ICAR-NBSS&LUP Sujala MWS Publ.260

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

HATTIKUNI (4D5B1E2d) MICROWATERSHED

Hattikuni Hobli, Yadgir 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 Panjab rao 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., B.A. Dhanorkar, S. Srinivas, M. Lalitha, K.V. Niranjana, R.S. Reddy and S.K. Singh (2019). "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of Hattikuni (4D5B1E2d) Microwatershed, Hattikuni Hobli, Yadgir Taluk and District, Karnataka", ICAR-NBSS&LUP Sujala MWS Publ.260, ICAR – NBSS & LUP, RC, Bangalore. p.131 & 28.

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.260

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

HATTIKUNI (4D5B1E2d) MICROWATERSHED

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

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

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

The natural resources (land, water and vegetation) of the state need adequate and constant care and management, backed by site-specific technological interventions and investments particularly by the government. Detailed database pertaining to the nature of the land resources, their constraints, inherent potentials and suitability for various land based rural enterprises, crops and other uses is a prerequisite for preparing location-specific action plans, which are in tune with the inherent capability of the resources. Any

effort to evolve climate resilient technologies has to be based on the baseline scientific database. Then only one can expect effective implementation of climate resilient technologies, monitor the progress, make essential review of the strategy, and finally evaluate the effectiveness of the implemented programs. The information available at present on the land resources of the state are of general nature and useful only for general purpose planning. Since the need of the hour is to have site-specific information suitable for farm level planning and detailed characterization and delineation of the existing land resources of an area into similar management units is the only option.

ICAR-NBSS&LUP, Regional Centre, Bangalore has taken up a project sponsored by the Karnataka Watershed Development Project-II, (Sujala-III), Government of Karnataka funded by the World Bank under Component-1 Land Resource Inventry. This study was taken up to demonstrate the utility of such a database in reviewing, monitoring and evaluating all the land based watershed development programs on a scientific footing. To meet the requirements of various land use planners at grassroots level, the present study on "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of Hattikuni Microwatershed, Yadgir 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:16-07-2019

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

Contributors

Dr. Rajendra Hegde Principal Scientist, Head & Project Leader, Sujala-III Project ICAR-NBSS&LUP, Regional Centre, Bangalore	**Dr. S.K.Singh** Director, ICAR-NBSS&LUP Coordinator, Sujala-III Project Nagpur
Soil Survey, Mapping & Report Preparation	
Dr. B.A. Dhanorkar	Sh. R.S. Reddy
Dr. K.V. Niranjana	Mr. Somashekar T N
	Smt. Chaitra, S.P.
	Dr. Gopali bardhan
	Ms. Arpitha
	Dr. Mahendra Kumar, M.B.
Field Work	
Sh. C.BacheGowda	Sh. Mahesh, D.B.
Sh. Somashekar	Sh. Ashok S Sindagi
Sh. M. Jayaramaiah	Sh. Veerabhadrappa B.
Sh. Paramesha, K.	Sh. Shankarappa
Sh. B. M. Narayana Reddy	Sh. Anand
	Sh. Arun N Kambar.
	Sh Kamalesh Awate
	Sh. Sharaan Kumar Huppar
	Sh. Yogesh H.N.
	Sh. Kalaveerachari R Kammar
GIS Work	
Dr. S.Srinivas	Sh. A.G.Devendra Prasad
Sh. D.H.Venkatesh	Sh. Prakashanaik, M.K.
Smt.K.Sujatha	Sh. Abhijith Sastry, N.S.
Smt. K.V.Archana	Sh. Sudip Kumar Suklabaidya
Sh. N. Maddileti	Sh. Avinash, K.N.
	Sh. Amar Suputhra, S
	Sh. Deepak, M.J.
	Smt. K.Karunya Lakshmi
	Ms. Seema, K.V.
	Ms. A. Rajab Nisha

Laboratory Analysis	
Dr. K.M.Nair	Ms. Steffi Peter
Smt. Arti Koyal	Ms. Thara, V.R
Smt. Parvathy	Ms. Roopa, G.
	Ms. Swati, H.
	Sh. Shantaveera Swami
	Ms. Shwetha, N.K.
	Smt. Ishrat Haji
	Ms. P. Pavan Kumari
	Ms. Padmaja
	Ms. Veena, M.
Socio-Economic Analysis	
Dr. S.C. Ramesh Kumar	Sh. M.K. Prakashanaik
	Dr. Shridevi. R.Kanabargi
	Ms. Shraddha Hegde
	Sh. Pradyumna, K
	Sh. Vijaya Kumar S Lamani
	Ms. Sowmya K.B
	Mrs. Prathibha, D.G
	Sh. Rajendra,D
Soil & Water Conservation	
Sh. Sunil P. Maske	
Watershed Development Department, GoK, Bangalore	
Sh. Rajeev Ranjan IFS Project Director & Commissioner, WDD	Dr. A. Natarajan NRM Consultant, Sujala-III Project
Dr. S.D. Pathak IFS Executive Director & Chief Conservator of Forests, WDD	

PART-A

LAND RESOURCE INVENTORY

Contents

Preface		
Contributors		
Executive Summary		
Chapter 1	Introduction	1
Chapter 2	Geographical Setting	3
2.1	Location and Extent	3
2.2	Geology	3
2.3	Physiography	4
2.4	Drainage	4
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	15
3.5	Laboratory Characterization	16
Chapter 4	The Soils	17
4.1	Soils of granite gneiss landscape	21
Chapter 5	Interpretation for Land Resource Management	35
5.1	Land Capability Classification	35
5.2	Soil Depth	37
5.3	Surface Soil Texture	38
5.4	Soil Gravelliness	39
5.5	Available Water Capacity	40
5.6	Soil Slope	41
5.7	Soil Erosion	42
Chapter 6	Fertility Status	45
6.1	Soil Reaction (pH)	45
6.2	Electrical Conductivity (EC)	45
6.3	Organic Carbon (OC)	45
6.4	Available Phosphorus	47
6.5	Available Potassium	47
6.6	Available Sulphur	47
6.7	Available Boron	47
6.8	Available Iron	47
6.9	Available Manganese	48
6.10	Available Copper	48
6.11	Available Zinc	48
Chapter 7	Land Suitability for Major Crops	53

7.1	Land suitability for Sorghum	53
7.2	Land suitability for Maize	54
7.3	Land suitability for Bajra	55
7.4	Land suitability for Groundnut	56
7.5	Land suitability for Sunflower	57
7.6	Land suitability for Red gram	58
7.7	Land suitability for Bengal gram	59
7.8	Land suitability for Cotton	60
7.9	Land suitability for Chilli	61
7.10	Land suitability for Tomato	62
7.11	Land suitability for Brinjal	63
7.12	Land suitability for Onion	64
7.13	Land suitability for Bhendi	65
7.14	Land suitability for Drumstick	66
7.15	Land suitability for Mango	67
7.16	Land suitability for Guava	68
7.17	Land suitability for Sapota	69
7.18	Land Suitability for Pomegranate	70
7.19	Land Suitability for Musambi	71
7.20	Land Suitability for Lime	72
7.21	Land Suitability for Amla	73
7.22	Land Suitability for Cashew	74
7.23	Land Suitability for Jackfruit	75
7.24	Land Suitability for Jamun	76
7.25	Land Suitability for Custard apple	77
7.26	Land Suitability for Tamarind	78
7.27	Land Suitability for Mulberry	79
7.28	Land Suitability for Marigold	80
7.29	Land Suitability for Chrysanthemum	81
7.30	Land management units	113
7.31	Proposed Crop Plan	114
Chapter 8	Soil Health Management	117
Chapter 9	Soil and Water conservation Treatment Plan	123
9.1	Treatment Plan	124
9.2	Recommended Soil and Water Conservation measures	127
9.3	Greening of Microwatershed	128
	References	131
	Appendix I	I-VI
	Appendix II	VII-XII
	Appendix III	XIII-XVIII

LIST OF TABLES

2.1	Mean Monthly Rainfall, PET, 1/2 PET at Yadgir Taluk & District	5
2.2	Land Utilization in Yadgir district	8
3.1	Differentiating Characteristics used for Identifying Soil Series	15
3.2	Soil map unit description of Hattikuni Microwatershed	16
4.1	Physical and Chemical Characteristics of Soil Series identified in Hattikuni microwatershed	27
7.1	Soil-Site Characteristics of Hattikuni Microwatershed	83
7.2	Land suitability for Sorghum	84
7.3	Land suitability for Maize	85
7.4	Land suitability for Bajra	86
7.5	Land suitability for Groundnut	87
7.6	Land suitability for Sunflower	88
7.7	Land suitability for Redgram	89
7.8	Land suitability for Bengal gram	90
7.9	Land suitability for Cotton	91
7.10	Land suitability for Chilli	92
7.11	Land suitability for Tomato	93
7.12	Land suitability for Brinjal	94
7.13	Land suitability for Onion	95
7.14	Land suitability for Bhendi	96
7.15	Land suitability for Drumstick	97
7.16	Land suitability for Mango	98
7.17	Land suitability for Guava	99
7.18	Land suitability for Sapota	100
7.19	Land suitability for Pomegranate	101
7.20	Land suitability for Musambi	102
7.21	Land suitability for Lime	103
7.22	Land suitability for Amla	104
7.23	Land suitability for Cashew	105
7.24	Land suitability for Jackfruit	106

7.25	Land suitability for Jamun	107
7.26	Land suitability for Custard apple	108
7.27	Land suitability for Tamarind	109
7.28	Land suitability for Mulberry	110
7.29	Land suitability for Marigold	111
7.30	Land suitability for Chrysanthemum	112
7.31	Proposed Crop Plan for Hattikuni Microwatershed	115

LIST OF FIGURES

2.1	Location map of Hattikuni Microwatershed	3
2.2	Granite and granite gneiss rock formation	4
2.3	Rainfall distribution in Yadgir Taluk & District	6
2.4	Natural vegetation of Hattikuni Microwatershed	7
2.5	Current Land use map of Hattikuni Microwatershed	8
2.6	Location of wells map of Hattikuni Microwatershed	9
2.7 a	Different crops and cropping systems in Hattikuni Microwatershed	9
2.7 b	Different crops and cropping systems in HattikuniMicrowatershed	10
3.1	Scanned and Digitized Cadastral map of Hattikuni Microwatershed	12
3.2	Satellite image of Hattikuni Microwatershed	13
3.3	Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Hattikuni Microwatershed	13
3.4	Location of profiles in a transect	14
3.5	Soil phase or management units of Hattikuni Microwatershed	19
5.1	Land Capability Classification map of Hattikuni Microwatershed	37
5.2	Soil Depth map of Hattikuni Microwatershed	38
5.3	Surface Soil Texture map of Hattikuni Microwatershed	39
5.4	Soil Gravelliness map of Hattikuni Microwatershed	40
5.5	Soil Available Water Capacity map Hattikuni Microwatershed	41
5.6	Soil Slope map of Hattikuni Microwatershed	42
5.7	Soil Erosion map of Hattikuni Microwatershed	43
6.1	Soil Reaction (pH) map of Hattikuni Microwatershed	46
6.2	Electrical Conductivity (EC) map of Hattikuni Microwatershed	46
6.3	Soil Organic Carbon (OC) map of Hattikuni Microwatershed	47
6.4	Soil Available Phosphorus map of Hattikuni Microwatershed	48
6.5	Soil Available Potassium map of Hattikuni Microwatershed	49
6.6	Soil Available Sulphur map of Hattikuni Microwatershed	49
6.7	Soil Available Boron map of Hattikuni Microwatershed	50
6.8	Soil Available Iron map of Hattikuni Microwatershed	50
6.9	Soil Available Manganese map of Hattikuni Microwatershed	51
6.10	Soil Available Copper map of Hattikuni Microwatershed	51
6.11	Soil Available Zinc map of Hattikuni Microwatershed	52

7.1	Land suitability for Sorghum	54
7.2	Land suitability for Maize	55
7.3	Land suitability for Bajra	56
7.4	Land suitability for Groundnut	57
7.5	Land suitability for Sunflower	58
7.6	Land suitability for Red gram	59
7.7	Land suitability for Bengal gram	60
7.8	Land suitability for Cotton	61
7.9	Land suitability for Chilli	62
7.10	Land suitability for Tomato	63
7.11	Land suitable for Brinjal	64
7.12	Land suitable for Onion	65
7.13	Land suitable for Bhendi	66
7.14	Land suitable for Drumstick	67
7.15	Land suitability for Mango	68
7.16	Land suitability for Guava	69
7.17	Land suitability for Sapota	70
7.18	Land suitability for Pomegranate	71
7.19	Land suitability for Musambi	72
7.20	Land suitability for Lime	73
7.21	Land suitability for Amla	74
7.22	Land suitability for Cashew	75
7.23	Land suitability for Jackfruit	76
7.24	Land suitability for Jamun	77
7.25	Land suitability for Custard apple	78
7.26	Land suitability for Tamarind	79
7.27	Land suitability for Mulberry	80
7.28	Land suitability for Marigold	81
7.29	Land suitability for Chrysanthemum	82
7.30	Land management units map of Hattikuni Microwatershed	114
9.1	Soil and water conservation plan map of Hattikuni Microwatershed	128

EXECUTIVE SUMMARY

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

The present study covers an area of 737 ha in Yadgir taluk & district, Karnataka. The climate is semiarid and categorized as drought-prone with an average annual rainfall of 866 mm, of which about 652 mm is received during south-west monsoon, 138 mm during north-east and the remaining 76 mm during the rest of the year. An area of 648 ha in the microwatershed is covered by soils, about 16 ha in the microwatershed is covered by rock outcrops and about 71 ha by others (habitation and water bodies). The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 8 soil series and 16 soil phases (management units) and 4 land management units.*
- *The length of crop growing period is about 120-150 days starting from 1st week of June to 4th week of October.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 29 major agricultural and horticultural crops was assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area in the microwatershed is suitable for agriculture.*
- *About 63 per cent area of the microwatershed has soils that are moderately deep to very deep (75 - >150 cm) and 26 per cent soils are shallow to moderately shallow (25-75 cm).*
- *About 7 per cent area in the microwatershed has sandy soils, 58 per cent area in the microwatershed has loamy soils and 23 per cent clayey soils at the surface.*
- *About 81 per cent area in the microwatershed has non gravelly (<15%) and 7 per cent area in the microwatershed has gravelly (15-35%).*
- *About 59 per cent area of the microwatershed is very high (>200 mm/m) in available water capacity, 6 per cent is low (51-100 mm/m) and 24 per cent area very low (<51 mm/m) in available water capacity.*

- *About 38 per cent area of the microwatershed has very gently sloping (1-3% slope) lands and about 50 per cent area of the microwatershed has nearly level (0-1% slope) lands.*
- *An area of about 38 per cent area is moderately (e2) eroded and about 50 per cent area is slightly (e1) eroded.*
- *An area of about <1 per cent soils are strongly acid to moderately acid (pH 5.0-6.0) in soil reaction, <1 per cent soils are slightly acid (pH 6.0-6.5) in soil reaction, 27 per cent soils are neutral (pH 6.5-7.3) in soil reaction, 56 per cent soil are slightly to moderately alkaline (pH 7.3-8.4) and 5 per cent soils are strongly to very strongly alkaline (8.4 - >9.0).*
- *The Electrical Conductivity (EC) of the soils in the entire cultivated area of the microwatershed is dominantly <2 dsm^{-1} indicating that the soils are non-saline.*
- *About 4 per cent of the soils are low (<0.5%) in organic carbon, 61 per cent medium (0.5-0.75%) in organic carbon and 23 per cent high (>0.75%).*
- *About 81 per area is medium (23-57 kg/ha) in available phosphorus and 7 per area is high (>57 kg/ha).*
- *Entire cultivated area is medium (145-337 kg/ha) in available potassium.*
- *Available sulphur is low (<10 ppm) in an area of about 23 per cent, medium (10 - 20 ppm) in 59 per cent and high (>20 ppm) in 6 per cent area of the microwatershed.*
- *Available boron is low (<0.5 ppm) in an area of about 54 per cent and medium (0.5-1.0 ppm) in an area of 34 per cent.*
- *Available iron is sufficient (>4.5 ppm) in 87 per cent area of the microwatershed and <1 per cent of area is deficient (<4.5 ppm).*
- *Available manganese and copper are sufficient in all the soils of the microwatershed.*
- *Available zinc is deficient (<0.6 ppm) in the entire area of the microwatershed.*
- *The land suitability for 29 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	*435(59)*	*41(6)*		*Guava*	-	-
Maize	-	*476(65)*		*Sapota*	-	-
Bajra	-	*502(69)*		*Pomegranate*	-	*435(59)*
Groundnut	-	*26(4)*		*Musambi*	*422(57)*	*13(2)*
Sunflower	*423(57)*	*12(2)*		*Lime*	*422(57)*	*13(2)*
Redgram	-	*435(59)*		*Amla*	-	*502(69)*
Bengal gram	*435(59)*	*41(6)*		*Cashew*	-	-
Cotton	*423(57)*	*53(8)*		*Jackfruit*	-	-
Chilli	-	*476(65)*		*Jamun*	-	*435(59)*
Tomato	-	*463(63)*		*Custard apple*	*434(59)*	*68(10)*
Brinjal	*50(7)*	*452(62)*		*Tamarind*	-	*435(59)*
Onion	*291(39)*	*67(10)*		*Mulberry*	-	*26(4)*
Bhendi	*195(26)*	*307(43)*		*Marigold*	-	*476(65)*
Drumstick	-	*461(63)*		*Chrysanthemum*	-	*476(65)*
Mango	-	*39(5)*				

- *Apart from the individual crop suitability, a proposed crop plan has been prepared for the identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fiber and horticulture crops.*
- *Maintaining soil-health is vital to crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested to these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation treatment plan has been prepared that would help in identifying the sites to be treated and also the type of structures required.*
- *As part of the greening programme, several tree species have been suggested to be planted in marginal and submarginal lands, field bunds and also in the hillocks, mounds and ridges. This would help in not only supplementing the farm income but also provide fodder and fuel to generate lot of biomass which would help in maintaining an ecological balance and also 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 geographical area and more than 60 per cent of the people are still dependant on agriculture for their livelihood. The limited land area is under severe stress and strain due to increasing population pressure and competing demands of various land uses. Due to this, every year there is significant diversion of farm lands and water resources for non-agricultural purposes. Apart from this, due to lack of interest in farmers for farming, large tracts of cultivable lands are turning into fallows in many areas and this trend is continuing at an alarming rate.

Further, land degradation has emerged as a serious problem which has already affected about 38 lakh ha of cultivated area in the state. Soil erosion alone has degraded about 35 lakh ha. Almost all the uncultivated areas are facing various degrees of degradation, particularly soil erosion. Salinity and alkalinity has emerged as a major problem 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 an urgent need to generate a detailed site-specific farm level database on various land resources for all the villages/watersheds in a time bound manner that would help to protect the valuable soil and land resources and also to stabilize the farm production.

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

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

The Land Resource Inventory is basically done for identifying the potential and problem areas, developing sustainable land use plans, estimation of surface run off and water harvesting potential, preparation of soil and water conservation plans, land degradation/desertification etc. The Bureau is presently engaged in developing an LRI methodology using high resolution satellite remote sensing data and Digital Elevation Model (DEM) data to prepare Landscape Ecological Units (LEU) map representing agro-ecosystem as a whole. The LEU is preferred over landform as the base map for LRI. LEU is the assemblage of landform, slope and land use. An attempt has already been 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 Hattikuni microwatershed in Yadgir Taluk & 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.

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Hattikuni microwatershed is located in the northern part of Karnataka in Yadgir Taluk & District, Karnataka State (Fig.2.1). It comprises parts of Hatthakuni, Honagera & Yaddalli Villages. It lies between 16^0 49' and 16^0 51' North latitudes and 77^0 9' and 76^0 11' East longitudes covering an area of about 737 ha. It is about 11 km northwest of Yadgir town and is surrounded by Hatthakuni on the north, Yaddalli on the southwest and Honagera village on the southern side.

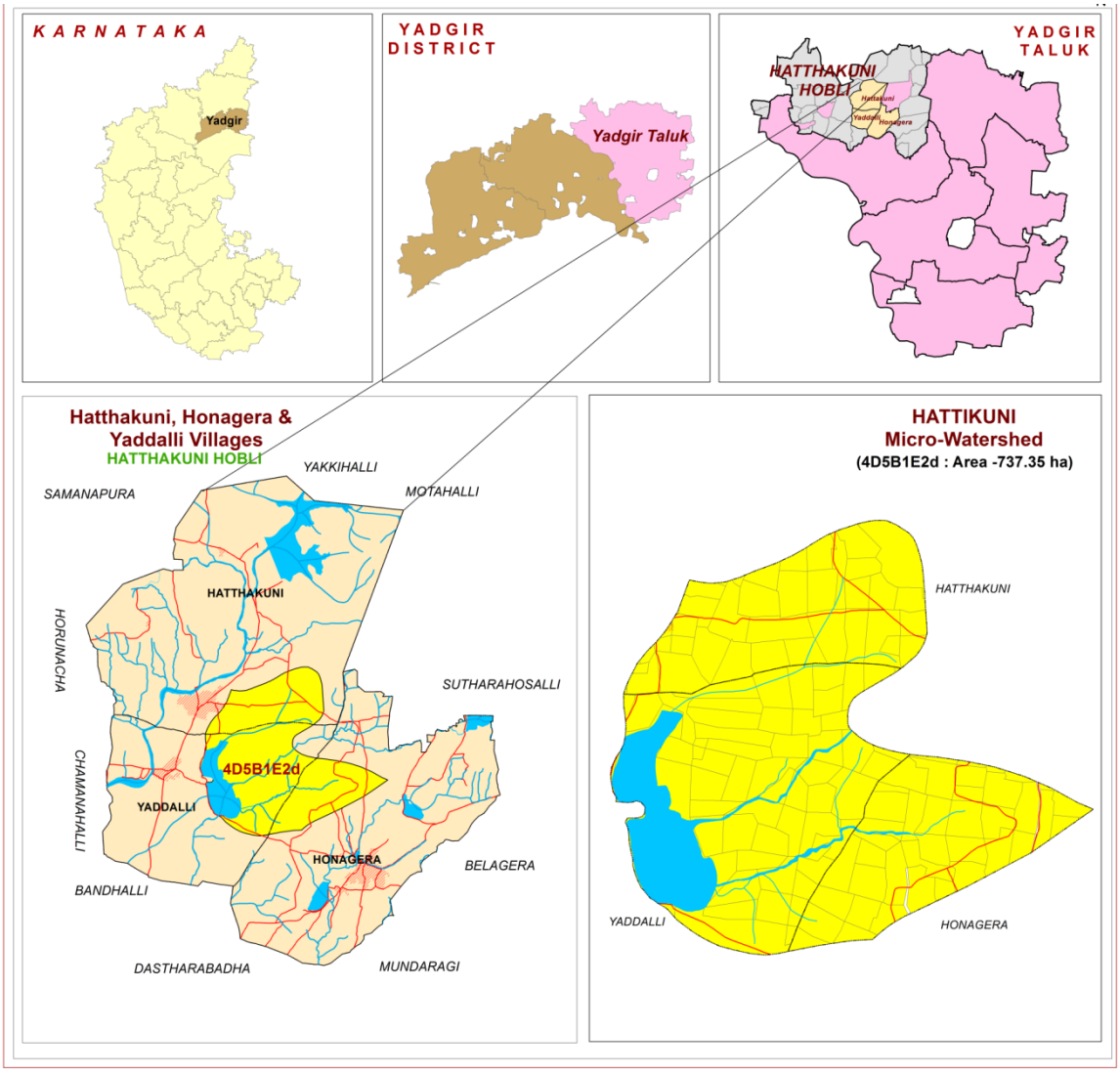


Fig.2.1 Location map of Hattikuni Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are granite gneiss (Figs.2.2). 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 Hattikuni microwatershed.

Fig.2.2 Granite and granite gneiss rocks

2.3 Physiography

Physiographically, the area has been identified as granite gneiss landscape based on geology. The area has been further subdivided into five landforms, *viz;* mounds/ridges, summits, side slopes and very gently sloping uplands, plains and valleys based on slope and its relief features. The elevation ranges from 379-409 m above MSL. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

The area is drained by several parallel streams like Bori, Amerja and Kanga which finally join the river Bhima along its course. Though, they are not perennial, during rainy season they carry large quantities of rain water. The microwatershed has only few small tanks which are not capable of storing the water that flows during the rainy season. Due to this, the ground water recharge is very much affected. This is reflected in the failure of many bore wells in the villages. If the available rain water is properly harnessed by constructing new tanks and recharge structures at appropriate places in the villages, then the drinking and irrigation needs of the area can be easily met. The drainage network is parallel to sub parallel and dendritic.

2.5 Climate

The Yadgir district lies in the northern plains of Karnataka and falls under semiarid tract of the state and is categorized as drought- prone with total annual rainfall of 866 mm (Table 2.1). Of the total rainfall, maximum of 652 mm is received during the south–west monsoon period from June to September the north-east monsoon from October to early December contributes about 138 mm and the remaining 76 mm during the rest of the year. The summer season starts during the middle of February and continues up to the first week of June. The period from December to the middle of February is the coldest season. December is the coldest month with mean daily maximum and minimum temperatures being 29.5^0C and 10^0C respectively. During peak summer, temperature shoots up to 45^0C. Relative humidity varies from 26% in summer to 62% in winter. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo-Transpiration (PET) is 141 mm and varies from a low of 81 mm in December to 199 mm in the month of May. The PET is always higher than precipitation in all the months except end of June to end of September. Generally, the Length of crop Growing Period (LGP) is 120-150 days and starts from 1st week of June to 4th week of October.

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

Sl. No.	Months	Rainfall	PET	1/2 PET
1	January	4.30	86.0	43.0
2	February	2.30	125.5	62.7
3	March	15.10	166.0	83.0
4	April	18.50	179.8	89.9
5	May	36.0	198.8	97.9
6	June	118.0	175.1	87.5
7	July	171.80	156.3	78.1
8	August	182.9	150.3	75.1
9	September	179.7	142.0	71.0
10	October	105.3	138.5	69.2
11	November	26.4	97.60	48.6
12	December	6.0	80.90	40.4
Total		**866.3**		

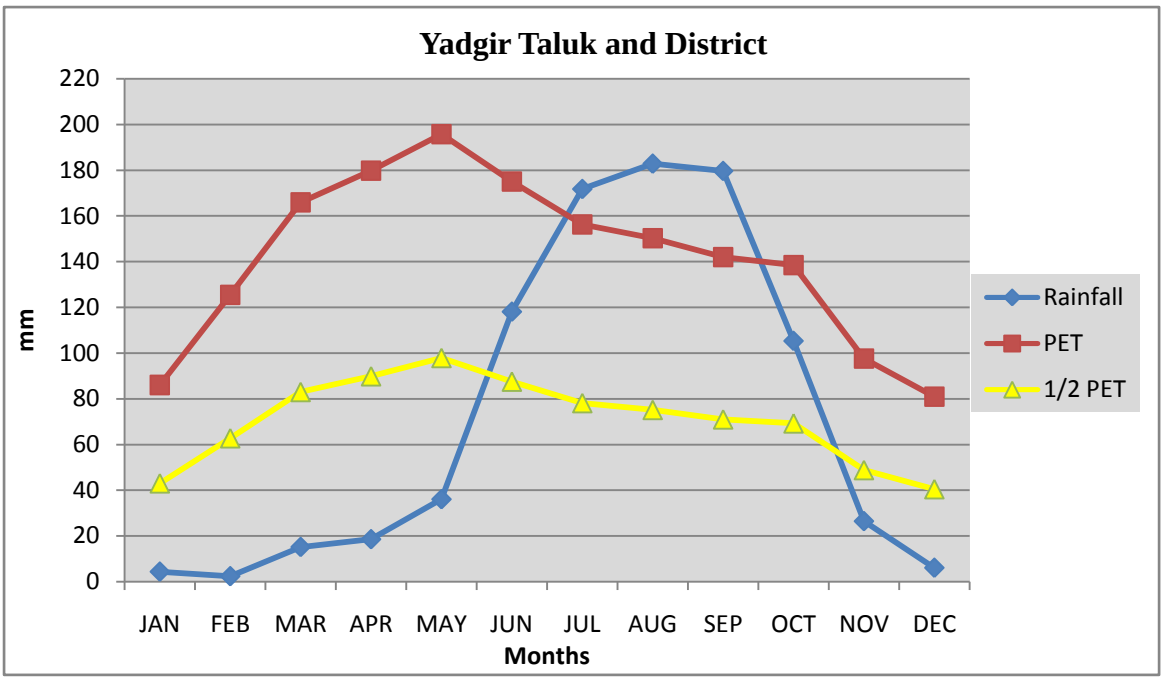


Fig 2.3 Rainfall distribution in Yadgir Taluk, Yadgir District

2.6 Natural Vegetation

The natural vegetation is sparse comprising few tree species, shrubs and herbs. The mounds, ridges and boulders occupy very sizeable area which is 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 that eventually result in the heavy siltation of tanks and reservoirs in the microwatershed.

Fig 2.4 Natural vegetation of Hattikuni Microwatershed

2.7 Land Utilization

About 72 per cent area (Table 2.2) in Yadgir district is cultivated at present. An area of about 2 per cent is permanently under pasture, 20 per cent under current fallows and 6 per cent under non-agricultural land and 5 per cent under currently barren. Forests occupy an area of about 7 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, cotton, sunflower, groundnut, red gram, mango, pomegranate, marigold and sapota. While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Hattikuni microwatershed is presented in Fig.2.5. The location of wells map of Hattikuni microwatershed is presented in Fig.2.6. The different crops and cropping systems adopted in the microwatershed is presented in the Figures 2.7 a & b.

Table 2.2 Land Utilization in Yadgir District

Sl. No.	Agricultural land use	Area (ha)	Per cent
1	Total geographical area	516088	-
2	Total cultivated area	373617	72.4
3	Area sown more than once	74081	14.3
4	Cropping intensity	-	119.8
5	Trees and grooves	737	0.14
6	Forest	33773	6.54
7	Cultivable wasteland	2385	0.46
8	Permanent Pasture land	11755	2.28
9	Barren land	27954	5.41
10	Non- Agriculture land	29623	5.73
11	Current Fallows	105212	20.4

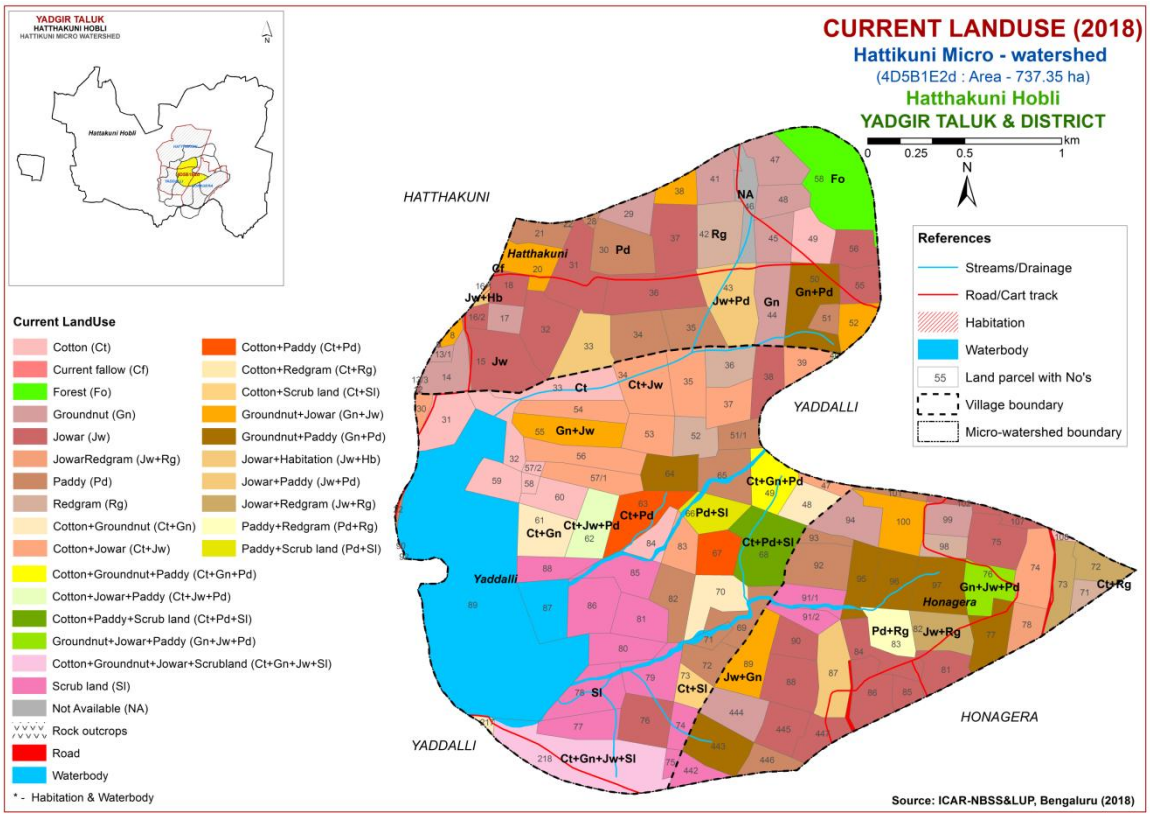


Fig.2.5 Current Land Use map of Hattikuni Microwatershed

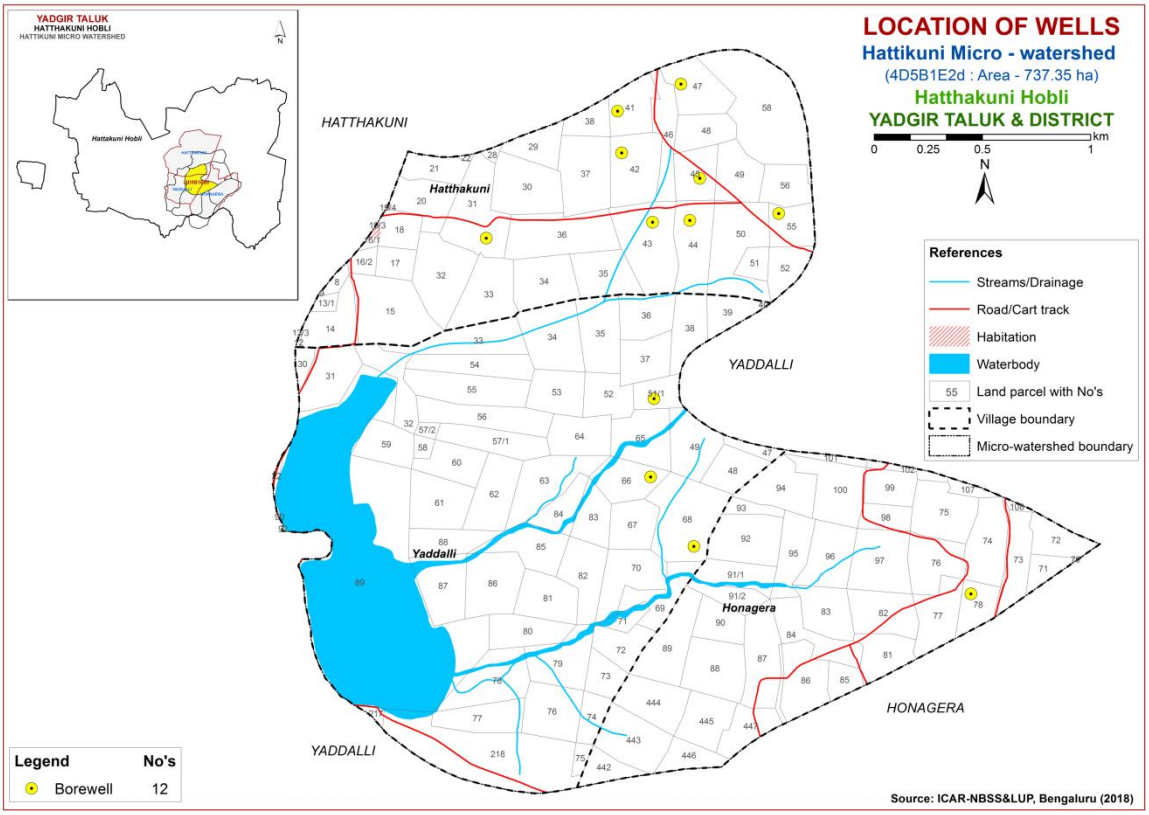


Fig.2.5 Location of wells map of Hattikuni Microwatershed

Fig. 2.6 a. Different Crops and Cropping Systems in Hattikuni Microwatershed

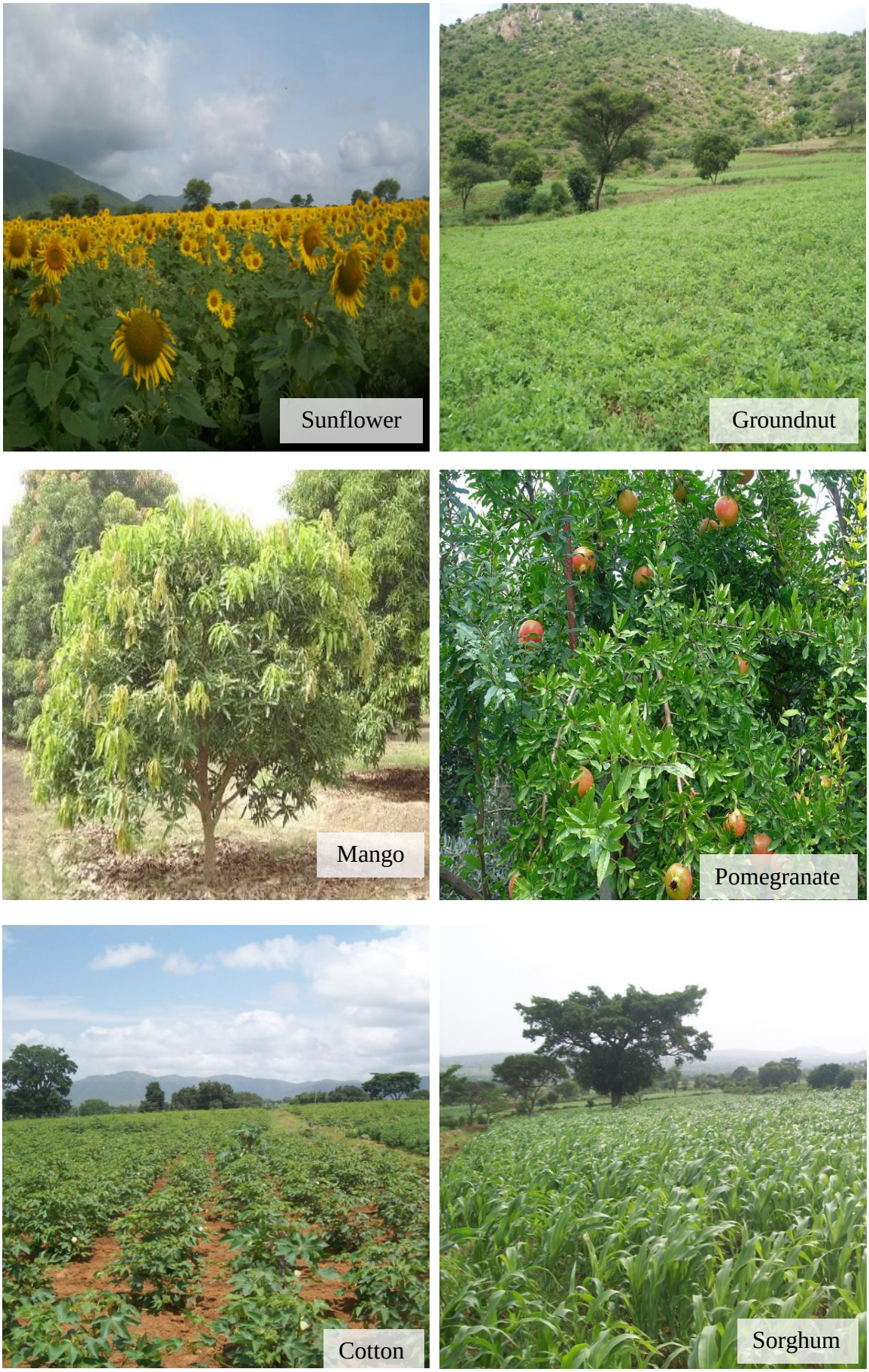


Fig. 2.6 b. Different Crops and Cropping Systems in Hattikuni Microwatershed

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 Hattikuni microwatershed by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site characteristics (slope of the land, 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 the area extent and their geographic distribution on the microwatershed cadastral map. The detailed survey at 1:7920 scale was carried out in an area of 737.35 ha. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

The detailed survey of the land resources occurring in the microwatershed was carried out by using digitized cadastral map and IRS satellite imagery as base supplied by KSRSAC. The cadastral map shows field boundaries with their survey numbers, location of tanks, streams and other permanent features of the area (Fig. 3.1). Apart from the cadastral map, remote sensing data products from Cartosat-1 and LISS IV merged at the scale of 1:7920 were used in conjunction with the cadastral map to identify the 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 also used for initial traversing, identification of geology and landforms, drainage features, present land use and also for selection of transects in the microwatershed.

3.2 Image Interpretation for Physiography

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

subdivided into physiographic/image interpretation units based on image characteristics. The image interpretation legend for physiography is given below.

Image Interpretation Legend for Physiography

G- Granite Gneiss Landscape

G1		Hills/ Ridges/ Mounds
	G11	Summits
	G12	Side slopes
		G121 Side slopes with dark grey tones
G2		Uplands
	G21	Summits
	G22	Gently sloping uplands
		G221 Gently sloping uplands, yellowish green (eroded)
		G222 Gently sloping uplands, yellowish white (severely eroded)
	G23	Very gently sloping uplands
		G231 Very gently sloping uplands, yellowish green
		G232 Very gently sloping uplands, medium green and pink
		G233 Very gently sloping uplands, pink and green (scrub land)
		G234 Very gently sloping uplands, medium greenish grey
		G235 Very gently sloping uplands, yellowish white (eroded)
		G236 Very gently sloping uplands, dark green
		G237 Very gently sloping uplands, medium pink (coconut garden)
		G238 Very gently sloping uplands, pink and bluish white (eroded)
	G24	Valleys/ lowlands
		G241 Valleys, pink tones
		G242 Valleys gray mixed with pink tones

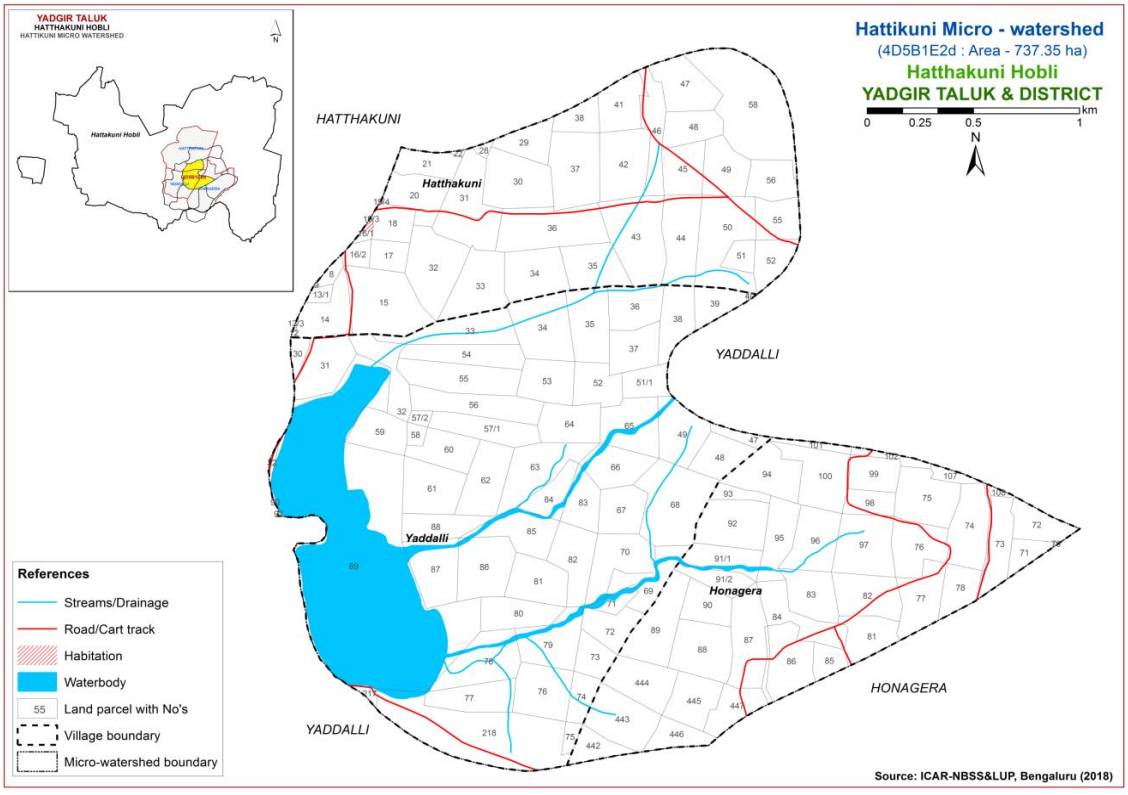


Fig 3.1 Scanned and Digitized Cadastral map of Hattikuni Microwatershed

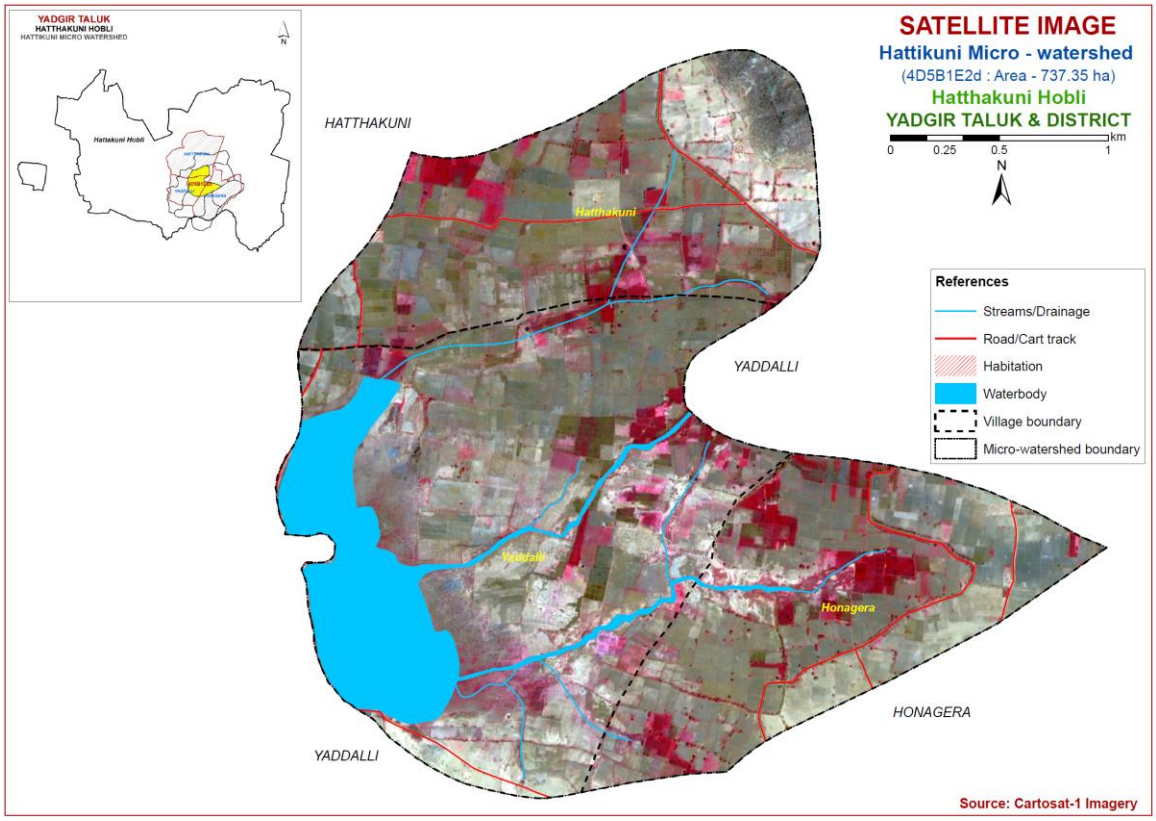


Fig.3.2 Satellite Image of Hattikuni Microwatershed

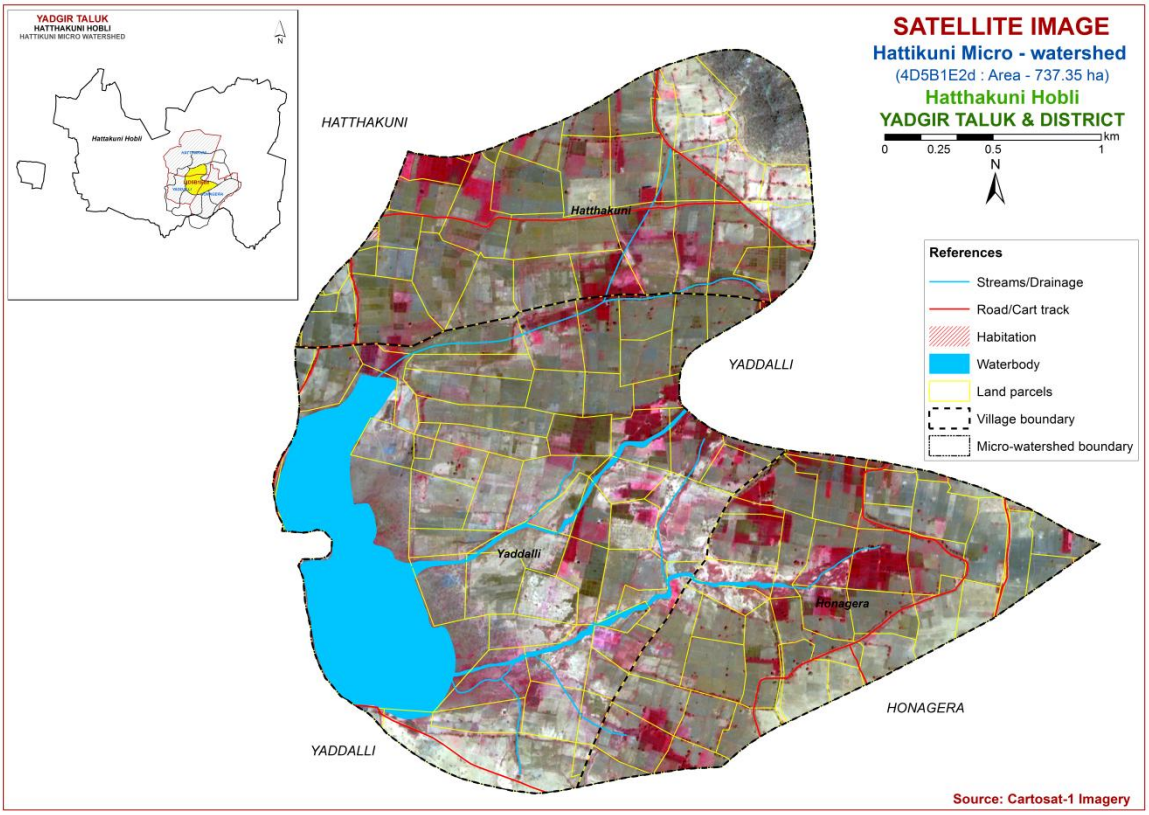


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Hattikuni Microwatershed

3.3 Field Investigation

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

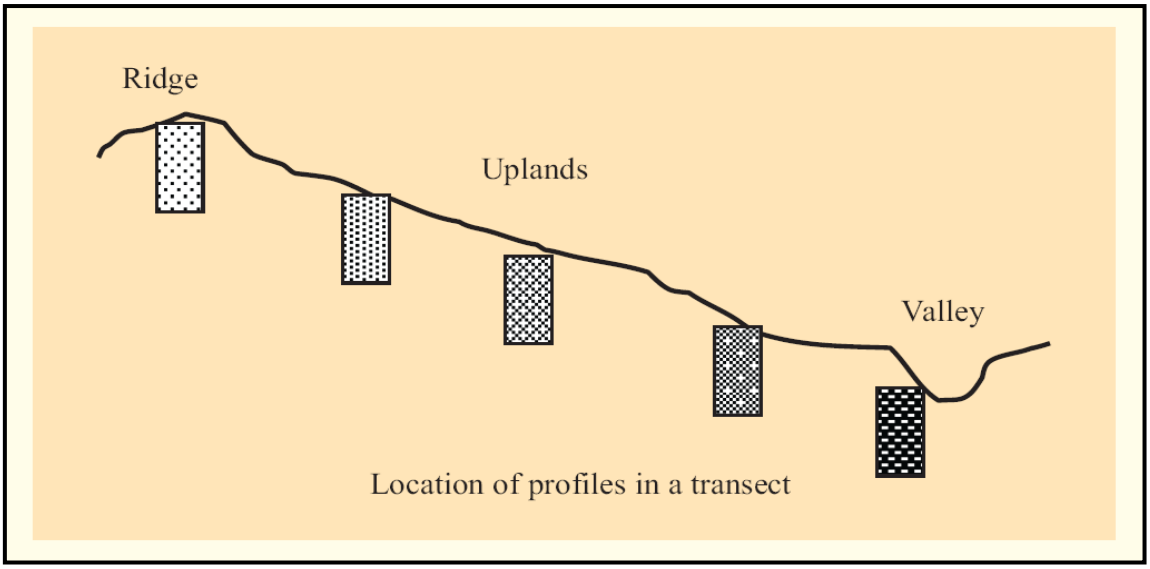


Fig: 3.4. Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, calcareousness, amount and nature of gravel present, nature of substratum etc, were used as the major differentiating characteristics for

identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 8 soil series were identified in the Hattikuni 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**	**Calcareous-ness**
Soil of Granite and Granite Gneiss Landscape							
1	BDL (Badiyala)	25-50	7.5YR 2.5/3,2.5/2,3/3 10YR 3/4,4/3	sl	-	Ap-Bw	e
2	HTK (Hattikuni)	25-50	10YR, 7.5YR	sl	10-25	Ap-AC	-
3	SBR (Sambara)	50-75	10YR 7/1 7.5YR 7/4	ls	<15	Ap-AC	-
4	JNK (Jinkera)	50-75	10YR 3/1,3/2 7.5YR 3/4	scl	<15	Ap-Bw	e
5	KBD (Kalebelagundi)	75-100	2.5YR4/4, 3/4, 5YR4/2,4/3	g scl	35-60	Ap-Bt	-
6	ANR (Anur)	100-150	10YR 4/3,4/1	c	-	Ap-Bw	es
7	MDG (Mundaragi)	100-150	10YR4/4,3/3, 7.5YR 4/4	scl	-	Ap-Bw	-
8	MDR (Madhwara)	>150	10YR3/2,3/1,2/1,2/2	sc	-	Ap-Bw	e

3.4 Soil Mapping

The area under each soil series was further separated into soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management. The soil mapping units are shown on the map (Fig.3.5) in the form of symbols. During the survey about 10 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 16 mapping units representing 8 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 16 soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

3.5 Land Management Units (LMU's)

The 16 soil phases identified and mapped in the microwatershed were grouped into 4 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been choosen for identification and delineation of LMUs. For Hattikuni microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope, erosion and gravel content have been considered for defining LMUs. The land use classes are expected to behave similarly for a given level of management.

3.6 Laboratory Characterization

Soil samples were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected from farmer's fields (68 samples) for fertility status (major and micronutrients) at 320 m grid interval in the year 2017 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 by using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Hattikuni Microwatershed

Soil No*	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
SOIL OF GRANITE GNEISS LANDSCAPE				
	BDL	Badiyala soils are shallow (25-50 cm), well drained, have dark brown to very dark brown and dark yellowish brown, slightly calcareous sandy loam soils occurring on very gently to gently sloping uplands under cultivation		**27 (3.66)**
5		BDLiB2	Sandy clay surface, slope 1-3%, moderate erosion	27 (3.66)
	HTK	Hattikuni soils are shallow (25-50 cm), well drained, have dark yellowish brown sandy loam soils occurring on very gently sloping uplands under cultivation		**69(9.32)**
161		HTKbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	51 (6.92)
165		HTKcB2	Sandy loam surface, slope 1-3%, moderate erosion	18 (2.4)
	SBR	Sambara soils are moderately shallow (50-75 cm), somewhat excessively drained, have light gray to pink, loamy sand soils occurring on very gently to gently sloping uplands under cultivation		**52 (6.99)**
11		SBRcB2	Sandy loam surface, slope 1-3%, moderate erosion	52 (6.99)

	JNK	Jinkera soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark grayish brown, slightly calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation		**41(5.6)**
22		JNKiB2	Sandy clay surface, slope 1-3%, moderate erosion	2 (0.27)
166		JNKcA1	Sandy loam surface, slope 0-1%, slight erosion	39 (5.33)
	KBD	Kalabelagundi soils are moderately deep (75-100 cm), well drained, have reddish brown to dark reddish brown and dark reddish gray, gravelly sandy clay loam red soils occurring on very gently sloping uplands under cultivation		**26 (3.55)**
130		KBDhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	26 (3.55)
	ANR	Anur soils are deep (100-150 cm), moderately well drained, have dark gray to brown, calcareous sodic clay soils occurring on very gently sloping uplands under cultivation		**240(32.59)**
53		ANRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	52 (7.12)
167		ANRcA1	Sandy loam surface, slope 0-1%, slight erosion	150(20.31)
168		ANRcB2	Sandy loam surface, slope 1-3%, moderate erosion	38 (5.16)
	MDG	Mundargi soils are deep (100-150 cm), moderately well drained, have brown to dark yellowish brown, sandy clay loam soils occurring on very gently sloping uplands under cultivation		**38(5.24)**
169		MDGcA1	Sandy loam surface, slope 0-1%,slight erosion	37 (5.06)
148		MDGhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	1 (0.18)
	MDR	Madhwara soils are very deep (>150 cm), moderately well drained, have very dark gray to very dark brown, slightly calcareous sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation		**155.39 (21.14)**
59		MDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	2 (0.25)
60		MDRiA1	Sandy clay surface, slope 0-1%, slight erosion	142 (19.3)
132		MDRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	11 (1.54)
133		MDRiB2	Sandy clay surface, slope 1-3%, moderate erosion	0.39(0.05)
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	**16 (2.21)**
1000		Others	Habitation & Water body	**71 (9.69)**

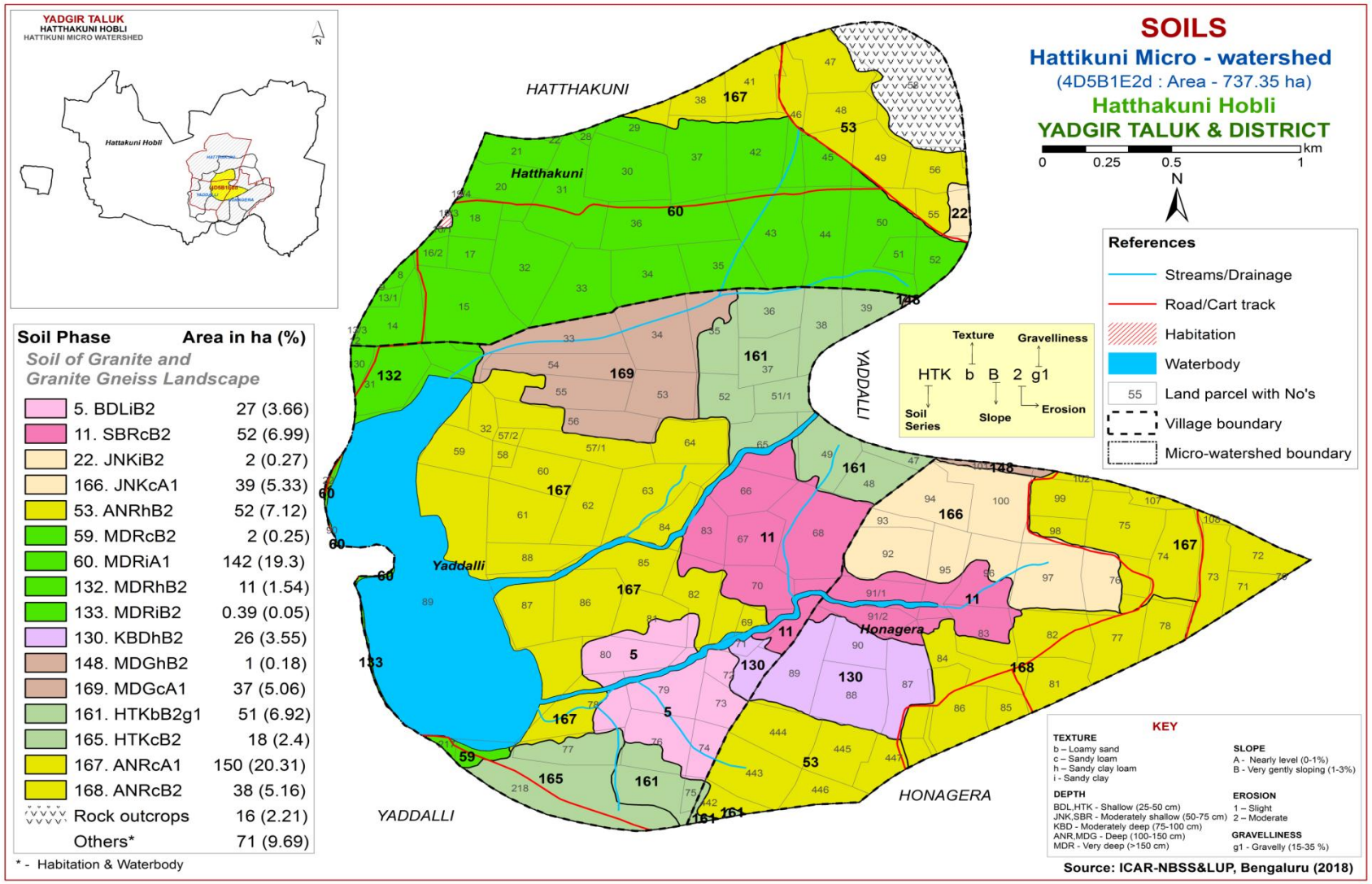


Fig 3.5 Soil Phase or Management Units - Hattikuni Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and their distribution of different kinds of soils occurring in Hattikuni microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss landscape based on geology. In all, 8 soil series are identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. In the granite gneiss landscape, it is by parent material, relief and climate.

A brief description of each of the 8 soil series identified followed by 16 soil phases (management units) mapped under each series are furnished below. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of granite gneiss landscape

In this landscape, 8 soil series are identified and mapped. Of these, ANR series occupies maximum area of 240 ha (33%) followed by MDR 155 ha (21%), HTK 69 ha (9%), SBR 52 ha (7%), JNK 41 ha (6%), MDG 38 ha (5%), BDL 27 ha (4%) and KBD 26 ha (4%). Brief description of each series identified and number of soil phases mapped is given below.

4.1.1 Badiyala (BDL) Series: Badiyala soils are shallow (25-50 cm), well drained, have very dark brown, dark yellow brown and dark brown, slightly calcareous sandy loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Badiyala series has been classified as a member of the coarse-loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum ranges from 28 to 50 cm. The thickness of A horizon ranges from 4 to 12 cm. Its colour is in 10YR hue with value 3 to 4 and chroma 3 to 4. The texture is loamy sand, sandy clay loam and sandy clay. The thickness of B horizon ranges from 27 to 45 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 4 and chroma 3 to 4. Its texture is sandy loam to sandy clay loam and is slightly calcareous. The available water capacity is very low (<50mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Badiyala (BDL) Series

4.1.2 Hattikuni (HTK) Series: Hattikuni soils are shallow (25-50 cm), well drained, have dark brown to dark yellowish brown sandy loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Hattikuni series has been classified as a member of the mixed, isohyperthermic family of Lithic Ustipsamments.

The thickness of the soil ranges from 36 to 50 cm. The thickness of A horizon ranges from 8 to 12 cm. Its colour is in 10YR and 7.5 YR hue with value 3 to 4 and chroma 4 to 6. The texture varies from loamy sand to sandy loam. The thickness of subsurface horizon ranges from 28 to 42 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 4 and chroma 4 to 6. Its texture varies from loamy sand to sand and sandy loam. The available water capacity is very low (<50 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Hattikuni (HTK) Series

4.1.3 Sambara (SBR) Series: Sambara soils are moderately shallow (50-75 cm), somewhat excessively drained, have light grey to reddish yellow, loamy sand soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Sambara series has been classified as a member of the sandy, mixed, isohyperthermic family of Typic Ustipsamments.

The thickness of the soil ranges from 52-75 cm. Thickness of A horizon ranges from 8 to 23 cm. Its colour is in hue 10 YR and 7.5 YR with value 3 and chroma 1 to 4. The texture varies from loamy sand to sandy loam. The thickness of subsurface horizons ranges from 41 to 66 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 5 and chroma 1 to 4. The texture is loamy sand. The available water capacity is very low (<50 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Sambara (SBR) Series

4.1.4 Jinkera (JNK) Series: Jinkera soils are moderately shallow (50-75 cm), well drained, have very dark gray to very dark grayish brown and dark brown, slightly calcareous sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Jinkera series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 51-75 cm. Thickness of A horizon ranges from 6 to 11 cm. Its colour is in hue 10 YR and 7.5 YR with value and chroma of 3 to 4. The texture varies from sandy loam to sandy clay. The thickness of B horizon ranges from 53 to 66 cm. Its colour is in 10 YR and 7.5 YR hue with value and chroma of 2 to 4. The texture varies from sandy clay loam to sandy clay and is slightly calcareous. The available water capacity is low (51-100 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Jinkera (JNK) Series

4.1.5 Kalabelagundi (KBD) Series: Kalabelagundi soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark reddish grey and reddish brown, gravelly sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Kalabelagundi series has been classified as a member of the loamy-skeletal, mixed, isohyperthermic family of Typic Haplustalfs.

The thickness of the solum ranges from 75 to 98 cm. The thickness of A horizon ranges from 10 to 19 cm. Its colour is in hue 5 YR and 7.5 YR with value 3 to 4 and chroma 2 to 4. Its texture varies from loamy sand to sandy loam and sandy clay loam. The thickness of B horizon ranges from 70 to 84 cm. Its colour is in hue 5 YR and 2.5YR with value 3 to 4 and chroma 2 to 4. Its texture is sandy clay loam to sandy 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 Kalabelagundi (KBD) Series

4.1.6 Anur (ANR) Series: Anur soils are deep (100-150 cm), moderately well drained, have dark gray to dark brown, calcareous sodic clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Anur series has been classified as a member of the fine, mixed (calcareous), isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 102 to 148 cm. The thickness of A-horizon ranges from 9 to 17 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture ranges from loamy sand to sandy clay loam and sandy clay and are calcareous. The thickness of B horizon ranges from 102 to 135 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 6. Texture is sandy clay loam to sandy clay and clay and is calcareous sodic soils. The available water capacity is very high (>200 mm/m). Three phases were identified and mapped.

Landscape and Soil Profile characteristics of Anur (ANR) Series

4.1.7 Mundargi (MDG) Series: Mundargi soils are deep (100-150 cm), moderately well drained, dark brown to dark yellowish brown, sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Mundargi series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum ranges from 100 to 149 cm. The thickness of A horizon ranges from 8 to 20 cm. Its colour is in 10 YR hue with value 3 and chroma 1 to 4. The texture ranges from sandy loam to sandy clay loam and sandy clay. The thickness of B horizon ranges from 105 to 140 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture varies from sandy loam to sandy clay loam and sandy clay. The available water capacity is very high (>200 mm/m). Three phases were identified and mapped.

Landscape and Soil Profile characteristics of Mundargi (MDG) Series

4.1.8 Madhwara (MDR) Series: Madhwara soils are very deep (>150 cm), well drained, have black to very dark brown and very dark gray to very dark grayish brown, slightly calcareous sandy clay soils. They are developed from weathered granite gneiss and occur on nearly level to very gently sloping uplands under cultivation. The Madhwara series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 10 to 16 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 2 to 3. Texture varies from sandy clay and clay. The thickness of B horizon is >150 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. Texture varies from sandy clay loam to sandy clay and is slightly calcareous. The available water capacity is very high (>200 mm/m). Four phases were identified and mapped.

Landscape and Soil Profile characteristics of Madhwara (MDR) Series

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

Soil Series: Badiyala **(**BDL) **Pedon:** R-5

Location: $16^0$37'10.0"N $77^0$20'21.5", Gudalagunta village, Balichakra hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Coarse-loamy, mixed, isohyperthermic Fluventic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-12	Ap	87.13	7.04	5.83	10.03	24.32	23.61	23.51	5.67	<15	ls	6.27	2.44
12-28	Bw1	64.63	13.30	22.07	6.74	13.07	22.30	17.01	5.50	<15	scl	16.34	7.83
28-52	BC	73.11	12.02	14.87	3.93	16.03	26.89	18.41	7.86	<15	sl	12.94	5.47

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	6.20	-	-	0.074	1.00	0.00	2.80	0.98	0.14	0.01	3.92	4.20	0.72	93	0.20
12-28	9.04	-	-	0.253	0.80	3.20	-	-	0.16	0.69	-	16.90	0.77	100	4.09
28-52	9.41	-	-	0.364	1.10	3.60	-	-	0.16	1.39	-	11.10	0.75	100	12.52

Contd...

Soil Series: Hattikuni (HTK), Pedon: R-7

Location: $16^0$50'46.5"N $77^0$10'16.4"E, Yaddalli village, Hattikuni hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Mixed, isohyperthermic Lithic Ustipsamments

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	90.89	5.62	3.49	8.50	13.46	29.86	29.55	9.51	20	s	7.73	3.16
12-22	A1	89.97	6.53	3.50	7.19	13.48	29.48	29.79	10.03	20	s	8.00	3.05
22-45	A2	87.20	6.43	6.38	11.09	14.42	31.55	7.16	22.98	40	ls	7.67	3.96

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	6.81	-	-	0.062	0.07	-	2.35	0.50	0.16	0.01	3.02	3.0	0.86	100	0.38
12.0-22	6.80	-	-	0.050	0.21	-	1.67	0.30	0.09	0.01	2.07	2.4	0.69	86.30	0.45
22-45	6.85	-	-	0.044	0.19	-	1.82	0.42	0.10	0.06	2.40	2.6	0.41	92.41	2.17

Contd...

Soil Series: Sambara (SBR) **Pedon:** R-10

Location: $16^0$42'04.5"N $77^0$14'35.3"E, Jinatera village, Balichakra hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Mixed, isohyperthermic Typic Ustipsamments

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
0-9	Ap	81.90	8.22	9.88	23.76	14.05	23.76	10.62	9.71	-	ls	9.45	2.69
9-17	C1	84.08	6.59	9.33	21.30	20.69	17.65	17.65	6.80	-	ls	7.84	2.65
17-60	C2	86.86	6.17	6.98	11.53	21.54	25.08	23.46	5.26	-	ls	5.48	2.62
60-78	C3	87.27	6.92	5.81	15.05	20.91	26.36	19.29	5.66	-	ls	5.19	2.81

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}							%	%
0-9	8.24	-	-	0.145	0.61	0.91	-	-	0.12	0.09	-	7.50	0.76	100	1.15
9-17	8.21	-	-	0.068	0.57	0.39	-	-	0.06	0.12	-	6.70	0.72	100	1.82
17-60	8.47	-	-	0.080	0.38	0.48	-	-	0.03	0.17	-	2.70	0.39	100	6.34
60-78	8.50	-	-	0.081	0.30	0.52	-	-	0.03	0.17	-	2.70	0.46	100	6.43

Contd...

Soil Series: Jinkera **(**JNK) **Pedon:** R-1

Location: $16^0$45'13.5"N $77^0$10'59.8"E, Varkanahalli village, Yadgir hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-15	Ap	66.84	13.62	19.54	12.15	21.22	11.23	12.56	9.68	10	sl	14.42	7.70
15-38	Bw1	59.08	12.11	28.81	12.53	12.42	17.85	8.77	7.52	20	scl	18.21	12.23
38-50	Bw2	68.21	11.68	20.11	17.90	21.81	10.60	10.80	7.10	10	scl	14.54	8.96

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-15	8.42	-	-	0.148	0.70	0.65	-	-	0.15	0.03	-	14.50	0.74	100	0.18
15-38	8.38	-	-	0.226	0.31	2.21	-	-	0.09	0.23	-	21.70	0.75	100	1.05
38-50	8.40	-	-	0.195	0.25	1.17	-	-	0.07	0.19	-	15.90	0.79	100	1.23

Contd...

Soil Series: Kalabelagundi (KBD) **Pedon:** R-13

Location: $16^0$43'78.3"n $77^0$13'71.4"E, Halagera village, Yadgir hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Loamy-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
0-11	Ap	72.35	5.19	22.46	7.19	14.29	19.01	25.28	6.58	15	scl	15.12	8.16
11-35	Bt1	73.20	5.81	20.99	13.66	18.67	16.79	17.62	6.47	20	scl	11.58	7.29
35-64	Bt2	51.68	7.30	41.03	29.41	8.00	4.86	5.62	3.78	40	sc	19.86	14.24
64-89	BC	64.35	3.51	32.15	21.84	12.03	14.87	10.23	5.38	40	scl	16.72	10.36

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}							%	%
0-11	7.84	-	-	0.604	0.88	0.52	8.69	2.17	0.44	0.49	11.78	11.50	0.51	102	4.27
11-35	5.57	-	-	0.181	0.68	0.00	6.40	1.63	0.18	0.14	8.36	9.10	0.43	92	1.57
35-64	7.42	-	-	0.098	0.44	1.05	15.82	2.34	0.12	0.76	19.04	19.60	0.48	97	3.90
64-89	6.66	-	-	0.165	0.56	0.65	10.45	4.00	0.09	0.43	14.97	15.10	0.47	99	2.86

Contd...

Soil Series: Anur (ANR) **Pedon:** R-15

Location: $16^0$32'45.0"N $77^0$23'57.4"E, Duppalli village, Sydhapura hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	64.60	13.44	21.96	7.33	10.42	18.68	20.12	8.05	<15	scl	16.59	7.96
18-49	Bw1	56.66	12.19	31.15	4.73	9.80	18.66	17.02	6.45	-	scl	33.38	13.51
49-95	Bw2	39.94	17.81	42.25	3.09	3.30	15.44	10.65	7.45	<15	c	44.68	25.23
95-123	Bw3	30.65	17.58	51.77	1.50	5.57	10.18	9.65	3.75	<15	c	54.94	32.07

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	10.17	-	-	0.365	0.48	6.11	-	-	0.25	3.52	-	19.90	0.91	100	7.08
18-49	10.32	-	-	1.38	0.30	6.76	-	-	0.21	16.03	-	24.60	0.79	100	26.07
49-95	10.08	-	-	2.55	0.17	6.11	-	-	0.33	21.49	-	32.60	0.77	100	26.36
95-123	9.92	-	-	2.56	0.12	7.93	-	-	0.51	26.03	-	36.00	0.70	100	28.92

Contd...

Soil Series: Mundargi **(**MDG) **Pedon:** R-2

Location: $16^0$46'82.4"N $77^0$04'85.2"E, Thumakura village, Yadgir hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-9	Ap	81.23	12.97	5.80	4.84	10.19	14.83	37.94	13.42	<15	ls	11.75	3.31
9-20	A2	76.82	16.19	6.98	4.96	10.12	20.75	27.53	13.46	-	ls	14.52	3.99
20-46	Bw1	42.43	17.43	40.15	2.26	5.59	11.49	14.93	8.16	-	c	34.90	21.14
46-90	Bw2	54.51	16.56	28.93	4.72	5.03	19.92	16.67	8.18	-	scl	36.73	18.88
90-110	Bw3	53.69	11.00	35.30	9.57	9.89	16.23	13.01	4.99	-	sc	38.72	20.53

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}							%	%
0-9	8.2	-	-	0.399	0.44	0.78	-	-	0.16	0.38	-	4.90	0.84	100	3.08
9-20	8.44	-	-	0.075	0.29	1.82	-	-	0.05	0.35	-	4.90	0.70	100	2.88
20-46	9.39	-	-	0.451	0.32	2.73	-	-	0.12	5.22	-	20.77	0.52	100	10.06
46-90	9.75	-	-	0.616	0.24	3.25	-	-	0.12	5.72	-	16.56	0.57	100	13.82
90-110	9.72	-	-	0.725	0.24	3.64	-	-	0.14	6.84	-	19.76	0.56	100	13.836

Contd...

Soil Series: Madhawara (MDR) **Pedon:** T_2 P_2

Location: $16^0$43'48.9"N $77^0$18'38.3"E, Yaleri village, Balichakra hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-11	Ap	58.94	20.74	20.32	5.41	7.28	13.31	20.89	12.06	-	scl	16.47	8.85
11-30	Bw1	55.52	19.32	25.16	5.00	7.19	13.12	19.69	10.52	-	scl	18.25	10.18
30-53	Bw2	53.95	19.15	26.90	4.68	7.48	12.58	19.65	9.56	-	scl	26.99	14.02
53-117	Bw3	52.68	19.51	27.81	2.84	5.47	14.72	20.82	8.83	-	scl	37.86	17.40
117-160	Bw4	49.95	17.27	32.79	2.11	5.07	14.15	20.49	8.13	-	scl	44.15	20.38

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}							%	%
0-11	8.31	-	-	0.33	0.46	2.76	-	-	0.45	0.47	-	20.57	1.01	100	0.90
11-30	9.25	-	-	0.20	0.31	4.20	-	-	0.19	1.40	-	23.98	0.95	100	2.34
30-53	9.78	-	-	0.40	0.19	5.76	-	-	0.16	1.53	-	24.53	0.91	100	2.49
53-117	9.94	-	-	0.88	0.23	4.80	-	-	0.18	9.09	-	24.31	0.87	100	14.96
117-160	9.98	-	-	0.93	0.15	3.00	-	-	0.24	11.09	-	28.27	0.86	100	15.69

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

Soil Characteristics: Depth, texture, gravelliness, calcareousness.

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

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

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

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

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

Class III: They are moderately good lands that have moderate 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 16 soil map units identified in the Hattikuni microwatershed are grouped under 2 land capability classes and 4 subclasses. An area about 650 ha (89%) in the microwatershed is suitable for agriculture (Fig. 5.1).

Good cultivable lands (Class II) cover an area of about 528 ha (72%) and are distributed in the major part of the microwatershed with minor problems of soil depth and erosion. Moderately good cultivable lands (Class III) cover an area of about 122 ha (17%) and are distributed in southern and central part of the microwatershed with moderate problems of soil depth and erosion. An area about 16 ha (2%) in the microwatershed is covered by rock outcrops and distributed in the northern part of the microwatershed. An area about 71 ha (10%) covered by others (habitation and water bodies) and distributed in the southwestern part of the microwatershed.

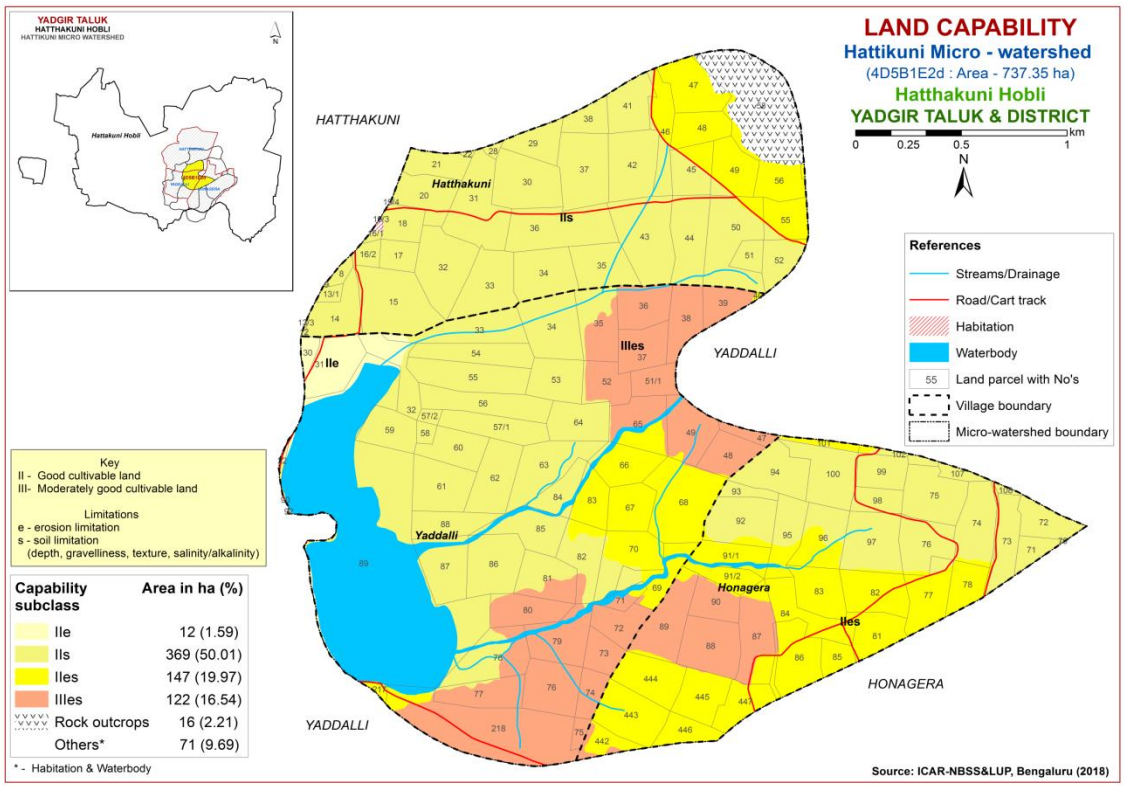


Fig. 5.1 Land Capability map of Hattikuni Microwatershed

5.2 Soil Depth

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

Shallow (25-50 cm) soils occur in an area of 96 ha (13%) and are distributed in the southern and central part of the microwatershed. Moderately shallow (50-75 cm) soils occupy an area of about 93 ha (13%) and are distributed in the southeastern part of the microwatershed. Moderately deep (75-100 cm) soils occupy an area of about 26 ha (4%) and are distributed in the southern part of microwatershed. Deep (100-150 cm) soils cover an area of 279 ha (38%) and are distributed in the major part of the microwatershed. Very deep (>150 cm) soils cover an area of 156 ha (21%) and are distributed in the northwestern, western and northern part of the microwatershed.

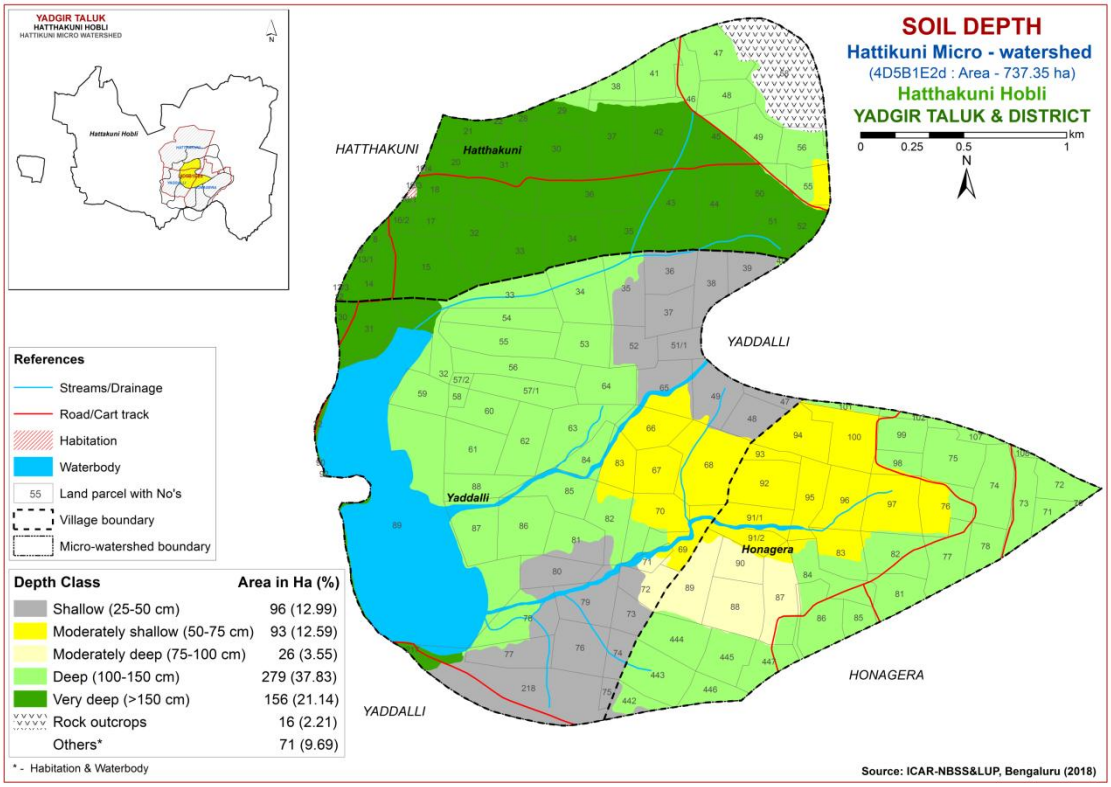


Fig. 5.2 Soil Depth map of Hattikuni Microwatershed

The most productive lands 435 ha (59%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep to very deep (100 to >150 cm depth) soils occurring in the major part of the microwatershed. The problematic soils covered an area about 96 ha (13%) which occupy southern and central part of the microwatershed, where the soils are shallow and suitable for short duration crops and the probability of crop failure is high.

5.3 Surface Soil Texture

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

An area of about 51 ha (7%) has soils that are sandy at the surface and are distributed in the central and southern part of the microwatershed. Maximum area of about 427 ha (58%) is loamy and is distributed in the major part of the microwatershed. An area of 172 ha (23%) has soils that are clayey at the surface and occur in the southern, northern and northwestern part of the microwatershed.

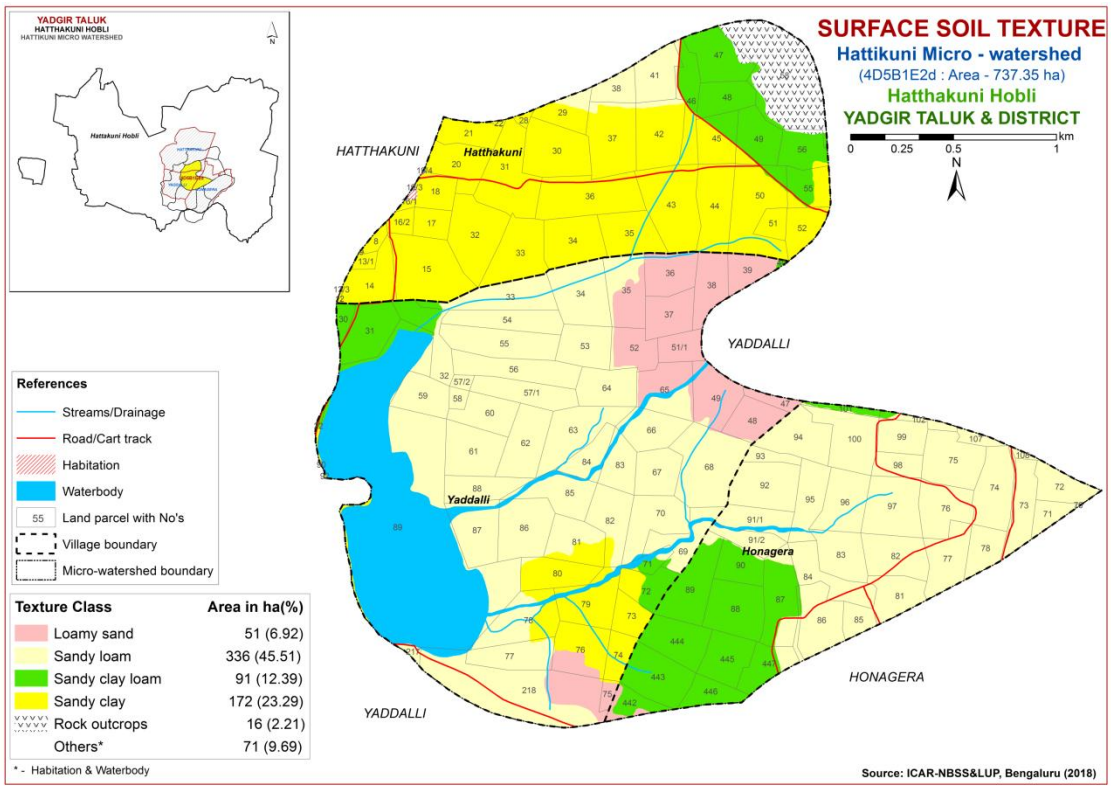


Fig. 5.3 Surface Soil Texture map of Hattikuni Microwatershed

Entire area has most productive lands with respect to surface soil texture except 7 per cent area where they are sandy soils. The clayey soils (23%) have high potential for soil-water retention and availability, and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other productive lands are loamy soils (58%) which also have high potential for soil-water retention and nutrient availability but have no drainage or other physical problems. The sandy soils (7%) are also productive for root and tuber crops, but these soils have the major limitation of moisture and nutrient retention capacity, hence frequent and shallow irrigation with balanced fertilizer application is to be followed in order to get better crop yields.

5.4 Soil Gravelliness

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

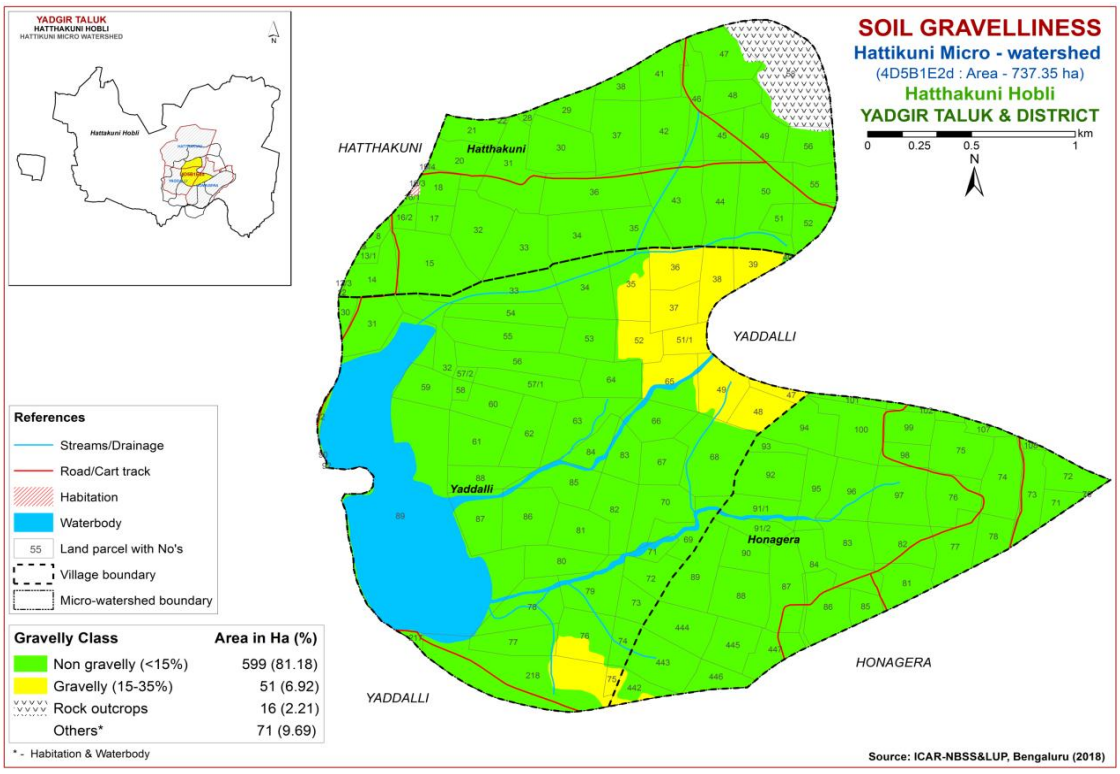


Fig. 5.4 Soil Gravelliness map of Hattikuni Microwatershed

Non gravelly (<15%) soils cover maximum area of about 599 ha (81%) and are distributed in the major part of the microwatershed. An area of about 51 ha (7%) is gravelly (15-35%) and are distributed in the central and southern part of the microwatershed.

The problem soils (7%) that are gravelly (15-35%) where only short or medium duration crops can be grown. The most productive soils (81%) that are non gravelly (<15%), where all climatically adapted long duration crops can be grown.

5.5 Available Water Capacity

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

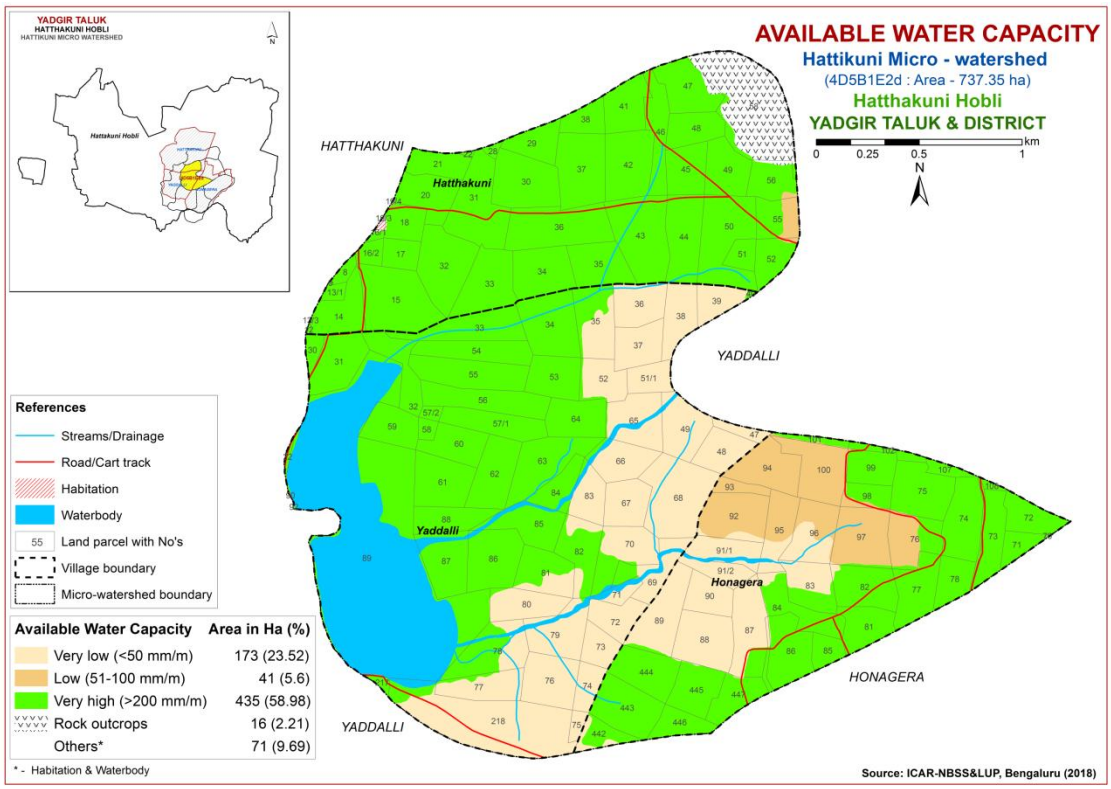


Fig. 5.5 Soil Available Water Capacity map of Hattikuni Microwatershed

An area of about 173 ha (24%) and 41 ha (6%) in the microwatershed has soils that are very low (<50 mm/m) and low (51-100 mm/m) in available water capacity respectively and are distributed in the central southern and southeastern part of the microwatershed. Very high (>200 mm/m) in 435 ha (59%) and are distributed in the major part of the microwatershed.

About 214 ha (30%) area in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. An area of 435 ha (59%) are potential areas with regard to AWC where all climatically adapted annual and perennial crops can be grown.

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 two slope classes and a slope map was generated showing the area extent and their geographic distribution in the microwatershed (Fig. 5.6).

Maximum area of about 369 ha (50%) falls under nearly level (0-1% slope) lands and is distributed in the major part of the microwatershed. An area of about 281

ha (38%) falls under very gently sloping (1-3% slope) lands and is distributed in the central, southern, northern, western and southeastern part of the microwatershed.

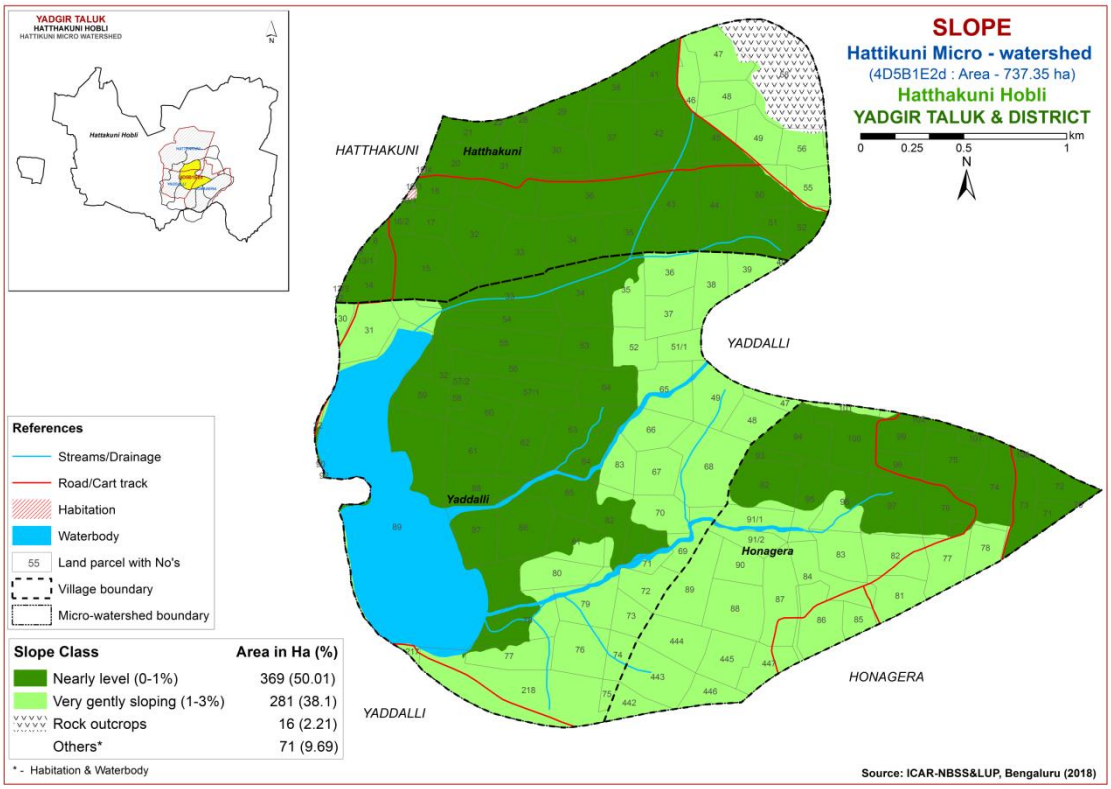


Fig. 5.6 Soil Slope map of Hattikuni Microwatershed

Entire cultivated area of 650 ha (88%) in the microwatershed has soils that have high potential in respect of soil slopes. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

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) cover an area of 369 ha (50%) and are distributed in the major part of the microwatershed. Soils that are moderately eroded

(e2 class) cover an area of 281 ha (38%) and are distributed in the central, southern, western, northern and southeastern part of the microwatershed.

An area about 281 ha (38%) in the microwatershed is problematic because of moderate erosion. For these areas, taking up soil and water conservation and other land development measures are needed.

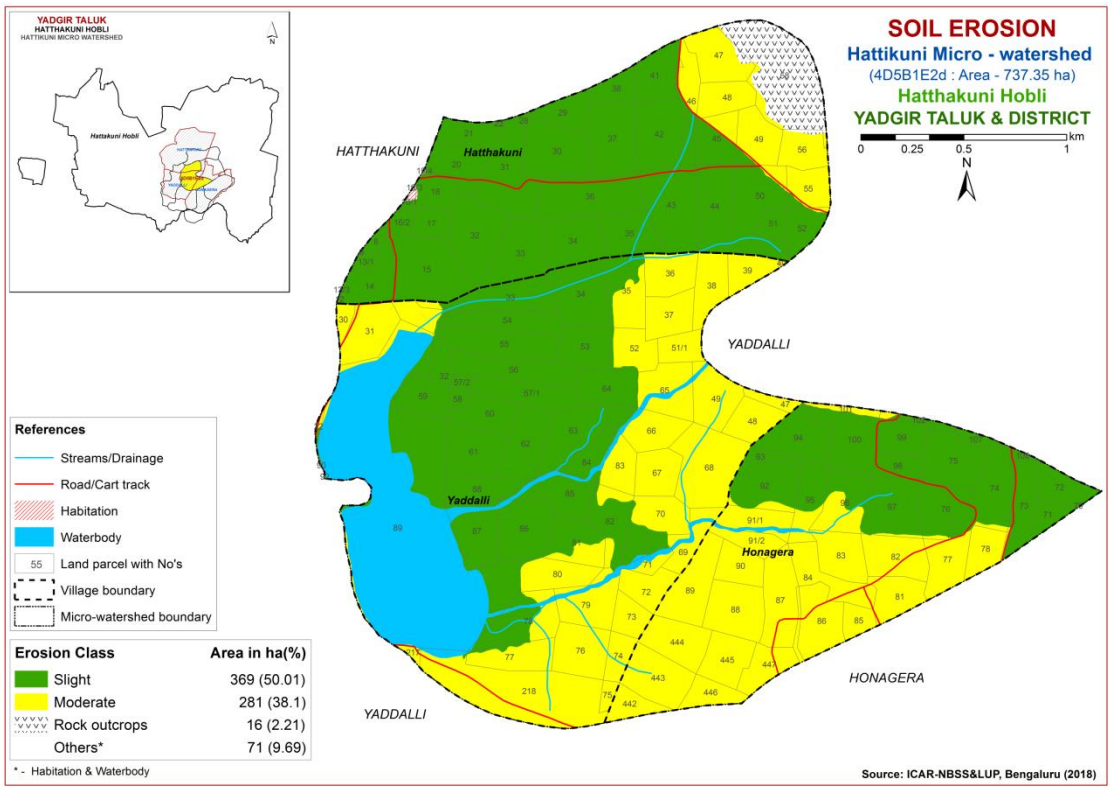


Fig. 5.7 Soil Erosion map of Hattikuni Microwatershed

Chapter 6

FERTILITY STATUS

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

Soil fertility data generated has been assessed and individual maps for all the nutrients for the microwatershed have been generated using 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 Hattikuni microwatershed for soil reaction (pH) showed that an area of about < 1 ha (<1%) is strongly acid (pH 5.0-5.5), < 1 ha (<1%) is moderately acid (pH 5.5-6.0) and 1 ha (<1%) is slightly acid (pH 6.0-6.5) and are distributed in the minor part of the microwatershed. An area of about 201 ha (27%) is neutral (pH 6.5-7.3) and are distributed in the southern, western, southeastern, northern and northwestern part of the microwatershed. Maximum area of about 285 ha (39%) is slightly alkaline (pH 7.3-7.8) and are distributed in the major part of the microwatershed. An area of about 127 ha (17%) are moderately alkaline (pH 7.8-8.4) and are distributed in the southern and northeastern part of the microwatershed. 31 ha (4%) is strongly alkaline (pH 8.4-9.0) and are distributed in the southern part of the microwatershed. An area of 5 ha (<1%) is very strongly alkaline (pH >9.0) and are distributed in minor part of microwatershed. (Fig. 6.1). In all, major area of about 448 ha is alkaline, 201 ha is under neutral and 1 ha is under acid soils.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is high (>0.75%) covering an area of about 170 ha (23%) and are distributed in the central and southeastern part of the microwatershed. Medium (0.5-0.75%) covering a maximum area of about 450 ha (61%) and are distributed in the major part of the microwatershed, whereas low (<0.5%) in about 29 ha (4%) area and are distributed in the southern part of the microwatershed (Fig. 6.3).

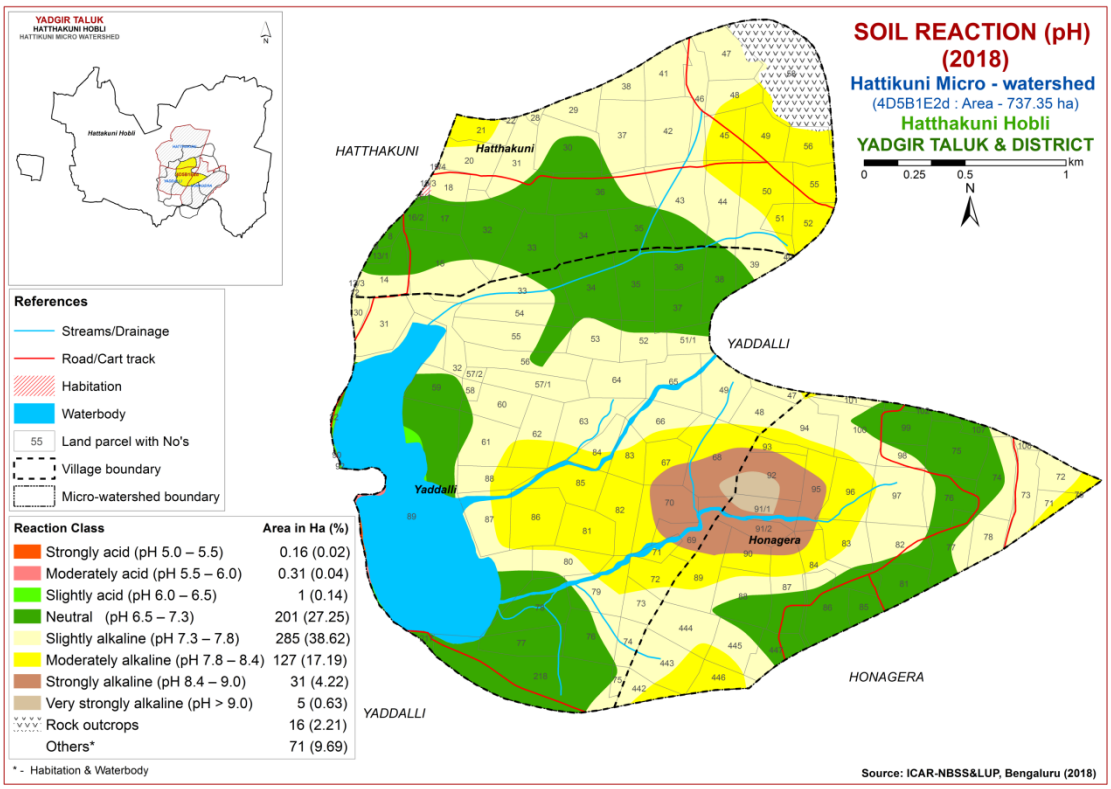


Fig.6.1 Soil Reaction (pH) map of Hattikuni Microwatershed

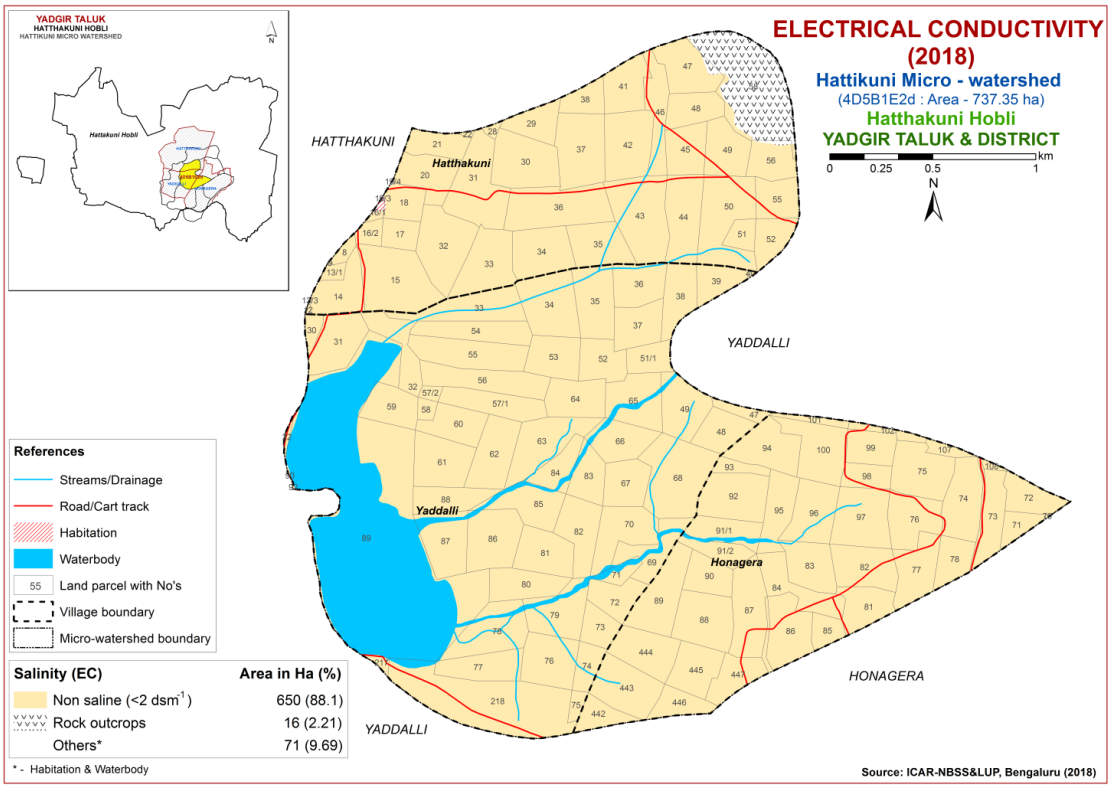


Fig.6.2 Electrical Conductivity (EC) map of Hattikuni Microwatershed

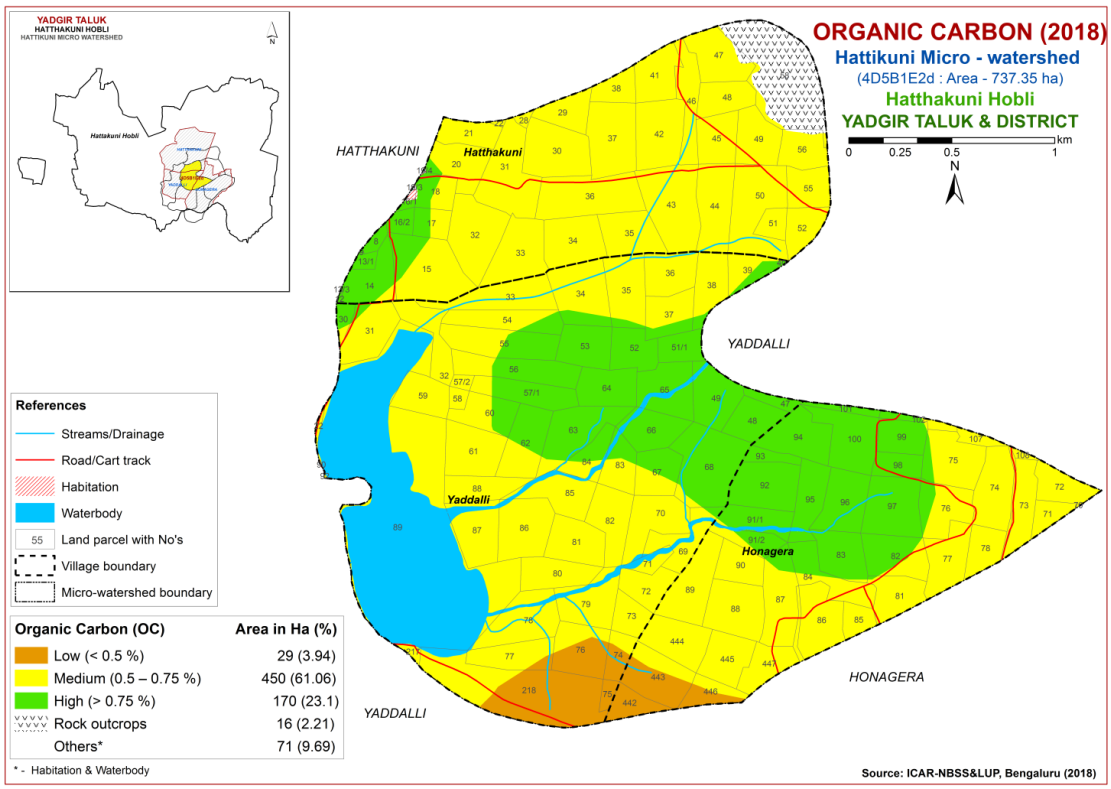


Fig.6.3 Soil Organic Carbon map of Hattikuni Microwatershed

6.4 Available Phosphorus

Available phosphorus content is medium (23-57 kg/ha) in an area of about 595 ha (81%) and occur in all parts of the microwatershed and high (>57 kg/ha) in an area of about 55 ha (7%) and are distributed in the northern, western and southwestern part of the microwatershed (Fig. 6.4).

6.5 Available Potassium

Available potassium content is medium (145-337 kg/ha) in the entire cultivated area of about 650 ha (88%) and are distributed in all parts of the microwatershed (Fig. 6.5).

6.6 Available Sulphur

An area of about 170 ha (23%) is low (<10 ppm) in available sulphur content and are distributed in the northern, southeastern and southern part of the microwatershed, maximum area of about 436 ha (59%) is medium (10-20 ppm) and are distributed in the major part of the microwatershed. High in a small area of about 44 ha (6%) and are distributed in the southwestern and northeastern part of the microwatershed (Fig. 6.6).

6.7 Available Boron

Available boron content is medium (0.5-1.0 ppm) in a maximum area of 251 ha (34 %) and are distributed in the southern, northern, southeastern and northeastern part of the microwatershed. An area of about 398 ha (54%) is low (<0.5 ppm) in available

boron and are distributed in the central, western, eastern and southeastern part of the microwatershed (Fig. 6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) in a maximum area of 643 ha (87%) and are distributed in the major part of the microwatershed and deficient (<4.5 ppm) in an area of 7 ha (<1%) and are distributed in the northern part of the microwatershed (Fig 6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in the entire cultivated area of the microwatershed (Fig 6.11).

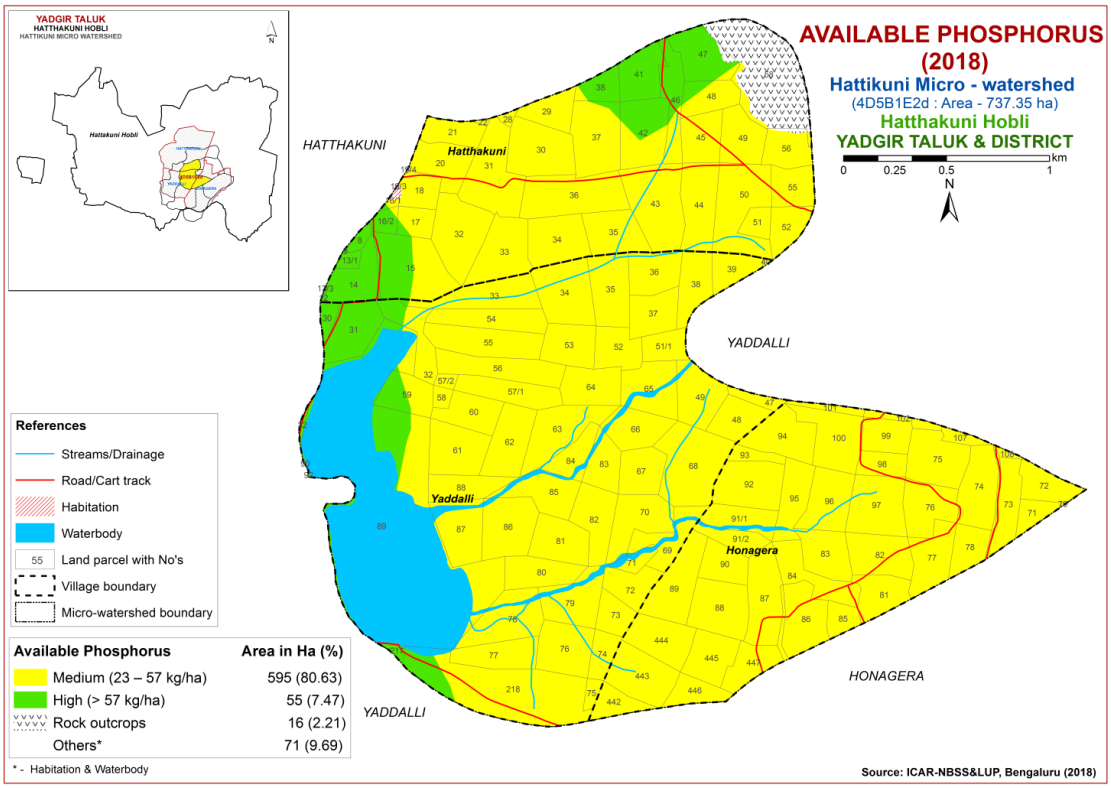


Fig.6.4 Soil Available Phosphorus map of Hattikuni Microwatershed

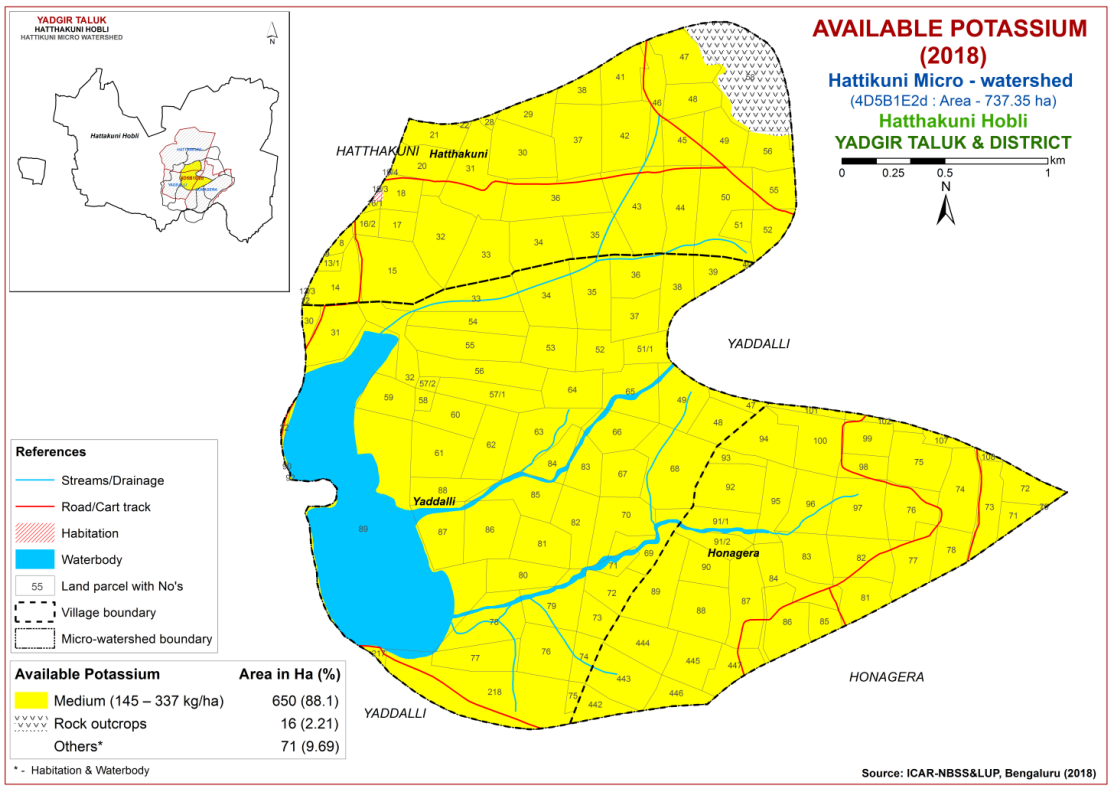


Fig.6.5 Soil Available Potassium map of Hattikuni Microwatershed

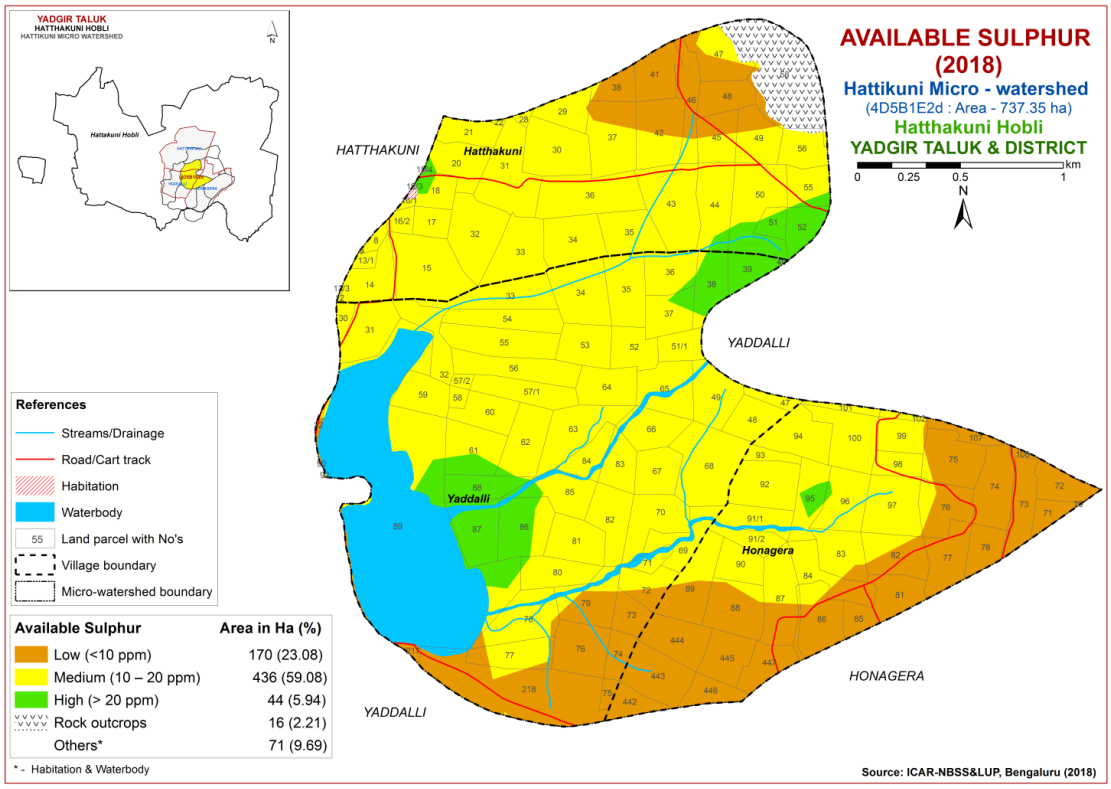


Fig.6.6 Soil Available Sulphur map of Hattikuni Microwatershed

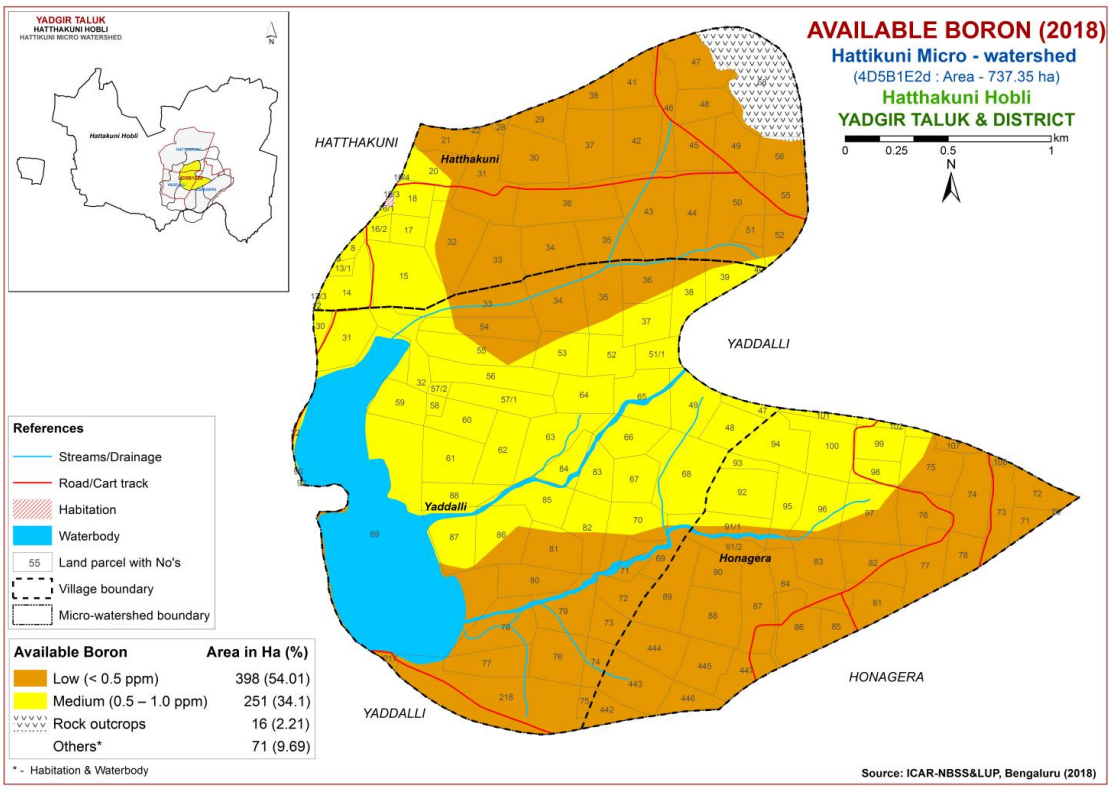


Fig.6.7 Soil Available Boron map of Hattikuni Microwatershed

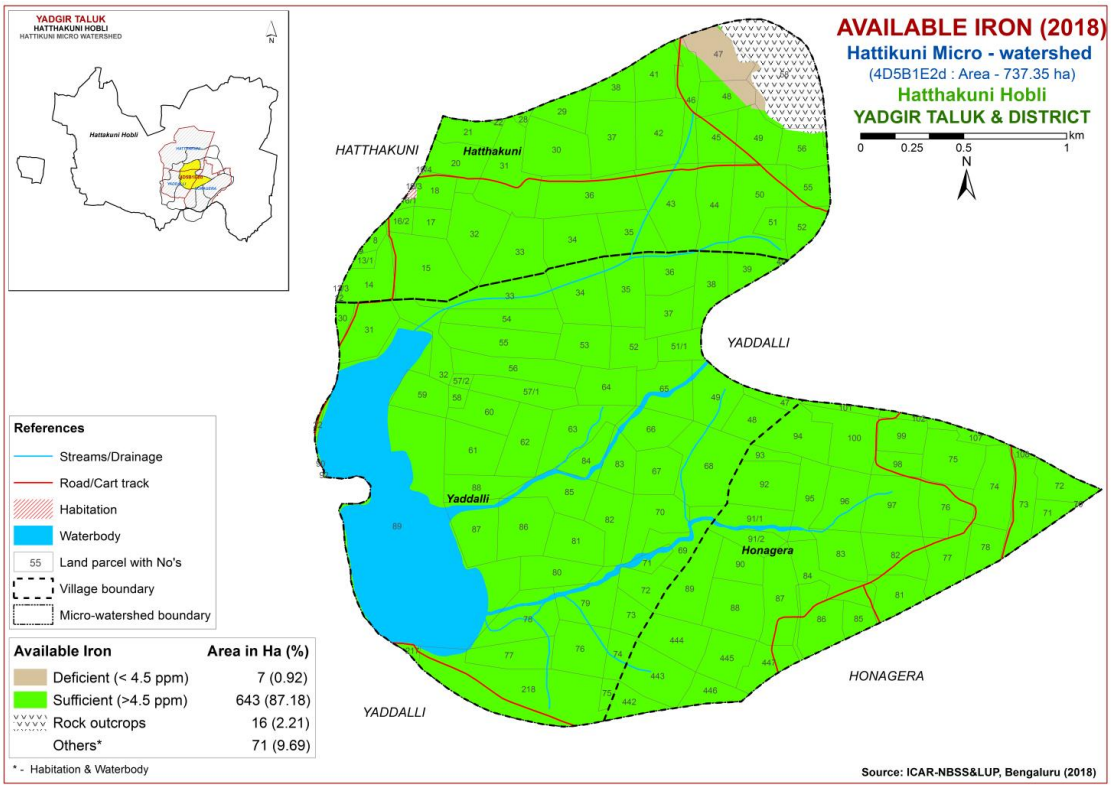


Fig.6.8 Soil Available Iron map of Hattikuni Microwatershed

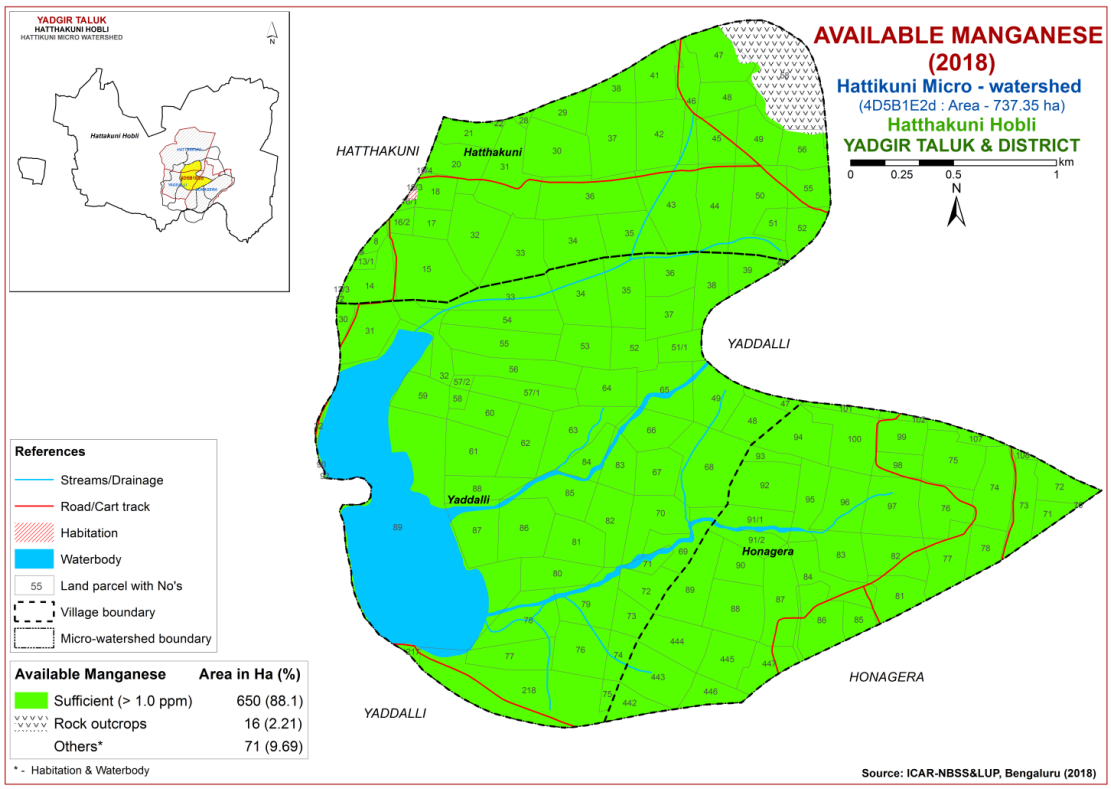


Fig.6.9 Soil Available Manganese map of Hattikuni Microwatershed

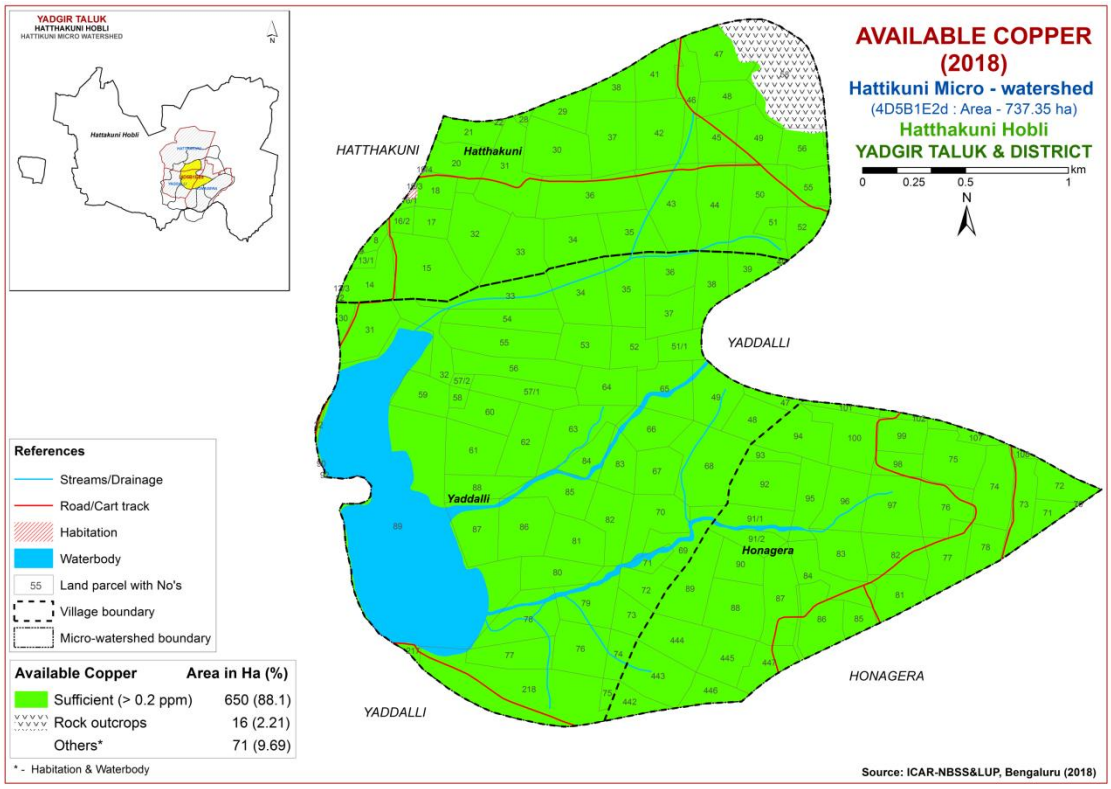


Fig.6.10 Soil Available Copper map of Hattikuni Microwatershed

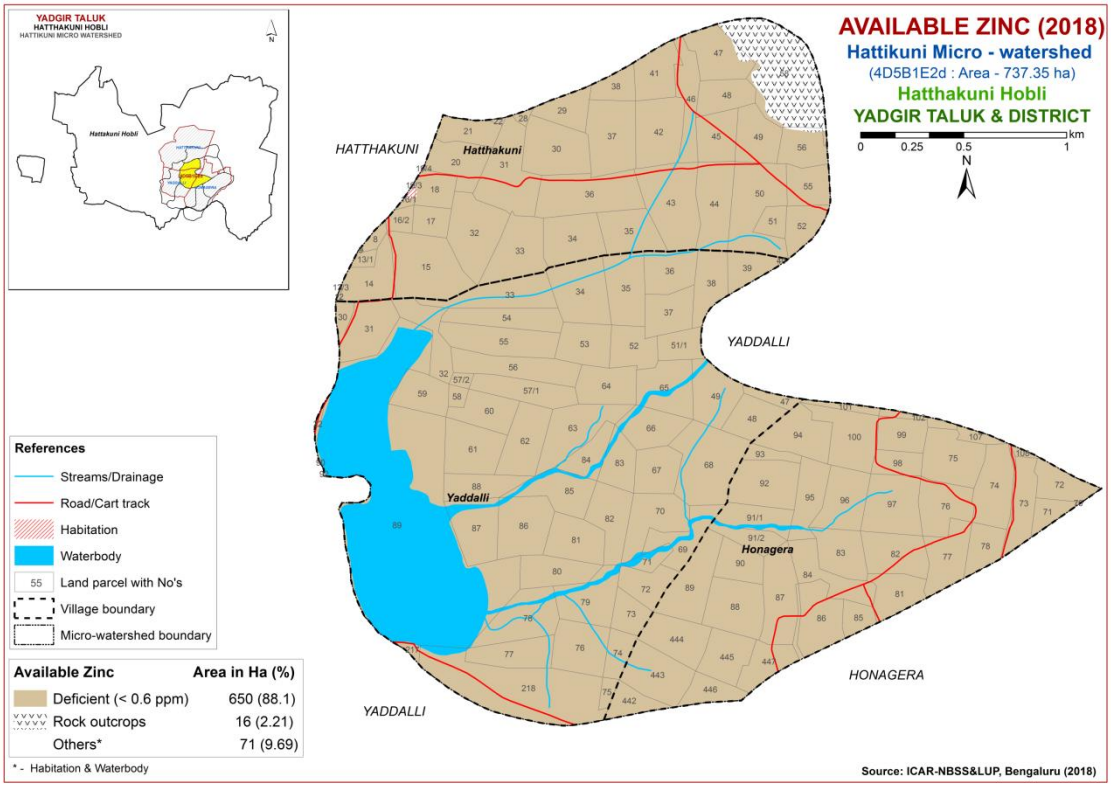


Fig.6.11 Soil Available Zinc map of Hattikuni Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Hattikuni microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015).). The soil and land characteristics were matched with the crop requirements to arrive at the crop suitability. The soil and land characteristics table (Table 7.1) and crop requirements tables (Tables 7.2 to 7.30) are given at the end. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3- Marginally Suitable. Order N has two classes, N1-Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'w' for drainage and 'z' for calcareousness. 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 29 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 crop grown in Karnataka in an area of 10.47 lakh ha in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad, Bellary, Chitradurga, Mysore and Tumakuru districts. The crop requirements for growing sorghum (Table 7.2) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing sorghum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.1.

Major area of about 435 ha (59%) is highly suitable (Class S1) for growing sorghum and are distributed in the major part of the microwatershed. An area of about

41 ha (6%) is moderately suitable (Class S2) for growing sorghum and are distributed in the southeastern part of the microwatershed. They have minor limitation of rooting depth. An area of about 174 ha (24%) is marginally suitable (Class S3) for growing sorghum and are distributed in the central, southeastern and southern part of the microwatershed with moderate limitations of rooting depth, gravelliness and texture.

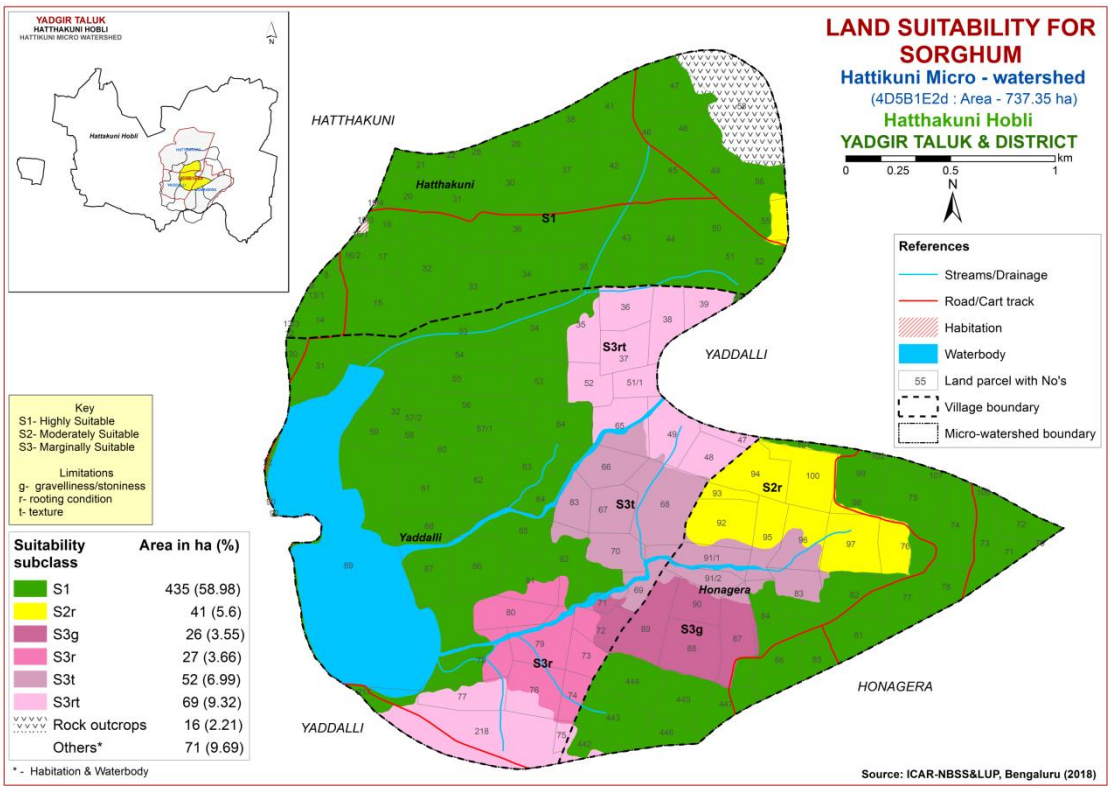


Fig. 7.1 Land Suitability map of Sorghum

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.

Moderately suitable (Class S2) lands cover maximum area of about 476 ha (65%) and occur in the major part of the microwatershed. They have minor limitations of texture and drainage. Marginally suitable lands (Class S3) for growing maize occupy an area of about 174 ha (24%) and occur in the central, southern and southeastern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and texture.

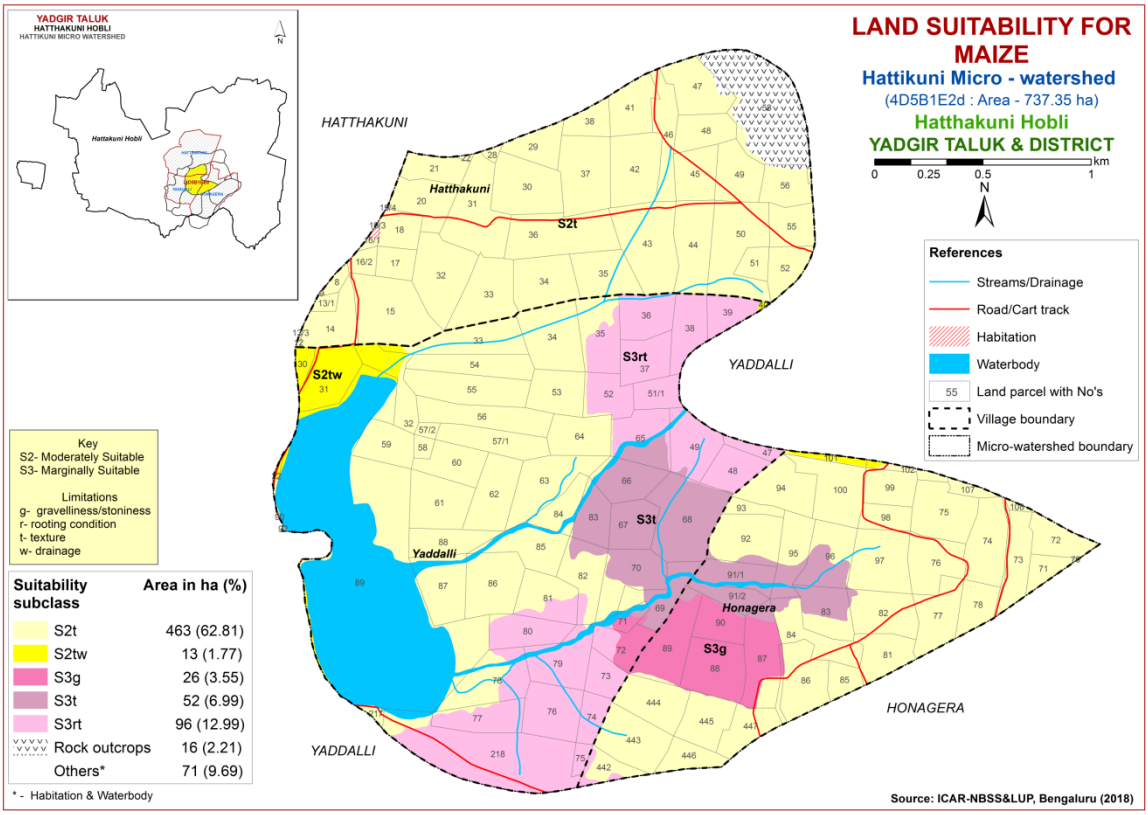


Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

Major area of about 502 ha (69%) is moderately suitable (Class S2) for growing bajra and are distributed in the major part of the microwatershed. They have minor limitations of texture, rooting depth, gravelliness and calcareousness. Marginally suitable lands (Class S3) occupy an area of about 148 ha (20%) and distributed in the central, southern and southeastern part of the microwatershed. They have moderate limitations of rooting depth and texture.

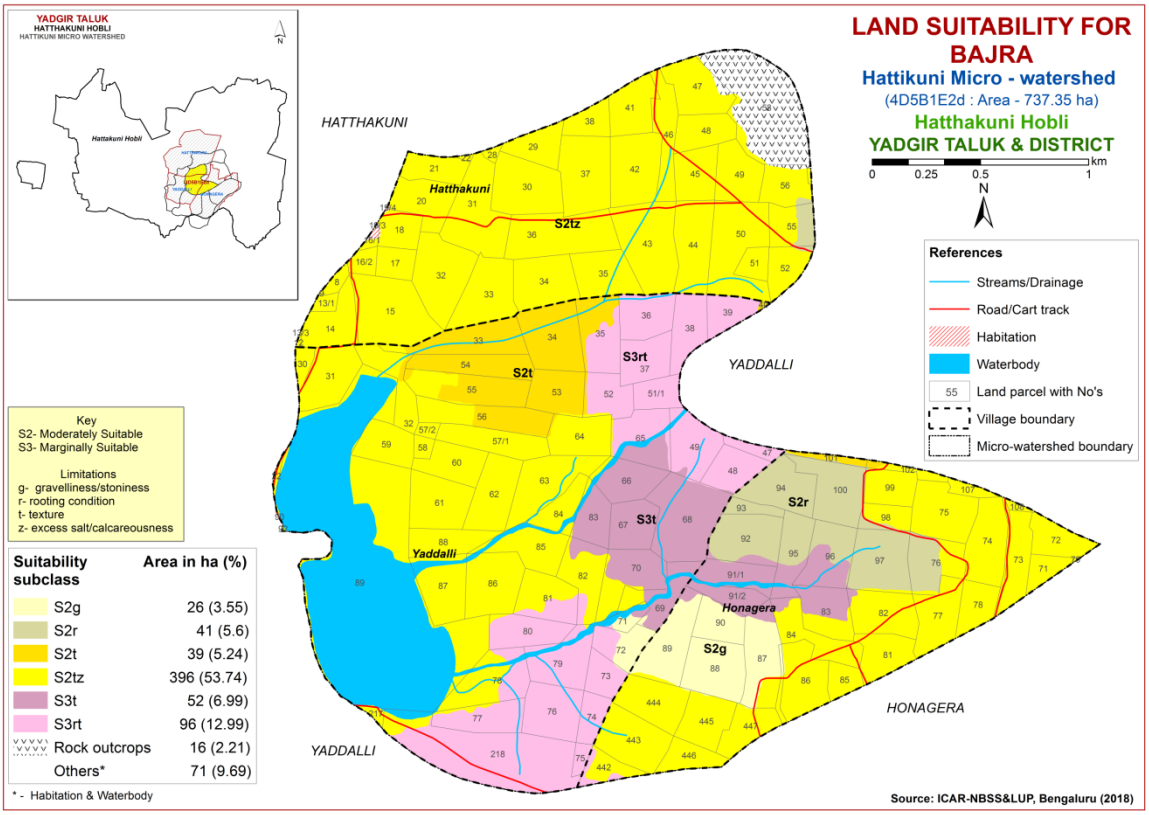


Fig. 7.3 Land Suitability map of Bajra

7.4 Land Suitability for Groundnut (*Arachis hypogaea*)

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

An area of about 26 ha (4%) is moderately suitable (Class S2) for groundnut and are distributed in the southern part of the microwatershed. They have minor limitations of gravelliness. Marginally suitable lands (Class S3) for growing groundnut occupy a maximum area of about 624 ha (85%) and are distributed in the major part of the microwatershed. They have moderate limitations of texture, drainage and rooting depth.

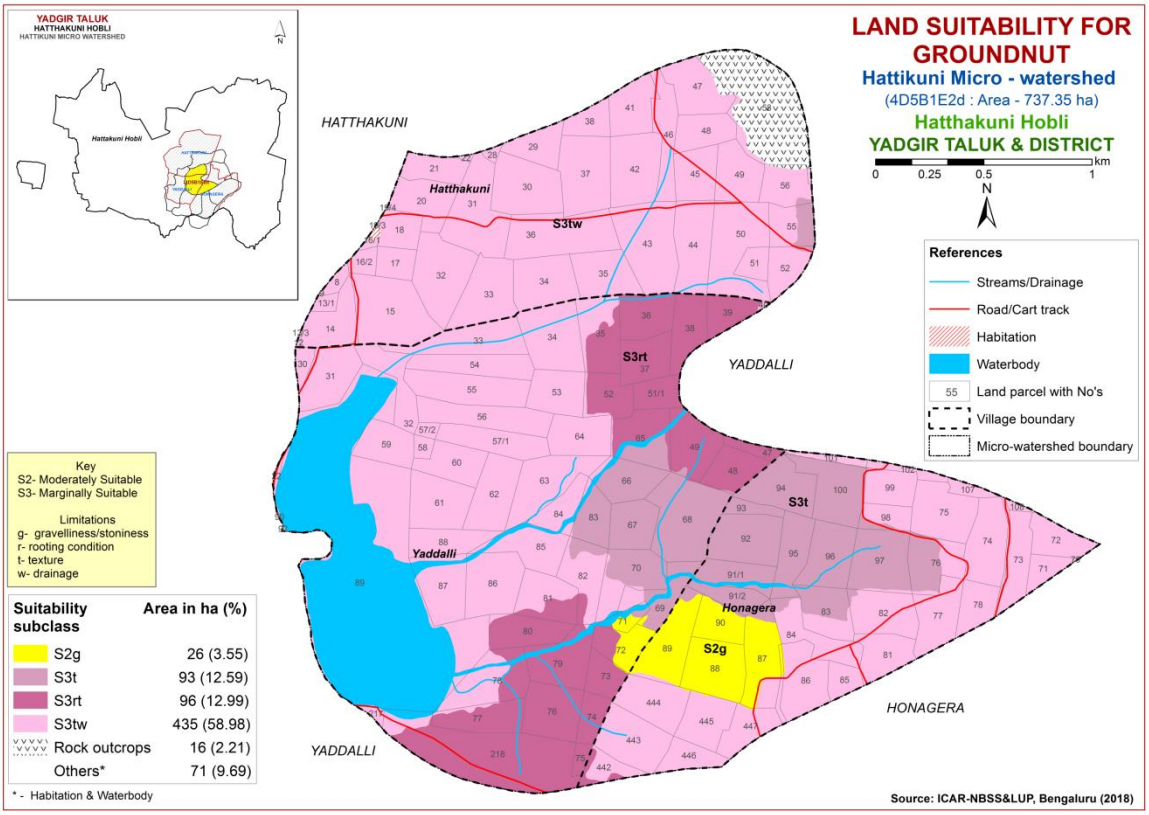


Fig. 7.4 Land Suitability map of Groundnut

7.5 Land Suitability for Sunflower (*Helianthus annus*)

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

Maximum area of about 423 ha (57%) is highly suitable (Class S1) for growing sunflower and is distributed in the major part of the microwatershed. An area of about 12 ha (2%) is moderately suitable (Class S2) for sunflower and are distributed in the western part of the microwatershed. They have minor limitations of calcareousness and drainage. Marginally suitable lands (Class S3) for growing sunflower occupy area of about 119 ha (17%) and are distributed in the southern and southeastern part of the microwatershed. They have moderate limitations of texture, gravelliness and rooting depth. An area of about 96 ha (13%) is currently not suitable (Class N1) and are distributed in the central and southern part of the microwatershed with severe limitation of rooting depth.

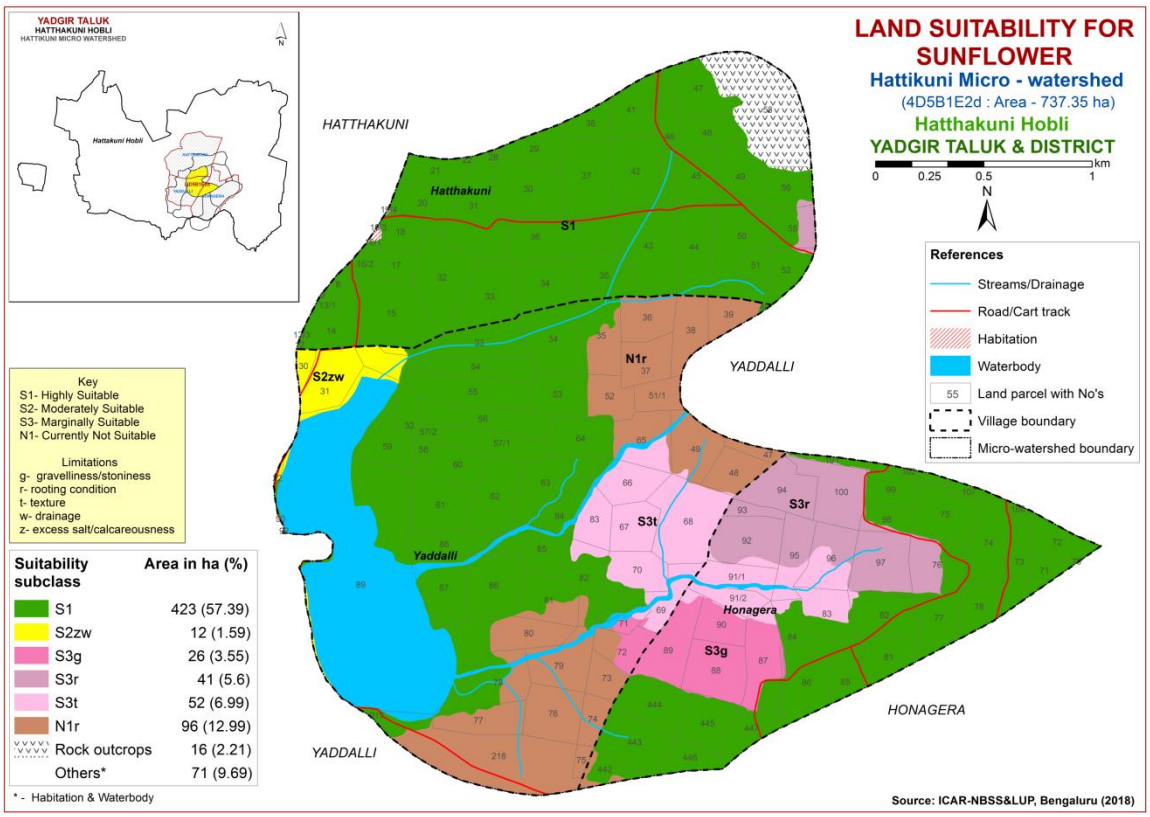


Fig. 7.5 Land Suitability map of Sunflower

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

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

Maximum area of about 435 ha (59%) is moderately suitable (Class S2) for growing red gram and are distributed in the major part of the microwatershed. They have minor limitations of texture and drainage. Marginally suitable lands (Class S3) for growing red gram occupy an area of about 146 ha (21%) and occur in the southern and southeastern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and texture. An area of about 69 ha (9%) is currently not suitable (Class N1) and are distributed in the central and southern part of the microwatershed with severe limitation of rooting depth.

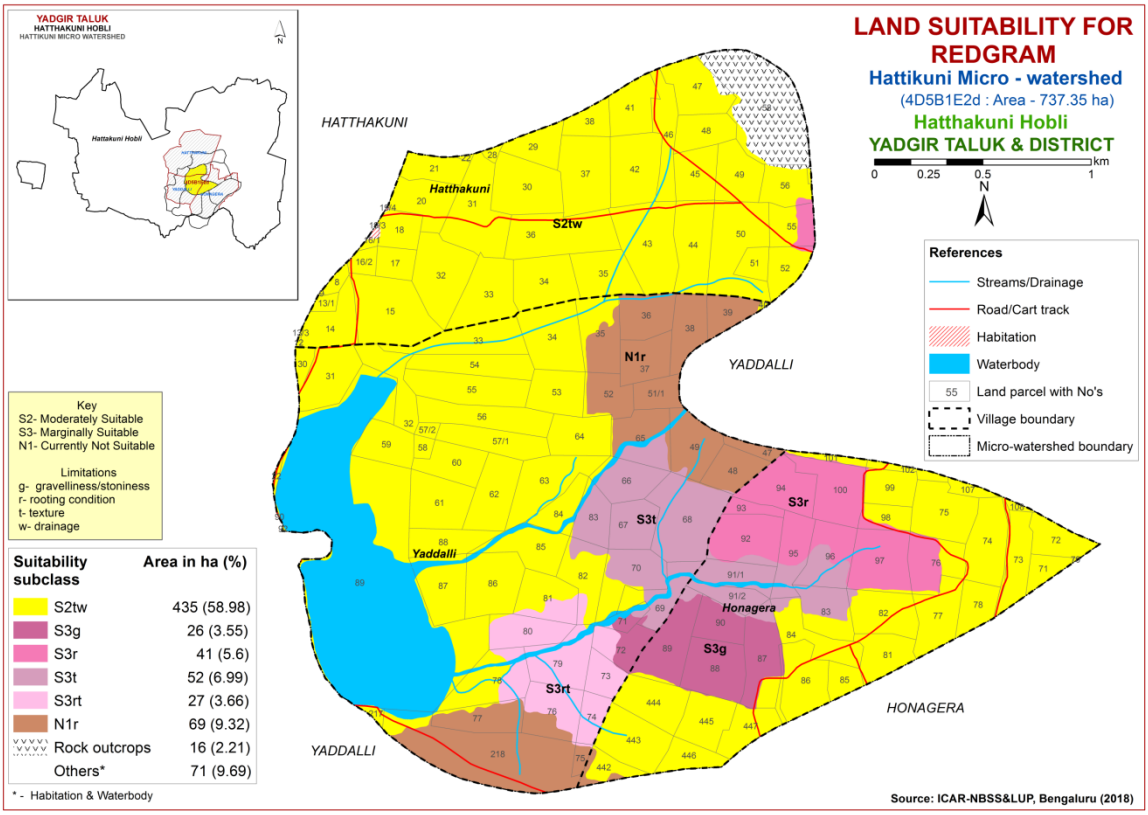


Fig. 7.6 Land Suitability map of Redgram

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

Bengal gram is one of the most important pulse crop grown in about 9.39 lakh ha area in Bijapur, Raichur, Kalaburgi, Dharwad, Belgaum and Bellary districts. The crop requirements for growing Bengal gram (Table 7.8) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Bengal gram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.7.

Highly (Class S1) suitable lands for growing Bengal gram occur in a maximum area of 435 ha (59%) and are distributed in the major part of the microwatershed. Small area of about 41 ha (6%) is moderately suitable (Class S2) for growing Bengal gram and are distributed in southeastern and northeastern part of the microwatershed. They have minor limitation of rooting depth. Marginally suitable lands (Class S3) occupy an area of about 53 ha (8%) and are distributed in the southern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness. Currently not suitable (Class N1) lands occur in an area of 120 ha (16%) and are distributed in the central and southern part of the microwatershed with severe limitation of texture.

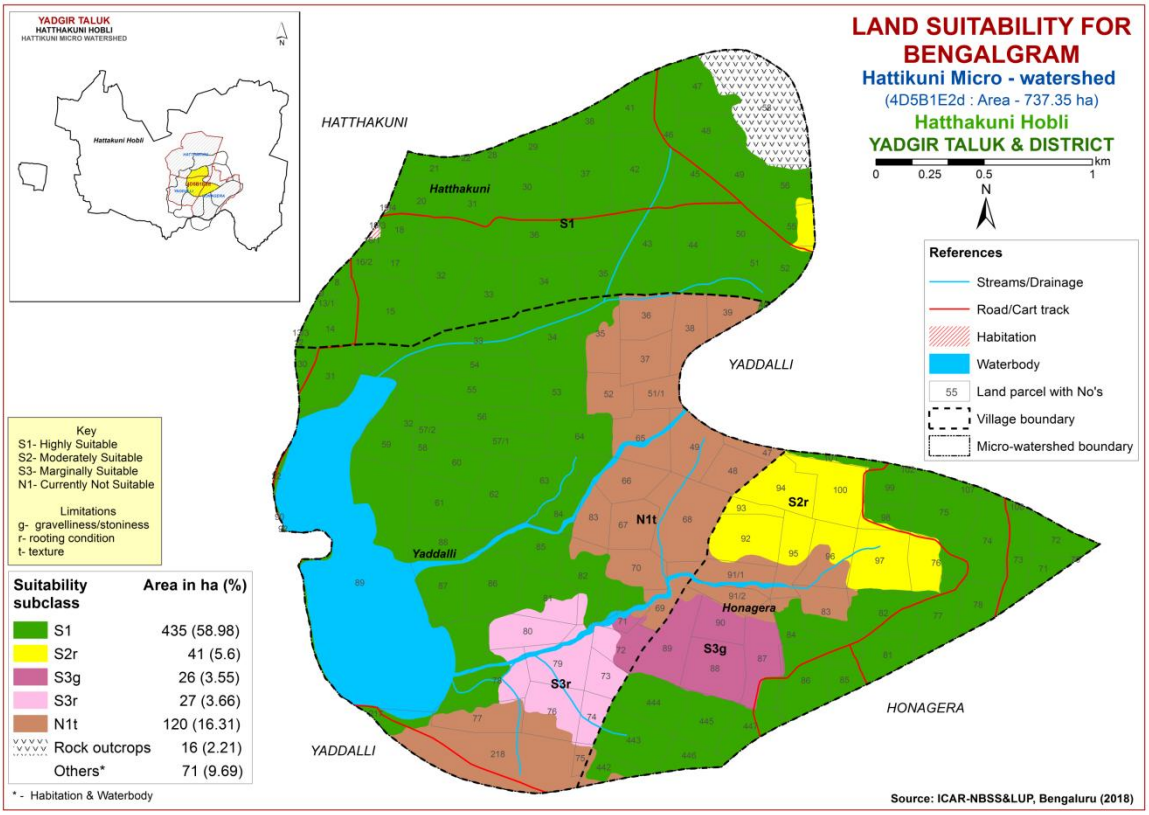


Fig. 7.7 Land Suitability map of Bengal gram

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, Kalaburgi, Bijapur, Bidar, Bellary, Chitradurga and Chamarajnagar districts. The crop requirements for growing cotton (Table 7.9) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cotton was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.8.

Highly (Class S1) suitable lands for growing cotton occur in maximum area of 423 ha (57%) and are distributed in the major part of the microwatershed. Moderately suitable (Class S2) lands are found to occur in an area of about 53 ha (7%). The soils have moderate limitations of rooting depth and calcareousness. They are distributed in the western, southeastern and northeastern part of the microwatershed. Marginally suitable (Class S3) lands for cotton are found to occur in an area of about 53 ha (7%) with moderate limitations of rooting depth and gravelliness and are distributed in the southern part the microwatershed. Currently not suitable (Class N1) lands occur in an area of 120 ha (16%) and are distributed in the central and southern part of the microwatershed with severe limitation of texture.

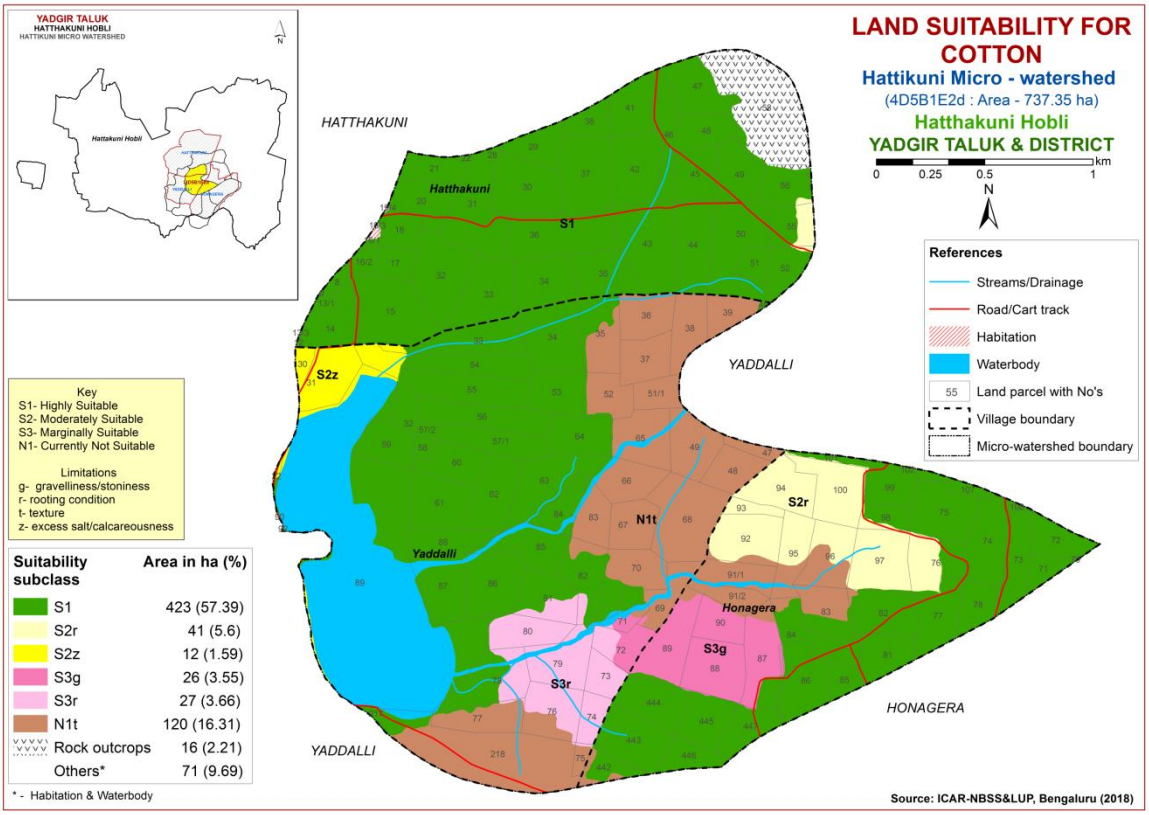


Fig. 7.8 Land Suitability map of Cotton

7.9 Land Suitability for Chilli (*Capsicum annuum)*

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

Major area of about 476 ha (65%) is moderately suitable (Class S2) for growing chilli and are distributed in the major part of the microwatershed. They have minor limitations of texture, drainage and rooting depth. Marginally suitable lands (Class S3) occupy an area of about 174 ha (24%) and are distributed in the central, southern and southeastern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and texture.

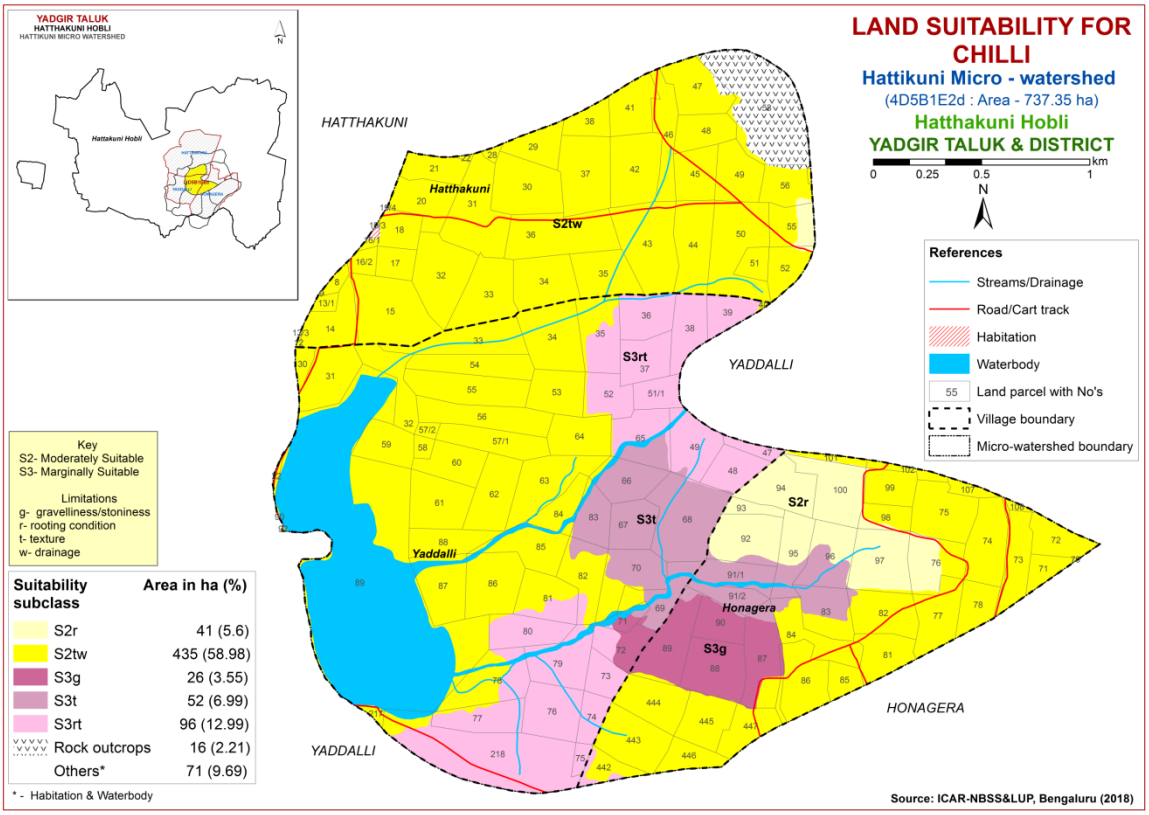


Fig 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato (*Lycopersicon esculentum*)

Tomato is one of the most important fruit crop grown in about 0.61 lakh ha covering almost all the district of the state. The crop requirements for growing tomato (Table 7.11) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tomato was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.10.

Maximum area of about 463 ha (63%) is moderately suitable (Class S2) for growing tomato and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, texture and drainage. Marginally suitable lands (Class S3) occupy an area of about 187 ha (26%) and are distributed in the central, western, southern and southeastern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness, drainage and texture.

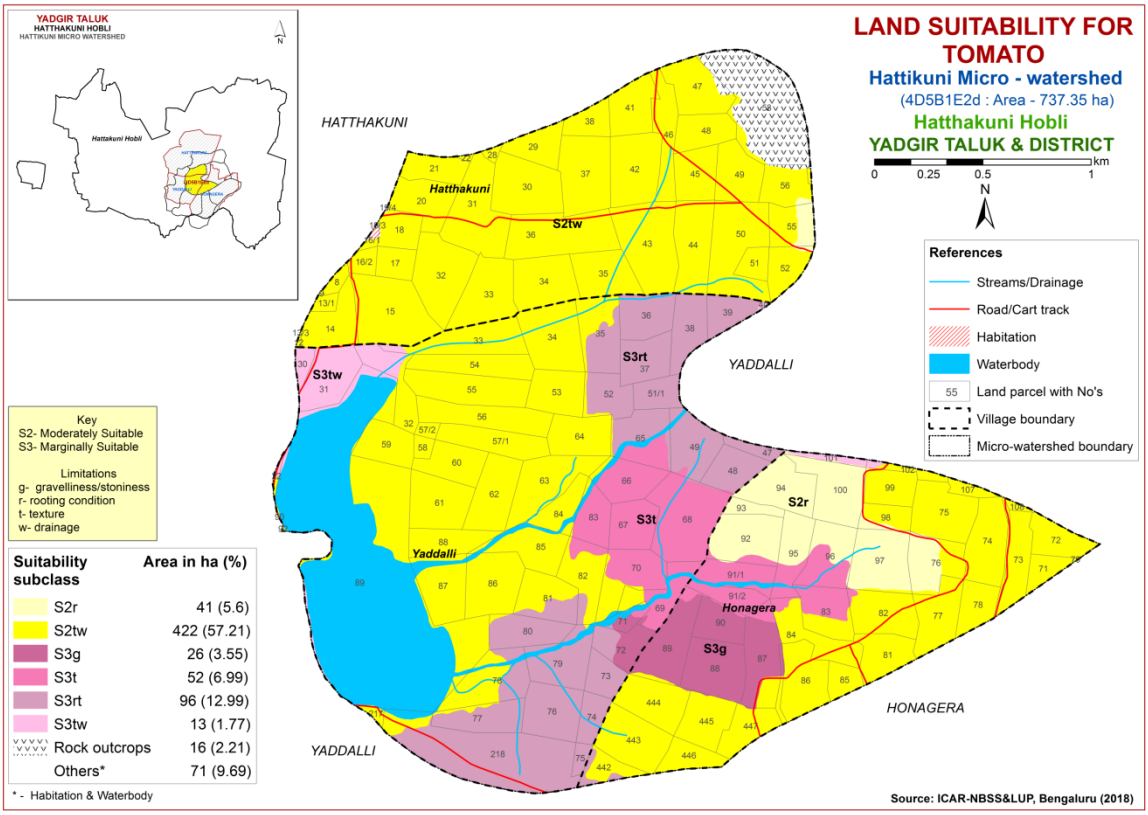


Fig 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Brinjal (*Solanum melongena*)

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

Highly (Class S1) suitable lands for growing brinjal occur in an area of 50 ha (7%) and are distributed in the central and western part of the microwatershed. Maximum area of about 452 ha (62%) is moderately suitable (Class S2) for brinjal and is distributed in the major part of the microwatershed. They have minor limitations of gravelliness, rooting depth and texture. Small area about of 148 ha (20%) is marginally suitable (Class S3) and is distributed in the central, southern and southeastern part of the microwatershed with moderate limitations of rooting depth and texture.

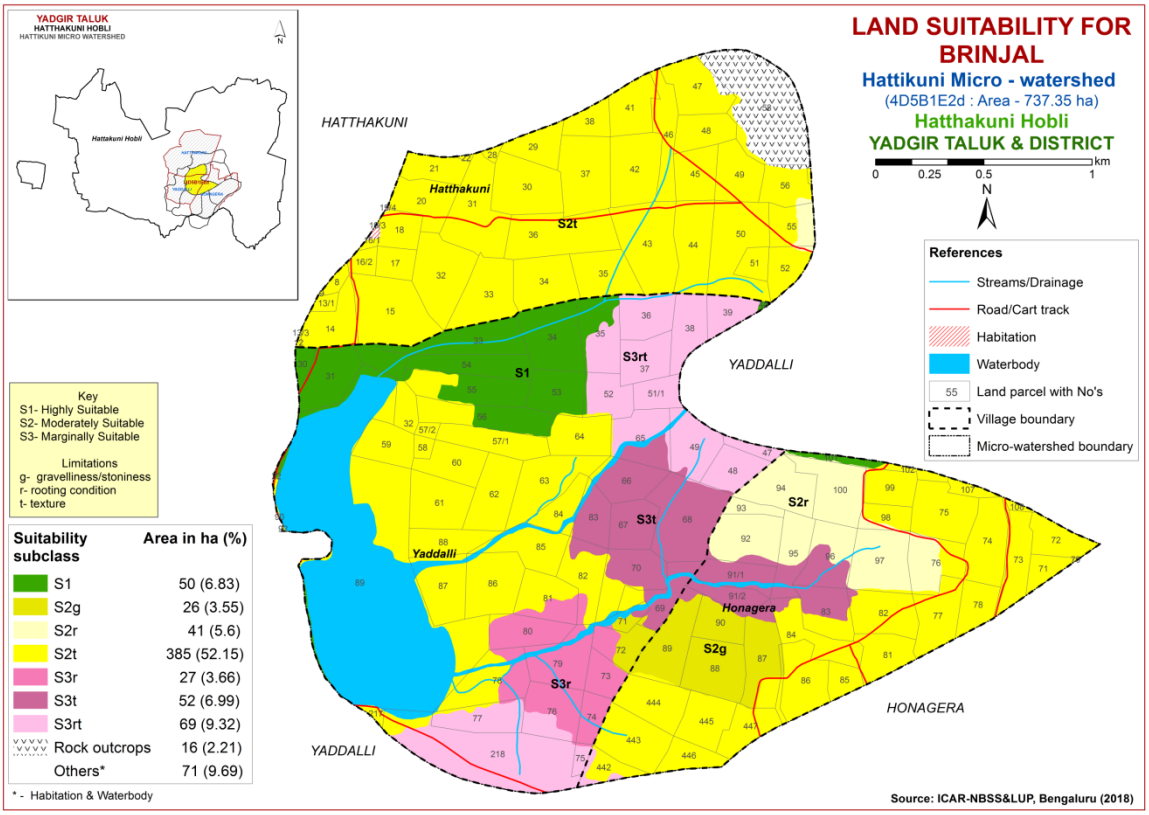


Fig 7.11 Land Suitability map of Brinjal

7.12 Land Suitability for Onion (*Allium cepa L.*,)

Onion is one of the most important vegetable crop grown in the state. The crop requirements for growing onion (Table 7.13) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing onion was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.12.

Highly (Class S1) suitable lands for growing onion occur in an area of 291 ha (39%) and are distributed in the major part of the microwatershed. An area of about 67 ha (10%) is moderately suitable (Class S2) for onion and is distributed in the southeastern, northeastern and southern part of the microwatershed. They have minor limitations of rooting depth and gravelliness. Maximum area of about 292 ha (40 %) is marginally suitable (Class S3) and is distributed in the major part of the microwatershed with moderate limitations of rooting depth, gravelliness and texture.

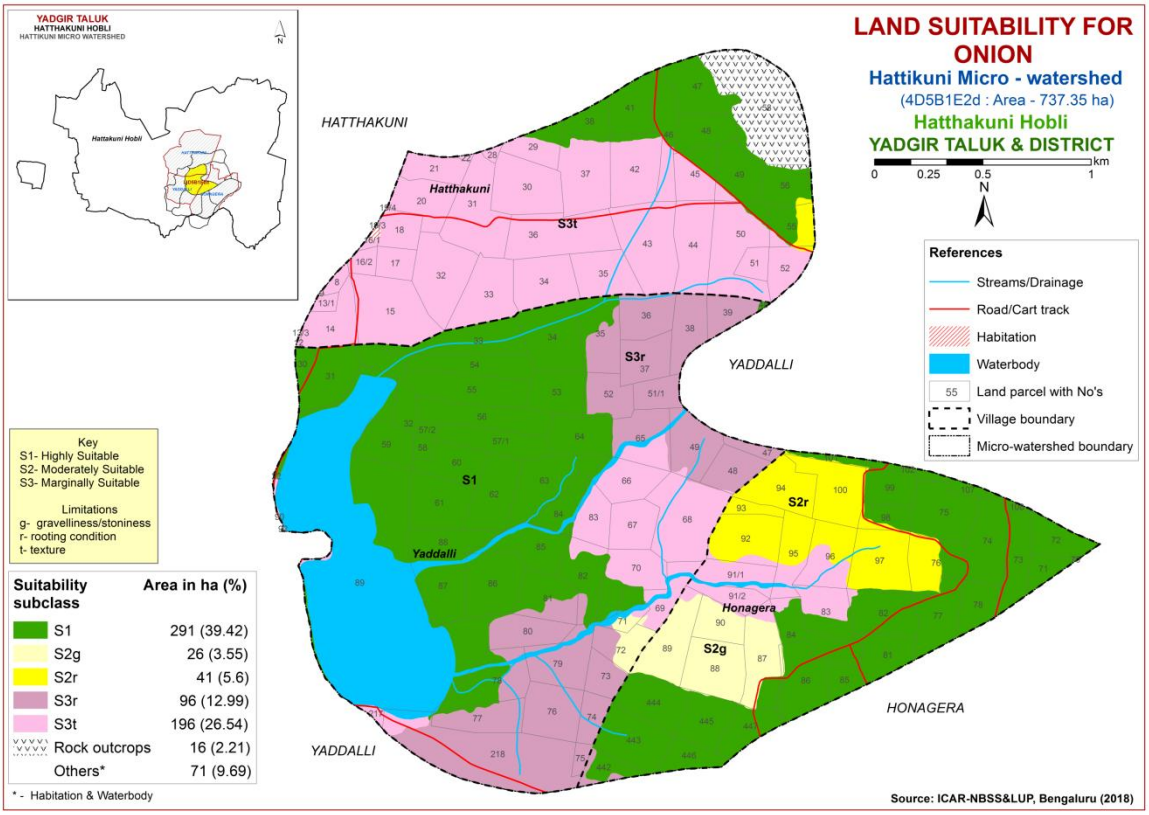


Fig 7.12 Land Suitability map of Onion

7.13 Land Suitability for Bhendi (*Abelmoschus esculentus*)

Bhendi is one of the most important vegetable crop grown in the state. The crop requirements for growing bhendi (Table 7.14) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing bhendi was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.13.

Highly (Class S1) suitable lands for growing bhendi occur in area of 195 ha (26%) and are distributed in the western, northeastern, northwestern and northern part of the microwatershed. Maximum area of about 307 ha (43%) is moderately suitable (Class S2) for bhendi and is distributed in the major part of the microwatershed. They have minor limitations of texture, gravelliness and rooting depth. An area of 148 ha (20%) is marginally suitable (Class S3) and is distributed in the central, southern and southeastern part of the microwatershed with moderate limitations of rooting depth and texture.

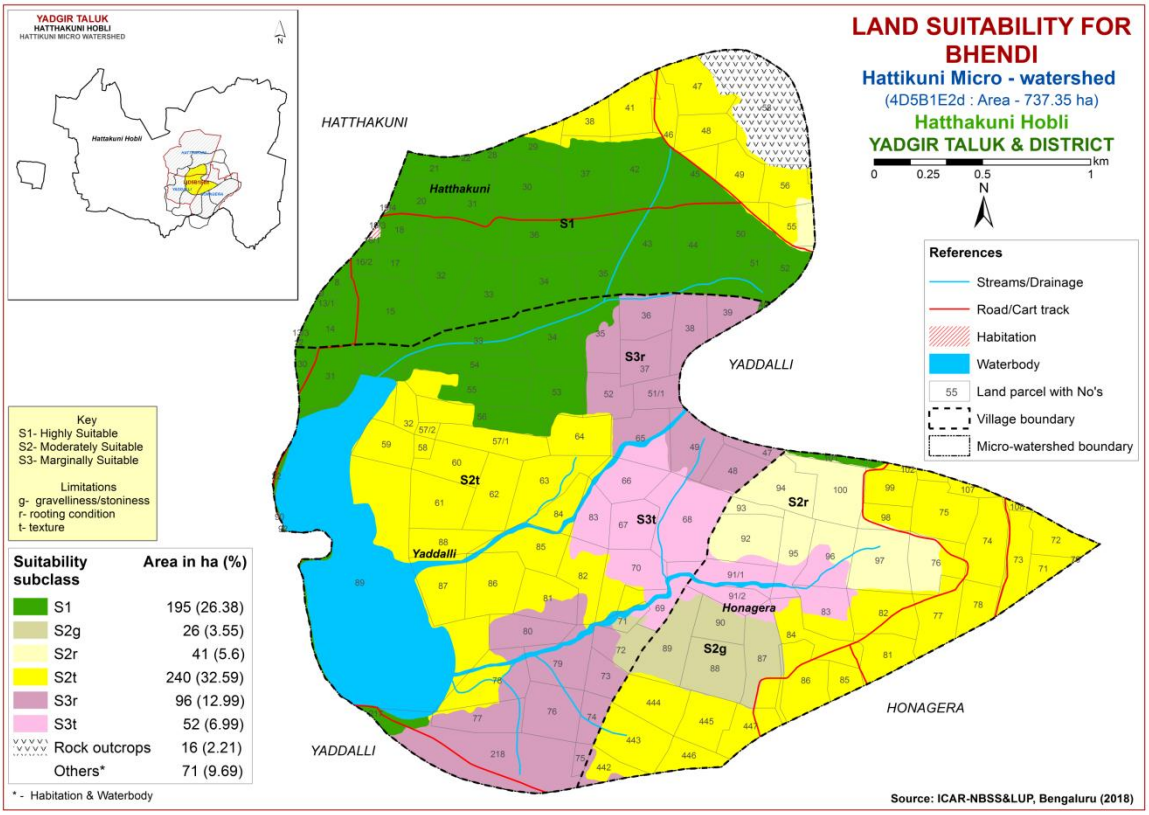


Fig 7.13 Land Suitability map of Bhendi

7.14 Land Suitability for Drumstick (*Moringa oleifera*)

Drumstick is one of the most important vegetable crop grown in about 2403 ha in the state. The crop requirements for growing drumstick (Table 7.15) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing drumstick was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.14.

Maximum area of about 461 ha (63%) is moderately suitable (Class S2) for drumstick and is distributed in the major part of the microwatershed. They have minor limitations of gravelliness, texture and drainage. Marginally suitable lands (Class S3) occupy a small area of about 93 ha (13%) and are distributed in the northeastern and southeastern part of the microwatershed. They have moderate limitations of rooting depth and texture. An area of about 96 ha (13%) is currently not suitable (Class N1) for growing drumstick and are distributed in the central and southern part of the microwatershed. They have severe limitations of rooting depth and texture.

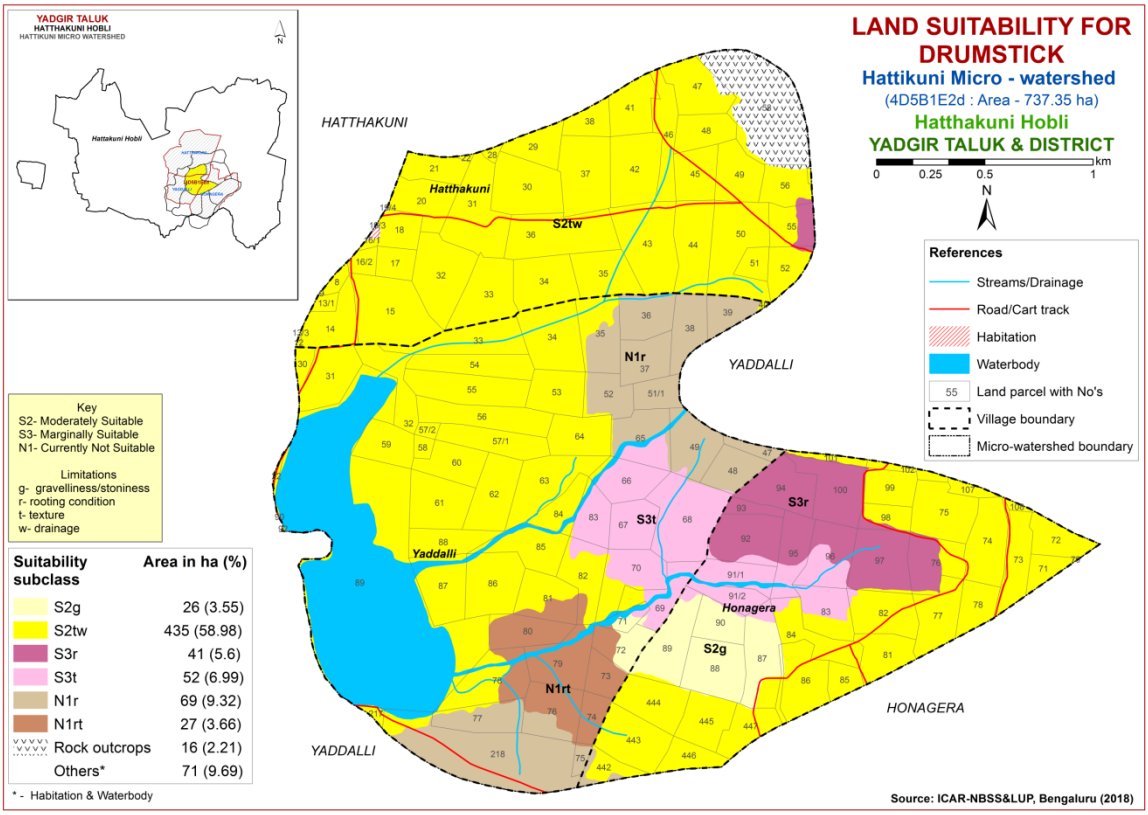


Fig 7.14 Land Suitability map of Drumstick

7.15 Land suitability for Mango (*Mangifera indica*)

Mango is one of the most important fruit crop grown in an area of 1.73 lakh ha in almost all the districts of the State. The crop requirements (Table 7.16) for growing mango were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mango was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.15.

Small area of about 39 ha (5%) is moderately suitable (Class S2) for growing mango and are distributed in the western part of the microwatershed and have minor limitation of rooting depth. Maximum area of 422 ha (58%) is marginally suitable (Class S3) for growing mango with moderate limitations of texture, calcareousness, gravelliness and rooting depth and are distributed in the major part of the microwatershed. An area of about 189 ha (26%) is currently not suitable (Class N1) for growing mango and occur in the central, northeastern, southeastern and southern part of the microwatershed with severe limitation of rooting depth.

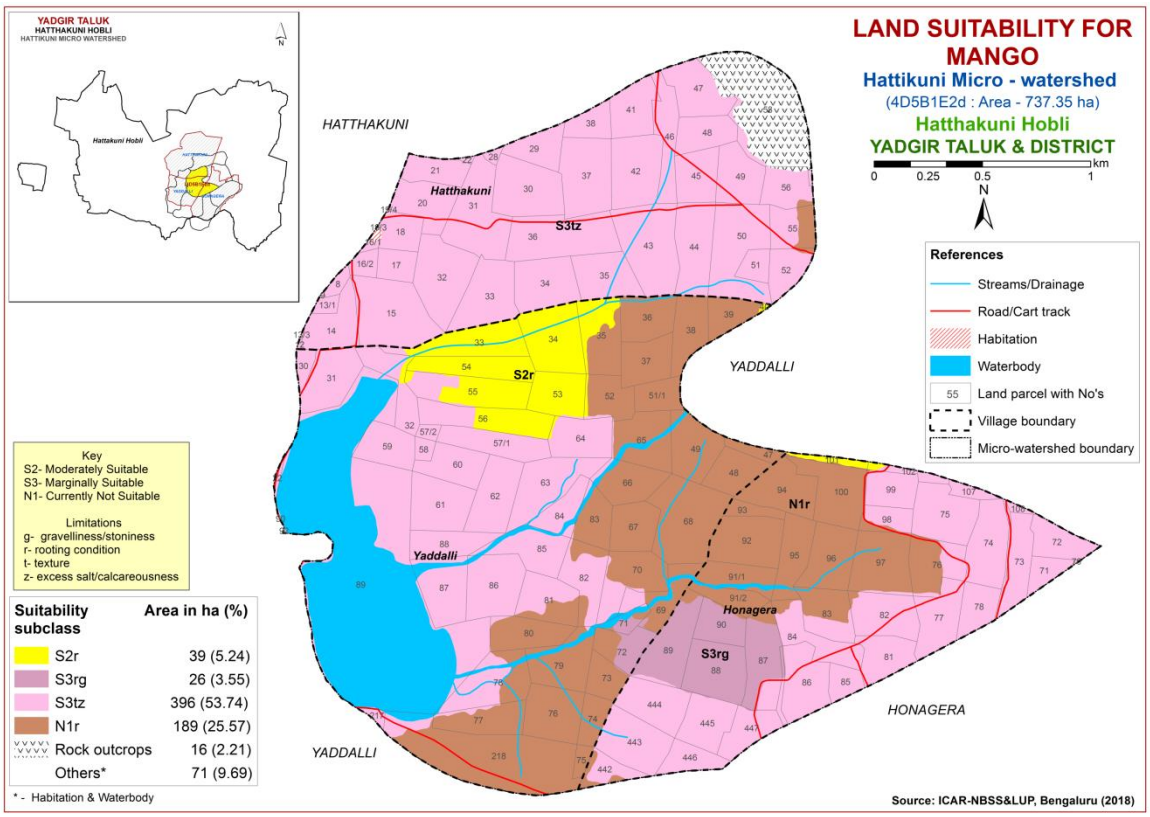


Fig. 7.15 Land Suitability map of Mango

7.16 Land suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in an area of 0.06 lakh ha in almost all the districts of the State. The crop requirements (Table 7.17) for growing guava were matched with the soil-site characteristics (7.1) and a land suitability map for growing guava was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.16.

Marginally suitable (Class S3) lands cover a maximum area of about 554 ha (76%) and are distributed in the major part of the microwatershed. They have moderate limitations of texture, rooting depth and gravelliness. An area of about 96 ha (13%) is currently not suitable (Class N1) for growing guava and occur in the central and southern part of the microwatershed with severe limitations of rooting depth and texture.

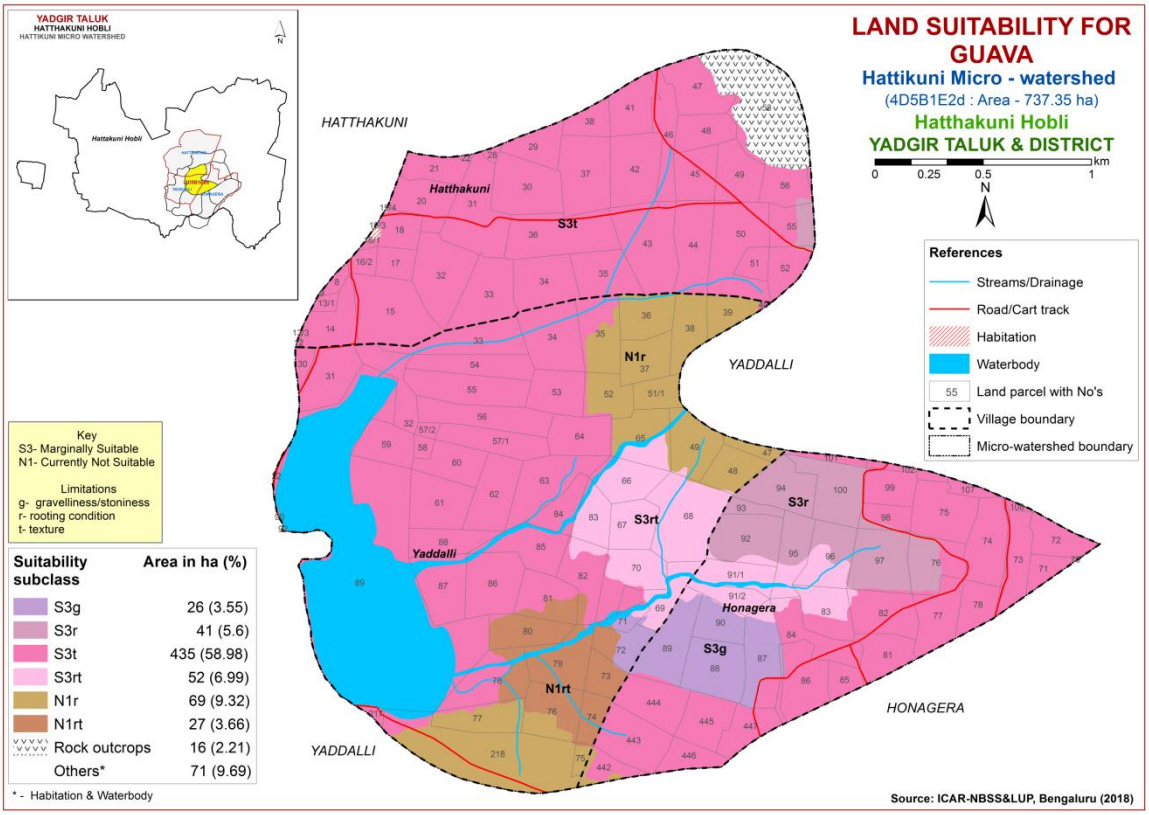


Fig. 7.16 Land Suitability map of Guava

7.17 Land suitability for Sapota (*Manilkara zapota*)

Sapota is one of the most important fruit crop grown in an area of 29373 ha in almost all the districts of the State. The crop requirements (Table 7.18) for growing sapota were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sapota was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.17.

Maximum area of about 554 ha (76%) is marginally suitable (Class S3) for growing sapota and are distributed in the major part of the microwatershed. They have moderate limitations of texture, rooting depth and gravelliness. An area of about 96 ha (13%) is currently not suitable (Class N1) for growing sapota and occur in the central and southern part of the microwatershed with severe limitation of rooting depth.

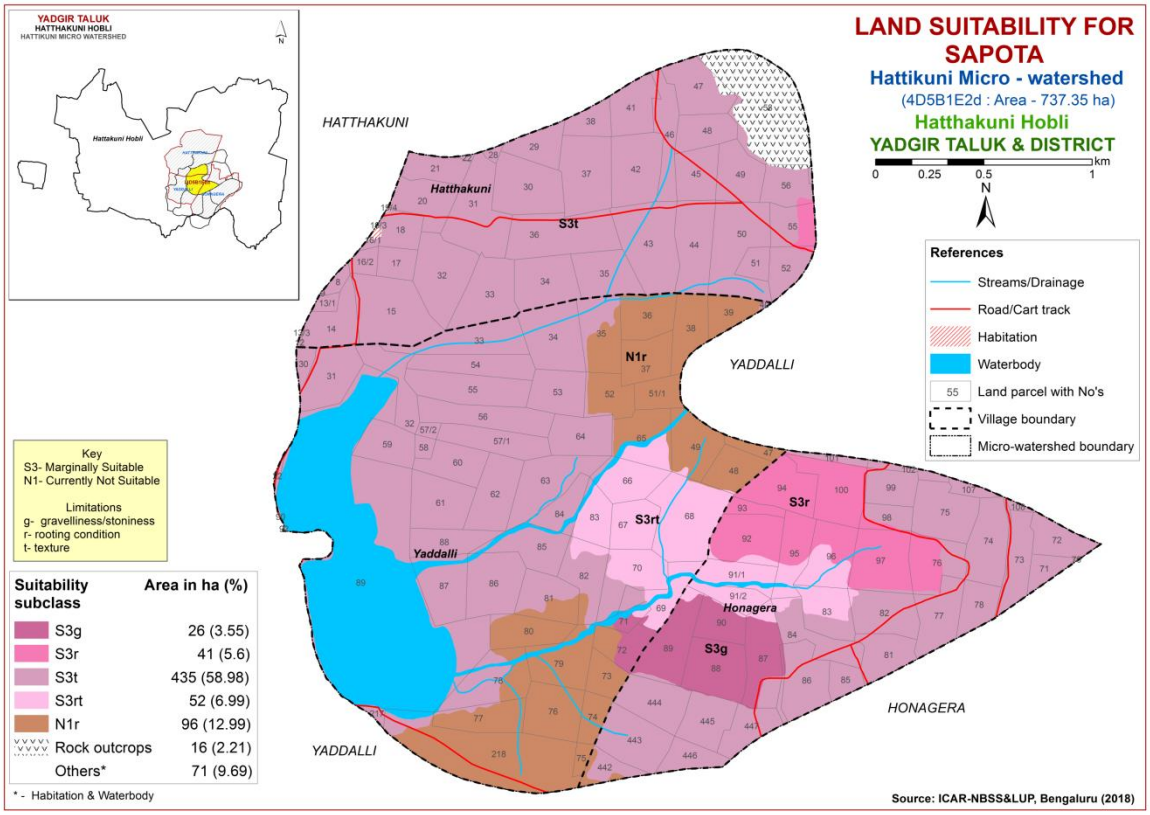


Fig. 7.17 Land Suitability map of Sapota

7.18 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the most important fruit crop commercially grown in about 18488 ha in Karnataka, mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing pomegranate (Table 7.19) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing pomegranate was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.18.

Maximum area of about 435 ha (59%) is moderately suitable (Class S2) for pomegranate and is distributed in the major part of the microwatershed. They have minor limitation of texture. An area of about 119 ha (17%) is marginally suitable (Class S3) for growing pomegranate and are distributed in the southern, southeastern and northeastern part of the microwatershed. They have moderate limitations of texture, rooting depth and gravelliness. An area of about 96 ha (13%) is currently not suitable (Class N1) for growing pomegranate and are distributed in the central and southern part of the microwatershed. They have severe limitation of rooting depth.

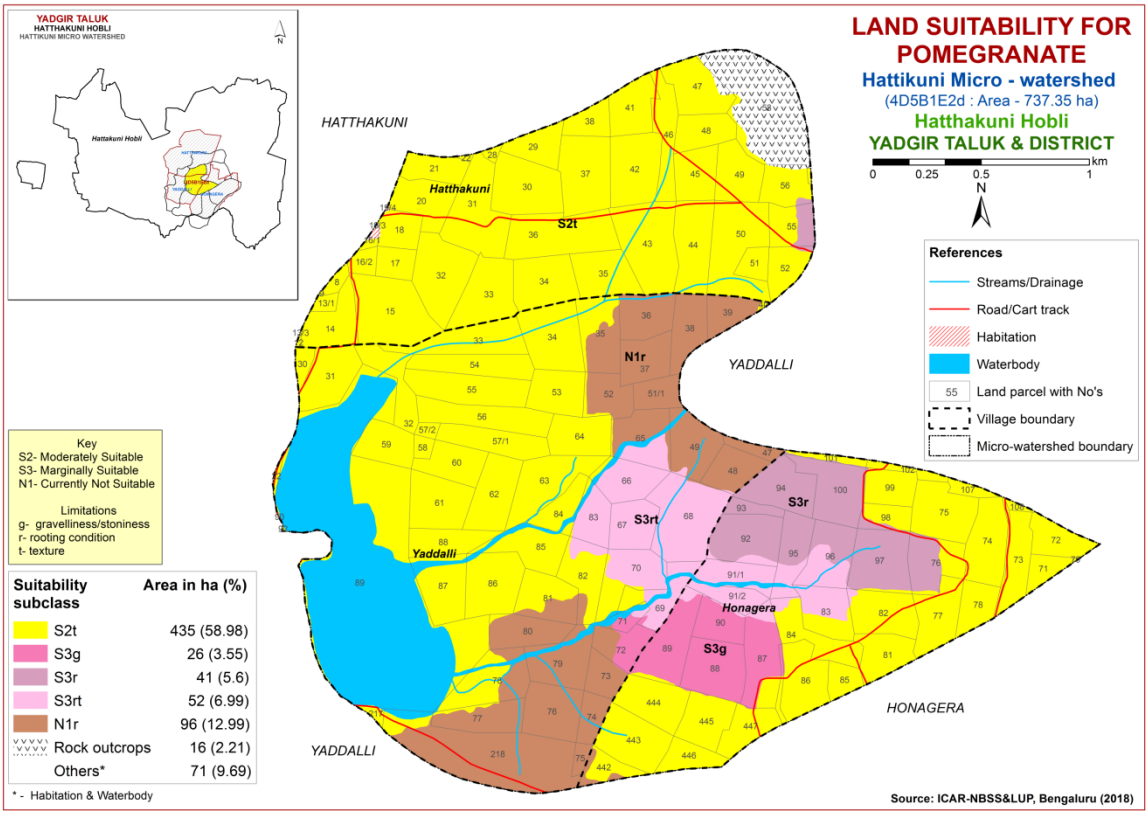


Fig 7.18 Land Suitability map of Pomegranate

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the important fruit crop grown in an area of 3446 ha in almost all the districts of the State. The crop requirements for growing musambi (Table 7.20) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing musambi was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.19.

Major area of about 422 ha (57%) is highly suitable (Class S1) for growing musambi and are distributed in the major part of the microwatershed. An area of about 13 ha (2%) is moderately suitable (Class S2) for growing musambi and are distributed in the western part of the microwatershed. They have minor limitation of calcareousness. An area of about 119 ha (17%) is marginally suitable (Class S3) for growing musambi and are distributed in the southern, southeastern and northeastern part of the microwatershed. They have moderate limitations of texture, rooting depth and gravelliness. An area of about 96 ha (13%) is currently not suitable (Class N1) and are distributed in the central and southern part of the microwatershed with severe limitation of rooting depth.

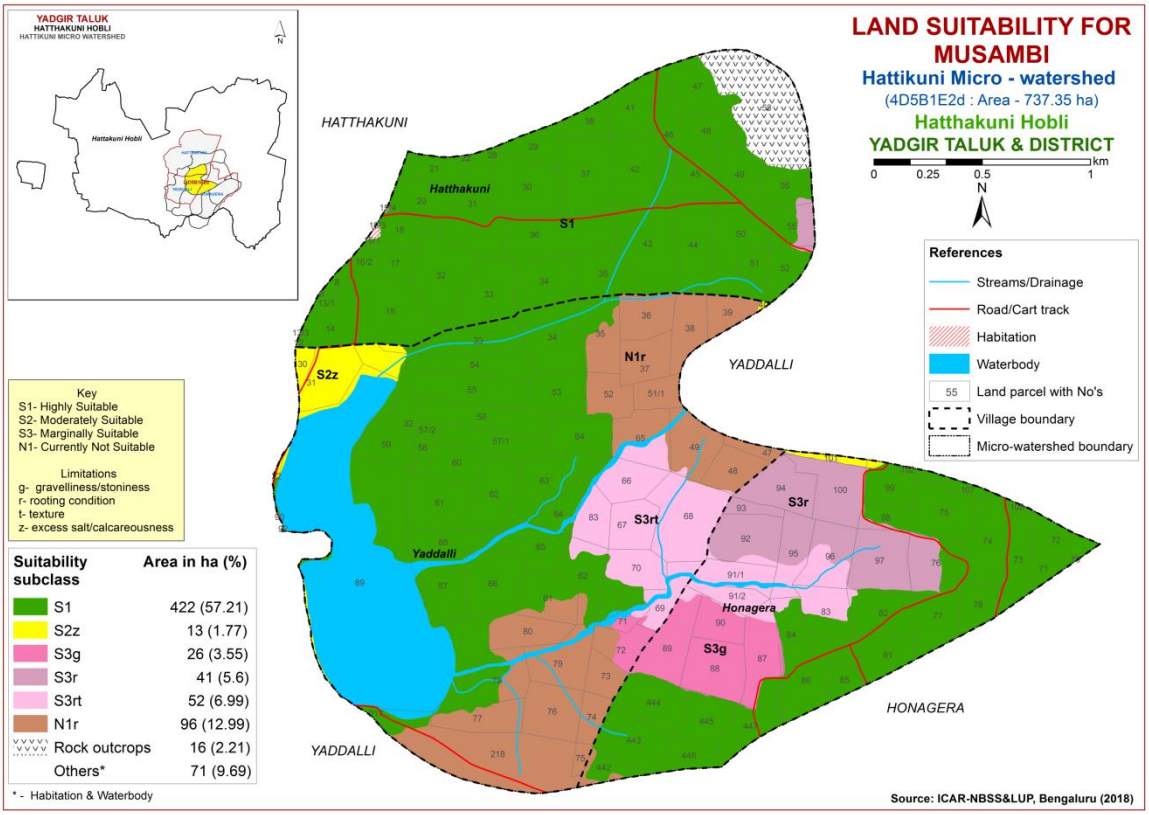


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 0.11 lakh ha in almost all the districts of the State. The crop requirements for growing lime (Table 7.21) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7. 20.

Major area of about 422 ha (57%) is highly suitable (Class S1) for growing lime and are distributed in the major part of the microwatershed. An area of about 13 ha (2%) is moderately suitable (Class S2) for growing lime and are distributed in the western part of the microwatershed. They have minor limitation of calcareousness. An area of about 119 ha (17%) is marginally suitable (Class S3) for growing lime and are distributed in the southern, southeastern and northeastern part of the microwatershed. They have moderate limitations of texture, rooting depth and gravelliness. An area of about 96 ha (13%) is currently not suitable (Class N1) and are distributed in the central and southern part of the microwatershed with severe limitation of rooting depth.

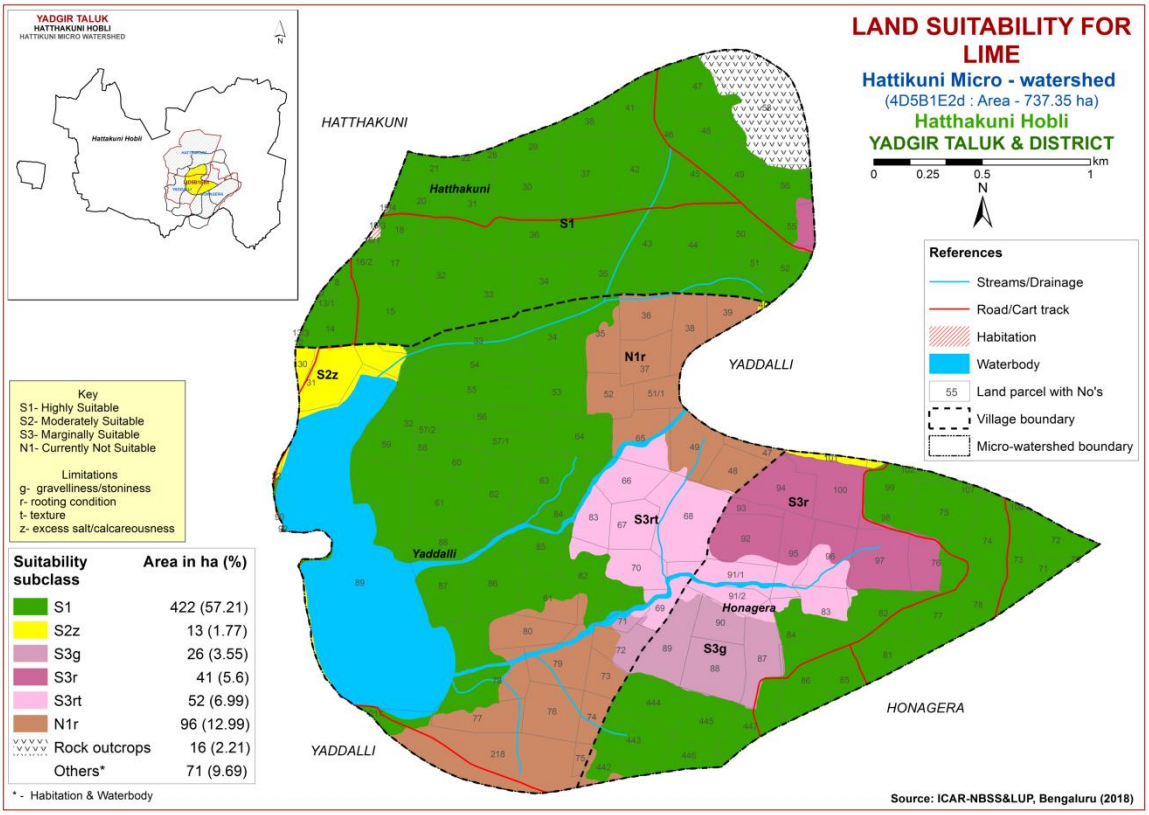


Fig. 7.18 Land Suitability map of Lime

7.21 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the medicinal fruit crop grown in almost all the districts of the State. The crop requirements for growing Amla (Table 7.22) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Amla was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.21.

Maximum area of about 502 ha (69%) has soils that are moderately suitable (Class S2) for growing Amla with minor limitations of rooting depth, texture and gravelliness and are distributed in the major part of the microwatershed. An area of 148 ha (20%) is marginally suitable (Class S3) with moderate limitations of rooting depth and texture are distributed in the central, southern and southeastern part of the microwatershed.

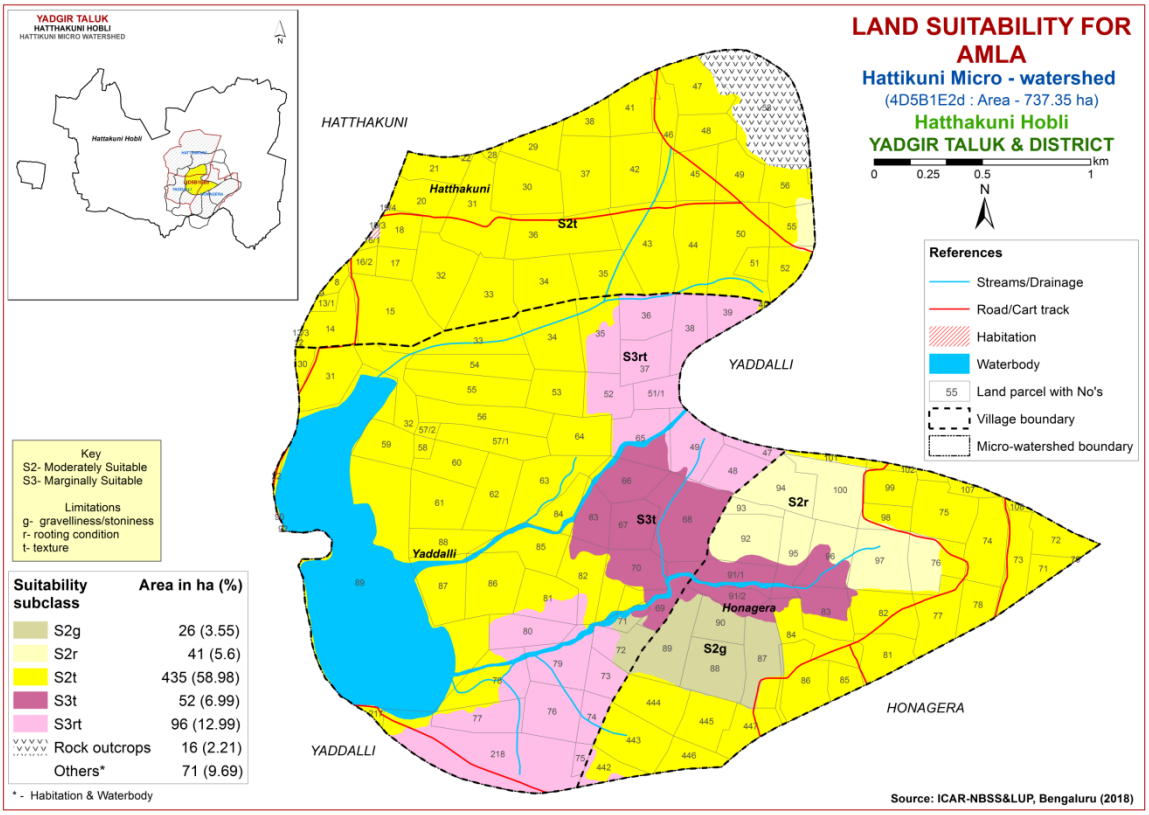


Fig. 7.21 Land Suitability map of Amla

7.22 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important plantation nut crop grown in an area of 0.7 lakh ha in almost all the districts of the State. The crop requirements for growing cashew (Table 7.23) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.22.

An area of 78 ha (11%) is marginally suitable (Class S3) for growing cashew and are distributed in the southern and southeastern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and texture. Maximum area of about 572 ha (78%) is currently not suitable (Class N1) and are distributed in all parts of the microwatershed with severe limitations of rooting depth and texture.

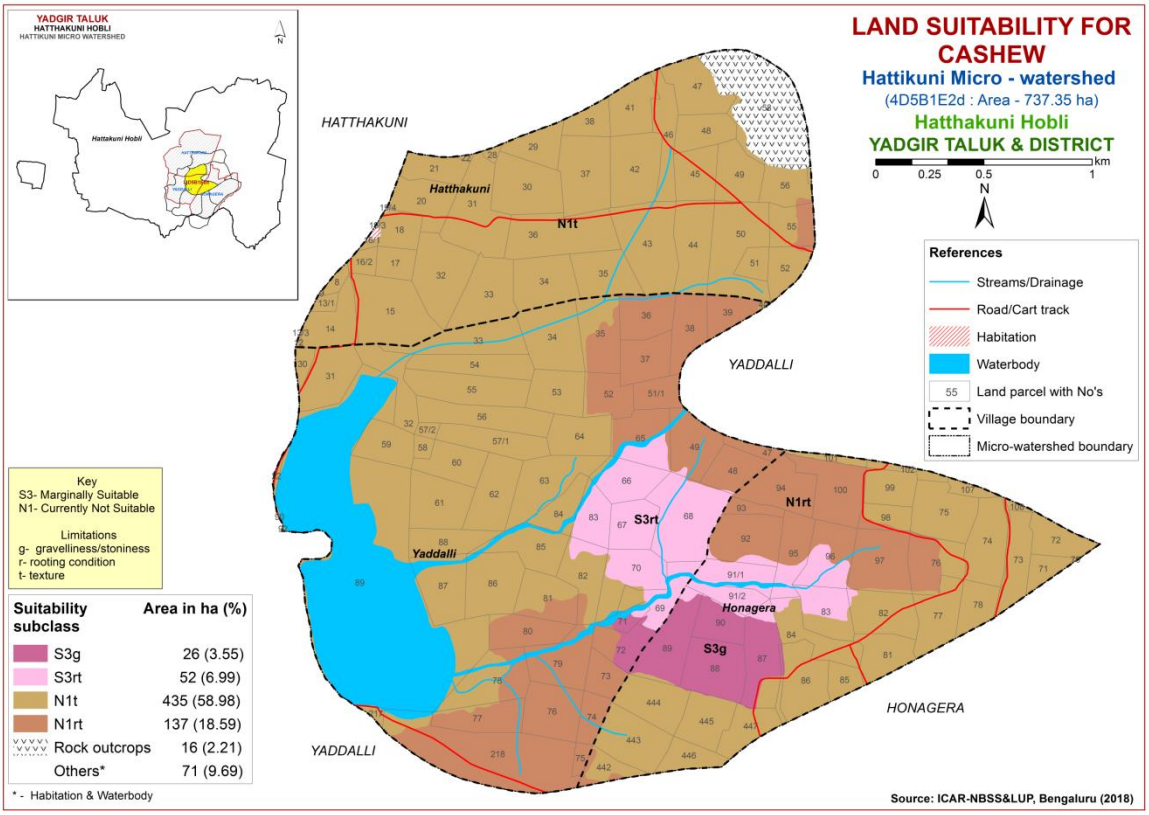


Fig. 7.22 Land Suitability map of Cashew

7. 23 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is one of the most important fruit crop grown in an area of 5368 ha in almost all the districts of the State. The crop requirements for growing jackfruit (Table 7.24) 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 geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.23.

Marginally suitable (Class S3) lands for growing Jackfruit occupy a maximum area of about 554 ha (76%) and are distributed in all parts of the microwatershed. They have moderate limitations of rooting depth, gravelliness and texture. An area of about 96 ha (13%) is currently not suitable (Class N1) and are distributed in the central and southern part of the microwatershed with severe limitations of rooting depth and texture.

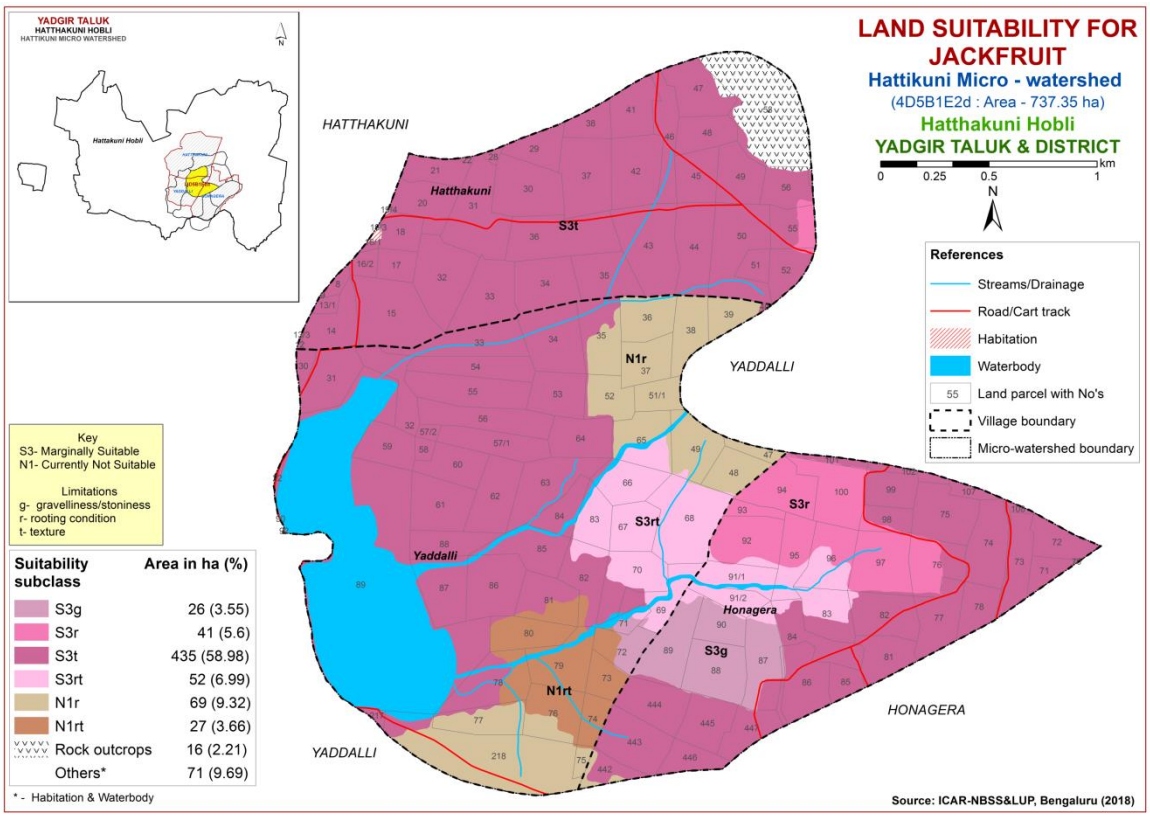


Fig. 7.23 Land Suitability map of Jackfruit

7.24 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is one of the important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun (Table 25) 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 geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.24.

Major area of about 435 ha (59%) is moderately suitable (Class S2) for growing Jamun and are distributed in the major part of the microwatershed. They have minor limitation of texture. An area of about 119 ha (17%) is marginally suitable (Class S3) for growing Jamun and are distributed in the southern, southeastern and northeastern part of the microwatershed. They have moderate limitations of gravelliness, texture and rooting depth. An area of about 96 ha (13%) is currently not suitable (Class N1) and are distributed in the central and southern part of the microwatershed with severe limitations of rooting depth and texture.

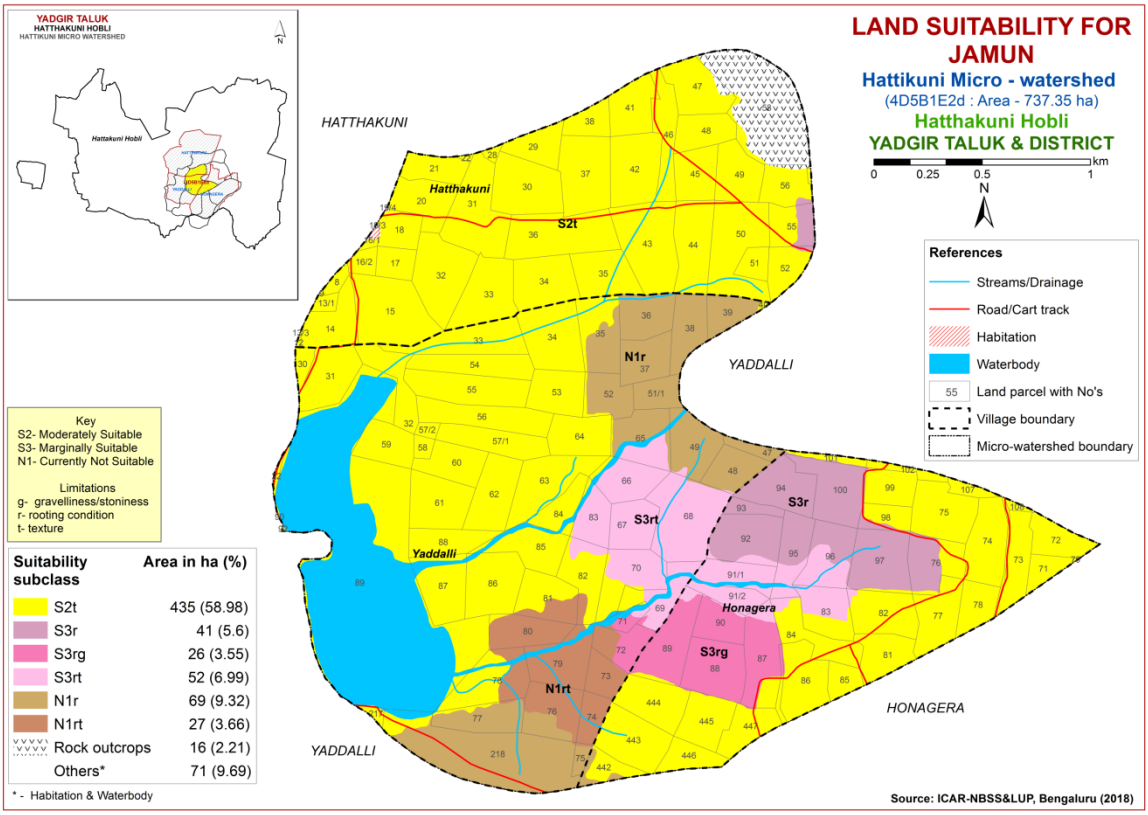


Fig. 7.24 Land Suitability map of Jamun

7.25 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 (Table7.26) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

Maximum area of 434 ha (59%) is highly suitable (Class S1) for growing custard apple and are distributed in the major part of the microwatershed. An area of about 68 ha (10%) has soils that are moderately suitable (Class S2) for growing custard apple with minor limitations of gravelliness, rooting depth and calcareousness and are distributed in the southern, southeastern and northeastern part of the microwatershed. An area of about 148 ha (20%) is marginally suitable (Class S3) for growing custard apple and are distributed in the central, southern and southeastern part of the microwatershed with moderate limitations of rooting depth and texture.

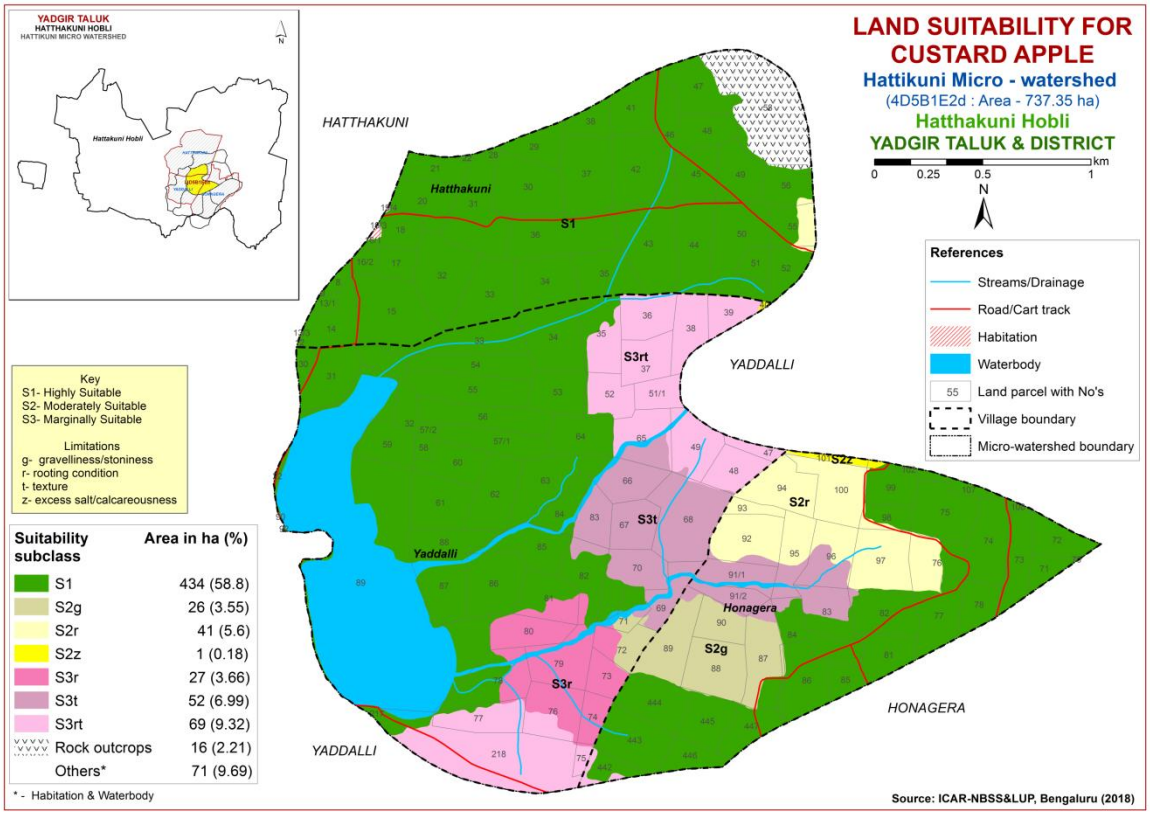


Fig. 7.25 Land Suitability map of Custard Apple

7.26 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the most important spice crop grown in almost all the districts of the state. The crop requirements for growing tamarind (Table 7.27) 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 Fig. 7.26.

Maximum area of about 435 ha (59%) is moderately suitable (Class S2) for growing Tamarind and are distributed in the major part of the microwatershed. They have minor limitation of texture. Marginally suitable (Class S3) lands for growing Tamarind occupy a small area of about 26 ha (4%) and are distributed in the southern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness. An area of about 189 ha (26%) is currently not suitable (Class N1) for growing Tamarind and occur in the central, southern, southeastern and northeastern part of the microwatershed with severe limitations of rooting depth and texture.

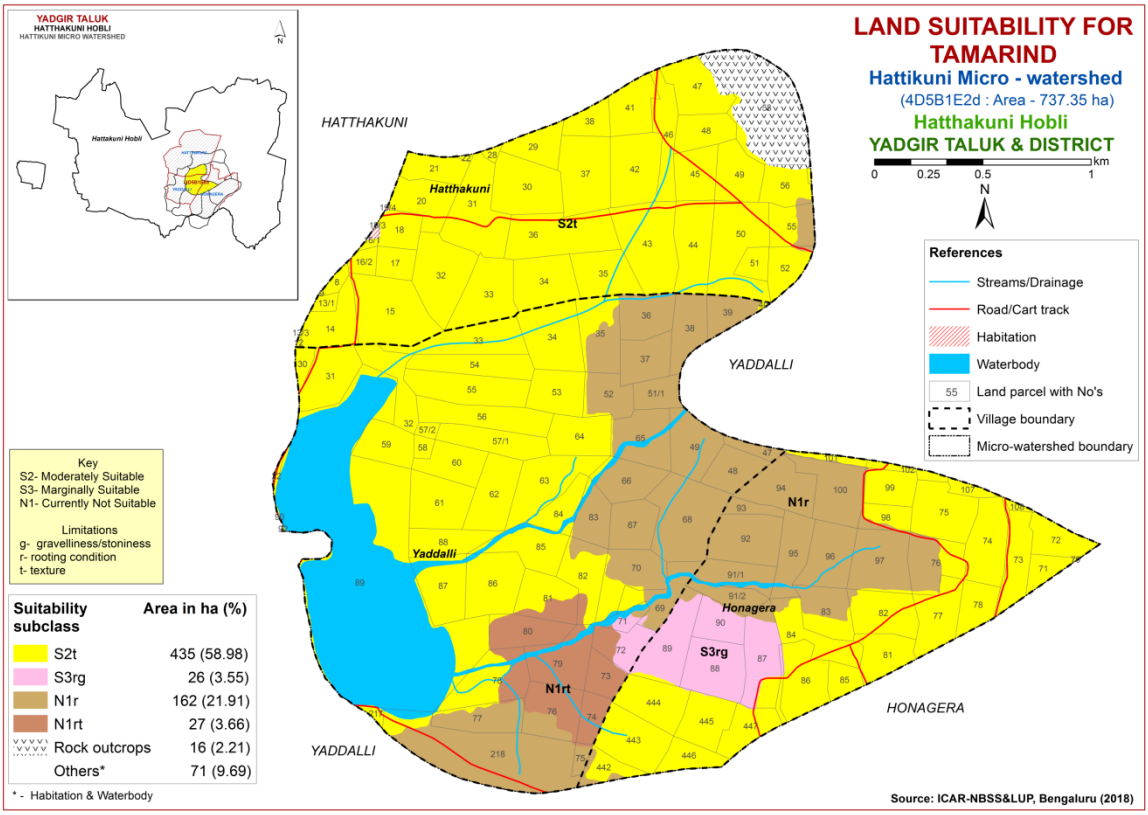


Fig. 7.26 Land Suitability map of Tamarind

7.27 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is one of the important crop grown for rearing silkworms in about 1.6 lakh ha area in all the districts of the state. The crop requirements for growing mulberry (Table 7.28) 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 7.27.

Moderately (Class S2) suitable lands occur in 26 ha (4%) and are distributed in the southern part of the microwatershed with minor limitation of gravelliness. Maximum area of about 528 ha (72%) is marginally suitable (Class S3) for growing mulberry and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, texture and drainage. Currently not suitable lands (Class N1) occupy an area of about 96 ha (13%) and distributed in the central and southern part of the microwatershed. They have severe limitations of rooting depth and texture.

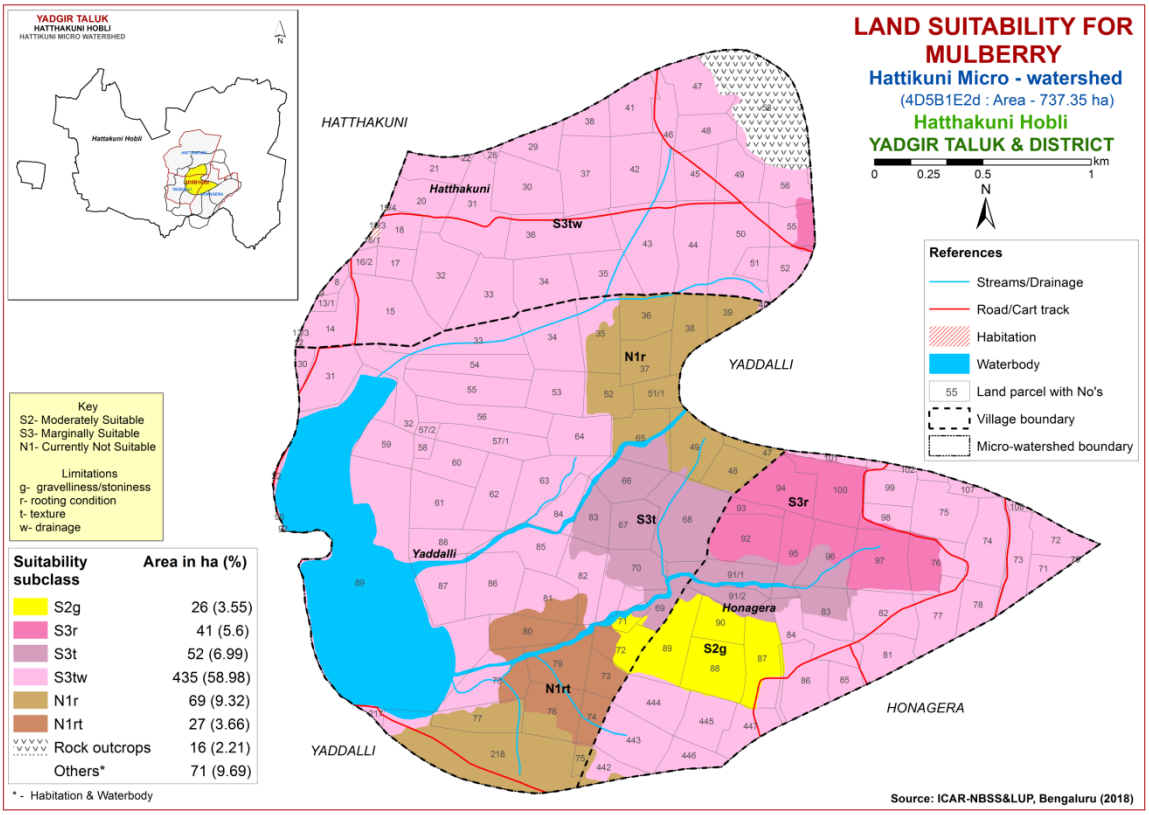


Fig 7.27 Land Suitability map of Mulberry

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

Marigold is one of the most important flower crop grown in an area of 9108 ha in almost all the districts of the State. The crop requirements (Table 7.29) for growing marigold were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.28.

An area of about 476 ha (65%) is moderately suitable (Class S2) for growing Marigold and are distributed in the major part of the microwatershed. They have minor limitations of texture, drainage and rooting depth. Marginally suitable (Class S3) lands for growing Marigold occupy an area of about 174 ha (24%) and are distributed in the central, southern and southeastern part of the microwatershed. They have moderate limitations of texture, gravelliness and rooting depth.

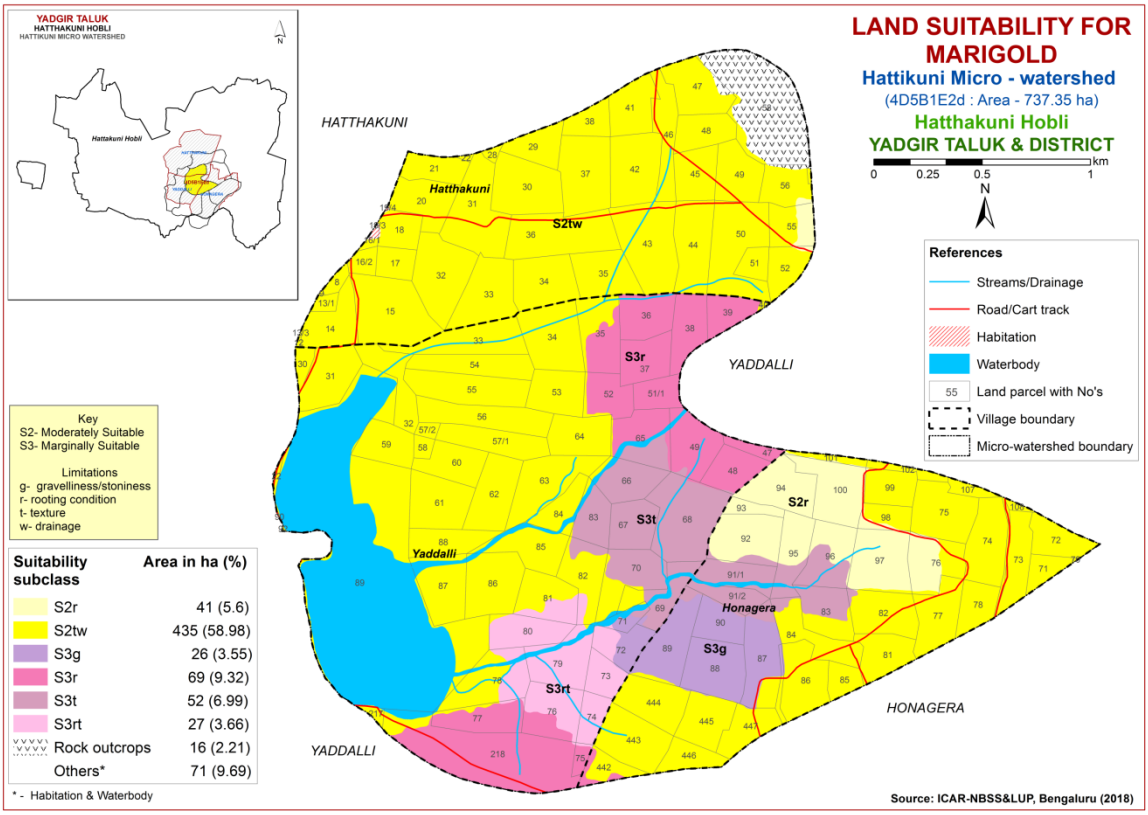


Fig. 7.28 Land Suitability map of Marigold

7.29 Land Suitability for Chrysanthemum (*Dendranthema grandiflora*)

Chrysanthemum is one of the most important flower crop grown in an area of 4978 ha in almost all the districts of the State. The crop requirements (Table 7.30) for growing chrysanthemum were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing chrysanthemum was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.29.

Maximum area of about 476 ha (65%) is moderately suitable (Class S2) for growing Chrysanthemum and are distributed in the major part of the microwatershed. They have minor limitations of texture, drainage and rooting depth. Marginally suitable (Class S3) lands for growing Chrysanthemum occupy an area of about 174 ha (24%) and are distributed in the central, southern and southeastern part of the microwatershed. They have moderate limitations of texture, gravelliness and rooting depth.

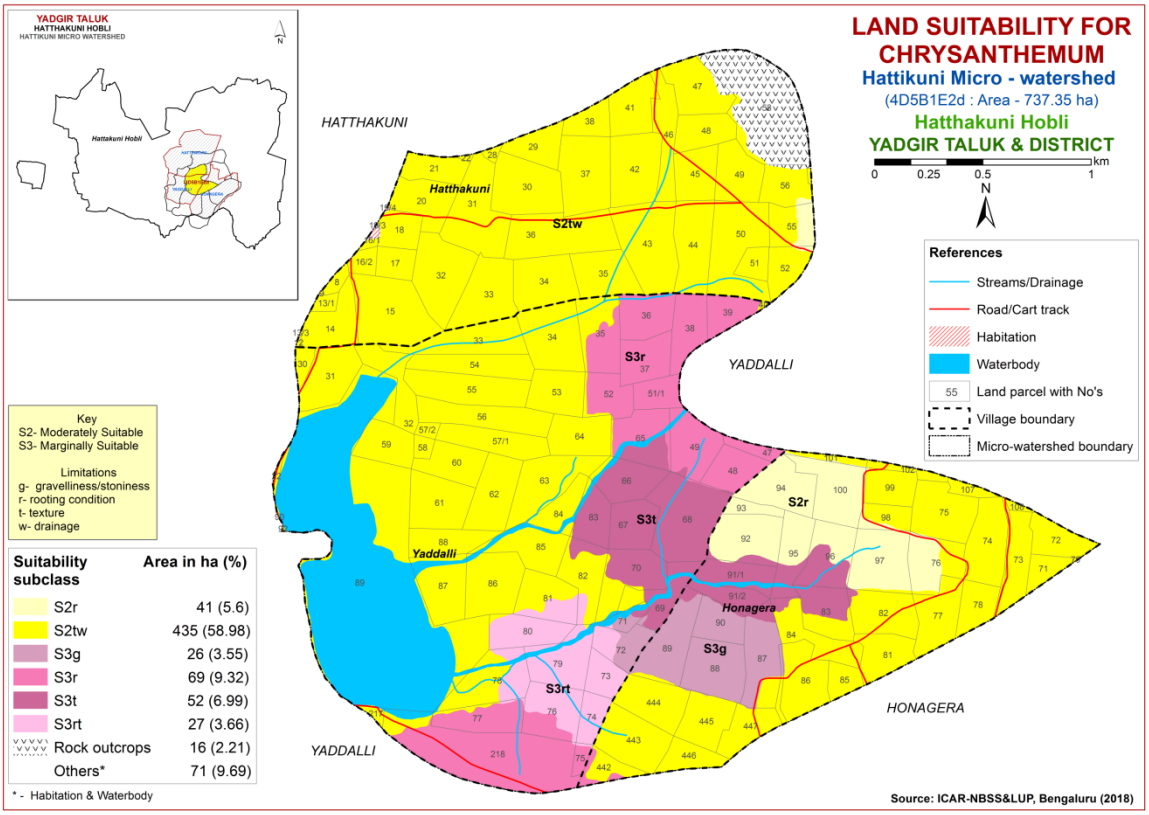


Fig. 7.29 Land Suitability map of Chrysanthemum

Table 7.1 Soil-Site Characteristics of Hattikuni Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drain-age Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP (%)	CEC [Cmol (p^{+})kg^{-1}]	BS (%)
					Sur-face	Sub-surface	Surface (%)	Sub-surface (%)								
BDLiB2	866	150	WD	25-50	sc	sl	<15	-	<50	1-3	moderate	6.20	0.074	0.20	4.20	93
HTKbB2g1	866	150	WD	25-50	ls	sl	15-35	10-25	<50	1-3	moderate	6.81	0.062	0.38	3.0	100
HTKcB2	866	150	WD	25-50	sl	sl	<15	10-25	<50	1-3	moderate	6.81	0.062	0.38	3.0	100
SBRcB2	866	150	SED	50-75	sl	ls	<15	-	<50	1-3	moderate	8.24	0.145	1.15	7.50	100
JNKiB2	866	150	WD	50-75	sc	scl	<15	-	51-100	1-3	moderate	8.42	0.148	0.18	14.50	100
JNKcA1	866	150	WD	50-75	sl	scl	<15	10-25	51-100	0-1	slight	8.42	0.148	0.18	14.50	100
KBDhB2	866	150	WD	75-100	scl	g scl	<15	35-60	<50	1-3	moderate	7.84	0.604	4.27	11.50	100
ANRhB2	866	150	MWD	100-150	scl	c	<15	-	>200	1-3	moderate	10.17	0.365	7.08	19.90	100
ANRcA1	866	150	MWD	100-150	sl	c	<15	-	>200	0-1	slight	10.17	0.365	7.08	19.90	100
ANRcB2	866	150	MWD	100-150	sl	c	<15	-	>200	1-3	moderate	10.17	0.365	7.08	19.90	100
MDGcA1	866	150	WD	100-150	sl	scl	<15	-	>200	0-1	slight	8.20	0.399	3.08	4.90	100
MDGhB2	866	150	WD	100-150	scl	scl	<15	-	>200	1-3	moderate	8.20	0.399	3.08	4.90	100
MDRcB2	866	150	WD	>150	sl	scl	<15	-	>200	1-3	moderate	8.31	0.33	0.90	20.57	100
MDRiA1	866	150	WD	>150	sc	scl	<15	-	>200	0-1	slight	8.31	0.33	0.90	20.57	100
MDRhB2	866	150	WD	>150	scl	scl	<15	-	>200	1-3	moderate	8.31	0.33	0.90	20.57	100
MDRiB2	866	150	WD	>150	sc	scl	<15	-	>200	1-3	moderate	8.31	0.33	0.90	20.57	100

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

Table 7.2 Land suitability criteria for Sorghum

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

Table 7.3 Land suitability criteria for Maize

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

Table 7.4 Land suitability criteria for Bajra

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

Table 7.5 Land suitability criteria for Groundnut

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

Table 7.6 Land suitability criteria for Sunflower

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

Table 7.7 Land suitability criteria for Redgram

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

Table 7.8 Land suitability criteria for Bengal gram

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

Table 7.9 Land suitability criteria for Cotton

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

Table 7.10 Land suitability criteria for Chilli

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

Table 7.11 Land suitability criteria for Tomato

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

Table 7.12 Land suitability criteria for Brinjal

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

Table 7.13 Land suitability criteria for Onion

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C	20-30	30-35	35-40	>40
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately /imperfectly	-	Poorly to V poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sl,scl,cl,sc,c (red)	-	c (Black),ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-7.8	7.8-8.4	>8.4
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<1.0	1.0-2.0	2.0-4.0	<4
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.14 Land suitability criteria for Bhendi

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

Table 7.15 Land suitability criteria for Drumstick

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

Table 7.16 Land suitability criteria for Mango

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

Table 7.17 Land suitability criteria for Guava

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

Table 7.18 Land suitability criteria for Sapota

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

Table 7.19 Land suitability criteria for Pomegranate

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

Table 7.20 Land suitability criteria for Musambi

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

Table 7.21 Land suitability criteria for Lime

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

Table 7.22 Land suitability criteria for Amla

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

Table 7.23 Land suitability criteria for Cashew

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

Table 7.24 Land suitability criteria for Jackfruit

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

Table 7.25 Land suitability criteria for Jamun

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

Table 7.26 Land suitability criteria for Custard apple

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

Table 7.27 Land suitability criteria for Tamarind

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

Table 7.28 Land suitability criteria for Mulberry

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

Table 7.29 Land suitability criteria for Marigold

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

Table 7.30 Land suitability criteria for Chrysanthemum

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

7.30 Land Management Units (LMUs)

The 16 soil map units identified in Hattikuni microwatershed have been grouped into 4 Land Management Units (LMUs) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig. 7.30) 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 4 Land Management Units along with brief description of soil and site characteristics are given below.

LUC NO.	Soil map units	Soil and site characteristics
1	53.ANRhB2 59.MDRcB2 60.MDRiA1 132.MDRhB2 133.MDRiB2 148.MDGhB2 167.ANRcA1 168.ANRcB2 169.MDGcA1	Deep to very deep, black sandy clay loam to clay soils, 0-3 % slopes, non-gravelly, slight to moderate erosion.
2	130.KBDhB2	Moderately deep, red loamy soils, 1-3 % slopes, non-gravelly, moderate erosion.
3	11.SBRcB2 22.JNKiB2 166.JNKcA1	Moderately shallow, sandy clay loam to loamy sand soils, 0-3% slopes, non-gravelly, slight to moderate erosion.
4	5.BDLiB2 161.HTKbB2g1 165.HTKcB2	Shallow, sandy loam soils, 1-3 % slopes, non-gravelly to gravelly, moderate erosion.

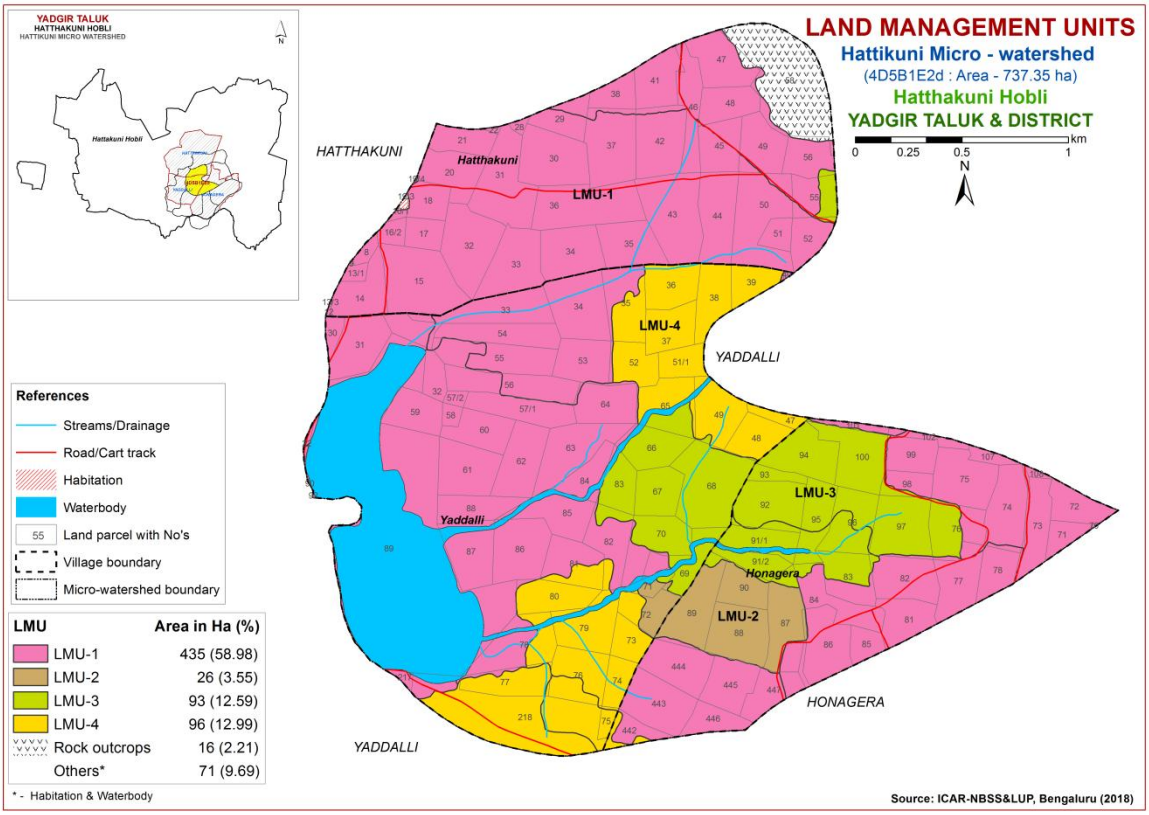


Fig. 7.30 Land management unit Map- Hattikuni Microwatershed

7.31 Proposed Crop Plan for Hattikuni Microwatershed

After assessing the land suitability for the 29 crops, the Proposed Crop Plan has been prepared for the 4 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 29 crops. The resultant proposed crop plan is presented below in Table 7.31.

Table 7.31 Proposed Crop Plan for Hattikuni Microwatershed

LMU	Soil Map Units	Survey Number	Soil and site characteristics	Field Crops/Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	53.ANRhB2 59.MDRcB2 60.MDRiA1 132.MDRhB2 133.MDRiB2 148.MDGhB2 167.ANRcA1 168.ANRcB2 169.MDGcA1	**Hatthakuni:**8,9,12,13/1,13/3,14,15,16/1,16/2,17,18,20,21,22,28,29,30,31,32,33,34,35,36,37,38,41,42,43,44,45,46,47,48,49,50,51,52,55,56 **Honagera:**70,71,72,73,74,75,77,78,81,82,84,85,86,98,99,101,102,107,108,442,443,444,445,446,447 **Yaddalli:**22,30,31,32,33,34,40,53,54,55,56,57/1,57/2,58,59,60,61,62,63,64,78,81,82,84,85,86,87,88,90,92,217	Deep to very deep, black sandy clay loam to clay soils, 0-3 % slopes, non-gravelly, slight to moderate erosion.	Sunflower, Sorghum, Maize, Soybean, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Tamarind, Pomegranate, Lime, Musambi, Jamun, Amla, Custard apple **Vegetables:** Drumstick, Chilli, Bhendi, Cluster bean, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
2	130.KBDhB2	**Honagera:** 87,88,89,90 **Yaddalli:** 71,72	Moderately deep, red loamy soils, 1-3 % slopes, non-gravelly, moderate erosion.	Groundnut, Bajra, Horse gram, Castor, Mulberry	**Fruit crops:** Musambi, Lime, Jamun, Jackfruit Amla, Custard apple, Tamarind **Vegetable crops:** Drumstick, Curry leaves	Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc)
3	11.SBRcB2 22.JNKiB2 166.JNKcA1	**Honagera:**76,83,91/1,91/2,92,93,94,95,96,97,100 **Yaddalli :** 66,67,68,69,70,83	Moderately shallow, sandy clay loam to loamy sand soils, 0-3% slopes, non-gravelly, slight to moderate erosion.	Sorghum, Bajra, Coriander	**Fruit crops:** Amla, Custard apple **Vegetables:** Coriander, Bhendi **Flowers:** Marigold, Jasmine, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
4	5.BDLiB2 161.HTKbB2g1 165.HTKcB2	**Yaddalli:**35,36,37,38,39,47,48,49,51/1,52,65,73,74,75,76,77,79,80,218	Shallow, sandy loam soils, 1-3 % slopes, non-gravelly to gravelly, moderate erosion.	-	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata, Styloxanthes scabra*	Use of short duration varieties, sowing across the slope, drip irrigation and mulching is recommended

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Hattikuni Microwatershed

- The soil phases identified in the microwatershed belonged to the soil series of ANR series occupies maximum area of 240 ha (33%) followed by MDR 155 ha (21%), HTK 69 ha (9%), SBR 52 ha (7%), JNK 41 ha (6%), MDG 38 ha (5%), BDL 27 ha (4%) and KBD 26 ha (4%).
- As per land capability classification entire area of the microwatershed falls under arable land category (Class II & III). The major limitations identified in the arable lands were soil and erosion.

- On the basis of soil reaction, about 1 ha (<1%) is strongly to slightly acid (pH 5.0-6.5), 201 ha (27%) is neutral (pH 6.5 -7.3), 412 ha (56%) area is slightly to moderately alkaline (pH 7.3-8.4) and 36 ha (5%) is strongly to very strongly alkaline (pH 8.4 - >9.0).
- **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

Strongly acid to slightly acid soils occur in about 1 ha area in the microwatershed.

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

Liming materials:

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

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

Alkaline soils

Slightly alkaline to very strongly alkaline soils cover about 448 ha area in the microwatershed.

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

Neutral soils

Neutral soils occur in about 201ha area in the microwatershed.

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

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

Soil Degradation

Soil erosion is one of the major factors affecting the soil health in the microwatershed. Out of total 737 ha area in the microwatershed, an area of about 281 ha is suffering from moderate erosion. These areas need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning (Saturation Plan) in IWMP is focusing on preparation of

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

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

- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.
- **Surface Soil Texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato

etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Hattikuni microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is high (>0.75%) in 170 ha (23%) area, medium (0.5-0.75%) in 450 ha (61%) area and low (<0.5%) in 29 ha (4%). The areas that are medium and low 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 479 ha area where OC is low to medium (<0.5-0.75%). For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus**: Available Phosphorus is medium (23-57 kg/ha) in 595 ha (81%) of the microwatershed. In 55 ha (7%) area, the available phosphorus is high (>57 kg/ha). For all the crops 25% additional P needs to be applied where available P is medium.
- **Available Potassium:** Available potassium is medium (145-337 kg/ha) in the entire area of 650 ha (88%) area of the microwatershed. All the plots, where available potassium is medium, for all the crops, additional 25% potassium may be applied.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops, it is high in 44 ha (6%), medium in 436 ha (59%) and low in 170 ha (23%). Low and medium areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** An area of 398 ha (54%) is low and 251 ha (34%) is medium. For these areas, application of sodium borate @ 10 kg/ha as soil application or 0.2 % borax as foliar spray is recommended.

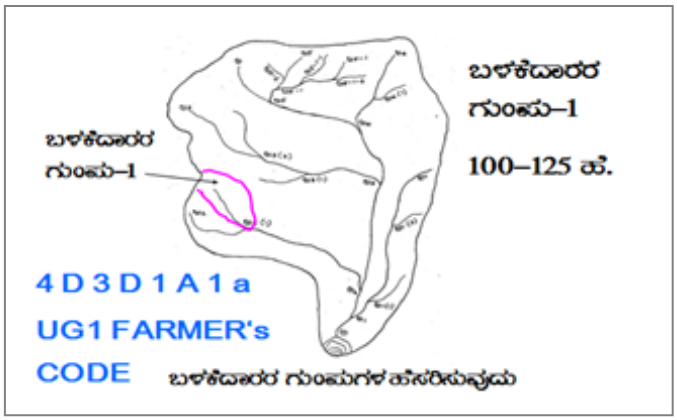
- **Available Iron:** An area of 643 ha (87%) is sufficient in available iron and deficient in 7 ha (<1%) area of the microwatershed. For the deficient areas, iron sulphate @ 25 kg/ha need to be applied for 2-3 years.
- **Available Manganese:** Entire cultivated area of the microwatershed is sufficient in the available manganese content.
- **Available Copper:** Entire cultivated area of the microwatershed is sufficient in the available copper content.
- **Available Zinc:** Entire cultivated area of the microwatershed is deficient in available zinc content. Application of zinc sulphate @25 kg/ha is recommended for the deficient areas.
- **Soil Alkalinity:** The microwatershed has 448 ha (61%) area with soils that are slightly to very strongly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.
- **Land Suitability for various crops:** Areas that are highly, moderately and marginally suitable 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 the 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 Hattikuni 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
- Rainfall
- Hydrology
- Water Resources
- Socio-economic data
- Contour plan with existing features- network of waterways, pothissa boundaries, cut up/ minor terraces etc.
- Cadastral map (1:7920 scale)
- Satellite imagery (1:7920 scale)



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

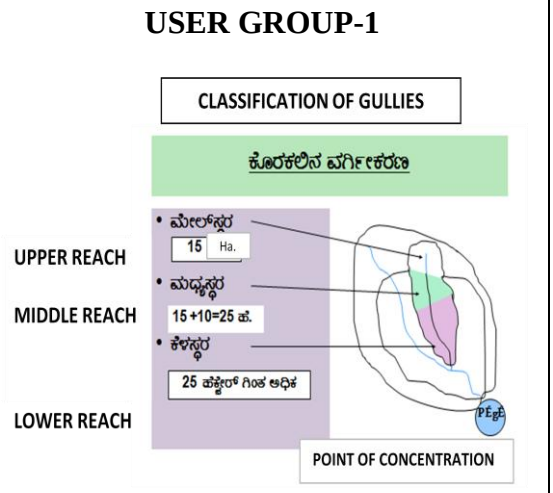
9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below

9.1.1 Arable Land Treatment

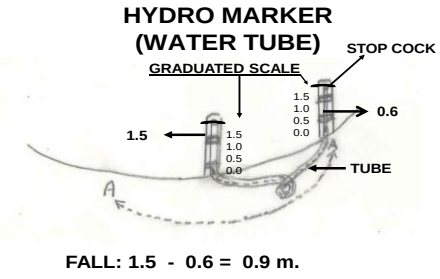
A. BUNDING

Steps for Survey and Preparation of Treatment Plan	
• 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.

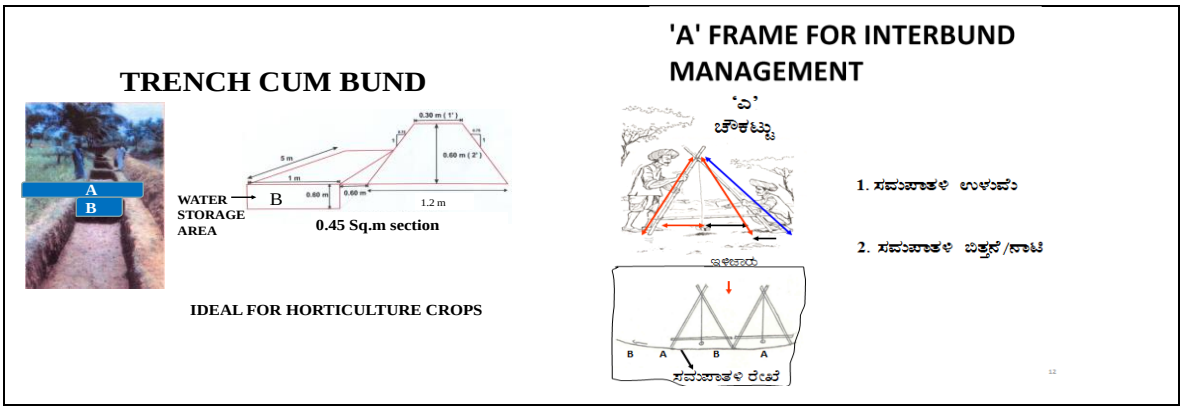
Recommended Bund Section

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 soils	
0.45	2	0.75	01:01	0.92		
0.45	2.4	0.75	1.3:1	1.07	Shallow black soils	
0.6	3.1	0.7	1.78:1	1.29	Medium black soils	
0.5	3	0.85	1.47:1	1.49		

Formation of Trench cum Bund

Dimensions of the Borrow Pits/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. Water Ways

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

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

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 from water budgeting and quality of water in the wells and site suitability.
e) Detailed Leveling Survey using Dumpy Level / Total Station has to be carried out to arrive at the site-specific designs as shown in the Manual.
f) The location of ground water recharge structures are decided by examining the lineaments and fracture zones from geological maps.
g) Rainfall intensity data of the nearest Rain Gauge Station is considered for Hydrologic Designs.
h) Silt load to the Storage/Recharge Structures is reduced by providing vegetative, boulder and earthen checks in the natural water course. Location and design details are given in the Manual.

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. An area of about 26 ha (4%) needs Trench cum Bunding, 255 ha (35%) needs Graded Bunding and 369 ha (50%) needs strengthening of existing bunds.

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

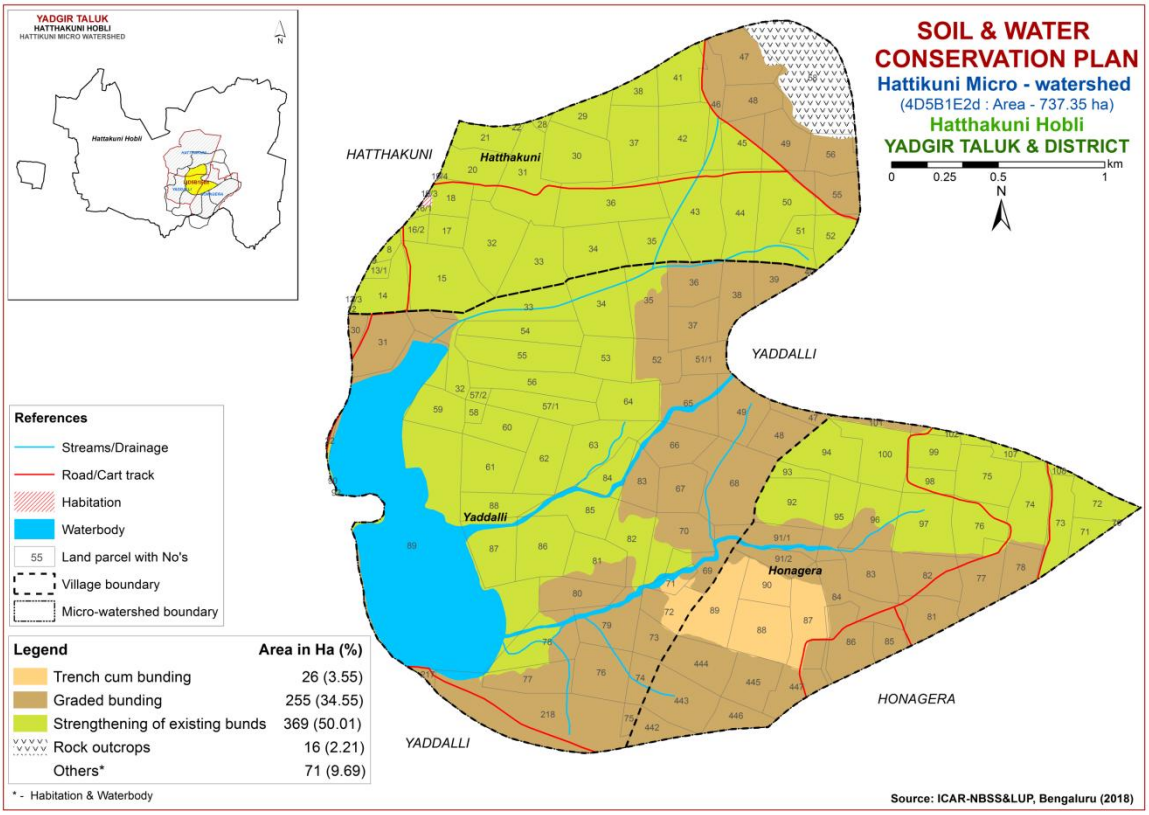


Fig. 9.1 Soil and Water Conservation Plan map of Hattikuni Microwatershed

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 and field bunds for growing annual and perennial crops. The method of planting these trees is given below.

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

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

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

References

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

Appendix I

Hattikuni Microwatershed

Soil Phase Information

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Hatthakuni	8	0.86	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar+Groundnut (Jw+Gn)	Not Available	IIs	Graded bunding
Hatthakuni	9	0.04	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	12	0.08	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	13/1	0.84	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	Not Available	IIs	Graded bunding
Hatthakuni	13/3	0.03	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	14	5.04	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	Not Available	IIs	Graded bunding
Hatthakuni	15	10.17	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	16/1	0.5	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar+Habitation (Jw+Hb)	Not Available	IIs	Graded bunding
Hatthakuni	16/2	1.41	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	17	2.49	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	Not Available	IIs	Graded bunding
Hatthakuni	18	3.18	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	19/3	0.04	Habitation	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Hatthakuni	19/4	0.04	Habitation	Others	Others	Others	Others	Others	Others	Others	Others	Not Available	Others	Others
Hatthakuni	20	5.25	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar+Groundnut (Jw+Gn)	Not Available	IIs	Graded bunding
Hatthakuni	21	3.43	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Hatthakuni	22	0.16	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Hatthakuni	28	0.43	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Hatthakuni	29	3.65	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	Not Available	IIs	Graded bunding
Hatthakuni	30	7.74	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Hatthakuni	31	9.27	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	1 Borewell	IIs	Graded bunding
Hatthakuni	32	8.38	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	33	7.13	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar+Paddy (Jw+Pd)	Not Available	IIs	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Hatthakuni	34	6.47	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Hatthakuni	35	5.64	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Hatthakuni	36	9.56	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	37	8.09	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Hatthakuni	38	2.75	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut+Jowar (Gn+Jw)	Not Available	IIs	Graded bunding
Hatthakuni	41	4.87	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	1 Borewell	IIs	Graded bunding
Hatthakuni	42	7.36	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	1 Borewell	IIs	Graded bunding
Hatthakuni	43	10.02	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar+Paddy (Jw+Pd)	1 Borewell	IIs	Graded bunding
Hatthakuni	44	7.02	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	1 Borewell	IIs	Graded bunding
Hatthakuni	45	4.58	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	1 Borewell	IIs	Graded bunding
Hatthakuni	46	4.96	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Hatthakuni	47	5.92	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	1 Borewell	IIes	Graded bunding
Hatthakuni	48	4.08	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Hatthakuni	49	5.16	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Hatthakuni	50	10.02	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut+Paddy (Gn+Pd)	Not Available	IIs	Graded bunding
Hatthakuni	51	1.89	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Hatthakuni	52	3.53	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut+Jowar (Gn+Jw)	Not Available	IIs	Graded bunding
Hatthakuni	55	4	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	1 Borewell	IIes	Graded bunding
Hatthakuni	56	4.12	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Hatthakuni	58	16.61	RO	RO	RO	RO	RO	RO	RO	RO	Forest (Fo)	Not Available	RO	RO
Honagera	100	7.06	JNKcA1	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Jowar+Groundnut (Jw+Gn)	Not Available	IIs	Graded bunding
Honagera	101	1.1	MDGhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Honagera	102	1.25	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Honagera	107	1.13	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Honagera	108	0.37	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly	Very high (>200	Nearly level (0-	Slight	Cotton (Ct)	Not	IIs	Graded

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
							(<15%)	mm/m)	1%)			Available		bunding
Honagera	442	2.83	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Honagera	443	6.96	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Paddy (Gn+Pd)	Not Available	IIes	Graded bunding
Honagera	444	5.94	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Honagera	445	5.09	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Honagera	446	3.11	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Honagera	447	4.06	ANRhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Honagera	70	0.03	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Redgram (Ct+Rg)	Not Available	IIs	Graded bunding
Honagera	71	2.16	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Honagera	72	3.89	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar+Redgram (Jw+Rg)	Not Available	IIs	Graded bunding
Honagera	73	4.69	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar+Redgram (Jw+Rg)	Not Available	IIs	Graded bunding
Honagera	74	6.53	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Jowar (Ct+Jw)	Not Available	IIs	Graded bunding
Honagera	75	6.87	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Honagera	76	5.76	JNKcA1	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Groundnut+Jowar+ Paddy (Gn+Jw+Pd)	Not Available	IIs	Graded bunding
Honagera	77	5.72	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Paddy (Gn+Pd)	Not Available	IIes	Graded bunding
Honagera	78	3.52	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	JowarRedgram (Jw+Rg)	1 Borewell	IIes	Graded bunding
Honagera	81	4.54	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Honagera	82	6.06	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding
Honagera	83	5.24	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Redgram (Pd+Rg)	Not Available	IIes	Graded bunding
Honagera	84	5.36	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Honagera	85	2.14	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Honagera	86	6.4	ANRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Honagera	87	7.29	KBDhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Paddy (Jw+Pd)	Not Available	IIIes	Trench cum bunding
Honagera	88	7.08	KBDhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Honagera	89	7.32	KBDhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Groundnut (Jw+Gn)	Not Available	IIIes	Trench cum bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Honagera	90	3.85	KBDhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Honagera	91/1	4.19	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Honagera	91/2	2.86	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Honagera	92	7.12	JNKcA1	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Honagera	93	1.51	JNKcA1	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Honagera	94	6.3	JNKcA1	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	Not Available	IIs	Graded bunding
Honagera	95	5	JNKcA1	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Groundnut+Paddy (Gn+Pd)	Not Available	IIs	Graded bunding
Honagera	96	6.21	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Paddy (Gn+Pd)	Not Available	IIes	Graded bunding
Honagera	97	7.55	JNKcA1	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Groundnut+Paddy (Gn+Pd)	Not Available	IIs	Graded bunding
Honagera	98	2.73	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Honagera	99	3.77	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut (Gn)	Not Available	IIs	Graded bunding
Yaddalli	22	0.34	MDRhB2	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIe	Graded bunding
Yaddalli	30	1.21	MDRhB2	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIe	Graded bunding
Yaddalli	31	6.01	MDRhB2	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIe	Graded bunding
Yaddalli	32	4.57	MDRhB2	LMU-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIe	Graded bunding
Yaddalli	33	6.83	MDGcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Yaddalli	34	7.82	MDGcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Jowar (Ct+Jw)	Not Available	IIs	Graded bunding
Yaddalli	35	6.44	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIIes	Graded bunding
Yaddalli	36	5	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Yaddalli	37	4.69	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIIes	Graded bunding
Yaddalli	38	4.74	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Yaddalli	39	3.29	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIIes	Graded bunding
Yaddalli	40	0.11	MDGhB2	LMU-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar+Paddy (Ct+Jw+Pd)	Not Available	IIes	Graded bunding
Yaddalli	47	1.36	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Yaddalli	48	4.13	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIIes	Graded bunding
Yaddalli	49	5.91	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut+Paddy (Ct+Gn+Pd)	Not Available	IIIes	Graded bunding
Yaddalli	51/1	3	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	1 Borewell	IIIes	Graded bunding
Yaddalli	52	4.29	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Yaddalli	53	5.01	MDGcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Jowar (Ct+Jw)	Not Available	IIs	Graded bunding
Yaddalli	54	5.39	MDGcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Jowar (Ct+Jw)	Not Available	IIs	Graded bunding
Yaddalli	55	7.36	MDGcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut+Jowar (Gn+Jw)	Not Available	IIs	Graded bunding
Yaddalli	56	6.75	MDGcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Jowar (Ct+Jw)	Not Available	IIs	Graded bunding
Yaddalli	57/1	5.33	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Jowar (Ct+Jw)	Not Available	IIs	Graded bunding
Yaddalli	57/2	0.67	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Yaddalli	58	0.88	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Yaddalli	59	4.49	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Yaddalli	60	4.63	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Yaddalli	61	6.51	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Groundnut (Ct+Gn)	Not Available	IIs	Graded bunding
Yaddalli	62	6.38	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Jowar+Paddy (Ct+Jw+Pd)	Not Available	IIs	Graded bunding
Yaddalli	63	7.41	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton+Paddy (Ct+Pd)	Not Available	IIs	Graded bunding
Yaddalli	64	5.24	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Groundnut+Paddy (Gn+Pd)	Not Available	IIs	Graded bunding
Yaddalli	65	6.5	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIIes	Graded bunding
Yaddalli	66	5.03	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Scrub land (Pd+Sl)	1 Borewell	IIes	Graded bunding
Yaddalli	67	4.64	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Paddy (Ct+Pd)	Not Available	IIes	Graded bunding
Yaddalli	68	10.82	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Paddy+Scrub land (Ct+Pd+Sl)	1 Borewell	IIes	Graded bunding
Yaddalli	69	4.89	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Yaddalli	70	6.42	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Yaddalli	71	1.6	KBDhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIIes	Trench cum bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Yaddalli	72	3.86	KBDhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIIes	Trench cum bunding
Yaddalli	73	2.91	BDLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Scrub land (Ct+Sl)	Not Available	IIIes	Graded bunding
Yaddalli	74	2.58	BDLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIIes	Graded bunding
Yaddalli	75	0.95	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIIes	Graded bunding
Yaddalli	76	6.3	BDLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Yaddalli	77	5.06	HTKcB2	LMU-4	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIIes	Graded bunding
Yaddalli	78	7.47	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Scrub land (Sl)	Not Available	IIs	Graded bunding
Yaddalli	79	6.42	BDLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIIes	Graded bunding
Yaddalli	80	4.9	BDLiB2	LMU-4	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIIes	Graded bunding
Yaddalli	81	5.54	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Scrub land (Sl)	Not Available	IIs	Graded bunding
Yaddalli	82	5.72	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Yaddalli	83	3.89	SBRcB2	LMU-3	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIes	Graded bunding
Yaddalli	84	3.51	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Yaddalli	85	5.73	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Scrub land (Sl)	Not Available	IIs	Graded bunding
Yaddalli	86	7.21	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Scrub land (Sl)	Not Available	IIs	Graded bunding
Yaddalli	87	6.5	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Waterbody	Not Available	IIs	Graded bunding
Yaddalli	88	4.28	ANRcA1	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Scrub land (Sl)	Not Available	IIs	Graded bunding
Yaddalli	89	79.93	Waterbody	Others	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Yaddalli	90	0.04	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Yaddalli	92	0.02	MDRiA1	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	RO	Not Available	IIs	Graded bunding
Yaddalli	217	0.54	MDRcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Yaddalli	218	19.8	HTKcB2	LMU-4	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut +Jowar+Scrubland (Ct+Gn+Jw+Sl)	Not Available	IIIes	Graded bunding

Appendix II

Hattikuni Microwatershed

Soil Fertility Information

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hatthakuni	8	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	9	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	12	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	13/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	13/3	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	14	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	15	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	16/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	16/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	17	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	18	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	19/3	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hatthakuni	19/4	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hatthakuni	20	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	21	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	22	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	28	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	29	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	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)	Deficient (< 0.6 ppm)
Hatthakuni	31	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	32	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	33	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	34	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hatthakuni	35	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	36	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	37	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	38	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	41	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)
Hatthakuni	42	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)
Hatthakuni	43	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	44	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	45	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	46	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)
Hatthakuni	47	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	48	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)
Hatthakuni	49	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	50	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	51	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)	Deficient (< 0.6 ppm)
Hatthakuni	52	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)	Deficient (< 0.6 ppm)
Hatthakuni	55	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	56	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatthakuni	58	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Honagera	100	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	101	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	102	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	107	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)
Honagera	108	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)
Honagera	442	Slightly alkaline (pH	Non saline	Low (< 0.5 %)	Medium (23 –	Medium (145 –	Low (<10	Low (< 0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		7.3 – 7.8)	(<2 dsm)		57 kg/ha)	337 kg/ha)	ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Honagera	443	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	444	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)
Honagera	445	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)
Honagera	446	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	447	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)
Honagera	70	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	71	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	72	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)
Honagera	73	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)
Honagera	74	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)
Honagera	75	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	76	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	77	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)
Honagera	78	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)
Honagera	81	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)
Honagera	82	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)	Deficient (< 0.6 ppm)
Honagera	83	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)	Deficient (< 0.6 ppm)
Honagera	84	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	85	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)
Honagera	86	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)
Honagera	87	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	88	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)
Honagera	89	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	90	Moderately alkaline	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Medium (10 –	Low (< 0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		(pH 7.8 – 8.4)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	20 ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Honagera	91/1	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	91/2	Strongly alkaline (pH 8.4 – 9.0)	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)	Deficient (< 0.6 ppm)
Honagera	92	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	93	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	94	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	95	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	96	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	97	Slightly alkaline (pH 7.3 – 7.8)	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)	Deficient (< 0.6 ppm)
Honagera	98	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Honagera	99	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	22	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	30	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	31	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	32	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	33	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	34	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	35	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	36	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	37	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	38	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	39	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	40	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	47	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	48	Slightly alkaline (pH	Non saline	High (> 0.75	Medium (23 –	Medium (145 –	Medium (10 –	Medium (0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		7.3 – 7.8)	(<2 dsm)	%)	57 kg/ha)	337 kg/ha)	20 ppm)	– 1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Yaddalli	49	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	51/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	52	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	53	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	54	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	55	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	56	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	57/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	57/2	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	58	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	59	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	60	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	61	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	62	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	63	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	64	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	65	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	66	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	67	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	68	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	69	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	70	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	71	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	72	Moderately alkaline	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Medium (10 –	Low (< 0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		(pH 7.8 – 8.4)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	20 ppm)	ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Yaddalli	73	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)
Yaddalli	74	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	75	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	76	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	77	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	78	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	79	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)
Yaddalli	80	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	81	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)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	82	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	83	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	84	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	85	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)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	86	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	87	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	88	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)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	89	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Yaddalli	90	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	92	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaddalli	217	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)
Yaddalli	218	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Appendix III

Hattikuni Microwatershed

Soil Suitability Information

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Hatthakuni	8	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	9	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	12	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	13/1	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	13/3	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	14	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	15	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	16/1	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	16/2	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	17	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	18	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	19/3	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hatthakuni	19/4	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hatthakuni	20	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	21	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	22	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	28	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	29	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	30	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	31	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	32	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	33	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	34	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	35	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	36	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Hatthakuni	37	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	38	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Hatthakuni	41	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Hatthakuni	42	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	43	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	44	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	45	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	46	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Hatthakuni	47	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Hatthakuni	48	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Hatthakuni	49	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Hatthakuni	50	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	51	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	52	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Hatthakuni	55	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Hatthakuni	56	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Hatthakuni	58	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Honagera	100	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Honagera	101	S2r	S2tw	S3t	S1	S3t	S1	S2t	S2z	S1	S1	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S1	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Honagera	102	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	107	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	108	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	442	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	443	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	444	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	445	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	446	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Honagera	447	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	70	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	71	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	72	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	73	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	74	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	75	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	76	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Honagera	77	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	78	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	81	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	82	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	83	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Honagera	84	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	85	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	86	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	87	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Honagera	88	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Honagera	89	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Honagera	90	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Honagera	91/1	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Honagera	91/2	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Honagera	92	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Honagera	93	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Honagera	94	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Honagera	95	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Honagera	96	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Honagera	97	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Honagera	98	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Honagera	99	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	22	S3tz	S2tw	S3t	S1	S3t	S2z	S2t	S2z	S1	S2zw	S2tw	S2t	S3t	S1	N1t	S2t	S2z	S3tw	S1	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S1	S1	S2tw	S3tw
Yaddalli	30	S3tz	S2tw	S3t	S1	S3t	S2z	S2t	S2z	S1	S2zw	S2tw	S2t	S3t	S1	N1t	S2t	S2z	S3tw	S1	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S1	S1	S2tw	S3tw
Yaddalli	31	S3tz	S2tw	S3t	S1	S3t	S2z	S2t	S2z	S1	S2zw	S2tw	S2t	S3t	S1	N1t	S2t	S2z	S3tw	S1	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S1	S1	S2tw	S3tw
Yaddalli	32	S3tz	S2tw	S3t	S1	S3t	S2z	S2t	S2z	S1	S2zw	S2tw	S2t	S3t	S1	N1t	S2t	S2z	S3tw	S1	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S1	S1	S2tw	S3tw
Yaddalli	33	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Yaddalli	34	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Yaddalli	35	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	36	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	37	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	38	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	39	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	40	S2r	S2tw	S3t	S1	S3t	S1	S2t	S2z	S1	S1	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S1	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Yaddalli	47	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	48	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	49	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	51/1	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	52	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	53	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Yaddalli	54	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Yaddalli	55	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Yaddalli	56	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Yaddalli	57/1	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	57/2	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	58	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Yaddalli	59	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	60	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	61	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	62	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	63	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	64	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	65	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	66	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Yaddalli	67	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Yaddalli	68	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Yaddalli	69	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Yaddalli	70	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Yaddalli	71	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Yaddalli	72	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Yaddalli	73	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Yaddalli	74	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Yaddalli	75	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	76	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Yaddalli	77	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Yaddalli	78	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	79	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Yaddalli	80	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Yaddalli	81	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	82	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	83	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Yaddalli	84	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	85	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Yaddalli	86	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	87	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	88	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S2t	S2tw	S3tw
Yaddalli	89	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Yaddalli	90	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Yaddalli	92	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Yaddalli	217	S3tz	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S3t	S2tw	S2tw	S2tw	S2tw	S2t	S2tz	S2t	S1	S2tw	S3tw
Yaddalli	218	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r

RO- Rock outcrops , TCB-Trench cum bunding

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

1.	Salient findings of the survey	1-4
2.	Introduction	5
3	Methodology	5-6
4	Salient features of the survey	7-24
5	Summary	25-28

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	10
10	Average value of durable assets owned by households	10
11	Farm implements owned by households	10
12	Average value of farm implements owned by households	10
13	Livestock possession by households	11
14	Average labour availability	11
15	Adequacy of hired labour	12
16	Distribution of land (ha)	12
17	Average land value (Rs./ha)	12
18	Status of borewells	12
19	Source of irrigation	13
20	Depth of water	13
21	Irrigated area (ha)	13
22	Cropping pattern	13
23	Cropping intensity	14
24	Possession of Bank account	14
25	Borrowing status	14
26	Average credit amount	14
27	Cost of cultivation of Groundnut	15
28	Cost of cultivation of Paddy	16
29	Cost of cultivation of Greengram	17
30	Cost of cultivation of Red gram	18
31	Cost of cultivation of Cotton	19

32	Adequacy of fodder	20
33	Average Annual gross income of households	20
34	Average annual expenditure	20
35	Horticulture species grown	21
36	Forest species grown	21
37	Average additional investment capacity	21
38	Marketing of the agricultural produce	21
39	Marketing channels used for sale of agricultural produce	22
40	Mode of transport of agricultural produce	22
41	Interest towards soil testing	22
42	Usage pattern of fuel for domestic use	22
43	Source of drinking water	22
44	Source of light	23
45	Existence of sanitary toilet facility	23
46	Possession of public distribution system(PDS) card	23
47	Participation in NREGA programme	23
48	Adequacy of food items	23
49	Response on inadequacy of food items	24
50	Farming constraints experienced	24

Chapter 1

SALIENT FINDINGS OF THE STUDY

- *The data indicated that there were 96 (61.94%) men and 59 (38.06%) women in the micro watershed.*
- *The average family size of landless farmers was 2.8, marginal farmers were 4.6, small farmers were 5.3, semi medium farmer was 4.5 and in medium farmers it was 4.5.*
- *The data indicated that 13 (8.39%) people were in 0-15 years of age, 62 (40%) were in 16-35 years of age, 67 (43.23%) were in 36-60 years of age and 13 (8.39%) were above 61 years of age.*
- *The results indicated that Hattikuni had 58.06 per cent illiterates, 18.06 per cent of them had primary school education, 4.52 per cent of them had middle school education, 8.39 per cent of them had high school education, 5.16 per cent of them had PUC education, 1.94 per cent them had Diploma education, 2.58 per cent of them had degree education, and 1.29 per cent of them had other education.*
- *The results indicated that, 85.29 per cent of households were practicing agriculture, 8.82 per cent of the household heads were general labourers, 2.94 per cent of the household heads were agricultural labourers and 5.88 per cent were housewives.*
- *The results indicated that agriculture was the major occupation for 54.84 per cent of the household members, 2.58 per cent were agricultural labourers, 1.94 per cent were general labours, 1.94 percent were in private service, 10.32 per cent of them were students, 25.81 per cent were housewives and 1.29 per cent were children.*
- *The results showed no participation of households in any local institutions.*
- *The results indicated that 64.71 per cent of the households possess katha house, and 35.29 per cent of the households possess pucca house.*
- *The results showed that 100 per cent of the households possess TV, 8.82 per cent of the households possess Mixer grinder, 23.53 per cent of the households possess motor cycle, and 100 per cent of the households possess mobile phones.*
- *The average value of television was Rs. 9088, mixer grinder was Rs.2500, motor cycle was Rs.70500, and mobile phone was Rs.2391.*
- *About 23.53 per cent of the households possess plough, 23.53 per cent of them possess bullock cart and 23.53 per cent of the households possess weeder.*
- *The results show that the average value of plough was Rs.7250, the average value of bullock cart was Rs. 16500, and the average value of weeder was Rs. 106.*
- *The results indicated that, 29.41 per cent of the households possess bullocks, 5.88 per cent of the households possess local cow, and 5.88 per cent of the households possess sheep. Marginal farmers possessed bullock and local cow, small farmers*

possessed bullock and sheep, semi medium farmers possessed bullock and local cow, and medium farmers possessed bullock and sheep.

- *The results indicated that, average own labour men available in the micro-watershed was 9.82, average own labour (women) available was 7.16, average hired labour (men) available was 58.79 and average hired labour (women) available was 54.46.*
- *The results indicated that, 88.24 per cent of the household opined that hired labour was adequate. About 100 per cent of the marginal farmers, 100 per cent of small, 100 per cent of semi medium and 100 per cent of medium farmers have opined that the hired labour was adequate.*
- *The results indicated that, households of the Hattikuni micro-watershed possess 28.11 ha (70.12%) of dry land and 11.98 ha (29.88%) of irrigated land. Marginal farmers possess 8.49 ha (94.93%) of dry land and 0.45 ha (5.07%). Small farmers possess 14.27 ha (100%) of dry land. Semi medium farmers possess 5.34 ha (61.51%) of dry land and 3.34 ha (38.49%) of irrigated land. Medium farmers possess 8.18 ha (100%) of irrigated land.*
- *The results indicated that, the average value of dry land was Rs. 426,781.86 and average value of irrigated was Rs. 250,422.44.*
- *The results indicated that, there were 3 functioning bore wells in the micro watershed.*
- *The results indicated that, bore well was the major irrigation source for 8.82 per cent of the farmers and canal was the major source of irrigation for 2.94 per cent of the farmers in the micro watershed.*
- *The depth of bore well was 70.34 meters on an average and the depth of canal was 1.14 meters.*
- *The results indicated that, in case of marginal farmers there was 0.45 ha, in case of small farmers there was 1.29 ha, in case of semi medium farmers there was 3.34 ha and in case of medium farmers there was 8.18 ha of irrigated land.*
- *The results indicated that, farmers have grown groundnut (14.06 ha), paddy (11.53 ha), redgram (6.95 ha), greengram (3.98 ha) and cotton (3.59 ha).*
- *Marginal farmers have grown groundnut, redgram, greengram and cotton. Small farmers have grown groundnut, redgram and greengram. Semi medium farmers have grown groundnut, paddy and cotton. Medium farmers have grown only paddy.*
- *The cropping intensity in Hattikuni micro-watershed was found to be 100 per cent among marginal farmers, small farmers, semi medium farmers and medium farmers.*
- *The results indicated that, 91.18 per cent of the households have bank account and savings.*

- *The results indicate that, the average amount of loan borrowed by semi medium farmer is Rs.25000 and a medium farmer is Rs.175000.*
- *The results indicated that, the total cost of cultivation for cotton was Rs. 65030.63. The gross income realized by the farmers was Rs. 88027.40. The net income from groundnut cultivation was Rs. 22996.77, thus the benefit cost ratio was found to be 1:1.35.*
- *The total cost of cultivation for paddy was Rs. 63586.05. The gross income realized by the farmers was Rs. 121364.59. The net income from paddy cultivation was Rs. 57778.54. Thus the benefit cost ratio was found to be 1:1.91.*
- *The total cost of cultivation for green gram was Rs. 34519.74. The gross income realized by the farmers was Rs. 65035.12. The net income from green gram cultivation was Rs. 30515.38. Thus the benefit cost ratio was found to be 1:1.88.*
- *The total cost of cultivation for redgram was Rs. 29855.77. The gross income realized by the farmers was Rs. 72510.01. The net income from red gram cultivation was Rs. 42654.25. Thus the benefit cost ratio was found to be 1:2.43.*
- *The total cost of cultivation for cotton was Rs. 30852.19. The gross income realized by the farmers was Rs. 76711.16. The net income from cotton cultivation was Rs. 45858.97. Thus the benefit cost ratio was found to be 1:2.49.*
- *The results indicate that, 44.12 per cent of the households opined that dry fodder was adequate which includes 64.29 per cent of marginal, 30 per cent of small farmers, 50 per cent of semi medium farmers and 50 per cent of medium farmers. Around 41.18 per cent of the households opined that green fodder was adequate.*
- *The table indicated that the average income of landless farmers was Rs.57500, marginal farmers' was Rs.110035.71, small farmers' was Rs. 193000, semi medium farmers' was Rs.280750 and medium farmers' was Rs.440000.*
- *The results indicate that the average annual expenditure is Rs. 14906. For landless farmers it was Rs.5625, marginal farmers it was Rs. 2836, for small farmers it was Rs. 15711, for semi medium farmers it was Rs. 31875 and for medium farmers it was Rs. 80000.*
- *The results indicated that, cotton, greengram and groundnut were sold to the extent of 100 per cent. Paddy was sold to the extent of 98.1 per cent and sorghum 85 per cent.*
- *The results indicated that, 2.94 per cent of the households sold their produce to agent/traders, 82.35 per cent of the households have sold their produce to local/village merchants and 2.94 per cent of the households sold their produce in regulated markets.*
- *The results indicated that 5.88 per cent of the households have used cart as a mode of transport and 82.35 per cent have used tractor.*
- *The results indicated that, 85.29 per cent of the households have shown interest in soil testing.*

- *The results indicated that, 82.35 percent used fire wood as a source of fuel.*
- *Piped supply was the major source for drinking water for 100 per cent of the households in the micro watershed.*
- *Electricity was the major source of light for 100 per cent of the population.*
- *The results indicated that, 23.53 per cent of the households possess sanitary toilet i.e. 50 per cent of landless, 14.29 per cent of marginal, 10 per cent of small, 25 per cent of semi medium and 100 per cent of medium famers had sanitary toilet facility.*
- *The results indicated that, 100 per cent of the sampled households possessed BPL card.*
- *The results indicated that, 79.41 per cent of the households participated in NREGA programme which included 75 per cent of the landless, 57.14 percent of the marginal, 100 per cent of the small, 100 per cent of the semi medium and 100 percent of the medium farmers.*
- *The results indicated that, cereals were adequate for 79.41 per cent of the households, pulses were adequate for 55.88 per cent of the households, oilseeds were adequate for 35.29 per cent, vegetables were adequate for 64.71 per cent of the household, fruits for 41.18 percent, milk for 73.53, egg for 70.59 and meat was adequate for 67.65 per cent of the households.*
- *The results indicated that, lower fertility status of the soil was the constraint experienced by 88.24 per cent of the households, wild animal menace on farm field (76.47%), frequent incidence of pest and diseases (32.35%), inadequacy of irrigation water (8.82%), high cost of fertilizers and plant protection chemicals (79.41%), high rate of interest on credit (85.29%), low price for the agricultural commodities (82.35%), lack of marketing facilities in the area (79.41%), inadequate extension services (5.88%), lack of transport for safe transport of the agricultural produce to the market (76.47%) and less rainfall (2.94%).*

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

Yadgir District is one of the 30 districts of Karnataka state in southern India. This district was carved out from the erstwhile Gulbarga district as the 30th district of Karnataka on 10 April 2010. Yadgir town is the administrative headquarters of the district. The district comprises of 3 taluks namely, Shahapur, Yadgiri and Shorapur (There are 16 hoblies, 117 Gram Panchayats, 4 Municipalities,8 Towns/ Urban agglomeration and 487 inhabited &32 un-inhabited villages The district occupies an area of 5,160.88 km².

Yadgir district is the second smallest district in the state, area wise is very rich in cultural traditions. The vast stretch of fertile black soil of the district is known for bumper red gram and jawar crops. The district is a "Daal bowl" of the state. The district is also known for cluster of cement industries and a distinct stone popularly known as "Malakheda Stone". Two main rivers, Krishna and Bhima, and a few tributaries flow in this region. Krishna and Bhima Rivers drain the district. They constitute the two major river basins of the district. Kagna and Amarja are the two sub - basins of Bhima River, which occur within the geographical area of the district

According to the 2011 census Yadgir district has a population of 1, 172,985, roughly equal to the nation of Timor-Lesteor the US state of Rhode Island. This gives it a ranking of 404th in India (out of a total of 640). The district has a population density of 224 inhabitants per square kilometre (580/sq mi). Its population growth rate over the decade 2001-2011 was 22.67%. Yadgir has a sex ratio of 984 females for every 1000 males, and a literacy rate of 52.36%.

Description of the micro watershed

Hattikuni micro-watershed in Hattikuni sub-watershed (Yadgir taluk and district) is located in between 16^0 49’36.649’’ to 16^0 51’25.488’’ North latitudes and 77^0 9’13.174’’ to 77^0 11’18.533’’ East longitudes, covering an area of about 737.06 ha, bounded by Hattikuni, Yaddalli and Honagera 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 34 households located in the micro-watershed were interviewed for the survey.

Chapter 4

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 Hattikuni micro-watershed is presented in Table 1 and it indicated that 34 farmers were sampled in Hattikuni micro-watershed among them 14 (41.18%) were marginal farmers, 10 (29.41%) were small farmers, 4 (11.76%) were semi medium farmers, 2 (5.88%) medium farmers and 4 (11.76%) landless farmers were also interviewed for the survey.

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

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	4	11.76	14	41.18	10	29.41	4	11.76	2	5.88	34	100.00

Population characteristics: The population characteristics of households sampled for socio-economic survey in Hattikuni micro-watershed is presented in Table 2. The data indicated that there were 96 (61.94%) men and 59 (38.06%) women in the micro watershed. The average family size of landless farmers was 2.8, marginal farmers were 4.6, small farmers were 5.3, semi medium farmer was 4.5 and in medium farmers it was 4.5.

Table 2: Population characteristics of Hattikuni micro-watershed

Sl.No.	Particulars	LL (11)		MF (64)		SF (53)		SMF (18)		MDF (9)		All (155)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Male	7	63.64	40	62.50	33	62.26	12	66.67	4	44.44	96	61.94
2	Female	4	36.36	24	37.50	20	37.74	6	33.33	5	55.56	59	38.06
Total		11	100.00	64	100.00	53	100.00	18	100.00	9	100.00	155	100.00
Average family		2.8		4.6		5.3		4.5		4.5		4.6	

Age wise classification of population: The age wise classification of household members in Hattikuni micro-watershed is presented in Table 3. The data indicated that 13 (8.39%) people were in 0-15 years of age, 62 (40%) were in 16-35 years of age, 67 (43.23%) were in 36-60 years of age and 13 (8.39%) were above 61 years of age.

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

Sl.No.	Particulars	LL (11)		MF (64)		SF (53)		SMF (18)		MDF (9)		All (155)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	2	18.18	5	7.81	6	11.32	0	0.00	0	0.00	13	8.39
2	16-35 years of age	5	45.45	28	43.75	20	37.74	8	44.44	1	11.11	62	40.00
3	36-60 years of age	4	36.36	24	37.50	25	47.17	8	44.44	6	66.67	67	43.23
4	> 61 years	0	0.00	7	10.94	2	3.77	2	11.11	2	22.22	13	8.39
Total		11	100.00	64	100.00	53	100.00	18	100.00	9	100.00	155	100.00

Education level of household members: Education level of household members in Hattikuni micro-watershed is presented in Table 4. The results indicated that Hattikuni had 58.06 per cent illiterates, 18.06 per cent of them had primary school education, 4.52 per cent of them had middle school education, 8.39 per cent of them had high school education, 5.16 per cent of them had PUC education, 1.94 per cent them had Diploma education, 2.58 per cent of them had degree education, and 1.29 per cent of them had other education.

Table 4: Education level of household members in Hattikuni micro-watershed

Sl.No.	Particulars	LL (11)		MF (64)		SF (53)		SMF (18)		MDF (9)		All (155)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	7	63.64	40	62.50	26	49.06	11	61.11	6	66.67	90	58.06
2	Primary School	1	9.09	14	21.88	10	18.87	2	11.11	1	11.11	28	18.06
3	Middle School	0	0.00	2	3.13	4	7.55	1	5.56	0	0.00	7	4.52
4	High School	0	0.00	5	7.81	7	13.21	1	5.56	0	0.00	13	8.39
5	PUC	1	9.09	0	0.00	3	5.66	2	11.11	2	22.22	8	5.16
6	Diploma	0	0.00	1	1.56	1	1.89	1	5.56	0	0.00	3	1.94
7	Degree	0	0.00	2	3.13	2	3.77	0	0.00	0	0.00	4	2.58
8	Others	2	18.18	0	0.00	0	0.00	0	0.00	0	0.00	2	1.29
Total		11	100.00	64	100.00	53	100.00	18	100.00	9	100.00	155	100.00

Occupation of household heads: The data regarding the occupation of the household heads in Hattikuni micro-watershed is presented in Table 5. The results indicated that, 85.29 per cent of households were practicing agriculture, 8.82 per cent of the household heads were general labourers, 2.94 per cent of the household heads were agricultural labourers and 5.88 per cent were housewives.

Table 5: Occupation of household heads in Hattikuni micro-watershed

Sl. No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0.00	13	92.86	10	100.00	4	100.00	1	50.00	29	85.29
2	Agricultural Labour	1	25.00	0	0.00	0	0.00	0	0.00	0	0.00	1	2.94
3	General Labour	3	75.00	0	0.00	0	0.00	0	0.00	0	0.00	3	8.82
4	Housewife	0	0.00	1	7.14	0	0.00	0	0.00	1	50.00	2	5.88
Total		4	100.00	14	100.00	10	100.00	4	100.0	2	100.0	35	100.0

Occupation of the household members: The data regarding the occupation of the household members in Hattikuni micro-watershed is presented in Table 6. The results indicated that agriculture was the major occupation for 54.84 per cent of the household members, 2.58 per cent were agricultural labourers, 1.94 per cent were general labours, 1.94 percent were in private service, 10.32 per cent of them were students, 25.81 per cent were housewives and 1.29 per cent were children. In case of landless households 27.27 per cent were general labour, 9.09 per cent were agricultural labour, 9.09 per cent were students, 36.36 per cent were housewives and 18.18 per cent were children. In case of

marginal households 59.38 per cent were practicing agriculture, 4.69 per cent were agricultural labour, 1.56 per cent were into trade and business, 10.94 per cent of them were students and 21.88 per cent were housewives. In case of small farm households 60.38 per cent were practicing agriculture, 3.77 per cent were into trade and business, 11.32 per cent were students and 24.53 per cent were housewives. In case of semi medium farmers 61.11 per cent were practicing agriculture, 5.56 per cent were in private service, 11.11 per cent were students and 22.22 per cent of them were housewives. In case of medium farmers 44.44 per cent were practicing agriculture and 55.56 per cent were housewives.

Table 6: Occupation of family members in Hattikuni micro-watershed

Sl.No.	Particulars	LL (11)		MF (64)		SF (53)		SMF (18)		MDF (9)		All (155)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0.00	38	59.38	32	60.38	11	61.11	4	44.44	85	54.84
2	Agricultural Labour	1	9.09	3	4.69	0	0.00	0	0.00	0	0.00	4	2.58
3	General Labour	3	27.27	0	0.00	0	0.00	0	0.00	0	0.00	3	1.94
4	Private Service	0	0.00	0	0.00	2	3.77	1	5.56	0	0.00	3	1.94
5	Trade & Business	0	0.00	1	1.56	0	0.00	0	0.00	0	0.00	1	0.65
6	Student	1	9.09	7	10.94	6	11.32	2	11.11	0	0.00	16	10.32
7	Others	0	0.00	1	1.56	0	0.00	0	0.00	0	0.00	1	0.65
8	Housewife	4	36.36	14	21.88	13	24.53	4	22.22	5	55.56	40	25.81
9	Children	2	18.18	0	0.00	0	0.00	0	0.00	0	0.00	2	1.29
Total		11	100.00	64	100.00	53	100.00	18	100.00	9	100.00	155	100.00

Institutional participation of the household members: The data regarding the institutional participation of the household members in Hattikuni micro-watershed is presented in Table 7. The results showed no participation of households in any local institutions.

Table 7: Institutional Participation of household members in Hattikuni micro-watershed

Sl. No.	Particulars	LL (11)		MF (64)		SF (53)		SMF (18)		MDF (9)		All (155)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Gram Panchayat	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
2	No Participation	11	100.00	64	100.00	53	100.00	18	100.00	9	100.00	155	100.00
Total		11	100.00	64	100.00	53	100.00	18	100.00	9	100.00	155	100.00

Type of house owned: The data regarding the type of house owned by the households in Hattikuni micro-watershed is presented in Table 8. The results indicated that 64.71 per cent of the households possess katha house, and 35.29 per cent of the households possess pucca house.

Table 8: Type of house owned by households in Hattikuni micro-watershed

Sl. No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		LF (0)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Katcha	4	100.00	10	71.43	6	60.00	2	50.00	0	0.00	0	0.00	22	64.71
2	Pucca/RCC	0	0.00	4	28.57	4	40.00	2	50.00	2	100.00	0	0.00	12	35.29
Total		4	100.00	14	100.00	10	100.00	4	100.00	2	100.00	0	100.00	34	100.00

Durable Assets owned by the households: The data regarding the durable assets owned by the households in Hattikuni micro-watershed is presented in Table 9. The results showed that 100 per cent of the households possess TV, 8.82 per cent of the households possess Mixer grinder, 23.53 per cent of the households possess motor cycle, and 100 per cent of the households possess mobile phones.

Table 9: Durable Assets owned by households in Hattikuni micro-watershed

Sl. No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	4	100.00	14	100.00	10	100.00	4	100.00	2	100.00	34	100.00
2	Mixer/Grinder	0	0.00	2	14.29	1	10.00	0	0.00	0	0.00	3	8.82
3	Motor Cycle	0	0.00	3	21.43	3	30.00	1	25.00	1	50.00	8	23.53
4	Mobile Phone	4	100.00	14	100.00	10	100.00	4	100.00	2	100.00	34	100.00

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Hattikuni micro-watershed is presented in Table 10. The results showed that the average value of television was Rs. 9088, mixer grinder was Rs.2500, motor cycle was Rs.70500, and mobile phone was Rs.2391.

Table 10: Average value of durable assets owned by households in Hattikuni micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
1	Television	8,500.00	8,571.00	9,100.00	10,000.00	12,000.00	9,088.00
2	Mixer/Grinder	0.00	2,500.00	2,500.00	0.00	0.00	2,500.00
3	Motor Cycle	0.00	68,333.00	70,000.00	75,000.00	74,000.00	70,500.00
4	Mobile Phone	2,000.00	2,035.00	2,560.00	3,272.00	1,733.00	2,391.00

Farm Implements owned: The data regarding the farm implements owned by the households in Hattikuni micro-watershed is presented in Table 11. About 23.53 per cent of the households possess plough, 23.53 per cent of them possess bullock cart and 23.53 per cent of the households possess weeder.

Table 11: Farm Implements owned by households in Hattikuni micro-watershed

Sl. No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0.00	4	28.57	2	20.00	2	50.00	0	0.00	8	23.53
2	Plough	0	0.00	4	28.57	2	20.00	2	50.00	0	0.00	8	23.53
3	Weeder	0	0.00	4	28.57	2	20.00	2	50.00	0	0.00	8	23.53
4	Blank	4	100.00	10	71.43	8	80.00	2	50.00	2	100.00	26	76.47

Table 12: Average value of farm implements owned by households in Hattikuni micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
1	Bullock Cart	0.00	16,500.00	17,000.00	16,000.00	0.00	16,500.00
2	Plough	0.00	5,625.00	8,250.00	9,500.00	0.00	7,250.00
3	Weeder	0.00	114.00	100.00	100.00	0.00	106.00

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Hattikuni micro-watershed is presented in Table

12. The results show that the average value of plough was Rs.7250, the average value of bullock cart was Rs. 16500, and the average value of weeder was Rs. 106.

Possession by the households: The data regarding the Livestock possession by the households in Hattikuni micro-watershed is presented in Table 13. The results indicated that, 29.41 per cent of the households possess bullocks, 5.88 per cent of the households possess local cow, and 5.88 per cent of the households possess sheep.

Marginal farmers possessed bullock and local cow, small farmers possessed bullock and sheep, semi medium farmers possessed bullock and local cow, and medium farmers possessed bullock and sheep.

Table 13: Livestock possession by households in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0.00	5	35.71	3	30.00	1	25.00	1	50.00	10	29.41
2	Local cow	0	0.00	1	7.14	0	0.00	1	25.00	0	0.00	2	5.88
3	Sheep	0	0.00	0	0.00	1	10.00	0	0.00	1	50.00	2	5.88
4	blank	4	100.00	9	64.29	7	70.00	3	75.00	1	50.00	24	70.59

Average Labour availability: The data regarding the average labour availability in Hattikuni micro-watershed is presented in Table 14. The results indicated that, average own labour men available in the micro-watershed was 9.82, average own labour (women) available was 7.16, average hired labour (men) available was 58.79 and average hired labour (women) available was 54.46.

In case of marginal farmers, average own labour men available was 2.07, average own labour (women) was 1.86, average hired labour (men) was 7.29 and average hired labour (women) available was 6.71. In case of small farmers, average own labour men available was 2.50, average own labour (women) was 1.80, average hired labour (men) was 11.50 and average hired labour (women) available was 11.50. In case of semi medium farmers, average own labour men available was 2.75, average own labour (women) was 1.50, average hired labour (men) was 17.50 and average hired labour (women) available was 13.75. In medium farmers average own labour men available was 2.50, average own labour (women) was 2, average hired labour (men) was 22.50 and average hired labour (women) available was 22.50.

Table 14: Average Labour availability in Hattikuni micro-watershed

Sl. No.	Particulars	LL(4)	MF(14)	SF(10)	SMF(4)	MDF(2)	All(34)
		N	N	N	N	N	N
1	Own labour Male	0.00	2.07	2.50	2.75	2.50	9.82
2	Own Labour Female	0.00	1.86	1.80	1.50	2.00	7.16
3	Hired labour Male	0.00	7.29	11.50	17.50	22.50	58.79
4	Hired labour Female	0.00	6.71	11.50	13.75	22.50	54.46

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Hattikuni micro-watershed is presented in Table 15. The results indicated that, 88.24 per

cent of the household opined that hired labour was adequate. About 100 per cent of the marginal farmers, 100 per cent of small, 100 per cent of semi medium and 100 per cent of medium farmers have opined that the hired labour was adequate.

Table 15: Adequacy of Hired Labour in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0.00	14	100.00	10	100.00	4	100.00	2	100.00	30	88.24
2	Inadequate	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Distribution of land (ha): The data regarding the distribution of land (ha) in Hattikuni micro-watershed is presented in Table 16. The results indicated that, households of the Hattikuni micro-watershed possess 28.11 ha (70.12%) of dry land and 11.98 ha (29.88%) of irrigated land. Marginal farmers possess 8.49 ha (94.93%) of dry land and 0.45 ha (5.07%). Small farmers possess 14.27 ha (100%) of dry land. Semi medium farmers possess 5.34 ha (61.51%) of dry land and 3.34 ha (38.49%) of irrigated land. Medium farmers possess 8.18 ha (100%) of irrigated land.

Table 16: Distribution of land (Ha) in Hattikuni micro-watershed

Sl. No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	0	0	8.49	94.93	14.27	100	5.34	61.51	0	0	28.11	70.12
2	Irrigated	0	0	0.45	5.07	0	0	3.34	38.49	8.18	100	11.98	29.88
Total		0	100	8.94	100	14.27	100	8.68	100	8.18	100	40.08	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Hattikuni micro-watershed is presented in Table 17. The results indicated that, the average value of dry land was Rs. 426,781.86 and average value of irrigated was Rs. 250,422.44. In case of marginal famers, the average land value was Rs. 647,521.44 for dry land and Rs. 1,323,214.28. In case of small famers, the average land value was Rs. 378,168.42 for dry land. In case of semi medium famers, the average land value was Rs. 205,833.34 for dry land and Rs. 358,837.78 for irrigated land. In case of medium famers, the average land value was Rs. 146,660.07 for irrigated land.

Table 17: Average land value (Rs. /ha) in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
		N	N	N	N	N	N
1	Dry	0.00	647,521.44	378,168.42	205,833.34	0.00	426,781.86
2	Irrigated	0.00	1,323,214.28	0.00	358,837.78	146,660.07	250,422.44

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

Table 18: Status of bore wells in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
		N	N	N	N	N	N
1	De-functioning	0	0	0	0	0	0
2	Functioning	0	1	0	1	1	3

Source of irrigation: The data regarding the source of irrigation in Hattikuni micro-watershed is presented in Table 19. The results indicated that, bore well was the major irrigation source for 8.82 per cent of the farmers and canal was the major source of irrigation for 2.94 per cent of the farmers in the micro watershed.

Table 19: Source of irrigation in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	1	7.14	0	0	1	25	1	50	3	8.82
2	Canal	0	0	0	0	1	10	0	0	0	0	1	2.94

Depth of water (Average in meters): The data regarding the depth of water (in meters) in Hattikuni micro-watershed is presented in Table 20. The results indicated that, the depth of bore well was 70.34 meters on an average and the depth of canal was 1.14 meters.

Table 20: Depth of water (Average in meters) in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
		N	N	N	N	N	N
1	Bore Well	0.00	4.05	0.00	26.67	39.62	70.34
2	Canal	0.00	0.00	0.00	0.38	0.76	1.14

Irrigated Area (ha): The data regarding the irrigated area (ha) in Hattikuni micro-watershed is presented in Table 21. The results indicated that, in case of marginal farmers there was 0.45 ha, in case of small farmers there was 1.29 ha, in case of semi medium farmers there was 3.34 ha and in case of medium farmers there was 8.18 ha of irrigated land.

Table 21: Irrigated Area (ha) in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
1	Kharif	0.00	0.45	1.29	3.34	8.18	13.27
Total		0.00	0.45	1.29	3.34	8.18	13.27

Table 22: Cropping pattern (area in ha) in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
1	Kharif - Groundnut	0	3.91	6.89	3.26	0	14.06
2	Kharif - Paddy	0	0	0	3.34	8.18	11.53
3	Kharif - Red gram	0	2.21	4.74	0	0	6.95
4	Kharif - Greengram	0	1.34	2.64	0	0	3.98
5	Kharif - Cotton	0	1.5	0	2.09	0	3.59
Total		0	8.95	14.28	8.69	8.18	40.1

Cropping pattern: The data regarding the cropping pattern in Hattikuni micro-watershed is presented in Table 22. The results indicated that, farmers have grown groundnut (14.06 ha), paddy (11.53 ha), redgram (6.95 ha), greengram (3.98 ha) and cotton (3.59 ha). Marginal farmers have grown groundnut, redgram, greengram and cotton. Small farmers have grown groundnut, redgram and greengram. Semi medium farmers have grown groundnut, paddy and cotton. Medium farmers have grown only paddy.

Cropping intensity: The data regarding the cropping intensity in Hattikuni micro-watershed is presented in Table 23. The results indicated that, the cropping intensity in Hattikuni micro-watershed was found to be 100 per cent among marginal farmers, small farmers, semi medium farmers and medium farmers.

Table 23: Cropping intensity (%) in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
1	Cropping Intensity	0.00	100.00	100.00	100.00	100.00	100.00

Possession of Bank account: The data regarding the possession of Bank account and savings in Hattikuni micro-watershed is presented in Table 24. The results indicated that, 91.18 per cent of the households have bank account and savings. Among landless farmers 25 per cent of them possess bank account and savings. Among marginal, small, semi medium and medium farmers 100 per cent of them possess bank account and savings.

Table 24: Possession of Bank account and savings in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	1	25.00	14	100.00	10	100.00	4	100.00	2	100.00	31	91.18
2	Savings	1	25.00	14	100.00	10	100.00	4	100.00	2	100.00	31	91.18

Borrowing status: The data regarding the possession of borrowing status in Hattikuni micro-watershed is presented in Table 25. The results indicated that, 25 per cent of landless, 100 per cent of marginal, 90 per cent of small, 100 per cent semi medium and 100 per cent of medium farmers have borrowed credit from different sources.

Table 25: Borrowing status in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	1	25.00	14	100.00	9	90.00	4	100.00	2	100.00	30	88.24

Average credit amount: The data regarding the average credit amount availed by households in Hattikuni micro watershed is presented in Table 26. The results indicate that, the average amount of loan borrowed by semi medium farmer is Rs.25000 and a medium farmer is Rs.175000.

Table 26. Average Credit amount availed by households in Hattikuni micro watershed

Sl.No.	Particulars	LL (1)	MF (14)	SF (9)	SMF (4)	MDF (2)	All (30)
1	Average Credit	0	0	0	25,000	175,000	15,000

Cost of Cultivation of Groundnut: The data regarding the cost of cultivation of groundnut in Hattikuni micro-watershed is presented in Table 27. The results indicated that, the total cost of cultivation for cotton was Rs. 65030.63. The gross income realized by the farmers was Rs. 88027.40. The net income from groundnut cultivation was Rs. 22996.77, thus the benefit cost ratio was found to be 1:1.35.

Table 27: Cost of Cultivation of Groundnut in Hattikuni micro-watershed

Sl. No	Particulars		Units	Phy Units	Value (Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	39.85	7483.17	11.51
2	Bullock		Pairs/day	3.94	2525.26	3.88
3	Tractor		Hours	5.35	3766.73	5.79
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	136.00	17646.43	27.14
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	38.45	6503.63	10.00
8	Fertilizer + micronutrients		Quintal	6.70	4450.81	6.84
9	Pesticides (PPC)		Kgs / ltrs	2.34	2436.23	3.75
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	368.43	0.57
14	Land revenue and Taxes			0.00	3.86	0.01
II	**Cost B1**					
16	Interest on working capital				3724.52	5.73
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				48909.08	75.21
III	**Cost B2**					
18	Rental Value of Land				610.26	0.94
19	**Cost B2 = (Cost B1 + Rental value)**				49519.34	76.15
IV	**Cost C1**					
20	Family Human Labour			41.44	9598.88	14.76
21	**Cost C1 = (Cost B2 + Family Labour)**				59118.22	90.91
V	**Cost C2**					
22	Risk Premium				0.54	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				59118.76	90.91
VI	**Cost C3**					
24	Managerial Cost				5911.88	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				65030.63	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		17.23	86138.78	
		b) Main Crop Sales Price (Rs.)			5000.00	
	By Product	e) Main Product (q)		5.58	1888.63	
		f) Main Crop Sales Price (Rs.)			338.46	
b.	Gross Income (Rs.)				88027.40	
c.	Net Income (Rs.)				22996.77	
d.	Cost per Quintal (Rs./q.)				3774.76	
e.	Benefit Cost Ratio (BC Ratio)				1:1.35	

Cost of Cultivation of Paddy: The data regarding the cost of cultivation of paddy in Hattikuni micro-watershed is presented in Table 28. The results indicated that, the total cost of cultivation for paddy was Rs. 63586.05. The gross income realized by the farmers was Rs. 121364.59. The net income from paddy cultivation was Rs. 57778.54. Thus the benefit cost ratio was found to be 1:1.91.

Table 28: Cost of Cultivation of Paddy in Hattikuni micro-watershed

Sl.No	Particulars		Units	Phy Units	Value (Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	26.77	4730.52	7.44
2	Bullock		Pairs/day	0.00	0.00	0.00
3	Tractor		Hours	5.22	4128.60	6.49
4	Machinery		Hours	0.20	121.38	0.19
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	65.02	30485.47	47.94
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	12.87	2362.48	3.72
8	Fertilizer + micronutrients		Quintal	8.35	6325.16	9.95
9	Pesticides (PPC)		Kgs / ltrs	0.63	679.66	1.07
10	Irrigation		Number	2.36	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	153.80	0.24
14	Land revenue and Taxes			0.00	3.50	0.01
II	**Cost B1**					
16	Interest on working capital				4782.42	7.52
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				53773.00	84.57
III	**Cost B2**					
18	Rental Value of Land				366.67	0.58
19	**Cost B2 = (Cost B1 + Rental value)**				54139.66	85.14
IV	**Cost C1**					
20	Family Human Labour			15.44	3665.09	5.76
21	**Cost C1 = (Cost B2 + Family Labour)**				57804.75	90.91
V	**Cost C2**					
22	Risk Premium				0.75	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				57805.50	90.91
VI	**Cost C3**					
24	Managerial Cost				5780.55	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				63586.05	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		99.33	119199.41	
		b) Main Crop Sales Price (Rs.)			1200.00	
	By Product	e) Main Product (q)		15.47	2165.18	
		f) Main Crop Sales Price (Rs.)			140.00	
b.	Gross Income (Rs.)				121364.59	
c.	Net Income (Rs.)				57778.54	
d.	Cost per Quintal (Rs./q.)				640.13	
e.	Benefit Cost Ratio (BC Ratio)				1:1.91	

Cost of Cultivation of green gram: The data regarding the cost of cultivation of green gram in Hattikuni micro-watershed is presented in Table 29. The results indicated that, the total cost of cultivation for green gram was Rs. 34519.74. The gross income realized by the farmers was Rs. 65035.12. The net income from green gram cultivation was Rs. 30515.38. Thus the benefit cost ratio was found to be 1:1.88.

Table 29: Cost of Cultivation of green gram in Hattikuni micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	27.89	5147.73	14.91
2	Bullock		Pairs/day	2.06	1196.45	3.47
3	Tractor		Hours	7.35	4601.28	13.33
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	17.50	1377.74	3.99
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	26.28	4023.73	11.66
8	Fertilizer + micronutrients		Quintal	4.14	3239.87	9.39
9	Pesticides (PPC)		Kgs / ltrs	1.97	2267.31	6.57
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	3.71	0.01
II	**Cost B1**					
16	Interest on working capital				1309.10	3.79
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				23166.94	67.11
III	**Cost B2**					
18	Rental Value of Land				350.00	1.01
19	**Cost B2 = (Cost B1 + Rental value)**				23516.94	68.13
IV	**Cost C1**					
20	Family Human Labour			35.61	7864.14	22.78
21	**Cost C1 = (Cost B2 + Family Labour)**				31381.08	90.91
V	**Cost C2**					
22	Risk Premium				0.50	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				31381.58	90.91
VI	**Cost C3**					
24	Managerial Cost				3138.16	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				34519.74	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		11.82	65035.12	
		b) Main Crop Sales Price (Rs.)			5500.00	
b.	Gross Income (Rs.)				65035.12	
c.	Net Income (Rs.)				30515.38	
d.	Cost per Quintal (Rs./q.)				2919.32	
e.	Benefit Cost Ratio (BC Ratio)				1:1.88	

Cost of cultivation of Red gram: The data regarding the cost of cultivation of redgram in Hattikuni micro-watershed is presented in Table 30. The results indicated that, the total cost of cultivation for redgram was Rs. 29855.77. The gross income realized by the farmers was Rs. 72510.01. The net income from red gram cultivation was Rs. 42654.25. Thus the benefit cost ratio was found to be 1:2.43.

Table 30: Cost of Cultivation of Red gram in Hattikuni micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	18.47	3092.54	10.36
2	Bullock		Pairs/day	0.66	395.20	1.32
3	Tractor		Hours	8.13	5503.34	18.43
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	10.61	1181.06	3.96
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	19.84	3176.64	10.64
8	Fertilizer + micronutrients		Quintal	3.10	2435.59	8.16
9	Pesticides (PPC)		Kgs / ltrs	1.35	1479.58	4.96
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	139.65	0.47
14	Land revenue and Taxes			0.00	3.84	0.01
II	**Cost B1**					
16	Interest on working capital				992.80	3.33
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				18400.24	61.63
III	**Cost B2**					
18	Rental Value of Land				361.11	1.21
19	**Cost B2 = (Cost B1 + Rental value)**				18761.35	62.84
IV	**Cost C1**					
20	Family Human Labour			37.24	8379.76	28.07
21	**Cost C1 = (Cost B2 + Family Labour)**				27141.10	90.91
V	**Cost C2**					
22	Risk Premium				0.50	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				27141.60	90.91
VI	**Cost C3**					
24	Managerial Cost				2714.16	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				29855.77	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		14.23	71146.92	
		b) Main Crop Sales Price (Rs.)			5000.00	
	By Product	e) Main Product (q)		4.54	1363.09	
		f) Main Crop Sales Price (Rs.)			300.00	
b.	Gross Income (Rs.)				72510.01	
c.	Net Income (Rs.)				42654.25	
d.	Cost per Quintal (Rs./q.)				2098.18	
e.	Benefit Cost Ratio (BC Ratio)				1:2.43	

Cost of cultivation of Cotton: The data regarding the cost of cultivation of cotton in Hattikuni micro-watershed is presented in Table 31. The results indicated that, the total cost of cultivation for cotton was Rs. 30852.19. The gross income realized by the farmers was Rs. 76711.16. The net income from cotton cultivation was Rs. 45858.97. Thus the benefit cost ratio was found to be 1:2.49.

Table 31: Cost of Cultivation of cotton in Hattikuni micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	21.13	3592.03	11.64
2	Bullock		Pairs/day	0.82	411.67	1.33
3	Tractor		Hours	7.28	4849.67	15.72
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	2.58	3617.79	11.73
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	21.11	2788.60	9.04
8	Fertilizer + micronutrients		Quintal	3.40	2561.33	8.30
9	Pesticides (PPC)		Kgs / ltrs	1.47	1564.07	5.07
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	153.98	0.50
14	Land revenue and Taxes			0.00	4.39	0.01
II	**Cost B1**					
16	Interest on working capital				1263.85	4.10
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				20807.38	67.44
III	**Cost B2**					
18	Rental Value of Land				355.56	1.15
19	**Cost B2 = (Cost B1 + Rental value)**				21162.93	68.59
IV	**Cost C1**					
20	Family Human Labour			32.42	6884.18	22.31
21	**Cost C1 = (Cost B2 + Family Labour)**				28047.11	90.91
V	**Cost C2**					
22	Risk Premium				0.33	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				28047.45	90.91
VI	**Cost C3**					
24	Managerial Cost				2804.74	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				30852.19	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		15.34	76711.16	
		b) Main Crop Sales Price (Rs.)			5000.00	
b.	Gross Income (Rs.)				76711.16	
c.	Net Income (Rs.)				45858.97	
d.	Cost per Quintal (Rs./q.)				2010.93	
e.	Benefit Cost Ratio (BC Ratio)				1:2.49	

Adequacy of fodder: The data regarding the adequacy of fodder in Hattikuni micro watershed is presented in Table 32. The results indicate that, 44.12 per cent of the households opined that dry fodder was adequate which includes 64.29 per cent of marginal, 30 per cent of small farmers, 50 per cent of semi medium farmers and 50 per cent of medium farmers. Around 41.18 per cent of the households opined that green fodder was adequate.

Table 32. Adequacy of fodder in Hattikuni micro watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0.00	9	64.29	3	30.00	2	50.00	1	50.00	15	44.12
2	Inadequate-Dry Fodder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
3	Adequate-Green Fodder	0	0.00	7	50.00	4	40.00	2	50.00	1	50.00	14	41.18
4	Inadequate-Green Fodder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Average Annual gross income of households: The results of the overall average annual gross income of the household in Hattikuni is presented in table 33. The table indicated that the average income of landless farmers was Rs.57500, marginal farmers' was Rs.110035.71, small farmers' was Rs. 193000, semi medium farmers' was Rs.280750 and medium farmers' was Rs.440000.

Table 33: Average Annual gross income of households in Hattikuni micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
1	Service/salary	0.00	0.00	30,000	0.00	0.00	8,824
2	Business	0.00	0.00	0.00	7,500	0.00	882.35
3	Wage	57,500	61,786	50,500	47,500	45,000.	55,294
4	Agriculture	0.00	47,536	112,500	225,750	395,000	102,456
5	Dairy Farm	0.00	714.29	0.00	0.00	0.00	294.12
Income(Rs.)		57,500	110,035.71	193,000	280,750	440,000	167,750

Average annual expenditure: The data regarding the average annual expenditure in Hattikuni micro watershed is presented in Table 34. The results indicate that the average annual expenditure is Rs. 14906. For landless farmers it was Rs.5625, marginal farmers it was Rs. 2836, for small farmers it was Rs. 15711, for semi medium farmers it was Rs. 31875 and for medium farmers it was Rs. 80000.

Table 34. Average annual expenditure in Hattikuni micro watershed

(Avg value in Rs.)

Sl. No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
1	Service/salary	0.00	0.00	100,000	0.00	0.00	2,941
2	Business	0.00	0.00	0.00	10,000	0.00	294
3	Wage	22,500	18,214	16,111.11	20,000	10,000	17,352
4	Agriculture	0.00	18,500	41,000	97,500	150,000	39,970
5	Dairy Farm	0.00	3,000	0.00	0.00	0.00	88.24
Total		22,500	39,714	157,111	127,500	160,000	506,825
Average		5,625	2,836	15,711	31,875	80,000	14,906

Horticulture species grown: The data regarding horticulture species grown in Hattikuni micro watershed is presented in Table 35. The results indicate that, households have planted 14 coconut trees, 1 lemon tree and 2 sapota trees in their field.

Table 35. Horticulture species grown in Hattikuni micro watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	5	0	5	0	2	0	1	0	13	0
2	Lemon	0	0	1	0	0	0	0	0	0	0	1	0
3	Sapota	0	0	2	0	0	0	0	0	0	0	2	0

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

Forest species grown: The data regarding forest species grown in Hattikuni micro watershed is presented in Table 36. The results indicate that, households have planted 60 neem trees, and 2 tamarind trees in their field.

Table 36. Forest species grown in Hattikuni micro watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Neem	0	0	19	0	29	0	8	0	4	0	60	0
2	Tamarind	0	0	2	0	0	0	0	0	0	0	2	0

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

Additional investment capacity: The data regarding additional investment capacity in Hattikuni micro watershed is presented in Table 37. The results indicate that, the average additional investment capacity for land development was Rs. 500 for marginal farmers, Rs. 1000 for small farmers and Rs. 1750 for semi medium farmers.

Table 37. Additional investment capacity in Hattikuni micro watershed

Sl. No.	Particulars	LL (4)	MF (14)	SF (10)	SMF (4)	MDF (2)	All (34)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Land development	0.00	500.00	1,000.00	1,750.00	0.00	705.88

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Hattikuni micro-watershed is presented in Table 38. The results indicated that, cotton, greengram and groundnut were sold to the extent of 100 per cent. Paddy was sold to the extent of 98.1 per cent and sorghum 85 per cent.

Table 38. Marketing of the agricultural produce in Hattikuni micro-watershed

Sl. No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Cotton	60.0	0.0	60.0	100.0	5000.0
2	Greengram	46.0	0.0	46.0	100.0	5500.0
3	Groundnut	199.0	50.0	149.0	100.0	5000.0
4	Paddy	1050.0	20.0	1030.0	98.1	1200.0
5	Redgram	103.0	10.0	93.0	90.29	5000.0

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Hattikuni micro-watershed is presented in Table 39. The results indicated that, 2.94 per cent of the households sold their produce to agent/traders, 82.35 per cent of the households have sold their produce to

local/village merchants and 2.94 per cent of the households sold their produce in regulated markets.

Table 39: Marketing Channels used for sale of agricultural produce in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agent/Traders	0	0.00	0	0.00	0	0.00	1	25.00	0	0.00	1	2.94
2	Local/village Merchant	0	0.00	14	100.00	10	100.00	3	75.00	1	50.00	28	82.35
3	Regulated Market	0	0.00	0	0.00	0	0.00	0	0.00	1	50.00	1	2.94

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Hattikuni micro-watershed is presented in Table 40. The results indicated that 5.88 per cent of the households have used cart as a mode of transport and 82.35 per cent have used tractor.

Table 40. Mode of transport of agricultural produce in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cart	0	0.00	2	14.29	0	0.00	0	0.00	0	0.00	2	5.88
2	Tractor	0	0.00	12	85.71	10	100.00	4	100.00	2	100.00	28	82.35

Interest towards soil testing: The data regarding interest shown towards soil testing in Hattikuni micro-watershed is presented in Table 41. The results indicated that, 85.29 per cent of the households have shown interest in soil testing.

Table 41. Interest shown towards soil testing in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0.00	14	100.00	9	90.00	4	100.00	2	100.00	29	85.29

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Hattikuni micro-watershed is presented in Table 42. The results indicated that, 82.35 percent used fire wood as a source of fuel.

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

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	2	50.00	13	92.86	8	80.00	4	100.00	1	50.00	28	82.35

Source of drinking water: The data regarding source of drinking water in Hattikuni micro-watershed is presented in Table 43. The results indicated that, piped supply was the major source for drinking water for 100 per cent of the households in the micro watershed.

Table 43. Source of drinking water in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	4	100.00	14	100.00	10	100.00	4	100.00	2	100.00	34	100.00

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

Table 44: Source of light in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	4	100.00	14	100.00	10	100.00	4	100.00	2	100.00	34	100.00

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facili**t**y in Hattikuni micro-watershed is presented in Table 45. The results indicated that, 23.53 per cent of the households possess sanitary toilet i.e. 50 per cent of landless, 14.29 per cent of marginal, 10 per cent of small, 25 per cent of semi medium and 100 per cent of medium famers had sanitary toilet facility.

Table 45. Existence of Sanitary toilet facility in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	2	50.00	2	14.29	1	10.00	1	25.00	2	100.00	8	23.53

Possession of PDS card: The data regarding possession of PDS card in Hattikuni micro-watershed is presented in Table 46. The results indicated that, 100 per cent of the sampled households possessed BPL card.

Table 46. Possession of PDS card in Hattikuni micro-watershed

Sl. No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	APL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
2	BPL	4	100.00	14	100.00	10	100.00	4	100.00	2	100.00	34	100.00
3	Not Possessed	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Participation in NREGA programme: The data regarding participation in NREGA programme in Hattikuni micro-watershed is presented in Table 47. The results indicated that, 79.41 per cent of the households participated in NREGA programme which included 75 per cent of the landless, 57.14 percent of the marginal, 100 per cent of the small, 100 per cent of the semi medium and 100 percent of the medium farmers.

Table 47. Participation in NREGA programme in Hattikuni micro-watershed

Sl. No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	3	75.00	8	57.14	10	100.00	4	100.00	2	100.00	27	79.41

Table 48. Adequacy of food items in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	3	75.00	10	71.43	8	80.00	4	100.00	2	100.00	27	79.41
2	Pulses	0	0.00	10	71.43	5	50.00	3	75.00	1	50.00	19	55.88
3	Oilseed	1	25.00	5	35.71	3	30.00	1	25.00	2	100.00	12	35.29
4	Vegetables	2	50.00	7	50.00	7	70.00	4	100.00	2	100.00	22	64.71
5	Fruits	3	75.00	3	21.43	5	50.00	2	50.00	1	50.00	14	41.18
6	Milk	3	75.00	7	50.00	9	90.00	4	100.00	2	100.00	25	73.53
7	Egg	3	75.00	7	50.00	8	80.00	4	100.00	2	100.00	24	70.59
8	Meat	3	75.00	7	50.00	7	70.00	4	100.00	2	100.00	23	67.65

Adequacy of food items: The results indicated (Table 48) that, cereals were adequate for 79.41 per cent of the households, pulses were adequate for 55.88 per cent of the households, oilseeds were adequate for 35.29 per cent, vegetables were adequate for 64.71 per cent of the household, fruits for 41.18 percent, milk for 73.53, egg for 70.59 and meat was adequate for 67.65 per cent of the households.

Response on Inadequacy of food items: The results indicated (Table 49) that, cereals were inadequate for 20.59 per cent of the households, pulses for 44.12 per cent, oilseeds for 64.71 per cent, vegetables for 35.29 per cent, fruits for 58.82 per cent, milk for 26.47 per cent, egg for 29.41 per cent and meat was inadequate for 32.35 per cent of households.

Table 49: Response on Inadequacy of food items in Hattikuni micro-watershed

Sl.No.	Particulars	LL (4)		MF (14)		SF (10)		SMF (4)		MDF (2)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	1	25.00	4	28.57	2	20.00	0	0.00	0	0.00	7	20.59
2	Pulses	4	100.00	4	28.57	5	50.00	1	25.00	1	50.00	15	44.12
3	Oilseed	3	75.00	9	64.29	7	70.00	3	75.00	0	0.00	22	64.71
4	Vegetables	2	50.00	7	50.00	3	30.00	0	0.00	0	0.00	12	35.29
5	Fruits	1	25.00	11	78.57	5	50.00	2	50.00	1	50.00	20	58.82
6	Milk	1	25.00	7	50.00	1	10.00	0	0.00	0	0.00	9	26.47
7	Egg	1	25.00	7	50.00	2	20.00	0	0.00	0	0.00	10	29.41
8	Meat	1	25.00	7	50.00	3	30.00	0	0.00	0	0.00	11	32.35

Farming constraints: The results indicated (Table 50) that, lower fertility status of the soil was the constraint experienced by 88.24 per cent of the households, wild animal menace on farm field (76.47%), frequent incidence of pest and diseases (32.35%), inadequacy of irrigation water (8.82%), high cost of fertilizers and plant protection chemicals (79.41%), high rate of interest on credit (85.29%), low price for the agricultural commodities (82.35%), lack of marketing facilities in the area (79.41%), inadequate extension services (5.88%), lack of transport for safe transport of the agricultural produce to the market (76.47%) and less rainfall (2.94%).

Table 50: Farming constraints Experienced in Hattikuni micro-watershed

S. N.	Particulars	MF(14)		SF(10)		SMF(4)		MDF(2)		All(34)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	14	100	10	100	4	100	2	100	30	88.24
2	Wild animal menace on farm field	14	100	8	80	2	50	2	100	26	76.47
3	Frequent incidence of pest and diseases	7	50	2	20	2	50	0	0	11	32.35
4	Inadequacy of irrigation water	1	7.14	0	0	1	25	1	50	3	8.82
5	High cost of Fertilizers and plant protection chemicals	14	100	8	80	3	75	2	100	27	79.41
6	High rate of interest on credit	14	100	9	90	4	100	2	100	29	85.29
7	Low price for the agricultural commodities	12	85.7	10	100	4	100	2	100	28	82.35
8	Lack of marketing facilities in the area	12	85.7	10	100	3	75	2	100	27	79.41
9	Inadequate extension services	1	7.14	1	10	0	0	0	0	2	5.88
10	Lack of transport for safe transport of the Agril produce to the market.	11	78.6	9	90	4	100	2	100	26	76.47
11	Less rainfall	1	7.14	0	0	0	0	0	0	1	2.94

Chapter 3

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 96 (61.94%) men and 59 (38.06%) women in the micro watershed. The average family size of landless farmers was 2.8, marginal farmers were 4.6, small farmers were 5.3, semi medium farmer was 4.5 and in medium farmers it was 4.5. The data indicated that 13 (8.39%) people were in 0-15 years of age, 62 (40%) were in 16-35 years of age, 67 (43.23%) were in 36-60 years of age and 13 (8.39%) were above 61 years of age.

The results indicated that Hattikuni had 58.06 per cent illiterates, 18.06 per cent of them had primary school education, 4.52 per cent of them had middle school education, 8.39 per cent of them had high school education, 5.16 per cent of them had PUC education, 1.94 per cent them had Diploma education, 2.58 per cent of them had degree education, and 1.29 per cent of them had other education. The results indicated that, 85.29 per cent of households were practicing agriculture, 8.82 per cent of the household heads were general labourers, 2.94 per cent of the household heads were agricultural labourers and 5.88 per cent were housewives.

The results indicated that agriculture was the major occupation for 54.84 per cent of the household members, 2.58 per cent were agricultural labourers, 1.94 per cent were general labours, 1.94 percent were in private service, 10.32 per cent of them were students, 25.81 per cent were housewives and 1.29 per cent were children. The results also showed no participation of households in any local institutions.

The results indicated that 64.71 per cent of the households possess katha house, and 35.29 per cent of the households possess pucca house. The results showed that 100 per cent of the households possess TV, 8.82 per cent of the households possess Mixer grinder, 23.53 per cent of the households possess motor cycle, and 100 per cent of the households possess mobile phones. The average value of television was Rs. 9088, mixer grinder was Rs.2500, motor cycle was Rs.70500, and mobile phone was Rs.2391.

About 23.53 per cent of the households possess plough, 23.53 per cent of them possess bullock cart and 23.53 per cent of the households possess weeder. The results show that the average value of plough was Rs.7250, the average value of bullock cart was Rs. 16500, and the average value of weeder was Rs. 106.

The results indicated that, 29.41 per cent of the households possess bullocks, 5.88 per cent of the households possess local cow, and 5.88 per cent of the households possess sheep. Marginal farmers possessed bullock and local cow, small farmers possessed bullock and sheep, semi medium farmers possessed bullock and local cow, and medium farmers possessed bullock and sheep.

The results indicated that, average own labour men available in the micro-watershed was 9.82, average own labour (women) available was 7.16, average hired labour (men) available was 58.79 and average hired labour (women) available was 54.46. The results indicated that, 88.24 per cent of the household opined that hired labour was adequate. About 100 per cent of the marginal farmers, 100 per cent of small, 100 per cent of semi medium and 100 per cent of medium farmers have opined that the hired labour was adequate.

The results indicated that, households of the Hattikuni micro-watershed possess 28.11 ha (70.12%) of dry land and 11.98 ha (29.88%) of irrigated land. Marginal farmers possess 8.49 ha (94.93%) of dry land and 0.45 ha (5.07%). Small farmers possess 14.27 ha (100%) of dry land. Semi medium farmers possess 5.34 ha (61.51%) of dry land and 3.34 ha (38.49%) of irrigated land. Medium farmers possess 8.18 ha (100%) of irrigated land. The results indicated that, the average value of dry land was Rs. 426,781.86 and average value of irrigated was Rs. 250,422.44. In case of marginal famers, the average land value was Rs. 647,521.44 for dry land and Rs. 1,323,214.28. In case of small famers, the average land value was Rs. 378,168.42 for dry land. In case of semi medium famers, the average land value was Rs. 205,833.34 for dry land and Rs. 358,837.78 for irrigated land. In case of medium famers, the average land value was Rs. 146,660.07 for irrigated land.

The results indicated that, there were 3 functioning bore wells in the micro watershed. The results indicated that, bore well was the major irrigation source for 8.82 per cent of the farmers and canal was the major source of irrigation for 2.94 per cent of the farmers in the micro watershed. The depth of bore well was 70.34 meters on an average and the depth of canal was 1.14 meters. The results indicated that, in case of marginal farmers there was 0.45 ha, in case of small farmers there was 1.29 ha, in case of semi medium farmers there was 3.34 ha and in case of medium farmers there was 8.18 ha of irrigated land.

The results indicated that, farmers have grown groundnut (14.06 ha), paddy (11.53 ha), redgram (6.95 ha), greengram (3.98 ha) and cotton (3.59 ha). Marginal farmers have grown groundnut, redgram, greengram and cotton. Small farmers have grown groundnut, redgram and greengram. Semi medium farmers have grown groundnut, paddy and cotton. Medium farmers have grown only paddy. The cropping intensity in Hattikuni micro-watershed was found to be 100 per cent among marginal farmers, small farmers, semi medium farmers and medium farmers.

The results indicated that, 91.18 per cent of the households have bank account and savings. Among landless farmers 25 per cent of them possess bank account and savings. Among marginal, small, semi medium and medium farmers 100 per cent of them possess bank account and savings. The results indicated that, 25 per cent of landless, 100 per cent of marginal, 90 per cent of small, 100 per cent semi medium and 100 per cent of medium farmers have borrowed credit from different sources. The results indicate that, the average amount of loan borrowed by semi medium farmer is Rs.25000 and a medium farmer is Rs.175000.

The results indicated that, the total cost of cultivation for cotton was Rs. 65030.63. The gross income realized by the farmers was Rs. 88027.40. The net income from groundnut cultivation was Rs. 22996.77, thus the benefit cost ratio was found to be 1:1.35. The total cost of cultivation for paddy was Rs. 63586.05. The gross income realized by the farmers was Rs. 121364.59. The net income from paddy cultivation was Rs. 57778.54. Thus the benefit cost ratio was found to be 1:1.91. The total cost of cultivation for green gram was Rs. 34519.74. The gross income realized by the farmers was Rs. 65035.12. The net income from green gram cultivation was Rs. 30515.38. Thus the benefit cost ratio was found to be 1:1.88. the total cost of cultivation for redgram was Rs. 29855.77. The gross income realized by the farmers was Rs. 72510.01. The net income from red gram cultivation was Rs. 42654.25. Thus the benefit cost ratio was found to be 1:2.43. The total cost of cultivation for cotton was Rs. 30852.19. The gross income realized by the farmers was Rs. 76711.16. The net income from cotton cultivation was Rs. 45858.97. Thus the benefit cost ratio was found to be 1:2.49.

The results indicate that, 44.12 per cent of the households opined that dry fodder was adequate which includes 64.29 per cent of marginal, 30 per cent of small farmers, 50 per cent of semi medium farmers and 50 per cent of medium farmers. Around 41.18 per cent of the households opined that green fodder was adequate.

The table indicated that the average income of landless farmers was Rs.57500, marginal farmers' was Rs.110035.71, small farmers' was Rs. 193000, semi medium farmers' was Rs.280750 and medium farmers' was Rs.440000. The results indicate that the average annual expenditure is Rs. 14906. For landless farmers it was Rs.5625, marginal farmers it was Rs. 2836, for small farmers it was Rs. 15711, for semi medium farmers it was Rs. 31875 and for medium farmers it was Rs. 80000.

The results indicated that, cotton, greengram and groundnut were sold to the extent of 100 per cent. Paddy was sold to the extent of 98.1 per cent and sorghum 85 per cent. The results indicated that, 2.94 per cent of the households sold their produce to agent/traders, 82.35 per cent of the households have sold their produce to local/village merchants and 2.94 per cent of the households sold their produce in regulated markets. The results indicated that 5.88 per cent of the households have used cart as a mode of transport and 82.35 per cent have used tractor.

The results indicated that, 85.29 per cent of the households have shown interest in soil testing. The results indicated that, 82.35 percent used fire wood as a source of fuel. Piped supply was the major source for drinking water for 100 per cent of the households in the micro watershed. Electricity was the major source of light for 100 per cent of the population. The results indicated that, 23.53 per cent of the households possess sanitary toilet i.e. 50 per cent of landless, 14.29 per cent of marginal, 10 per cent of small, 25 per cent of semi medium and 100 per cent of medium famers had sanitary toilet facility. The results indicated that, 100 per cent of the sampled households possessed BPL card. The results indicated that, 79.41 per cent of the households participated in NREGA programme which included 75 per cent of the landless, 57.14 percent of the marginal, 100 per cent of the small, 100 per cent of the semi medium and 100 percent of the medium farmers.

The results indicated that, cereals were adequate for 79.41 per cent of the households, pulses were adequate for 55.88 per cent of the households, oilseeds were adequate for 35.29 per cent, vegetables were adequate for 64.71 per cent of the household, fruits for 41.18 percent, milk for 73.53, egg for 70.59 and meat was adequate for 67.65 per cent of the households. Cereals were inadequate for 20.59 per cent of the households, pulses for 44.12 per cent, oilseeds for 64.71 per cent, vegetables for 35.29 per cent, fruits for 58.82 per cent, milk for 26.47 per cent, egg for 29.41 per cent and meat was inadequate for 32.35 per cent of households.

The results indicated that, lower fertility status of the soil was the constraint experienced by 88.24 per cent of the households, wild animal menace on farm field (76.47%), frequent incidence of pest and diseases (32.35%), inadequacy of irrigation water (8.82%), high cost of fertilizers and plant protection chemicals (79.41%), high rate of interest on credit (85.29%), low price for the agricultural commodities (82.35%), lack of marketing facilities in the area (79.41%), inadequate extension services (5.88%), lack of transport for safe transport of the agricultural produce to the market (76.47%) and less rainfall (2.94%).