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

HATTI-2 (4D4A1S2a) MICROWATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

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

Citation: Rajendra Hegde, Ramesh kumar, S.C., K.V. Niranjana, S. Srinivas, M.Lalitha, B.A. Dhanorkar, R.S. Reddy and S.K. Singh (2019). "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of Hatti-2 (4D4A1S2a) Microwatershed, Koppal Taluk and District, Karnataka", ICAR-NBSS&LUP Sujala MWS Publ.154, ICAR – NBSS & LUP, RC, Bangalore. p.109&33.

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.154

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

Hatti-3 (4D4A1S2b) MICRO WATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

Sujala-III

World Bank funded Project

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

WATERSHED DEVELOPMENT DEPARTMENT, GOVT. OF KARNATAKA, BANGALORE

PREFACE

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

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

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

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

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

ICAR-NBSS&LUP, Regional Centre, Bangalore has taken up a project sponsored by the Karnataka Watershed Development Project-II, (Sujala-III), Government of Karnataka funded by the World Bank under Component -1 Land Resource Inventry. This study was taken up to demonstrate the utility of such a database in reviewing, monitoring and evaluating all the land based watershed development programs on a scientific footing. To meet the requirements of various land use planners at grassroots level, the present study on "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of for Hatti-2 microwatershed in Koppal Taluk, Koppal 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: 24.01.2019

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

Contributors

Dr. Rajendra Hegde Principal Scientist, Head & Project Leader, Sujala-III Project ICAR-NBSS&LUP, Regional Centre, Bangalore	**Dr. S.K.Singh** Director, ICAR-NBSS&LUP Coordinator, Sujala-III Project Nagpur
Soil Survey, Mapping & Report Preparation	
Dr. K.V. Niranjana	Sh. R.S. Reddy
Dr. B.A. Dhanorkar	Ms. Arpitha, G.M
	Smt. Chaitra, S.P.
	Dr. Mahendra Kumar, M.B
	Dr. Savitha, H.R.
	Dr. Gayathri, B.
	Dr. Gopali Bardhan
	Sh. Nagendra, B.R.
	Sh. Somashekar T.N
Field Work	
Sh. C. Bache Gowda	Sh. Mayur Patil
Sh. Somashekar	Sh. Arun Kumar, S.
Sh. M. Jayaramaiah	Sh. Sunil Raj
	Sh. Yogesh Kumar, B.
	Sh. Vikas, N.K.
	Sh. Arun Kumar, S.G.
	Sh. Umesh Jadiyappa Madolli
	Sh. Praveen Kumar P. Achalkar
	Sh. Veerabhadraswamy
	Sh. Vinay
	Sh. Shankarappa, K.
	Sh. Lankesh, R.S.
	Sh. Appanna B. Hattigoudar
	Sh. Maharudra
GIS Work	
Dr. S.Srinivas	Sh. A.G. Devendra Prasad
Sh. D.H.Venkatesh	Sh. Abhijith Sastry, N.S.
Smt. K.Sujatha	Sh. Nagendra Babu Kolukondu
Smt. K.V.Archana	Sh. Avinash
Sh. N.Maddileti	Sh. Amar Suputhra, S.
	Sh. Deepak M.J.
	Sh. Madappaswamy
	Smt. K.Karunya Lakshmi
	Ms. Seema, K.V.
	Ms. Ramireddy Lakshmi Silpa
	Ms. Bhanu Rekha, T.
	Ms. Rajata Bhat
	Ms. Shruthi
	Ms. Suman, S.

Laboratory Analysis	
Dr. M. Lalitha	Ms. Thara, V.R.
Smt. Arti Koyal	Ms. Roopa, G.
Smt. Parvathy, S.	Ms. Vindhya, N.G.
	Ms. Shwetha N.K.
	Ms. Pavana Kumari, P.
	Ms. Leelavathy, K.U.
	Ms. Rashmi, N.
	Ms. Padmaja, S.
	Ms. Veena, M.
	Ms. Chaithrashree B
	Ms. Shwetha N
Socio-economic Analysis	
Dr. Ramesh Kumar, S.C.	Sh. Prakashanaik, M.K.
	Sh. Basavaraj
	Sh. Vinod, R.
Soil & Water Conservation	
Sh. Sunil P. Maske	
Socio-Economic Analysis	
Dr. S.C. Ramesh Kumar	Sh. M. K. Prakashanaik
	Ms. Sowmya K.B
	Sh.Manjunath M
	Sh.Veerabhadraswamy R
	Sh.Lankesh RS
	Sh.Kalaveerachari R Kammar
	Sh.Pradyumma U
	Sh.Yogesha HN
	Sh.Vijay kumar lamani
	Sh.Arun N Kambar
	Sh.Vinay
	Sh.Basavaraj.Biradar
	Sh.Vinod R
	Sh.Praveenkumar P Achalkar
	Sh.Rajendra D
Watershed Development Department, GoK, Bangalore	
Sh. Rajeev Ranjan IFS Project Director & Commissioner, WDD	Dr. A. Natarajan NRM Consultant, Sujala-III Project
Dr. S.D. Pathak IFS Executive Director & Chief Conservator of Forests, WDD	

PART-A

LAND RESOURCE INVENTORY

Contents

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The land resource inventory of Hatti-2 microwatershed was conducted using village cadastral maps and IRS satellite imagery on 1:7920 scale. The false colour composites of IRS imagery were interpreted for physiography and these physiographic delineations were used as base for mapping soils. The soils were studied in several transects and a soil map was prepared with phases of soil series as mapping units. Random checks were made all over the area outside the transects to confirm and validate the soil map unit boundaries. The soil map shows the geographic distribution and extent, characteristics, classification, behavior and use potentials of the soils in the Microwatershed.

The present study covers an area of 425 ha in Koppal taluk and district, Karnataka. The climate is semiarid and categorized as drought - prone with an average annual rainfall of 662 mm, of which about 425 mm is received during south –west monsoon, 161 mm during north-east and the remaining 77 mm during the rest of the year. An area of about 97 per cent is covered by soils, one per cent by rock out crops and 2 per cent by water bodies, settlements and others. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 12 soil series and 25 soil phases (management units) and 4 land use classes.*
- *The length of crop growing period is <90 days and starts from 2nd week of August to 2nd week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 250 m grid interval.*
- *Land suitability for growing 28 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area is suitable for agriculture.*
- *About 4 per cent of the soils is moderately shallow (50-75 cm), 34 per cent moderately deep (75- 100 cm) and 58 per cent has deep to very deep soils (100 ->150 cm).*
- *About 9 per cent of the area is sandy, 54 per cent loamy and 33 per cent has clayey soils at the surface.*
- *About 75 per cent of the area has non-gravelly (<15%) soils, 20 per cent has gravelly soils (15-35 % gravel) and 2 per cent has very gravelly (35- 60% gravel) soils.*
- *With respect to available water capacity 22 per cent of the area has very low (<50mm/m), 35 per cent of the area has low (51-100 mm/m), 24 per cent medium (101-150 mm/m) and 15 per cent area has high to very high (>200mm/m).*

- *An area of about 2 per cent has nearly level (0-1%) lands and 95 per cent has very gently sloping (1-3%) lands.*
- *An area of about 9 per cent is slightly eroded (e1) and 88 per cent is moderately eroded (e2) lands.*
- *An area of about 71 per cent has neutral (pH 6.5 to 7.3) soils, 13 per cent slightly alkaline(pH 7.3 to 7.8), 6 per cent moderately alkaline (pH 7.8 to 8.4), 4 per cent strongly alkaline (pH 8.4 to 9.0) and 3 per cent soils very strongly alkaline (pH>9.0).*
- *The Electrical Conductivity (EC) of the soils are dominantly <2 dsm^{-1} indicating that soils are non saline.*
- *Organic carbon is medium (0.5-0.75%) in 85 per cent and high (>0.75%) in 12 per cent area of the soils.*
- *Available phosphorus is low (<23 kg/ha) in 3 per cent, medium (23-57 kg/ha) in 44 and high (>57 kg/ha) in 50 per cent of the soils.*
- *Available potassium is medium (145-337 kg/ha) in 64 per cent and high (>337 kg/ha) in 34 per cent of the soils.*
- *Available sulphur is low (< 10 ppm) in 19 per cent, medium (10-20 ppm) in 63 per cent and high (>20 ppm) in 15 per cent area of the soils.*
- *Available boron is low (<0.5 ppm) in about 85 per cent and medium (0.5-1.0 ppm) in 13 per cent area of the soils.*
- *Available iron is deficient in 44 per cent of the area and sufficient (>4.5 ppm) in 53 per cent of the area.*
- *Available zinc is deficient (<0.6 ppm) in 52 per cent of the area and sufficient (>0.6 ppm) in 45 per cent of the area.*
- *Available manganese and copper are sufficient in the entire area.*
- *The land suitability for 28 major crops grown in the microwatershed was 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	*180 (42)*	*46(11)*		*Pomegranate*	*135(32)*	*118(28)*
Maize	*115(27)*	*112(26)*		*Guava*	*112(26)*	*85(20)*
Bajra	*156(37)*	*113(26)*		*Jackfruit*	*135(32)*	*62(15)*
Redgram	*121(28)*	*74 (17)*		*Jamun*	*64(15)*	*121(28)*
Bengal gram	*24(6)*	*220 (51)*		*Musambi*	*159 (37)*	*94(22)*
Groundnut	*66(34)*	*239 (56)*		*Lime*	*159 (37)*	*94 (22)*
Sunflower	*145 (5)*	*82 (19)*		*Cashew*	*123(29)*	*102 (24)*
Cotton	*88 (21)*	*139(32)*		*Custard apple*	*195(46)*	*219(51)*
Chilli	*156(37)*	*14(3)*		*Amla*	*171(40)*	*243 (57)*
Tomato	*156(37)*	*14(3)*		*Tamarind*	*64(15)*	*106(25)*
Drumstick	*121(28)*	*197 (46)*		*Marigold*	*121(28)*	*106(25)*
Mulberry	*121(28)*	*276(65)*		*Chrysanthemum*	*121(28)*	*106 (25)*
Mango	*64(15)*	*71(17)*		*Jasmine*	*121(28)*	*50(12)*
Sapota	*135(32)*	*62(15)*		*Crossandra*	*121(28)*	*82(19)*

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 4 identified LUCs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and other horticulture crops.

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

Chapter 1

INTRODUCTION

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

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

In this critical juncture, the challenge before us is not only to increase the productivity per unit area which is steadily declining and showing a fatigue syndrome, but also to prevent or at least reduce the severity of degradation. If the situation is not reversed at the earliest, then the sustainability of the already fragile crop production system and the overall ecosystem will be badly affected in the state.The continued neglect and unscientific use of the resources for a long time has led to the situation observed at present in the state. It is a known fact and established beyond doubt by many studies in the past that the cause for all kinds of degradation is the neglect and irrational use of the land resources. Hence, there is urgent need to generate a detailed site-specific farm level database on various land resources for all the villages/watersheds in a time bound manner that would help to protect the valuable soil and land resources and also to stabilize the farm production.

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

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

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

The land resource inventory aims to provide site specific database for Hatti-2 microwatershed in Koppal Taluk, Koppal District, Karnataka State for the Karnataka Watershed Development Department. The database was generated by using cadastral map of the village as a base along with high resolution IRS LISS IV and Cartosat-1 merged satellite imagery. Later, an attempt will be made to uplink this LRI data generated at 1:7920 scale under Sujala-III Project to the proposed Landscape Ecological Units (LEUs) map.

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

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Hatti-2 micro-watershed is located in the central part of Karnataka in Koppal taluk and district (Fig. 2.1). It lies between$17^0$04' and $17^0$07' North latitudes and $62^0$65' and $62^0$99' East longitudesand covers an area of about 425 ha. It comprises parts of Hatti, Lebagiri and Kalakeri villages. It is about 72km from Koppal town and is bounded byKalakeri on the southwest, Lebagiri on the southeast, Chilavadgi on the south and Hatti and Thalakanapura on the northern and northeasternside of the microwatershed.

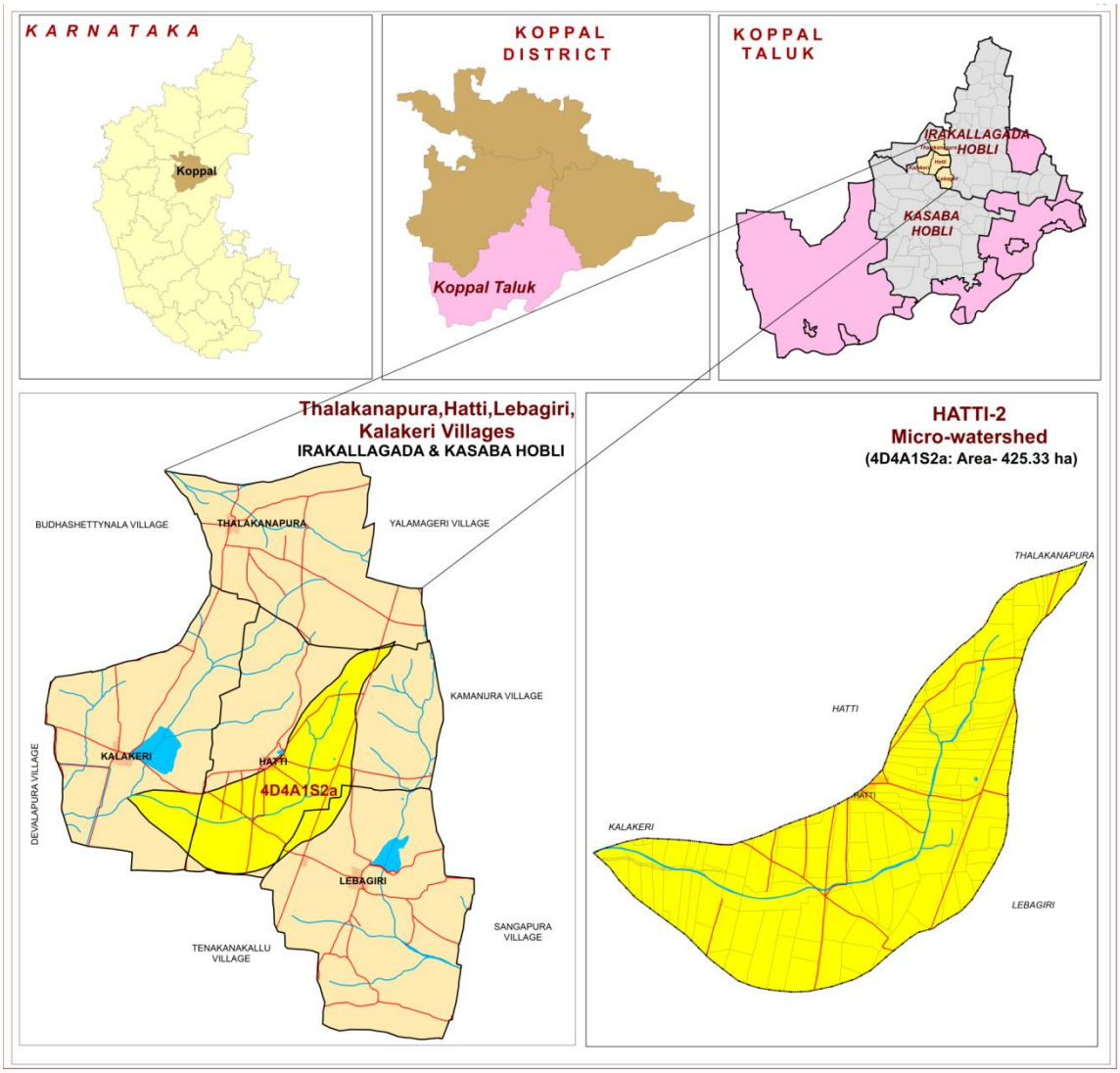


Fig.2.1 Location map of Hatti-2 Microwatershed

2.2 Geology

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

gray granite gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in Hatti-2village. The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent paleo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2 a Granite and granite gneiss rocks

Fig.2.2 b Alluvium

2.3 Physiography

Physiographically, the area has been identified as Granite gneiss and Alluvial landscapes based on geology. The microwatershed area has been further divided into mounds/ridges, summits, side slopes and very gently sloping uplands and nearly level

plains based on slope and its relief features. The elevation ranges from 540 to 556 m in the gently sloping uplands. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

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

2.5 Climate

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

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

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

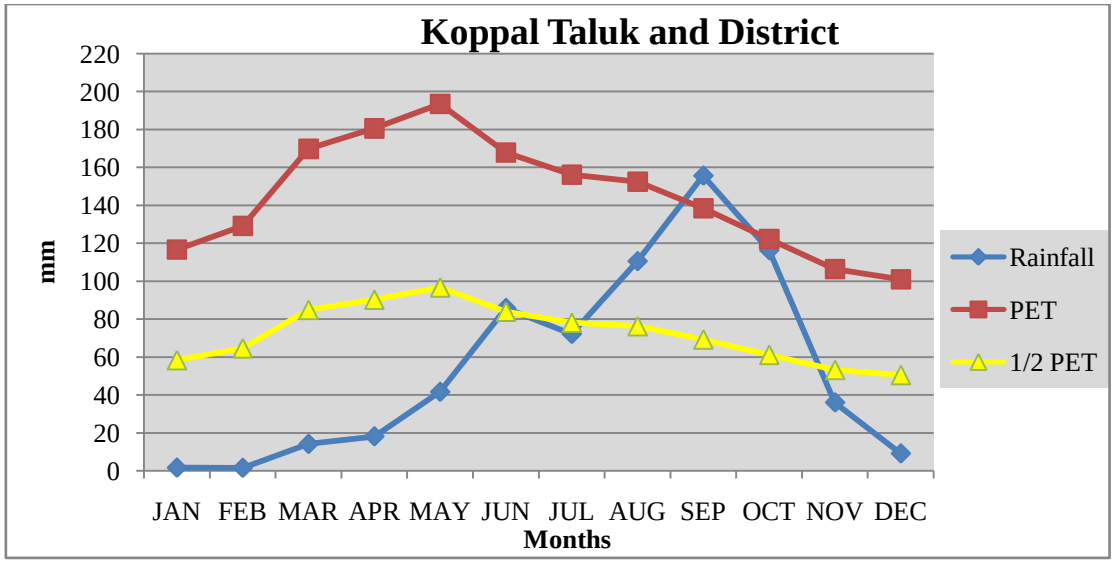


Fig. 2.3 Rainfall distribution in Koppal Taluk and District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Hatti-2 microwatershed

2.7 Land Utilization

About 91 per cent area (Table 2.2) in Koppal district is cultivated at present and about 17 per cent of the area is sown more than once. An area of about 3 per cent is currently barren. Forests occupy a small area of about 5 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and boulder areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, bajra, cotton, safflower, sunflower, red gram, horse gram, onion, mulberry, pomegranate, sugarcane, bengalgram and groundnut (Fig. 2.5). While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Hatti-2 microwatershed is presented in Fig.2.6. Simultaneously, enumeration of existing wells (bore wells) and conservation structures is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells and conservation structures in Hatti-2 microwatershed is given in Fig. 2.7.

Table 2.2 Land Utilization in Koppal District

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

Fig.2.5 (a) Different crops and cropping systems in Hatti-2 Microwatershed

Fig.2.5(b) Different crops and cropping systems in Hatti-2 Microwatershed

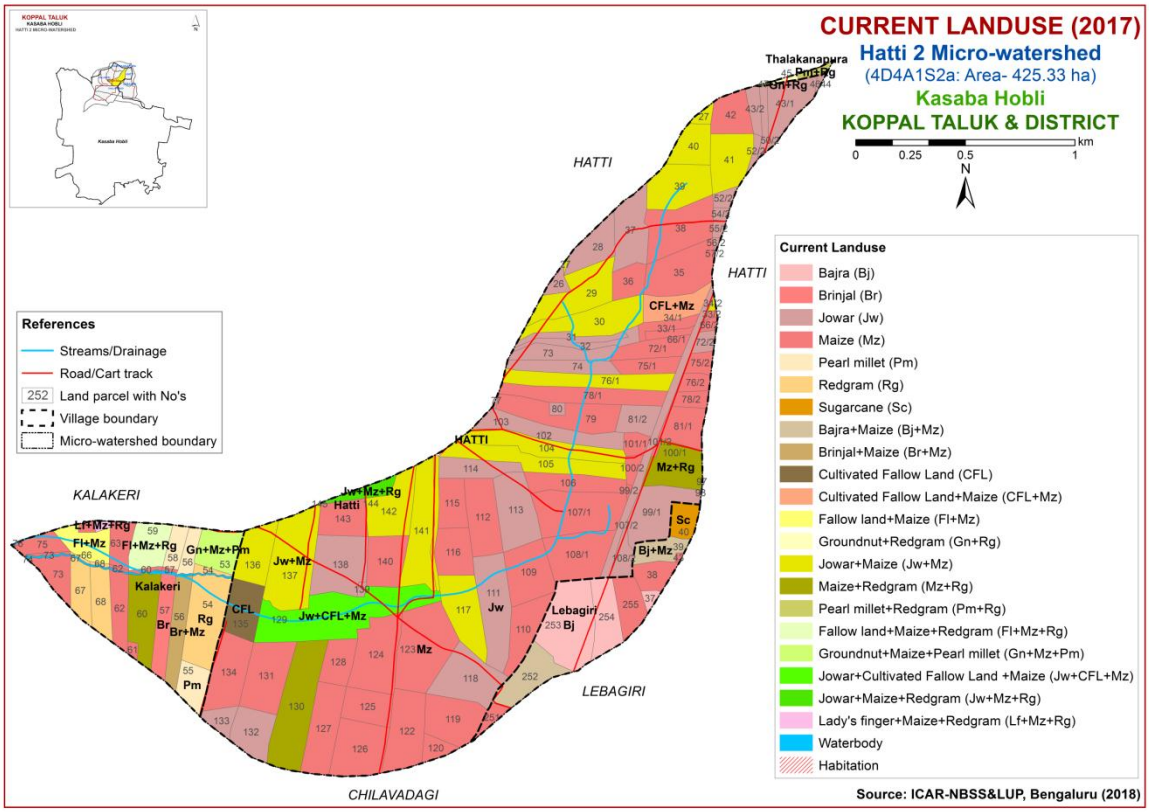


Fig.2.6 Current Land Use – Hatti-2Microwatershed

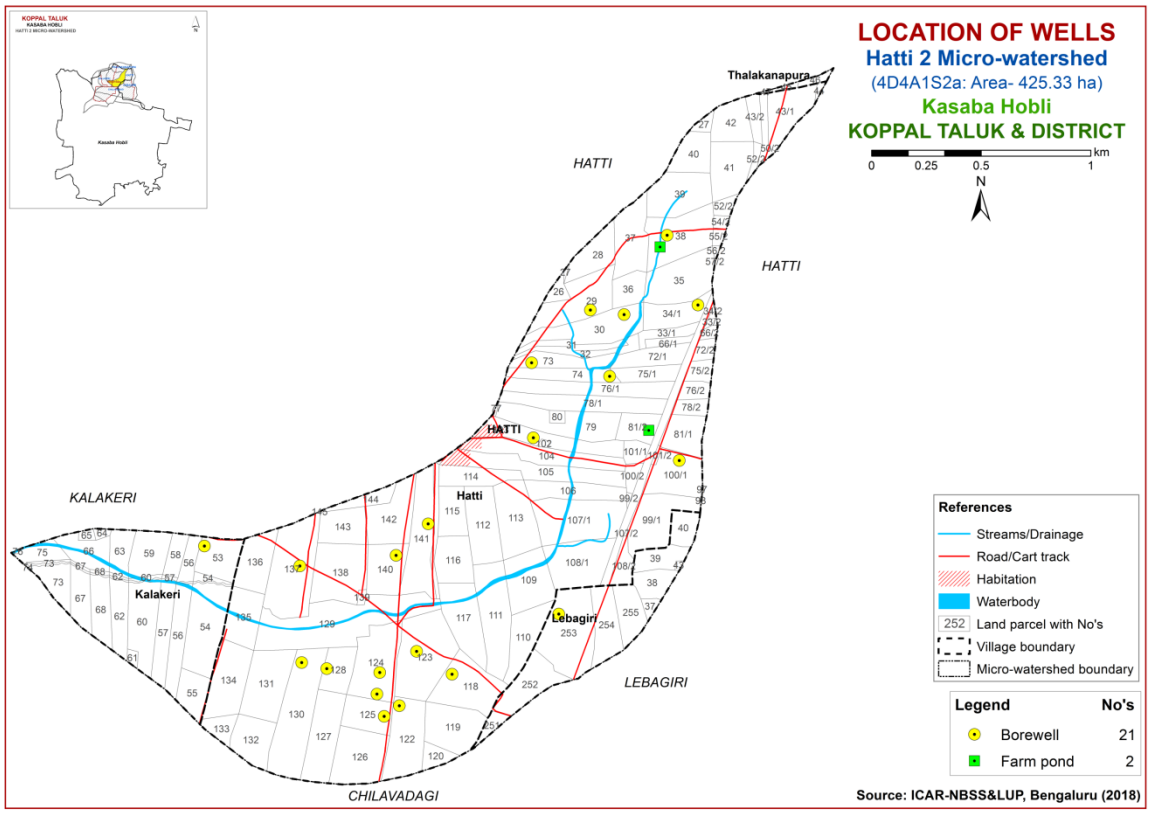


Fig.2.7 Location of wells and conservation structures– Hatti-2Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly for a given level of management. This was achieved in Hatti-2 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 (slope, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units and showing their extent and geographic distribution on the microwatershed cadastral map. The detailed soil survey at 1:7920 scale was carried out in 425ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

Image Interpretation Legend for Physiography

G- Granite gneiss landscape

G1 Hills/ Ridges/ Mounds

G11 Summits

G12 Side slopes

G121 Side slopes with dark grey tones

G2 Uplands

G21 Summits

G22 Gently sloping uplands

G221 Gently sloping uplands, yellowish green (eroded)

G222 Gently sloping uplands, yellowish white (severely eroded)

G23 Very gently sloping uplands

G231 Very gently sloping uplands, yellowish green

G232 Very gently sloping uplands, medium green and pink

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

G234 Very gently sloping uplands, medium greenish grey

G235 Very gently sloping uplands, yellowish white (eroded)

G236 Very gently sloping uplands, dark green

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

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

DSe -Alluvial landscape

DSe1 Summit

DSe11Nearly level Summit with dark grey tone

DSe12 Nearly level Summit with medium grey tone

DSe13 Nearly level Summit with whitish grey tone

DSe14 Nearly level Summit with whitish tone (Calcareousness)

DSe15 Nearly level Summit with pinkish grey tone

DSe16 Nearly level Summit with medium pink tone

DSe17 Nearly level Summit with bluish white tone

DSe 18 Nearly level Summit with greenish grey tone

DSe2 Very genetly sloping

DSe21 Very gently sloping, whitish tone

DSe22 Very gently sloping, greyish pink tone

DSe23 Very gently sloping, whitish grey tone

DSe24 Very gently sloping, medium grey tone

DSe25 Very gently sloping, medium pink tone

DSe26 Very gently sloping, dark grey tone

DSe27 Very gently sloping, bluish grey tone

DSe28 Very gently sloping, greenish grey tone

DSe 29 Very gently sloping, Pinkish grey

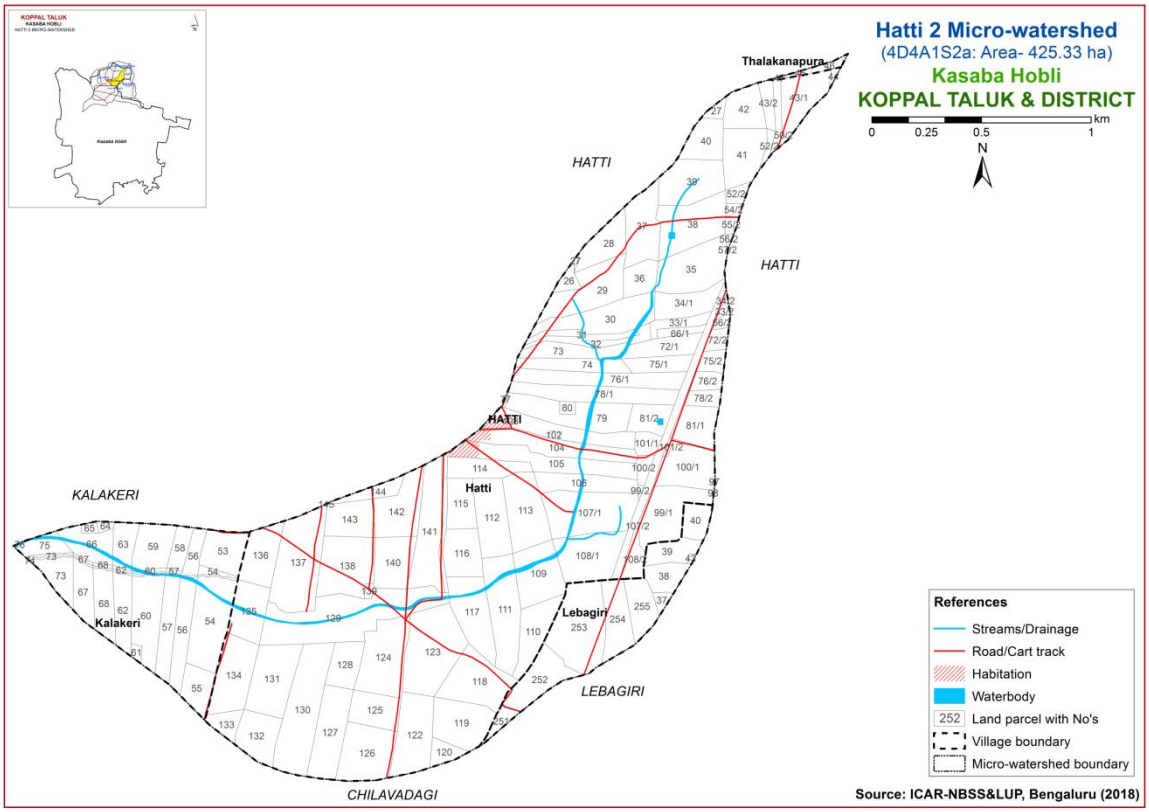


Fig 3.1 Scanned and Digitized Cadastral map of Hatti-2 Microwatershed

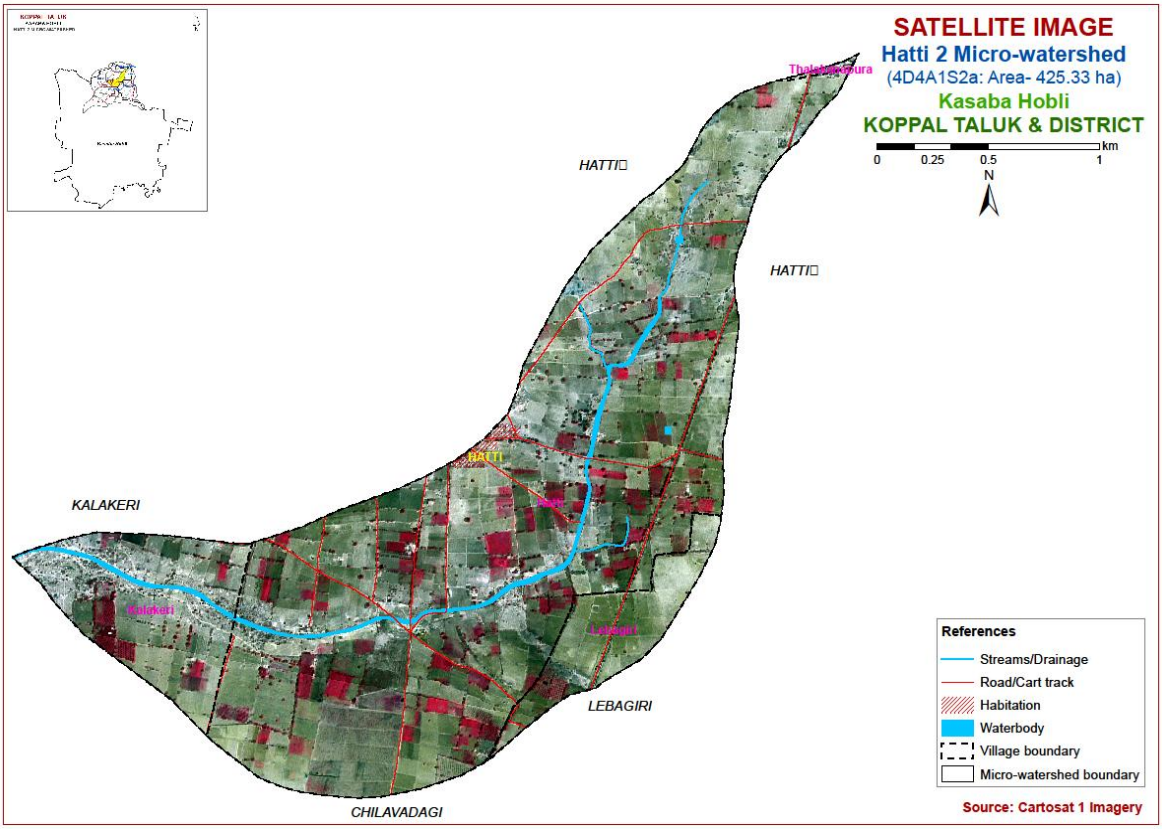


Fig.3.2 Satellite Image of Hatti-2 Microwatershed

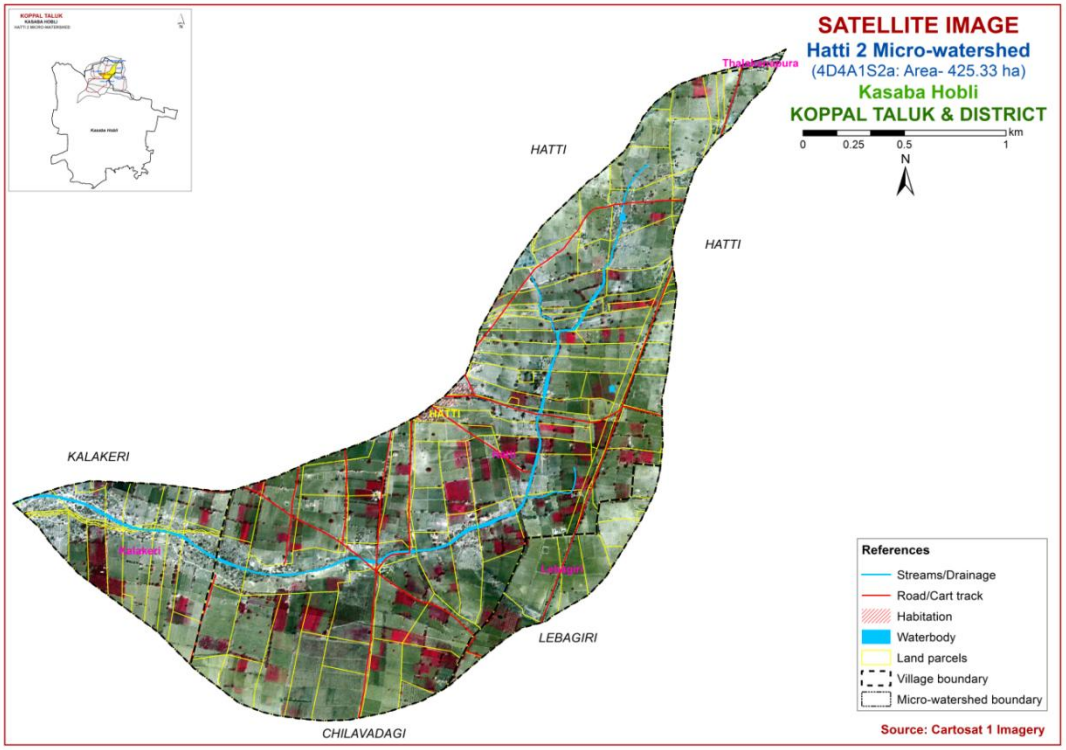


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Hatti-2 Microwatershed

3.3 Field Investigation

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

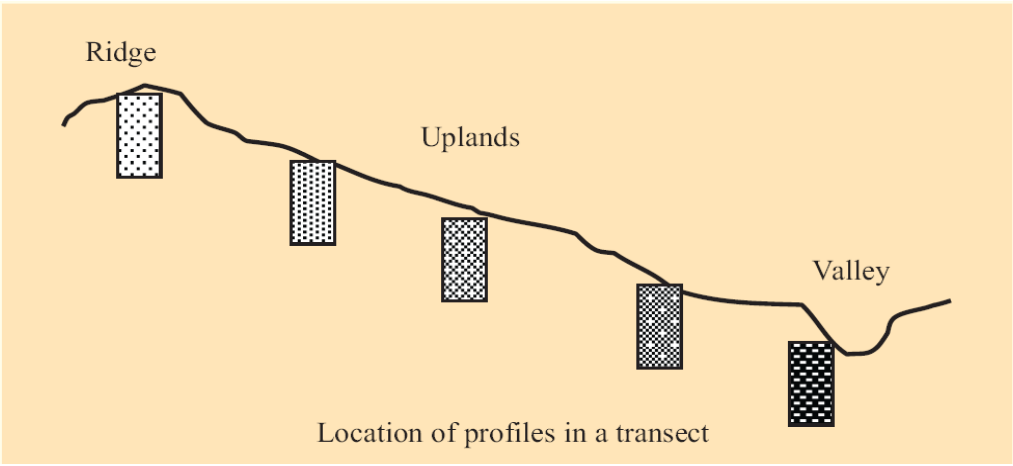


Fig: 3.4. Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, calcareousness, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 12soil series were identified in Hatti-2 microwatershed.

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

Soils of Granite Gneiss Landscape							
Sl. No	**Soil Series**	**Depth (cm)**	**Colour (moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcareo -usness**
1	Lakkur (LKR)	50-75	2.5YR 2.5/3, 2.5/4, 3/4, 3/6	gsc	40-60	Ap-Bt-Bc-Cr	-
2	Hooradhahalli (HDH)	75-100	2.5YR2.5/4, 3/4,3/6	gsc-gc	>35	Ap-Bt-Cr	-
3	Bisarahalli(BSR)	75-100	5 YR 3/3, 3/4	gsc	15-35	Ap-Bt-Cr	-
4	Bidanagere (BDG)	75-100	5YR3/3,3/4,4/3 ,5/4 2.5YR3/4	gc	35-60	Ap-Bt-Cr	-
5	Kumchahalli (KMH)	100-150	2.5YR3/4, 3/6	sc	<15	Ap-Bt-Cr	-
6	Mornal (MNL)	100-150	5YR 3/4, 2.5 YR 3/4, 4/6	gsc	15-35	Ap-Bt-Cr	-
7	Balapur (BPR)	100-150	2.5YR2.5/4,3/4	gsc-gc	>35	Ap-Bt-Cr	-
8	Nagalapur (NGP)	100-150	5YR2.5/2,3/2, 2.5YR3/6,4/6	gsc-gc	>35	Ap-Bt-Cr	-
9	Giddadapalya (GDP)	100-150	2.5YR3/4,3/6	gsc-gc	30-60, >60 cm	Ap-Bt-Cr	-
10	Ranatur (RTR)	>150	2.5YR2.5/3, 2.5/4, 3/3,4/6	c	-	Ap-Bt	-
Soils of Alluvial Landscape							
11	Dambarahalli (DRL)	75-100	10YR 2/1, 3/1, 4/3	c	<15	Ap-Bw-Ck	e-es
12	Gatareddihal (GRH)	100-150	10 YR 2/1, 3/1, 2.5Y 4/3, 5/4	c	<15	Ap-Bw-BC-C	es

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 surveymany soil profile pits, few minipits and a few auger bores representing different landforms occurring in the microwatershed were studied. In addition to the profile study, spot observations in the form of minipits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map.

The soil map shows the geographic distribution of 25 mapping units representing 12soil 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 25 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 soil phase will have similar management needs and have to be treated accordingly.

3.5 Land Use Classes

The 25 soil phases identified and mapped in the microwatershed were regrouped into four Land Use Classes (LUC's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Use Classes (LUC's) based on the management needs. One or more than one soil site characteristic having influence on the management have been chosen for identification and delineation of LUCs. For Hatti-2 microwatershed, five soil and site characteristics, namely the soil depth, soil texture, slope, erosion and gravel content have been considered for defining LUCs. The land use classes are expected to behave similarly for a given level of management.

3.5 Laboratory Characterization

Soil samples for each series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2017 from farmer's fields inHatti-2 microwatershed(37 samples) for fertility status (major and micronutrients) at 250 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Hatti-2 Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss landscape				
	LKR	Lakkur soils are moderately shallow (50-75 cm), well drained, have dark reddish brown to dark red, red gravelly sandy clay soils occurring on very gently to moderately sloping uplands under cultivation		**17 (3.89)**
452		LKRhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	17 (3.89)
	HDH	Hooradhahalli soils are moderately deep (75-100 cm), well drained, have dark red to dark reddish brown, red gravelly sandy clay to clay soils occurring on nearly level to moderately sloping uplands under cultivation		**26 (6.12)**
104		HDHbB2	Loamy sand surface, slope 1-3%, moderate erosion	6 (1.46)
110		HDHcB2	Sandy loam surface, slope 1-3%, moderate erosion	20 (4.66)
	BSR	Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly red sandy clay soils occurring on very gently sloping uplands under cultivation		**36 (8.39)**
161		BSRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	36 (8.39)
	KMH	Kumchahalli soils are deep (100-150cm), well drained, have dark reddish brown to dark red sandy clay red soils occurring on nearly level to very gently sloping uplands under cultivation		**46 (10.86)**
195		KMHbB2	Loamy sand surface, slope 1-3%, moderate erosion	14 (3.33)
201		KMHiB2	Sandy clay surface, slope 1-3%, moderate erosion	32 (7.53)
	BDG	Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly clay soils occurring on nearly level to gently sloping uplands under cultivation		**52 (12.45)**
180		BDGcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	17 (3.99)
187		BDGhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	9 (2.21)
188		BDGhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	18 (4.28)
191		BDGiB1	Sandy clay surface, slope 1-3%, slight erosion	8 (1.97)
	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**24 (5.74)**
204		MNLcB2	Sandy loam surface, slope 1-3%, moderate erosion	24 (5.74)
	BPR	Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils		**86.19 (20.16)**

		occurring on nearly level to gently sloping uplands under cultivation		
217		BPRbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	22 (5.15)
224		BPRcB2	Sandy loam surface, slope 1-3%, moderate erosion	19 (4.37)
228		BPRhB1	Sandy clay loam surface, slope 1-3%, slight erosion	6 (1.52)
229		BPRhB1g1	Sandy clay loam surface, slight erosion, gravelly (15-35%)	0.19 (0.04)
231		BPRhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	11 (2.52)
236		BPRiA1g2	Sandy clay surface, slope 0-1%, slight erosion, very gravelly (35-60%)	8 (1.95)
239		BPRiB2	Sandy clay surface, slope 1-3%, moderate erosion	20 (4.61)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation		**5 (1.29)**
260		NGPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	5 (1.29)
	GDP	Giddadapalya soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on very gently sloping uplands under cultivation		**23 (5.39)**
267		GDPcB2	Sandy loam surface, slope 1-3%, moderate erosion	23 (5.39)
	RTR	Ranatur soils are very deep (>150 cm), well drained, have dark reddish brown to dark red clay soils occurring on nearly level to very gently sloping uplands under cultivation		**41 (9.73)**
285		RTRcB2	Sandy loam surface, slope 1-3%, moderate erosion	25 (5.91)
288		RTRiB2	Sandy clay surface, slope 1-3%, moderate erosion	16 (3.82)
Soils of Alluvial landscape				
	DRL	Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have dark brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**32 (7.49)**
342		DRLiB2	Sandy clay surface, slope 1-3%, moderate erosion	32 (7.49)
	GRH	Gatareddihal soils are deep (100-150 cm), moderately well drained, have light olive brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**24 (5.63)**
368		GRHiB2	Sandy clay surface, slope 1-3%, moderate erosion	24 (5.63)
999		Rock outcrops	Rock lands, both massive and bouldery	**4 (1.03)**
1000		Others	Habitation and Waterbody	**8 (1.85)**

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

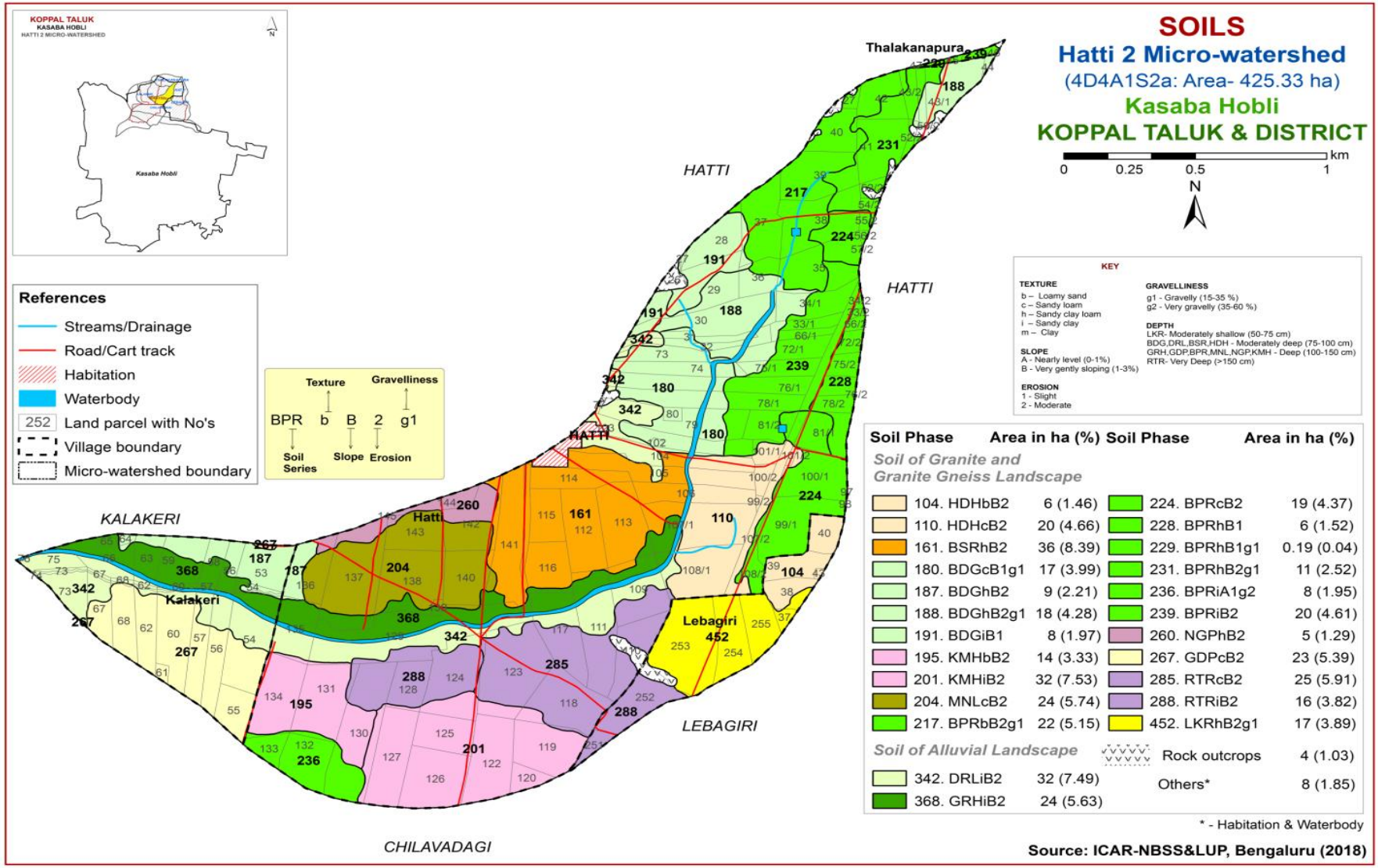


Fig 3.5 Soil Phase or Management Units- Hatti-2 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Hatti-2 microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluvial landscapesbased on geology. In all, 12soil series were identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by the parent material, climate, time and relief.

A brief description of each of the 12 soil series identified followed by 25 soil phases (management units) mapped (Fig. 3.5) are furnished below. The physical and chemical characteristics of soil series identified in Hatti-2microwatershed are given in Table 4.1. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Granite and Granite gneiss landscape

In this landscape, 10 soil series were identified and mapped.Of these series, Balapur (BPR) series occupies maximum area of about 86 ha (20%) followed by Bidanagere (BDG) 52 ha (12%). The brief description of the soil series along with the soil phases identified and mapped is given below.

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

The thickness of the solum ranges from 51 to 74 cm. The thickness of A horizon ranges from 12 to 18 cm. Its colour is in 5YR and 2.5 YR hue with value 3 to 4 and chroma 4 to 6. The texture varies from loamy sand to sandy clay loam with 15 to 50 per cent gravel. The thickness of B horizon ranges from 39 to 58 cm. Its colour is in 2.5 YR hue with value 3 to 4 and chroma 4 to 6. Texture is sandy clay with 40 to 60 per cent gravel. The available water capacity is low (50-100 mm/m). One soil phase was identified and mapped.

Landscape and soil profile characteristics of Lakkur (LKR) Series

4.1.2Hooradhahalli (HDH) Series: Hooradhahalli soils are moderately deep (75-100 cm), well drained, have red to dark red and reddish brown gravelly sandy clay to clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands.The Hooradhahalli series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Rhodic Paleustalfs.

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

Landscape and soil profile characteristics of Hooradhahalli (HDH) Series

4.1.3Bisarahalli (BSR) Series: Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly sandy clay red soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 75 to 98 cm. The thickness of A horizon ranges from 17 to 25 cm. Its colour is in 5 YR hue with value 3 to 4 and chroma 3 to 6. The texture ranges from sandy clay loam to sandy clay with 15 to 35 per cent gravel. The thickness of B horizon ranges from 61 to 79 cm. Its colour is in 5 YR hue with value 3 and chroma 3 to 4. Its texture is gravelly sandy clay with gravel content of 15-35 per cent. The available water capacity is low (50-100 mm/m). One soil phase was identified and mapped.

Landscape and soil profile characteristics of Bisarahalli (BSR)Series

4.1.4Bidanagere (BDG) Series: Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly clay soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.The Bidanagere series has been classified as a member of theclayey-skeletal, mixed, isohyperthermic family of Rhodic Paleustalfs.

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

Landscape and soil profile characteristics of Bidanagere (BDG) Series

4.1.5Kumchahalli (KMH) Series: Kumchahalli soils are deep (100-150cm), well drained, have dark reddish brown to dark red sandy clay soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands. The Kumchahalli series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 102 to 150 cm. The thickness of surface horizon ranges from 11 to 23 cm. Its colour is in 5 YR and 2.5 YR hue with value 2.5 to 3 and chroma 3 to 6. The texture is dominantly sandy clay. The thickness of B horizon ranges from 95 to 132 cm. Its colour is in 2.5 YR hue with value 3 and chroma 4 to 6. Its texture is dominantly sandy clay. The available water capacity is high (150-200 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Kumchahalli (KMH) Series

4.1.6Mornal(MNL) Series: Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay soils. They are developed from weathered granite gneiss and occur on very gently sloping uplandsunder cultivation.The Mornal series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Rhodustalfs.

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

Landscape and soil profile characteristics of Mornal (MNL)Series

4.1.7Balapur (BPR) Series: Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils. These soils are developed from weathered granite gneiss and occur on very gently to gently sloping uplands.TheBalapur series has been tentatively classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 102 to 147 cm. The thickness of A horizon ranges from 12 to 17cm. Its colour is in 5 YR and 2.5 YR hue with value and chroma 3 to 4. The texture ranges from loamy sand to sandy clay with 15 to 50 per cent gravel. The thickness of B horizon ranges from 90 to 132 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4 to 6. Texture is sandy clay to clay with 35 to 50 per cent gravel. The available water capacity is medium (100-150 mm/m). Seven soil phases were identified and mapped.

Landscape and soil profile characteristics of Balapur (BPR)Series

4.1.8Nagalapur (NGP) Series: Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands.

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

Landscape and soil profile characteristics of Nagalapur (NGP)Series

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

The thickness of the solum ranges from 106 to 145 cm. The thickness of A-horizon ranges from 12 to 13 cm. Its colour is in 5 YR hue with value and chroma 3 to 4. The texture is sandyloamwith 10 to 15 per cent gravel. The thickness of B-horizon ranges from 106 to 123 cm. Its colour is in 2.5 YR hue with value 3 to 4 and chroma 3 to 6. Texture is sandy clay to clay with 35 to 75 per cent gravel. The available water capacity is low (51-100 mm/m). One soil phase was identified and mapped.

Landscape and soil profile characteristics of Giddadapalya (GDP)Series

4.1.10Ranatur (RTR) Series: Ranatur soils are very deep (> 150 cm), well drained, have dark reddish brown to dark red clayey soils. They are developed from granite gneiss and occur on very gently sloping uplands.The Ranatur series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

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

Landscape and soil profile characteristics of Ranatur (RTR) Series

4.2 Soils of Alluvial Landscape

In this landscape, 2 soil series were identified and mapped. The brief description of each soil series along with the soil phases identified and mapped is given below.

4.2.1Dambarahalli (DRL) Series: Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have black and very dark gray to dark brown calcareous cracking clay soils. They have developed from alluvium and occur on very gently to gently slopingplains under cultivation.

The thickness of the solum ranges from 75 to 99 cm. The thickness of A horizon ranges from 13 to 24 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 2. The texture is clay. The thickness of Bhorizon ranges from 54 to 85 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 3. Its texture is clay and is calcareous. The available water capacity is high (150-200 mm/m).One soil phase was identified and mapped.

Landscape and soil profile characteristics of Dambarahalli (DRL)Series

4.2.2Gatareddihal(GRH) Series: Gatareddihalsoils are deep (100-150 cm), moderately well drained, have black or dark greyto light olive brown,calcareous cracking clay soils. They are developed from alluvium and occur on nearly level to very gently slopinguplandsunder cultivation.The Gatareddihal series has been classified as a member of the fine, smectitic, isohyperthermic(calc) family of Vertic Haplustepts.

The thickness of the solum ranges from 102 to 149 cm. The thickness of A-horizon ranges from 12 to 19 cm. Its colour is in 7.5 YR, 10 YR hue with value 3 to 4 and chroma 1 to 6. The texture is sandy clay loam to clay. The thickness of B-horizon ranges from 86 to 117 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 and chroma 2 to 6. Texture is clay and are calcareous with less than 15 per cent gravel. The available water capacity is very high (>200 mm/m).One soil phase was identified and mapped.

Landscape and soil profile characteristics of Gatareddihal (GRH)Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Hatti-2 microwatershed

Soil Series: Lakkur (LKR), **Pedon:** RM-8.
Location: $15^0$04'26.3"N, $75^0$37'84.1"E, (4D4A3I1f), Belhatti village, Shirahatti taluk, Gadag distrtict
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Typic Rhodustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-21	Ap	74.00	8.34	17.66	9.62	11.57	15.76	23.13	13.92	20	sl	-	-
21-35	Bt1	54.37	10.48	35.14	16.33	8.64	9.69	11.59	8.11	40	sc	-	-
35-56	Bt2	48.37	13.46	38.17	10.96	7.69	9.17	11.28	9.27	60	sc	-	-

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

Contd…

Soil Series: Hooradhahalli (HDH), Pedon: RM-69
Location: $13^0$24'31"N, $76^0$33'41"E, (4D3D8G2d), Hesarahalli village, Chikkanayakanahalli taluk, Tumukur district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Rhodic Paleustalfs

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

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

Contd…

Series: Bidanagere (BDG), **Pedon**: RM-3
Location: $13^0$22'11"N, $76^0$38'03"E, (4D3D8G1a), Tharabenahalli village, Chikkanayakanahalli taluk, Tumakuru district.
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Rhodic Paleustalfs

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

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

Contd…

Series Name: Kumchahalli (KMH), Pedon: RM- 9
Location: $15^0$20'05"N, $76^0$13'21"E, Basapura village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore**Classification:** Fine, mixed, isohyperthermic Typic Rhodustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-13	Bt1	51.76	9.05	39.19	7.99	8.84	13.42	14.38	7.14	-	sc	20.08	13.69
13-27	Bt2	53.50	8.12	38.38	7.00	11.05	15.21	14.33	5.91	-	sc	17.05	12.32
27-43	Bt3	63.60	5.01	31.40	3.85	11.56	24.52	18.52	5.14	-	scl	11.76	9.09
43-64	Bt4	48.74	5.91	45.35	8.87	9.31	12.49	12.27	5.81	10	sc	16.68	13.35
64-84	Bt5	45.13	8.90	45.97	9.86	7.12	10.95	10.62	6.57	20	sc	17.45	13.42
84-114	Bt6	65.04	6.94	28.02	10.49	16.21	17.80	13.88	6.67	40	scl	13.20	9.75

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}							%	%
0-13	7.2	-	-	0.193	0.81	3.00	9.69	3.93	1.41	0.08	15.10	15.07	0.38	100	0.54
13-27	7.13	-	-	0.161	0.7	3.00	8.69	3.57	1.29	0.16	13.70	13.75	0.36	100	1.14
27-43	7.31	-	-	0.096	0.89	2.64	5.19	2.36	1.07	0.24	8.86	9.46	0.30	94	2.51
43-64	7.65	-	-	0.089	1.16	2.52	8.25	2.88	0.72	0.35	12.20	12.65	0.28	96	2.79
64-84	7.98	-	-	0.1	0.38	3.12	10.49	2.88	0.26	0.41	14.04	14.63	0.32	96	2.78
84-114	8.23	-	-	0.121	0.58	2.88	8.02	1.87	0.09	0.43	10.41	10.67	0.38	98	4.02

Contd…

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

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

Analysis at: NBSS&LUP, Regional Centre, Bangalore**Classification:** Fine Mixed, isohyperthermic Typic Rhodustalfs

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-17	7.89	-	-	0.137	0.33	0.00	4.92	3.35	0.35	0.45	9.07	9.01	0.67	101	5.04
17-31	8.19	-	-	0.31	0.45	0.00	7.24	5.16	0.16	0.15	12.70	13.57	0.35	94	1.12
31-56	8.2	-	-	0.414	0.53	0.00	6.49	5.32	0.11	0.13	12.05	18.55	0.41	65	0.71
56-104	8.64	-	-	0.422	0.37	0.00	6.21	4.64	0.16	0.14	11.15	15.16	0.42	74	0.95
104-126	8.71	-	-	0.436	0.2	0.00	7.06	6.31	0.09	0.33	13.79	14.52	0.44	95	2.31

Contd…

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

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

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

Contd…

Series Name: Giddadapalya (GDP), Pedon: R-8
Location: $15^0$23'01"N, $76^0$10'55"E, Tenakanakallu village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore Classification: Fine, mixed, isohyperthermic Rhodic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	73.96	9.66	16.38	18.31	13.12	11.29	18.41	12.82	-	sl	7.71	4.11
18-55	Bt1	49.53	10.48	39.99	23.81	11.06	4.43	5.80	4.43	-	sc	20.83	10.68
55-80	Bt2	50.53	12.63	36.84	27.10	6.41	7.35	3.89	5.78	30	sc	16.66	9.25
80-130	Bt3	53.28	15.54	31.18	24.30	11.78	8.13	4.59	4.48	60	scl	15.20	7.86

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	5.54	-	-	0.027	0.67	0.00	2.37	1.35	0.09	0.03	3.85	5.60	0.34	69	0.58
18-55	6.31	-	-	0.036	0.75	0.00	7.42	3.37	0.09	0.08	10.95	13.00	0.33	84	0.62
55-80	6.51	-	-	0.031	0.39	0.00	8.45	3.81	0.11	0.14	12.50	14.50	0.39	86	0.96
80-130	6.7	-	-	0.049	0.41	0.00	7.93	3.61	0.08	0.19	11.81	12.10	0.39	98	1.60

Contd…

Soil Series: Ranatur (RTR), Pedon: RM-87
Location: $13^0$21'49.0"N, $76^0$38'06"E, (4B3D4L2a), J C Pura village, Chikkanayakanahalli taluk, Tumakuru district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, mixed, isohyperthermic Rhodic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-17	Ap	84.16	9.46	6.38	2.22	18.57	26.14	24.32	12.92	-	ls	-	-
17-47	Bt1	51.14	8.30	40.56	1.66	13.49	14.52	13.59	7.88	-	sc	-	-
47-89	Bt2	51.99	11.01	37.00	1.94	13.99	15.32	13.18	7.56	-	sc	-	-
89-123	Bt3	51.58	9.07	39.35	3.47	14.50	14.61	11.64	7.35	-	sc	-	-
123-152	Bt4	47.89	8.88	43.23	2.27	12.36	14.21	11.12	7.93	-	sc	-	-
152-198	Bt5	43.37	13.17	43.45	2.48	9.83	13.25	10.87	6.94	-	c	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-17	5.08	-	-	0.03	0.52	0.00	3.68	0.72	0.06	0.19	4.65	9.21	1.44	50.50	2.06
17-47	6.28	-	-	0.03	0.48	0.00	3.93	0.72	0.08	0.07	4.80	7.92	0.20	60.59	0.94
47-89	6.42	-	-	0.03	0.40	0.00	4.40	0.74	0.08	0.06	5.28	7.52	0.20	70.15	0.79
89-123	6.50	-	-	0.02	0.32	0.00	4.44	0.76	0.09	0.07	5.36	7.82	0.20	68.58	0.93
123-152	6.52	-	-	0.02	0.28	0.00	4.40	0.71	0.09	0.07	5.26	8.22	0.19	64.00	0.81
152-198	7.09	-	-	0.02	0.24	0.00	6.10	0.98	0.10	0.20	7.38	9.60	0.22	76.89	2.09

Contd…

Series Name: Gatareddihalla (GRH), Pedon: RM-2
Location: $15^0$24'01"N, $76^0$09'29"E, Chilavadagi village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore**Classification:** Fine, smectitic, isohyperthermic (calc) Vertic 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	45.30	15.84	38.86	4.01	9.19	10.45	13.31	8.34	-	sc	25.72	17.55
11-35	Bw1	39.72	13.13	47.15	3.41	10.65	11.50	9.05	5.11	-	c	29.58	20.25
35-66	Bw2	34.69	17.29	48.02	3.32	4.93	12.63	8.14	5.67	-	c	35.93	18.05
66-86	Bw3	34.09	18.15	47.76	4.96	10.14	7.98	7.01	3.99	-	c	35.19	16.79
86-112	Bw4	42.55	16.46	40.98	5.53	11.91	9.68	10.21	5.21	-	c	44.70	16.06
112-125	Bc	56.02	14.48	29.50	11.41	17.07	12.36	10.26	4.92	-	scl	37.55	11.51

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	8.27	-	-	1.11	0.91	5.40	-	-	0.44	3.70	-	31.60	0.81	-	11.72
11-35	8.82	-	-	0.476	0.67	5.28	-	-	0.46	7.29	-	35.10	0.74	-	20.77
35-66	9.14	-	-	0.637	0.87	3.60	-	-	0.45	10.70	-	37.70	0.79	-	28.39
66-86	9.11	-	-	0.633	0.23	5.60	-	-	0.42	10.55	-	38.10	0.80	-	27.70
86-112	9.6	-	-	0.847	0.35	4.92	-	-	0.40	14.55	-	33.90	0.83	-	42.93
112-125	9.73	-	-	0.783	0.19	4.44	-	-	0.25	12.99	-	25.30	0.86	-	51.33

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

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

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

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

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

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

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

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

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

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

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

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

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

The land capability subclasses are recognized 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 25 soil map units identified in the Hatti-2 microwatershed are grouped under two land capability classes and five land capability subclasses (Fig. 5.1).

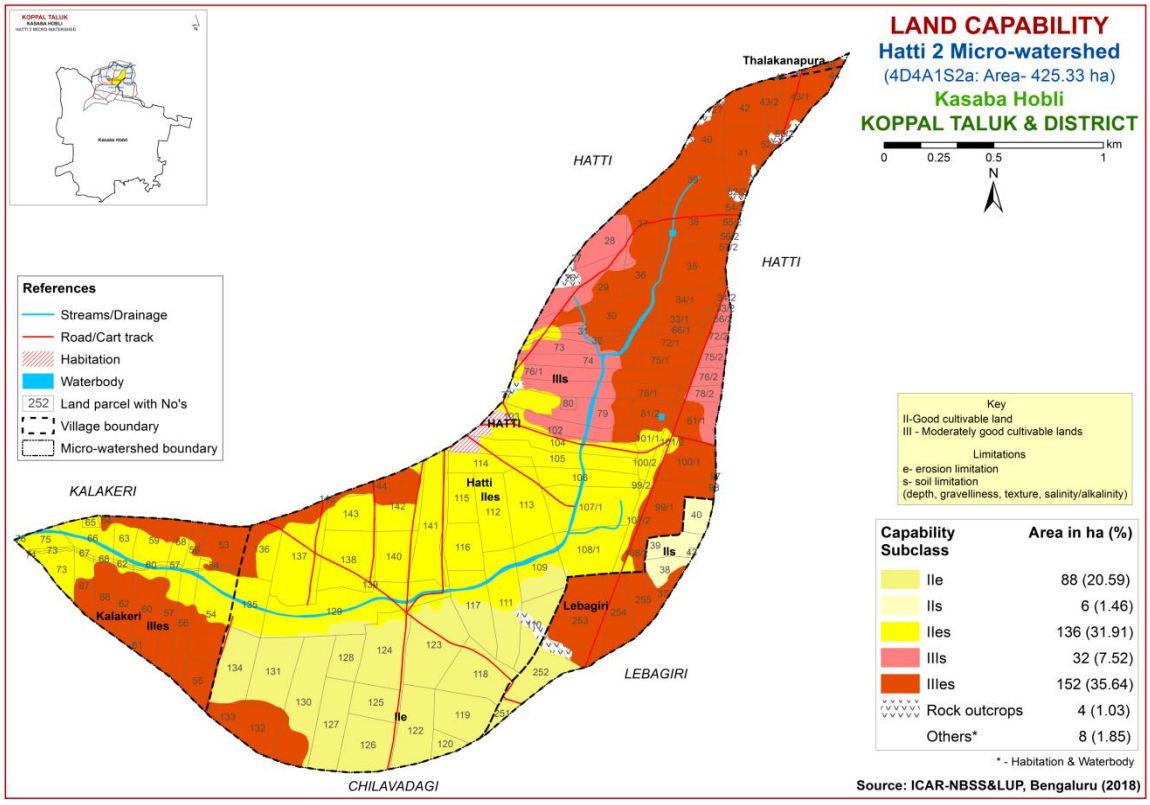


Fig. 5.1 Land Capability map of Hatti-2 Microwatershed

Entire area in the microwatershed is suitable for agriculture. Good lands (Class II) cover an area of about 230 ha (54%) and distributed in the major part of the microwatershed with minor problems of soil and erosion. Moderately good lands (Class III) occupy an area of about 184 ha (43 %) and distributed in the southern, centraland southeastern part of the microwatershed with severe limitations of soil and erosion.

5.2 Soil Depth

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

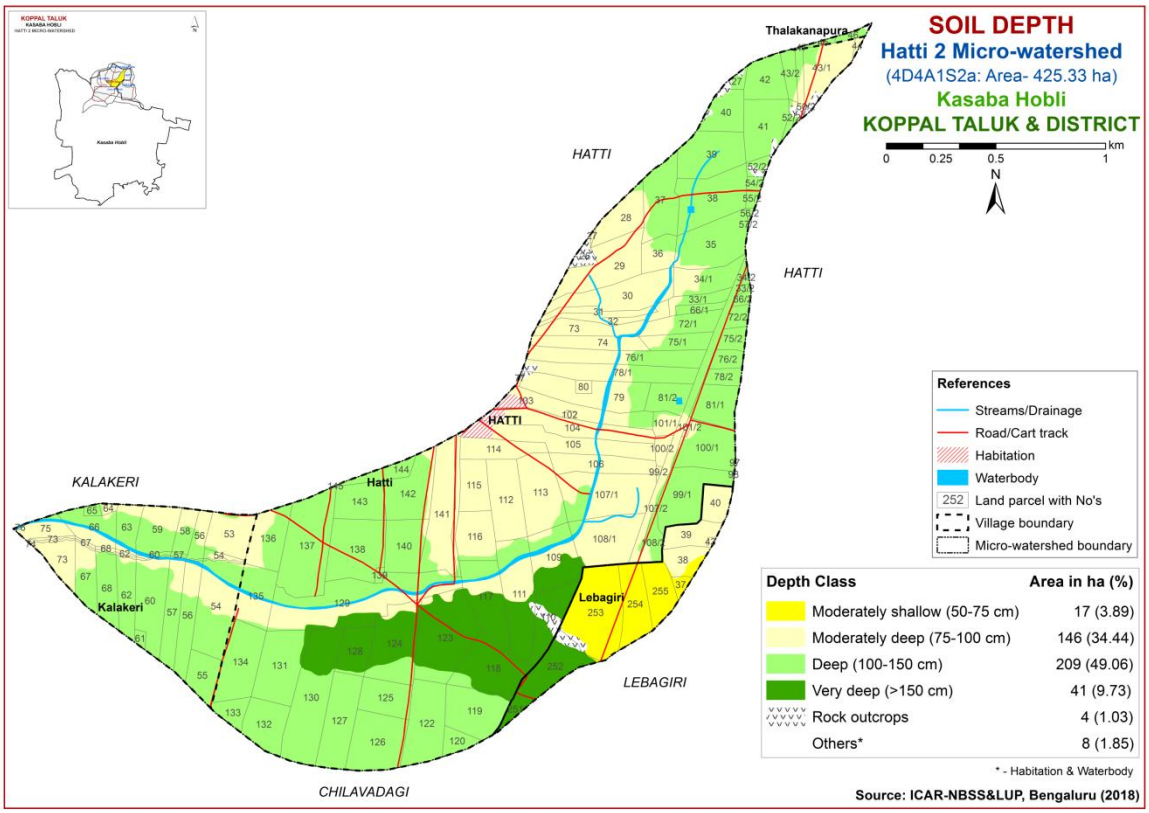


Fig. 5.2 Soil Depth map of Hatti-2 Microwatershed

Moderately shallow soils (50-75 cm) occupy an area of about 17 ha (4%) and occur in the eastern part of the microwatershed. An area of about 146 ha (34%) is moderately deep (75-100 cm) and distributed in the western, central and northern part of

the microwatershed. Deep (100-150 cm) soils occupy maximum area of about 209 ha (49%) area and distributed in the major part of the microwatershed. Very deep soils cover an area of about 41 ha (10%) and distributed in the southeastern part of the microwatershed.

The most productive lands cover about 250 ha (59%) where all climatically adapted long duration crops be grown.

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 Fig 5.3.

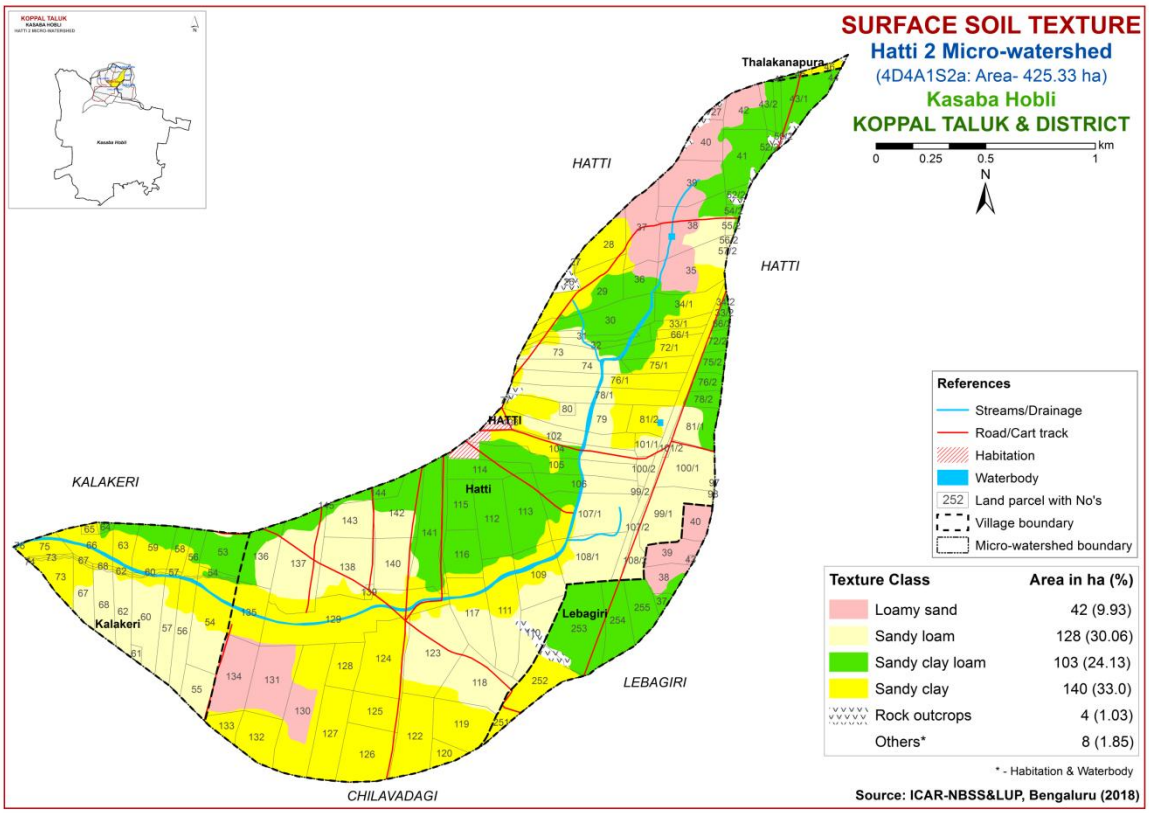


Fig. 5.3 Surface Soil Texture map of Hatti-2 Microwatershed

An area of about 42 ha (10%) is sandy at the surface and distributed in the northern and eastern part of the microwatershed. Maximum area of about 231 ha (54%) is loamy at the surface and distributed in the major part of the microwatershed. An area of

about 140 ha (33%) is clayey at the surface and distributed in the southern and central part of the microwatershed.

The most productive lands with respect to surface soil texture are clayey soils that (33 %) 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 (54%) soils which also have high potential for soil- water retention and nutrient availability but have no drainage or other physical problems. The problem soils are sandy covering 10 per cent area that has moisture and nutrient constraints.

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 Fig. 5.4.

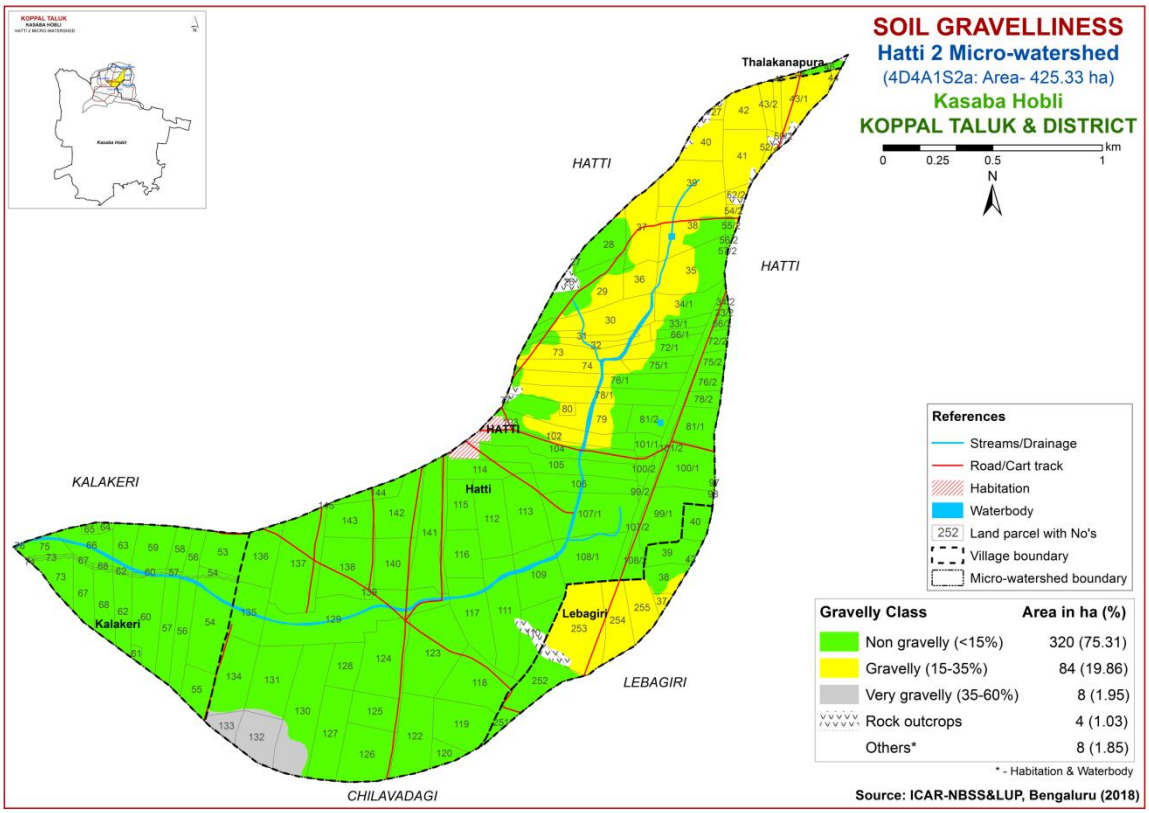


Fig. 5.4 Soil Gravelliness map of Hatti-2 Microwatershed

The soils that are non-gravelly (<15% gravel) cover a maximum area of about 320 ha (75 %) and distributed in the major part of the microwatershed.An area of about 84 ha (20 %) is covered by gravelly (15-35% gravel) soils and are distributed in the northern and eastern part of the microwatershed.A small area of about 8 ha (2%) is covered by very gravelly (35-60%) soils and distributed in the southern part of the microwatershed (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 75 per cent. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem soils that are very gravelly (35-60%) cover about 2 per cent where only short duration 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 shown in Fig. 5.5.

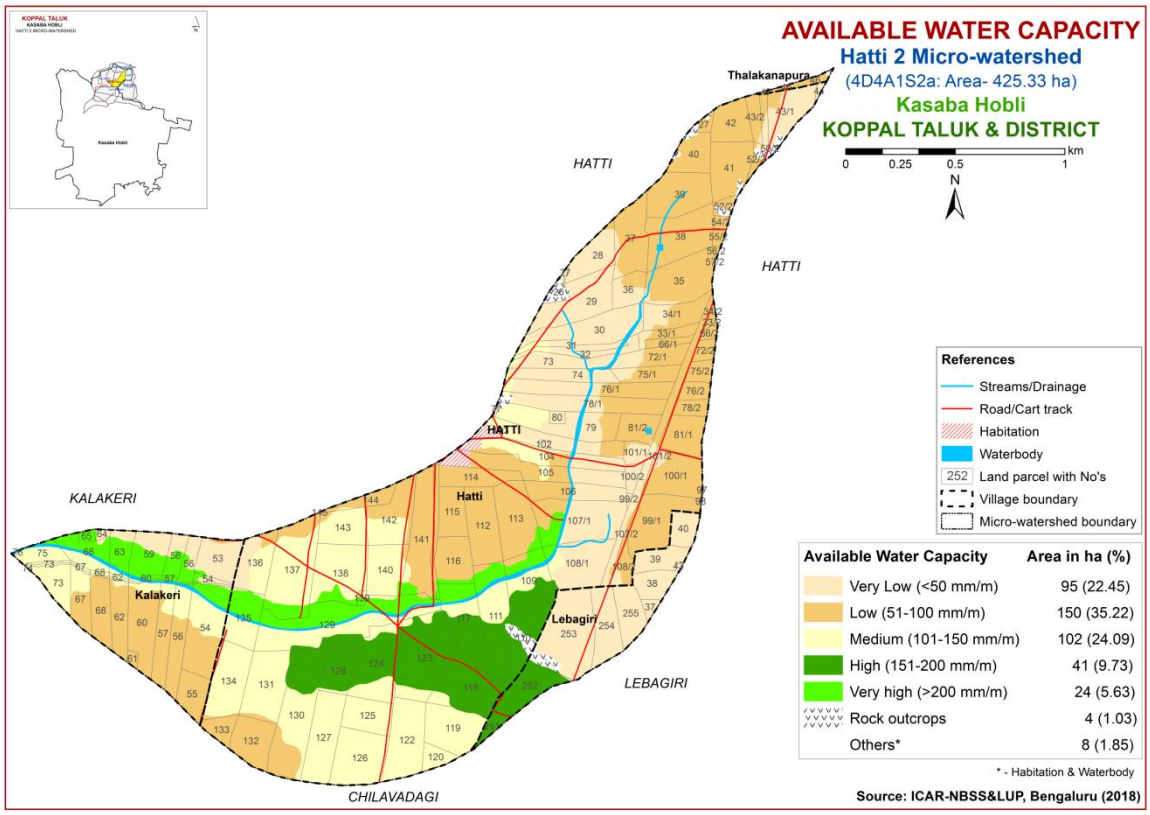


Fig. 5.5 Soil Available Water Capacity map of Hatti-2 Microwatershed

An area of about 95 ha (22%) in the microwatershed has soils that are very low (<50 mm/m) in available water capacity and are distributed in the northern, central and eastern part of the microwatershed. Maximum area of about 150 ha (35 %) has soils that are low (51 to 100 mm/m) in available water capacity and are distributed in the major part of the microwatershed. An area of about 102 ha (24%) has soils that are medium (101-150 mm/m) in available water capacity and are distributed in the southern and western part of the microwatershed.An area of about 41 ha (10%) is high in available water capacity and distributed in the southeastern part of the microwatershed. An area of about 24 ha (6%) is very high (>200 mm/min) in available water capacity and distributed in the central and western part of the microwatershed.

An area of about 95 ha (22%) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. An area of about 24 ha (6 %) has soils that have high potential (>200 mm/m) with regard to available water capacity where all climatically adapted long duration crops can be grown successfully.

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 of different slope classes in the microwatershed (Fig. 5.6).

An area of about 8 ha (2%) falls under nearly level (0-1% slope) lands and distributed in the southern part of the microwatershed. Very gently sloping (1-3%) lands cover a maximum area of about 405 ha (95 %) and distributed in the major part of the microwatershed. In all these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

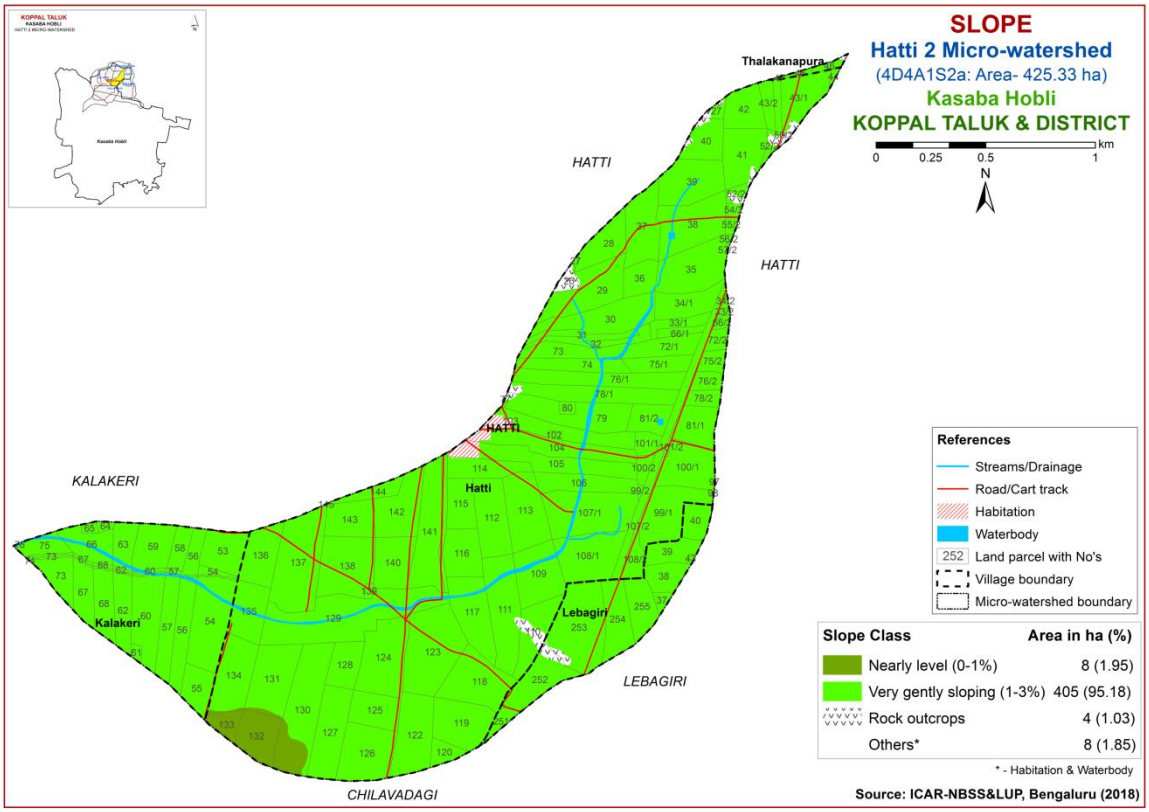


Fig. 5.6 Soil Slope map of Hatti-2 Microwatershed

5.7 Soil Erosion

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

Slightly eroded lands cover an area of about 40 ha (9%) and distributed in the southern, eastern and western part of the microwatershed. Maximum area of about 373 ha (88%) is moderately eroded (e2 class)and distributed in the major part of the microwatershed.

Moderately eroded lands are problematic and need appropriate soil and water conservation and other land development measures.

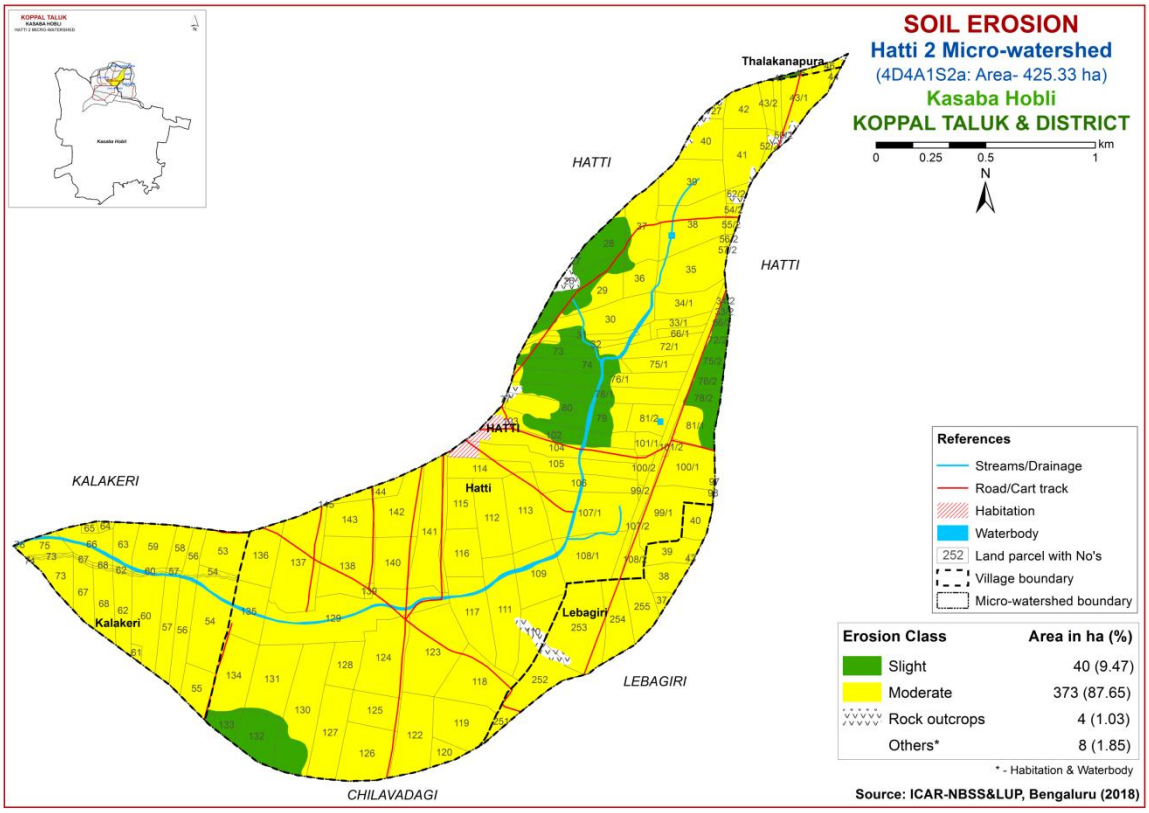


Fig. 5.7 Soil Erosion map of Hatti-2 Microwatershed

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 arecharacterized by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 250 m grid interval) all over the microwatershed through land resource inventory in the year 2017 were analyzed for pH, EC, organic carbon, available phosphorus and potassium, and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

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

6.1 Soil Reaction (pH)

The soil analysis of the Hatti-2 microwatershed for soil reaction (pH) showed that neutral soils cover a maximum area of about 302 ha (71%) and distributed in the major part of the microwatershed. An area of about 81 ha (19%) is slightly to moderately alkaline (pH 7.3-8.4) and is distributed in the southwestern and central part of the microwatershed. Strongly to very strongly alkaline (pH 8.4->9.0) soils cover anarea of about 30 ha (7%) and are distributed in the westernpart of the microwatershed. (Fig.6.1). Thus, major soils in the microwatershed areneutral in reaction.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

An area of about 360 ha (85%) is medium (0.5-0.75%) in organic carbon content and distributed in the major part of the microwatershed. About 53 ha (12%) area is high (>0.75%) in OC and distributed in the central part of the microwatershed (Fig.6.3).

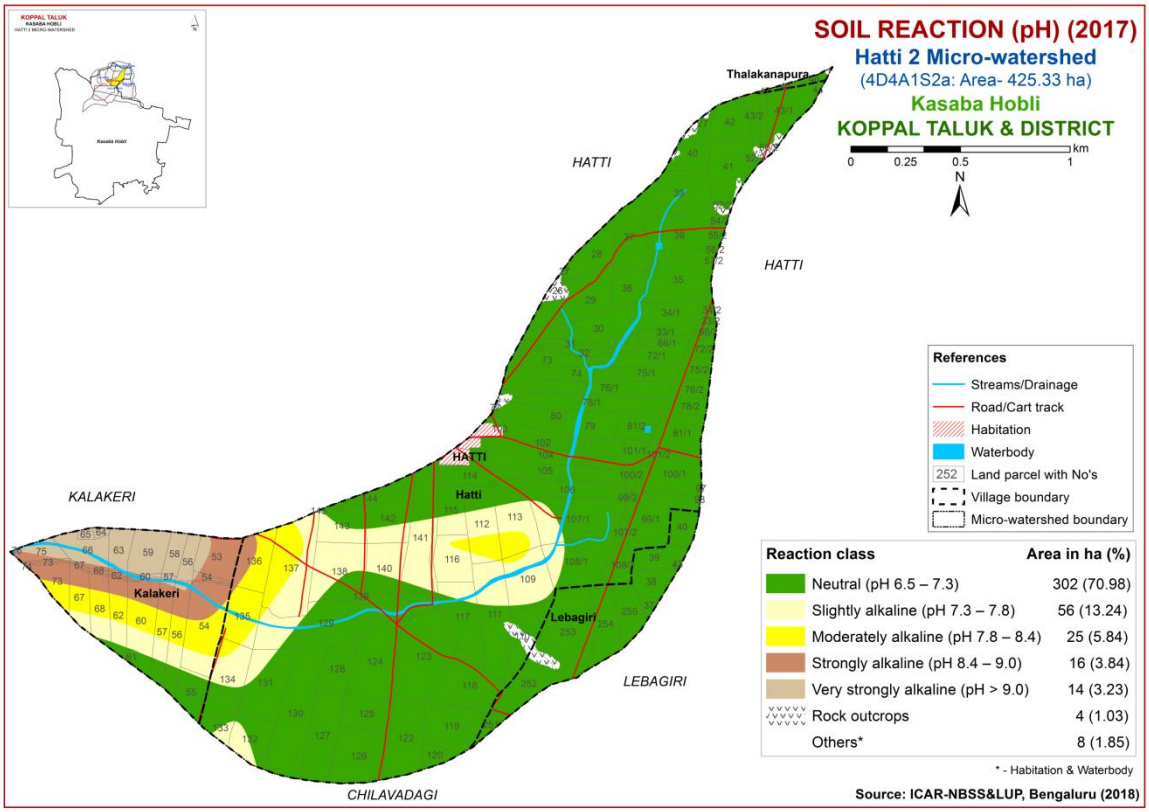


Fig.6.1 Soil Reaction (pH) map of Hatti-2 Microwatershed

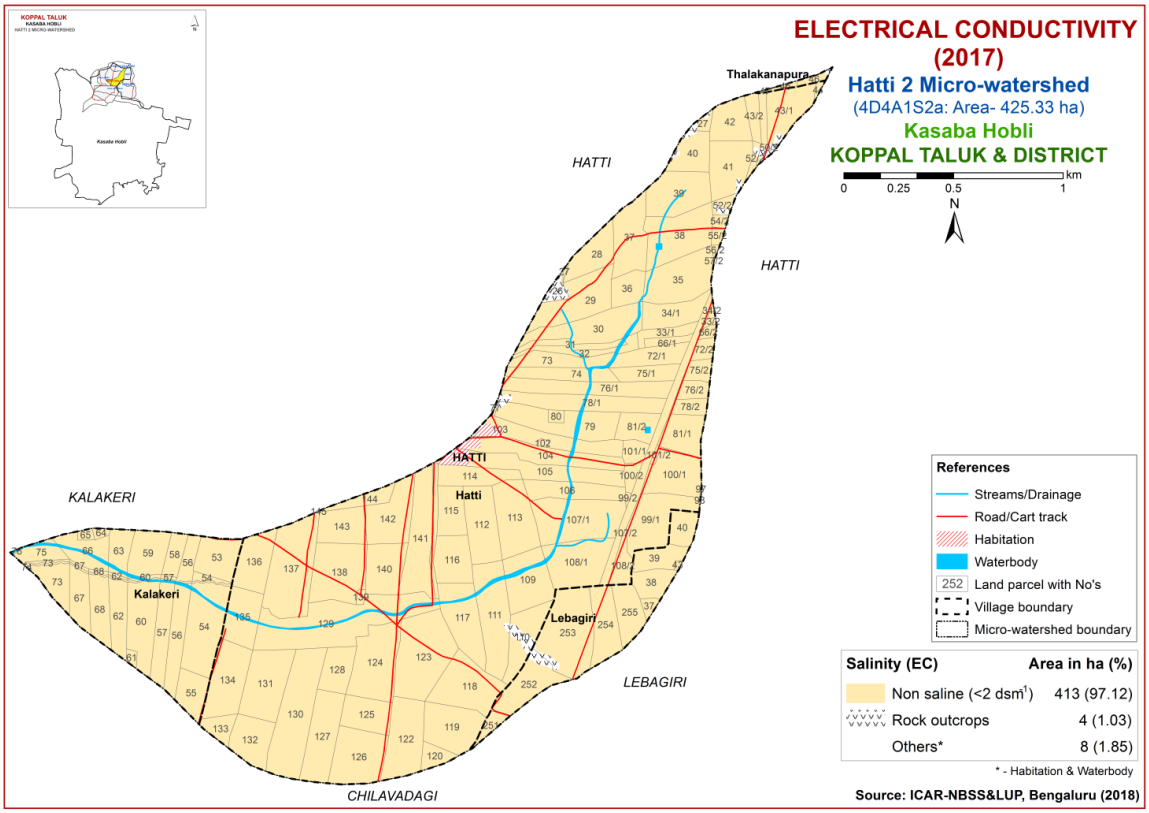


Fig.6.2 Electrical Conductivity (EC) map of Hatti-2 Microwatershed

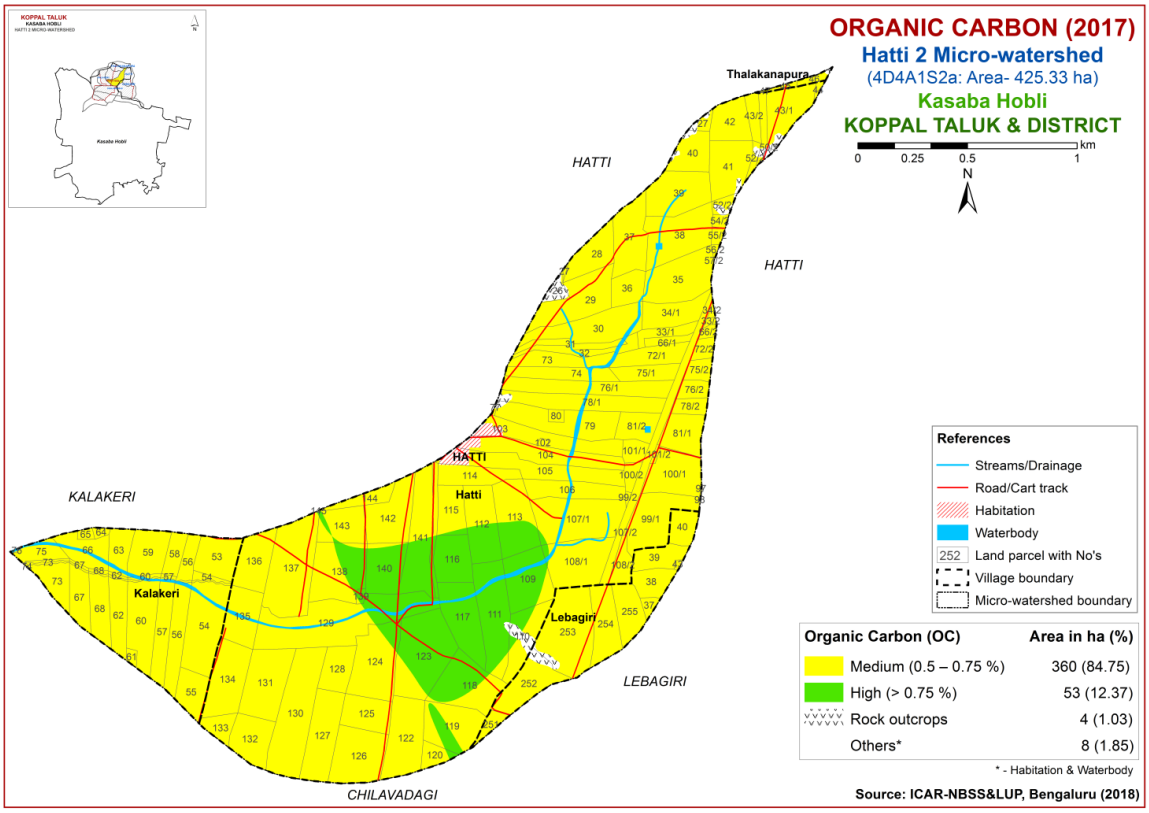


Fig.6.3 Soil Organic Carbon map of Hatti-2Microwatershed

6.4 Available Phosphorus

An area of about 13 ha (3%) is low (<23 kg/ha) in available phosphorus and distributed in the western part of the microwatershed. Available phosphorus is medium (23-57 kg/ha) in an area of about 189 ha (44%) and distributed in the northern and western part of the microwatershed. Maximum area of about 211 ha (50%) is high and distributed in the major part of the microwatershed.The areas with high phosphorus content reduce 25 per cent from the recommended dose to avoid the excess application of fertilizer and apply additional 25% phosphorus in areas where it is low and medium (Fig 6.4).

6.5 Available Potassium

Maximum area of about 270 ha (64 %) is medium (145-337 kg/ha) in available potassium content and distributed in the major part of the microwatershed.An area of about 143 ha (34 %) is high (>337 kg/ha) in available potassium content and distributed in the southern and western part of the microwatershed.The areas with high potassium content reduce 25 per cent from the recommended dose to avoid the excess application of fertilizer and apply additional 25% potassium in area where it is medium (Fig 6.5).

6.6 Available Sulphur

Soil analysis of available sulphur content in Hatti-2 microwatershed showed thatan area of about 81 ha (19%) is low in available sulphur (<10 ppm) and distributed in

the northern and western part of the microwatershed. Maximum area of about 270 ha (63 %) is medium (10-20 ppm) and distributed in the major part of the microwatershed. An area of about 62 ha (15 %) is high (>20ppm) in available sulphur and distributed in the southern part of the microwatershed (Fig.6.6).The areas that are low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or factomphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Soil analysis of available boron content in Hatti-2 microwatershed showed that a maximumarea of about 359 ha (85 %) is low (<0.5ppm) in available boron content and distributed in the major part of the microwatershed. An area of about 54 ha (13 %) is medium (0.5-1.0ppm) in available boron content and distributed in the southern part of the microwatershed (Fig.6.7).

6.8 Available Iron

Available iron content in the soils of the Hatti-2 microwatershed is deficient (<4.5 ppm) inan area of about 186 ha (44 %) and distributed in the southern, central and southwestern part. Maximum area of about 228 ha (53 %) showed sufficiency (>4.5 ppm) with respect to iron content and distributed in the major 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).

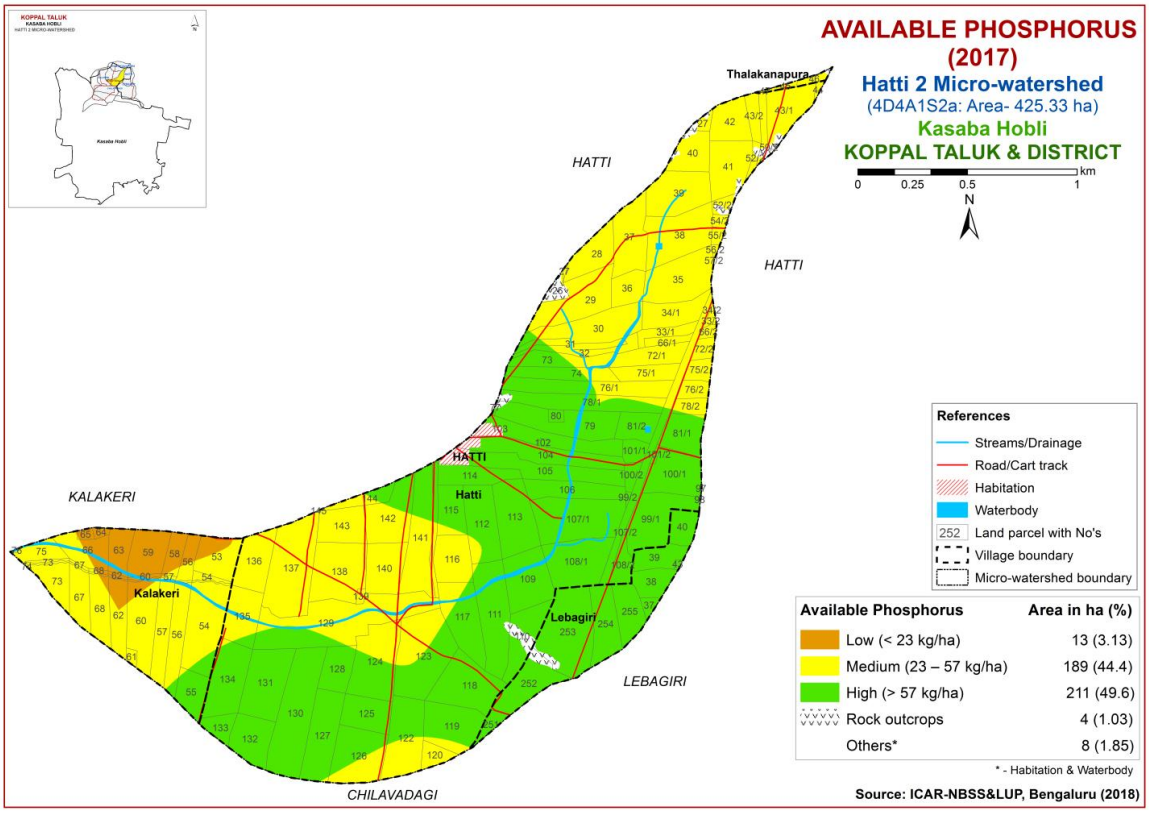


Fig.6.4 Soil Available Phosphorus map of Hatti-2Microwatershed

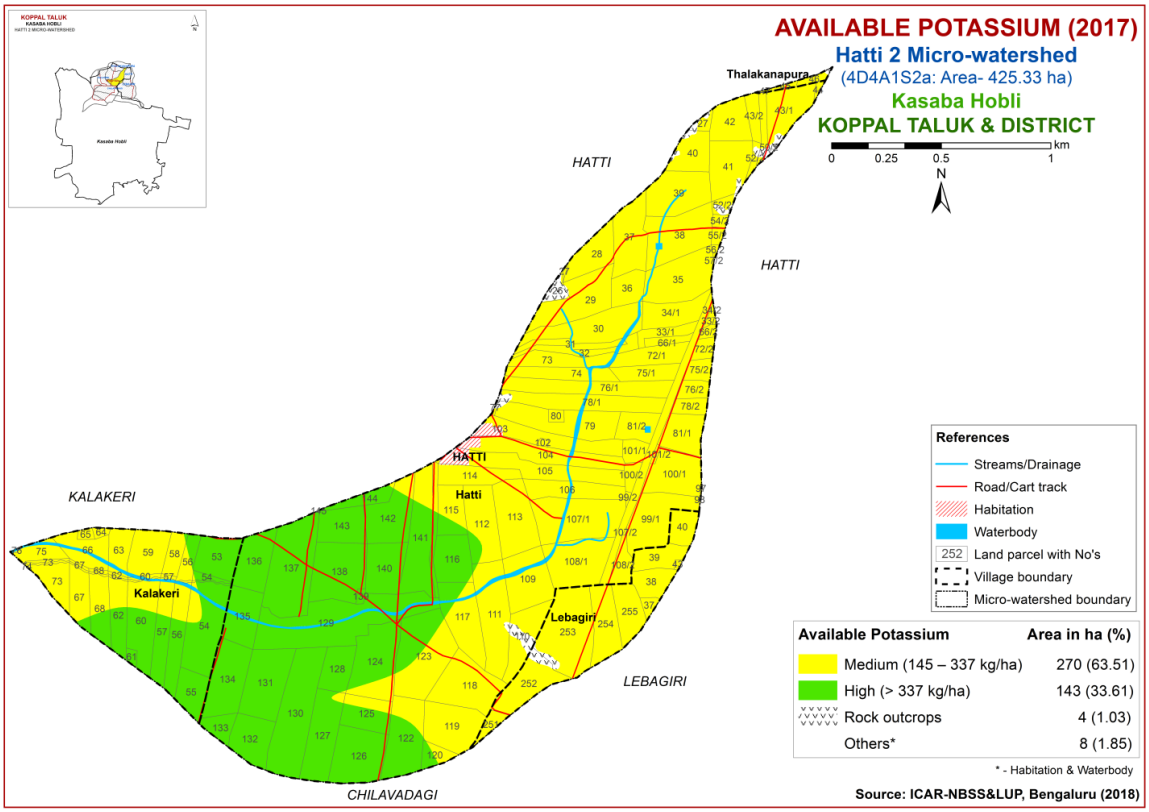


Fig.6.5 Soil Available Potassium map of Hatti-2 Microwatershed

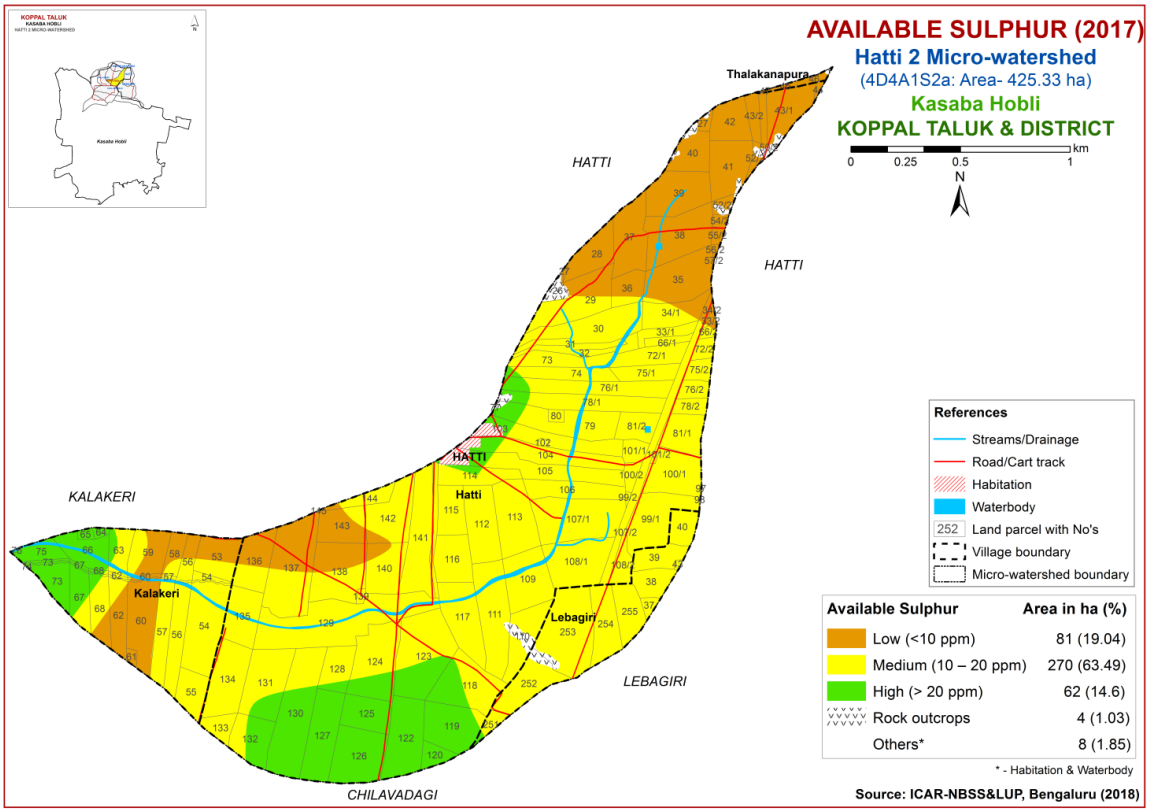


Fig.6.6 Soil Available Sulphur map of Hatti-2Microwatershed

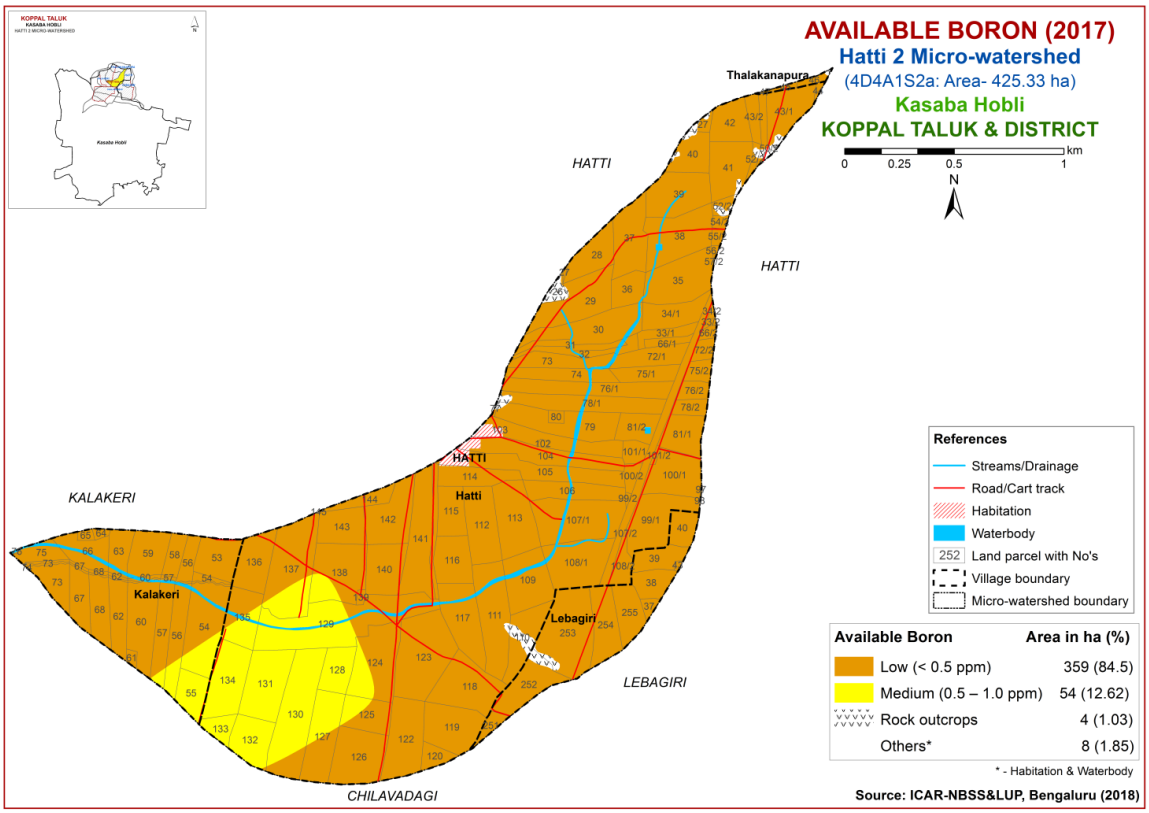


Fig.6.7 Soil Available Boron map of Hatti-2Microwatershed

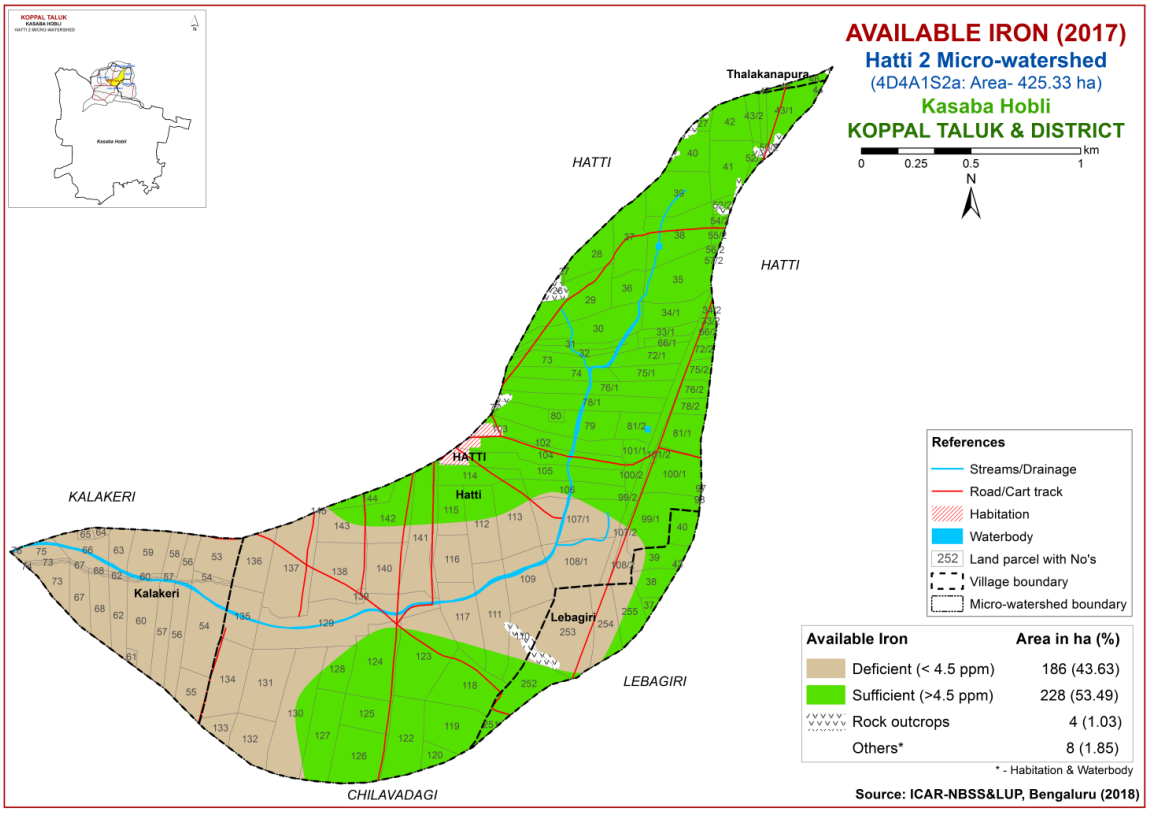


Fig.6.8 Soil Available Iron map of Hatti-2Microwatershed

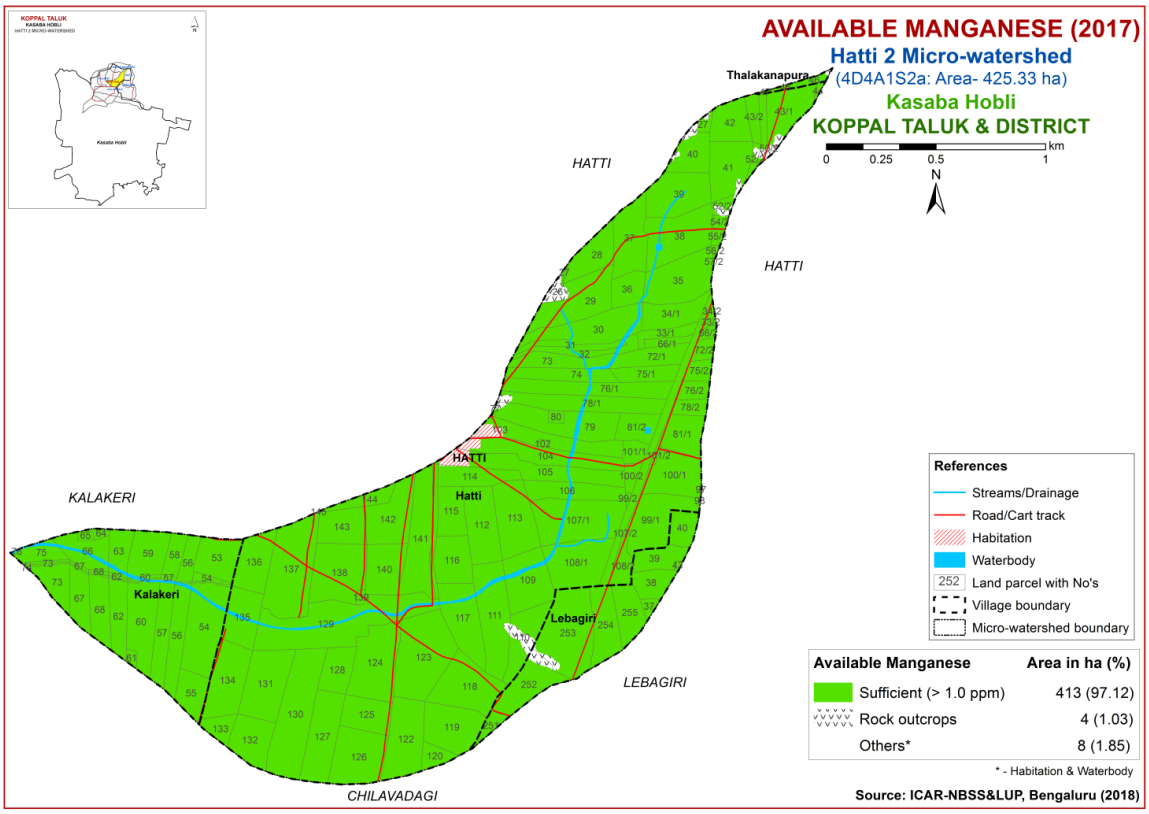


Fig.6.9 Soil Available Manganese map of Hatti-2 Microwatershed

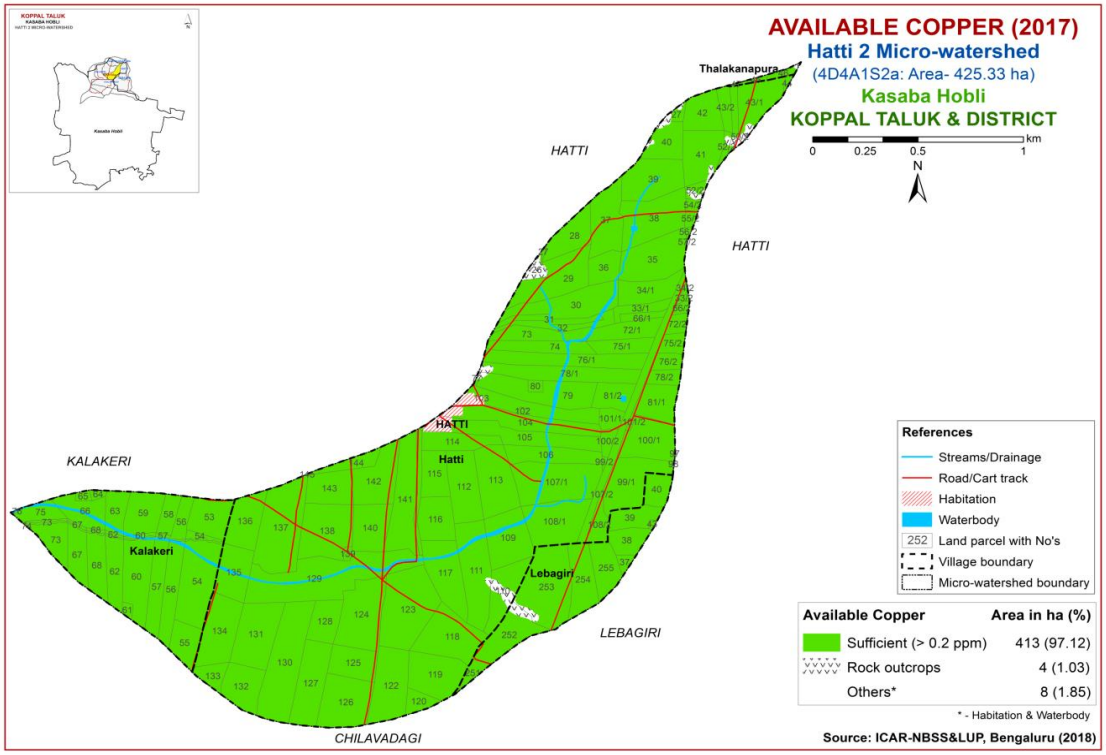


Fig.6.10 Soil Available Copper map of Hatti-2 Microwatershed

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in a maximum area of about 222 ha (52%) and distributed in the major part of the microwatershed. An area of about 191 ha (45 %) is sufficient (>0.6) in zinc content and distributed in the eastern, northern and central part of the microwatershed (Fig 6.11).

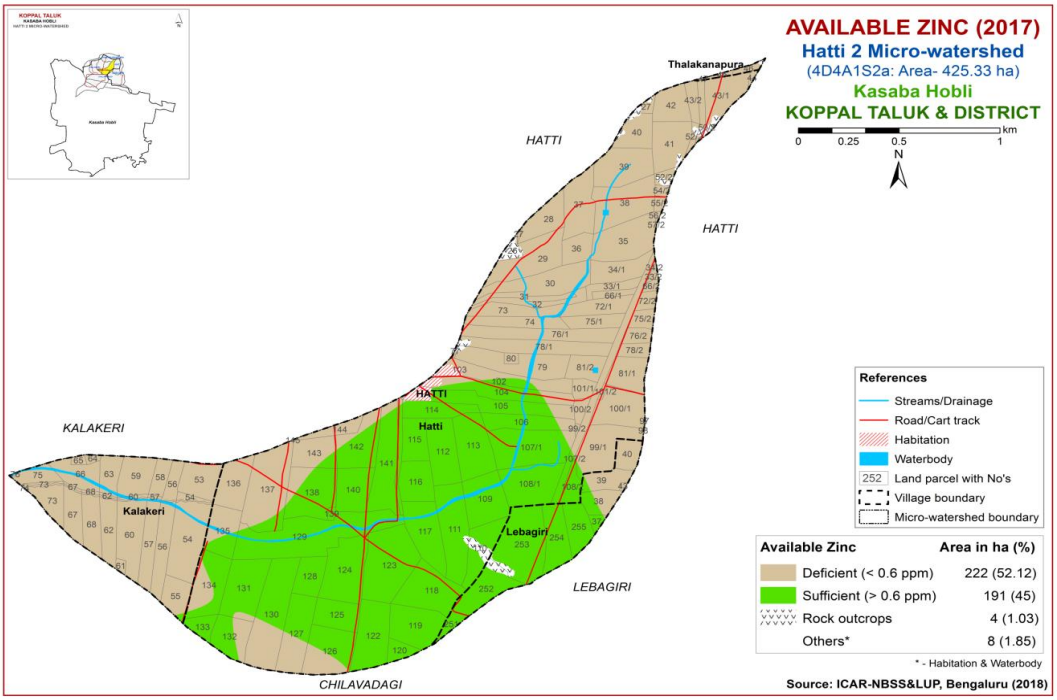


Fig.6.11 Soil Available Zinc map of Hatti-2 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Hatti-2 microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S- Suitable and Order N- Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1- Highly Suitable, Class S2- Moderately Suitable and Class S3- Marginally Suitable. Order N has two Classes, N1- Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 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, 'z' for calcareousness and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

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

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

Highly suitable (Class S1) lands occupy an area of about180 ha (42%) for growing sorghum and occur in the central, western, southeastern and southern part of the microwatershed. An area of about 46 ha (11%) is moderately suitable (Class S2) for growing sorghum and distributed in the western and centralpart of the microwatershed

Table 7.1 Soil-Site Characteristics of Hatti-2 Microwatershed

Soil Map Units	Climate (P)(mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP	CEC [Cmol (p^{+})kg^{-1}]	BS (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface								
LKRhB2g1	662	<90	WD	50-75	scl	gsc	15-35	40-60	51-100	1-3	moderate	8.18	0.30	4.51	12.19	100
HDHbB2	662	<90	WD	75-100	ls	gsc-gc	-	>35	51-100	1-3	moderate	6.54	0.07	7.11	5.84	84.07
HDHcB2	662	<90	WD	75-100	sl	gsc-gc	-	>35	51-100	1-3	moderate	6.54	0.07	7.11	5.84	84.07
BSRhB2	662	<90	WD	75-100	scl	gsc	-	15-35	51-100	1-3	moderate	-	-	-	-	-
BDGcB1g1	662	<90	WD	75-100	sl	gc	15-35	35-60	<50	1-3	slight	6.24	0.06	0.35	3.76	52.56
BDGhB2	662	<90	WD	75-100	scl	gc	-	35-60	<50	1-3	moderate	6.24	0.06	0.35	3.76	52.56
BDGhB2g1	662	<90	WD	75-100	scl	gc	15-35	35-60	<50	1-3	moderate	6.24	0.06	0.35	3.76	52.56
BDGiB1	662	<90	WD	75-100	sc	gc	-	35-60	<50	1-3	slight	6.24	0.06	0.35	3.76	52.56
KMHbB2	662	<90	WD	100-150	ls	sc	-	<15	151-200	1-3	moderate	7.2	0.19	0.54	15.07	100
KMHiB2	662	<90	WD	100-150	sc	sc	-	<15	151-200	1-3	moderate	7.2	0.19	0.54	15.07	100
MNLcB2	662	<90	WD	100-150	sl	gscl	-	15-35	101-150	1-3	moderate	7.89	0.13	5.04	9.01	101
BPRbB2g1	662	<90	WD	100-150	ls	gsc-gc	15-35	>35	101-150	1-3	moderate	6.64	0.03	0.51	5.45	63.40
BPRcB2	662	<90	WD	100-150	sl	gsc-gc	-	>35	101-150	1-3	moderate	6.64	0.03	0.51	5.45	63.40
BPRhB1	662	<90	WD	100-150	scl	gsc-gc	-	>35	101-150	1-3	slight	6.64	0.03	0.51	5.45	63.40
BPRhB1g1	662	<90	WD	100-150	scl	gsc-gc	15-35	>35	101-150	1-3	slight	6.64	0.03	0.51	5.45	63.40
BPRhB2g1	662	<90	WD	100-150	scl	gsc-gc	15-35	>35	101-150	1-3	moderate	6.64	0.03	0.51	5.45	63.40
BPRiA1g2	662	<90	WD	100-150	sc	gsc-gc	35-60	>35	101-150	0-1	slight	6.64	0.03	0.51	5.45	63.40
BPRiB2	662	<90	WD	100-150	sc	gsc-gc	-	>35	101-150	1-3	moderate	6.64	0.03	0.51	5.45	63.40
NGPhB2	662	<90	WD	100-150	scl	gsc-gc	-	>35	51-100	1-3	moderate	-	-	--	-	-
GDPcB2	662	<90	WD	100-150	sl	gsc-gc	-	30-60	51-100	1-3	moderate	5.54	0.02	0.58	5.60	69
RTRcB2	662	<90	WD	>150	sl	c	-	-	151-200	1-3	moderate	5.08	0.03	2.06	9.21	50.50
RTRiB2	662	<90	WD	>150	sc	c	-	-	151-200	1-3	moderate	5.08	0.03	2.06	9.21	50.50
DRLiB2	662	<90	MWD	75-100	sc	c	-	<15	151-200	1-3	moderate	-	-	-	-	-
GRHiB2	662	<90	MWD	100-150	sc	c	-	<15	>200	1-3	moderate	8.27	1.11	11.72	31.60	-

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

with minor limitations of calcareousness, nutrient availability and texture.An area of about 187 ha (44%) is marginally suitable for growing sorghum and distributed in the major part of the microwatershed. They have moderate limitations of gravelliness and rooting depth.

Table 7.2 Crop suitability criteria for Sorghum

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

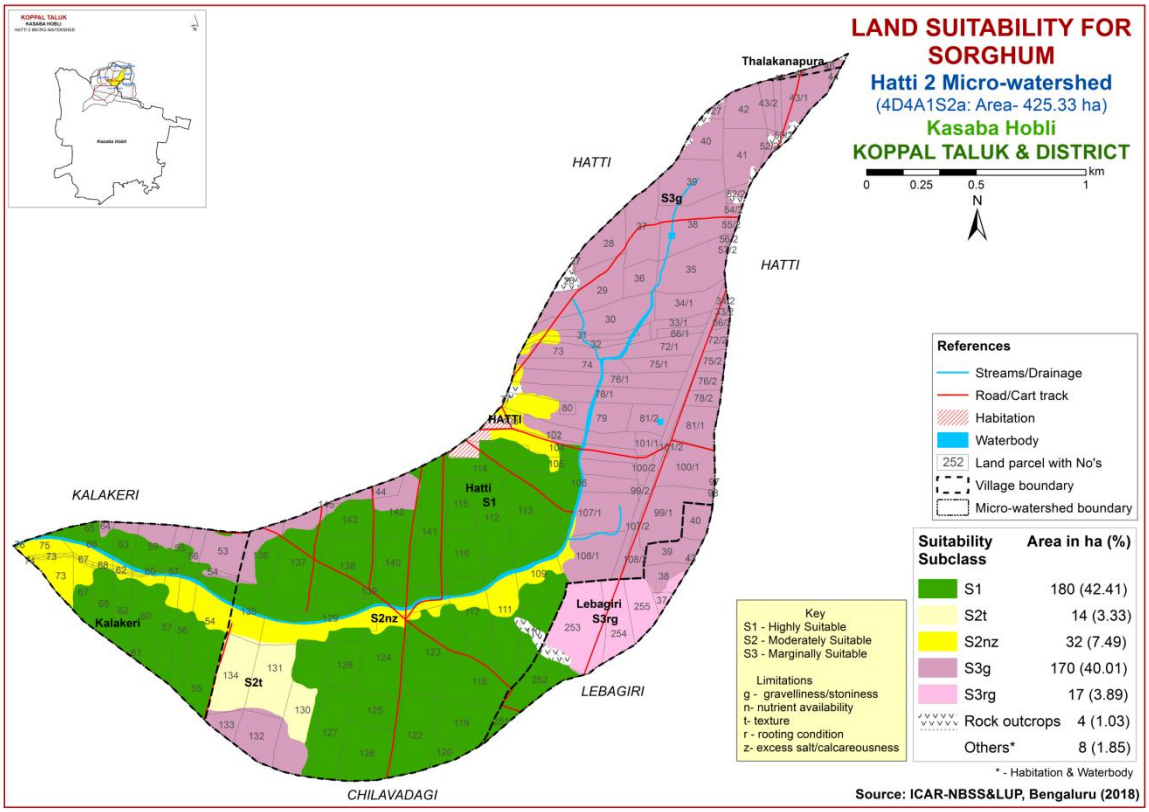


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for 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 are given in Figure 7.2.

Table 7.3 Crop suitability criteria for Maize

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

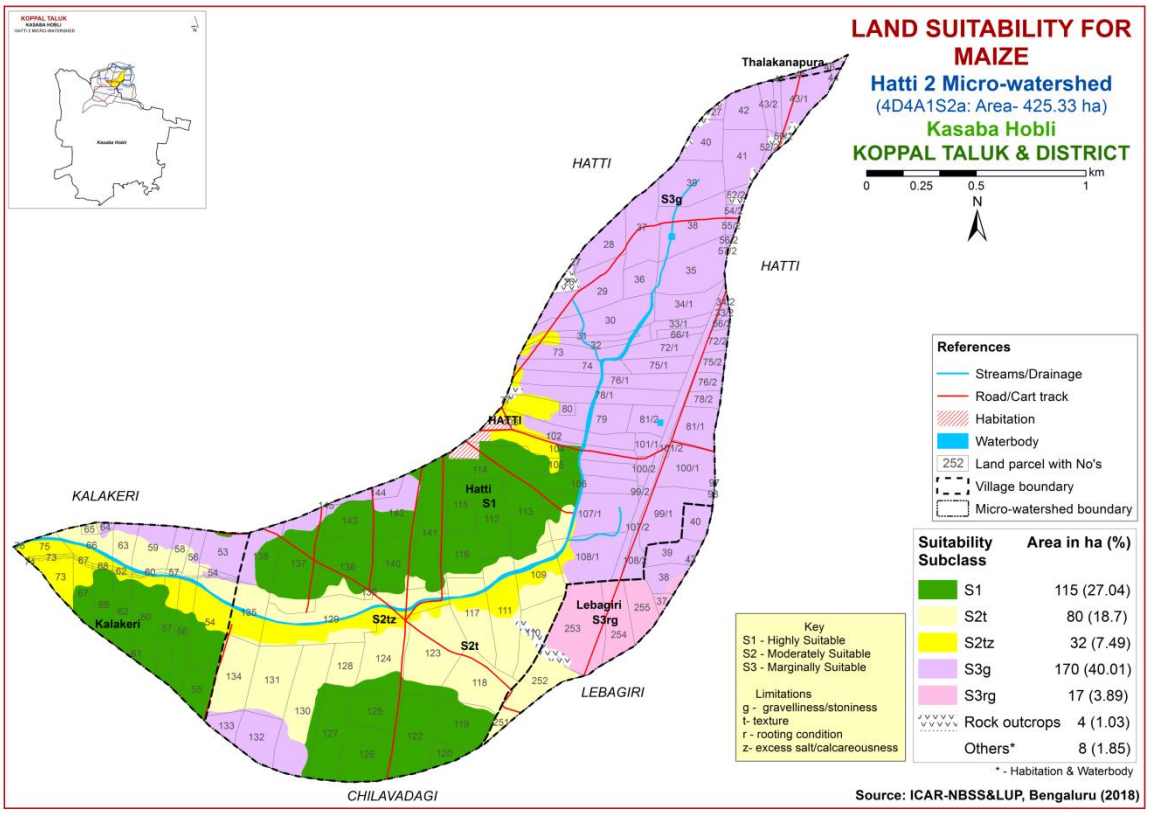


Fig. 7.2 Land Suitability map of Maize

Highly suitable (S1) lands cover an area of about 115 ha (27 %) and distributed in the southern and western part of the microwatershed. Moderately suitable (S2) lands for growing maize cover an area of about 112 ha (26 %) and distributed in the southern, western and central part of the microwatershed with minor limitations of texture and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 187

ha (44 %) and occur in the major part of the microwatershed. They have moderate limitations of gravelliness and rooting depth.

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

Highly suitable (S1) lands cover an area of about 156 ha (37 %) and distributed in the major part of the microwatershed. Moderately suitable (S2) lands for growing bajra cover an area of about 113 ha (26 %) and distributed in the southwestern, eastern and central part of the microwatershed with minor limitations of gravelliness, texture, rooting depth and calcareousness. Marginally suitable (Class S3) lands cover an area of about 144 ha (34%) and occur in the northern, eastern and central part of the microwatershed. They have moderate limitation of gravelliness.

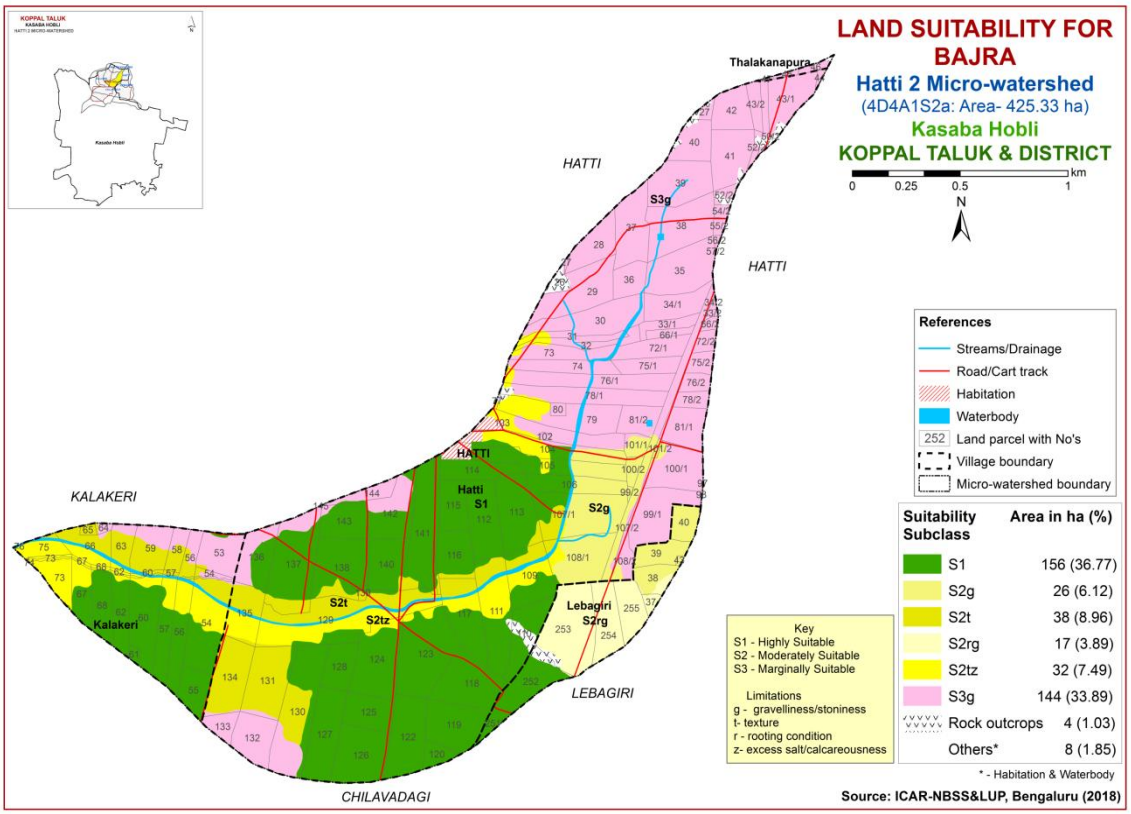


Fig. 7.3 Land Suitability map of Bajra

Table 7.4 Crop suitability criteria for Bajra

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately suitable(S2)**	**Marginally suitable (S3)**	**Not suitable (N)**
Slope	%	2-3	3-8	8-15	>15
LGP	Days	120-150	120-90	<90	
Soil drainage	Class	Well to mod.Well drained	imperfect	Poorly/excessively	V.poorly
Soil reaction	pH	5.5-8.0	5.0-5.5,7.8-8.4	8.4-9.0	>9.0
Surface soil texture	Class	c(red), sicl, sc,sl, cl	l, c (black) scl, sil, sic	sl, ls	s, fragmental skeletal
Soil depth	cm	100-75	50-75	25-50	<25
Gravel content	% vol.	15-35	35-60	60-80	-
Salinity (EC)	dSm^{-1}	2-4	4-8	8-10	>10
Sodicity (ESP)	%	5-8	8-10	10-15	>15

7.4 Land Suitability for Redgram (*Cajanus cajan*)

Redgram is one of the most important pulse crop grown in an area of 7.28 lakh ha in almost all the districts of the State. The crop requirements for growing redgram (Table 7.5) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing redgram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.4.

Highly suitable (Class S1) lands for growing redgram cover an area of about 121 ha (28%) and distributed in the southern part of the microwatershed. An area of about 74 ha (17%) is moderately suitable (Class S2) for growing redgram and occur in the western and southern part of the microwatershed. They have minor limitations of texture and rooting depth. Marginally suitable lands (Class S3) occupy maximum area of about219 ha (51%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and calcareousness.

Table 7.5 Land suitability criteria for Red gram

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

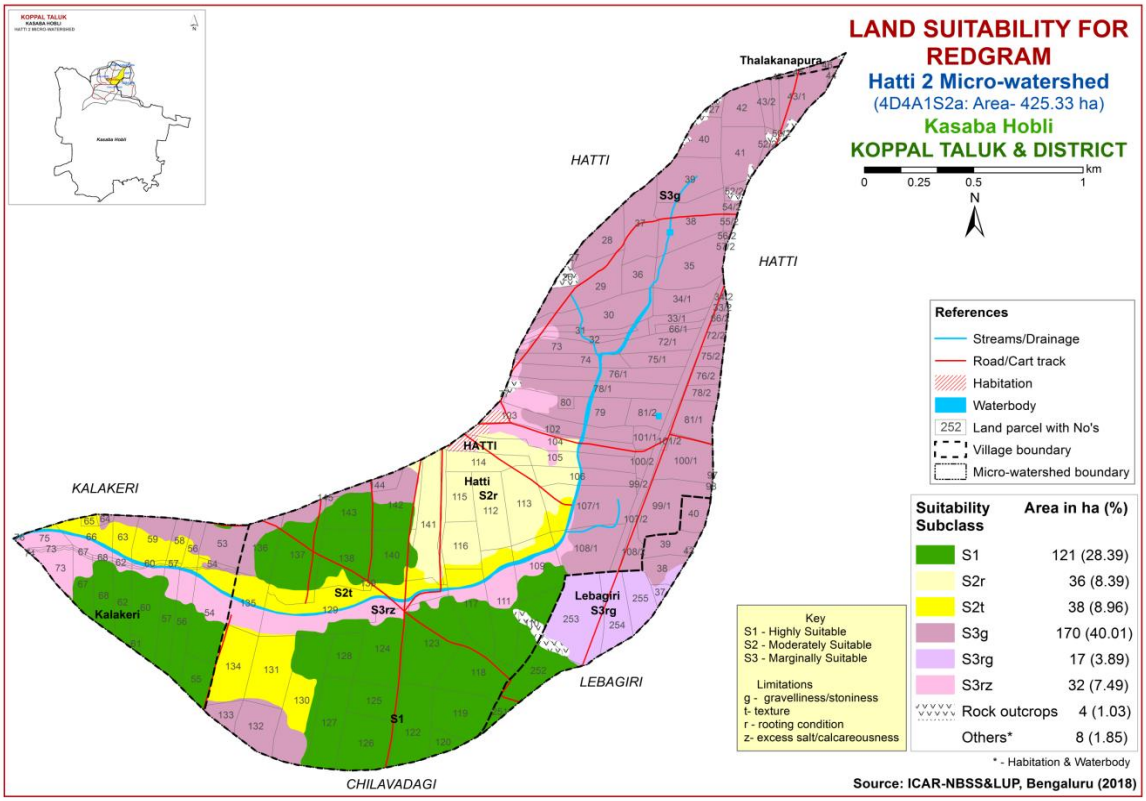


Fig. 7.4 Land Suitability map of Redgram

7.5 Land Suitability for Bengal gram (*Cicer arietinum*)

Bengal gram is one of the major pulse crop grown in an area of 9.39 lakh ha in northern Karnataka in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad and Bellary districts. The crop requirements for growing Bengal gram (Table 7.6) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing Bengal gram was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.5.

Table 7.6 Crop suitability criteria for Bengal gram

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

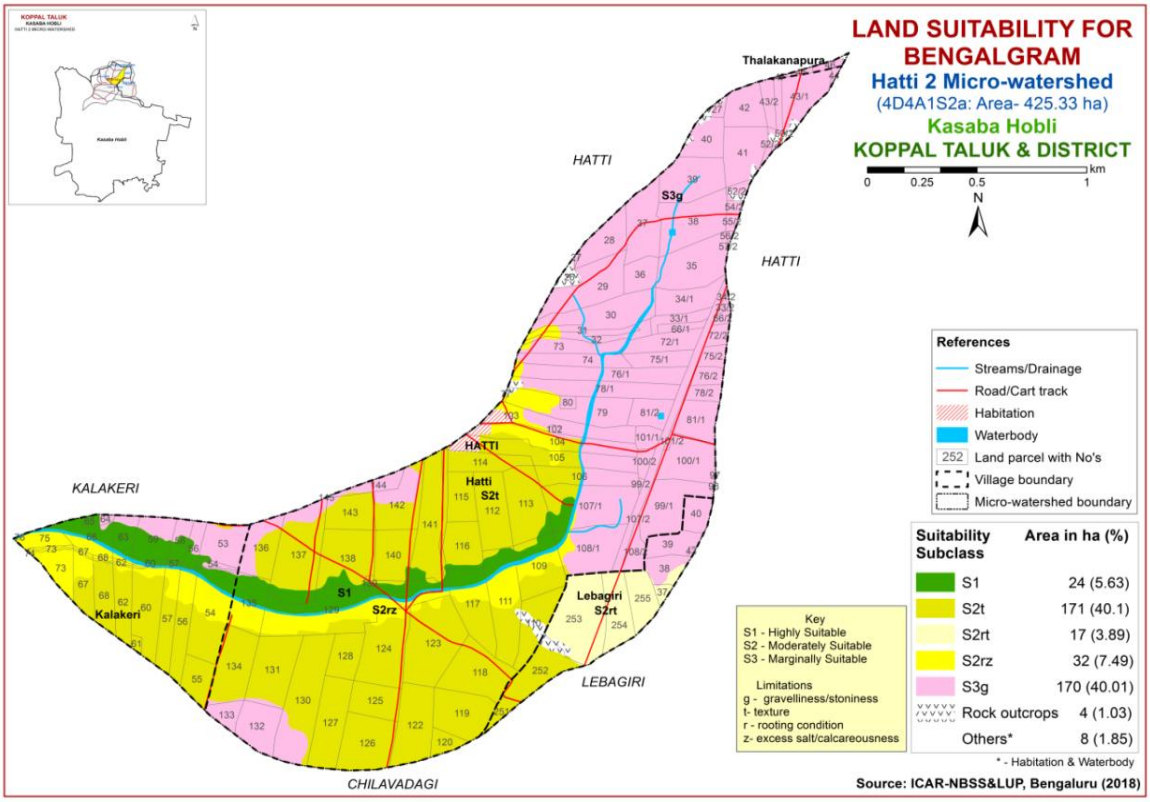


Fig. 7.5 Land Suitability map of Bengal gram

An area of about 24 ha (6 %) in the microwatershed has soils that are highly suitable (Class S1) for growing Bengal gram and are distributed in the western and central part of the microwatershed. Maximum area of about 220 ha (51 %) is moderately suitable (Class S2) for growing bengalgram and are distributed in the major part of the microwatershed. They have minor limitations of rooting depth, calcareousness and texture. Marginally suitable (Class S3) lands cover an area of about 170 ha (40 %) and are distributed in the northern, western, eastern and central part of the microwatershed. They have moderate limitation of gravelliness.

7.6 Land Suitability for Groundnut (*Arachis hypogaea*)

Groundnut is one of the major oilseed crop grown in an area of 6.54 lakh ha in Karnataka in most of the districts either as rainfed or irrigated crop. The crop requirements for growing groundnut (Table 7.7) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing groundnut was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.6.

Anarea of about 66 ha (15%) ishighly suitable (Class S1) for growing groundnut and are distributed in the southeastern and western part of the microwatershed. Moderately suitable (Class S2) lands for growing groundnut cover a maximum area of about 239 ha (56 %) and distributed in the major part of the microwatershed. They have minor limitations of gravelliness, texture and rooting depth.An area of about 109 ha

(26%) is marginally suitable (Class S3) for growing groundnut and occur inthe western and central part of the microwatershed with moderate limitations of gravelliness, texture and calcareousness.

Table 7.7 Crop suitability criteria for Groundnut

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

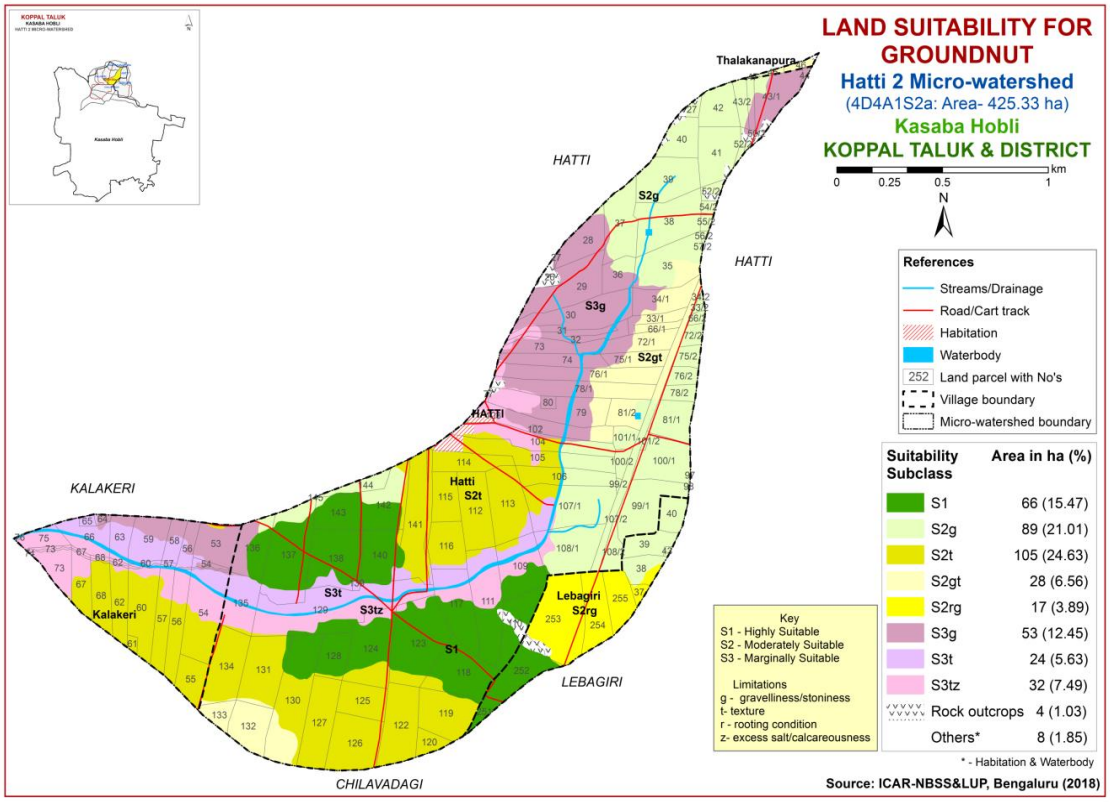


Fig. 7.6 Land Suitability map of Groundnut

7.7 Land Suitability for Sunflower (*Helianthus annus*)

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

7.8) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sunflower was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.7.

Table 7.8 Crop suitability criteria for Sunflower

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

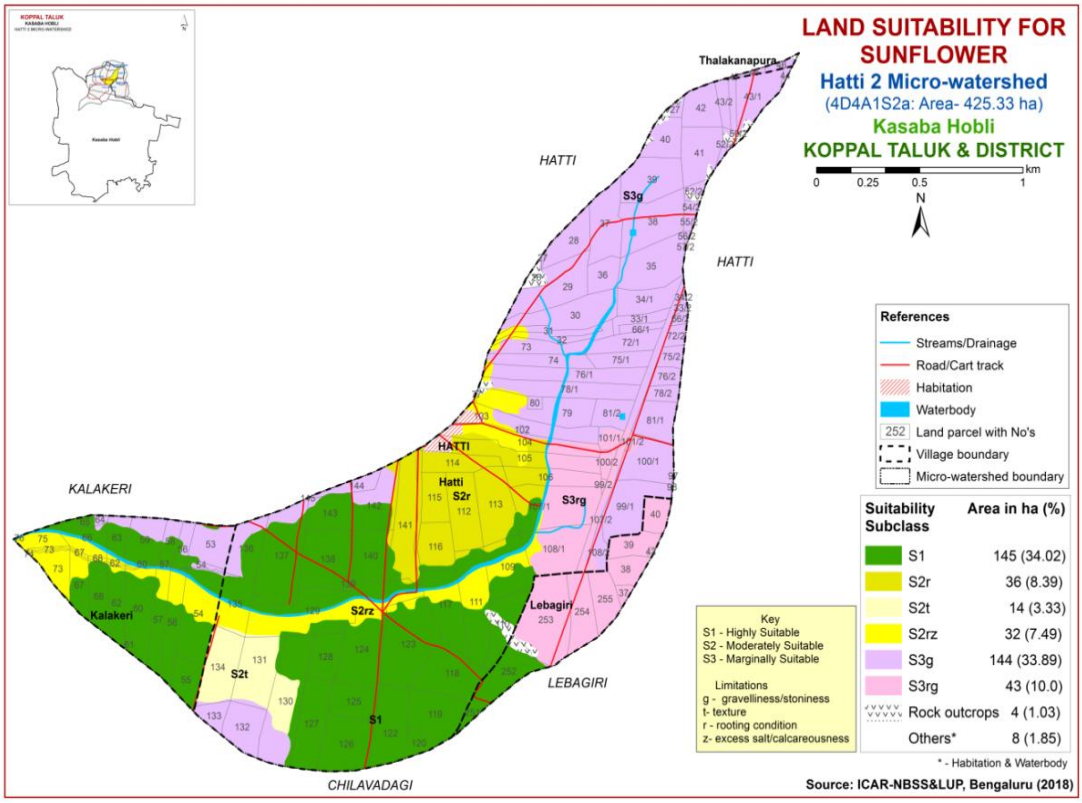


Fig. 7.7 Land Suitability map of Sunflower

An area of about 145 ha (34 %) is highly suitable (Class S1) for growing sunflower and are distributed in the southern and western part of the microwatershed. An area of about 82 ha (19%) is moderately suitable (Class S2) and distributed in the western part of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands occupy a maximum area of about 187 ha (44 %) and are distributed in the major part of the microwatershed with moderate limitations of rooting depth and gravelliness.

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

Cotton is one of the most important fibre crop grown in the State in about 8.75 lakh ha area in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and 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.

An area of about 88 ha (21 %) in the microwatershed has soils that are highly suitable (Class S1) for growing cotton and are distributed in the southern and southeastern part of the microwatershed. An area of about 139 ha (32%) is moderately suitable (Class S2) for growing cotton and are distributed in the southern, central and western part of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 187 ha (44 %) and are distributed in the major part of the microwatershed. They have moderate limitations of gravelliness and rooting depth.

Table 7.9 Crop suitability criteria for Cotton

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

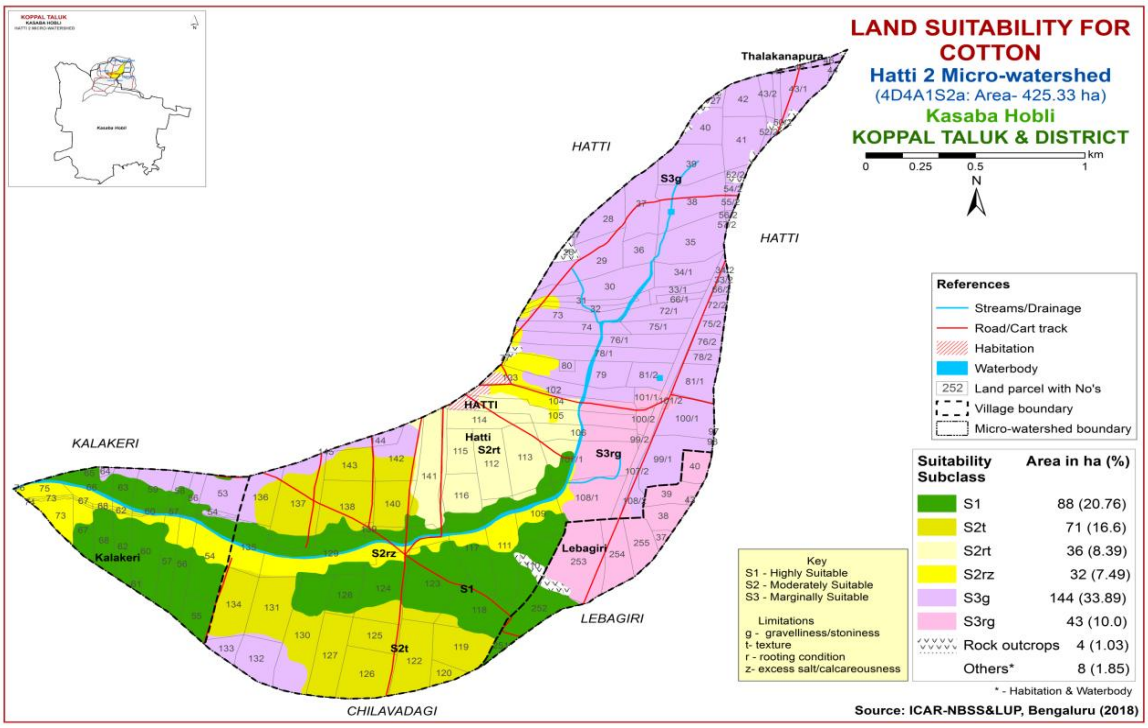


Fig. 7.8 Land Suitability map of Cotton

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

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

Table 7.10 Crop suitability criteria for Chilli

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

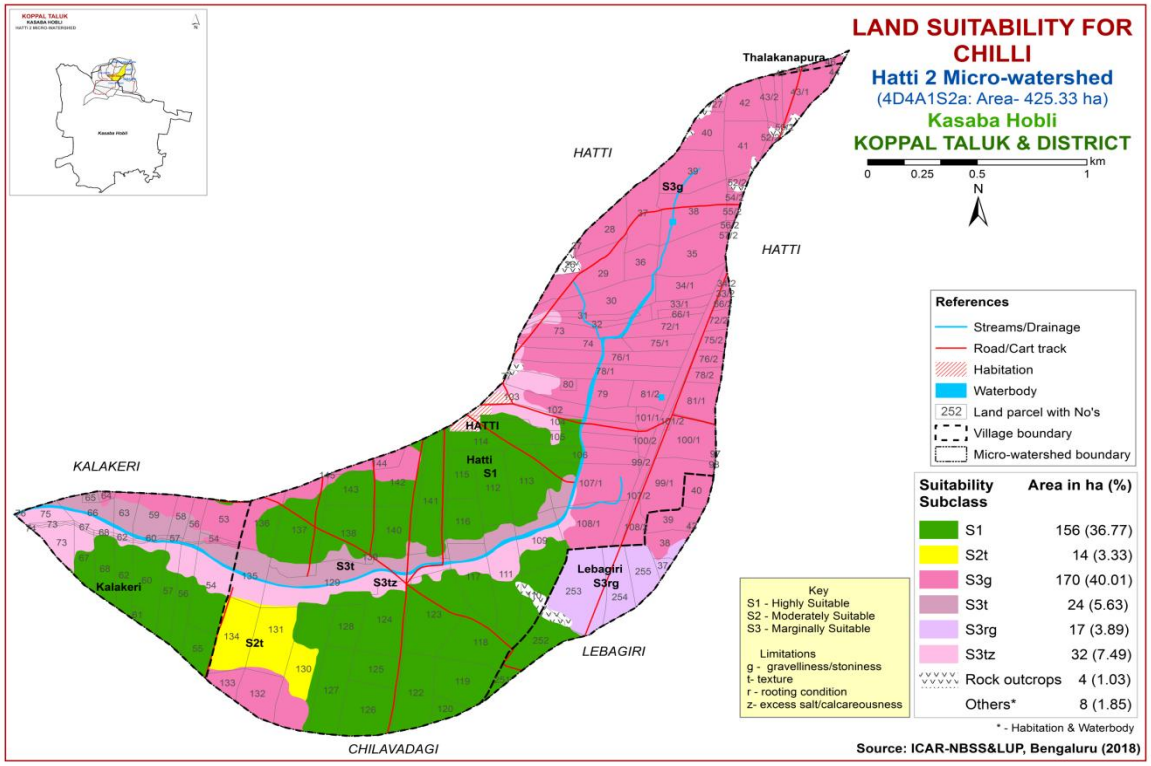


Fig. 7.9 Land Suitability map of Chilli

Highly suitable (S1) lands for growing chilli cover an area of about 156 ha (37%)and distributed in the southern, southeastern and western part of the microwatershed. Moderately suitable (S2) lands cover a small area of about 14 ha (3%) and distributed in the southern part of the microwatershed with minor limitation of texture. Marginally suitable (Class S3) lands cover a maximum area of about 243 ha (57%) and distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, texture, rooting depth and calcareousness.

7.10 Land Suitability for Tomato (*Solanum lycopersicum*)

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

Highly suitable (S1) lands for growing tomato cover an area of about 156 ha (37%)and distributed in the southern, southeastern and western part of the microwatershed. Moderately suitable (S2) lands cover a small area of about 14 ha (3%) and distributed in the southern part of the microwatershed with minor limitation of texture. Marginally suitable (Class S3) lands cover a maximum area of about 243 ha (57%) and distributed in the major part of the microwatershed. They have moderate limitations of gravelliness, texture, rooting depth and calcareousness.

Table 7.11 Crop suitability criteria for Tomato

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

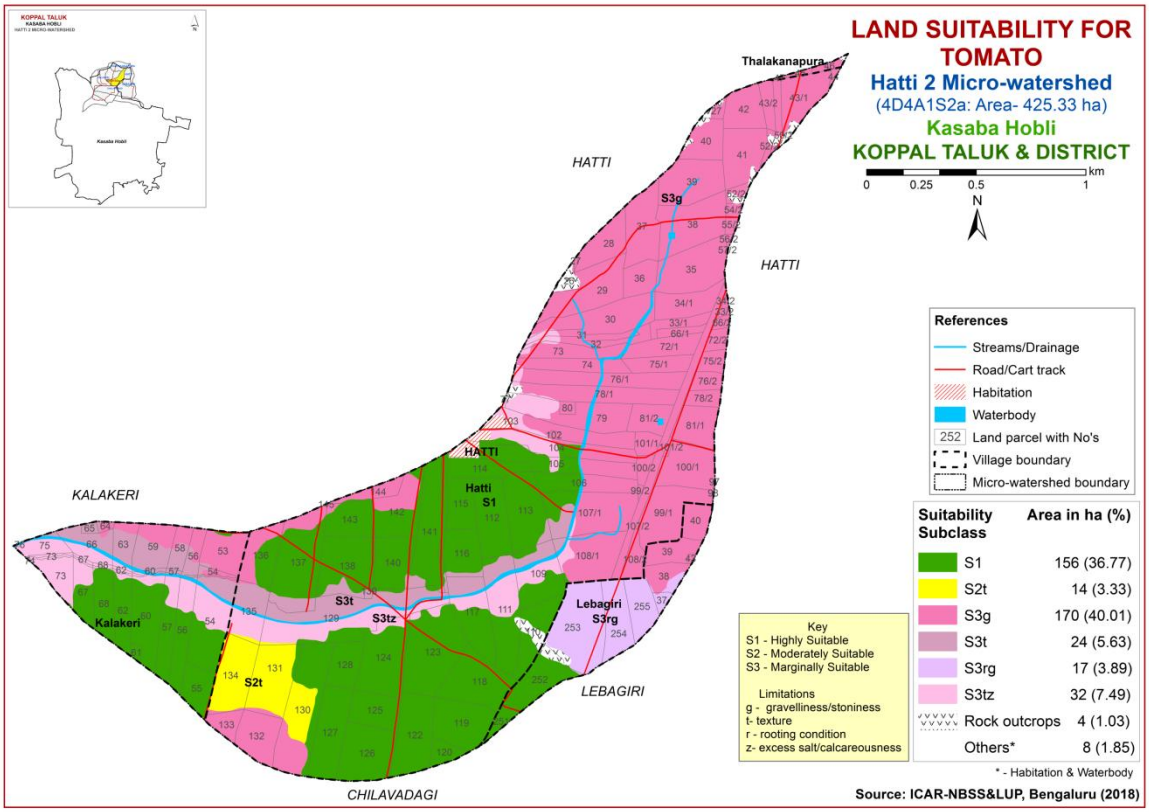


Fig. 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Drumstick (*Moringa oleifera)*

Drumstick is one of the most important vegetable crop grown in 2403 ha area in the state. The crop requirements for growing drumstick (Table 7.12) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing drumstick

was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.11.

Highly suitable lands cover an area of about 121 ha (28 %) and distributed in the southern and western part of the microwatershed. Maximum area of about 197 ha (46%) in the microwatershed has soils that are moderately suitable (Class S2) for growing drumstick and are distributed in the major part. They have minor limitations of gravelliness, rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands cover an area of about 96 ha (22 %) and distributed in the eastern, western and northern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness.

Table 7.12 Land suitability criteria for Drumstick

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

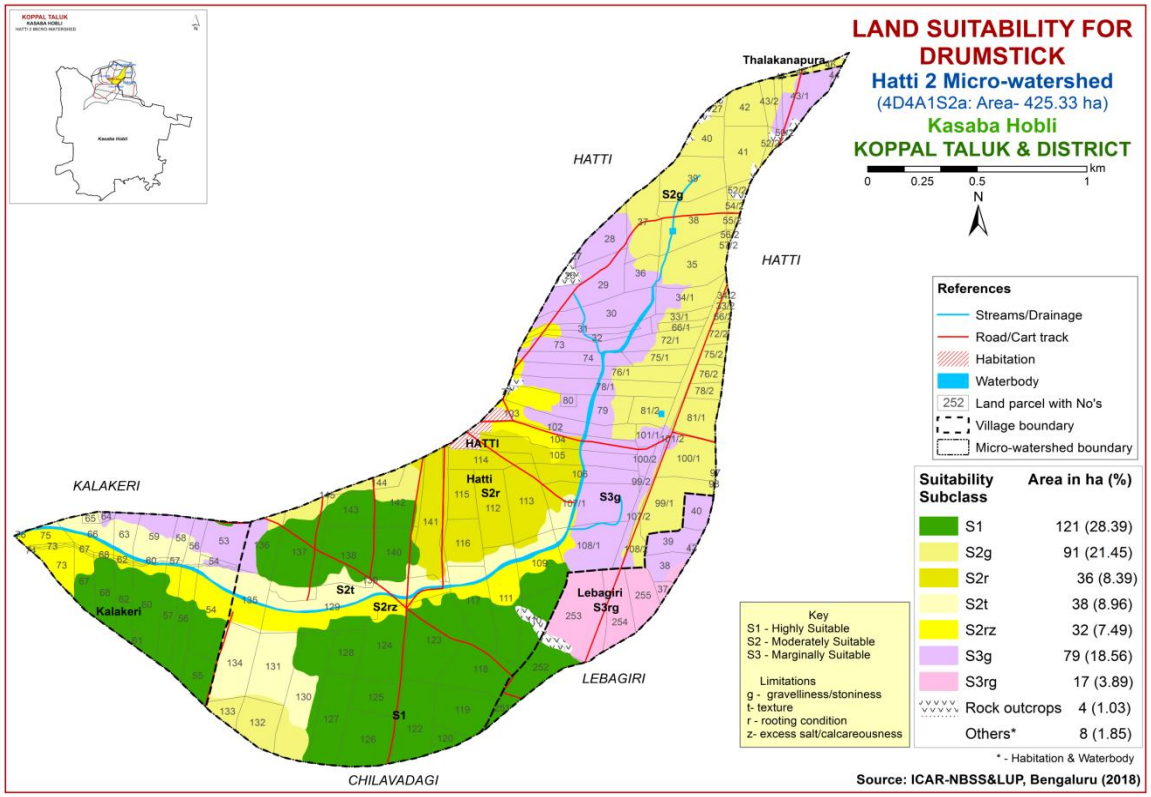


Fig. 7.11 Land Suitability map of Drumstick

7.12 Land Suitability for Mulberry (*Morus nigra*)

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

Table 7.13 Land suitability criteria for Mulberry

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

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

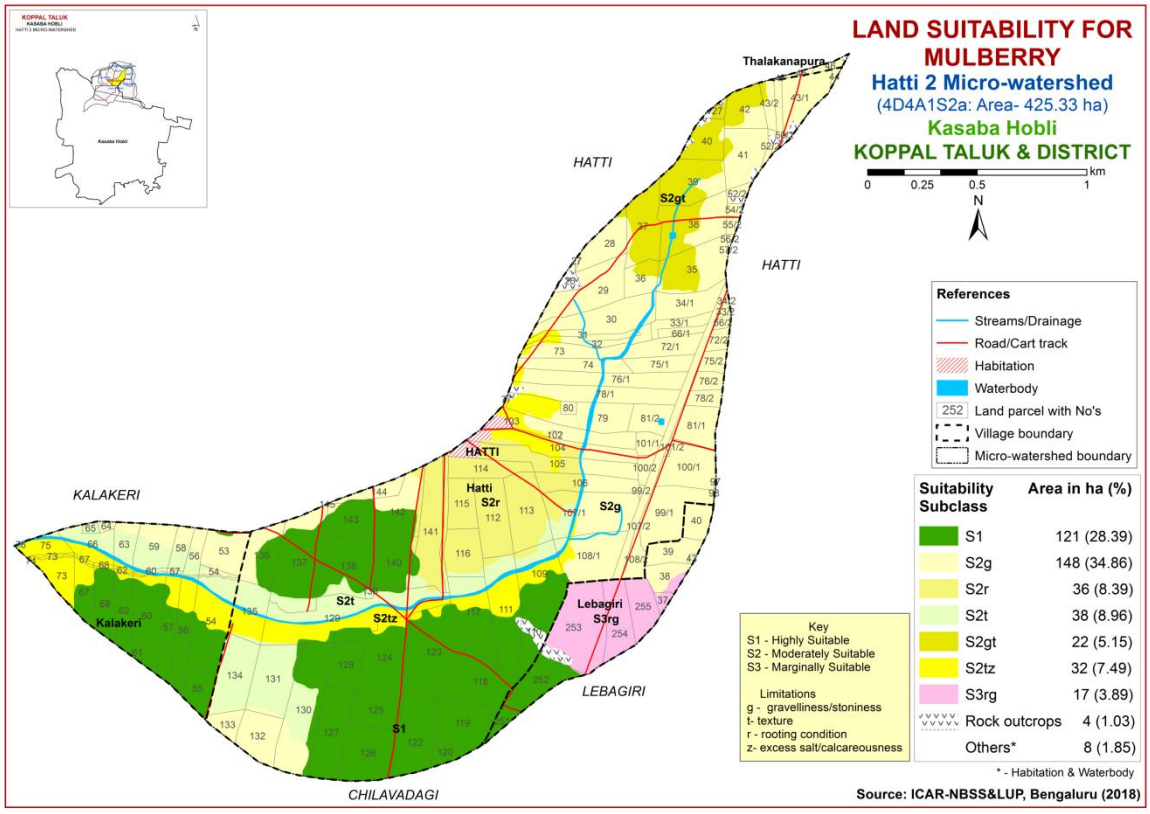


Fig. 7.12 Land Suitability map of Mulberry

An area of about 121 ha (28 %) in the microwatershed has soils that are highly (Class S1) suitable for growing mulberry and distributed in the southern and western

partof the microwatershed. Moderately suitable (Class S2) lands cover a maximum area of about 276 ha (65%) and distributed in the major part of the microwatershed. They have minor limitations of texture, gravelliness, rooting depth and calcareousness. Marginally suitable lands cover an area of about 17 ha (4 %) and distributed in the eastern part of the microwatershed. They have moderate limitations of rooting depth and gravelliness.

7.13 Land suitability for Mango (*Mangifera indica*)

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

Highly (S1) suitable lands for growing mango cover an area of about 64 ha (15%) and distributed in the southern and southeastern part of the microwatershed. Moderately suitable (S2) lands cover an area of about 71 ha (17%) and distributed in the southern and western part of the microwatershed. They have minor limitation of rooting depth.Marginally suitable (Class S3) lands cover a maximumarea of about262 ha (62%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, texture, gravelliness and calcareousness. An area of about17 ha (4%) is not suitable (Class N1) for growing mango and occur in the eastern part of the microwatershed with severe limitations of rooting depth and gravelliness.

Table 7.14 Crop suitability criteria for Mango

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

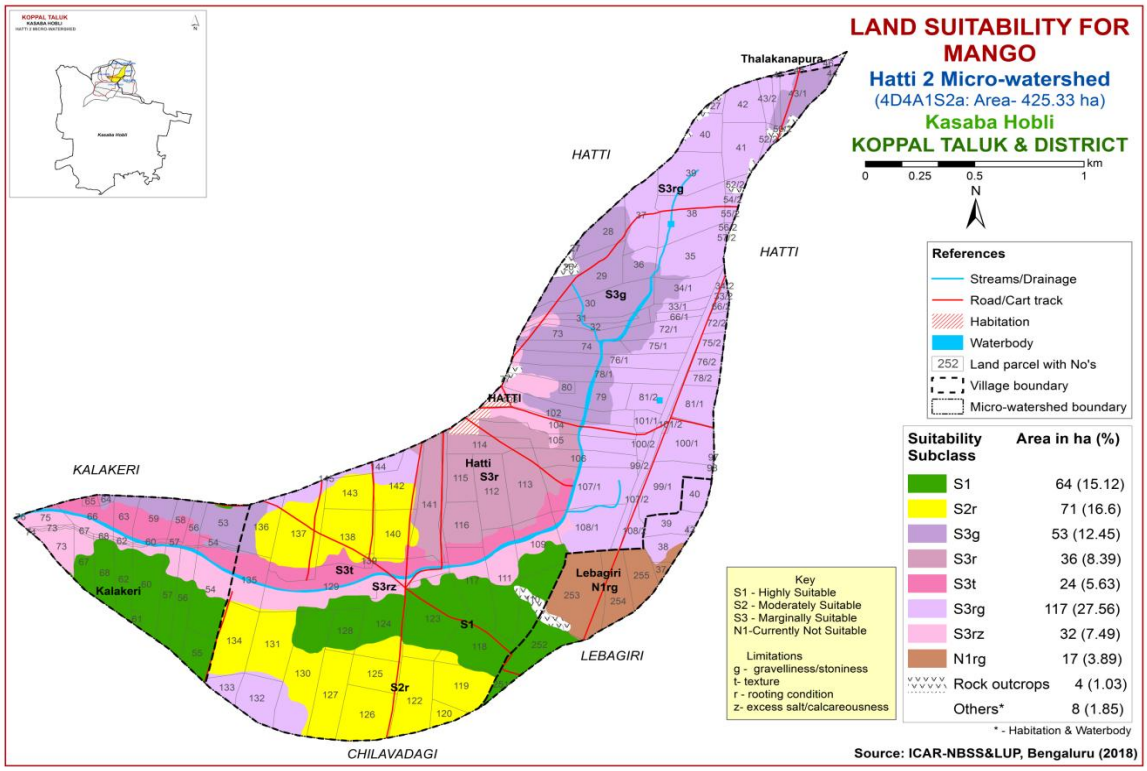


Fig. 7.13 Land Suitability map of Mango

7.14 Land suitability for Sapota (*Manilkara zapota*)

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

Table 7.15 Crop suitability criteria for Sapota

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

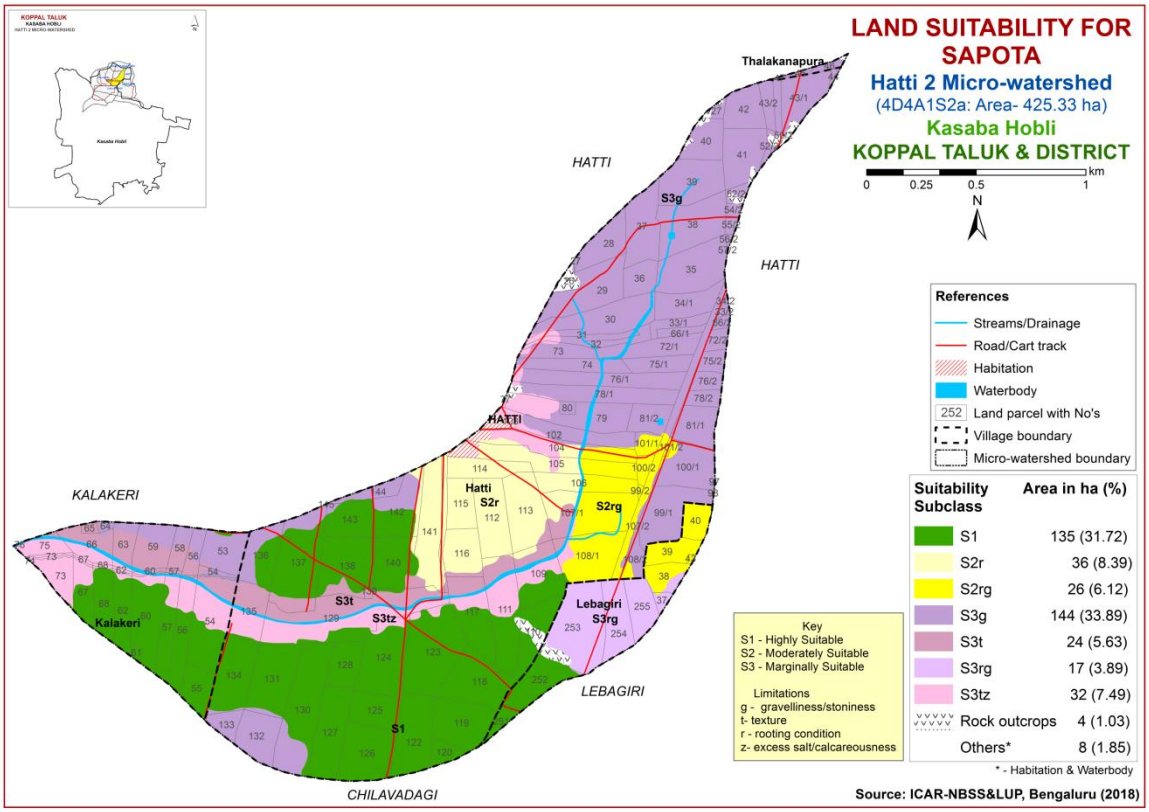


Fig. 7.14 Land Suitability map of Sapota

Highly suitable (Class S1) lands cover an area of about 135 ha (32 %) and distributed in the southern and western part of the microwatershed. Moderately suitable (S2) lands cover an area of about 62 ha (15%) and distributed in the western, central and eastern part of the microwatershed. They have minor limitations of rooting depth and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 217 ha (51%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, texture, gravelliness and calcareousness.

7.15 Land Suitability for Pomegranate (*Punica granatum*)

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

Highly suitable (Class S1) lands for growing pomegranate cover an area of about 135 ha (32 %) and distributed in the southern and western part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 118 ha (28%) and are distributed in the central, eastern and western part of the microwatershed. They have minor limitations of rooting depth,gravelliness and texture. Marginally suitable (Class S3) lands for growing pomegranate occupy maximum area of about 161 ha (38%) and are

distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth.

Table 7.16 Crop suitability criteria for Pomegranate

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

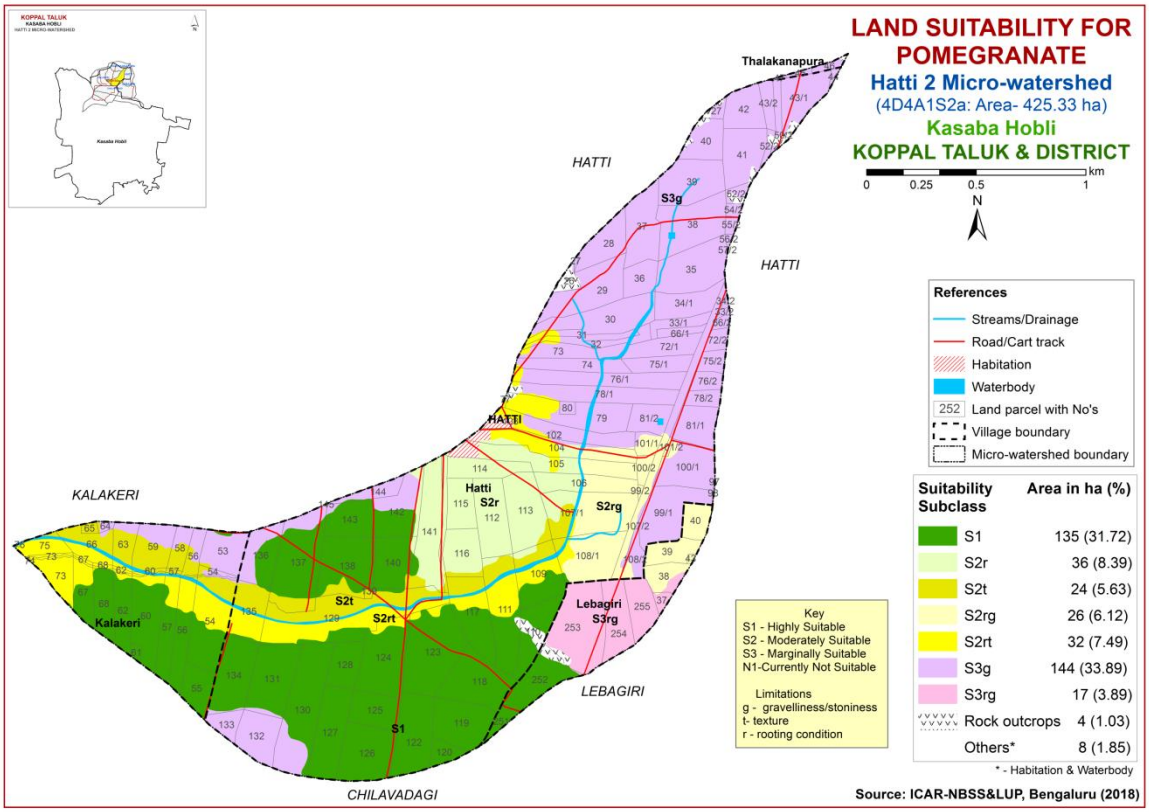


Fig. 7.15 Land Suitability map of Pomegranate

7.16 Land suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in an area of about 6558 ha in almost all the districts of the state. The crop requirements (Table 7.17) for growing guava

were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing guava was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.16.

Table 7.17 Crop suitability criteria for Guava

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

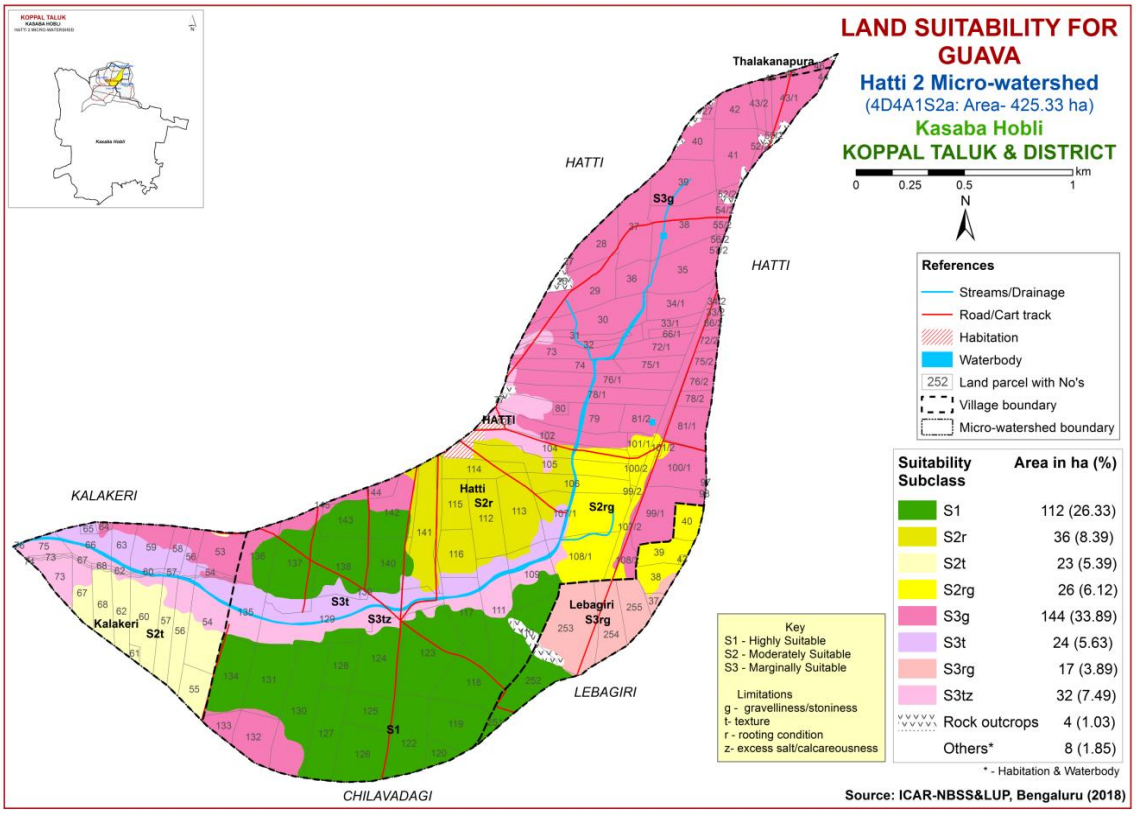


Fig. 7.16 Land Suitability map of Guava

Highly suitable (Class S1) lands for growing guava cover an area of about 112 ha (26%) and distributed in the southern and western part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 85 ha (20%) and are distributed in the central, eastern and western part of the microwatershed. They have minor limitations of rooting depth,gravelliness and texture. Marginally suitable (Class S3) lands cover a maximum area of about 217 ha (51 %) and occur in the major part of the microwatershed. They have moderate limitations of gravelliness, texture, rooting depth and calcareousness.

7.17 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

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

Highly suitable (Class S1) lands for growing jackfruit cover an area of about 135 ha (32 %) and distributed in the southern and western part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 62 ha (15%) and are distributed in the central, eastern and western part of the microwatershed. They have minor limitations of rooting depth andgravelliness. Marginally suitable (Class S3) lands for growing jackfruit occupy maximum area of about 217 ha (51 %) and are distributed in the major part of the microwatershed with moderate limitations of gravelliness, texture, calcareousness and rooting depth.

Table 7.18Land suitability criteria for Jackfruit

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

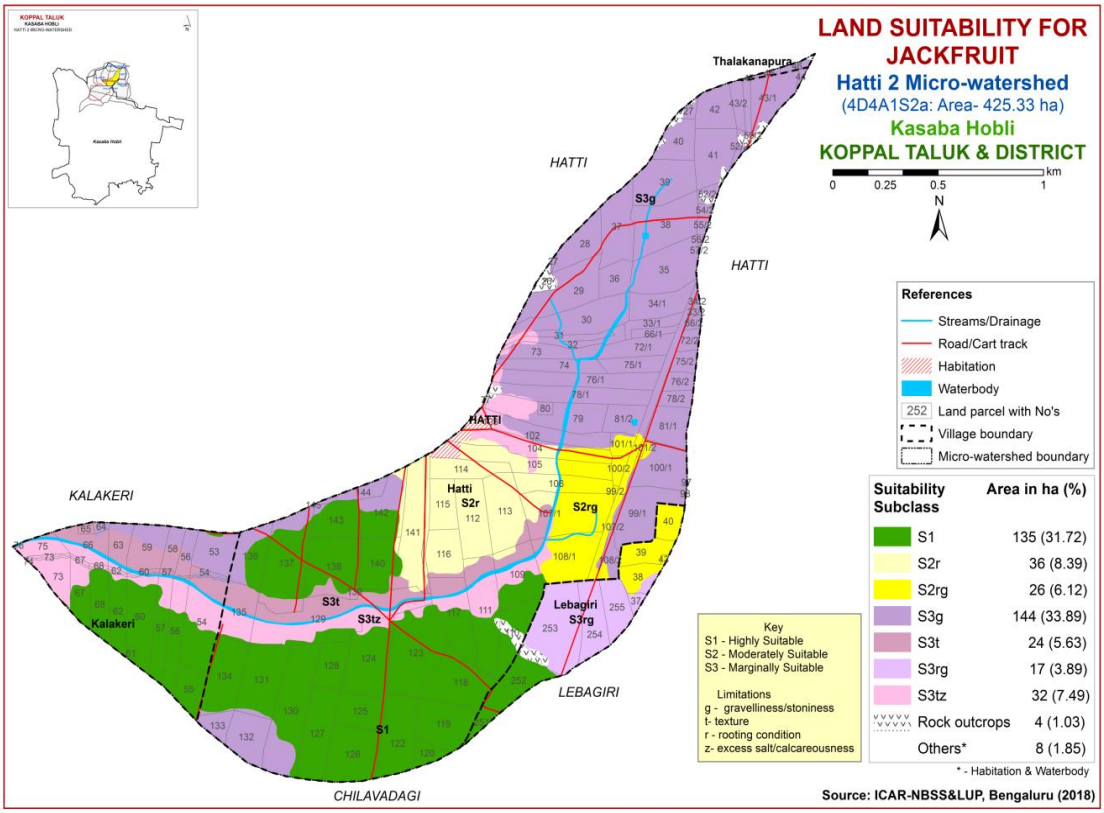


Fig. 7.17 Land Suitability map of Jackfruit

7.18 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the state. The crop requirements (Table 7.19) for growing jamun were matched with the soil-site characteristics and a land suitability map for growing jamun was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.18.

Highly suitable (Class S1) lands for growing jamun cover an area of about 64 ha (15%) and distributed in the southern and southeastern part of the micro watershed. Moderately suitable (Class S2) lands occupy an area of about 121 ha (28%) and are distributed in the southern, eastern and western part of the microwatershed. They have minor limitations of rooting depth, texture and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of about 229ha (54%) and are distributed in the major part of the micro watershed with moderate limitations of rooting depth, calcareousness and gravelliness.

Table 7.19 Land suitability criteria for Jamun

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

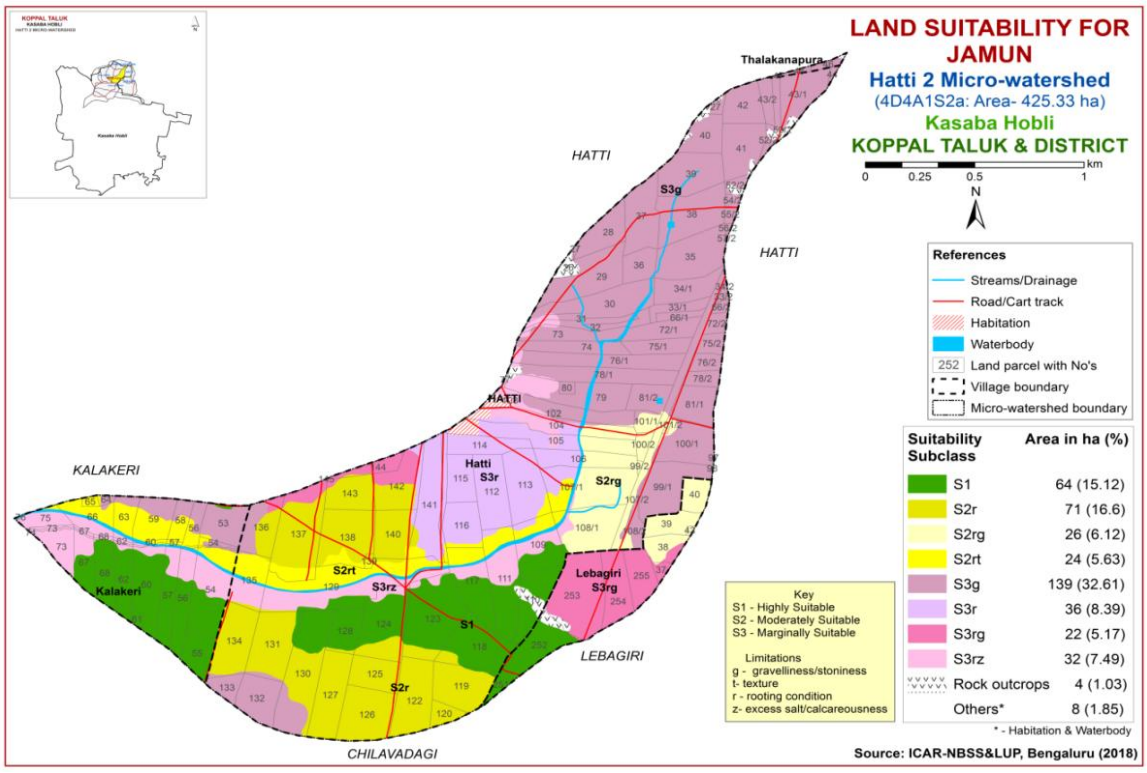


Fig. 7.18 Land Suitability map of Jamun

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the most important fruit crop grown in an area of 5446 ha in almost all the districts of the state. The crop requirements (Table 7.20) for growing musambi were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing musambi was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.19.

Table 7.20 Crop suitability criteria for Musambi

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

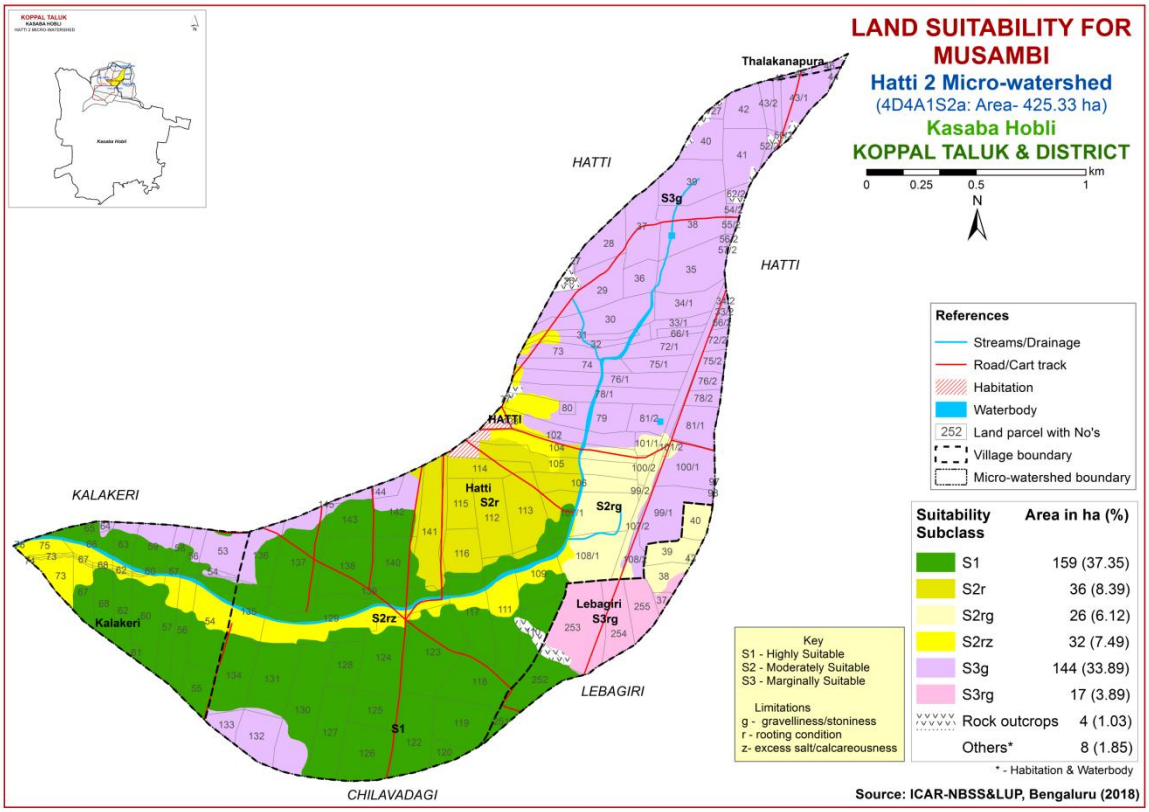


Fig. 7.19 Land Suitability map of Musambi

An area of about 159 ha (37 %) is highly suitable (Class S1) for growing musambi and are distributed in the southern and western part of the microwatershed. An area of about 94 ha (22 %) is moderately suitable (Class S2) and occur in the eastern, central and western part of the microwatershed. They have minor limitations of gravelliness, rooting depth and calcareousness. An area of about 161 ha (38 %) is marginally suitable (Class S3) for growing musambi and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth.

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 11752 ha in almost all the districts of the State. The crop requirements 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 geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.20.

An area of about 159 ha (37 %) is highly suitable (Class S1) for growing lime and are distributed in the southern and western part of the microwatershed. An area of about 94 ha (22 %) is moderately suitable (Class S2) and occur in the eastern, central and western part of the microwatershed. They have minor limitations of gravelliness, rooting depth and calcareousness. An area of about 161 ha (38 %) is marginally suitable (Class S3) for growing lime and are distributed in the major part of the microwatershed with moderate limitations of gravelliness and rooting depth.

Table 7.21 Crop suitability criteria for Lime

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

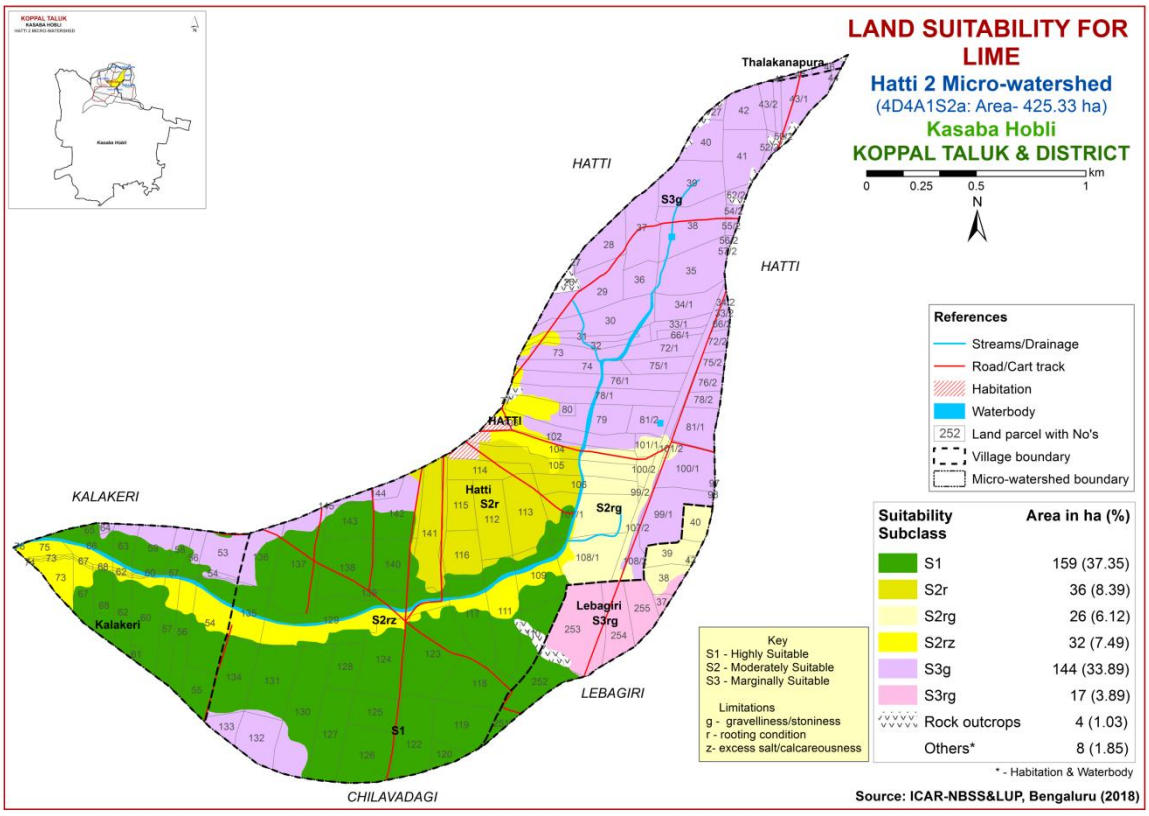


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

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

Table 7.22 Land suitability criteria for Cashew

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

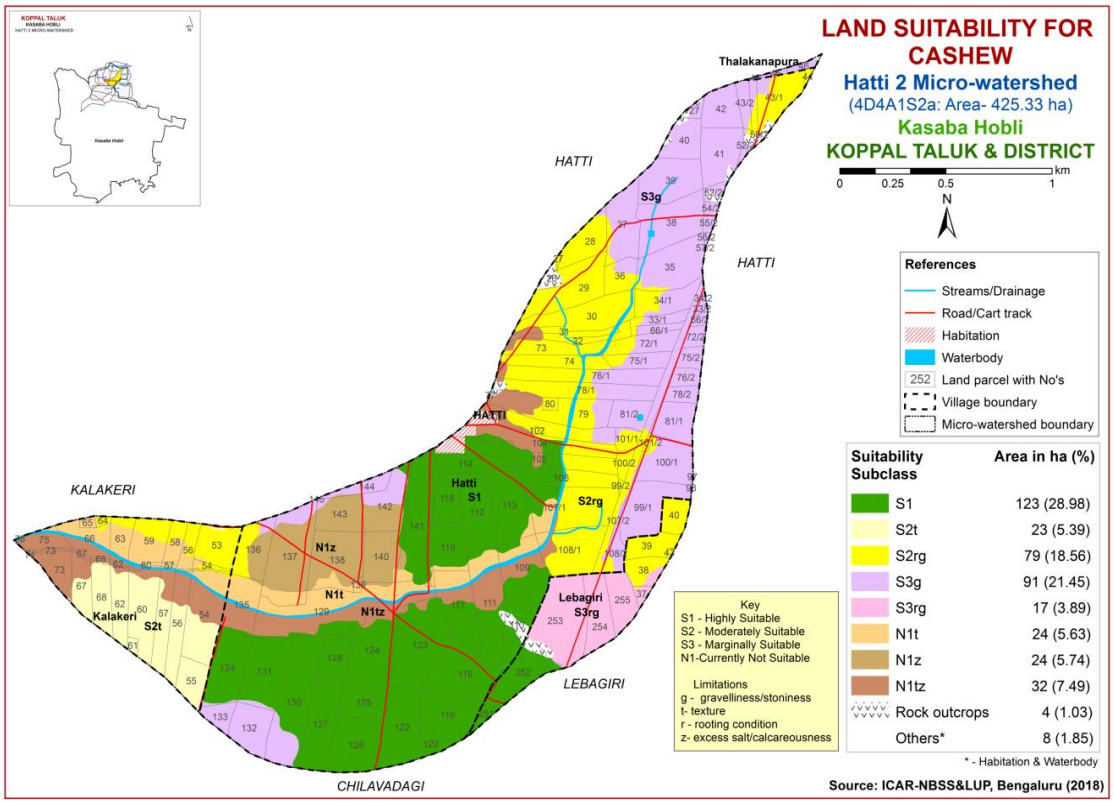


Fig. 7.21 Land Suitability map of Cashew

Highly suitable (Class S1) lands cover an area of about 123 ha (29 %) and distributed in the southern and western part of the microwatershed. Moderately suitable lands cover an area of about 102 ha (24 %) and distributed in the western, central and

northern part of the microwatershed with minor limitations of rooting depth, texture and gravelliness. An area of about 108 ha (25 %) is marginally suitable (Class S3) for growing cashew and distributed in the eastern and northern part of the microwatershed with moderate limitation of gravelliness and rooting depth. An area of about 80 ha (19 %) is not suitable (Class N1) for growing cashew and distributed in the western part of the microwatershed with severe limitations of textureand calcareousness.

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

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

An area of about 195 ha (46%) is highly suitable (Class S1) for growing custard apple and are distributed in the southern, western and eastern part of the microwatershed.Moderately suitable (Class S2) lands cover a maximum area of about 219 ha (51%) and occur in the major part of the microwatershed. They have minor limitations of rooting depth, gravelliness and calcareousness.

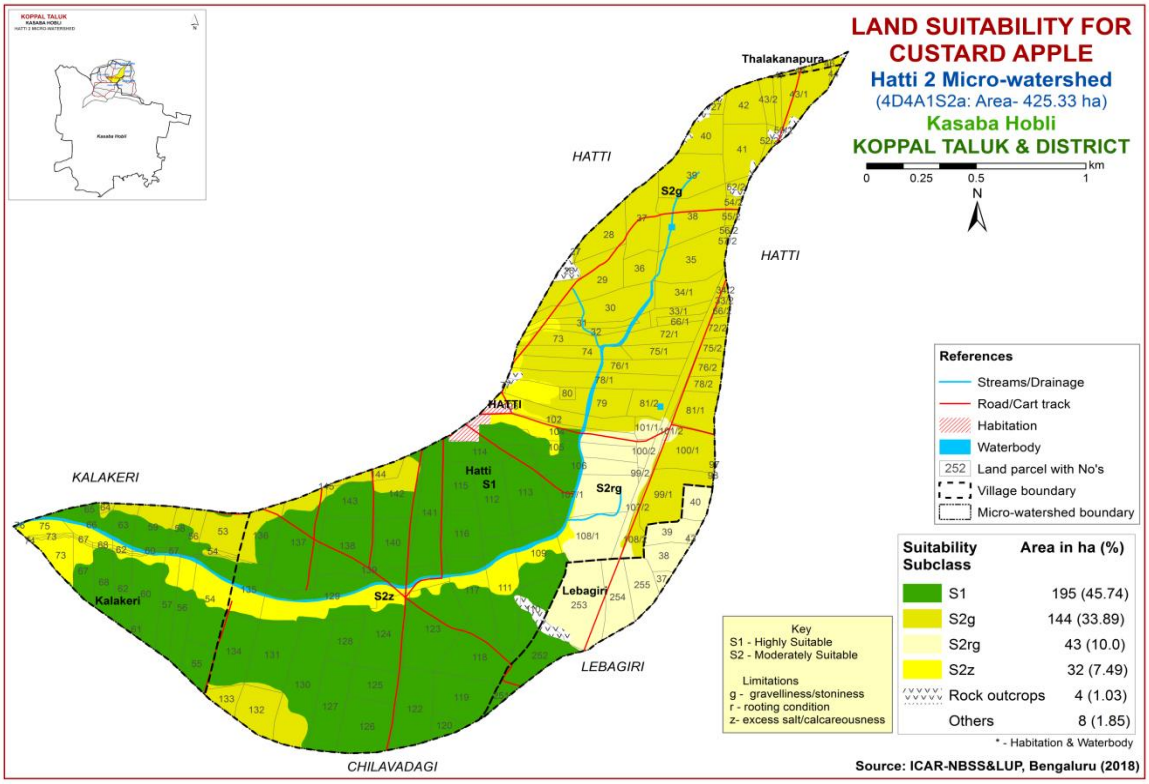


Fig. 7.22 Land Suitability map of Custard Apple

Table 7.23 Land suitability criteria for Custard apple

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

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

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

Highly suitable lands (Class S1) cover an area of about 171 ha (40%) and are distributed in the southern and western part of the microwatershed. Moderately suitable lands (Class S2) for growing amla occupy a maximum area of about 243 ha (57%) and distributed in the major part of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture and calcareousness.

Table 7.24 Land suitability criteria for Amla

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

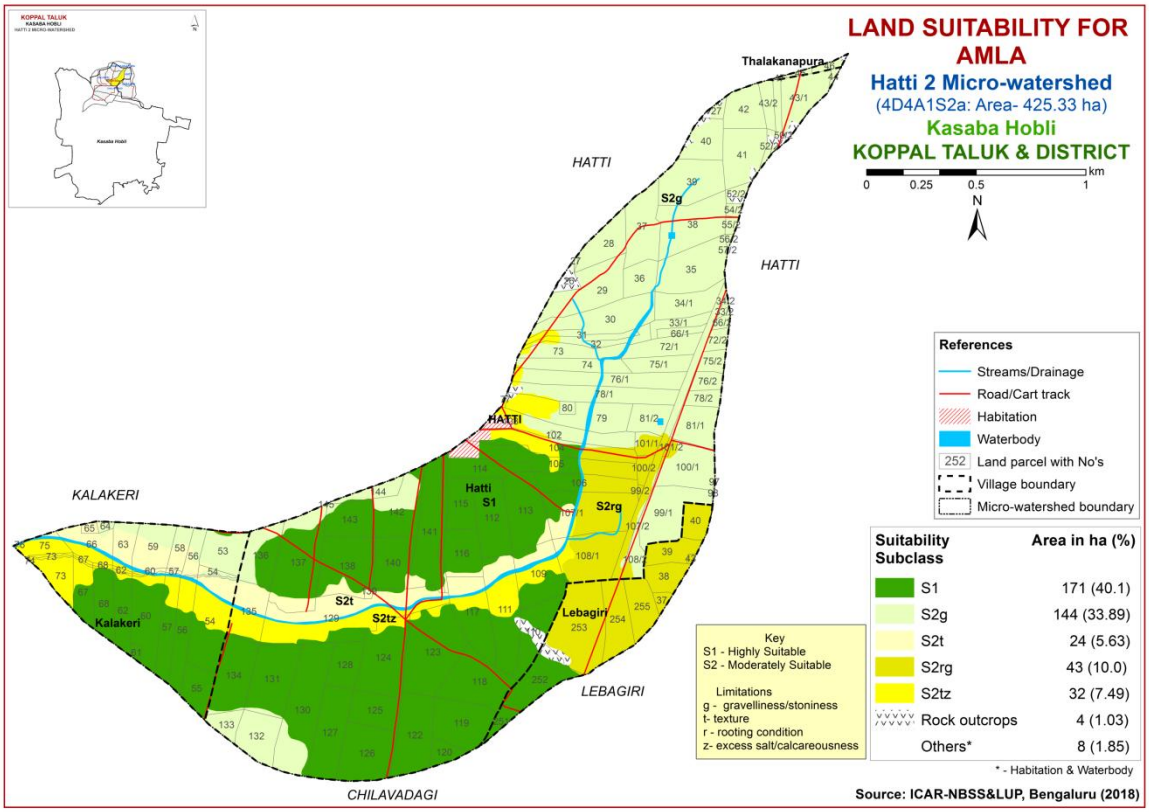


Fig. 7.23 Land Suitability map of Amla

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

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

Table 7.25 Land suitability criteria for Tamarind

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

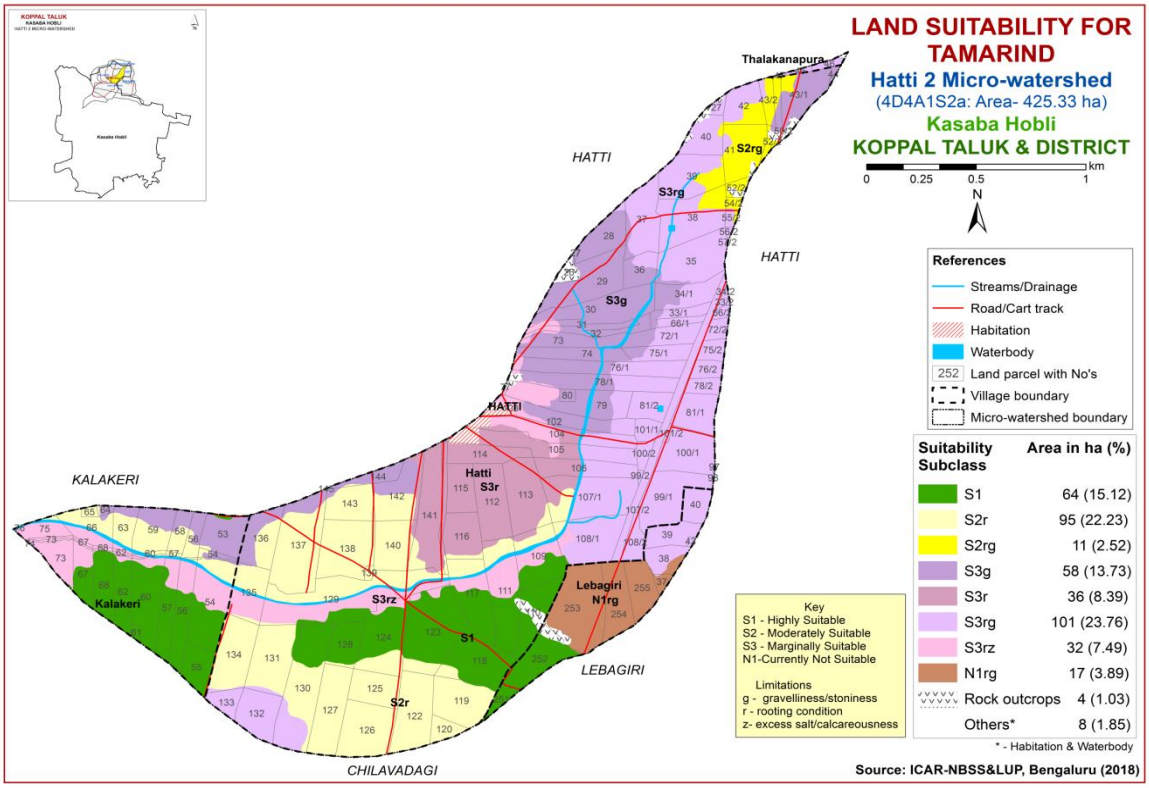


Fig. 7.21 Land Suitability map of Tamarind

Highly suitable lands (Class S1) for growing tamarind cover an area of about 64 ha (15%) and distributed in the southeastern and western part of the microwatershed. An area of about 106 ha (25 %) is moderately suitable (Class S2) and occur in the southern, western and northern part of the microwatershed. They have minor limitations of gravelliness and rooting depth. Maximum area of about 227 ha (53%) is marginally suitable (Class S3) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and calcareousness. An area of about 17 ha (4%) is not suitable (Class N1) for growing tamarind and distributed in the major part of the microwatershed with severe limitations of rooting depth and gravelliness.

7.25 Land Suitability for Marigold (*Tagetes erecta*)

Marigold is one of the most important flower crop grown in an area of 9108 ha in almost all the districts of the state. The crop requirements(Table 7.26) for growing marigold were matched with the soil-site characteristics and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

Highly suitable (Class S1) lands for growing marigold cover an area of about 121 ha (28%) and distributed in the southern and western part of the microwatershed.An area of about 106 ha (25%) is moderately suitable (Class S2) for growing marigold and occur in the southern and western part of the microwatershed. They have minor limitations of texture and calcareousness. An area of about 187 ha (44%) is marginally suitable (Class

S3) and distributed in the major part of the microwatershedwith moderate limitations of gravelliness and rooting depth.

Table 7.26 Land suitability criteria for Marigold

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

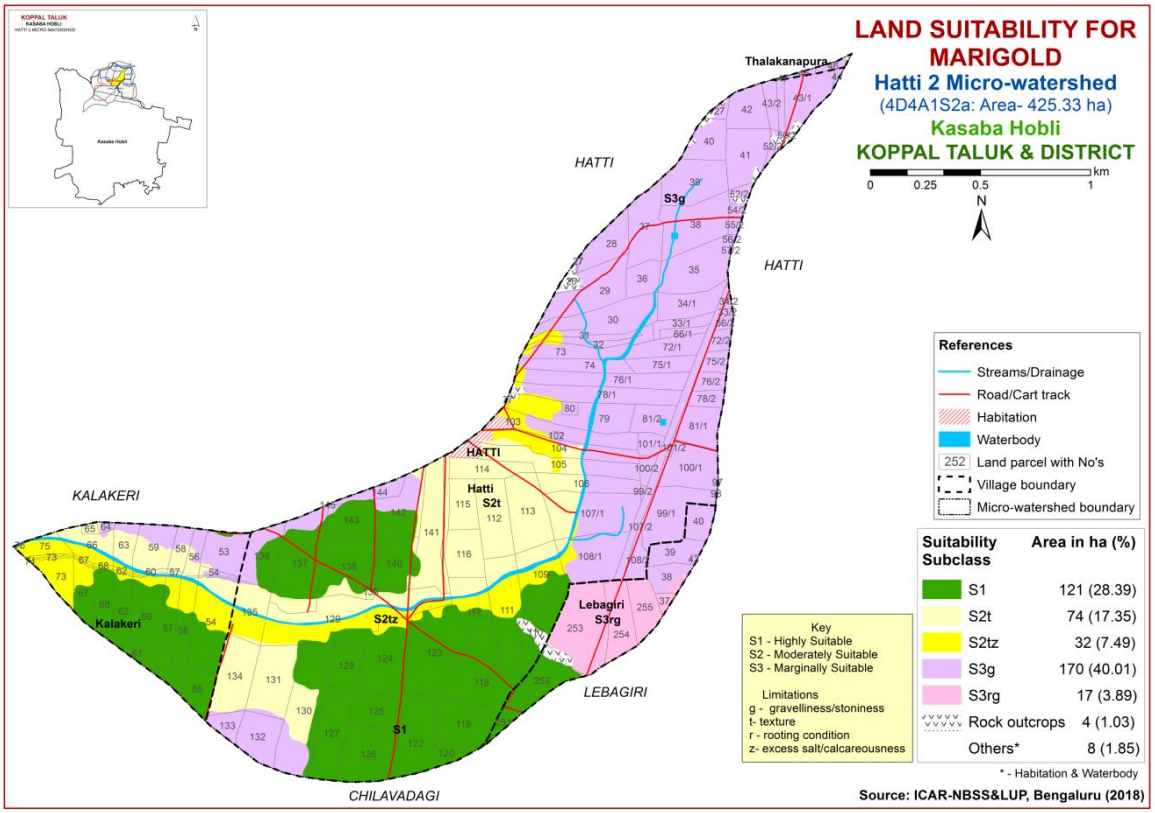


Fig. 7.25 Land Suitability map of Marigold

7.26 Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

Chrysanthemum is one of the most important flower crop grown in an area of 4978 ha in almost all the districts of the State. The crop requirements(Table 7.27) for growing chrysanthemum were matched with the soil-site characteristics (Table 7.1) and a

land suitability map for growing chrysanthemum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.26.

An area of about 121 ha (28%) is highly suitable (S1) for growing chrysanthemum and distributed in the southern and western part of the microwatershed. An area of about 106 ha (25%) is moderately suitable (Class S2) for growing chrysanthemum and occur in the western and southern part of the microwatershed. They have minor limitations of calcareousness and texture. Maximum area of about 187 ha (44%) is marginally suitable (Class S3) and distributed in the major part of the microwatershedwith moderate limitations of gravelliness and rooting depth.

Table 7.27 Land suitability criteria for Chrysanthemum

Crop requirement			Rating			
Soil–site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
climate	Temperature in growing season	^{0}C	18-23	17-15 24-35	35-40 10-14	>40 <10
Soil aeration	Soil drainage	class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l ,sl, scl,cl, sil	sicl, sc, sic, c	c	ls, s
	pH	1:2.5	7.0-7.5	5.5-5.9,7.6-8.5	<5,>8.5	
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	

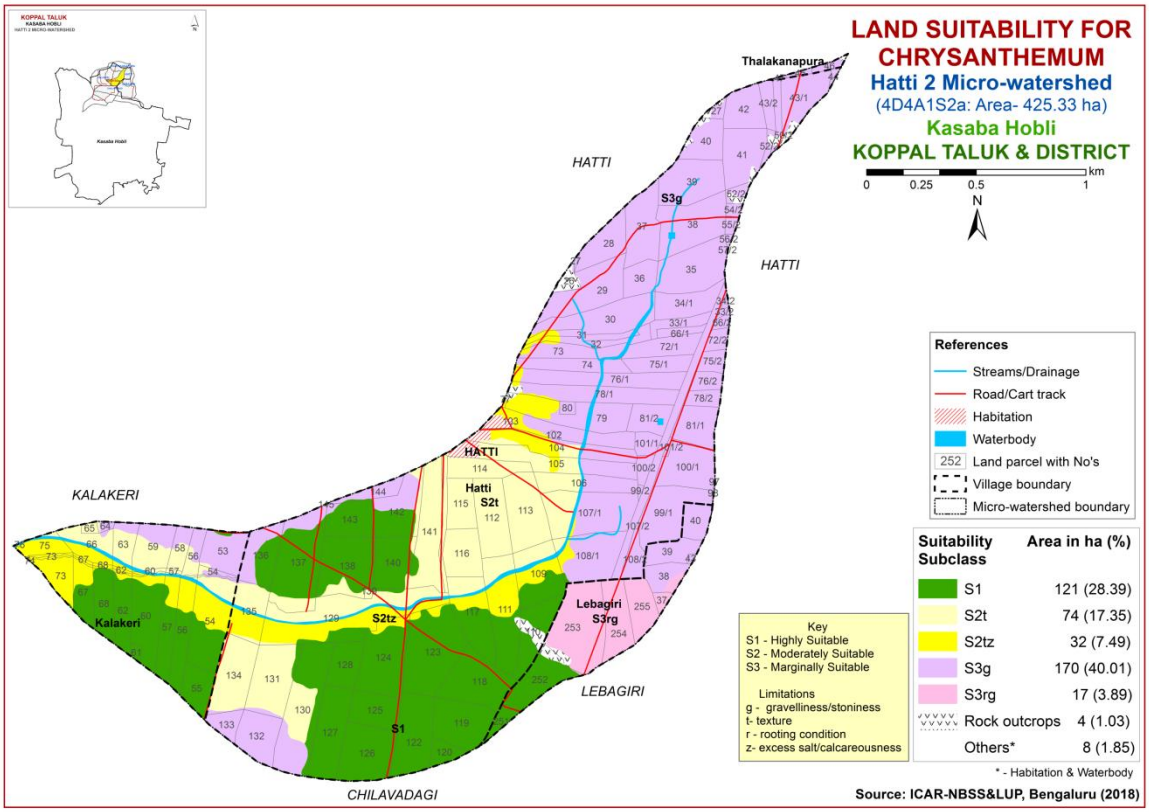


Fig. 7.26 Land Suitability map of Chrysanthemum

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

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

Table 7.28 Land suitability criteria for jasmine (irrigated)

Crop requirement			Rating			
Soil-site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	18-23	17-15 24-35	35-40 10-14	
Soil aeration	Soil drainage	Class	Well drained	Moderately drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	Scl,l,scl,cl, sil	sicl,sc,sic,c(m/k)	C(ss),	ls, s
	pH	1:2.5	6.0-7.5	5.5-5.9:7.6-8.5	<5: >8.5	
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strong calcareous	
Rooting conditions	Soil depth	Cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	
Soil toxicity	Salinity	ds/m	Non saline	Slight	Strongly	
	Sodicity	%	Non sodic	Slight	Strongly	
Erosion	Slope	%	1-3	3-5	5-10	

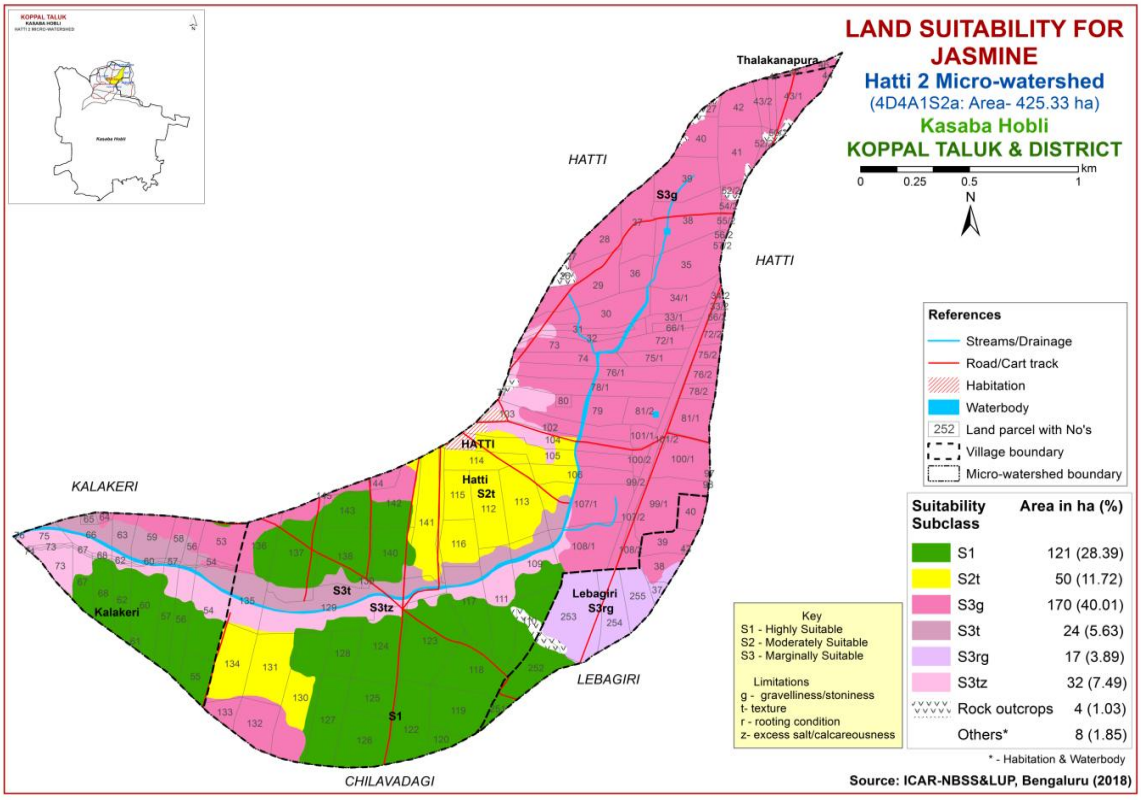


Fig. 7.27 Land Suitability map of Jasmine

An area of about 121 ha (28%) is highly suitable (S1) for growing jasmine and distributed in the southern and western part of the microwatershed. Moderately suitable (Class S2) lands for growing jasminecover an area of about 50 ha (12 %) and occur in the western and southern part of the microwatershed. They have minor limitation of texture. Maximum area of about 243 ha (57 %) is marginally suitable (Class S3) for growing jasmine and occur in the major part of the microwatershed. They have moderate limitations of gravelliness, texture, rooting depth and calcareousness.

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

Crossandra is one of the most important flower crop grown in almost all the districts of the State. Land suitability map for growing crossandra was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.28.

An area of about 121 ha (28%) is highly suitable (S1) for growing crossandra and distributed in the southern and western part of the microwatershed. Moderately suitable (Class S2) lands cover an area of about 82 ha (19 %) and occur in the western and southernpart of the microwatershed. They have minor limitations of texture and calcareousness.Maximum area of about 211ha (50%) is marginally suitable (Class S3) for growing crossandra and occur in the major part of the microwatershed. They have moderate limitations of gravelliness, texture and rooting depth.

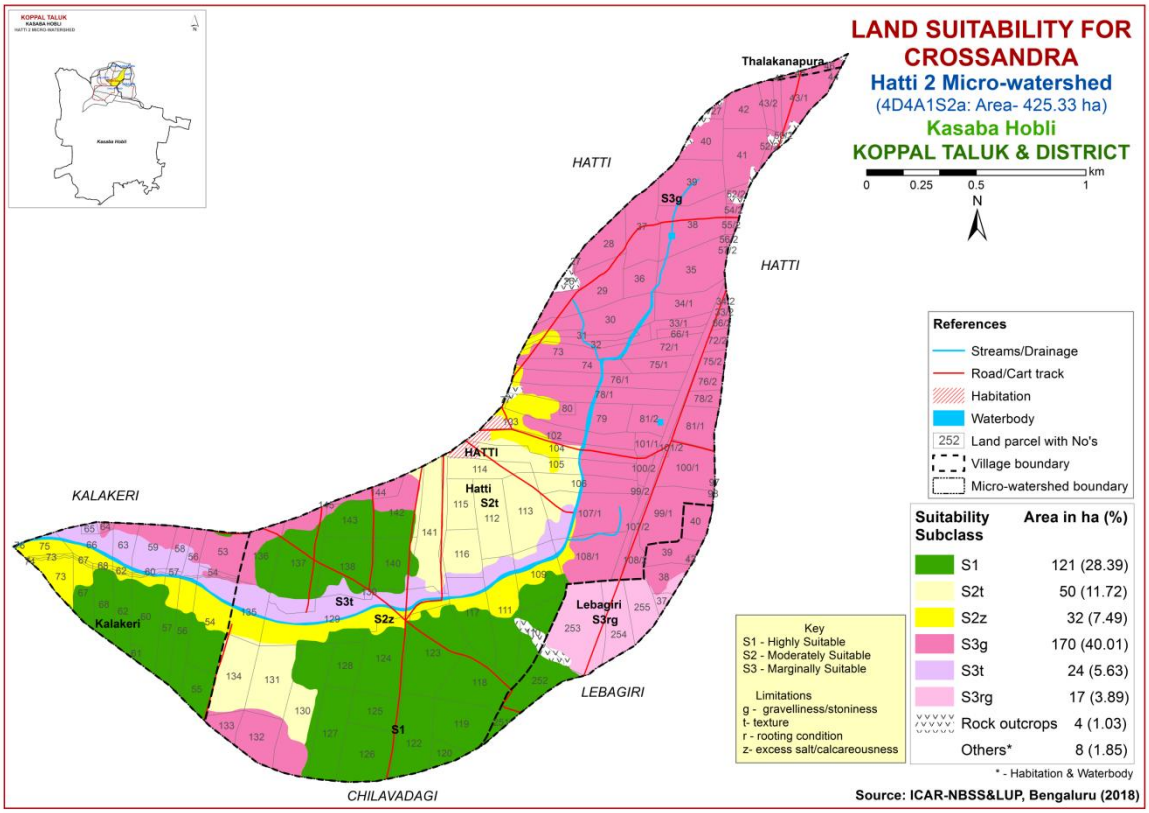


Fig. 7.28 Land Suitability map of Crossandra

7.29 Land Management Units (LMU)

The 25 soil map units identified in Hatti-2 microwatershed have been grouped into fourLand Management Units (LMU) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig.7.29) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

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

LMU	Mapping unit	Soil and site characteristics
1	BSRhB2, KMHbB2 ,KMHiB2 ,MNLcB2 ,RTRcB2,RTRiB2	Moderately deep to very deep, red sandy clay to sandy clay loam soils with slopes of 1-3 %, moderate erosion
2	HDHbB2, HDHcB2, BDGcB1g1 ,BDGhB2, BDGhB2g1, BDGiB1, BPRbB2g1 ,BPRcB2 ,BPRhB1 ,BPRhB1g1, BPRhB2g1 ,BPRiA1g2, BPRiB2 ,NGPhB2, GDPcB2	Moderately deep to very deep, red gravelly sandy clay to clay soils with slopes of 0-3%, slight to moderate erosion, gravelly to very gravelly (15-60%)
3	DRLiB2 ,GRHiB2	Moderately deep to deep, black calcareous to non calcareous clayey soils with slopes of 1-3%, moderate erosion
4	LKRhB2g1	Moderately shallow, red gravelly sandy clay soils with slopes of 1-3%, moderate erosion, gravelly (15-35%)

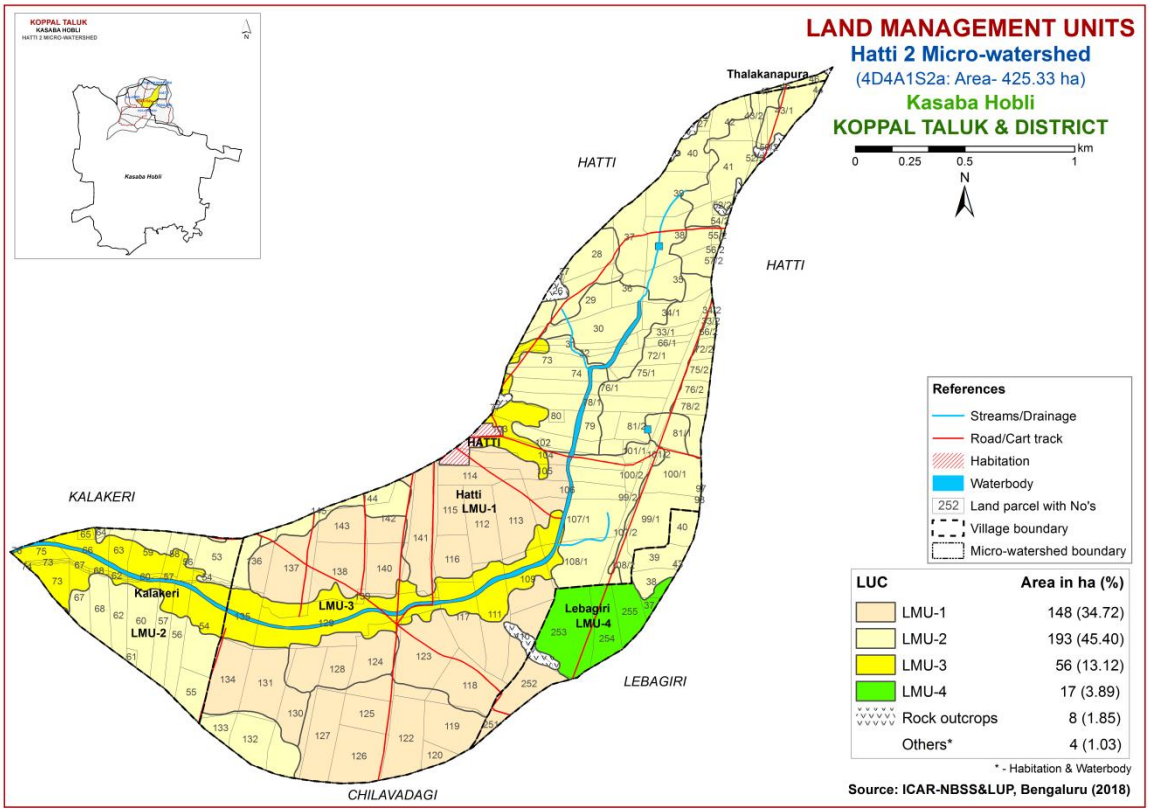


Fig 7.29 Land Management Units map of Hatti-2 microwatershed

7.30 Proposed Crop Plan for Hatti-2 Microwatershed

After assessing the land suitability for the 28 crops, the proposed crop plan has been prepared for the four identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 28 crops. The resultant proposed crop plan is presented in Table 7.28.

Table 7.28 Proposed Crop Plan for Hatti-2 Microwatershed

Proposed LMU	Soil Map Units	Survey Number	Field Crops	Horticulture Crops	Suitable Interventions
1	161.BSRhB2 195.KMHbB2 201.KMHiB2 204.MNLcB2 285.RTRcB2 288.RTRiB2 (Moderately deep to very deep, red sandy clay to sandy clay loam soils)	**Hatti:**105,109,110,111,112,113,114,115,116,117,118,119,120,122,123,124,125,126,127,128,130,131,134,136,137,138,140,141, 142,143 **Lebageri :** 251,252	Maize, Sorghum, Bajra, Groundnut, Redgram, Castor	**Fruit crops:** Pomegranate, Guava, Sapota, Jackfruit, Tamarind, Lime, Musambi, Amla,Custard apple **Vegetable crops:** Drumstick, Tomato, Chilli, Brinjal **Flower crops:** Marigold, Chrysanthemum, Jasmine, crossandra	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
2	104.HDHbB2 110.HDHcB2 180.BDGcB1g1 187.BDGhB2 188.BDGhB2g1 191.BDGiB1 217.BPRbB2g1 224.BPRcB2 228.BPRhB1 229.BPRhB1g1 231.BPRhB2g1 236.BPRiA1g2 239.BPRiB2 260.NGPhB2 267.GDPcB2 (Moderately deep to very deep, red	**Hatti:**27,28,29,30,31,32,33/1,33/2,34/1,34/2,35,36,37,38,39,40,41,42,43/1,43/2,44,52/2,54/2,55/2,56/2,57/2,66/1,66/2,72/1,72/2,73,74,75/1,75/2,76/1,76/2,78/1,78/2,79,80,81/1,81/2,97,98,99/1,99/2,100/1,100/2,101/1,101/2,102,103,106,107/1,107/2,108/1,108/2,132,133,144,145 **Kalakeri :** 53,54,55,56,57,60,61,62,64,67,68 **Lebageri :** 38,39,40,43 **Thalakanapura :** 45,46,47	Groundnut, Red gram, Bajra, Horse gram, Castor	**Fruit crops:** Lime, Musambi**,** Jackfruit, Jamun, Amla, Cashew,Custard apple **Vegetable crops:** Drumstick	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)

	gravelly sandy clay to clay soils)				
3	342.DRLiB2 368.GRHiB2 (Moderately deep to deep, black calcareous to non calcareous clayey soils)	**Hatti :** 77,104,129,135,139 **Kalakeri :** 58,59,63,65,66,73,74,75	Sorghum, Sunflower, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Pomegranate, Jamun, Lime, Musambi, Tamarind, Amla, Custard apple **Vegetable crops:** Drumstick, Chilli, Coriander, Bhendi **Flower crops:** Marigold, Jasmine, Crossandra Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
4	452.LKRhB2g1 (Moderately shallow, red gravelly sandy clay soils)	**Lebageri:** 37,253,254,255	Sorghum, Groundnut, Bajra, Castor	**Fruit crops:** Amla**,** Cashew, Custard apple	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)

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 Hatti-2 Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of BPR (86 ha), BDG (52 ha), KMH (46 ha), RTR (41 ha), BSR (36 ha), DRL (32 ha), HDH (26 ha), MNL (24 ha), GRH (24 ha), GDP (23 ha), LKR (17 ha)and NGP (5 ha).
- As per land capability classification, entire area in the microwatershed falls under arable land category (Class II and III). The major limitations identified in the arable lands were soil and erosion.

- On the basis of soil reaction, an area of about 302 ha (71%) is neutral (pH 6.5-7.3), 56ha (13%) is slightly alkaline (pH 7.3-7.8), 25 ha (6 %) is moderately alkaline (pH 7.8-8.4), 16 ha (4 %) under strongly alkaline (pH 8.4-9.0) and 14 ha (3 %) is very strongly alkaline(pH >9.0) in reaction. Thus,major portion in the microwatershed is neutral in reaction.

Soil Health Management

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

Alkaline soils

(Slightly alkaline to strongly alkaline soils)

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

Neutral soils

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

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

Soil Degradation

Soil erosion is one of the major factors affecting the soil health in the microwatershed. An area of about 373 ha (88 %) is under moderate erosion. The areas with moderate erosion need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

Any large scale implementation of soil health management requires that supporting information is made available widely, particularly through channels familiar to farmers and extension workers. Given the very high priority attached to soil health especially by the Central Government on issuing Soil-Health Cards to all the farmers,

media outlets like Regional, State and National Newspapers, Radio and Dooradarshan programs in local languages but also modern information and communication technologies such as Cellular phones and the Internet, which can be much more effective in reaching the younger farmers.

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning in IWMP is focusing on preparation of

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

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

- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.
- **Surface Soil Texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, radish, 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 Hatti-2 Microwatershed.
- **Organic Carbon:**An area of about 360 ha (85%) is medium (0.5-0.75%) and 53 ha (12 %) is high (>0.75)in OC content. The areas that are medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuringcropscosts 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 360 ha area where OC is less than 0.75 per cent. 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 low (<23 kg/ha) in 13 ha (3%), medium (23-57 kg/ha) in 189 ha (44 %) and high in 211 ha (50%) of the soils. The areas with high phosphorus content reduce 25% from the RDF to avoid the excess application of fertilizer and apply additional 25% phosphorus in areas where it is medium.
- **Available Potassium:** Available potassium is medium (145-337 kg/ha) in 270 ha (64%) and high (>337 kg/ha) in 143 ha (34 %) area of the microwatershed. The areas with high potassium content reduce 25% from the RDF to avoid the excess application of fertilizer and apply additional 25% potassium in area where it is low and medium.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. Available sulphur is low (<10 ppm) in 81 ha (19%), medium in 270 ha (63%) and high (>20ppm) in 62 ha (15%) area of the microwatershed. Areas with low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available iron:** It is deficient (<4.5 ppm) in 186ha (44%) and sufficient (>4.5 ppm) in 228 ha (53%) area of the microwatershed. To manage iron deficiency iron sulphate @ 25 kg/ha needs to be applied for 2-3 years.
- **Available Zinc:** It is deficient (<0.6 ppm) in 222 ha (52%) and sufficient (>0.6ppm) in 191 ha (45 %) area of the microwatershed. Application of zinc sulphate @ 25kg/ha is to be followed in areas that are deficient in available zinc.
- **Available Boron:**An area of about 359 ha (85 %) is low (<0.5 ppm) in available boron, and 54 ha (13 %) is medium (05-1.0 ppm) in available boron content.The areas with low and medium in boron content need to be applied with sodium borate @ 10kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency.
- **Available manganese**: It is sufficient in the entire area of the microwatershed**.**
- **Available copper:** It is sufficient in the entire area of the microwatershed**.**
- **Soil alkalinity:**The soils in the microwatershed with alkaline reaction needs application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

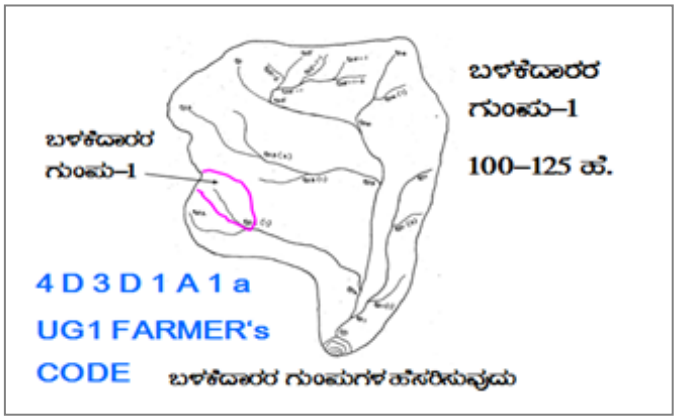
Land Suitability for various crops: Areas that are highly, moderately and marginally suitable and not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content,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

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Hatti-2 microwatershed, the land resource inventory database generated under Sujala-III project has been transformed as information through series of interpretative (thematic) maps using soil phase map as a base. The various thematic maps (1:7920 scale) generated were

- Soil depth
- Surface soil texture
- Available water capacity
- Soil slope
- Soil gravelliness
- Land capability
- Present land use and land cover
- Crop suitability maps
- Rainfall map
- Hydrology
- Water Resources
- Socio-economic data
- Contour plan with existing features- network of waterways, pothissa boundaries, cut up/ minor terraces etc.
- Cadastral map (1:7920 scale)
- Satellite imagery (1:7920 scale)



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

Steps for Survey and Preparation of Treatment Plan

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

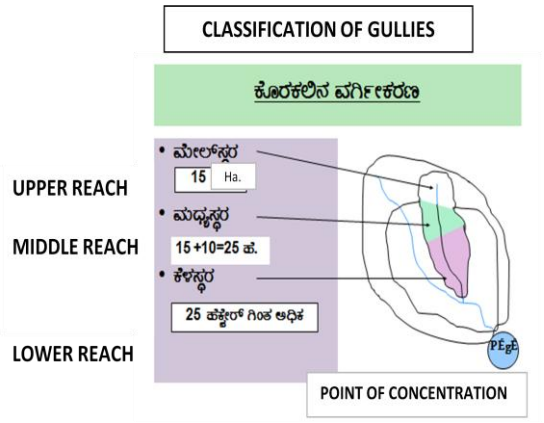
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

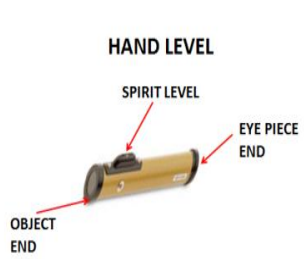
9.1.1 Arable Land Treatment

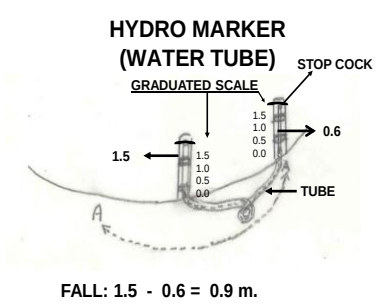
A. BUNDING

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

Measurement of Land Slope

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





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

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

Note: i) The above intervals are maximum.

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

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

Section of the Bund

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

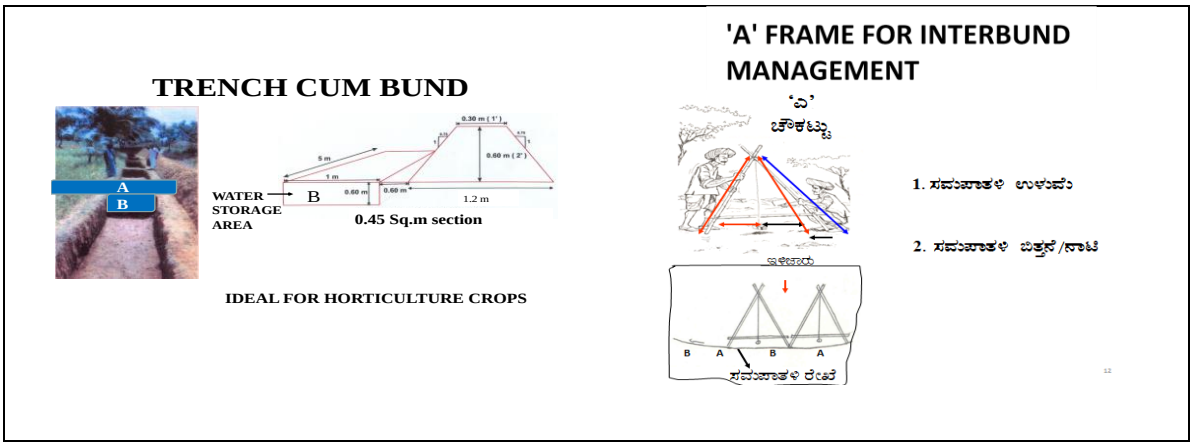
Recommended Bund Section

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

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

a) The cadastral map has to be updated as regards the network of drainge lines (gullies/ *nalas/ hallas*) and existing structures are marked to the scale and storage capacity of the existing water bodies are documented (Fig 9.1).

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

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

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

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

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

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

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

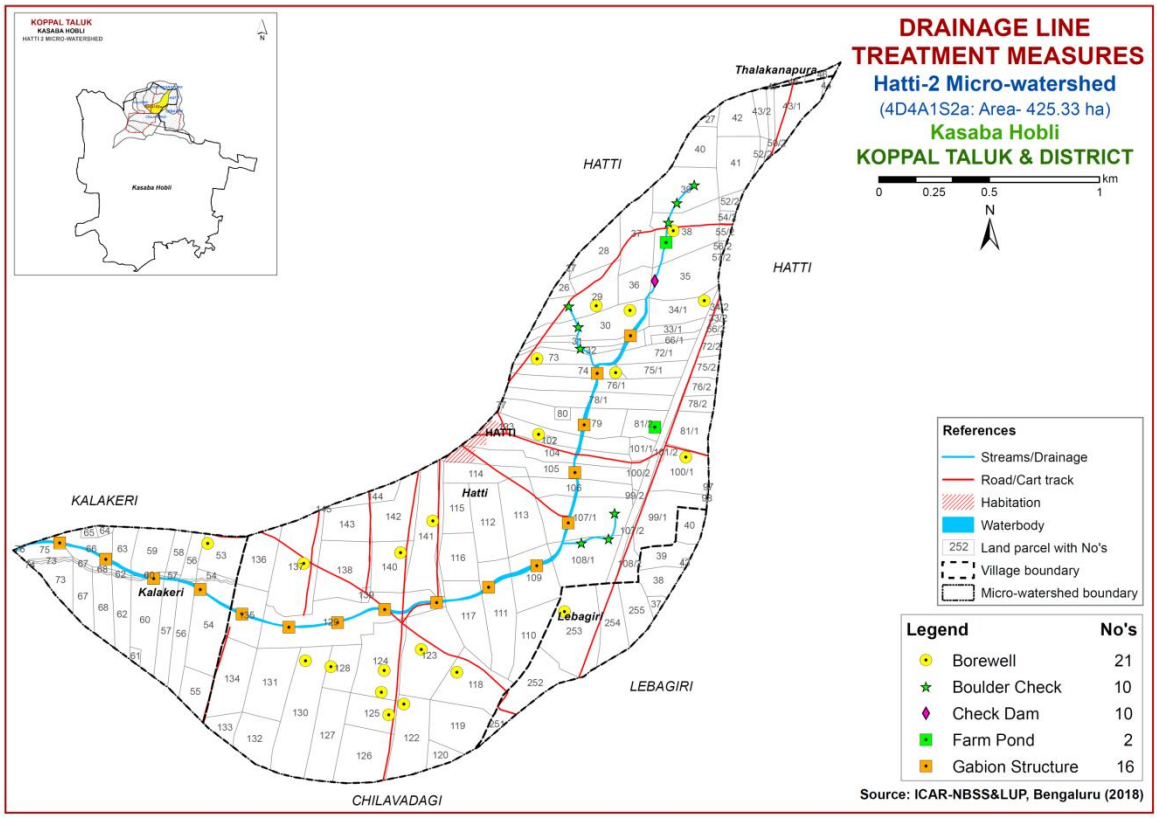


Fig. 9.1 Drainage line treatment of Hatti-2 Microwatershed

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. A maximum area of about 349 ha (82%) needs trench cum bunding, an area of about 56 ha (13 %) needs graded bunding and a small area of 8 ha (2%) 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.

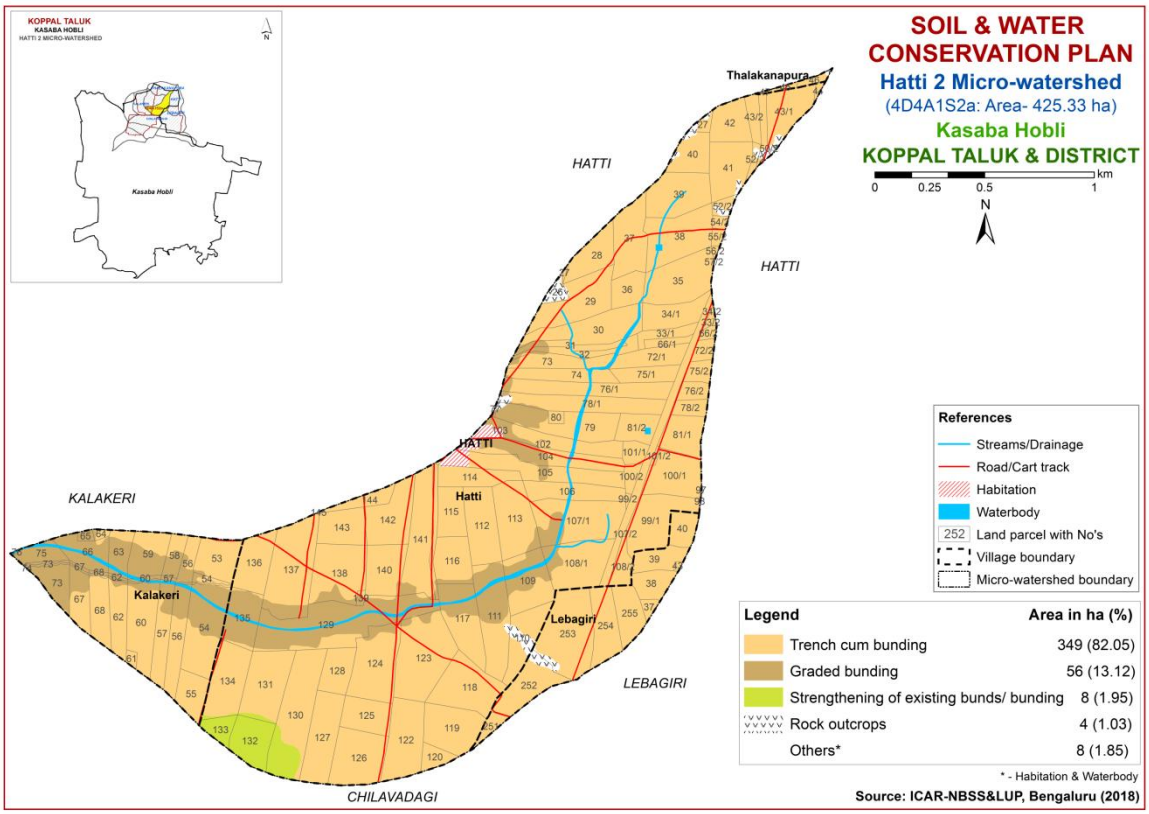


Fig. 9.2 Soil and Water Conservation Plan map of Hatti-2 Microwatershed

9.3 Greening of Microwatershed

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

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

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

Hatti-2 Microwatershed

Soil Phase Information

Village	Survey No.	Total 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
Hatti	26	0.86	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Jowar (Jw)	Not Available	Rock outcrops	Rock outcrops
Hatti	27	0.68	BPRbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIIes	Trench cum bunding
Hatti	28	3.37	BDGiB1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Trench cum bunding
Hatti	29	6.05	BDGiB1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	1 Borewell	IIIs	Trench cum bunding
Hatti	30	5.92	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	1 Borewell	IIIes	Trench cum bunding
Hatti	31	1.49	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	32	1.89	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	33/1	1.36	BPRiB2	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	33/2	0.18	BPRhB1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Hatti	34/1	3.35	BPRiB2	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land+Maize (CFL+Mz)	1 Borewell	IIIes	Trench cum bunding
Hatti	34/2	0.14	BPRhB1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Hatti	35	6.16	BPRbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	36	2.21	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	37	4.96	BPRbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	38	6.5	BPRbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Farm pond,1 Borewell	IIIes	Trench cum bunding
Hatti	39	5.39	BPRbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIIes	Trench cum bunding
Hatti	40	3.05	BPRbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIIes	Trench cum bunding
Hatti	41	4.62	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIIes	Trench cum bunding
Hatti	42	3.23	BPRbB2g1	LMU-2	Deep (100-150 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	43/1	4.25	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	43/2	1.2	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	44	0.21	BDGhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	49	0	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Cultivated Fallow Land (CFL)	Not Available	Rock outcrops	Rock outcrops

Village	Survey No.	Total 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
Hatti	50/2	0.11	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Jowar (Jw)	Not Available	Rock outcrops	Rock outcrops
Hatti	52/2	1.25	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	54/2	0.41	BPRhB2g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	55/2	0.42	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	56/2	0.15	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	57/2	0.01	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	66/1	0.78	BPRiB2	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	66/2	0.39	BPRhB1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Hatti	72/1	2.77	BPRiB2	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	72/2	0.89	BPRhB1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Trench cum bunding
Hatti	73	2.97	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	1 Borewell	IIIs	Trench cum bunding
Hatti	74	2.93	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	1 Borewell	IIIs	Trench cum bunding
Hatti	75/1	2.13	BPRiB2	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	75/2	1.17	BPRhB1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Hatti	76/1	5.29	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIIs	Trench cum bunding
Hatti	76/2	1.18	BPRhB1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Hatti	77	0.08	DRLiB2	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Hatti	78/1	5.37	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Hatti	78/2	1.2	BPRhB1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Hatti	79	6.03	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIIs	Trench cum bunding
Hatti	80	0.42	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Trench cum bunding
Hatti	81/1	3.26	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hatti	81/2	2.37	BPRiB2	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	1 Farm pond	IIIes	Trench cum bunding
Hatti	97	0.01	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIIes	Trench cum bunding
Hatti	98	0.04	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding

Village	Survey No.	Total 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
Hatti	99/1	5.67	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	99/2	0.12	HDHcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	100/1	4.81	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	1 Borewell	IIIes	Trench cum bunding
Hatti	100/2	0.79	HDHcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	101/1	1.14	HDHcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	101/2	0.2	HDHcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	102	0.16	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Trench cum bunding
Hatti	103	4.69	BDGcB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	1 Borewell	IIIs	Trench cum bunding
Hatti	104	5.44	DRLiB2	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	Graded bunding
Hatti	105	6.13	BSRhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	Trench cum bunding
Hatti	106	3.62	HDHcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	107/1	7.81	HDHcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	107/2	0.04	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	108/1	6.04	HDHcB2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	108/2	1.57	BPRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Trench cum bunding
Hatti	109	5.32	RTRcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Hatti	110	4.05	RTRcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Hatti	111	6.94	RTRcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIe	Trench cum bunding
Hatti	112	5.11	BSRhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	113	5.82	BSRhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hatti	114	3.06	BSRhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hatti	115	2.94	BSRhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	116	3.69	BSRhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	117	5.52	RTRcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIe	Trench cum bunding
Hatti	118	6.14	RTRcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	1 Borewell	IIe	Trench cum bunding

Village	Survey No.	Total 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
Hatti	119	5.23	KMHiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Hatti	120	1.3	KMHiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Hatti	122	5.95	KMHiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIe	Trench cum bunding
Hatti	123	8.88	RTRcB2	LMU-1	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIe	Trench cum bunding
Hatti	124	6.83	RTRiB2	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	2 Borewell	IIe	Trench cum bunding
Hatti	125	3.44	KMHiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIe	Trench cum bunding
Hatti	126	5.94	KMHiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Hatti	127	5.7	KMHiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Hatti	128	2.9	RTRiB2	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIe	Trench cum bunding
Hatti	129	13.22	DRLiB2	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Cultivated Fallow Land+Maize(Jw+CFL+Mz)	Not Available	IIes	Graded bunding
Hatti	130	9.4	RTRiB2	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	1 Borewell	IIe	Trench cum bunding
Hatti	131	6.16	KMHbB2	LMU-1	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Hatti	132	3.82	BPRiA1g2	LMU-2	Deep (100-150 cm)	Sandy clay	Verygravelly (35-60%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIIes	Strengthening of existing bunds
Hatti	133	1.5	BPRiA1g2	LMU-2	Deep (100-150 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIIes	Strengthening of existing bunds
Hatti	134	5.6	KMHbB2	LMU-1	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Hatti	135	4.02	GRHiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cultivated Fallow Land (CFL)	Not Available	IIes	Graded bunding
Hatti	136	4.1	MNLcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	Trench cum bunding
Hatti	137	9.01	MNLcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	1 Borewell	IIes	Trench cum bunding
Hatti	138	6.56	MNLcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hatti	139	0.26	GRHiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Hatti	140	4.05	MNLcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIes	Trench cum bunding
Hatti	141	6.49	BSRhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	1 Borewell	IIes	Trench cum bunding
Hatti	142	5.09	MNLcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIes	Trench cum bunding
Hatti	143	3.53	MNLcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hatti	144	1.59	NGPhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize+Redgram (Jw+Mz+Rg)	Not Available	IIIes	Trench cum bunding

Village	Survey No.	Total 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
Hatti	145	0.01	NGPhB2	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIIes	Trench cum bunding
Kalakeri	53	3.56	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Maize+Pearl millet (Gn+Mz+Pm)	1 Borewell	IIIes	Trench cum bunding
Kalakeri	54	7.52	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Kalakeri	55	2.62	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Pearl millet (Pm)	Not Available	IIIes	Trench cum bunding
Kalakeri	56	5.03	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Brinjal+Maize (Br+Mz)	Not Available	IIIes	Trench cum bunding
Kalakeri	57	3.43	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Brinjal (Br)	Not Available	IIIes	Trench cum bunding
Kalakeri	58	1.53	GRHiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200mm/m)	Very gently sloping (1-3%)	Moderate	Pearl millet (Pm)	Not Available	IIes	Graded bunding
Kalakeri	59	3.55	GRHiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200mm/m)	Very gently sloping (1-3%)	Moderate	Fallowland+Maize+Redgram (Fl+Mz+Rg)	Not Available	IIes	Graded bunding
Kalakeri	60	5.41	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Redgram (Mz+Rg)	Not Available	IIIes	Trench cum bunding
Kalakeri	61	0.34	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Kalakeri	62	2.9	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Kalakeri	63	2.13	GRHiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Kalakeri	64	0.32	BDGhB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Lady'sfinger+Maize+Redgram (Lf+Mz+Rg)	Not Available	IIIes	Trench cum bunding
Kalakeri	65	0.35	GRHiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Kalakeri	66	3.03	GRHiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land+Maize (Fl+Mz)	Not Available	IIes	Graded bunding
Kalakeri	67	2.61	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Kalakeri	68	3	GDPcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Kalakeri	73	2.64	DRLiB2	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Kalakeri	74	0	DRLiB2	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Kalakeri	75	1.78	DRLiB2	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Kalakeri	76	0.04	Waterbody	Others	Others	Others	Others	Others	Others	Others	Maize (Mz)	Not Available	Others	Others
Lebageri	37	0.53	LKRhB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Trench cum bunding
Lebageri	38	2.21	HDHbB2	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIs	Trench cum bunding
Lebageri	39	2.37	HDHbB2	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra+Maize (Bj+Mz)	Not Available	IIs	Trench cum bunding
Lebageri	40	1.98	HDHbB2	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Sugarcane (Sc)	Not Available	IIs	Trench cum bunding

Village	Survey No.	Total 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
Lebageri	43	0.13	HDHbB2	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIs	Trench cum bunding
Lebageri	251	0.92	RTRiB2	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIe	Trench cum bunding
Lebageri	252	4.54	RTRiB2	LMU-1	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	High (151-200 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra+Maize (Bj+Mz)	Not Available	IIe	Trench cum bunding
Lebageri	253	8.67	LKRhB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	1 Borewell	IIIes	Trench cum bunding
Lebageri	254	4.08	LKRhB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Trench cum bunding
Lebageri	255	3.05	LKRhB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Thalakan apura	45	0.24	BPRiB2	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIIes	Trench cum bunding
Thalakan apura	46	0.53	BPRiB2	LMU-2	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Pearl millet+Redgram (Pm+Rg)	Not Available	IIIes	Trench cum bunding
Thalakan apura	47	0.07	BPRhB1g1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Redgram (Mz+Rg)	Not Available	IIIs	Trench cum bunding

Appendix II

Hatti-2 Microwatershed

Soil Fertility Information

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hatti	26	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Hatti	27	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)
Hatti	28	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	29	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	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)
Hatti	31	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)
Hatti	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)
Hatti	33/1	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)
Hatti	33/2	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)
Hatti	34/1	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)
Hatti	34/2	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)
Hatti	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	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)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	39	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)
Hatti	40	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)
Hatti	41	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)
Hatti	42	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)
Hatti	43/1	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)
Hatti	43/2	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)
Hatti	44	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)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hatti	49	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Hatti	50/2	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Hatti	52/2	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)
Hatti	54/2	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)
Hatti	55/2	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)
Hatti	56/2	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)
Hatti	57/2	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)
Hatti	66/1	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)
Hatti	66/2	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)
Hatti	72/1	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)
Hatti	72/2	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)
Hatti	73	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	74	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	75/1	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)
Hatti	75/2	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)
Hatti	76/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	76/2	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)
Hatti	77	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	78/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	78/2	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)
Hatti	79	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	80	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	81/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	81/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	97	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	98	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hatti	99/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	99/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	100/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	100/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	101/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	101/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	102	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	103	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	104	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	105	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	106	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	107/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	107/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	108/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	108/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	109	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)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	110	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	111	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)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	112	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)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	113	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)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	114	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	115	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	116	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	117	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)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	118	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)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	119	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Hatti	120	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	122	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	123	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)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	124	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	125	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	126	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	127	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	128	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	129	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	130	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	131	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	132	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	133	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	134	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	135	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	136	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	137	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	138	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	139	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	140	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	141	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	142	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Hatti	143	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	144	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hatti	145	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	53	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Kalakeri	54	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	55	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	56	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	57	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	58	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	59	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	60	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	61	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	62	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	63	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	64	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	65	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	66	Very strongly alkaline (pH > 9.0)	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	67	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	68	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	73	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)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	74	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)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	75	Very strongly alkaline (pH > 9.0)	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)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kalakeri	76	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Lebageri	37	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Lebageri	38	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Lebageri	39	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Lebageri	40	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Lebageri	43	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Lebageri	251	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Lebageri	252	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Lebageri	253	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Lebageri	254	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Lebageri	255	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Thalakana pura	45	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)
Thalakana pura	46	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)
Thalakana pura	47	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)

Appendix III

Hatti-2 Microwatershed

Soil Suitability Information

Village	Survey No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crosandra	Drumstick	Mulbery
Hatti	26	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Hatti	27	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Hatti	28	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	29	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	30	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	31	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	32	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	33/1	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	33/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	34/1	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	34/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	35	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Hatti	36	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	37	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Hatti	38	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Hatti	39	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Hatti	40	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Hatti	41	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	42	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2gt
Hatti	43/1	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	43/2	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	44	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	49	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Hatti	50/2	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops	Rock outcrops
Hatti	52/2	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	54/2	S3rg	S3g	S3g	S3g	S3g	S3g	S2rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	55/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	56/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	57/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	66/1	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	66/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	72/1	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	72/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	73	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	74	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	75/1	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g

Village	Survey No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crosandra	Drumstick	Mulbery
Hatti	75/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	76/1	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	76/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	77	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Hatti	78/1	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	78/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	79	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	80	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	81/1	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	81/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	97	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	98	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	99/1	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	99/2	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hatti	100/1	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	100/2	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hatti	101/1	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hatti	101/2	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hatti	102	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	103	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Hatti	104	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Hatti	105	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Hatti	106	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hatti	107/1	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hatti	107/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	108/1	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Hatti	108/2	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	109	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	110	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	111	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	112	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Hatti	113	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Hatti	114	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Hatti	115	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Hatti	116	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Hatti	117	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	118	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	119	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	120	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	122	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	123	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	124	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	125	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	126	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	127	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S2r	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1

Village	Survey No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crosandra	Drumstick	Mulbery
Hatti	128	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	129	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Hatti	130	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	131	S2r	S2t	S1	S2t	S1	S2t	S2r	S1	S2t	S2t	S2t	S1	S1	S1	S1	S2r	S1	S2t	S2t	S2t	S2t	S2t	S1	S2t	S2t	S2t	S2t	S2t
Hatti	132	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	133	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	134	S2r	S2t	S1	S2t	S1	S2t	S2r	S1	S2t	S2t	S2t	S1	S1	S1	S1	S2r	S1	S2t	S2t	S2t	S2t	S2t	S1	S2t	S2t	S2t	S2t	S2t
Hatti	135	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Hatti	136	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	137	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	138	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	139	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Hatti	140	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	141	S3r	S1	S2r	S1	S2r	S2rt	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S1	S3r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r
Hatti	142	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	143	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Hatti	144	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Hatti	145	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Kalakeri	53	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kalakeri	54	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	55	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	56	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	57	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	58	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kalakeri	59	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kalakeri	60	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	61	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	62	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	63	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kalakeri	64	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g
Kalakeri	65	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kalakeri	66	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S3t	S2t	S2t
Kalakeri	67	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	68	S1	S1	S1	S1	S2t	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S2t	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Kalakeri	73	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Kalakeri	74	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Kalakeri	75	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2z	S2rz	S2tz
Kalakeri	76	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
Lebageri	37	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg
Lebageri	38	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Lebageri	39	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Lebageri	40	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Lebageri	43	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S2g
Lebageri	251	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Lebageri	252	S1	S2t	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1

Village	Survey No.	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crosandra	Drumstick	Mulbery
Lebageri	253	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg
Lebageri	254	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg
Lebageri	255	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg	S3rg	S2rg	S3rg	S3rg	S3rg	S3rg
Thalakan apura	45	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Thalakan apura	46	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2gt	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g
Thalakan apura	47	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

SALIENT FINDINGS OF THE SURVEY

- *The data indicated that there were 101 (53.44%) men and 88 (46.56%) women among the sampled households.*
- *The average family size of landless farmers' was 4.8, marginal farmers' was 5.42, small farmers' was 5.27, semi medium farmers' was 4.83, medium farmers' was 4.83 and large farmers' was 11.*
- *The data indicated that, 42 (22.22%) people were in 0-15 years of age, 90 (47.62%) were in 16-35 years of age, 42 (22.22%) were in 36-60 years of age and 15 (7.94%) were above 61 years of age.*
- *The results indicated that Hatti-2 had 31.75 per cent illiterates, 26.98 per cent of them had primary school education, 9.52 per cent of them had middle school education, 13.76 per cent of them had high school education, 6.88 per cent of them had PUC education, 0.53 per cent had ITI, 4.76 per cent of them had degree and 0.53 per cent of them did masters.*
- *The results indicate that, 61.11 per cent of household heads were practicing agriculture and 33.33 per cent of the household heads were agricultural labourers.*
- *The results indicate that agriculture was the major occupation for 36.51 per cent of the household members, 30.69 per cent were agricultural labourers, 1.59 per cent were general labourers, 1.06 per cent were in private service, 0.53 per cent was into trade and business, 22.75 per cent were students and 4.76 per cent were children.*
- *The results show that, 0.53 per cent of the households participated in sthree shakthi sangha and 99.47 per cent of the population in the micro watershed has not participated in any local institutions.*
- *The results indicate that 5.56 per cent of the households possess thatched house, 58.33 per cent of the households possess katcha house, 19.44 per cent of them possess pucca/RCC house and 16.67 per cent of the households possess semi pucca house.*
- *The results show that 77.78 per cent of the households possess TV, 88.89 per cent of them possess mixer/grinder, 2.78 per cent of them possess bicycle, 30.56 per cent of the households possess motor cycle and 80.56 per cent of the households possess mobile phones.*
- *The results show that the average value of television was Rs. 7,428, mixer grinder was Rs. 2,296, bicycle was Rs. 2,000, motor cycle was Rs. 40,416 and mobile phone was Rs. 2,526.*
- *About 13.89 per cent of the households possess bullock cart, 5.56 per cent of them possess plough, 2.78 per cent of them possess seed/fertilizer drill, 2.78 per cent of*

them possess irrigation pump, 13.89 per cent of them possess sprayer, 2.78 per cent of them possess sprinkler and 69.44 per cent of them possess weeder.

- *The results show that the average value of bullock cart was Rs. 24,000, plough was Rs. 1,850, seed/fertilizer drill was Rs.3,500, irrigation pump was Rs. 10,000, sprayer was Rs. 2,060, sprinkler was Rs.800 and weeder was Rs. 49.*
- *The results indicate that, 27.78 per cent of the households possess bullocks, 36.11 per cent of the households possess local cow, 5.56 per cent of them possess crossbred cow, 8.33 per cent possess buffalo, 2.78 per cent possess sheep, 2.78 per cent possess goat and 2.78 per cent of them possess poultry birds.*
- *The results indicate that, average own labour men available in the micro watershed was 1.68, average own labour (women) available was 1.39, average hired labour (men) available was 14.26 and average hired labour (women) available was 11.19.*
- *The results indicate that 77.78 per cent of the households opined that the hired labour was adequate.*
- *The results indicate that, households of the Hatti-2 micro-watershed possess 27.87 ha (52.35%) of dry land and 25.37 ha (47.65%) of irrigated land. Marginal farmers possess 4.08 ha (90%) of dry land and 0.45 ha (10%) of irrigated land. Small farmers possess 11.47 ha (83.04%) of dry land and 2.34 ha (16.96%) of irrigated land. Semi medium farmers possess 6.65 ha (60.87%) of dry land and 4.28 ha (39.13%) of irrigated land. Medium farmers possess 5.67 ha (30.30%) of dry land and 13.03 ha (69.70%) of irrigated land. Large farmers possess 5.26 ha (100%) of irrigated land.*
- *The results indicate that, the average value of dry land was Rs. 390,981.70 and the average value of irrigated land was Rs. 327,074.22. In case of marginal famers, the average land value was Rs. 710,615.08 for dry land and Rs. 882,142.85 for irrigated land. In case of small famers, the average land value was Rs. 461,926.60 for dry land and Rs. 255,960.68 for irrigated land. In case of semi medium famers, the average land value was Rs. 255,413.62 for dry land and Rs. 397,256.38 for irrigated land. In case of medium farmers, the average land value was Rs. 176,428.57 for dry land and Rs. 276,149.07. In case of large farmers the average land value was Rs. 380,000.*
- *The results indicate that, there were 12 functioning and 2 de-functioning bore wells in the micro watershed.*
- *The results indicate that, there were 2 functioning and 1 de-functioning open wells in the micro watershed.*
- *The results indicate that, bore well was the major irrigation source in the micro water shed for 33.33 per cent and open well was the source of irrigation for 5.56 per cent of the farmers.*

- *The results indicate that, the depth of bore well was found to be 40.40 meters and the depth of open well was found to be 8.81 per cent.*
- *The results indicate that small, semi medium, medium and large farmers had an irrigated area of 3.25 ha, 6.10 ha, 12.96 ha and 5.26 ha respectively.*
- *The results indicate that, farmers have grown maize (22.99 ha), bajra/pearl millet/sajje (19.03 ha), groundnut (6.57 ha), redgram (3.64 ha) and navane (0.81 ha). Marginal farmers had grown maize and bajra. Small and semi medium farmers had grown maize, bajra and groundnut. Medium farmers had grown maize, bajra, redgram, groundnut and navane. Large farmers had grown maize, bajra and groundnut.*
- *The results indicate that small, semi medium, medium and large farmers had an irrigated area of 3.25 ha, 6.10 ha, 12.96 ha and 5.26 ha respectively.*
- *The results indicate that, farmers have grown maize (22.99 ha), bajra/pearl millet/sajje (19.03 ha), groundnut (6.57 ha), redgram (3.64 ha) and navane (0.81 ha). Marginal farmers had grown maize and bajra. Small and semi medium farmers had grown maize, bajra and groundnut. Medium farmers had grown maize, bajra, redgram, groundnut and navane. Large farmers had grown maize, bajra and groundnut.*
- *The results indicate that, the cropping intensity in Hatti-2 micro-watershed was found to be 66.22 per cent.*
- *The results indicate that, the total cost of cultivation for maize was Rs. 31242.91. The gross income realized by the farmers was Rs. 76824.86. The net income from maize cultivation was Rs. 45581.96. Thus the benefit cost ratio was found to be 1:2.46.*
- *The total cost of cultivation for navane was Rs. 19242.89. The gross income realized by the farmers was Rs. 44460. The net income from navane cultivation was Rs. 25217.11. Thus the benefit cost ratio was found to be 1:2.31.*
- *The total cost of cultivation for redgram was Rs. 29582.79. The gross income realized by the farmers was Rs. 59280. The net income from redgram cultivation was Rs. 29697.21. Thus the benefit cost ratio was found to be 1:2.*
- *The total cost of cultivation for groundnut was Rs. 19973.19. The gross income realized by the farmers was Rs. 44460. The net income from groundnut cultivation was Rs. 24486.81. Thus the benefit cost ratio was found to be 1:2.23.*
- *The total cost of cultivation for bajra was Rs. 53039.21. The gross income realized by the farmers was Rs. 45570.78. The net income from bajra cultivation was Rs. -7468.43. Thus the benefit cost ratio was found to be 1:0.86.*
- *The results indicate that, 44.44 per cent of the households opined that dry fodder was adequate, 5.56 per cent of them opined that dry fodder was inadequate and 52.78 per cent opined that green fodder was adequate.*

- *The results indicate that the annual gross income was Rs. 29,000 for landless farmers, for marginal farmers it was Rs. 40,428.57, for small farmers it was Rs. 61,181.82, for semi medium farmers it was Rs. 83,000, for medium farmers it was Rs. 105,666.67 and for large farmers it was Rs. 355,800.*
- *The results indicate that, 44.44 per cent of the households opined that dry fodder was adequate, 5.56 per cent of them opined that dry fodder was inadequate and 52.78 per cent opined that green fodder was adequate.*
- *The results indicate that the annual gross income was Rs. 29,000 for landless farmers, for marginal farmers it was Rs. 40,428.57, for small farmers it was Rs. 61,181.82, for semi medium farmers it was Rs. 83,000, for medium farmers it was Rs. 105,666.67 and for large farmers it was Rs. 355,800.*
- *The results indicate that the average annual expenditure is Rs. 10,202.65. For landless households it was Rs. 3,120, for marginal farmers it was Rs. 3,394.56, for small farmers it was Rs. 2,833.33, for semi medium farmers it was Rs. 10,222.22, for medium farmers it was Rs. 10,888.89 and for large farmers it was Rs. 170,100.*
- *The results indicate that, sampled households have grown 105 coconut trees, 20 lemon trees and 69 mango trees in their field.*
- *The results indicate that, households have planted 202 neem trees, 22 tamarind trees, 2 acacia trees and 2 banyan trees in their field.*
- *The results indicated that, households have an average investment capacity of Rs. 1,527.78 for land development, Rs. 388.89 for irrigation facility, Rs. 972.22 for improved crop production and Rs. 388.89 for orchard development/maintenance.*
- *The results indicated that loan from bank was the source of additional investment for 13.89 per cent for land development, for 5.56 per cent for irrigation facility, for 16.67 per cent for improved crop production and for 8.33 per cent for orchard development/maintenance. Soft loan was the source of additional investment capacity for 2.78 per cent of the households for land development.*
- *The results indicated that, bajra, groundnut and maize were sold to the extent of 100 per cent. Navane was sold to the extent of 71.43 per cent and redgram was sold to the extent of 64 per cent.*
- *The results indicated that, about 13.89 per cent of the farmers sold their produce to agent/traders, 86.11 per cent of the farmers sold their produce to local/village merchants, 30.56 per cent of the farmers sold their produce to regulated market and 5.56 per cent of them sold their produce through cooperative marketing society.*
- *The results indicated that, 50 per cent of the households used cart, 2.78 per cent of them used truck and 83.33 per cent of them used tractor as a mode of transportation.*

- *The results indicated that, 19.44 per cent of the households have experienced soil and water erosion problems in the farm.*
- *The results indicated that, 19.44 per cent have shown interest in soil test.*
- *The results indicated that, 83.33 per cent of the households used firewood and 13.89 per cent of the households used LPG as a source of fuel.*
- *The results indicated that, piped supply was the major source of drinking water for 80.56 per cent of the households, bore well was the source of drinking water for 11.11 per cent, open well was the source of drinking water for 2.78 per cent and lake/tank was the source of drinking water for 2.78 per cent of the households in micro watershed.*
- *Electricity was the major source of light for 97.22 per cent of the households in micro watershed.*
- *The results indicated that, 30.56 per cent of the households possess sanitary toilet facility.*
- *The results indicated that, 97.22 per cent of the sampled households possessed BPL card.*
- *The results indicated that, 63.89 per cent of the households participated in NREGA programme.*
- *The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 63.89 per cent, oilseeds were adequate for 5.56 per cent, vegetables were adequate for 8.33 per cent, fruits were adequate for 2.78 per cent, milk was adequate for 47.22 per cent, eggs were adequate for 33.33 per cent and meat was adequate for 22.22 per cent.*
- *The results indicated that, pulses were in adequate for 33.33 per cent of the households, oilseeds were inadequate for 50 per cent, vegetables were inadequate for 75 per cent, fruits were inadequate for 88.89 per cent, milk was inadequate for 47.22 per cent, eggs were inadequate for 61.11 per cent and meat was inadequate for 55.56 per cent of the households.*
- *The results indicated that, oilseeds were market surplus for 41.67 per cent of the households, vegetables were market surplus for 8.33 per cent of the households, fruits were market surplus for 2.78 per cent of the households, milk was market surplus for 2.78 per cent of the households and meat was market surplus for 2.78 per cent of the households.*
- *The results indicated that, lower fertility status of the soil was the constraint experienced by 36.11 per cent of the households, wild animal menace on farm field (52.78%), frequent incidence of pest and diseases (44.44%), inadequacy of irrigation water (16.67%), high cost of fertilizers and plant protection chemicals (19.44%), high rate of interest on credit and lack of marketing facilities in the area (22.22%), low price for the agricultural commodities (41.67%), inadequate extension services (22.22%), lack of transport for safe transport of the*

agricultural produce to the market (27.78%), less rainfall (61.11%) and Source of Agri-technology information (30.56%).

Chapter 2

INTRODUCTION

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

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

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

Scope and importance of survey

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

Chapter 3

METHODOLOGY

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

Description of the study area

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

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

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

Description of the micro watershed

Hatti-2 micro-watershed in Kalakeri sub-watershed (Koppal taluk and district) is located in between $15^0$26’29.959’’ to 15^0 24’43.542” North latitudes and 76^0 15’42.465’’ to $76^0$10’33.95’’ East longitudes, covering an area of about 425.49 ha, bounded by Kalakeri, Katti and Lebagiri 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 analyse the data. About 36 households located in the micro-watershed were interviewed for the survey.

Chapter 4

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Hatti-2 micro-watershed is presented in Table 1 and it indicated that 36 farmers were sampled in Hatti-2 micro-watershed among them 5 (13.89%) were landless, 7 (19.44%) were marginal farmers, 11 (30.56%) were small farmers, 6 (16.67%) were semi medium farmers, 6 (16.67%) were medium farmers and 1 (2.78%) was large farmer.

Table 1: Households sampled for socio economic survey in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	13.89	7	19.44	11	30.56	6	16.67	6	16.67	1	2.78	36	100.00

Population characteristics: The population characteristics of households sampled for socio-economic survey in Hatti-2 micro-watershed is presented in Table 2. The data indicated that there were 101 (53.44%) men and 88 (46.56%) women among the sampled households. The average family size of landless farmers' was 4.8, marginal farmers' was 5.42, small farmers' was 5.27, semi medium farmers' was 4.83, medium farmers' was 4.83 and large farmers' was 11.

Table 2: Population characteristics of Hatti-2 micro-watershed

Sl. No.	Particulars	LL (24)		MF (38)		SF (58)		SMF (29)		MDF (29)		LF (11)		All (189)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Men	17	70.83	18	47.37	34	58.62	13	44.83	14	48.28	5	45.45	101	53.44
2	Women	7	29.17	20	52.63	24	41.38	16	55.17	15	51.72	6	54.55	88	46.56
Total		24	100.00	38	100.00	58	100.00	29	100.00	29	100.00	11	100.00	189	100.00
Average		4.8		5.42		5.27		4.83		4.83		11		5.25	

Age wise classification of population: The age wise classification of household members in Hatti-2 micro-watershed is presented in Table 3. The data indicated that, 42 (22.22%) people were in 0-15 years of age, 90 (47.62%) were in 16-35 years of age, 42 (22.22%) were in 36-60 years of age and 15 (7.94%) were above 61 years of age.

Table 3: Age wise classification of household members in Hatti-2 micro-watershed

Sl. No.	Particulars	LL (24)		MF (38)		SF (58)		SMF (29)		MDF (29)		LF (11)		All (189)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	2	8.33	11	28.95	11	18.97	7	24.14	8	27.59	3	27.27	42	22.22
2	16-35 years of age	15	62.50	15	39.47	31	53.45	11	37.93	13	44.83	5	45.45	90	47.62
3	36-60 years of age	6	25	9	23.68	10	17.24	9	31.03	7	24.14	1	9.09	42	22.22
4	> 61 years	1	4.17	3	7.89	6	10.34	2	6.90	1	3.45	2	18.18	15	7.94
Total		24	100	38	100	58	100	29	100	29	100	11	100	189	100

Education level of household members: Education level of household members in Hatti-2 micro-watershed is presented in Table 4. The results indicated that Hatti-2 had 31.75 per cent illiterates, 26.98 per cent of them had primary school education, 9.52 per

cent of them had middle school education, 13.76 per cent of them had high school education, 6.88 per cent of them had PUC education, 0.53 per cent had ITI, 4.76 per cent of them had degree and 0.53 per cent of them did masters.

Table 4. Education level of household members in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (24)		MF (38)		SF (58)		SMF (29)		MDF (29)		LF (11)		All (189)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	5	20.83	14	36.84	21	36.21	7	24.14	6	20.69	7	63.64	60	31.75
2	Primary School	4	16.67	11	28.95	18	31.03	7	24.14	9	31.03	2	18.18	51	26.98
3	Middle School	2	8.33	1	2.63	7	12.07	2	6.90	5	17.24	1	9.09	18	9.52
4	High School	7	29.17	4	10.53	6	10.34	5	17.24	4	13.79	0	0	26	13.76
5	PUC	3	12.50	2	5.26	2	3.45	4	13.79	1	3.45	1	9.09	13	6.88
6	ITI	1	4.17	0	0	0	0	0	0	0	0	0	0	1	0.53
7	Degree	1	4.17	1	2.63	1	1.72	2	6.90	4	13.79	0	0	9	4.76
8	Masters	0	0	0	0	0	0	1	3.45	0	0	0	0	1	0.53
9	Others	1	4.17	5	13.16	3	5.17	1	3.45	0	0	0	0	10	5.29
Total		24	100	38	100	58	100	29	100	29	100	11	100	189	100

Occupation of household heads: The data regarding the occupation of the household heads in Hatti-2 micro-watershed is presented in Table 5. The results indicate that, 61.11 per cent of household heads were practicing agriculture and 33.33 per cent of the household heads were agricultural labourers.

Table 5: Occupation of household heads in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	4	57.14	9	81.82	3	50	5	83.33	1	100	22	61.11
2	Agricultural Labour	5	100	1	14.29	2	18.18	3	50	1	16.67	0	0	12	33.33
3	Others	0	0	1	14.29	0	0	0	0	0	0	0	0	1	2.78
Total		5	100	6	100	11	100	6	100	6	100	1	100	35	100

Table 6: Occupation of family members in Hatti-2 micro-watershed

Sl. No.	Particulars	LL (24)		MF (38)		SF (58)		SMF (29)		MDF (29)		LF (11)		All (189)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	14	36.84	29	50	9	31.03	13	44.83	4	36.36	69	36.51
2	Agricultural Labour	19	79.17	6	15.79	20	34.48	7	24.14	4	13.79	2	18.18	58	30.69
3	General Labour	0	0	1	2.63	0	0	0	0	0	0	2	18.18	3	1.59
4	Private Service	1	4.17	0	0	0	0	1	3.45	0	0	0	0	2	1.06
5	Trade & Business	0	0	0	0	1	1.72	0	0	0	0	0	0	1	0.53
6	Student	4	16.67	10	26.32	5	8.62	10	34.48	11	37.93	3	27.27	43	22.75
7	Others	0	0	2	5.26	0	0	1	3.45	1	3.45	0	0	4	2.12
8	Children	0	0	5	13.16	3	5.17	1	3.45	0	0	0	0	9	4.76
Total		24	100	38	100	58	100	29	100	29	100	11	100	189	100

Occupation of the household members: The data regarding the occupation of the household members in Hatti-2 micro-watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 36.51 per cent of the household members, 30.69 per cent were agricultural labourers, 1.59 per cent were general

labourers, 1.06 per cent were in private service, 0.53 per cent was into trade and business, 22.75 per cent were students and 4.76 per cent were children.

Institutional participation of the household members: The data regarding the institutional participation of the household members in Hatti-2 micro-watershed is presented in Table 7. The results show that, 0.53 per cent of the households participated in sthree shakthi sangha and 99.47 per cent of the population in the micro watershed has not participated in any local institutions.

Table 7. Institutional Participation of household members in Hatti-2 micro-watershed

Sl. No.	Particulars	LL (24)		MF (38)		SF (58)		SMF (29)		MDF (29)		LF (11)		All (189)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Sthree Shakthi Sangha	0	0	1	2.63	0	0	0	0	0	0	0	0	1	0.53
2	No Participation	24	100	37	97.37	58	100	29	100	29	100	11	100	188	99.47
Total		24	100	38	100	58	100	29	100	29	100	11	100	189	100

Type of house owned: The data regarding the type of house owned by the households in Hatti-2 micro-watershed is presented in Table 8. The results indicate that 5.56 per cent of the households possess thatched house, 58.33 per cent of the households possess katcha house, 19.44 per cent of them possess pucca/RCC house and 16.67 per cent of the households possess semi pucca house.

Table 8. Type of house owned by households in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	1	20.00	0	0.00	1	9.09	0	0.00	0	0.00	0	0.00	2	5.56
2	Katcha	4	80.00	7	100.00	5	45.45	3	50.00	2	33.33	0	0.00	21	58.33
3	Pucca/RCC	0	0.00	0	0.00	0	0.00	3	50.00	3	50.00	1	100.00	7	19.44
4	Semi pacca	0	0.00	0	0.00	5	45.45	0	0.00	1	16.67	0	0.00	6	16.67
Total		5	100.00	7	100.00	11	100.00	6	100.00	6	100.00	1	100.00	36	100.00

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Hatti-2 micro-watershed is presented in Table 9. The results show that 77.78 per cent of the households possess TV, 88.89 per cent of them possess mixer/grinder, 2.78 per cent of them possess bicycle, 30.56 per cent of the households possess motor cycle and 80.56 per cent of the households possess mobile phones.

Table 9. Durable Assets owned by households in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Television	5	100.00	4	57.14	7	63.64	6	100.00	5	83.33	1	100.00	28	77.78
2	Mixer/Grinder	5	100.00	6	85.71	9	81.82	6	100.00	5	83.33	1	100.00	32	88.89
3	Bicycle	0	0.00	1	14.29	0	0.00	0	0.00	0	0.00	0	0.00	1	2.78
4	Motor Cycle	0	0.00	1	14.29	2	18.18	1	16.67	6	100.00	1	100.00	11	30.56
5	Mobile Phone	4	80.00	5	71.43	9	81.82	5	83.33	5	83.33	1	100.00	29	80.56

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Hatti-2 micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 7,428, mixer grinder was Rs. 2,296, bicycle was Rs. 2,000, motor cycle was Rs. 40,416 and mobile phone was Rs. 2,526.

Table 10. Average value of durable assets owned by households in Hatti-2 micro-watershed

Average value (Rs.)

Sl. No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Television	9,000.00	7,000.00	6,857.00	7,833.00	6,400.00	8,000.00	7,428.00
2	Mixer/Grinder	2,000.00	2,166.00	2,277.00	2,750.00	2,300.00	2,000.00	2,296.00
3	Bicycle	0.00	2,000.00	0.00	0.00	0.00	0.00	2,000.00
4	Motor Cycle	0.00	50,000.00	47,500.00	50,000.00	40,000.00	25,000.00	40,416.00
5	Mobile Phone	2,750.00	2,375.00	2,363.00	3,142.00	2,166.00	2,500.00	2,526.00

Farm Implements owned: The data regarding the farm implements owned by the households in Hatti-2 micro-watershed is presented in Table 11. About 13.89 per cent of the households possess bullock cart, 5.56 per cent of them possess plough, 2.78 per cent of them possess seed/fertilizer drill, 2.78 per cent of them possess irrigation pump, 13.89 per cent of them possess sprayer, 2.78 per cent of them possess sprinkler and 69.44 per cent of them possess weeder.

Table 11. Farm Implements owned by households in Hatti-2 micro-watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0.00	1	14.29	1	9.09	1	16.67	1	16.67	1	100.00	5	13.89
2	Plough	0	0.00	1	14.29	0	0.00	0	0.00	1	16.67	0	0.00	2	5.56
3	Seed/Fertilizer Drill	0	0.00	0	0.00	0	0.00	0	0.00	1	16.67	0	0.00	1	2.78
4	Irrigation Pump	0	0.00	0	0.00	0	0.00	0	0.00	1	16.67	0	0.00	1	2.78
5	Sprayer	0	0.00	2	28.57	1	9.09	0	0.00	2	33.33	0	0.00	5	13.89
6	Sprinkler	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	1	2.78
7	Weeder	5	100.00	6	85.71	4	36.36	5	83.33	4	66.67	1	100.00	25	69.44
8	Blank	0	0.00	0	0.00	6	54.55	0	0.00	1	16.67	0	0.00	7	19.44

Table 12. Average value of farm implements owned by households in Hatti-2 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Bullock Cart	0	25,000	20,000	25,000	25,000	25,000	24,000
2	Plough	0	1,200	0	0	2,500	0	1,850
3	Seed/Fertilizer Drill	0	0	0	0	3,500	0	3,500
4	Irrigation Pump	0	0	0	0	10,000	0	10,000
5	Sprayer	0	1,900	3,000	0	1,750	0	2,060
6	Sprinkler	0	0	0	0	0	800	800
7	Weeder	58	23	80	65	63	12	49

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Hatti-2 micro-watershed is presented in Table 12. The results show that the average value of bullock cart was Rs. 24,000, plough was

Rs. 1,850, seed/fertilizer drill was Rs.3,500, irrigation pump was Rs. 10,000, sprayer was Rs. 2,060, sprinkler was Rs.800 and weeder was Rs. 49.

Livestock possession by the households: The data regarding the Livestock possession by the households in Hatti-2 micro-watershed is presented in Table 13. The results indicate that, 27.78 per cent of the households possess bullocks, 36.11 per cent of the households possess local cow, 5.56 per cent of them possess crossbred cow, 8.33 per cent possess buffalo, 2.78 per cent possess sheep, 2.78 per cent possess goat and 2.78 per cent of them possess poultry birds.

Table 13. Livestock possession by households in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0.00	2	28.57	1	9.09	2	33.33	5	83.33	0	0.00	10	27.78
2	Local cow	0	0.00	2	28.57	4	36.36	3	50.00	3	50.00	1	100.00	13	36.11
3	Crossbred cow	0	0.00	2	28.57	0	0.00	0	0.00	0	0.00	0	0.00	2	5.56
4	Buffalo	0	0.00	0	0.00	0	0.00	1	16.67	1	16.67	1	100.00	3	8.33
5	Sheep	0	0.00	1	14.29	0	0.00	0	0.00	0	0.00	0	0.00	1	2.78
6	Goat	0	0.00	0	0.00	0	0.00	0	0.00	1	16.67	0	0.00	1	2.78
7	Poultry birds	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	1	2.78
8	blank	5	100.00	1	14.29	7	63.64	3	50.00	2	33.33	0	0.00	18	50.00

Average Labour availability: The data regarding the average labour availability in Hatti-2 micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.68, average own labour (women) available was 1.39, average hired labour (men) available was 14.26 and average hired labour (women) available was 11.19.

Table 14. Average Labour availability in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
		N	N	N	N	N	N	N
1	Hired labour Female	0.00	5.86	8.09	8.50	23.50	25.00	11.19
2	Own Labour Female	0.00	1.57	1.27	1.00	1.50	3.00	1.39
3	Own labour Male	0.00	1.43	2.00	1.17	1.67	3.00	1.68
4	Hired labour Male	0.00	6.57	10.00	10.83	32.67	25.00	14.26

In case of marginal farmers, average own labour men available in the micro watershed was 1.43, average own labour (women) available was 1.57, average hired labour (men) was 6.57 and average hired labour (women) available was 5.86. In case of small farmers, average own labour men available was 2, average own labour (women) was 1.27, average hired labour (men) was 10 and average hired labour (women) available was 8.09. In case of semi medium farmers, average own labour men available was 1.17, average own labour (women) was 1, average hired labour (men) available was 10.83 and average hired labour (women) available was 8.50. In case of medium farmers, average own labour men available was 1.67 and average own labour (women) was 1.50, average hired labour (men) available was 32.67 and average hired labour (women) available was

23.50. In case of large farmers, average own labour men available was 3 and average own labour (women) was 3, average hired labour (men) available was 25 and average hired labour (women) available was 25.

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Hatti-2 micro-watershed is presented in Table 15. The results indicate that 77.78 per cent of the households opined that the hired labour was adequate.

Table 15. Adequacy of Hired Labour in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0.00	6	85.71	9	81.82	6	100.00	6	100.00	1	100.00	28	77.78

Distribution of land (ha): The data regarding the distribution of land (ha) in Hatti-2 micro-watershed is presented in Table 16. The results indicate that, households of the Hatti-2 micro-watershed possess 27.87 ha (52.35%) of dry land and 25.37 ha (47.65%) of irrigated land. Marginal farmers possess 4.08 ha (90%) of dry land and 0.45 ha (10%) of irrigated land. Small farmers possess 11.47 ha (83.04%) of dry land and 2.34 ha (16.96%) of irrigated land. Semi medium farmers possess 6.65 ha (60.87%) of dry land and 4.28 ha (39.13%) of irrigated land. Medium farmers possess 5.67 ha (30.30%) of dry land and 13.03 ha (69.70%) of irrigated land. Large farmers possess 5.26 ha (100%) of irrigated land.

Table 16. Distribution of land (Ha) in Hatti-2 micro-watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	0	0	4.08	90	11.47	83.04	6.65	60.87	5.67	30.30	0	0	27.87	52.35
2	Irrigated	0	0	0.45	10	2.34	16.96	4.28	39.13	13.03	69.70	5.26	100	25.37	47.65
Total		0	100	4.53	100	13.81	100	10.93	100	18.70	100	5.26	100	53.23	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Hatti-2 micro-watershed is presented in Table 17. The results indicate that, the average value of dry land was Rs. 390,981.70 and the average value of irrigated land was Rs. 327,074.22. In case of marginal famers, the average land value was Rs. 710,615.08 for dry land and Rs. 882,142.85 for irrigated land. In case of small famers, the average land value was Rs. 461,926.60 for dry land and Rs. 255,960.68 for irrigated land. In case of semi medium famers, the average land value was Rs. 255,413.62 for dry land and Rs. 397,256.38 for irrigated land. In case of medium farmers, the average land value was Rs. 176,428.57 for dry land and Rs. 276,149.07. In case of large farmers the average land value was Rs. 380,000.

Table 17. Average land value (Rs./ha) in Hatti-2 micro-watershed

Sl.No.	Particulars	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Dry	710,615.08	461,926.60	255,413.62	176,428.57	0.00	390,981.70
2	Irrigated	882,142.85	255,960.68	397,256.38	276,149.07	380,000.00	327,074.22

Status of bore wells: The data regarding the status of bore wells in Hatti-2 micro-watershed is presented in Table 18. The results indicate that, there were 12 functioning and 2 de-functioning bore wells in the micro watershed.

Table 18. Status of bore wells in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
		N	N	N	N	N	N	N
1	De-functioning	0	0	0	0	1	1	2
2	Functioning	0	0	3	3	4	2	12

Status of open wells: The data regarding the status of open wells in Hatti-2 micro-watershed is presented in Table 19. The results indicate that, there were 2 functioning and 1 de-functioning open wells in the micro watershed.

Table 19. Status of open wells in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
		N	N	N	N	N	N	N
1	De-functioning	0	0	0	0	1	0	1
2	Functioning	0	0	0	1	1	0	2

Source of irrigation: The data regarding the source of irrigation in Hatti-2 micro-watershed is presented in Table 20. The results indicate that, bore well was the major irrigation source in the micro water shed for 33.33 per cent and open well was the source of irrigation for 5.56 per cent of the farmers.

Table 20. Source of irrigation in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0.00	0	0.00	3	27.27	3	50.00	4	66.67	2	200.00	12	33.33
2	Open Well	0	0.00	0	0.00	0	0.00	1	16.67	1	16.67	0	0.00	2	5.56

Depth of water (Avg in meters): The data regarding the depth of water in Hatti-2 micro-watershed is presented in Table 21. The results indicate that, the depth of bore well was found to be 40.40 meters and the depth of open well was found to be 8.81 per cent.

Table 21. Depth of water (Avg in meters) in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Bore Well	0.00	0.00	39.40	52.73	84.43	198.12	40.40
2	Open Well	0.00	0.00	0.00	26.42	26.42	0.00	8.81

Irrigated Area (ha): The data regarding the irrigated area (ha) in Hatti-2 micro-watershed is presented in Table 22. The results indicate that small, semi medium, medium and large farmers had an irrigated area of 3.25 ha, 6.10 ha, 12.96 ha and 5.26 ha respectively.

Table 22. Irrigated Area (ha) in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Kharif	0.00	0.00	2.34	4.28	12.96	5.26	24.84
2	Rabi	0.00	0.00	0.90	1.82	0.00	0.00	2.72
Total		0.00	0.00	3.25	6.10	12.96	5.26	27.57

Cropping pattern: The data regarding the cropping pattern in Hatti-2 micro-watershed is presented in Table 23. The results indicate that, farmers have grown maize (22.99 ha), bajra/pearl millet/sajje (19.03 ha), groundnut (6.57 ha), redgram (3.64 ha) and navane (0.81 ha). Marginal farmers had grown maize and bajra. Small and semi medium farmers had grown maize, bajra and groundnut. Medium farmers had grown maize, bajra, redgram, groundnut and navane. Large farmers had grown maize, bajra and groundnut.

Table 23. Cropping pattern in Hatti-2 micro-watershed (Area in ha)

Sl. No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Kharif - Maize	0	2.79	5.47	6.83	4.86	2.02	21.98
2	Kharif - Bajra	0	1.22	6.36	2.45	0	0	10.03
3	Kharif - Pearl millet (Sajje)	0	0.52	1.75	0.51	3.64	1.21	7.64
4	Kharif - Groundnut	0	0	0.9	0	2.83	2.02	5.76
5	Kharif - Red gram (togari)	0	0	0	0	3.64	0	3.64
6	Kharif - Pearlmillet [bajra]	0	0	0	1.54	0	0	1.54
7	Rabi - Maize	0	0	0	1.01	0	0	1.01
8	Kharif - Navane (Fox Millet)	0	0	0	0	0.81	0	0.81
9	Rabi - Groundnut	0	0	0	0.81	0	0	0.81
Total		0	4.53	14.48	13.16	15.79	5.26	53.23

Cropping intensity: The data regarding the cropping intensity in Hatti-2 micro-watershed is presented in Table 24. The results indicate that, the cropping intensity in Hatti-2 micro-watershed was found to be 66.22 per cent.

Table 24. Cropping intensity (%) in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Cropping Intensity	0.00	100.00	81.72	76.71	62.70	33.33	66.22

Cost of cultivation of Maize: The data regarding the cost of cultivation of maize in Hatti-2 micro-watershed is presented in Table 25. The results indicate that, the total cost of cultivation for maize was Rs. 31242.91. The gross income realized by the farmers was Rs. 76824.86. The net income from maize cultivation was Rs. 45581.96. Thus the benefit cost ratio was found to be 1:2.46.

Table 25. Cost of Cultivation of maize in Hatti-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	31.75	5694.35	17.52
2	Bullock		Pairs/day	0.56	282.50	0.87
3	Tractor		Hours	2.95	1849.21	5.69
4	Machinery		Hours	0.22	218.88	0.67
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	23.51	4236.35	13.04
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.50	2151.75	6.62
8	Fertilizer + micronutrients		Quintal	6.98	5742.99	17.67
9	Pesticides (PPC)		Kgs/liters	2.10	2015.41	6.20
10	Irrigation		Number	1.69	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	68.40	0.21
14	Land revenue and Taxes			0.00	6.67	0.02
II	**Cost B1**					
16	Interest on working capital				1697.62	5.22
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				23964.14	73.75
III	**Cost B2**					
18	Rental Value of Land				533.37	1.64
19	**Cost B2 = (Cost B1 + Rental value)**				24497.51	75.39
IV	**Cost C1**					
20	Family Human Labour			24.65	5041.49	15.52
21	**Cost C1 = (Cost B2 + Family Labour)**				29539.00	90.91
V	**Cost C2**					
22	Risk Premium				0.30	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				29539.30	90.91
VI	**Cost C3**					
24	Managerial Cost				2953.93	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				32493.23	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		31.55	34661.99	
		b) Main Crop Sales Price (Rs.)			1098.68	
	By Product	e) Main Product (q)		11.13	5269.90	
		f) Main Crop Sales Price (Rs.)			473.68	
b.	Gross Income (Rs.)				39931.89	
c.	Net Income (Rs.)				7438.66	
d.	Cost per Quintal (Rs./q.)				1029.94	
e.	Benefit Cost Ratio (BC Ratio)				1:1.23	

Cost of Cultivation of Navane: The data regarding the cost of cultivation of navane in Hatti-2 micro-watershed is presented in Table 26. The results indicate that, the total cost of cultivation for navane was Rs. 19242.89. The gross income realized by the farmers was Rs. 44460. The net income from navane cultivation was Rs. 25217.11. Thus the benefit cost ratio was found to be 1:2.31.

Table 26. Cost of Cultivation of Navane in Hatti-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	20.99	3643.25	12.96
2	Bullock		Pairs/day	0.00	0.00	0.00
3	Tractor		Hours	4.94	2964.00	10.55
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	12.35	1358.50	4.83
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.47	2470.00	8.79
8	Fertilizer + micronutrients		Quintal	6.18	5001.75	17.80
9	Pesticides (PPC)		Kgs / liters	2.47	2470.00	8.79
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	2.47	0.01
14	Land revenue and Taxes			0.00	6.59	0.02
II	**Cost B1**					
16	Interest on working capital				1356.03	4.83
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				19272.59	68.58
III	**Cost B2**					
18	Rental Value of Land				533.33	1.90
19	**Cost B2 = (Cost B1 + Rental value)**				19805.92	70.47
IV	**Cost C1**					
20	Family Human Labour			28.41	5742.75	20.43
21	**Cost C1 = (Cost B2 + Family Labour)**				25548.67	90.91
V	**Cost C2**					
22	Risk Premium				0.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				25548.67	90.91
VI	**Cost C3**					
24	Managerial Cost				2554.87	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				28103.54	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		17.29	25935.00	
		b) Main Crop Sales Price (Rs.)			1500.00	
b.	Gross Income (Rs.)				25935.00	
c.	Net Income (Rs.)				-2168.54	
d.	Cost per Quintal (Rs./q.)				1625.42	
e.	Benefit Cost Ratio (BC Ratio)				1:0.92	

Cost of Cultivation of Redgram: The data regarding the cost of cultivation of redgram in Hatti-2 micro-watershed is presented in Table 27. The results indicate that, the total cost of cultivation for redgram was Rs. 29582.79. The gross income realized by the farmers was Rs. 59280. The net income from redgram cultivation was Rs. 29697.21. Thus the benefit cost ratio was found to be 1:2.

Table 27. Cost of Cultivation of Redgram in Hatti-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	45.83	9633.00	29.98
2	Bullock		Pairs/day	0.00	0.00	0.00
3	Tractor		Hours	3.29	1646.67	5.13
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	10.98	1317.33	4.10
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	1.37	6861.11	21.35
8	Fertilizer + micronutrients		Quintal	6.59	5708.44	17.77
9	Pesticides (PPC)		Kgs / liters	0.27	1372.22	4.27
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	142.71	0.44
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				1831.33	5.70
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				28516.12	88.75
III	**Cost B2**					
18	Rental Value of Land				333.33	1.04
19	**Cost B2 = (Cost B1 + Rental value)**				28849.45	89.79
IV	**Cost C1**					
20	Family Human Labour			1.65	356.78	1.11
21	**Cost C1 = (Cost B2 + Family Labour)**				29206.23	90.90
V	**Cost C2**					
22	Risk Premium				2.00	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**				29208.23	90.91
VI	**Cost C3**					
24	Managerial Cost				2920.82	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				32129.05	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		6.86	27444.44	
		b) Main Crop Sales Price (Rs.)			4000.00	
b.	Gross Income (Rs.)				27444.44	
c.	Net Income (Rs.)				-4684.60	
d.	Cost per Quintal (Rs./q.)				4682.78	
e.	Benefit Cost Ratio (BC Ratio)				1:0.85	

Cost of Cultivation of Groundnut: The data regarding the cost of cultivation of groundnut in Hatti-2 micro-watershed is presented in Table 28. The results indicate that, the total cost of cultivation for groundnut was Rs. 19973.19. The gross income realized by the farmers was Rs. 44460. The net income from groundnut cultivation was Rs. 24486.81. Thus the benefit cost ratio was found to be 1:2.23.

Table 28. Cost of Cultivation of Groundnut in Hatti-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	24.48	4390.22	13.13
2	Bullock		Pairs/day	0.56	326.39	0.98
3	Tractor		Hours	2.32	1463.69	4.38
4	Machinery		Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	86.07	9148.34	27.35
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.20	1809.78	5.41
8	Fertilizer + micronutrients		Quintal	5.09	4213.26	12.60
9	Pesticides (PPC)		Kgs / liters	1.89	1755.50	5.25
10	Irrigation		Number	0.62	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	105.88	0.32
14	Land revenue and Taxes			0.00	3.41	0.01
II	**Cost B1**					
16	Interest on working capital				2031.24	6.07
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				25247.72	75.48
III	**Cost B2**					
18	Rental Value of Land				504.76	1.51
19	**Cost B2 = (Cost B1 + Rental value)**				25752.48	76.99
IV	**Cost C1**					
20	Family Human Labour			22.15	4655.56	13.92
21	**Cost C1 = (Cost B2 + Family Labour)**				30408.05	90.91
V	**Cost C2**					
22	Risk Premium				0.14	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				30408.19	90.91
VI	**Cost C3**					
24	Managerial Cost				3040.82	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				33449.01	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		13.86	50087.07	
		b) Main Crop Sales Price (Rs.)			3614.29	
	By Product	e) Main Product (q)		2.88	1068.15	
		f) Main Crop Sales Price (Rs.)			371.43	
b.	Gross Income (Rs.)				51155.22	
c.	Net Income (Rs.)				17706.21	
d.	Cost per Quintal (Rs./q.)				2413.68	
e.	Benefit Cost Ratio (BC Ratio)				1:1.53	

Cost of Cultivation of Bajra: The data regarding the cost of cultivation of bajra in Hatti-2 micro-watershed is presented in Table 29. The results indicate that, the total cost of cultivation for bajra was Rs. 53039.21. The gross income realized by the farmers was Rs. 45570.78. The net income from bajra cultivation was Rs. -7468.43. Thus the benefit cost ratio was found to be 1:0.86.

Table 29. Cost of Cultivation of Bajra in Hatti-2 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	21.40	3711.80	14.11
2	Bullock		Pairs/day	1.83	958.12	3.64
3	Tractor		Hours	2.57	1624.57	6.18
4	Machinery		Hours	0.18	183.97	0.70
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	10.29	1174.04	4.46
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.17	2695.44	10.25
8	Fertilizer + micronutrients		Quintal	6.22	5054.66	19.22
9	Pesticides (PPC)		Kgs / liters	1.91	1886.39	7.17
10	Irrigation		Number	0.82	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	182.11	0.69
14	Land revenue and Taxes			0.00	5.87	0.02
II	**Cost B1**					
16	Interest on working capital				1297.29	4.93
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				18774.25	71.39
III	**Cost B2**					
18	Rental Value of Land				455.21	1.73
19	**Cost B2 = (Cost B1 + Rental value)**				19229.46	73.12
IV	**Cost C1**					
20	Family Human Labour			22.51	4678.46	17.79
21	**Cost C1 = (Cost B2 + Family Labour)**				23907.92	90.91
V	**Cost C2**					
22	Risk Premium				0.25	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				23908.17	90.91
VI	**Cost C3**					
24	Managerial Cost				2390.82	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				26298.98	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		22.22	25770.20	
		b) Main Crop Sales Price (Rs.)			1160.00	
	By Product	e) Main Product (q)		6.80	3196.46	
		f) Main Crop Sales Price (Rs.)			470.00	
b.	Gross Income (Rs.)				28966.66	
c.	Net Income (Rs.)				2667.68	
d.	Cost per Quintal (Rs./q.)				1183.80	
e.	Benefit Cost Ratio (BC Ratio)				1:1.1	

Adequacy of fodder: The data regarding the adequacy of fodder in Hatti-2 micro-watershed is presented in Table 30. The results indicate that, 44.44 per cent of the households opined that dry fodder was adequate, 5.56 per cent of them opined that dry fodder was inadequate and 52.78 per cent opined that green fodder was adequate.

Table 30. Adequacy of fodder in Hatti-2 micro-watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0.00	4	57.14	5	45.45	3	50.00	4	66.67	0	0.00	16	44.44
2	Inadequate-Dry Fodder	0	0.00	1	14.29	0	0.00	0	0.00	0	0.00	1	100.00	2	5.56
3	Adequate-Green Fodder	0	0.00	6	85.71	5	45.45	3	50.00	4	66.67	1	100.00	19	52.78

Annual gross income: The data regarding the annual gross income in Hatti-2 micro-watershed is presented in Table 31. The results indicate that the annual gross income was Rs. 29,000 for landless farmers, for marginal farmers it was Rs. 40,428.57, for small farmers it was Rs. 61,181.82, for semi medium farmers it was Rs. 83,000, for medium farmers it was Rs. 105,666.67 and for large farmers it was Rs. 355,800.

Table 31. Annual gross income in Hatti-2 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Service/salary	0	0	0	5,000	0	0	833.33
2	Wage	29,000	8,571.43	7,727.27	15,833.33	11,666.67	0	12,638.89
3	Agriculture	0	22,000	52,090.91	62,166.67	90,166.67	300,000	53,916.67
4	Farm income	0	0	0	0	0	800	22.22
5	Dairy Farm	0	9,857.14	1,363.64	0	2,500	55,000	4,277.78
6	Goat Farming	0	0	0	0	1,333.33	0	222.22
Income(Rs.)		29,000	40,428.57	61,181.82	83,000	105,666.67	355,800	71,911.11

Average annual expenditure: The data regarding the average annual expenditure in Hatti-2 micro-watershed is presented in Table 32. The results indicate that the average annual expenditure is Rs. 10,202.65. For landless households it was Rs. 3,120, for marginal farmers it was Rs. 3,394.56, for small farmers it was Rs. 2,833.33, for semi medium farmers it was Rs. 10,222.22, for medium farmers it was Rs. 10,888.89 and for large farmers it was Rs. 170,100.

Table 32. Average annual expenditure in Hatti-2 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (11)	SMF (6)	MDF (6)	LF (1)	All (36)
1	Service/salary	0	0	0	17,000	0	0	472.22
2	Wage	15,600	9,000	10,250	14,000	12,333.33	0	6,638.89
3	Agriculture	0	9,428.57	18,416.67	30,333.33	45,000	150,000	24,694.44
4	Farm income	0	0	0	0	0	100	2.78
5	Dairy Farm	0	5,333.33	2,500	0	5,000	20,000	1,208.33
6	Goat Farming	0	0	0	0	3,000	0	83.33
Total		15,600	23,761.90	31,166.67	61,333.33	65,333.33	170,100	367,295.24
Average		3,120	3,394.56	2,833.33	10,222.22	10,888.89	170,100	10,202.65

Horticulture species grown: The data regarding horticulture species grown in Hatti-2 micro-watershed is presented in Table 33. The results indicate that, sampled households have grown 105 coconut trees, 20 lemon trees and 69 mango trees in their field.

Table 33. Horticulture species grown in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		F	B	F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	4	0	12	0	9	0	0	0	80	0	105	0
2	Lemon	0	0	0	0	0	0	0	0	0	0	20	0	20	0
3	Mango	0	0	7	0	10	0	4	0	0	0	48	0	69	0

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

Forest species grown: The data regarding forest species grown in Hatti-2 micro-watershed is presented in Table 34. The results indicate that, households have planted 202 neem trees, 22 tamarind trees, 2 acacia trees and 2 banyan trees in their field.

Table 34: Forest species grown in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		F	B	F	B	F	B	F	B	F	B	F	B	F	B
1	Neem	0	0	28	0	46	0	24	0	34	0	70	0	202	0
2	Tamarind	0	0	10	0	0	0	10	0	2	0	0	0	22	0
3	Acacia	0	0	0	0	2	0	0	0	0	0	0	0	2	0
4	Banyan	0	0	0	0	0	0	1	0	1	0	0	0	2	0

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

Average Additional investment capacity: The data regarding average additional investment capacity in Hatti-2 micro-watershed is presented in Table 35. The results indicated that, households have an average investment capacity of Rs. 1,527.78 for land development, Rs. 388.89 for irrigation facility, Rs. 972.22 for improved crop production and Rs. 388.89 for orchard development/maintenance.

Table 35: Source of funds for additional investment capacity in Hatti-2 micro-watershed

Sl.No.	Particulars	MF (7)	SF (11)	SMF (6)	MDF (6)	All (36)
		Rs.	Rs.	Rs.	Rs.	Rs.
1	Land development	714.29	1,818.18	3,000	2,000	1,527.78
2	Irrigation facility	0	0	1,000	1,333.33	388.89
3	Improved crop production	571.43	1,090.91	1,833.33	1,333.33	972.22
5	Orchard development/ maintenance	0	363.64	666.67	1,000	388.89

Source of additional investment: The data regarding source of funds for additional investment in Hatti-2 micro-watershed is presented in Table 36. The results indicated that loan from bank was the source of additional investment for 13.89 per cent for land development, for 5.56 per cent for irrigation facility, for 16.67 per cent for improved crop production and for 8.33 per cent for orchard development/maintenance. Soft loan was the source of additional investment capacity for 2.78 per cent of the households for land development.

Table 36: Source of funds for additional investment capacity in Hatti-2 micro-watershed

Sl.No	Item	Land development		Irrigation facility		Improved crop production		Orchard development/ maintenance	
		N	%	N	%	N	%	N	%
1	Loan from bank	5	13.89	2	5.56	6	16.67	3	8.33
2	Soft loan	1	2.78	0	0.0	0	0.0	0	0.0

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Hatti-2 micro-watershed is presented in Table 37. The results indicated that, bajra, groundnut and maize were sold to the extent of 100 per cent. Navane was sold to the extent of 71.43 per cent and redgram was sold to the extent of 64 per cent.

Table 37. Marketing of the agricultural produce in Hatti-2 micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	387.0	0.0	387.0	100.0	1160.0
2	Groundnut	111.0	0.0	141.0	100.0	2108.33
3	Maize	680.0	0.0	695.0	100.0	1103.75
4	Navane	14.0	4.0	10.0	71.43	1500.0
5	Redgram	25.0	9.0	16.0	64.0	4000.0

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Hatti-2 micro-watershed is presented in Table 38. The results indicated that, about 13.89 per cent of the farmers sold their produce to agent/traders, 86.11 per cent of the farmers sold their produce to local/village merchants, 30.56 per cent of the farmers sold their produce to regulated market and 5.56 per cent of them sold their produce through cooperative marketing society.

Table 38. Marketing Channels used for sale of agricultural produce in Hatti-2 micro-watershed

Sl.No.	Particulars	MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agent/Traders	3	42.86	0	0.00	1	16.67	1	16.67	0	0.00	5	13.89
2	Local/village Merchant	3	42.86	17	154.55	6	100.00	5	83.33	0	0.00	31	86.11
3	Regulated Market	1	14.29	2	18.18	3	50.00	3	50.00	2	200.00	11	30.56
4	Cooperative marketing Society	0	0.00	0	0.00	0	0.00	1	16.67	1	100.00	2	5.56

Table 39. Mode of transport of agricultural produce in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Cart	0	0.00	5	71.43	7	63.64	3	50.00	3	50.00	0	0.00	18	50.00
2	Tractor	0	0.00	2	28.57	12	109.09	7	116.67	7	116.67	2	200.00	30	83.33
3	Truck	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	1	2.78

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Hatti-2 micro-watershed is presented in Table 39. The results indicated that, 50 per cent of the households used cart, 2.78 per cent of them used truck and 83.33 per cent of them used tractor as a mode of transportation.

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Hatti-2 micro-watershed is presented in Table 40. The results indicated that, 19.44 per cent of the households have experienced soil and water erosion problems in the farm.

Table 40. Incidence of soil and water erosion problems in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	1	14.29	2	18.18	3	50	1	16.67	0	0	7	19.44

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Hatti-2 micro-watershed is presented in Table 41. The results indicated that, 19.44 per cent have shown interest in soil test.

Table 41. Interest shown towards soil testing in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0.00	1	14.29	2	18.18	3	50.00	1	16.67	7	19.44

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Hatti-2 micro-watershed is presented in Table 42. The results indicated that, 83.33 per cent of the households used firewood and 13.89 per cent of the households used LPG as a source of fuel.

Table 42. Usage pattern of fuel for domestic use in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	4	80.00	7	100.00	9	81.82	5	83.33	5	83.33	0	0.00	30	83.33
2	LPG	1	20.00	0	0.00	1	9.09	1	16.67	1	16.67	1	100.00	5	13.89

Table 43. Source of drinking water in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	4	80.00	7	100.00	9	81.82	6	100.00	3	50.00	0	0.00	29	80.56
2	Bore Well	0	0.00	0	0.00	1	9.09	0	0.00	2	33.33	1	100.00	4	11.11
3	Open well	1	20.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	2.78
4	Lake/ Tank	0	0.00	0	0.00	0	0.00	0	0.00	1	16.67	0	0.00	1	2.78

Source of drinking water: The data regarding source of drinking water in Hatti-2 micro-watershed is presented in Table 43. The results indicated that, piped supply was the major source of drinking water for 80.56 per cent of the households, bore well was the source of

drinking water for 11.11 per cent, open well was the source of drinking water for 2.78 per cent and lake/tank was the source of drinking water for 2.78 per cent of the households in micro watershed.

Source of light: The data regarding source of light in Hatti-2 micro-watershed is presented in Table 44. The results indicated that, Electricity was the major source of light for 97.22 per cent of the households in micro watershed.

Table 44. Source of light in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100.00	7	100.00	10	90.91	6	100.00	6	100.00	1	100.00	35	97.22

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facilit**y** in Hatti-2 micro-watershed is presented in Table 45. The results indicated that, 30.56 per cent of the households possess sanitary toilet facility.

Table 45. Existence of Sanitary toilet facility in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	2	40.00	1	14.29	4	36.36	1	16.67	2	33.33	1	100.00	11	30.56

Possession of PDS card: The data regarding possession of PDS card in Hatti-2 micro-watershed is presented in Table 46. The results indicated that, 97.22 per cent of the sampled households possessed BPL card.

Table 46. Possession of PDS card in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100.00	7	100.00	10	90.91	6	100.00	6	100.00	1	100.00	35	97.22

Participation in NREGA program: The data regarding participation in NREGA programme in Hatti-2 micro-watershed is presented in Table 47. The results indicated that, 63.89 per cent of the households participated in NREGA programme.

Table 47. Participation in NREGA programme in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	5	100	7	100	1	9.09	3	50	6	100	1	100	23	63.89

Adequacy of food items: The data regarding adequacy of food items in Hatti-2 micro-watershed is presented in Table 48. The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 63.89 per cent, oilseeds were adequate for 5.56 per cent, vegetables were adequate for 8.33 per cent, fruits were adequate for 2.78 per cent, milk was adequate for 47.22 per cent, eggs were adequate for 33.33 per cent and meat was adequate for 22.22 per cent.

Table 48. Adequacy of food items in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	6	120.00	7	100.00	10	90.91	6	100.00	6	100.00	1	100.00	36	100.00
2	Pulses	5	100.00	3	42.86	4	36.36	5	83.33	5	83.33	1	100.00	23	63.89
3	Oilseed	0	0.00	0	0.00	0	0.00	1	16.67	1	16.67	0	0.00	2	5.56
4	Vegetables	1	20.00	1	14.29	0	0.00	0	0.00	1	16.67	0	0.00	3	8.33
5	Fruits	1	20.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	2.78
6	Milk	5	100.00	2	28.57	3	27.27	4	66.67	3	50.00	0	0.00	17	47.22
7	Egg	4	80.00	1	14.29	2	18.18	3	50.00	2	33.33	0	0.00	12	33.33
8	Meat	1	20.00	1	14.29	2	18.18	2	33.33	2	33.33	0	0.00	8	22.22

Response on Inadequacy of food items: The data regarding inadequacy of food items in Hatti-2 micro-watershed is presented in Table 49. The results indicated that, pulses were in adequate for 33.33 per cent of the households, oilseeds were inadequate for 50 per cent, vegetables were inadequate for 75 per cent, fruits were inadequate for 88.89 per cent, milk was inadequate for 47.22 per cent, eggs were inadequate for 61.11 per cent and meat was inadequate for 55.56 per cent of the households.

Table 49. Response on Inadequacy of food items in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Pulses	0	0.00	4	57.14	6	54.55	1	16.67	1	16.67	0	0.00	12	33.33
2	Oilseed	5	100.00	4	57.14	4	36.36	3	50.00	2	33.33	0	0.00	18	50.00
3	Vegetables	4	80.00	5	71.43	7	63.64	6	100.00	4	66.67	1	100.00	27	75.00
4	Fruits	4	80.00	7	100.00	10	90.91	6	100.00	5	83.33	0	0.00	32	88.89
5	Milk	0	0.00	5	71.43	7	63.64	2	33.33	3	50.00	0	0.00	17	47.22
6	Egg	0	0.00	6	85.71	8	72.73	3	50.00	4	66.67	1	100.00	22	61.11
7	Meat	0	0.00	7	100.00	6	54.55	2	33.33	4	66.67	1	100.00	20	55.56

Response on Market surplus of food items: The data regarding market surplus of food items in Hatti-2 micro-watershed is presented in Table 50. The results indicated that, oilseeds were market surplus for 41.67 per cent of the households, vegetables were market surplus for 8.33 per cent of the households, fruits were market surplus for 2.78 per cent of the households, milk was market surplus for 2.78 per cent of the households and meat was market surplus for 2.78 per cent of the households.

Table 50. Response on Market surplus of food items in Hatti-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Oilseed	0	0.00	3	42.86	6	54.55	2	33.33	3	50.00	1	100.00	15	41.67
2	Vegetables	0	0.00	1	14.29	2	18.18	0	0.00	0	0.00	0	0.00	3	8.33
3	Fruits	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	1	2.78
4	Milk	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	1	2.78
5	Meat	0	0.00	0	0.00	0	0.00	1	16.67	0	0.00	0	0.00	1	2.78

Farming constraints: The data regarding farming constraints experienced by households in Hatti-2 micro-watershed is presented in Table 51. The results indicated that, lower

fertility status of the soil was the constraint experienced by 36.11 per cent of the households, wild animal menace on farm field (52.78%), frequent incidence of pest and diseases (44.44%), inadequacy of irrigation water (16.67%), high cost of fertilizers and plant protection chemicals (19.44%), high rate of interest on credit and lack of marketing facilities in the area (22.22%), low price for the agricultural commodities (41.67%), inadequate extension services (22.22%), lack of transport for safe transport of the agricultural produce to the market (27.78%), less rainfall (61.11%) and Source of Agri-technology information (30.56%).

Table 51. Farming constraints Experienced in Hatti-2 micro-watershed

Sl. No.	Particulars	MF (7)		SF (11)		SMF (6)		MDF (6)		LF (1)		All (36)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	5	71.43	2	18.18	5	83.33	1	16.67	0	0	13	36.11
2	Wild animal menace on farm field	5	71.43	5	45.45	2	33.33	6	100	1	100	19	52.78
3	Frequent incidence of pest and diseases	2	28.57	6	54.55	3	50	4	66.67	1	100	16	44.44
4	Inadequacy of irrigation water	1	14.29	2	18.18	2	33.33	1	16.67	0	0	6	16.67
5	High cost of Fertilizers and plant protection chemicals	1	14.29	3	27.27	2	33.33	1	16.67	0	0	7	19.44
6	High rate of interest on credit	0	0	5	45.45	2	33.33	0	0	0	0	7	19.44
7	Low price for the agricultural commodities	2	28.57	4	36.36	5	83.33	4	66.67	0	0	15	41.67
8	Lack of marketing facilities in the area	4	57.14	1	9.09	2	33.33	0	0	1	100	8	22.22
9	Inadequate extension services	0	0	4	36.36	2	33.33	2	33.33	0	0	8	22.22
10	Lack of transport for safe transport of the Agril produce to the market.	2	28.57	4	36.36	2	33.33	2	33.33	0	0	10	27.78
11	Less rainfall	5	71.43	8	72.73	3	50	5	83.33	1	100	22	61.11
12	Source of Agri-technology information(Newspaper/TV/Mobile)	3	42.86	3	27.27	2	33.33	2	33.33	1	100	11	30.56

Chapter 5

SUMMARY

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 36 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 101 (53.44%) men and 88 (46.56%) women among the sampled households. The average family size of landless farmers' was 4.8, marginal farmers' was 5.42, small farmers' was 5.27, semi medium farmers' was 4.83, medium farmers' was 4.83 and large farmers' was 11. The data indicated that, 42 (22.22%) people were in 0-15 years of age, 90 (47.62%) were in 16-35 years of age, 42 (22.22%) were in 36-60 years of age and 15 (7.94%) were above 61 years of age.

The results indicated that Hatti-2 had 31.75 per cent illiterates, 26.98 per cent of them had primary school education, 9.52 per cent of them had middle school education, 13.76 per cent of them had high school education, 6.88 per cent of them had PUC education, 0.53 per cent had ITI, 4.76 per cent of them had degree and 0.53 per cent of them did masters.

The results indicate that, 61.11 per cent of household heads were practicing agriculture and 33.33 per cent of the household heads were agricultural labourers. The results indicate that agriculture was the major occupation for 36.51 per cent of the household members, 30.69 per cent were agricultural labourers, 1.59 per cent were general labourers, 1.06 per cent were in private service, 0.53 per cent was into trade and business, 22.75 per cent were students and 4.76 per cent were children.

The results show that, 0.53 per cent of the households participated in sthree shakthi sangha and 99.47 per cent of the population in the micro watershed has not participated in any local institutions.

The results indicate that 5.56 per cent of the households possess thatched house, 58.33 per cent of the households possess katcha house, 19.44 per cent of them possess pucca/RCC house and 16.67 per cent of the households possess semi pucca house.

The results show that 77.78 per cent of the households possess TV, 88.89 per cent of them possess mixer/grinder, 2.78 per cent of them possess bicycle, 30.56 per cent of the households possess motor cycle and 80.56 per cent of the households possess mobile phones. The results show that the average value of television was Rs. 7,428, mixer grinder was Rs. 2,296, bicycle was Rs. 2,000, motor cycle was Rs. 40,416 and mobile phone was Rs. 2,526.

About 13.89 per cent of the households possess bullock cart, 5.56 per cent of them possess plough, 2.78 per cent of them possess seed/fertilizer drill, 2.78 per cent of them possess irrigation pump, 13.89 per cent of them possess sprayer, 2.78 per cent of them possess sprinkler and 69.44 per cent of them possess weeder. The results show that the average value of bullock cart was Rs. 24,000, plough was Rs. 1,850, seed/fertilizer drill was Rs.3,500, irrigation pump was Rs. 10,000, sprayer was Rs. 2,060, sprinkler was Rs.800 and weeder was Rs. 49.

The results indicate that, 27.78 per cent of the households possess bullocks, 36.11 per cent of the households possess local cow, 5.56 per cent of them possess crossbred cow, 8.33 per cent possess buffalo, 2.78 per cent possess sheep, 2.78 per cent possess goat and 2.78 per cent of them possess poultry birds.

The results indicate that, average own labour men available in the micro watershed was 1.68, average own labour (women) available was 1.39, average hired labour (men) available was 14.26 and average hired labour (women) available was 11.19. The results indicate that 77.78 per cent of the households opined that the hired labour was adequate.

The results indicate that, households of the Hatti-2 micro-watershed possess 27.87 ha (52.35%) of dry land and 25.37 ha (47.65%) of irrigated land. Marginal farmers possess 4.08 ha (90%) of dry land and 0.45 ha (10%) of irrigated land. Small farmers possess 11.47 ha (83.04%) of dry land and 2.34 ha (16.96%) of irrigated land. Semi medium farmers possess 6.65 ha (60.87%) of dry land and 4.28 ha (39.13%) of irrigated land. Medium farmers possess 5.67 ha (30.30%) of dry land and 13.03 ha (69.70%) of irrigated land. Large farmers possess 5.26 ha (100%) of irrigated land.

The results indicate that, the average value of dry land was Rs. 390,981.70 and the average value of irrigated land was Rs. 327,074.22. In case of marginal famers, the average land value was Rs. 710,615.08 for dry land and Rs. 882,142.85 for irrigated land. In case of small famers, the average land value was Rs. 461,926.60 for dry land and Rs. 255,960.68 for irrigated land. In case of semi medium famers, the average land value was Rs. 255,413.62 for dry land and Rs. 397,256.38 for irrigated land. In case of medium farmers, the average land value was Rs. 176,428.57 for dry land and Rs. 276,149.07. In case of large farmers the average land value was Rs. 380,000.

The results indicate that, there were 12 functioning and 2 de-functioning bore wells in the micro watershed. The results indicate that, there were 2 functioning and 1 de-functioning open wells in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 33.33 per cent and open well was the source of irrigation for 5.56 per cent of the farmers. The results indicate that, the depth of bore well was found to be 40.40 meters and the depth of open well was found to be 8.81 per cent.

The results indicate that small, semi medium, medium and large farmers had an irrigated area of 3.25 ha, 6.10 ha, 12.96 ha and 5.26 ha respectively. The results indicate that, farmers have grown maize (22.99 ha), bajra/pearl millet/sajje (19.03 ha), groundnut (6.57 ha), redgram (3.64 ha) and navane (0.81 ha). Marginal farmers had grown maize and bajra. Small and semi medium farmers had grown maize, bajra and groundnut. Medium farmers had grown maize, bajra, redgram, groundnut and navane. Large farmers had grown maize, bajra and groundnut. The results indicate that small, semi medium, medium and large farmers had an irrigated area of 3.25 ha, 6.10 ha, 12.96 ha and 5.26 ha respectively.

The results indicate that, farmers have grown maize (22.99 ha), bajra/pearl millet/sajje (19.03 ha), groundnut (6.57 ha), redgram (3.64 ha) and navane (0.81 ha). Marginal farmers had grown maize and bajra. Small and semi medium farmers had grown maize, bajra and groundnut. Medium farmers had grown maize, bajra, redgram, groundnut and navane. Large farmers had grown maize, bajra and groundnut. The results indicate that, the cropping intensity in Hatti-2 micro-watershed was found to be 66.22 per cent.

The results indicate that, the total cost of cultivation for maize was Rs. 31242.91. The gross income realized by the farmers was Rs. 76824.86. The net income from maize cultivation was Rs. 45581.96. Thus the benefit cost ratio was found to be 1:2.46. The total cost of cultivation for navane was Rs. 19242.89. The gross income realized by the farmers was Rs. 44460. The net income from navane cultivation was Rs. 25217.11. Thus the benefit cost ratio was found to be 1:2.31. The total cost of cultivation for redgram was Rs. 29582.79. The gross income realized by the farmers was Rs. 59280. The net income from redgram cultivation was Rs. 29697.21. Thus the benefit cost ratio was found to be 1:2. The total cost of cultivation for groundnut was Rs. 19973.19. The gross income realized by the farmers was Rs. 44460. The net income from groundnut cultivation was Rs. 24486.81. Thus the benefit cost ratio was found to be 1:2.23. The total cost of cultivation for bajra was Rs. 53039.21. The gross income realized by the farmers was Rs. 45570.78. The net income from bajra cultivation was Rs. -7468.43. Thus the benefit cost ratio was found to be 1:0.86.

The results indicate that, 44.44 per cent of the households opined that dry fodder was adequate, 5.56 per cent of them opined that dry fodder was inadequate and 52.78 per cent opined that green fodder was adequate.

The results indicate that the annual gross income was Rs. 29,000 for landless farmers, for marginal farmers it was Rs. 40,428.57, for small farmers it was Rs. 61,181.82, for semi medium farmers it was Rs. 83,000, for medium farmers it was Rs. 105,666.67 and for large farmers it was Rs. 355,800.

The results indicate that, 44.44 per cent of the households opined that dry fodder was adequate, 5.56 per cent of them opined that dry fodder was inadequate and 52.78 per cent opined that green fodder was adequate.

The results indicate that the annual gross income was Rs. 29,000 for landless farmers, for marginal farmers it was Rs. 40,428.57, for small farmers it was Rs. 61,181.82, for semi medium farmers it was Rs. 83,000, for medium farmers it was Rs. 105,666.67 and for large farmers it was Rs. 355,800.

The results indicate that the average annual expenditure is Rs. 10,202.65. For landless households it was Rs. 3,120, for marginal farmers it was Rs. 3,394.56, for small farmers it was Rs. 2,833.33, for semi medium farmers it was Rs. 10,222.22, for medium farmers it was Rs. 10,888.89 and for large farmers it was Rs. 170,100.

The results indicate that, sampled households have grown 105 coconut trees, 20 lemon trees and 69 mango trees in their field. The results indicate that, households have planted 202 neem trees, 22 tamarind trees, 2 acacia trees and 2 banyan trees in their field.

The results indicated that, households have an average investment capacity of Rs. 1,527.78 for land development, Rs. 388.89 for irrigation facility, Rs. 972.22 for improved crop production and Rs. 388.89 for orchard development/maintenance. The results indicated that loan from bank was the source of additional investment for 13.89 per cent for land development, for 5.56 per cent for irrigation facility, for 16.67 per cent for improved crop production and for 8.33 per cent for orchard development/maintenance. Soft loan was the source of additional investment capacity for 2.78 per cent of the households for land development.

The results indicated that, bajra, groundnut and maize were sold to the extent of 100 per cent. Navane was sold to the extent of 71.43 per cent and redgram was sold to the extent of 64 per cent. The results indicated that, about 13.89 per cent of the farmers sold their produce to agent/traders, 86.11 per cent of the farmers sold their produce to local/village merchants, 30.56 per cent of the farmers sold their produce to regulated market and 5.56 per cent of them sold their produce through cooperative marketing society. The results indicated that, 50 per cent of the households used cart, 2.78 per cent of them used truck and 83.33 per cent of them used tractor as a mode of transportation.

The results indicated that, 19.44 per cent of the households have experienced soil and water erosion problems in the farm. The results indicated that, 19.44 per cent have shown interest in soil test.

The results indicated that, 83.33 per cent of the households used firewood and 13.89 per cent of the households used LPG as a source of fuel. The results indicated that, piped supply was the major source of drinking water for 80.56 per cent of the households, bore well was the source of drinking water for 11.11 per cent, open well was the source of

drinking water for 2.78 per cent and lake/tank was the source of drinking water for 2.78 per cent of the households in micro watershed.

Electricity was the major source of light for 97.22 per cent of the households in micro watershed. The results indicated that, 30.56 per cent of the households possess sanitary toilet facility. The results indicated that, 97.22 per cent of the sampled households possessed BPL card. The results indicated that, 63.89 per cent of the households participated in NREGA programme.

The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 63.89 per cent, oilseeds were adequate for 5.56 per cent, vegetables were adequate for 8.33 per cent, fruits were adequate for 2.78 per cent, milk was adequate for 47.22 per cent, eggs were adequate for 33.33 per cent and meat was adequate for 22.22 per cent.

The results indicated that, pulses were in adequate for 33.33 per cent of the households, oilseeds were inadequate for 50 per cent, vegetables were inadequate for 75 per cent, fruits were inadequate for 88.89 per cent, milk was inadequate for 47.22 per cent, eggs were inadequate for 61.11 per cent and meat was inadequate for 55.56 per cent of the households.

The results indicated that, oilseeds were market surplus for 41.67 per cent of the households, vegetables were market surplus for 8.33 per cent of the households, fruits were market surplus for 2.78 per cent of the households, milk was market surplus for 2.78 per cent of the households and meat was market surplus for 2.78 per cent of the households.

The results indicated that, lower fertility status of the soil was the constraint experienced by 36.11 per cent of the households, wild animal menace on farm field (52.78%), frequent incidence of pest and diseases (44.44%), inadequacy of irrigation water (16.67%), high cost of fertilizers and plant protection chemicals (19.44%), high rate of interest on credit and lack of marketing facilities in the area (22.22%), low price for the agricultural commodities (41.67%), inadequate extension services (22.22%), lack of transport for safe transport of the agricultural produce to the market (27.78%), less rainfall (61.11%) and Source of Agri-technology information (30.56%).