small farmers it was Rs.134977, for semi medium farmers it was Rs.58125 and for medium farmers it was Rs.67500

Table 35. Average annual gross income in Allanagara micro watershed

(Avg value in Rs.)

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	All (33)
1	Service/salary	25,125.00	42,857.14	750.00	0.00	21,454.55
2	Business	7,500.00	6,428.57	0.00	5,000.00	5,303.03
3	Wage	2,812.50	1,142.86	2,500.00	5,000.00	2,515.15
4	Agriculture	30,896.88	50,857.14	39,500.00	48,500.00	38,283.33
5	Farm income	625.00	0.00	0.00	0.00	303.03
6	Non Farm income	2,500.00	5,714.29	8,750.00	9,000.00	5,090.91
7	Dairy Farm	2,327.50	15,120.00	6,625.00	0.00	5,941.82
8	Goat Farming	0.00	12,857.14	0.00	0.00	2,727.27
Income(Rs.)		71,786.88	134,977.14	58,125.00	67,500.00	81,619.09

Average annual expenditure: The data regarding the average annual expenditure in Allanagara micro watershed is presented in Table 36. The results indicate that the average annual expenditure is Rs. 8,193.66. For marginal farmers it was Rs 3,934.03, for small farmers it was Rs. 23,367.35, for semi medium farmers it was Rs. 2,109.38 and for medium farmers it was Rs. 13,500.

Table 36. Average annual expenditure in Allanagara micro watershed

(Avg value in Rs.)

Sl.No.	Particulars	MF (16)	SF (7)	SMF (8)	MDF (2)	All (33)
1	Service/salary	20,000.00	50,000.00	0.00	0.00	6,060.61
2	Business	21,000.00	28,000.00	0.00	2,000.00	2,818.18
3	Wage	0.00	0.00	0.00	2,000.00	60.61
4	Agriculture	9,444.44	17,571.43	11,875.0	15,000.00	12,666.67
5	Farm income	2,000.00	0.00	0.00	0.00	60.61
6	Non Farm income	3,333.33	4,000.00	0.00	8,000.00	787.88
7	Dairy Farm	7,166.67	54,000.00	5,000.00	0.00	2,590.91
8	Goat Farming	0.00	10,000.00	0.00	0.00	303.03
Total		62,944.44	163,571.43	16,875.00	27,000.00	270,390.87
Average		3,934.03	23,367.35	2,109.38	13,500.00	8,193.66

Horticulture species grown: The data regarding horticulture species grown in Allanagara micro watershed is presented in Table 37. The results indicate that, sampled households have grown 10 coconut, 2 guava, 1 mango trees in their backyard and 3 coconut and 2 mango trees in their field.

Table 37. Horticulture species grown in Allanagara micro watershed

S.N	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		F	B	F	B	F	B	F	B	F	B
1	Coconut	2	4	0	4	1	2	0	0	3	10
2	Guava	0	2	0	0	0	0	0	0	0	2
3	Mango	2	1	0	0	0	0	0	0	2	1

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

Forest species grown: The data regarding horticulture species grown in Allanagara micro watershed is presented in Table 38. The results indicate that, households have planted 50 neem trees, 1 tamarind trees and 7 banyan trees in their field. Households have also plated 21 neem trees and 2 banyan trees in their backyard.

Table 38. Forest species grown in Allanagara micro watershed

S.N	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		F	B	F	B	F	B	F	B	F	B
1	Neem	23	9	13	4	11	5	3	3	50	21
2	Tamarind	1	0	0	0	0	0	0	0	1	0
3	Banyan	1	0	3	0	1	0	2	2	7	2

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

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Allanagara micro watershed is presented in Table 39. The results indicated that, bajra, Bengal gram, cowpea, horsegram, sorghum, redgram, sesamum and sunflower were sold to the extent of 100 per cent.

Table 39. Marketing of the agricultural produce in Allanagara micro watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	152.0	0.0	152.0	100.0	1481.25
2	Bengal Gram	13.0	0.0	13.0	100.0	3850.0
3	Cow Pea	4.0	0.0	4.0	100.0	3000.0
4	Horse Gram	7.0	0.0	7.0	100.0	3000.0
5	Sorghum	5.0	0.0	5.0	100.0	3000.0
6	Maize	281.0	15.0	266.0	94.66	2765.79
7	Red Gram	20.0	0.0	20.0	100.0	3100.0
8	Sesamum	8.0	0.0	8.0	100.0	4900.0
9	Sunflower	62.0	0.0	62.0	100.0	3333.33

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Allanagara micro watershed is presented in Table 40. The results indicated that, 36.36 per cent of the households have sold their produce to agents/traders, 78.79 per cent of the households have sold their produce in regulated markets and 21.21 per cent of the households have sold their produce in cooperative marketing society.

Table 40. Marketing Channels used for sale of agricultural produce in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Agent/Traders	7	43.75	3	42.86	2	25.00	0	0.00	12	36.36
2	Regulated Market	6	37.50	8	114.29	10	125.00	2	100.00	26	78.79
3	Cooperative marketing Society	3	18.75	0	0.00	3	37.50	1	50.00	7	21.21

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Allanagara micro watershed is presented in Table 41. The results indicated that 9.09 per cent of the households have carried head load, 18.18 per cent have used cart and 109.09 per cent have used truck as a mode of transport for their agricultural produce.

Table 41. Mode of transport of agricultural produce in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Head Load	1	6.25	1	14.29	1	12.50	0	0.00	3	9.09
2	Cart	4	25.00	1	14.29	1	12.50	0	0.00	6	18.18
3	Tractor	11	68.75	9	128.57	13	162.50	3	150.00	36	109.09

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Allanagara micro watershed is presented in Table 42. The results

indicated that, 3.03 per cent of the households used dung cake as a source of fuel, 93.94 per cent used fire wood and another 3.03 per cent of the households used LPG.

Table 42. Usage pattern of fuel for domestic use in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Dung Cake	1	6.25	0	0.00	0	0.00	0	0.00	1	3.03
2	Fire Wood	14	87.50	7	100.00	8	100.00	2	100.00	31	93.94
3	LPG	1	6.25	0	0.00	0	0.00	0	0.00	1	3.03

Source of drinking water: The data regarding source of drinking water in Allanagara micro watershed is presented in Table 43. The results indicated that, piped supply was the major source for drinking water for 27.27 per cent of the households and bore well was the major source for 72.73 per cent of the households.

Table 43. Source of drinking water in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Piped supply	7	43.75	2	28.57	0	0.00	0	0.00	9	27.27
2	Bore Well	9	56.25	5	71.43	8	100.00	2	100.00	24	72.73

Source of light: The data regarding source of light in Allanagara micro watershed is presented in Table 44. The results indicated that, electricity was the major source of light for 100 per cent of the households in micro watershed.

Table 44. Source of light in Allanagara micro watershed

S.N	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Electricity	16	100.00	7	100.00	8	100.00	2	100.00	33	100.00

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facili**t**y in Allanagara micro watershed is presented in Table 45. The results indicated that, 39.39 per cent of the households possess sanitary toilet i.e. 12.50 per cent of the marginal, 100 per cent of the small, 25 per cent of the semi medium, 100 per cent of the medium farmers had sanitary toilet facility.

Table 45. Existence of Sanitary toilet facility in Allanagara micro watershed

S.N	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	2	12.50	7	100.00	2	25.00	2	100.00	13	39.39

Possession of PDS card: The data regarding possession of PDS card in Allanagara micro watershed is presented in Table 46. The results indicated that, 54.55 per cent of the sampled households possessed BPL card and 39.39 per cent possessed APL card.

Table 46. Possession of PDS card in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	APL	6	37.50	3	42.86	3	37.50	1	50.00	13	39.39
2	BPL	9	56.25	4	57.14	5	62.50	0	0.00	18	54.55

Participation in NREGA programme: The data regarding participation in NREGA programme in Allanagara micro watershed is presented in Table 47. The results indicated that, 45.45 per cent of the households participated in NREGA programme which included 37.50 percent of the marginal, 100 per cent of the small, 12.50 per cent of the semi medium and 50 percent of the medium farmers.

Table 47. Participation in NREGA programme in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	6	37.5	7	100	1	12.50	1	50.00	15	45.45

Adequacy of food items: The data regarding adequacy of food items in Allanagara micro watershed is presented in Table 48. The results indicated that, cereals were adequate for 96.97 per cent of the households, pulses were adequate for 12.12 per cent of the households, oilseeds were adequate for 3.03 per cent of the households, vegetables were adequate for 27.27 per cent of the households, fruits were adequate for 24.24 per cent of the households, milk was adequate for 57.58 per cent of the households, eggs were adequate for 27.27 per cent of the households and meat was adequate for 12.12 per cent of the households.

Table 48. Adequacy of food items in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Cereals	15	93.75	7	100	8	100	2	100	32	96.97
2	Pulses	3	18.75	1	14.29	0	0.00	0	0.00	4	12.12
3	Oilseed	1	6.25	0	0.00	0	0.00	0	0.00	1	3.03
4	Vegetables	7	43.75	2	28.57	0	0.00	0	0.00	9	27.27
5	Fruits	5	31.25	2	28.57	1	12.50	0	0.00	8	24.24
6	Milk	10	62.50	4	57.14	4	50.00	1	50.00	19	57.58
7	Egg	7	43.75	1	14.29	1	12.50	0	0.00	9	27.27
8	Meat	3	18.75	0	0.00	1	12.50	0	0.00	4	12.12

Response on Inadequacy of food items: The data regarding inadequacy of food items in Allanagara micro watershed is presented in Table 49. The results indicated that, pulses were inadequate for 90.91 per cent of the households, oilseeds were inadequate for 30.30 per cent of the households, vegetables were inadequate for 9.09 per cent of the households, fruits were inadequate for 6.06 per cent of the households, milk was inadequate for 42.42 per cent of the households, eggs were inadequate for 54.55 per cent of the households and meat was inadequate for 15.15 per cent of the households.

Response on market surplus of food items: The data regarding market surplus of food items in Allanagara micro watershed is presented in Table 50. The results indicated that, oilseeds and vegetables were market surplus for 72.73 per cent and 60.61 per cent of the households respectively.

Table 49. Response on Inadequacy of food items in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Pulses	14	87.50	6	85.71	8	100.00	2	100.00	30	90.91
2	Oilseed	7	43.75	2	28.57	1	12.50	0	0.00	10	30.30
3	Vegetables	0	0.00	0	0.00	2	25.00	1	50.00	3	9.09
4	Fruits	2	12.50	0	0.00	0	0.00	0	0.00	2	6.06
5	Milk	6	37.50	3	42.86	4	50.00	1	50.00	14	42.42
6	Egg	6	37.50	5	71.43	7	87.50	0	0.00	18	54.55
7	Meat	4	25.00	1	14.29	0	0.00	0	0.00	5	15.15

Table 50. Response on Market surplus of food items in Allanagara micro watershed

Sl.No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Oilseed	8	50.00	5	71.43	9	112.50	2	100.00	24	72.73
2	Vegetables	9	56.25	5	71.43	5	62.50	1	50.00	20	60.61

Farming constraints: The data regarding farming constraints experienced by households in Allanagara micro watershed is presented in Table 51. The results indicated that, lower fertility status of the soil was the constraint experienced by 3.03 per cent of the households, wild animal menace on farm field (60.61%), frequent incidence of pest and diseases (51.52%), high cost of Fertilizers and plant protection chemicals (15.15%), high rate of interest on credit (24.24%), lack of marketing facilities in the area (12.12%), lack of transport for safe transport of the agricultural produce to the market (90.91%), less rainfall (100%), source of Agri-technology information(Newspaper/TV/Mobile) (96.97).

Table 51. Farming constraints Experienced in Allanagara micro watershed

Sl. No.	Particulars	MF (16)		SF (7)		SMF (8)		MDF (2)		All (33)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	1	6.25	0	0.00	0	0.00	0	0.00	1	3.03
2	Wild animal menace on farm field	10	62.50	4	57.14	6	75.00	0	0.00	20	60.61
3	Frequent incidence of pest and diseases	5	31.25	5	71.43	5	62.50	2	100	17	51.52
4	Inadequacy of irrigation water	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5	High cost of Fertilizers and plant protection chemicals	3	18.75	0	0.00	2	25.00	0	0.00	5	15.15
6	High rate of interest on credit	5	31.25	2	28.57	1	12.50	0	0.00	8	24.24
7	Low price for the agricultural commodities	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
8	Lack of marketing facilities in the area	2	12.50	2	28.57	0	0.00	0	0.00	4	12.12
9	Inadequate extension services	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
10	Lack of transport for safe transport of the Agril produce to the market.	13	81.25	7	100	8	100	2	100	30	90.91
11	Less rainfall	16	100	7	100	8	100	2	100	33	100
12	Source of Agri-technology information(Newspaper/TV/Mobile)	15	93.75	7	100	8	100	2	100	32	96.97

Chapter 5

SUMMARY

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 34 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 107 (52.45%) men and 97 (47.55%) were women among the sampled households. The average family size of marginal farmers was 5.3, small farmer was 6.6, semi medium farmer was 7.75, medium farmers were 5.5 and for large farmers it was 6.2. The data indicated that 36 (17.65%) people were in 0-15 years of age, 105 (51.47%) were in 16-35 years of age, 44 (21.57 %) were in 36-60 years of age and 19 (9.31%) were above 61 years of age.

The results indicated that Allanagara had 38.73 per cent illiterates, 2.94 per cent were functional literates, 24.51 per cent of the people had primary school education, 2.94 per cent of them had middle school education, 12.75 per cent of them had high school education, 7.84 per cent of them had PUC education, 4.41 per cent of them had degree education and 2.94 had studied ITI.

The results indicate that, 97.97 per cent of the households were practicing agriculture and 3.03 per cent of the household heads had household industry. The results indicate that agriculture was the major occupation for 32.84 per cent of the household members, 26.47 per cent were agricultural labourers, 24.02 per cent were students, 4.90 per cent were children, 2.45 per cent had household industry and another 2.45 per cent were in private service. In the micro watershed 100 per cent of the population has not participated in any local institution.

The results indicate that 72.73 per cent of the households possess Katcha house and 27. 27 per cent of them possess semi pucca house. About 100 per cent of the households possess TV, 18.18 per cent of the households possess Mixer grinder, 54.55 per cent of the households possess bicycle, 87.88 per cent of the households possess motor cycle, 100 per cent of the households possess mobile phones and 3.03 per cent of the households possess auto. The average value of television was Rs.6170, mixer grinder was Rs.3000, bicycle was Rs.3138, motor cycle was Rs. 36103, auto was Rs. 55000 and mobile phone was Rs.1695.

About 12.12 per cent of the households possess plough, 12.12 per cent of them possess bullock cart, 12.12 per cent of the households possess sprayer, 27.27 per cent of the households possess weeder, and 3.03 per cent of the households possess tractor, chaff

cutter and power tiller. The average value of plough was Rs.3250, bullock cart was Rs.21250, sprayer was Rs.3250, power tiller was Rs.200000, tractor was Rs.500000, chaff cutter was Rs.2000 and weeder was Rs.75.

The results indicate that, 12.12 per cent of the households possess bullocks, 30.30 per cent of the households possess local cow, 3.03 per cent of the households possess crossbred cows, 6.06 per cent of the households possess buffalo and 3.03 per cent of the households possess goat. In case of marginal farmers, 25 per cent of the households possess local cow and 6.25 per cent of the households possess bullock, crossbred cow, buffalo and goat. In case of small farmers, 42.86 per cent of the households possess bullock, 28.57 per cent possess local cow. In case of semi medium farmers, 37.50 per cent of the households possess local cow, 12.50 per cent possess buffalo. Among medium farmers 50 per cent of the households possessed local cow and 50 per cent of them did not possess any livestock.

The results indicate that, average own labour men available in the micro watershed was 1.97, average own labour (women) available was 1.76, average hired labour (men) available was 3.03 and average hired labour (women) available was 2.88. In case of marginal farmers, average own labour men available was 1.69, average own labour (women) was 1.63, average hired labour (men) was 4 and average hired labour (women) available was 3.25. In case of small farmers, average own labour men available was 2.29, average own labour (women) was 2.29, average hired labour (men) was 3.29 and average hired labour (women) available was 3.71. In case of semi medium farmers, average own labour men available was 2.38, average own labour (women) was 1.88, average hired labour (men) was 1.25 and average hired labour (women) available was 1.50. In case of medium farmers, average own labour men available was 1.50, average own labour (women) was 0.50, average hired labour (men) was 1.50 and average hired labour (women) available was 2.50.

The results indicate that, 30.30 per cent of the household opined that hired labour was adequate and 69.70 per cent of the households opined that hired labour was inadequate. About 43.75 per cent of the marginal farmers, 28.75 per cent of small, 12.50 per cent of semi medium and 0 medium farmers have opined that the hired labour was adequate.

The results indicate that, households of the Allanagara micro watershed possess 43.21 ha (93.72%) of dry land and 2.89 ha (6.28%) of irrigated land. Marginal farmers possess 11.04 ha (100%) of dry land. Small farmers possess 11.49 ha (100%) of dry land. Semi medium farmers possess 12.58 ha (81.30%) of dry land and 2.89 ha (18.70%) of irrigated land. Medium farmers possess 8.09 ha (100%) of dry land. The average value of dry land was Rs. 414095.72 and average value of irrigated land was Rs.759999. In case of marginal famers, the average land value was Rs. 905093 for dry land and. In case of small famers, the average land value was Rs. 313098 for dry land. In case of semi medium

famers, the average land value was Rs. 278153 for dry land and Rs. 759999 for irrigated land. In case of medium famers, the average land value was Rs. 98800 for dry land.

The results indicate that, there were 3 functioning bore wells in the micro watershed. Bore well was the major irrigation source in the micro water shed which was possessed by semi medium farmers. The depth of bore well was found to be 10.62 meters. The results indicate that, marginal farmers had 2.56 ha, small farmers had 2.43 ha, semi medium farmers had 14.15 ha, medium farmers had 6.07 ha and large farmers had 2.83 ha of irrigated area.

The results indicate that, farmers have grown Maize (24.57 ha), Bajra (12.61 ha), Sunflower (4.59 ha), Redgram (1.62 ha), Sesamum (1.3 ha), Horsegram (1.21 ha), Bengal gram (0.88 ha), Cowpea (0.81 ha) and Sorghum (0.81 ha). Marginal farmers have grown maize, bajra, sesamum and bengal gram. Small farmers have grown maize, bajra, sunflower, redgram and sesamum. Semi medium farmers have grown maize, bajra, sunflower, horsegram, sorghum and cow pea. Medium farmers have grown maize, bajra and sunflower. The cropping intensity in Allanagara micro watershed was found to be 71.57 per cent. In case of Marginal farmers it was 100 per cent, for small farmers it was 62.84 per cent, in case of semi medium farmers it was 64.63 per cent, and medium farmers had cropping intensity of 66.67 per cent.

The results indicate that, the total cost of cultivation for maize was Rs. 34060.54. The gross income realized by the farmers was Rs. 40950.39. The net income from maize cultivation was Rs. 40950.39, thus the benefit cost ratio was found to be 1:1.2. The total cost of cultivation for bajra was Rs. 32405.93. The gross income realized by the farmers was Rs. 23088.86. The net income from bajra cultivation was Rs.- 9317.07. Thus the benefit cost ratio was found to be 1:0.71. The total cost of cultivation for sunflower was Rs. 22855.53. The gross income realized by the farmers was Rs. 44613.03. The net income from sunflower cultivation was Rs. 21757.50, thus the benefit cost ratio was found to be 1:1.95. The total cost of cultivation for redgram was Rs. 18952.48. The gross income realized by the farmers was Rs. 38285. The net income from redgram cultivation was Rs. 19332.52. Thus the benefit cost ratio was found to be 1:2.02. The total cost of cultivation for sesamum was Rs. 38628.92. The gross income realized by the farmers was Rs. 28458.41. The net income from sesamum cultivation was Rs. -10170.51. Thus the benefit cost ratio was found to be 1:0.74. The total cost of cultivation for horsegram was Rs. 16968.62. The gross income realized by the farmers was Rs. 19924.67. The net income from horsegram cultivation was Rs. 2956.05. Thus the benefit cost ratio was found to be 1:1.17. The total cost of cultivation for bengal gram was Rs. 42991.61. The gross income realized by the farmers was Rs. 56969.35. The net income from bengal gram cultivation was Rs. 13977.74. Thus the benefit cost ratio was found to be 1:1.33. The total cost of cultivation for cowpea was Rs. 25594.48. The gross income realized by the farmers was Rs. 14820.00. The net income from cowpea cultivation was Rs. -

10774.48. Thus the benefit cost ratio was found to be 1:0.58. The total cost of cultivation for sorghum was Rs. 25766.74. The gross income realized by the farmers was Rs. 18525.00. The net income from sorghum cultivation was Rs. -7241.74. Thus the benefit cost ratio was found to be 1:0.72.

The results indicate that, 47 tonnes of dry fodder available among the sampled households and it is available 120 days in a year. About 28 tonnes of green fodder available among the households and it is available for 76 days in a year. About 12.12 per cent of the households opined that dry fodder was adequate which includes 18.75 per cent of marginal farmers and 14.29 per cent of small farmers. Around 42.42 per cent of the households opined that green fodder was adequate. The data revealed that 30.30 per cent of the farmers opined that dry fodder is inadequate.

The results indicate that the average annual gross income is Rs.81619. For marginal farmers it was Rs 71786, for small farmers it was Rs.134977, for semi medium farmers it was Rs.58125 and for medium farmers it was Rs.67500. The average annual expenditure is Rs. 8,193.66. For marginal farmers it was Rs 3,934.03, for small farmers it was Rs. 23,367.35, for semi medium farmers it was Rs. 2,109.38 and for medium farmers it was Rs. 13,500.

The results indicated that, bajra, Bengal gram, cowpea, horsegram, sorghum, redgram, sesamum and sunflower were sold to the extent of 100 per cent. Around 36.36 per cent of the households have sold their produce to agents/traders, 78.79 per cent of the households have sold their produce in regulated markets and 21.21 per cent of the households have sold their produce in cooperative marketing society. The results indicated that 9.09 per cent of the households have carried head load, 18.18 per cent have used cart and 109.09 per cent have used truck as a mode of transport for their agricultural produce.

The results indicated that, 3.03 per cent of the households used dung cake as a source of fuel, 93.94 per cent used fire wood and another 3.03 per cent of the households used LPG. Piped supply was the major source for drinking water for 27.27 per cent of the households and bore well was the major source for 72.73 per cent of the households. Electricity was the major source of light for 100 per cent of the households in micro watershed. Around 39.39 per cent of the households possess sanitary toilet i.e. 12.50 per cent of the marginal, 100 per cent of the small, 25 per cent of the semi medium, 100 per cent of the medium farmers had sanitary toilet facility.

The results indicated that, 54.55 per cent of the sampled households possessed BPL card and 39.39 per cent possessed APL card. Around 45.45 per cent of the households participated in NREGA programme which included 37.50 percent of the marginal, 100 per cent of the small, 12.50 per cent of the semi medium and 50 percent of the medium farmers.

The results indicated that, cereals were adequate for 96.97 per cent of the households, pulses were adequate for 12.12 per cent of the households, oilseeds were adequate for 3.03 per cent of the households, vegetables were adequate for 27.27 per cent of the households, fruits were adequate for 24.24 per cent of the households, milk was adequate for 57.58 per cent of the households, eggs were adequate for 27.27 per cent of the households and meat was adequate for 12.12 per cent of the households. Oilseeds and vegetables were market surplus for 72.73 per cent and 60.61 per cent of the households respectively.

The data regarding farming constraints experienced by households in Allanagara micro watershed is presented in Table 51. The results indicated that, lower fertility status of the soil was the constraint experienced by 3.03 per cent of the households, wild animal menace on farm field (60.61%), frequent incidence of pest and diseases (51.52%), high cost of Fertilizers and plant protection chemicals (15.15%), high rate of interest on credit (24.24%), lack of marketing facilities in the area (12.12%), lack of transport for safe transport of the agricultural produce to the market (90.91%), less rainfall (100%), source of Agri-technology information(Newspaper/TV/Mobile) (96.97).