ICAR-NBSS&LUP Sujala MWS Publ.129

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

DADDEGALLU-2 (4D4A1T1f) MICRO WATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

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

Citation: Rajendra Hegde, Ramesh Kumar, S.C., K.V. Niranjana, S. Srinivas, M.Lalitha, B.A. Dhanorkar, R.S. Reddy and S.K. Singh (2019). “Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of Daddegallu-2 (4D4A1T1f) Microwatershed, Koppal Taluk and District, Karnataka”, ICAR-NBSS&LUP Sujala MWS Publ.129, ICAR – NBSS & LUP, RC, Bangalore. p.97 & 35.

TO OBTAIN COPIES,

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

Amaravati Road, NAGPUR - 440 033, India

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

Telefax : 0712-2522534

E-Mail : director@nbsslup.ernet.in

Website URL : nbsslup.in

Or

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

Phone : (080) 23412242, 23510350 (O)

Telefax : 080-23510350

E-Mail : nbssrcb@gmail.com

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

DADDEGALLU-2 (4D4A1T1f) MICRO WATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

Sujala-III

World Bank funded Project

THE WORLD BANK

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT, GOVT. OF KARNATAKA, BANGALORE

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 Daddegallu-2 microwatershed in Koppal Taluk and District, Karnataka" for integrated development was taken up in collaboration with the State Agricutural Universities, IISC, KSRSAC, KSNDMC as Consortia partners. The project provides detailed land resource information at cadastral level (1:7920 scale) for all the plots and socio-economic status of farm households covering thirty per cent farmers randomely selected representing landed and landless class of farmers in the micro-watershed. The project report with the accompanying maps for the microwatershed will provide required detailed database for evolving effective land use plan, alternative land use options and conservation plans for the planners, administrators, agricutural extention personnel, KVK officials, developmental departments and other land users to manage the land resources in a sustainable manner.

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

Nagapur
Date: 13.12.2018

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

Contributors

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

Laboratory Analysis	
Dr. M. Lalitha	Ms. Thara, V.R.
Smt. Arti Koyal	Ms. Roopa, G.
Smt. Parvathy, S.	Ms. Vindhya, N.G.
	Ms. Shwetha N.K.
	Ms. Pavana Kumari, P.
	Ms. Leelavathy, K.U.
	Ms. Rashmi, N.
	Ms. Padmaja, S.
	Ms. Veena, M.
	Ms. Chaithrashree B
	Ms. Shwetha N
Socio-economic Analysis	
Dr. Ramesh Kumar, S.C.	Sh. M. K. Prakashanaik
	Ms. Shraddha Hegde
	Mrs. Sowmya A N
	Sh. Basavaraj
	Sh. Vinod, R.
	Ms. Sowmya K.B
	Mrs. Prathibha, D.G
	Sh. Rajendra,D
Soil & Water Conservation	
Sh. Sunil P. Maske	
Watershed Development Department, GOK, Bangalore	
Sh. Rajeev Ranjan IFS Project Director & Commissioner, WDD	Dr. A. Natarajan NRM Consultant, Sujala-III Project
Dr. S.D. Pathak IFS Executive Director & Chief Conservator of Forests, WDD	

PART-A

LAND RESOURCE INVENTORY

Contents

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The land resource inventory of Daddegallu-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 514 ha in Koppal taluk and district, Karnataka. The climate is semiarid and categorized as drought - prone with an average annual rainfall of 662 mm, of which about 424 mm is received during south–west monsoon, 161 mm during north-east and the remaining 77 mm during the rest of the year. An area of about 99 per cent is covered by soils, <1 per cent by water bodies, settlements and others. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 5 soil series and 9 soil phases (management units) and 3 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 8 per cent of the soils are shallow (25-50 cm), 21 per cent are moderately shallow (50-75 cm), 24 per cent of the soils are moderately deep (75-100 cm), about 27 per cent are deep soils (100-150 cm) and 18 per cent area are very deep (>150 cm) in soils.*
- *Entire area of the microwatershed has clayey soils at the surface.*
- *About 80 per cent of the area has non-gravelly (<15%) soils and 19 per cent gravelly soils (15-35 % gravel) soils.*
- *About 30 per cent are low (51-100 mm/m), 24 per cent are medium (101-150 mm/m), 45 per cent are very high (151-200 mm/m) in available water capacity.*

- *About <1 per cent area has nearly level (0-1%), 99 per cent area has very gently sloping (1-3%) lands.*
- *An area of about 91 per cent has soils that are slightly eroded (e1) and 9 per cent moderately eroded (e2) lands.*
- *An area of about 59 per cent are strongly alkaline (pH 7.3 to 9.0) and 40 per cent are very strongly alkaline (pH >9.0).*
- *The Electrical Conductivity (EC) of all the soils is <2 dS m^{-1} and as such the soils are non-saline.*
- *Organic carbon content is low (<0.5%) in about 63 per cent and 37 per cent of the soils are medium (0.5-0.75%) in organic carbon.*
- *All the soils of the microwatershed are low (<23 kg/ha) in available phosphorous content.*
- *All the soils of the microwatershed are high (>337 kg/ha) in available potassium content.*
- *Available sulphur is low (<10 ppm) in about 80 per cent, medium (10-20 ppm) in 19 per cent and about <1 per cent area is high (>20 ppm).*
- *Available boron is low (0.5 ppm) in about 8 per cent area, 86 per cent area is medium (0.5-1.0 ppm) and high (>1.0 ppm) in about 5 per cent.*
- *Available iron is sufficient (>4.5 ppm) in 34 per cent and deficient (<4.5 ppm) in 66 per cent area.*
- *Available zinc is deficient (<0.6 ppm) in 74 per cent and sufficient (>0.6 ppm) in about 25 per cent area.*
- *Available manganese and copper are sufficient in all the soils.*
- *The land suitability for 28 major crops grown in the microwatershed were assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*315 (61)*	*153 (30)*		*Pomegranate*	-	*358 (70)*
Maize	-	-		*Guava*	-	-
Bajra	-	-		*Jackfruit*	-	-
Red gram	-	*357 (70)*		*Jamun*	-	*232 (45)*
Bengalgram	*357 (70)*	*110 (21)*		*Musambi*	*190 (37)*	*168 (33)*
Groundnut	-	-		*Lime*	*190 (37)*	*168 (33)*
Sunflower	*190 (37)*	*168 (33)*		*Cashew*	-	-
Cotton	*357 (70)*	*110 (21)*		*Custard apple*	*357 (70)*	*110 (21)*
Chilli	-	-		*Amla*	-	*467 (91)*
Tomato	-	-		*Tamarind*	-	*232 (45)*
Drumstick	-	*358 (70)*		*Marigold*	-	*468 (91)*
Mulberry	-	*265 (52)*		*Chrysanthemum*	-	*468 (91)*
Mango	-	-		*Jasmine*	-	*110 (21)*
Sapota	-	-		*Crossandra*	-	*233 (45)*

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 3 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 that helps in maintaining productivity and ecological balance in the microwatershed.

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

Chapter 1

INTRODUCTION

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

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

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

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

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

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

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

The land resource inventory aims to provide site specific database for Daddegallu-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 Daddegallu-2 microwatershed is located in the central part of northern Karnataka in Koppal Taluk, Koppal District, Karnataka State (Fig. 2.1). It comprises of Yathnatti, Halageri and Madhinura villages. It lies between $15^0$22' – $15^0$24' North latitudes and $75^0$7'–$76^0$5' East longitudes and covers an area of 514 ha. It is surrounded by Yathnatti village on the north, south and east, Halageri village on the west and madinura village on the northern side.

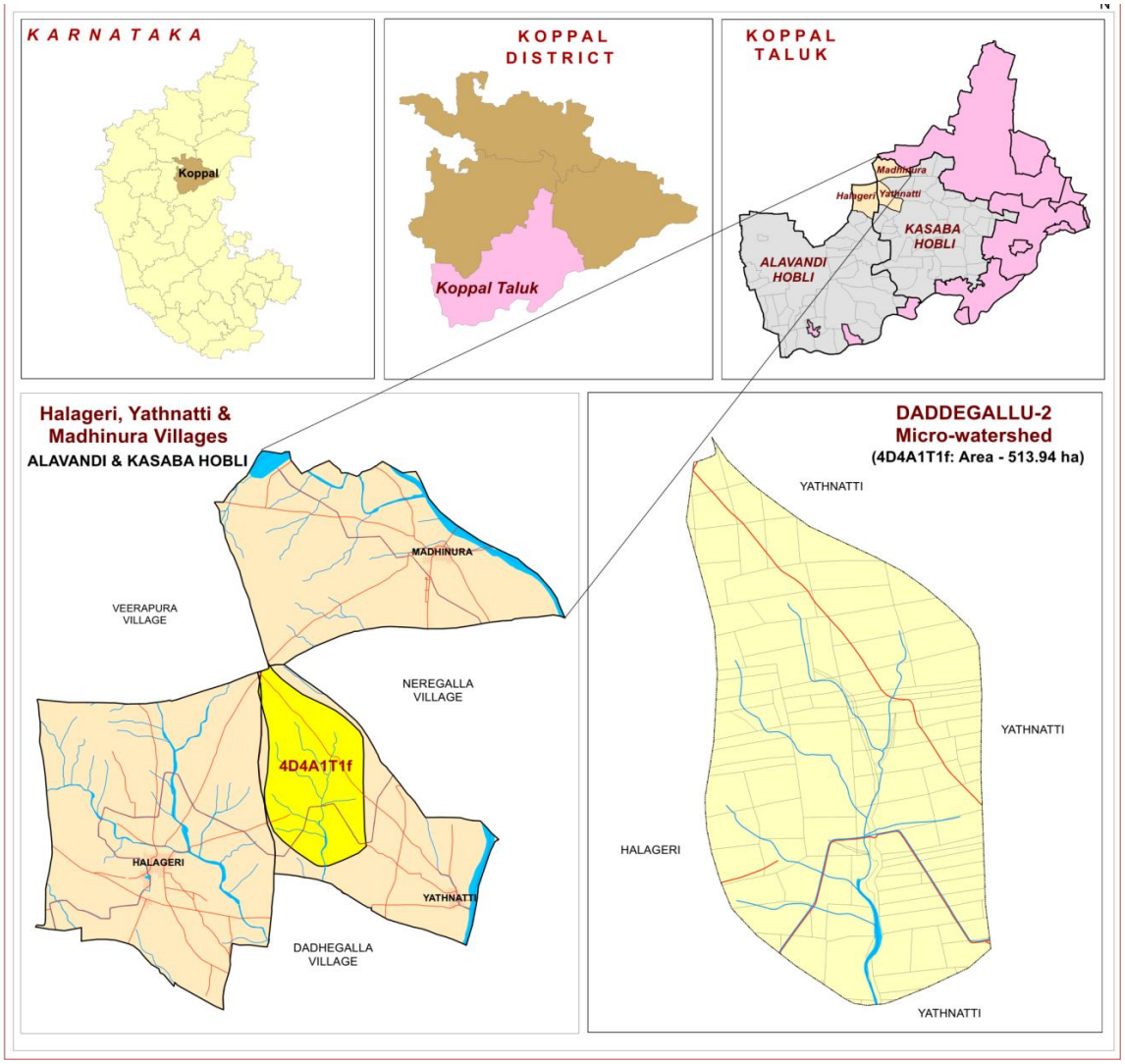


Fig. 2.1 Location map of Daddegallu-2 Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are alluvium (Figs. 2.2). The soil thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig. 2.2 Alluvium

2.3 Physiography

Physiographically, the area has been identified as Alluvial landscape based on geology. The microwatershed area has been further divided into summits very gently sloping uplands and nearly level plains based on slope and its relief features. The elevation ranges from 524 to 560 m in the gently sloping uplands.

2.4 Drainage

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

2.5 Climate

The district falls under semiarid tract of the state and is categorized as drought-prone with an average annual rainfall of 662 mm (Table 2.1). Maximum of 424 mm precipitation takes place during the south-west monsoon period from June to September, north-east monsoon contributes about 161 mm and prevails from October to early December and the remaining 77 mm takes place during the rest of the year. The winter season is from December to February. During April and May, the temperatures reach up to 45 °C and in December and January, the temperatures will go down to 16 °C. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo-ranspiration (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**	

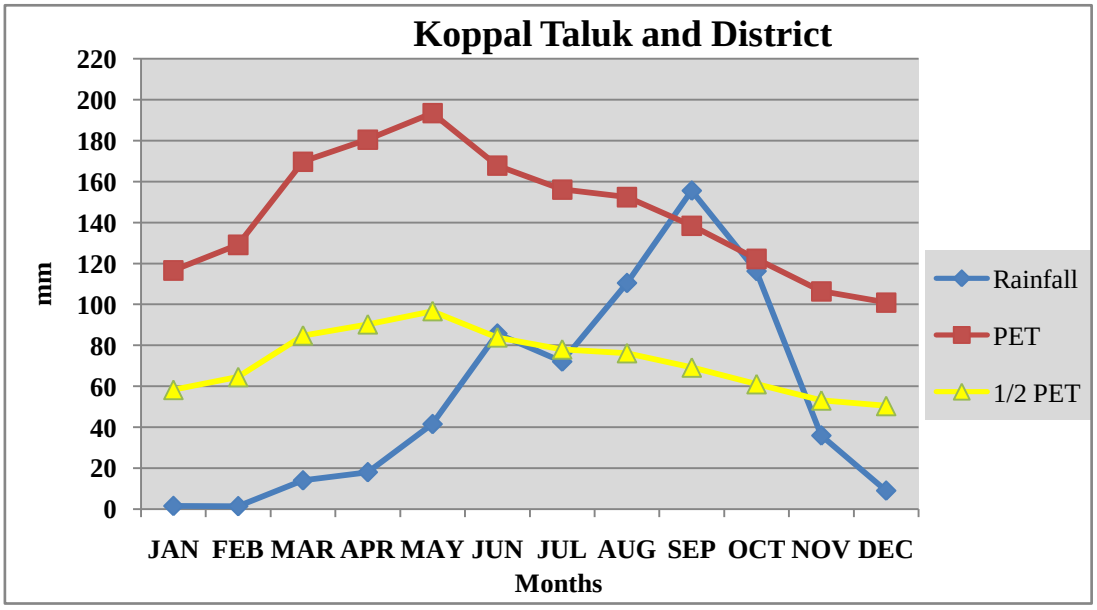


Fig. 2.3 Rainfall distribution in Koppal Taluk and District

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 Daddegallu-2 microwatershed

2.7 Land Utilization

About 91 per cent area (Table 2.2) in Koppal district is cultivated at present and about 16 per cent of the area is sown more than once. The cropping intensity is 118 per cent. An area of about 3 per cent is currently barren. Forests occupy a small area of about 5 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, bajra, cotton, safflower, sunflower, red gram, horse gram, onion, mulberry, pomegranate, sugarcane, bengalgram and groundnut (Fig 2.6 a & b). 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 Daddegallu-2 microwatershed is presented in Fig. 2.5.

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

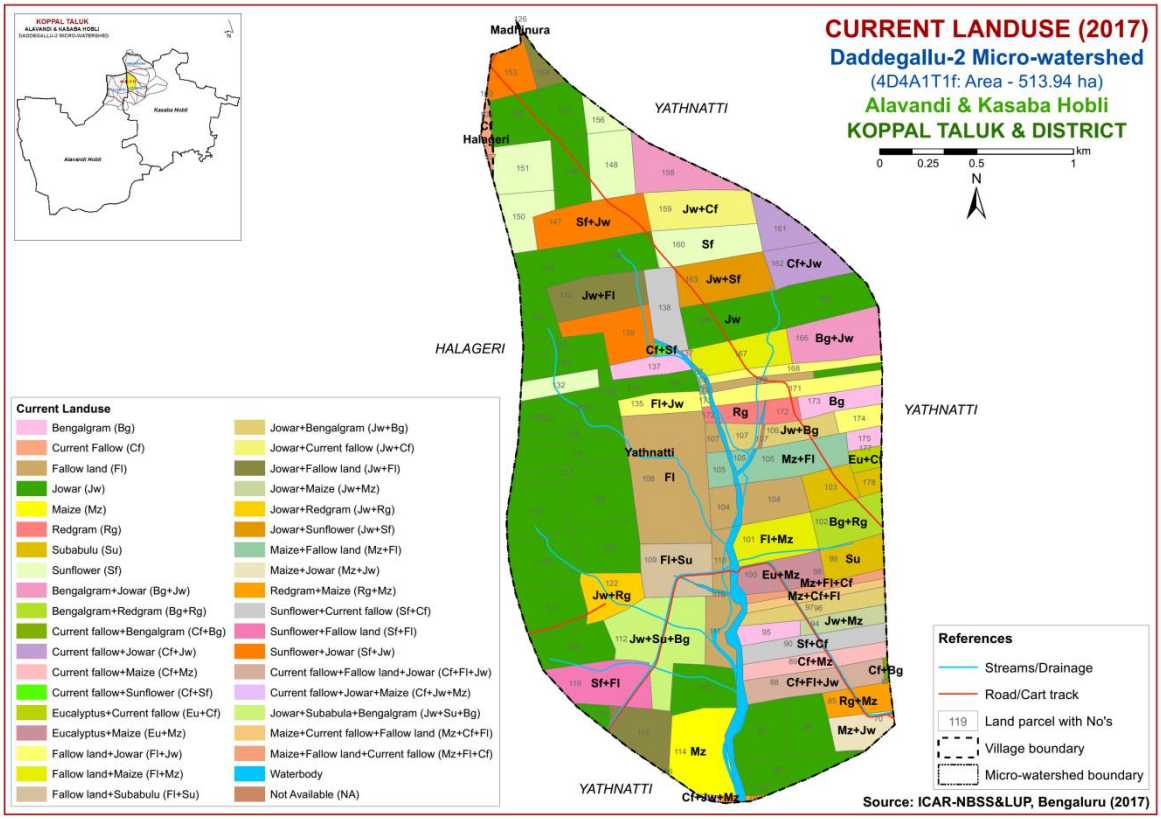


Fig. 2.5 Current Land Use – Daddegallu-2 Microwatershed

Fig. 2.6 (a) Different crops and cropping systems in Daddegallu-2 Microwatershed

Fig. 2.6 (b) Different crops and cropping systems in Daddegallu-2 Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly to a given level of management. This was achieved in Daddegallu-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 514 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

DSe Alluvial landscape

DSe 1 Summit

DSe 11 Nearly level Summit with dark grey tone

DSe 12 Nearly level Summit with medium grey tone

DSe 13 Nearly level Summit with whitish grey tone

DSe 14 Nearly level Summit with whitish tone (Calcareousness)

DSe 15 Nearly level Summit with pinkish grey tone

DSe 16 Nearly level Summit with medium pink tone

DSe 17 Nearly level Summit with bluish white tone

DSe 18 Nearly level Summit with greenish grey tone

DSe 2 Very genetly sloping

DSe 21 Very gently sloping, whitish tone

DSe 22 Very gently sloping, greyish pink tone

DSe 23 Very gently sloping, whitish grey tone

DSe 24 Very gently sloping, medium grey tone

DSe 25 Very gently sloping, medium pink tone

DSe 26 Very gently sloping, dark grey tone

DSe 27 Very gently sloping, bluish grey tone

DSe 28 Very gently sloping, greenish grey tone

DSe 29 Very gently sloping, Pinkish grey

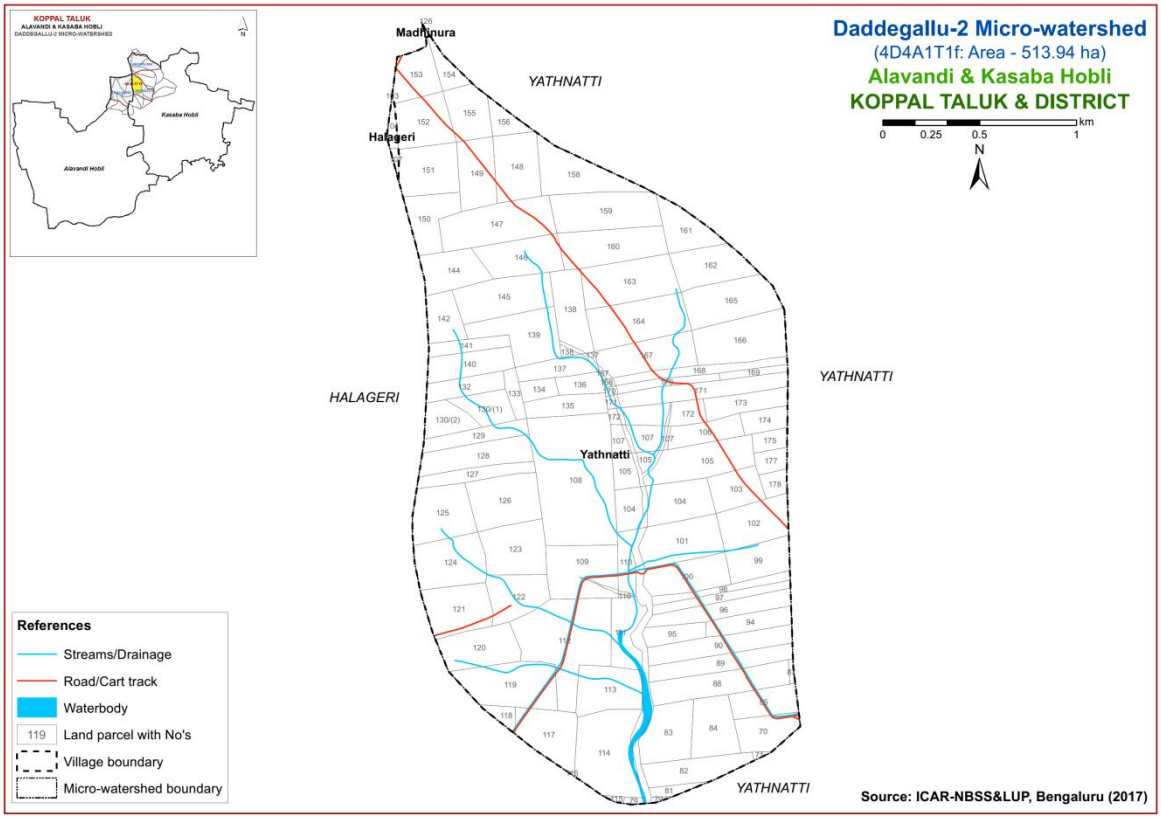


Fig. 3.1 Scanned and Digitized Cadastral map of Daddegallu-2 Microwatershed

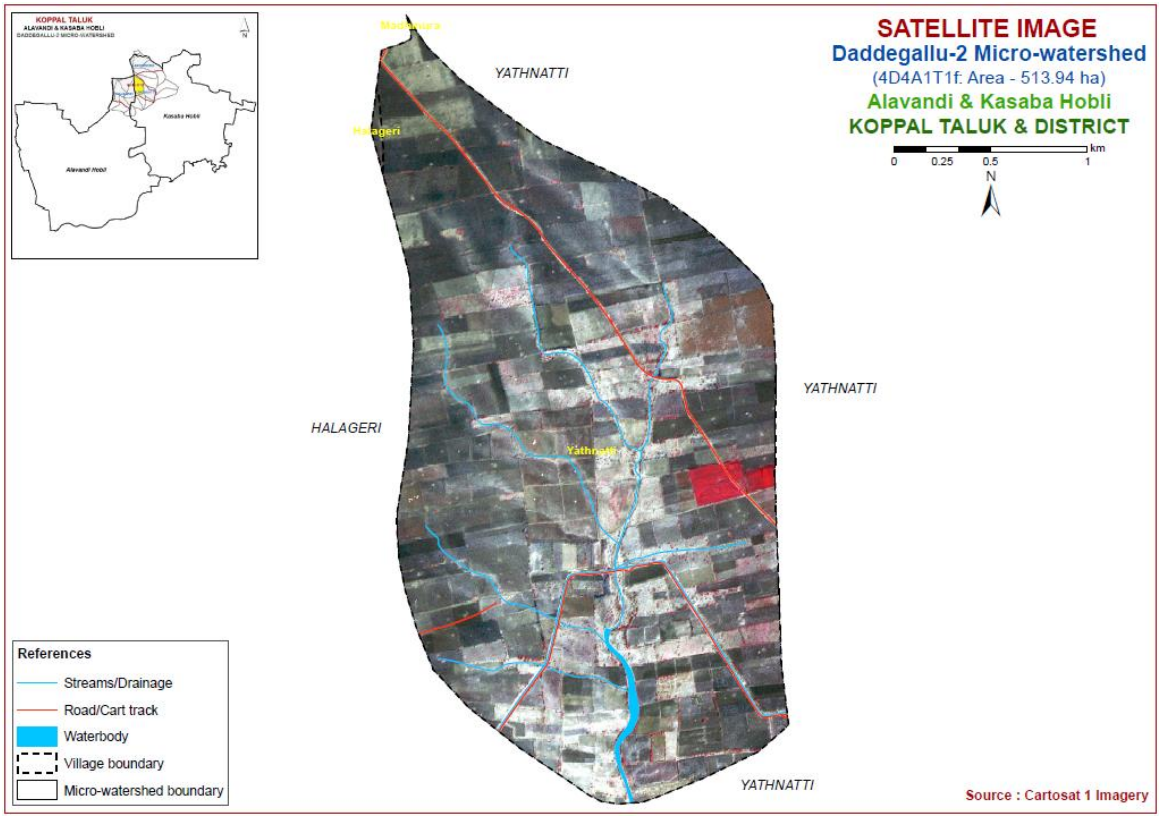


Fig. 3.2 Satellite Image of Daddegallu-2 Microwatershed

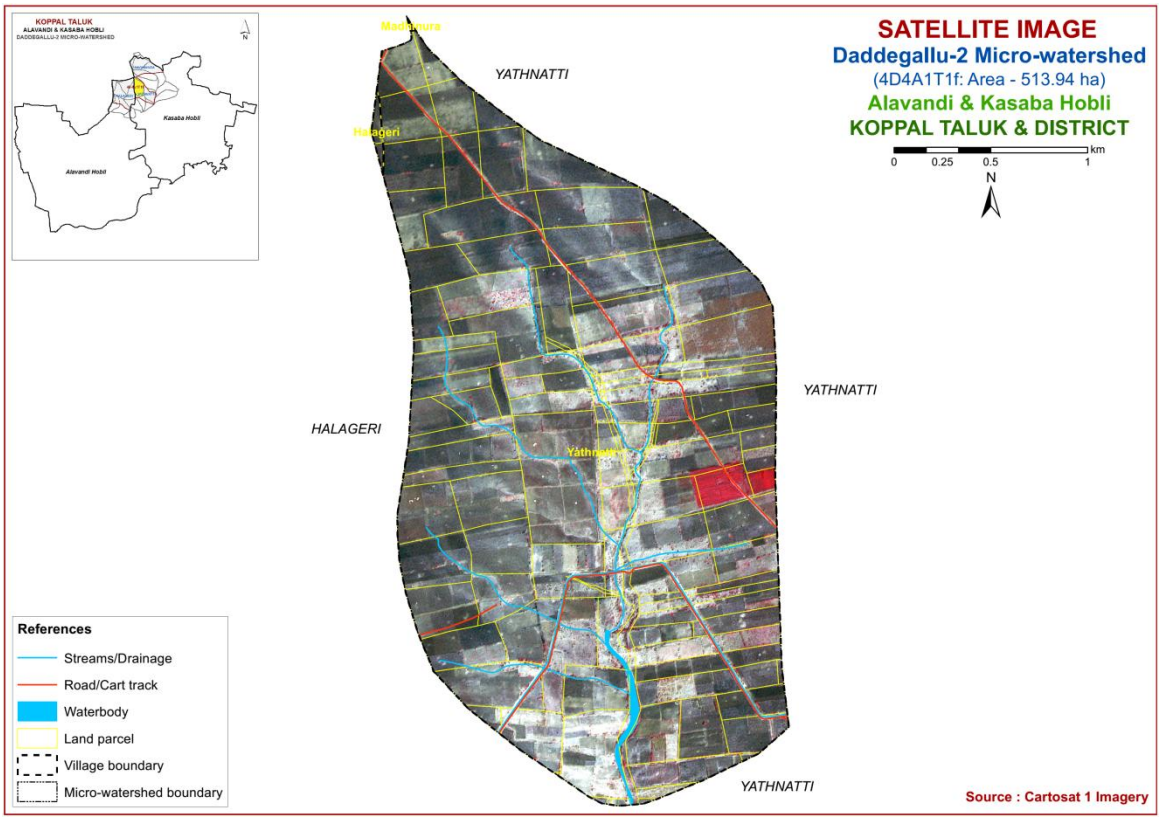


Fig. 3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Daddegallu-2 Microwatershed

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).

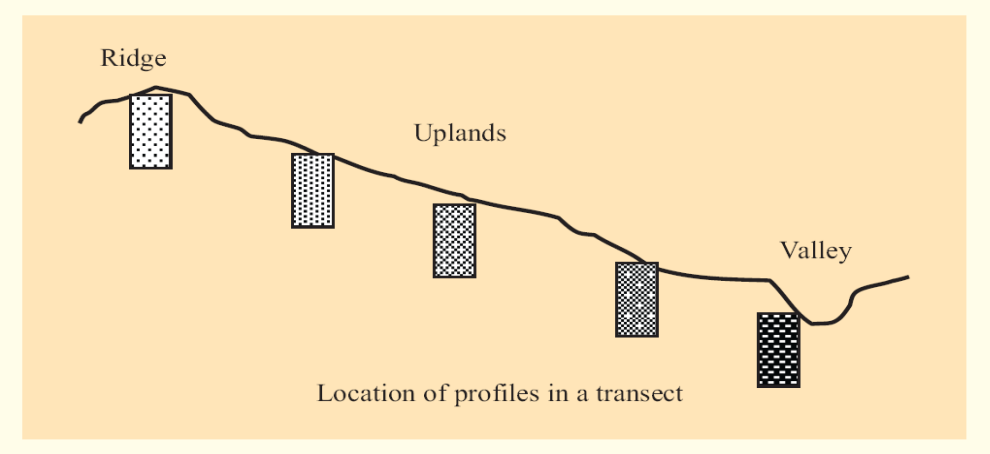


Fig. 3.4 Location of profiles in a transect

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, soil profiles (vertical cut showing the soil layers from surface to the rock) were opened upto 200 cm or to the depth limited by rock or hard substratum and studied in detail for all their morphological and physical characteristics. The soil and site characteristics were recorded for all profile sites on a standard proforma as per the guidelines given in USDA Soil Survey Manual (Soil Survey Staff, 2012). Apart from the transect study, profiles were also studied at random, almost like in a grid pattern, outside the transect areas to validate the soil map unit boundaries.

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, 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, 5 soil series were identified in Daddegallu-2 Microwatershed.

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

Soils of Alluvial landscape							
Sl. No	**Soil Series**	**Depth (cm)**	**Colour (moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcareo-usness**
1	Muttal (MTL)	25-50	10YR3/2,3/3,4/2, 7.5YR3/2,3/3,6/4	gc	15-35	Ap-Bw-Ck	e-ev
2	Ravanaki (RNK)	50-75	7.5YR3/2,3/3,5/2,5/3, 10YR3/1,3/2,4/1,4/2,5/1,6/1	c	<15	Ap-Bw-Cr	e-ev
3	Narasapura (NSP)	75-100	10 YR 3/1, 3/2, 4/2,	c		Ap-Bw-Cr	e-es
4	Handrala (HDL)	100-150	10 YR 2/1, 3/1,4/1,	c	-	Ap-Bw-Ck	es
5	Bardur (BDR)	>150	10YR 2/1, 3/1, 3/2,	c	<15	Ap-Bss	-

3.4 Soil Mapping

The area under each soil series was further separated into 9 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 soil map (Fig. 3.5) in the form of symbols. During the survey many soil profile pits, few minipits and a few auger bores representing different landforms occurring in the microwatershed were studied. In addition to the profile study, spot observations in the form of minipits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map. The soil map shows the geographic distribution of 9 mapping units representing 5 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2. The soil phase map (management units) shows the distribution of 9 phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

3.5 Laboratory Characterization

Soil samples for each soil series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2017 from Daddegallu-2 farmer's fields (53 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 Daddegallu-2 Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Alluvial landscape				
	MTL	Muttal soils are shallow (25-50 cm), well drained, have very dark grayish brown to dark brown, calcareous black gravelly sandy clay to clay soils occurring on nearly level to gently sloping plains under cultivation		**43 (8.33)**
307		MTLmB1	Clay surface, slope 1-3%, slight erosion	43(8.33)
	RNK	Ravanaki soils are moderately shallow (50-75 cm), moderately well drained, have dark brown to very dark grayish brown and dark gray, calcareous clay black soils occurring on nearly level to very gently sloping plains under cultivation		**110 (21.4)**
333		RNKmB1	Clay surface, slope 1-3%, slight erosion	53(10.23)
334		RNKmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	13 (2.62)
337		RNKmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	44 (8.55)
	NSP	Narasapura soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown and very dark gray, black, calcareous, cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**125 (24.27)**
360		NSPmB1	Clay surface, slope 1-3%, slight erosion	125(24.27)
	HDL	Handrala soils are deep (100-150 cm), moderately well drained, have dark gray to very dark gray, black, calcareous, cracking clay soils occurring on very gently sloping plains under cultivation		**141 (27.3)**
380		HDLmB1	Clay surface, slope 1-3%, slight erosion	98 (19.01)
381		HDLmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	43 (8.29)
	BDR	Bardur soils are very deep (>150 cm), moderately well drained, have very dark grayish brown to very dark gray, black, calcareous, cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**92 (17.98)**
428		BDRmA1	Clay surface, slope 0-1%, slight erosion	0(0.02)
430		BDRmB1	Clay surface, slope 1-3%, slight erosion	92(17.96)
1000	Others		Habitaion and waterbody	**4 (0.72)**

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

3.6 Land Use Classes

The 9 soil phases identified and mapped in the microwatershed were regrouped into 3 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 choosen for identification and delineation of LUCs. For Daddegallu-2 microwatershed, five soil and site characteristics, namely 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.

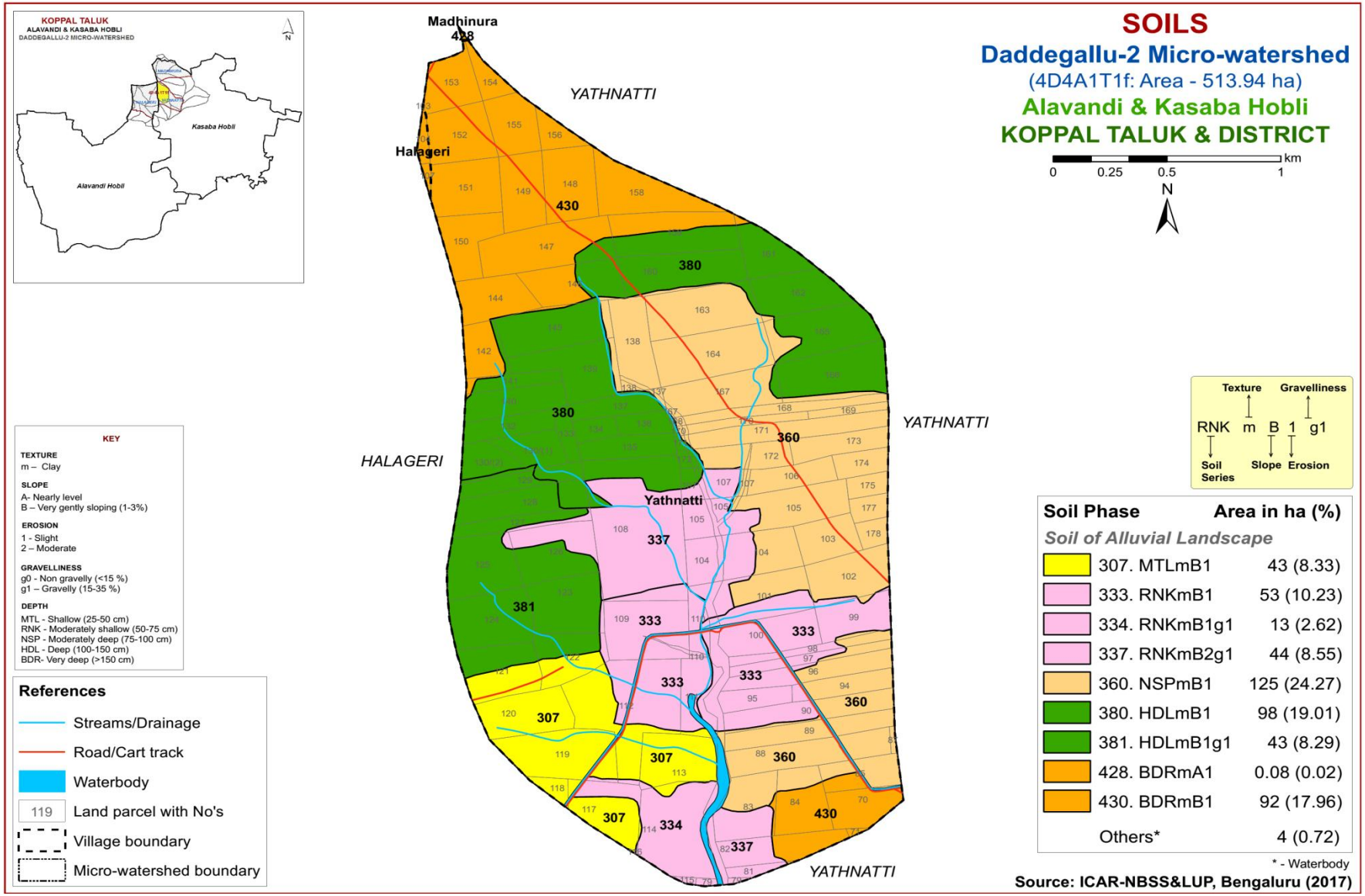


Fig 3.5 Soil Phase or Management Units-Daddegallu-2 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Daddegallu-2 microwatershed is provided in this chapter. The microwatershed area has been identified as alluvial landscape based on geology. In all, 5 soil series are identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by the parent material, climate, time and relief.

A brief description of each of the 5 soil series identified followed by 9 soil phases (management units) mapped (Fig. 3.4) are furnished below. The physical and chemical characteristics of soil series identified in Daddegallu-2 microwatershed are given in Table 4.1. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Alluvial landscape

In this landscape, 5 soil series are identified and mapped. Of these, Handrala (HDL) series occupies maximum area of 141 ha (27%), Narasapura (NSP) 125 ha (24%), Ravanaki (RNK) 110 ha (21%), Bardur (BDR) 92 ha (18%) and Muttal (MTL) 43 ha (8%) area in the microwatershed. The brief description of each soil series along with the soil phases identified and mapped is given below.

4.1.1 Muttal (MTL) Series: Muttal soils are shallow (25-50 cm), well drained, have dark brown to very dark grayish brown, calcareous clay soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands. The Muttal series has been classified as a member of the clayey, mixed, isohyperthermic (Calc) family of (Paralithic) Haplustepts.

The thickness of the solum ranges from 30 to 50 cm. The thickness of A horizon ranges from 15 to 18 cm. Its colour is in 7.5 YR and 10 YR hue with value 2 to 3 and chroma 2.5 to 4. The texture varies from sandy clay to clay with 10 to 15 per cent gravel. The thickness of B horizon ranges from 18 to 32 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 6 and chroma 2 to 4. Its texture is sandy clay to clay. The available water capacity is low (50-100 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Muttal (MTL) Series

4.1.2 Ravanaki (RNK) Series Ravanaki soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark grayish brown, calcareous clay soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands. The Ravanaki series has been classified as a member of the very fine, smectitic, isohyperthermic (calc) family of Typic Haplustepts.

The thickness of the solum ranges from 50 to 75 cm. The thickness of A horizon ranges from 15 to 20 cm. Its colour is in 7.5 YR and 10 YR hue with value 2 to 3 and chroma 2.5 to 4. The texture varies from sandy clay to clay with 10 to 15 per cent gravel. The thickness of B horizon ranges from 35 to 60 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 6 and chroma 2 to 4. Its texture is sandy clay to clay with gravel content of 10 to 20 per cent. The available water capacity is low (51-100 mm/m). Three phases were identified and mapped.

Landscape and soil Profile Characteristics of Ravanaki (RNK) Series

4.1.3 Narsapura (NSP) series: Narasapura soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown and very dark gray, black, calcareous, cracking clay soils They have developed from alluvium and occur on very gently sloping uplands. The Narsapura series has been classified as a member of the Very fine, smectitic, isohyperthermic (calc) family of Typic Haplustepts.

The thickness of the solum is 76 to 98 cm. The thickness of A horizon ranges from 15 to 19 cm. Its colour is in 10 YR hue with value 3 and chroma 1 to 2.The texture is clay with no gravel. The thickness of B horizon ranges from 57 to 83 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. Its texture is clay. The available water capacity is medium (101-150 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Narsapura (NSP) Series

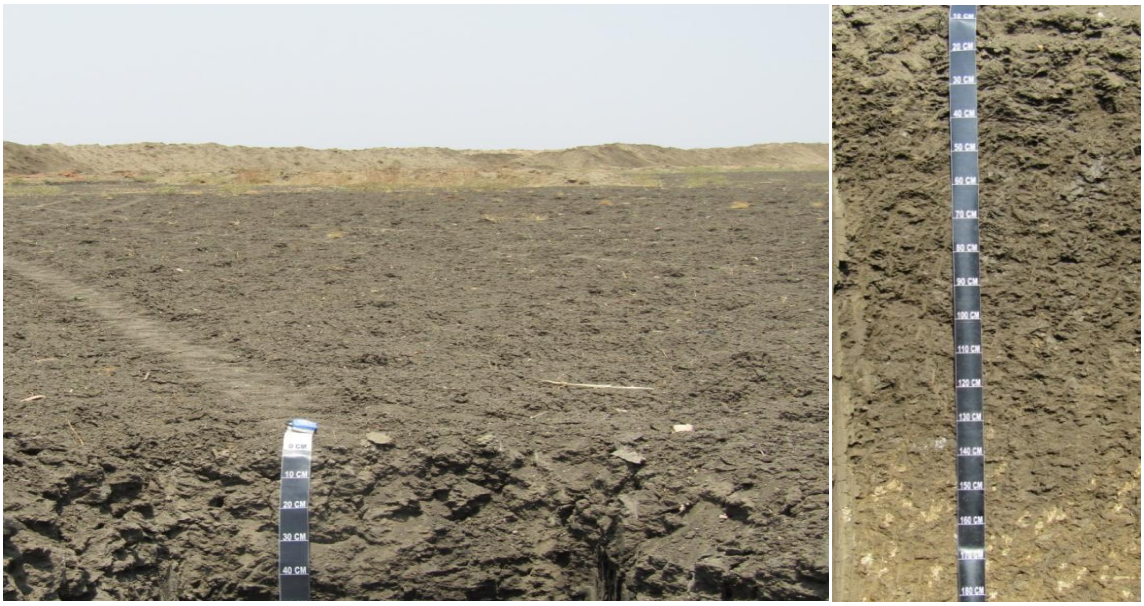
4.1.4 Handrala (HDL) Series: Handrala soils are deep (100-150 cm), moderately well drained, have black, very dark brown to dark gray, calcareous, cracking clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Handrala series has been classified as a member of the very fine, smectitic, isohyperthermic (calc) family of Typic Haplusterts.

The thickness of the solum ranges from 102 to 149 cm. The thickness of A horizon ranges from 14 to 26 cm. Its colour is in 10 YR hue with value 3 and chroma 1. The texture is clay. The thickness of B horizon ranges from 103 to 127 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 2. Texture is dominantly clay. The available water capacity is very high (>200 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Handrala (HDL) Series

4.1.5 Bardur (BDR) Series: Bardur soils are very deep (>150 cm), moderately well drained, have very dark grayish brown to very dark gray, black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation. The Bardur series has been classified as a member of the very fine, smectitic, isohyperthermic family of Typic Haplusterts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 15 to 19 cm. Its colour is in 10 YR hue with value 2 and chroma 1 with clay texture. The thickness of B horizon ranges from 146 to 180 cm. Its colour is in 10 YR hue with value 2 to 3 and chroma 1 to 2. Its texture is clay with less than 15 per cent gravel. The available water capacity is very high (>200 mm/m). Two soil phases were identified and mapped.



Landscape and soil profile characteristics of Bardur (BDR) Series

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

Series Name: Muttal (MTL), Pedon: RM-13
Location: $15^0$14'30.8"N, $75^0$56'50.6"E, Gatareddihalla village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey, mixed, isohyperthermic (calc) (Paralithic) 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
0-20	Ap	39.05	13.74	47.21	3.05	5.05	8.21	14.63	8.11	15-30	c	29.95	17.94
20-34	Bwk	28.77	19.57	51.66	4.81	4.71	4.92	9.09	5.24	10	c	33.44	21.56

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	8.27	-	-	0.202	0.79	6.10	-	-	0.62	0.25	-	36.64	0.78	-	0.69
20-34	8.36	-	-	0.177	0.99	23.04	-	-	0.29	0.38	-	39.60	0.77	-	0.96

Contd...

Series Name: Ravanaki (RNK), Pedon: RM-20
Location: $15^0$14'22.7"N, $75^0$57'45.8"E, Gatareddihalla village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, isohyperthermic (calc) Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-28	Ap	24.43	17.76	57.81	5.30	3.89	3.78	7.14	4.32	20	c	41.40	29.60
28-55	Bw	18.77	15.59	65.64	2.74	3.73	2.85	4.83	4.61	10	c	46.71	35.18
55-80	Bc	12.53	15.43	72.04	2.60	1.92	1.47	3.16	3.39	10	c	56.82	43.73

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}							%	%
0-28	8.86	-	-	0.483	0.63	15.48	-	-	0.86	6.27	-	37.00	0.64	-	16.94
28-55	8.61	-	-	1.4	0.23	13.68	-	-	0.68	12.27	-	53.20	0.81	-	23.06
55-80	8.35	-	-	4.53	0.91	11.40	-	-	0.75	28.97	-	54.80	0.76	-	52.86

Contd...

Series Name: Narsapura (NSP), Pedon: A2/RM-2

Location: $15^0$19'86.9"N, $75^0$57'86.1"E, Kavalura village, Koppal taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, isohyperthermic (calc) Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-29	Ap	31.32	16.52	52.16	5.51	5.40	5.51	9.83	5.08	10	c	38.86	27.64
29-52	Bw1	13.30	22.08	64.62	2.52	2.41	2.41	3.67	2.29	05	c	49.88	40.05
52-77	BW2	13.22	17.39	69.40	3.56	2.41	1.95	2.76	2.53	05	c	51.33	41.55

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}	%	%	C mol kg^{-1}							%	%
0-29	9.16	-	-	0.615	0.23	9.36	-	-	0.72	10.98	-	51.09	0.98	-	21.49
29-52	8.69	-	-	2.01	0.5	8.64	-	-	0.55	24.42	-	60.63	0.94	-	40.27
52-77	8.52	-	-	2.68	0.46	7.68	-	-	0.50	25.65	-	60.74	0.88	-	42.24

Contd...

Series Name: Handrala (HDL), Pedon: A2/RM-1

Location: $15^0$19'69.8"N, $75^0$58'00"E, Kavalura village, Koppal taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, isohyperthermic (calc) Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine 0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-25	Ap	21.68	16.62	61.70	4.42	3.98	3.43	5.64	4.20	10	c	41.36	31.27
25-50	Bss1	14.93	15.76	69.32	2.64	2.53	2.99	3.33	3.44	05	c	48.92	39.19
50-82	Bss2	23.11	16.60	60.29	4.51	3.61	6.31	4.74	3.95	05	c	42.46	33.85
82-117	Bss3	10.50	18.38	71.12	1.98	1.98	1.63	2.57	2.33	05	c	52.95	42.82

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}							%	%
0-25	9.06	-	-	0.371	0.16	4.80	-	-	0.80	7.93	-	62.33	1.01	-	12.72
25-50	9.09	-	-	0.719	0.2	7.20	-	-	0.42	14.94	-	67.10	0.97	-	22.26
50-82	9.28	-	-	0.47	0.19	9.36	-	-	0.47	11.59	-	60.21	1.00	-	19.26
82-117	8.76	-	-	1.55	0.36	8.64	-	-	0.11	2.28	-	25.33	0.36	-	9.02

Contd...

Series Name: Bardur (BDR), Pedon: R-4
Location: $15^0$14'31.7"N, $76^0$01'19.1"E, Moranali village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, isohyperthermic Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-25	Ap	21.78	22.78	55.44	2.17	3.68	4.44	6.61	4.88	-	c	36.78	26.95
25-53	BA	18.62	18.56	62.82	2.23	4.24	3.46	5.24	3.46	-	c	41.25	29.87
53-90	Bss1	15.87	18.60	65.53	2.23	1.34	4.25	3.91	4.13	-	c	44.73	33.64
90-126	Bss2	13.66	20.02	66.32	1.68	2.80	2.35	3.70	3.14	-	c	49.24	38.37
126-152	Bss3	11.64	20.79	67.57	1.69	1.81	1.81	3.50	2.82	-	c	53.50	41.90
152-210	Bss4	11.38	23.21	65.42	2.16	2.16	1.93	3.07	2.05	-	c	51.53	39.64

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}							%	%
0-25	8.73	-	-	0.203	0.24	5.76	-	-	0.65	4.43	-	40.56	0.73	-	10.93
25-53	9.17	-	-	0.295	0.45	4.92	-	-	0.32	10.47	-	74.70	1.19	-	14.02
53-90	9.27	-	-	0.388	0.66	6.00	-	-	0.24	10.49	-	76.20	1.16	-	13.77
90-126	9.22	-	-	0.608	0.57	5.88	-	-	0.21	15.93	-	77.20	1.16	-	20.63
126-152	9.21	-	-	0.936	0.33	6.60	-	-	0.37	20.88	-	80.90	1.20	-	25.81
152-210	9.03	-	-	1.47	0.33	8.16	-	-	0.24	15.34	-	73.10	1.12	-	20.98

Contd...

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The 9 soil map units identified in the Daddegallu-2 microwatershed are grouped under two land capability classes and three land capability subclasses (Fig. 5.1).

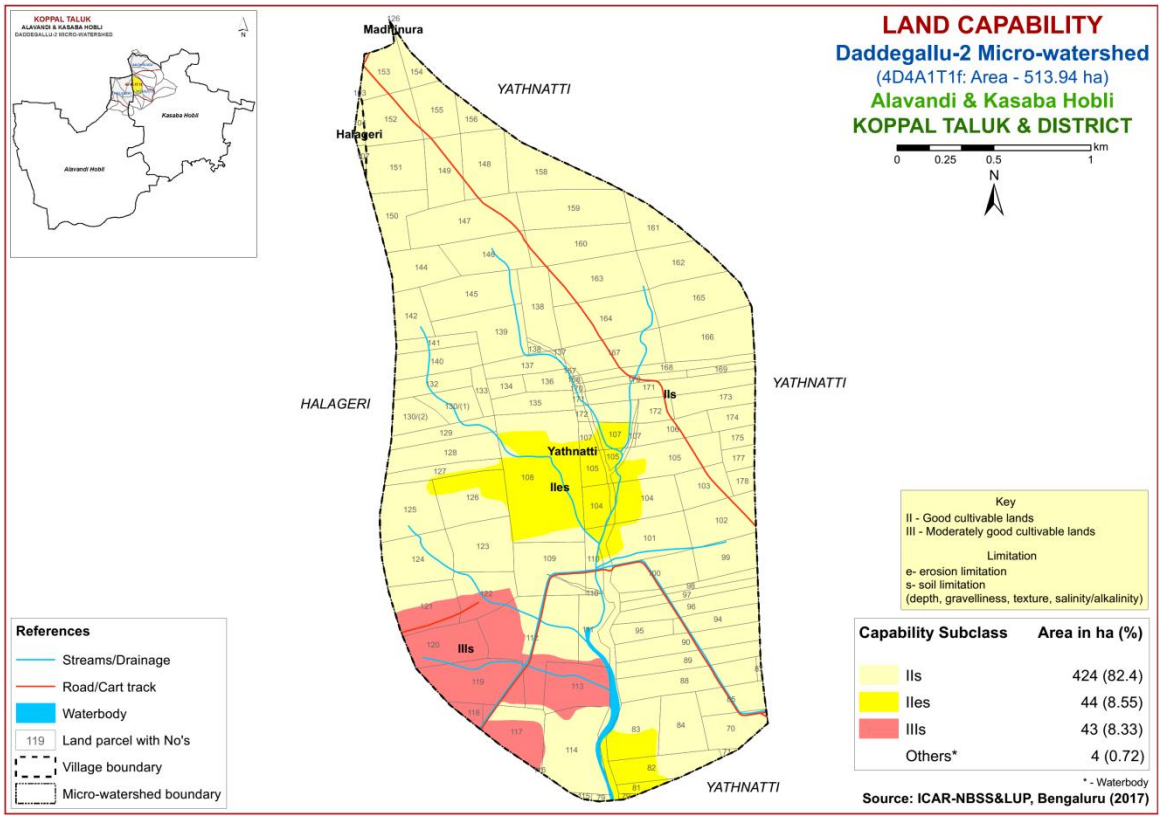


Fig. 5.1 Land Capability map of Daddegallu-2 Microwatershed

Entire are of the microwatershed is suitable for agriculture. An area of 468 ha (91%) is good cultivable lands (Class II) that have minor limitations and require moderate conservation practices and are distributed in the major part of the microwatershed. Moderately good cultivable lands (Class III) cover an area of 43 ha (8%) and are distributed in the southwestern parts of the microwatershed with moderate problems of soil.

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).

Shallow (25-50 cm) soils occupy an area of 43 ha (8%) and are distributed in the southwestern part of the microwatershed. An area of 110 ha (21%) is moderately shallow (50-75 cm) and are distributed in the southern and central part of the microwatershed.

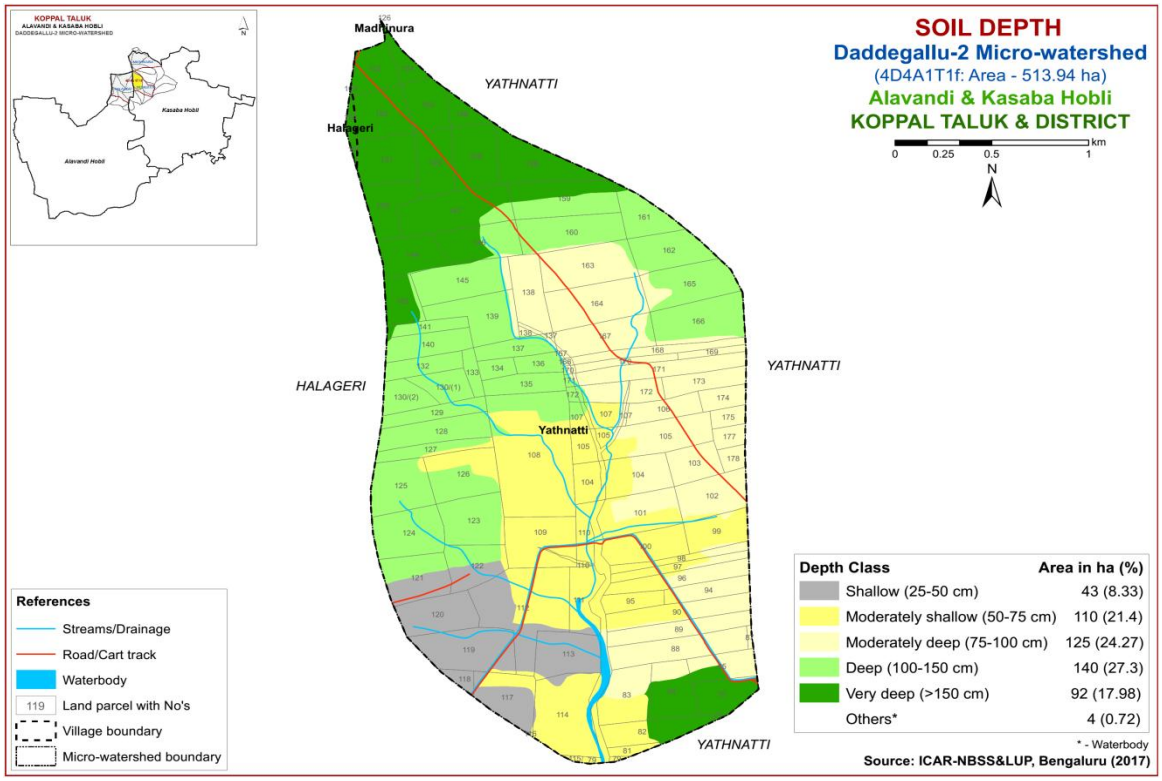


Fig. 5.2 Soil Depth map of Daddegallu-2 Microwatershed

Moderately deep soils (75-100 cm) occupy an area of 125 ha (24%) and occur in the eastern and central part of the microwatershed. Deep (100-150 cm) to very deep (>150

cm) soils occupy an area of 232 ha (45%) and are distributed in the southern, northern, northeastern and western part of the microwatershed.

The most problem lands with an area of about 153 ha (29%) having shallow to moderately shallow (25-75 cm) rooting depth. They are suitable for growing short duration agricultural crops but well suited for pasture, forestry or other recreational purposes. The most productive lands cover about 232 ha (45%) where all climatically adopted 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.

Entire area of the microwatershed is clayey at the surface in the microwatershed (Fig. 5.3).

The entire microwatershed has productive lands with respect to surface soil texture where they are clayey soils that have high potential for soil-water retention and availability, and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems.

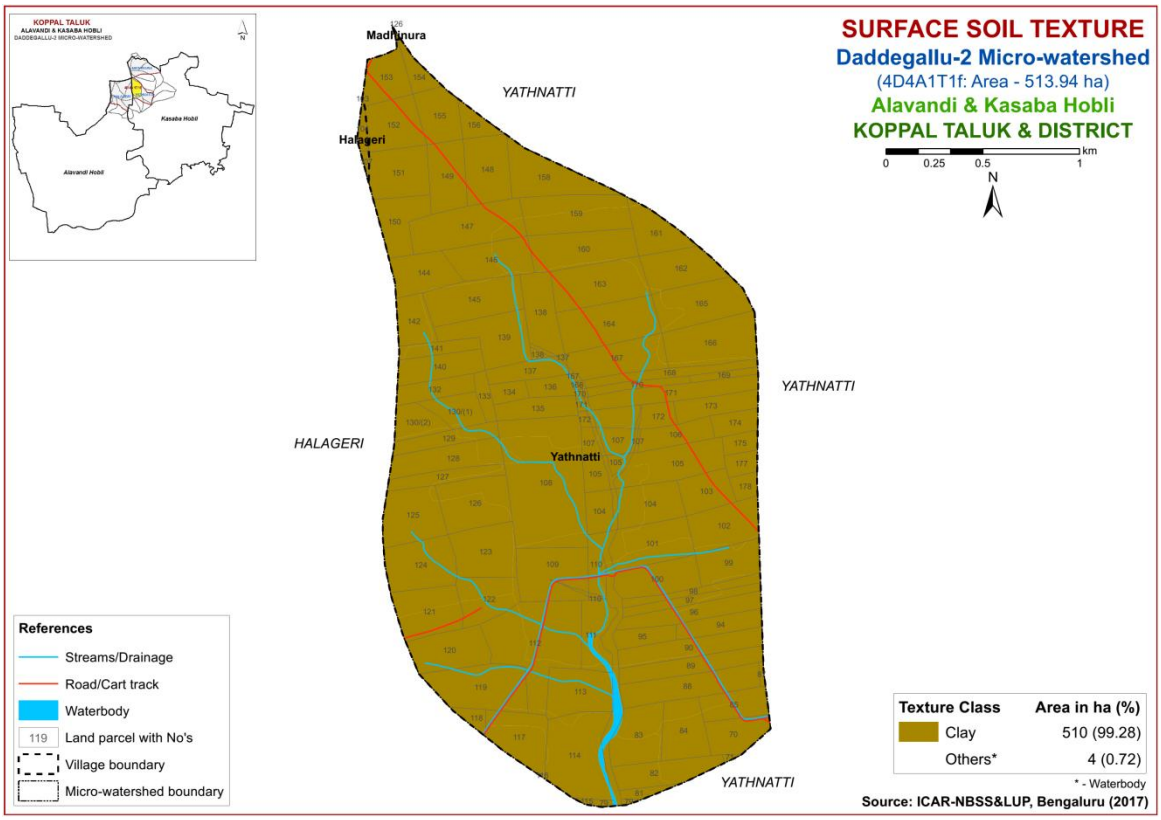


Fig. 5.3 Surface Soil Texture map of Daddegallu-2 Microwatershed

5.4 Soil Gravelliness

Gravel is the term used for describing coarse fragments between 2 mm and 7.5 cm diameter and stones for those between 7.5 cm and 25 cm. The presence of gravel and stones in soil reduces the volume of soil responsible for moisture and nutrient storage, drainage, infiltration and runoff, and hinders plant growth by impeding root growth and seedling emergence, intercultural operations and farm mechanization.

The soils that are non-gravelly (<15% gravel) cover an area of about 410 ha (80%) and are distributed in the major part of the microwatershed. An area of 100 ha (19%) is covered by gravelly (15-35% gravel) soils and are distributed in the southern, western and central part of the microwatershed (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 80%. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem soils that are gravelly (15-35%) cover 100 ha (19%) where only short duration crops can be grown.

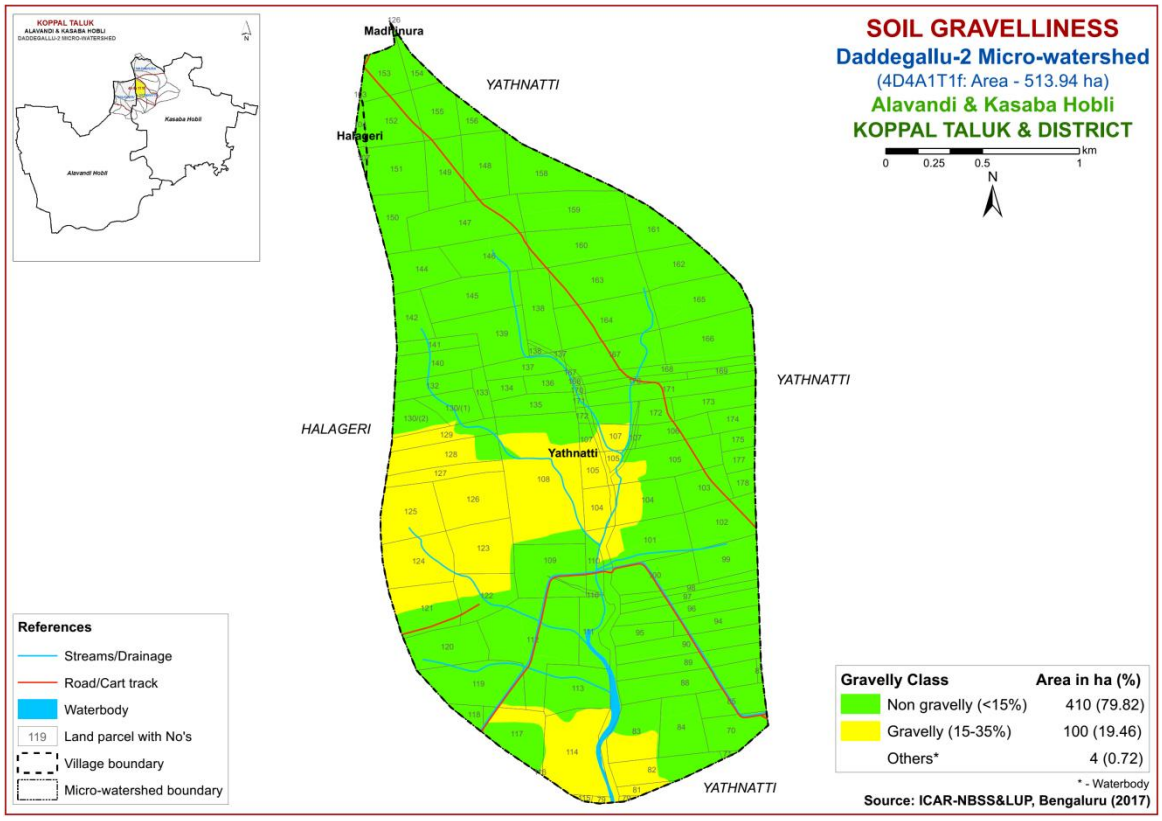


Fig. 5.4 Soil Gravelliness map of Daddegallu-2 Microwatershed

5.5 Available Water Capacity

The soil available water capacity (AWC) is estimated based on the ability of the soil column to retain water between the tensions of 0.33 and 15 bar in a depth of 100 cm or the entire solum if the soil is shallower. The AWC of the soils (soil series) as estimated by considering the soil texture, mineralogy, soil depth and gravel content (Sehgal *et al.*, 1990) and accordingly the soil map units were grouped into five AWC classes *viz*, very

low (<50 mm/m), low (50-100 mm/m), medium (100-150 mm/m), high (150-200 mm/m) and very high (>200 mm/m) and using these values, an AWC map was generated (Fig. 5.5).

An area of about 153 ha (30%) has soils that are low (51-100 mm/m) in available water capacity and are distributed in the southwestern and central part of the microwatershed. An area of about 125 ha (24%) is medium (101-150 mm/m) in available water capacity and are distributed in the eastern part of the microwatershed. About 233 ha (45%) area is very high (>200 mm/m) in available water capacity and are distributed in the northern, western and northwestern part of the microwatershed.

An area of about 153 ha (30%) 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. The potential soils with respect to AWC cover about 233 ha (45%) that have very high AWC, where all climatically adapted long duration crops can be grown.

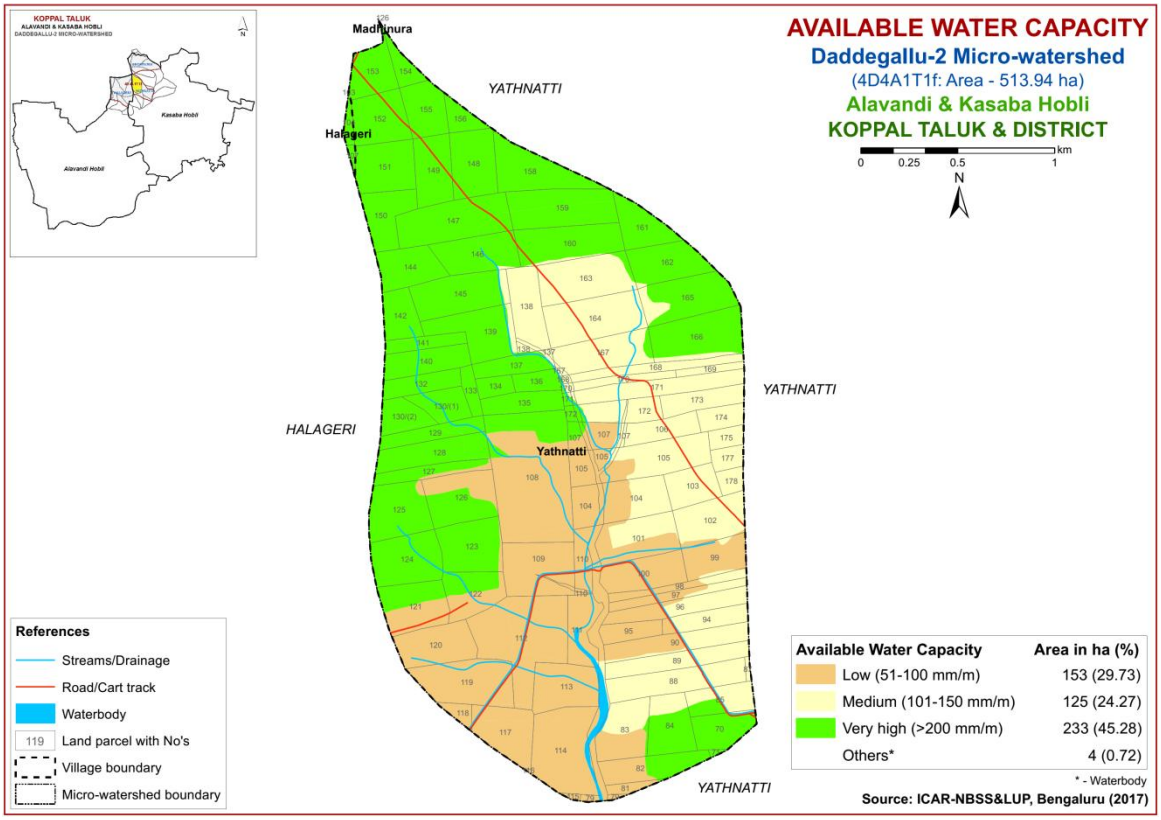


Fig. 5.5 Soil Available Water Capacity map of Daddegallu-2 Microwatershed

5.6 Soil Slope

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

showing the area extent and their geographic distribution of different slope classes in the microwatershed (Fig. 5.6).

A minor area of about 0.08 ha (<1%) is nearly level (0-1%) and are distributed in the northern part of the microwatershed. Very gently sloping (1-3% slope) lands occupy an area of 510 ha (99%) and are distributed in all parts of the microwatershed. In all these lands, all climatically adapted annual and perennial crops can be grown with appropriate soil and water conservation and other land development measures.

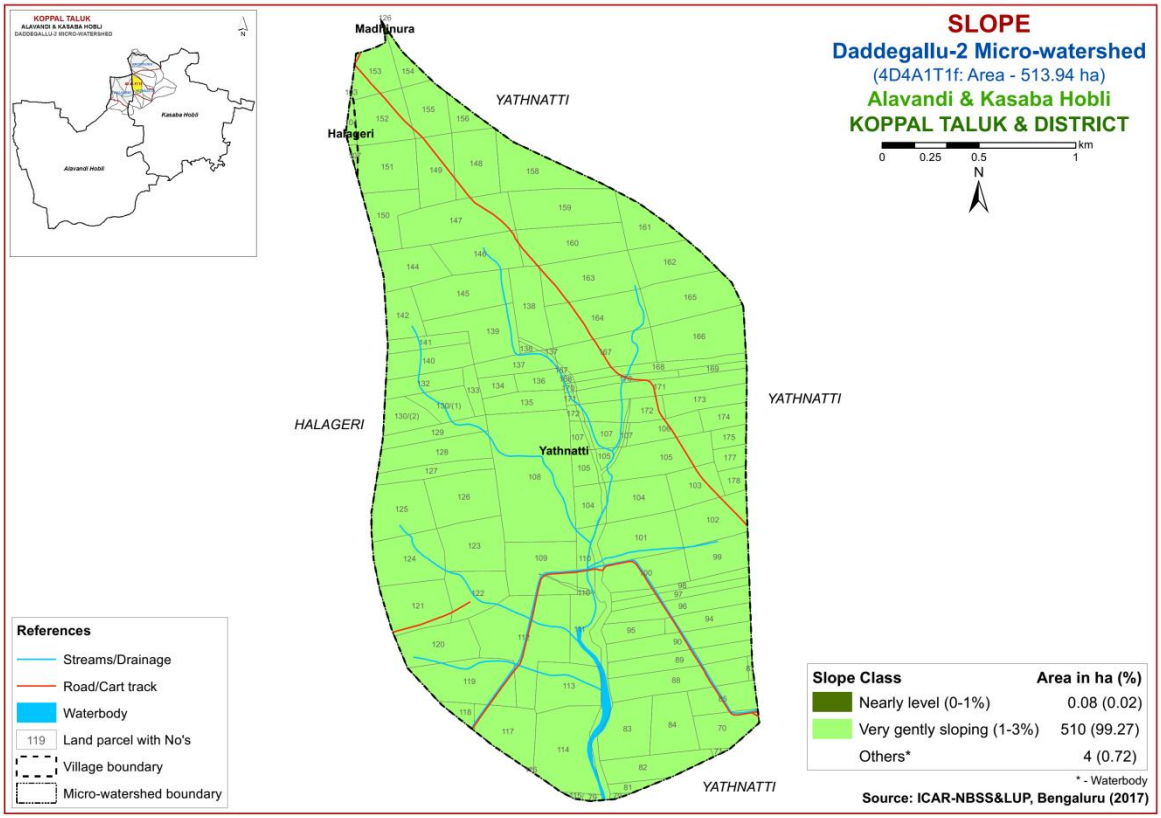


Fig. 5.6 Soil Slope map of Daddegallu-2 Microwatershed

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.

Soils that are slightly eroded (e1 class) occupy an area of about 466 ha (91%) and are distributed in the major part of the microwatershed. Moderately eroded (e2 class) soils

cover an area of 44 ha (9%) and are distributed in the central and southern part of the microwatershed.

An area of about 44 ha (9%) in the microwatershed is problematic because of moderate erosion. These areas need soil and water conservation and other land development measures for restoring the soil health.

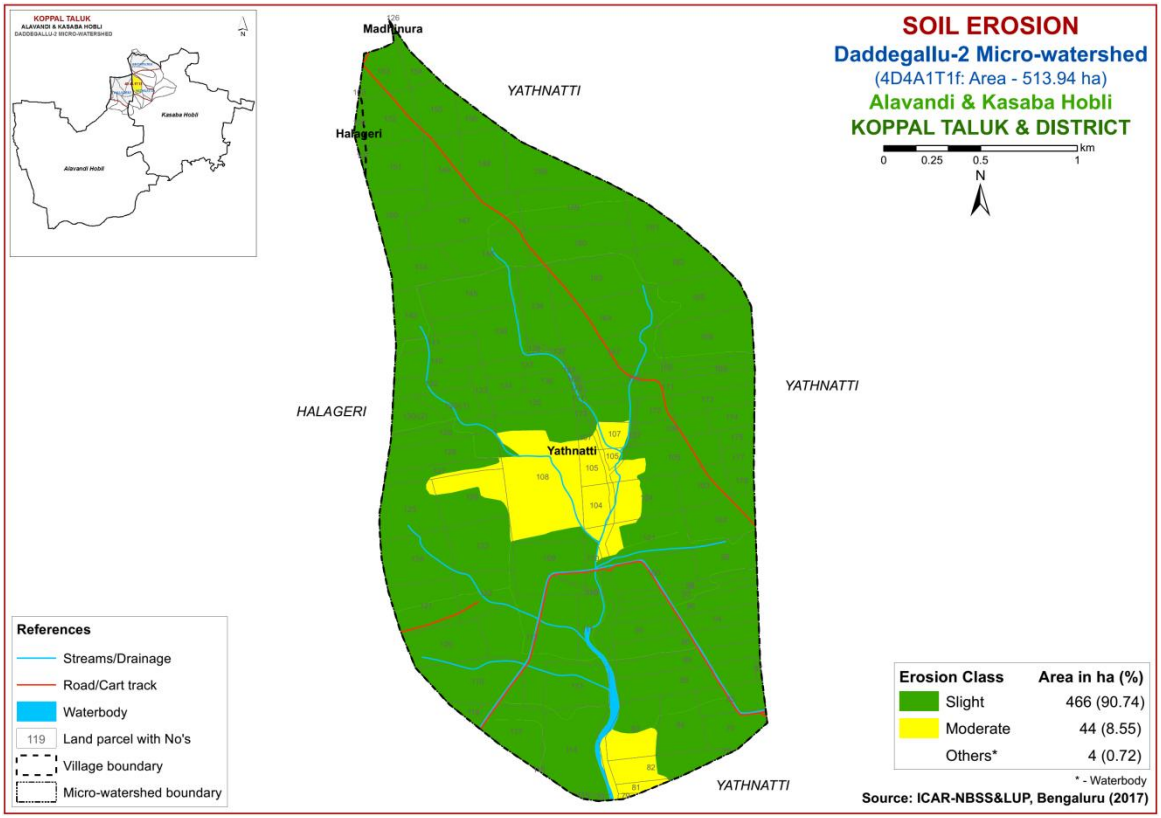


Fig. 5.7 Soil Erosion map of Daddegallu-2 Microwatershed

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

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

6.1 Soil Reaction (pH)

The soil analysis of the Daddegallu-2 microwatershed for soil reaction (pH) showed that an area of 304 ha (59%) is strongly alkaline (pH 8.4-9.0) and are distributed in the major part of the microwatershed. An area of 206 ha (40%) is very strongly alkaline (pH >9.0) and are distributed in the northern, western, central and northeastern part of the microwatershed (Fig. 6.1). thus, all the soils in the microwatershed are alkaline in reaction.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is low (<0.5%) covering an area of 322 ha (62%) and is distributed in the northwestern, southern, southwestern and southeastern part of the microwatershed. An area of 189 ha (37%) is medium (0.5-0.75%) in organic carbon content and is distributed in the northeastern, eastern and central part of the microwatershed (Fig. 6.3).

6.4 Available Phosphorus

Soil available phosphorus content is low (<23 kg/ha) in the entire part of the microwatershed (Fig. 6.4).

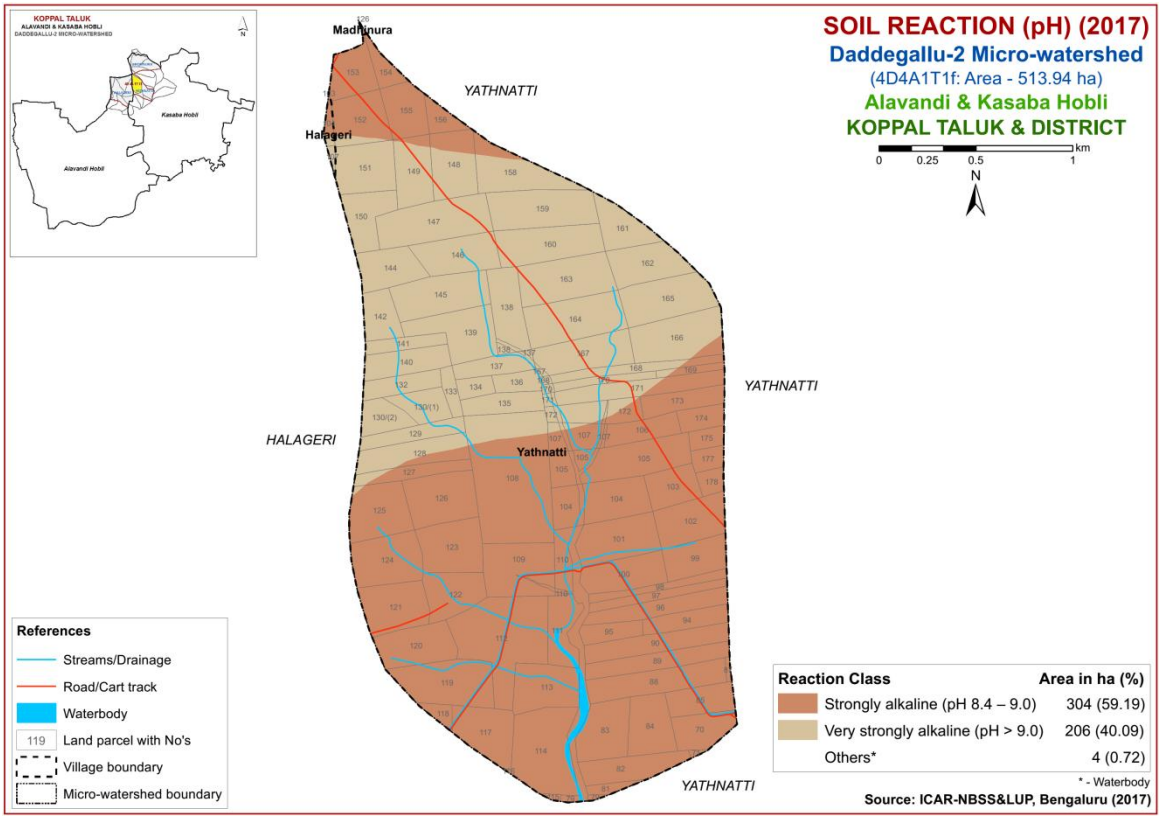


Fig. 6.1 Soil Reaction (pH) map of Daddegallu-2 Microwatershed

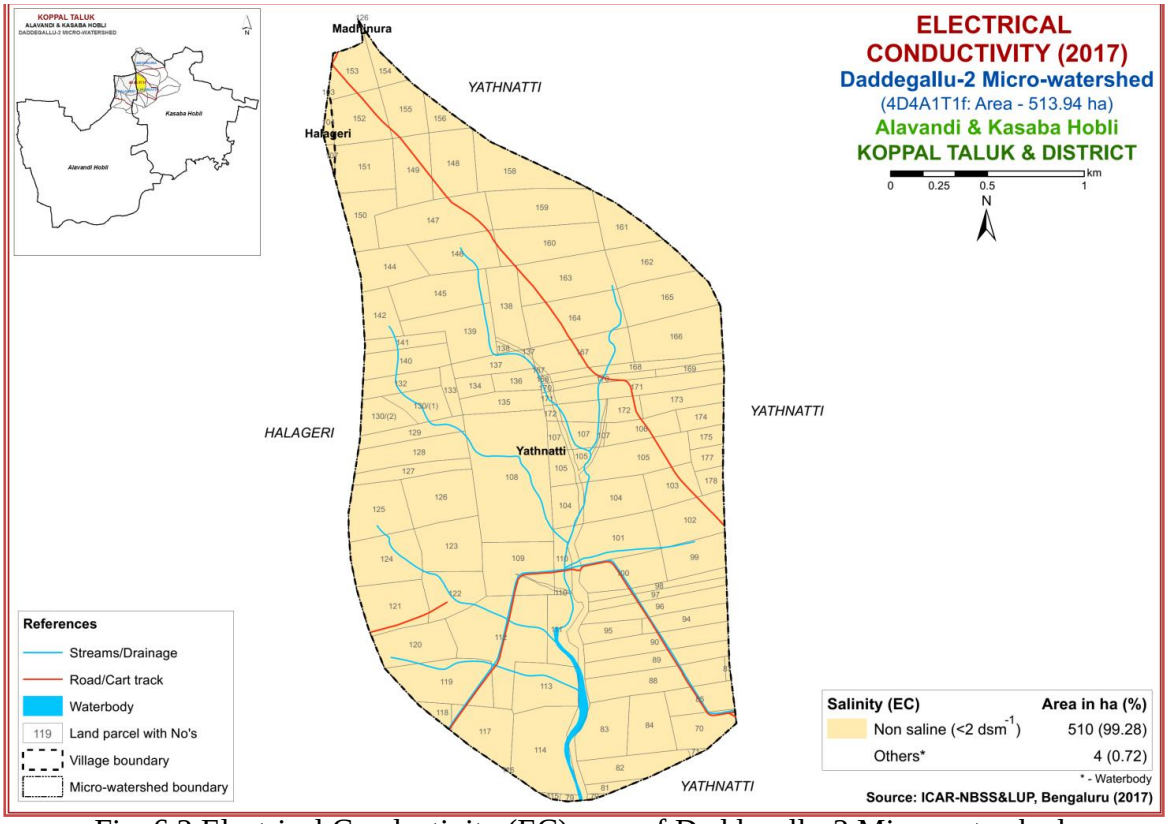


Fig. 6.2 Electrical Conductivity (EC) map of Daddegallu-2 Microwatershed

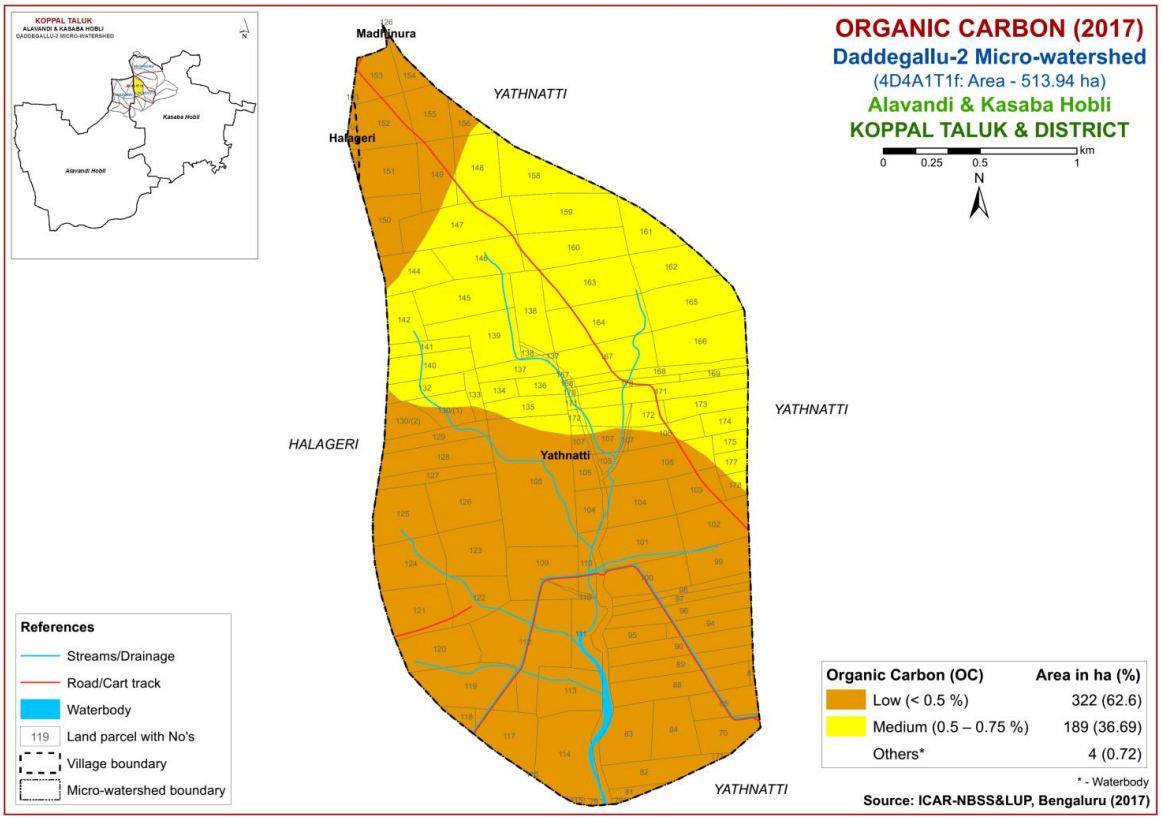


Fig. 6.3 Soil Organic Carbon map of Daddegallu-2 Microwatershed

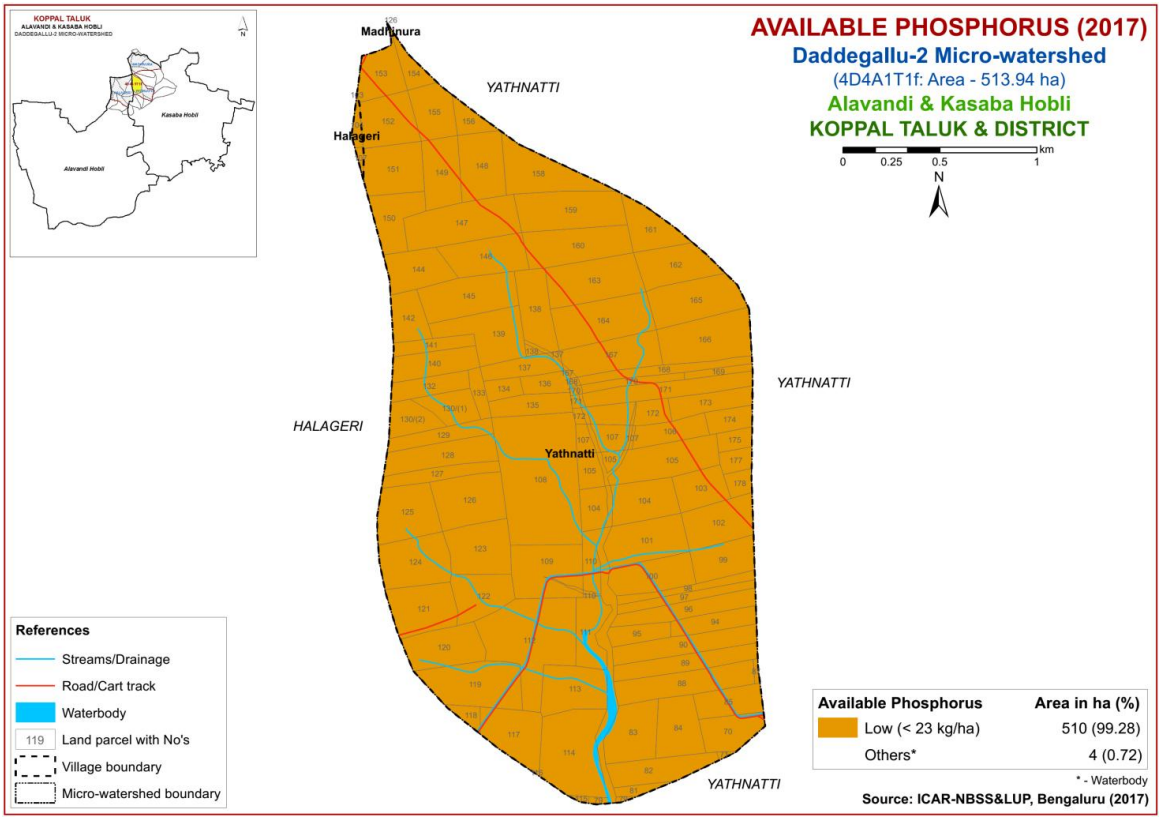


Fig. 6.4 Soil Available Phosphorus map of Daddegallu-2 Microwatershed

6.5 Available Potassium

Entire soils of the microwatershed are high (<337 kg/ha) in soil available potassium content (Fig. 6.5).

6.6 Available Sulphur

Soils that are low in available sulphur content (<10 ppm) cover an area of 413 ha (80%) and are distributed in the major part of the microwatershed. An area of 97 ha (19%) is medium (10-20 ppm) in available sulphur content and are distributed in the western, central, eastern and northeastern parts of the microwatershed. An area of about 0.02 ha (0.046%) is high (>20 ppm) in available sulphur content and are distributed in the northwestern 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

Available boron content is low (<0.5 ppm) in an area of 42 ha (8%) and are distributed in the southern and southwestern part of the microwatershed. An area of about 443 ha (86%) is medium (0.5-1.0 ppm) in available boron and are distributed in the major part of the microwatershed. High (>1.0 ppm) in available boron occupy an area of about 25 ha (5%) in the northwestern part of the microwatershed (Fig. 6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) in an area of 173 ha (34%) and are distributed in the western, northwestern, northeastern and central part of the microwatershed. An area of 337 ha (66%) is deficient (<4.5 ppm) and are distributed in 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).

6.11 Available Zinc

Available zinc content is sufficient (>0.6 ppm) in an area of 131 ha (26%) and occur in the southeastern and southern part of the microwatershed. Available zinc content is deficient (<0.6 ppm) in 379 ha (74%) and is distributed in the major part of the microwatershed (Fig. 6.11).

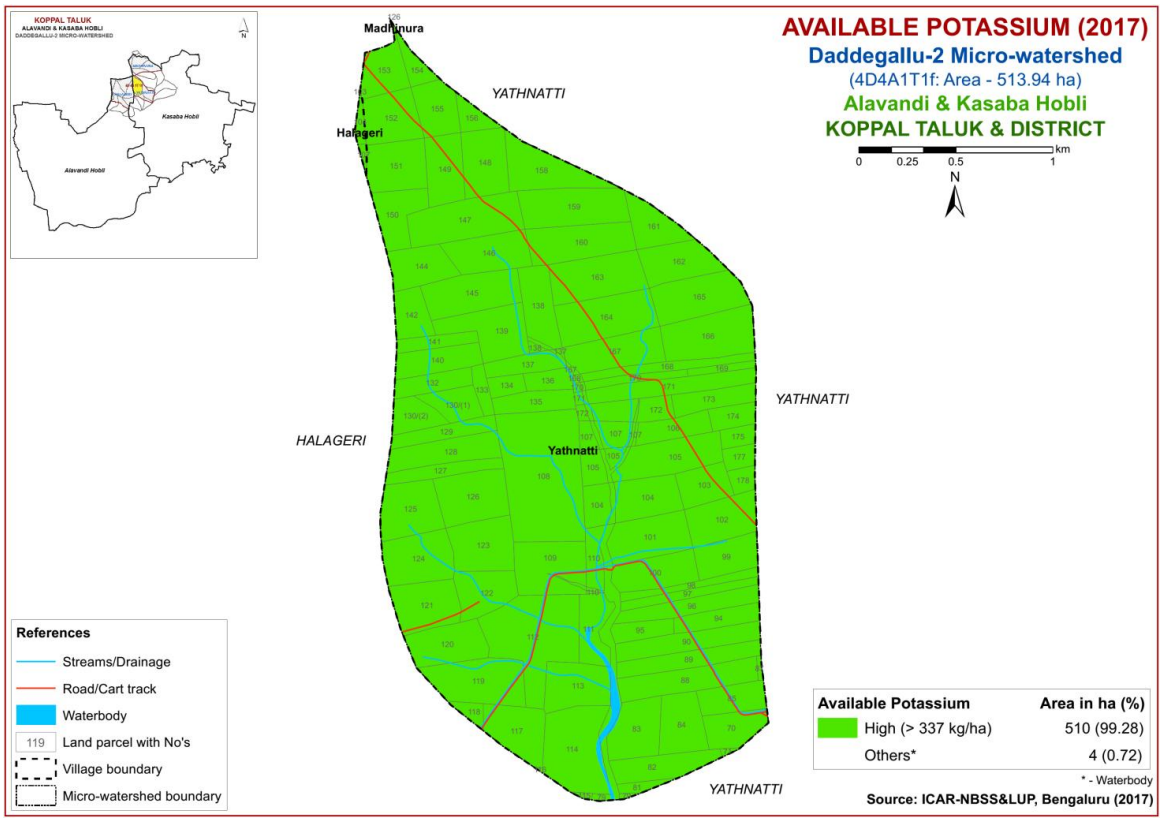


Fig. 6.5 Soil Available Potassium map of Daddegallu-2 Microwatershed

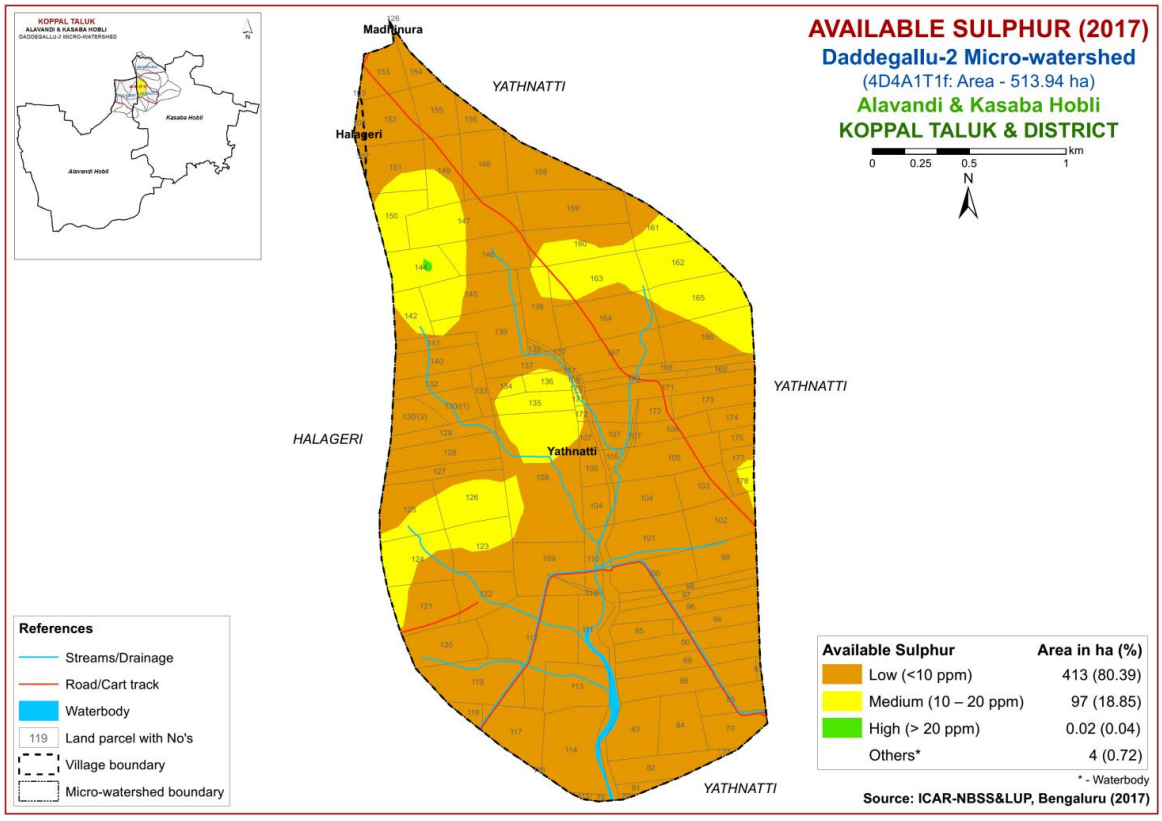


Fig. 6.6 Soil Available Sulphur map of Daddegallu-2 Microwatershed

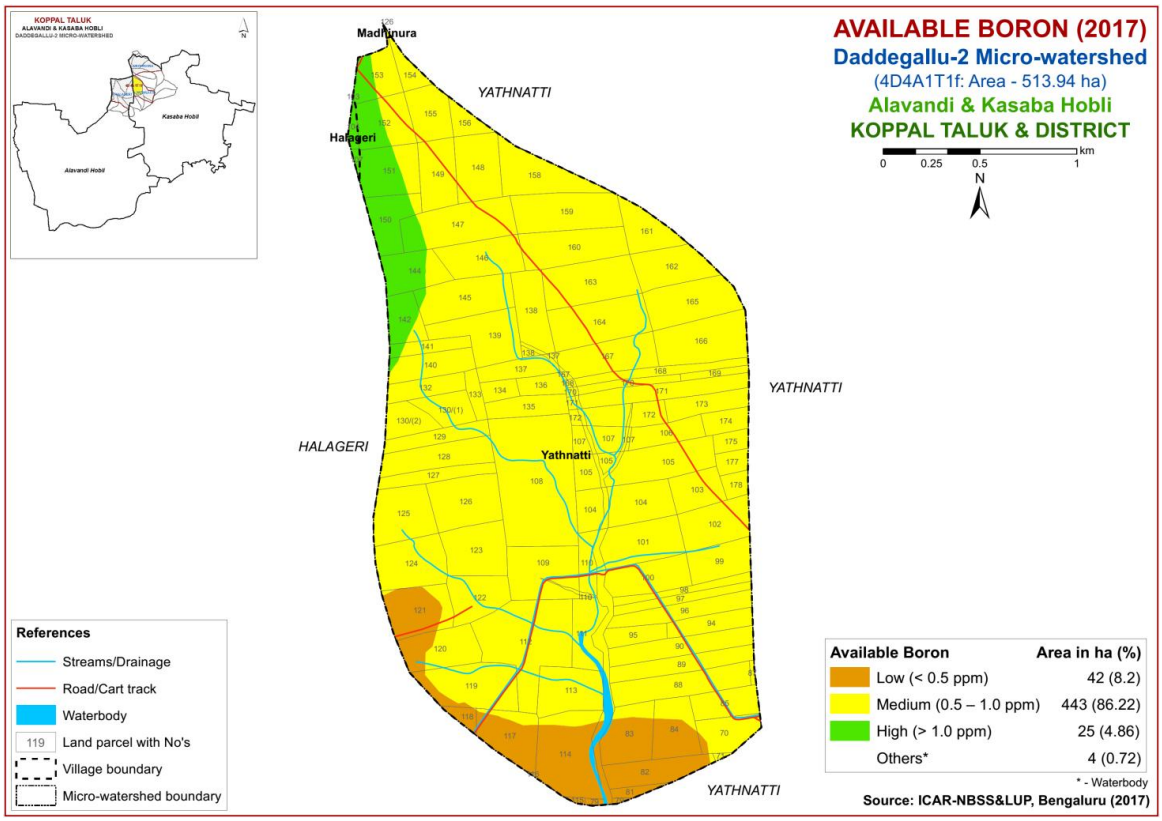


Fig. 6.7 Soil Available Boron map of Daddegallu-2 Microwatershed

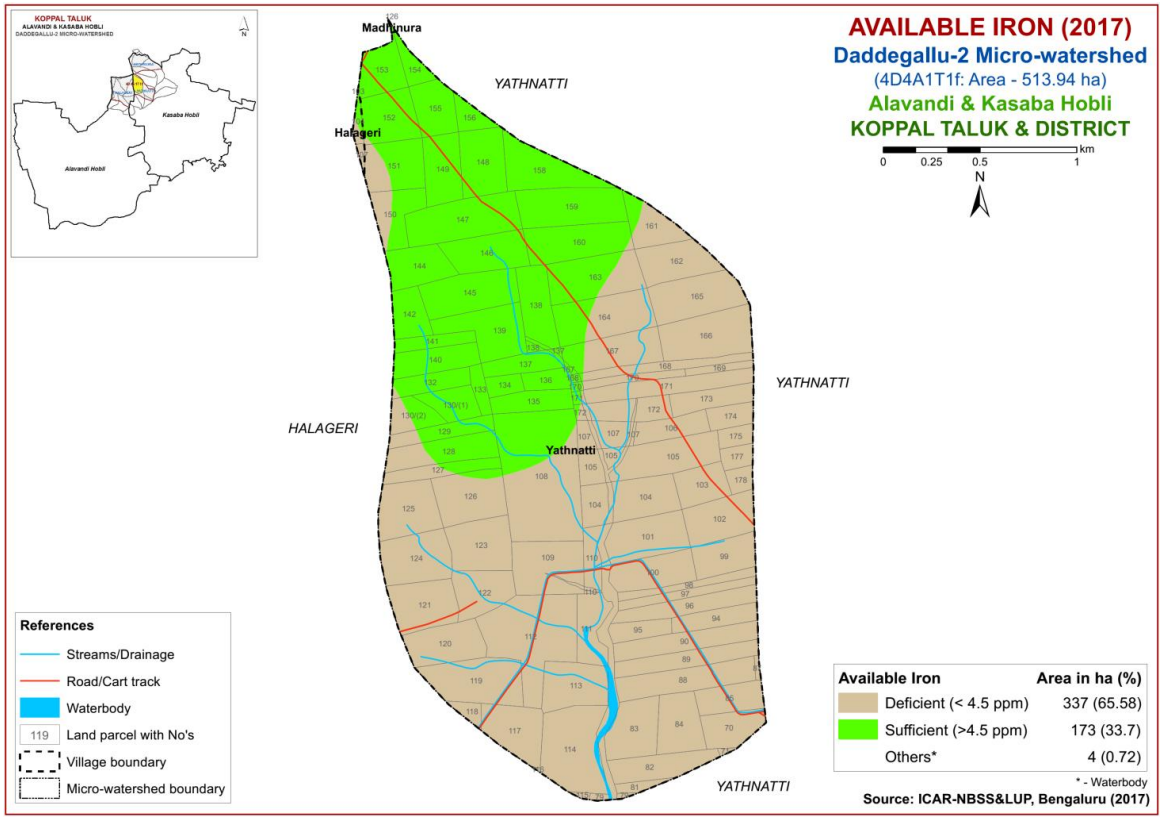


Fig. 6.8 Soil Available Iron map of Daddegallu-2 Microwatershed

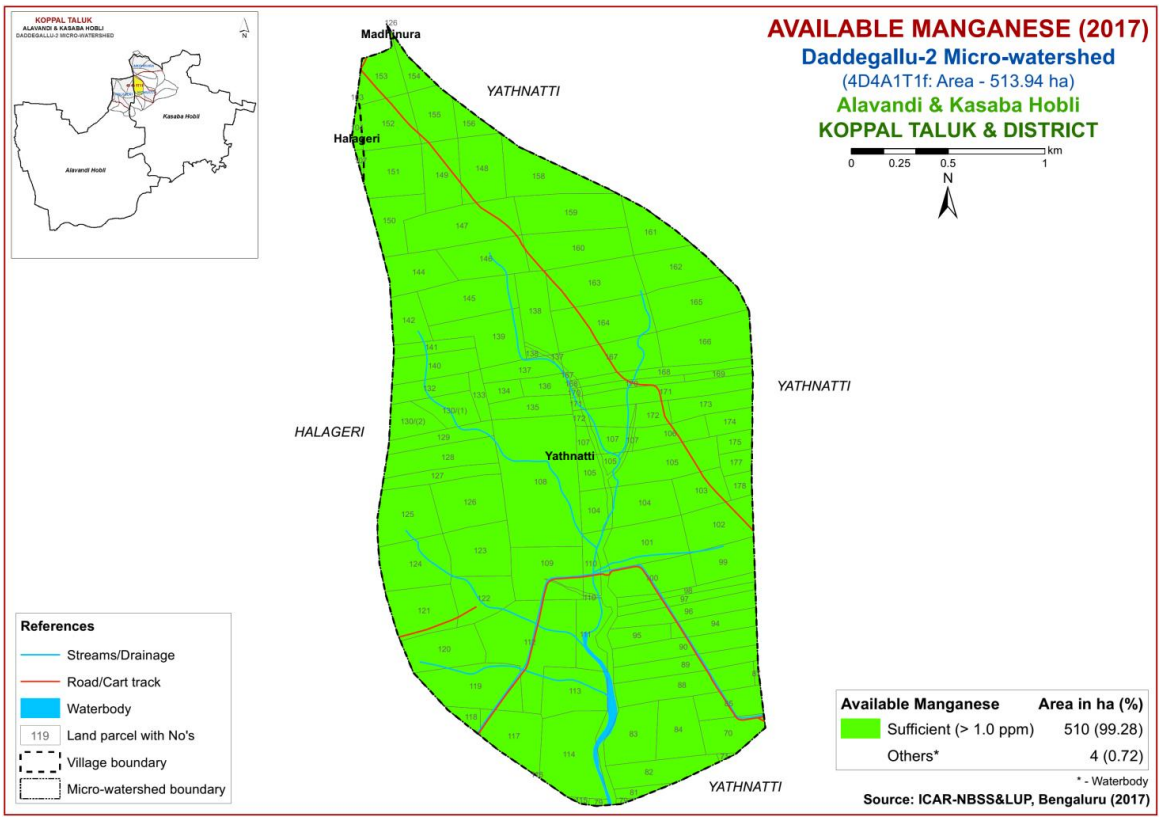


Fig. 6.9 Soil Available Manganese map of Daddegallu-2 Microwatershed

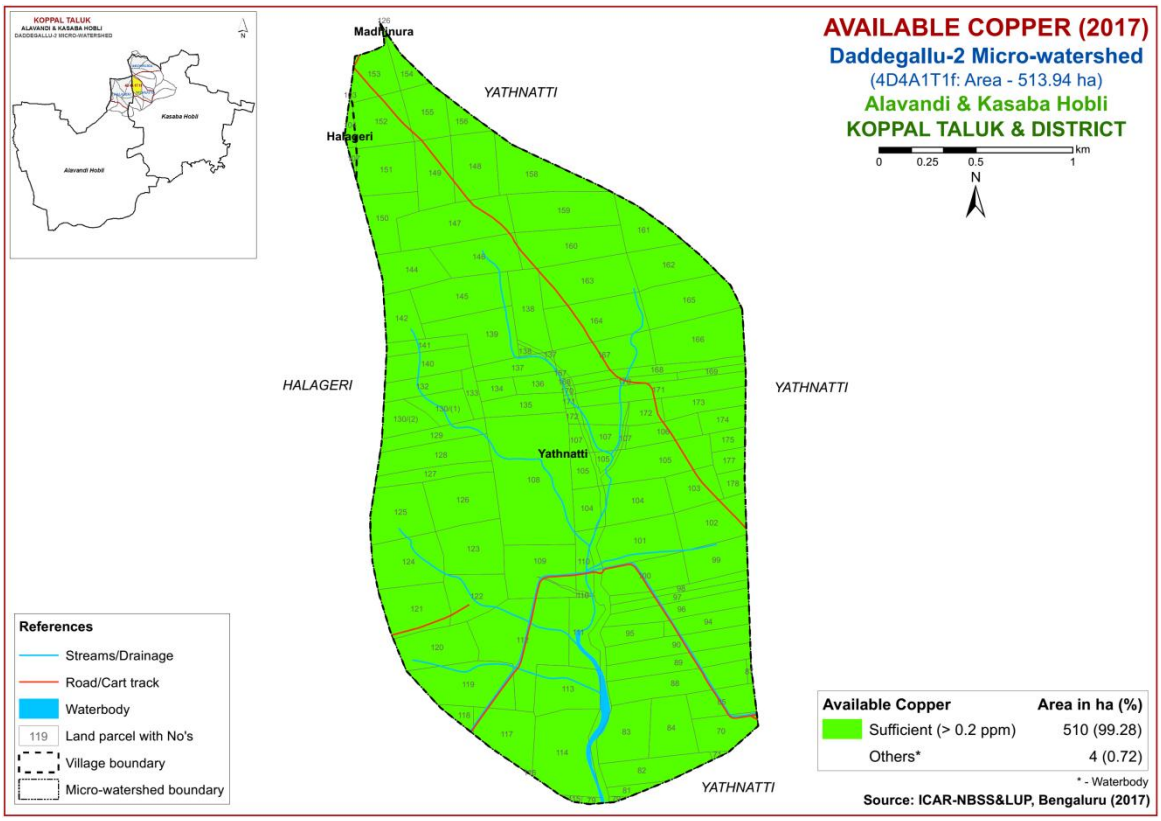


Fig. 6.10 Soil Available Copper map of Daddegallu-2 Microwatershed

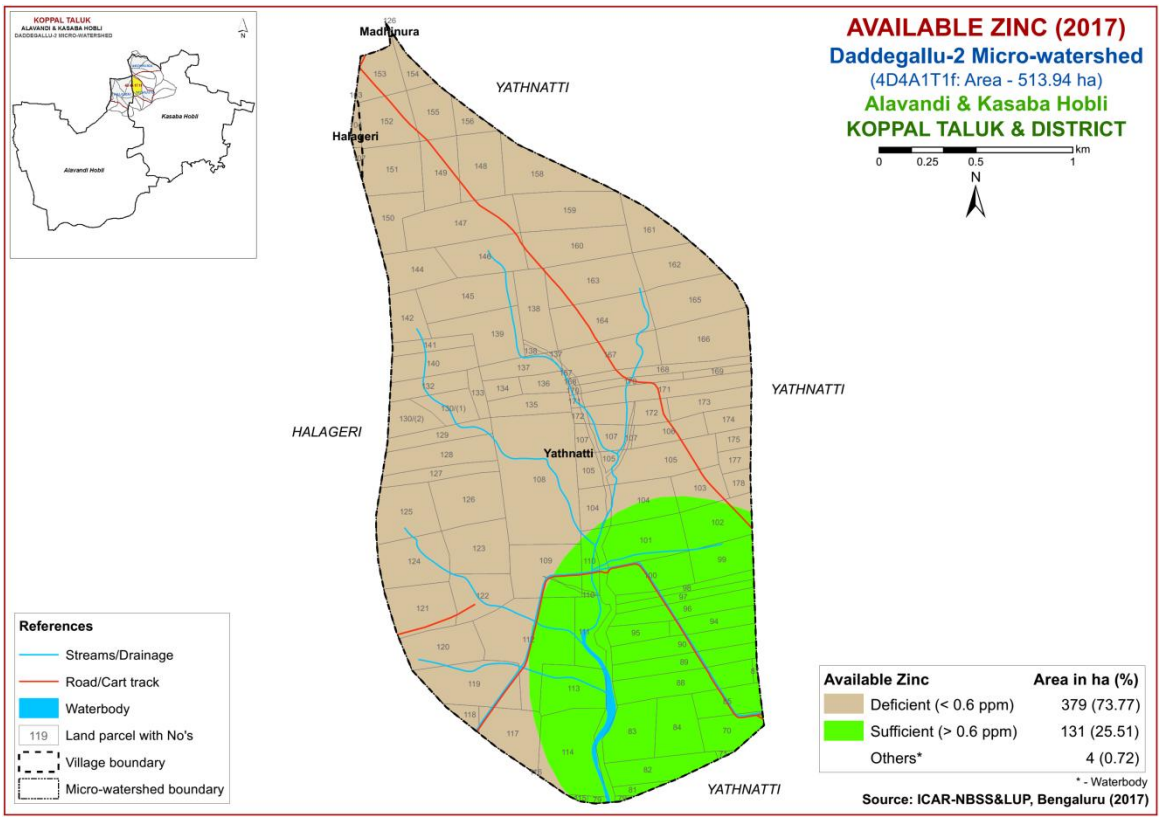


Fig. 6.11 Soil Available Zinc map of Daddegallu-2 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Daddegallu-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, N1 and N2 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'z' for calcareousness, 's' for sodium and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

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

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

Sorghum is one of the major crops grown in Karnataka in an area of 10.47 lakh ha in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad, Bellary, Chitradurga, Mysore and 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 315 ha (61%) for growing sorghum and are distributed in the major part of the microwatershed. An area of 153 ha (30%) is moderately suitable (Class S2) for growing sorghum and are distributed in the western, southern and central part of the microwatershed. They have minor limitations of gravelliness, rooting condition and calcareousness.

Table 7.1 Soil-Site Characteristics of Daddegallu-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	ESP	CEC [Cmol (p^+) kg^{-1}]	BS (%)
					Surface	Sub-surface	Surface	Sub-surface								
MTLmB1	662	90	WD	25-50	c	c	-	10-15	20-100	1-3	Slight	8.27	0.20	0.69	36.64	-
RNKmB1	662	90	MWD	50-75	c	c	-	10-20	51-100	1-3	Slight	8.86	0.48	16.9	37.00	-
RNKmB1g1	662	90	MWD	50-75	c	c	15-35	10-20	51-100	1-3	Slight	8.86	0.48	16.9	37.00	-
RNKmB2g1	662	90	MWD	50-75	c	c	15-35	10-20	51-100	1-3	Moderate	8.86	0.48	16.9	37.00	-
NSPmB1	662	90	MWD	75-100	c	c	-	-	101-150	1-3	Slight	9.16	0.61	21.5	51.09	-
HDLmB1	662	90	MWD	100-150	c	c	-	-	>200	1-3	Slight	9.06	0.37	12.7	62.3	-
HDLmB1g1	662	90	MWD	100-150	c	c	15-35	-	>200	1-3	Slight	9.06	0.37	12.7	62.3	-
BDRmA1	662	90	WD	>150	c	c	-	<15	>200	0-1	Slight	8.73	0.20	10.9	40.56	-
BDRmB1	662	90	WD	>150	c	c	-	<15	>200	1-3	Slight	8.73	0.20	10.9	40.56	-

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

An area of about 43 ha (8%) is marginally suitable (Class S3) for growing sorghum and are distributed in the southwestern part of the microwatershed with moderate limitations of rooting condition and calcareousness.

Table 7.2 Crop suitability criteria for Sorghum

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

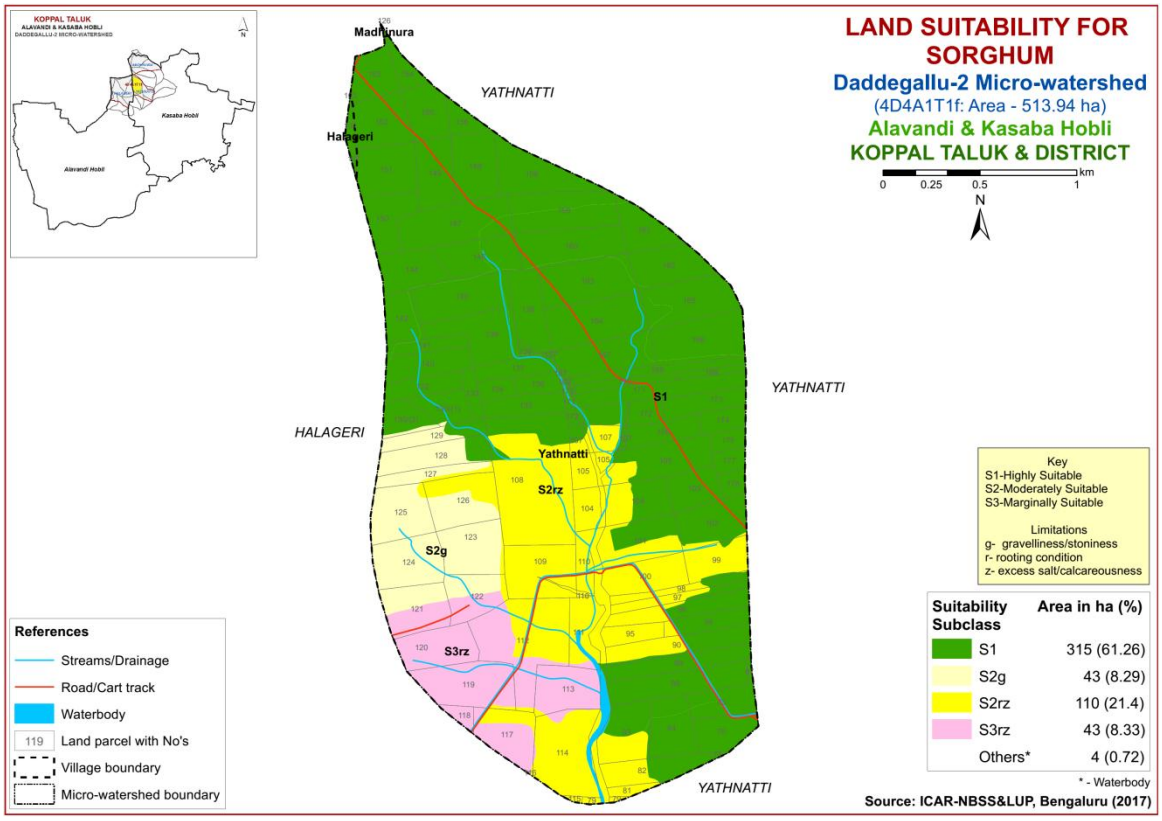


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

Maize is one of the most important food crop grown in an area of 13.37 lakh ha in almost all the districts of the State. The crop requirements for growing maize (Table 7.3) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for

growing maize was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.2.

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands for growing maize crop in the microwatershed. Entire area of about 510 ha (99%) is marginally suitable (Class S3) and are distributed in all parts of the microwatershed. They have moderate limitations of texture and calcareousness.

Table 7.3 Crop suitability criteria for Maize

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

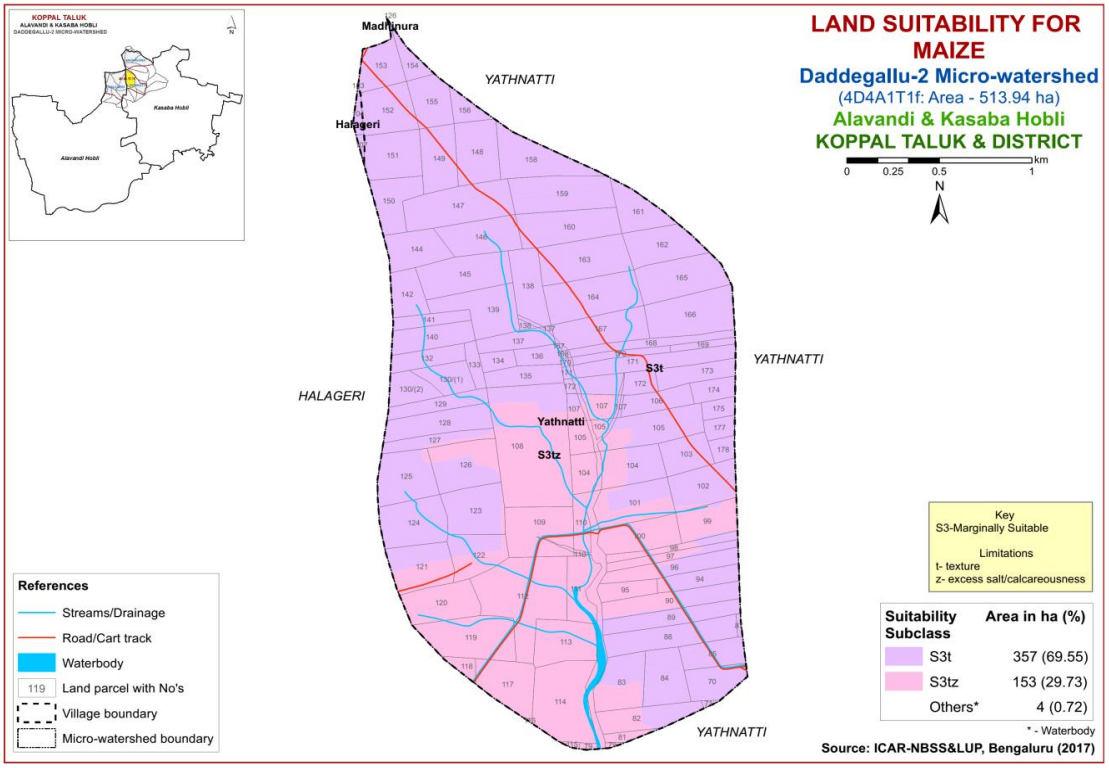


Fig. 7.2 Land Suitability map of Maize

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 the northern districts of the Karnataka State. The crop requirements for growing bajra (Table

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

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands for growing bajra crop in the microwatershed. Entire area of about 510 ha (99%) is marginally suitable (Class S3) and are distributed in all parts of the microwatershed. They have moderate limitations of texture, rooting condition and calcareousness.

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)	dS m^{-1}	2-4	4-8	8-10	>10
Sodicity (ESP)	%	5-8	8-10	10-15	>15

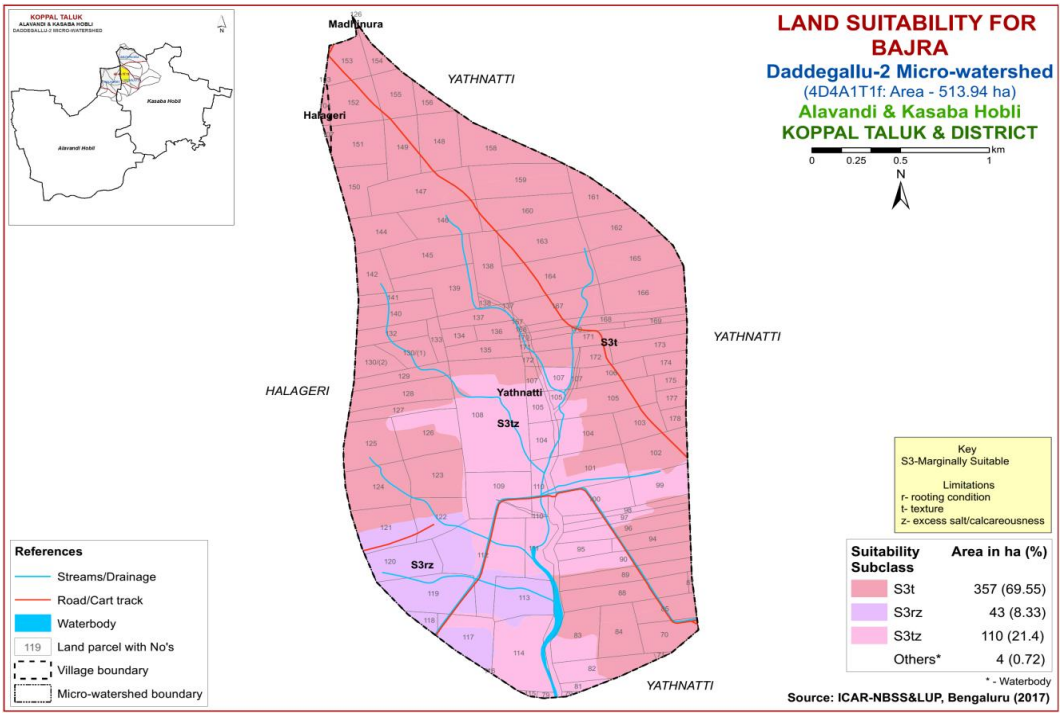


Fig. 7.3 Land Suitability map of Bajra

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

Redgram is one of the most important pulse crop grown in an area of 7.28 lakh ha in almost all the districts of the State. The crop requirements for growing redgram (Table

7.5) 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.

Table 7.5 Land suitability criteria for Red gram

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

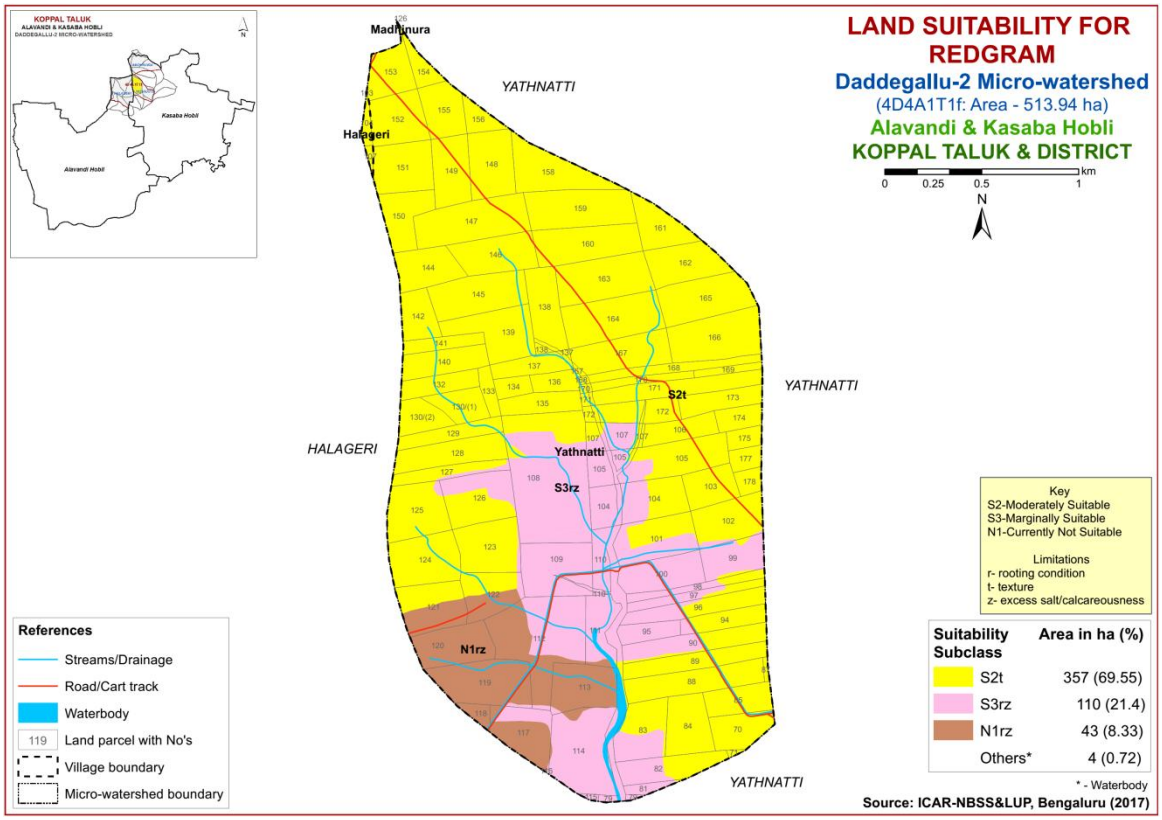


Fig. 7.4 Land Suitability map of Redgram

There are no highly suitable (Class S1) lands for growing redgram crop in the microwatershed. Moderately suitable lands occupy an area of 357 ha (70%) and are distributed in the major part of the microwatershed with minor limitation of texture.

Marginally suitable (Class S3) lands cover an area of about 110 ha (21%) and are distributed in the southern and central part of the microwatershed. They have moderate limitations of calcareousness and rooting condition. Not suitable (Class N1) lands cover an area of 43 ha (8%) for growing redgram and are distributed in the southwestern part of the microwatershed with severe limitations of calcareousness and rooting condition.

7.5 Land Suitability for Bengalgram (*Cicer arietinum*)

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

Highly suitable (Class S1) lands cover an area of 357 ha (70%) and are distributed in the major part of the microwatershed. Moderately suitable lands occupy an area of 110 ha (21%) and are distributed in the southern and central part of the microwatershed with minor limitations of rooting condition and calcareousness. Marginally suitable (Class S3) lands cover an area of 43 ha (8%) and are distributed in the southwestern part of the microwatershed. They have moderate limitations of rooting condition and calcareousness

Table 7.6 Crop suitability criteria for Bengalgram

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>100	90-100	70-90	<70
Soil drainage	class	Well drained	Mod. to well drained; Imp. drained	Poorly drained; excessively drained	Very Poorly drained
Soil reaction	pH	6.0-7.5	5.5-5.7;7.6-8.0	8.1-9.0;4.5-5.4	>9.0
Surface soil texture	Class	l, scl, sil, cl,	sicl, sic, c	sl, c>60%	s, fragmental
Soil depth	cm	>75	51-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (EC)	dS m^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

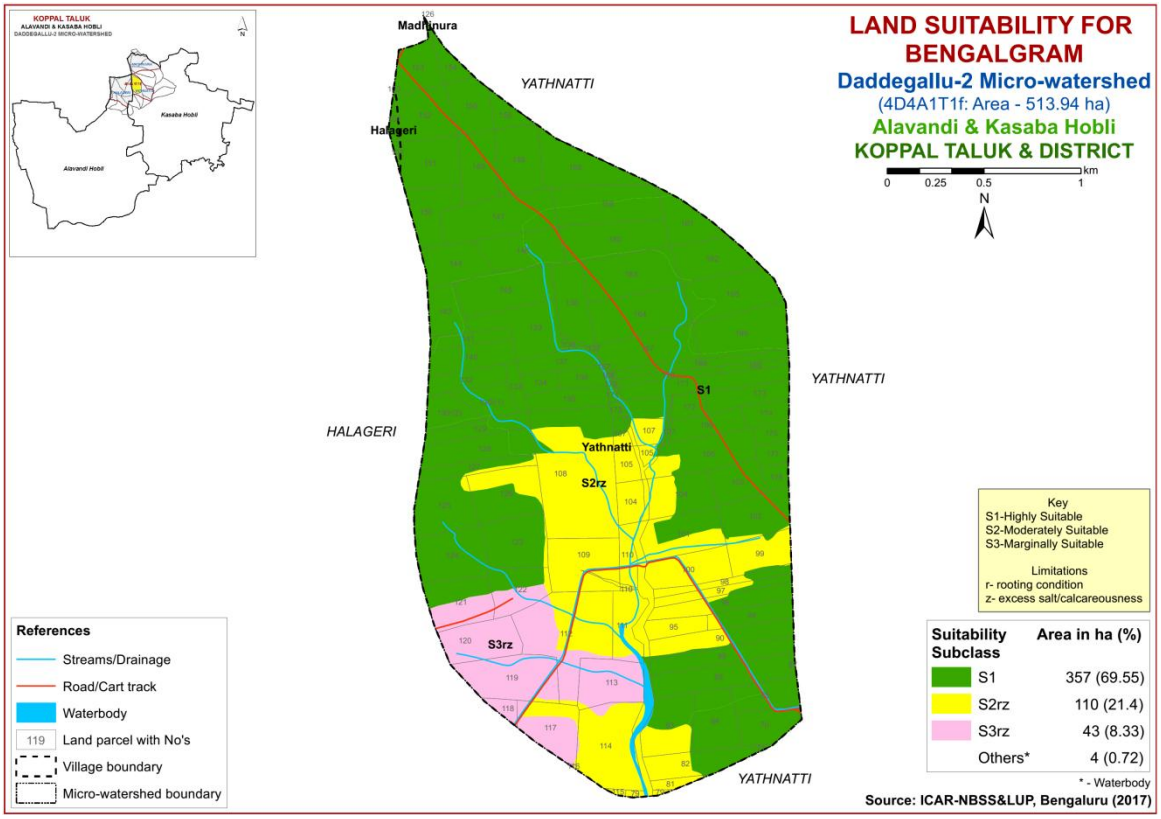


Fig. 7.5 Land Suitability map of Bengalgram

7.6 Land Suitability for Groundnut (*Arachis hypogaea*)

Groundnut is one of the major oilseed crop grown in an area of 6.54 lakh ha in Karnataka in most of the districts either as rainfed or irrigated crop. The crop requirements for growing groundnut (Table 7.7) 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.

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 rootzone	%	high	Medium	low	
Salinity (EC)	dS m^{-1}	<2.0	2.0-4.0	4.0-8.0	
Sodicity (ESP)	%	<5	5-10	>10	

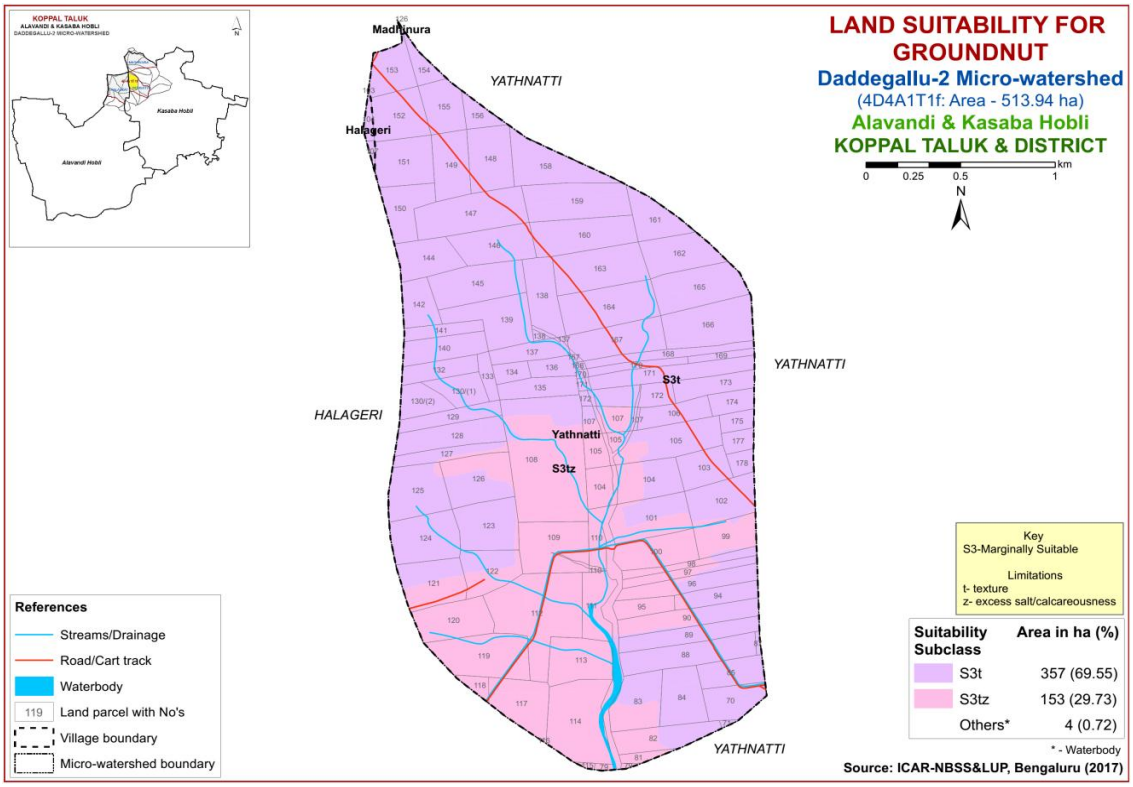


Fig. 7.6 Land Suitability map of Groundnut

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)	dS m^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

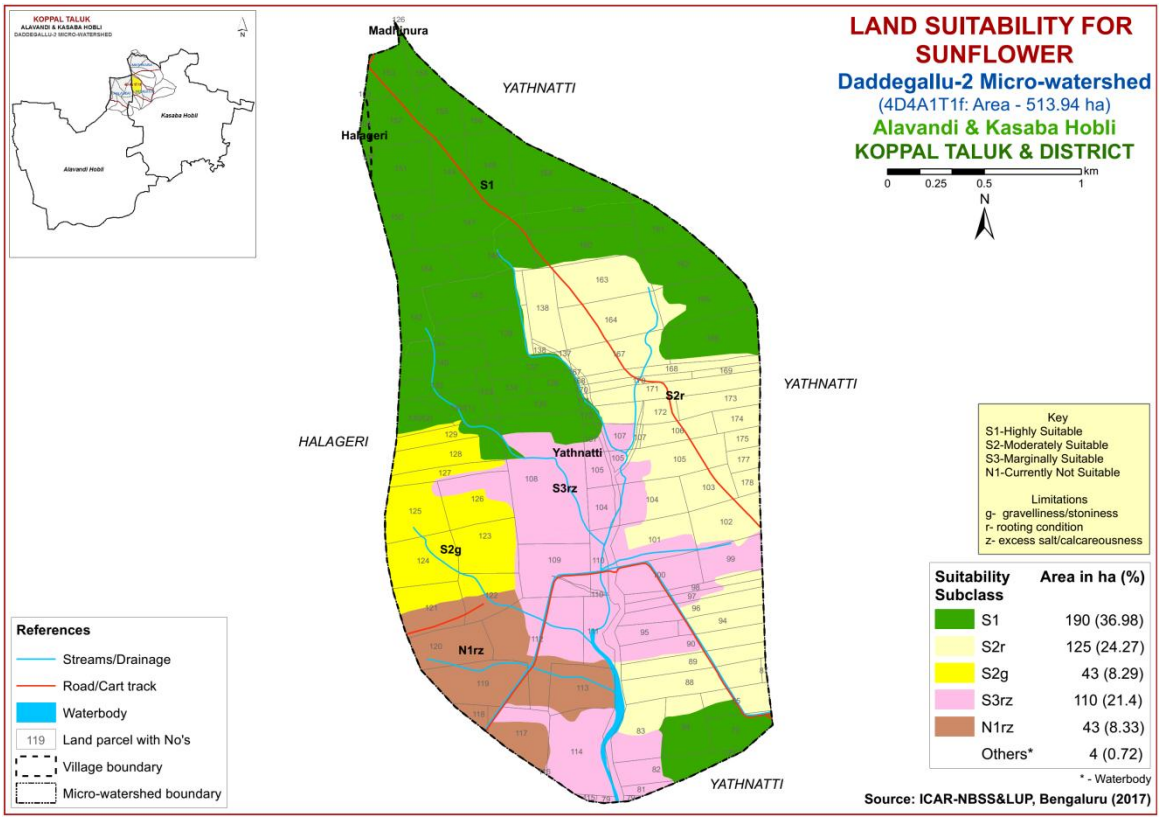


Fig. 7.7 Land Suitability map of Sunflower

Highly suitable (Class S1) lands occupy an area of 190 ha (37%) and are distributed in the northwestern, northern, southern and northeastern part of the microwatershed. An area of 168 ha (33%) is moderately suitable (Class S2) for growing sunflower and are distributed in the western, eastern, and southeastern part of the microwatershed. They have minor limitations of rooting condition and gravelliness. An area of 110 ha (21%) is marginally suitable (Class S3) for growing sunflower and are distributed in the central, southern and eastern part of the microwatershed with moderate limitations of rooting condition and calcareousness. Not suitable (Class N1) lands cover an area of 43 ha (8%) and are distributed in the southwestern part of the microwatershed with severe limitations of rooting condition and calcareousness.

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.

A major area of 357 ha (70%) is highly suitable (Class S1) for growing cotton and are distributed in the major part of the microwatershed. Moderately suitable (Class S2)

lands occupy an area of 110 ha (21%) and are distributed in the central and western part of the microwatershed. They have minor limitations of rooting condition and calcareousness. Marginally suitable (Class S3) lands cover an area of 43 ha (8%) and are distributed in the southwestern part of the microwatershed. They have moderate limitations of calcareousness and rooting condition.

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	Poor 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)	dS m^{-1}	2-4	4.0-8.0	8.0-12	>12
Sodicity (ESP)	%	5-10	10-20	20-30	>30

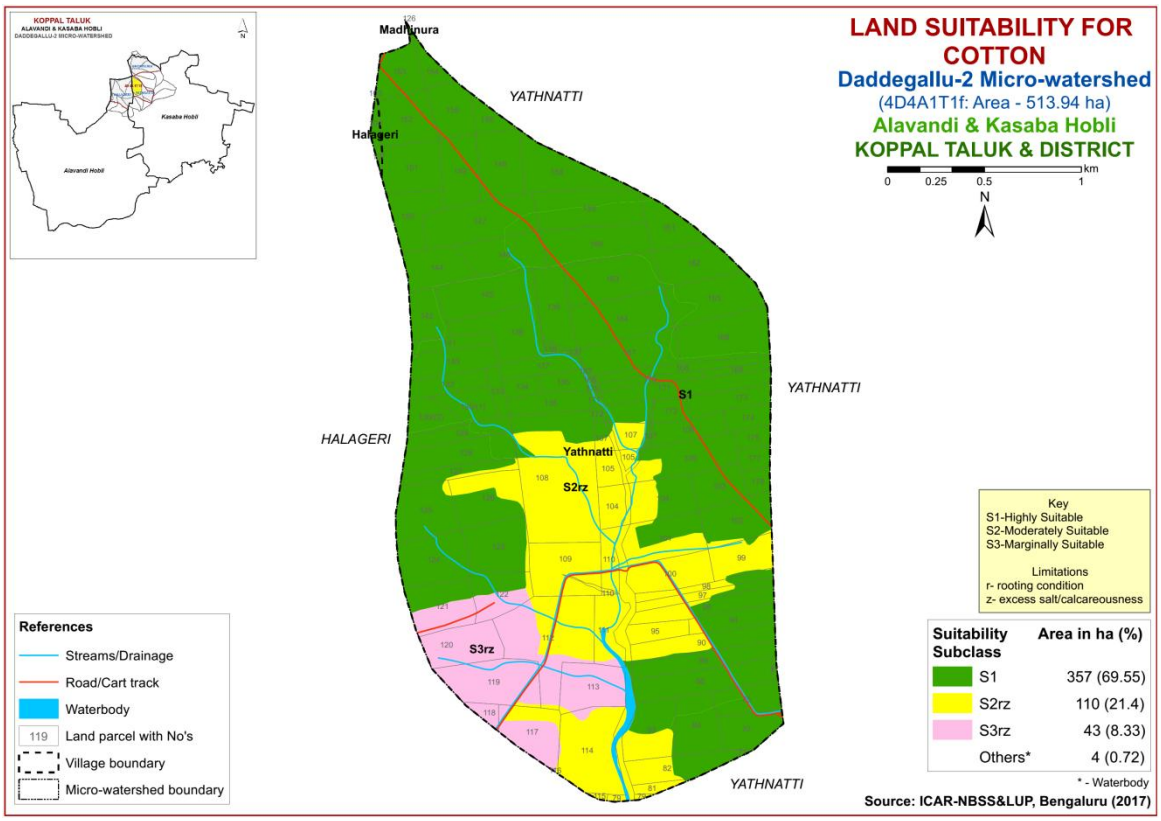


Fig. 7.8 Land Suitability map of Cotton

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

Chilli is one of the most important commercial crop grown in an area of 0.89 lakh ha in all the districts of 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)**
Mean temperature in growing season	^{0}c	20-30	30-35,13-15	35-40,10-12	>40,<10
Slope	%	<3	3-5	5-10	>10
LGP	Days	>150	120-150	90-120	<90
Soil drainage	Class	Well drained	Moderately drained	Imp./ poor drained/excessively	V.poorly drained
Soil reaction	pH	6.5-7.8,6.0-7.0	7.8-8.4	8.4-9.0,5.0-5.9	>9.0
Surface soil texture	Class	scl, cl, sil	sl, sc, sic,c (m/k)	c (ss), ls, s	
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (ECe)	dS m^{-1}	<1.0	1.0-2.0	2.0-4.0	<4
Sodicity (ESP)	%	<5	5-10	10-15	

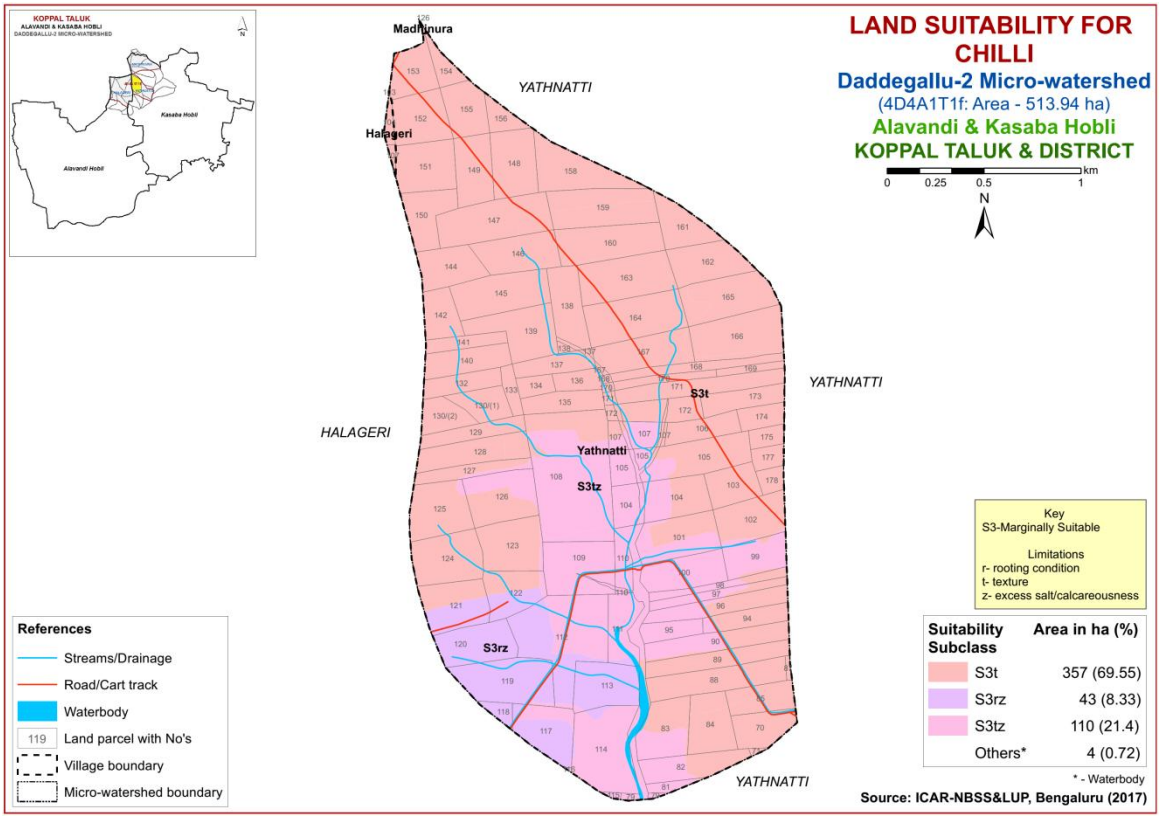


Fig. 7.9 Land Suitability map of Chilli

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands for growing chilli in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of about 510 ha (99%) and are distributed in all parts of the microwatershed. They have moderate limitations of calcareousness, texture and rooting condition.

7.10 Land Suitability for Tomato (*Solanum lycopersicum*)

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

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands for growing tomato in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of 510 ha (99%) and occur in all parts of the microwatershed. They have moderate limitations of texture, rooting condition 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	Nonsaline	slight	strongly	
	Sodicity(ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	>10

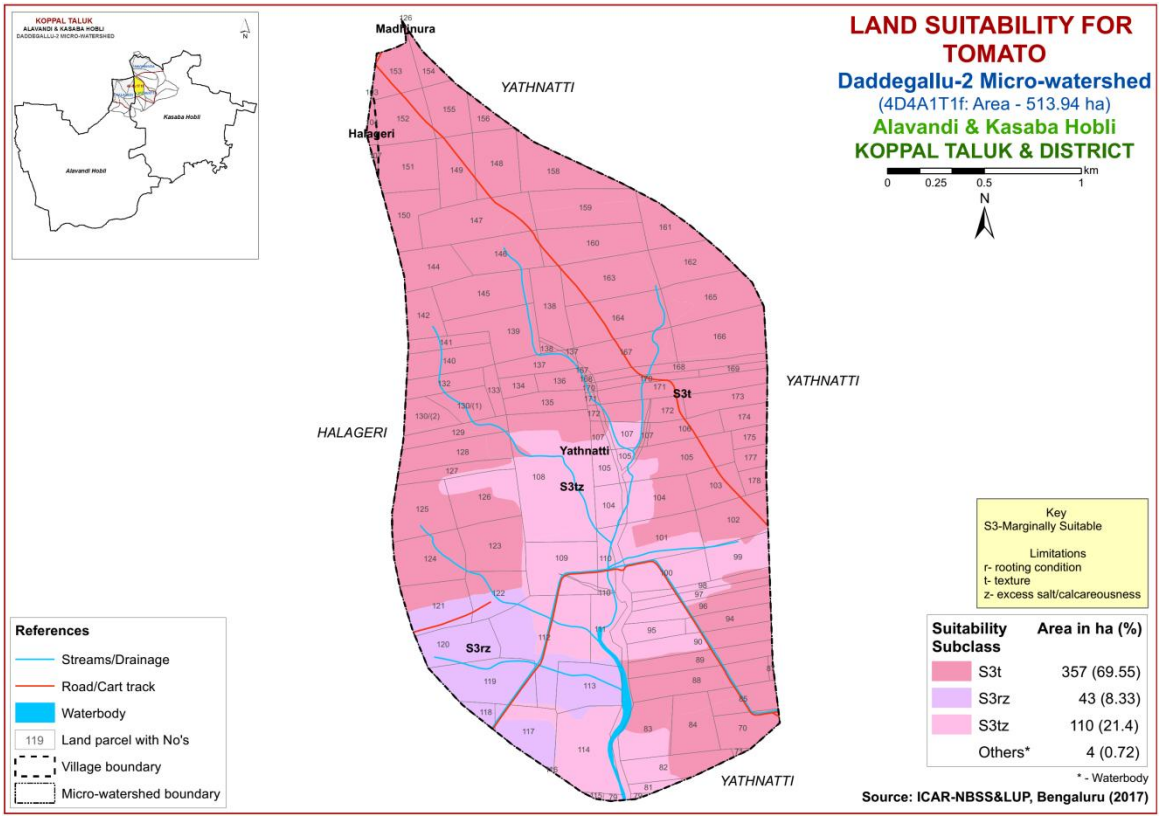


Fig. 7.10 Land Suitability map of Tomato

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 is given in Figure 7.11.

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
	Gravel content	%vol.	0-35	35-60	60-80	>80
Erosion	Slope	%	0-3	3-10	-	>10

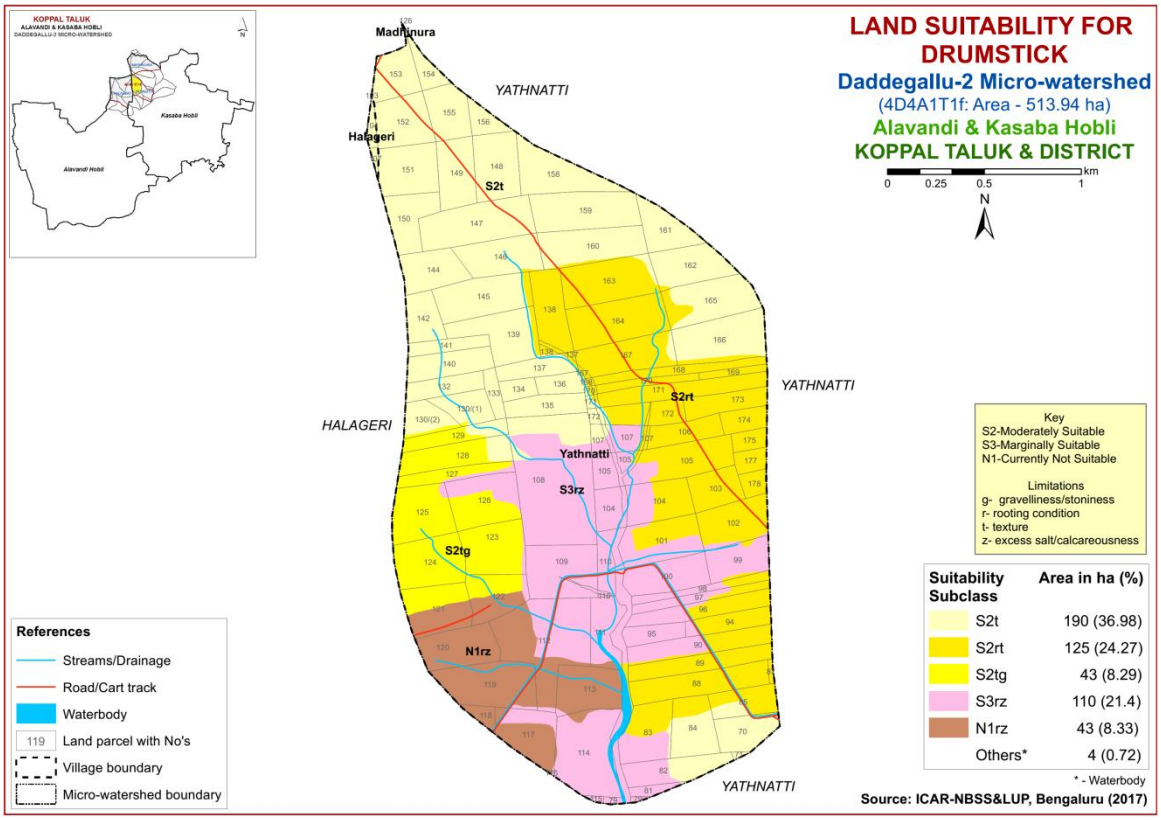


Fig. 7.11 Land Suitability map of Drumstick

There are no highly suitable (Class S1) lands for growing drumstick in the microwatershed. Moderately suitable (Class S2) lands occupy an area of 358 ha (70%) and are distributed in the major part of the microwatershed. They have minor limitations of gravelliness, rooting condition and texture. Marginally suitable (Class S3) lands cover an area of 110 ha (21%) and are distributed in the southern and central part of the microwatershed. They have moderate limitations of rooting condition and calcareousness. Not suitable (Class N1) lands cover an area of 43 ha (8%) and are distributed in the southwestern part of the microwatershed with severe limitations of rooting condition and calcareousness.

7.12 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is one of the most important leaf crop grown for rearing silkworms in about 1.66 lakh ha in all the districts of the State. The crop requirements for growing mulberry (Table 7.13) 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.

There are no highly suitable (Class S1) lands for growing mulberry in the microwatershed. Moderately suitable (Class S2) lands occupy a maximum area of 265 ha (52%) and are distributed in the western, southeastern, eastern and central part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable (Class S3) lands cover an area of 202 ha (39%) and occur in the northern,

northwestern, central and southern part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness. An area of 43 ha (8%) is not suitable (N1) and are distributed in the southwestern part of the microwatershed with severe limitations of rooting depth and calcareousness.

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

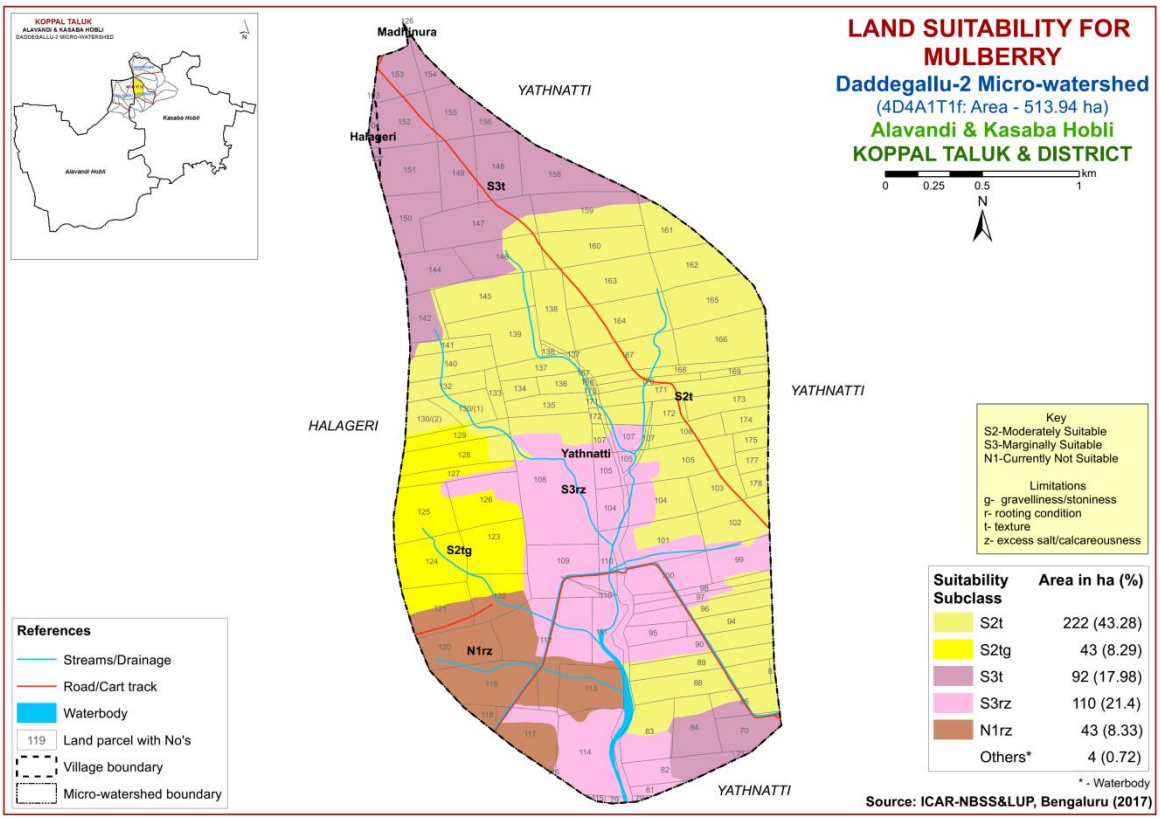


Fig. 7.12 Land Suitability map of Mulberry

7.13 Land Suitability for Mango (*Mangifera indica*)

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

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands for growing mango in the microwatershed. Marginally suitable (Class S3) lands cover a maximum area of 358 ha (70%) and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth and texture. An area of 153 ha (30%) is not suitable (Class N1) for growing mango and occur in the southwestern, central and southern part of the microwatershed with severe limitations of texture, calcareousness and rooting condition.

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 growing season	^{0}C	28-32	24-27 33-35	36-40	20-24
	Min.temp.before flowering	^{0}C	10-15	15-22	>22	
Soil moisture	Growing period	Days	>180	150-180	120-150	<120
Soil aeration	Soil drainage	Class	Well drained	Mod. To imp.drained	Poor drained	V.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	8.6-9.04.0-4.9	>9.0<4.0
	OC	%	High	medium	low	
	$CaCO_3$ in root zone	%	Non calcareous	<5	5-10	>10
Rooting conditions	Soil depth	cm	>200	125-200	75-125	<75
	Gravel content	%	Non-gravelly	<15	15-35	>35
Soil toxicity	Salinity	dS/m	Non saline	<2.0	2.0-3.0	>3.0
	Sodicity	%	Non sodic	<10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

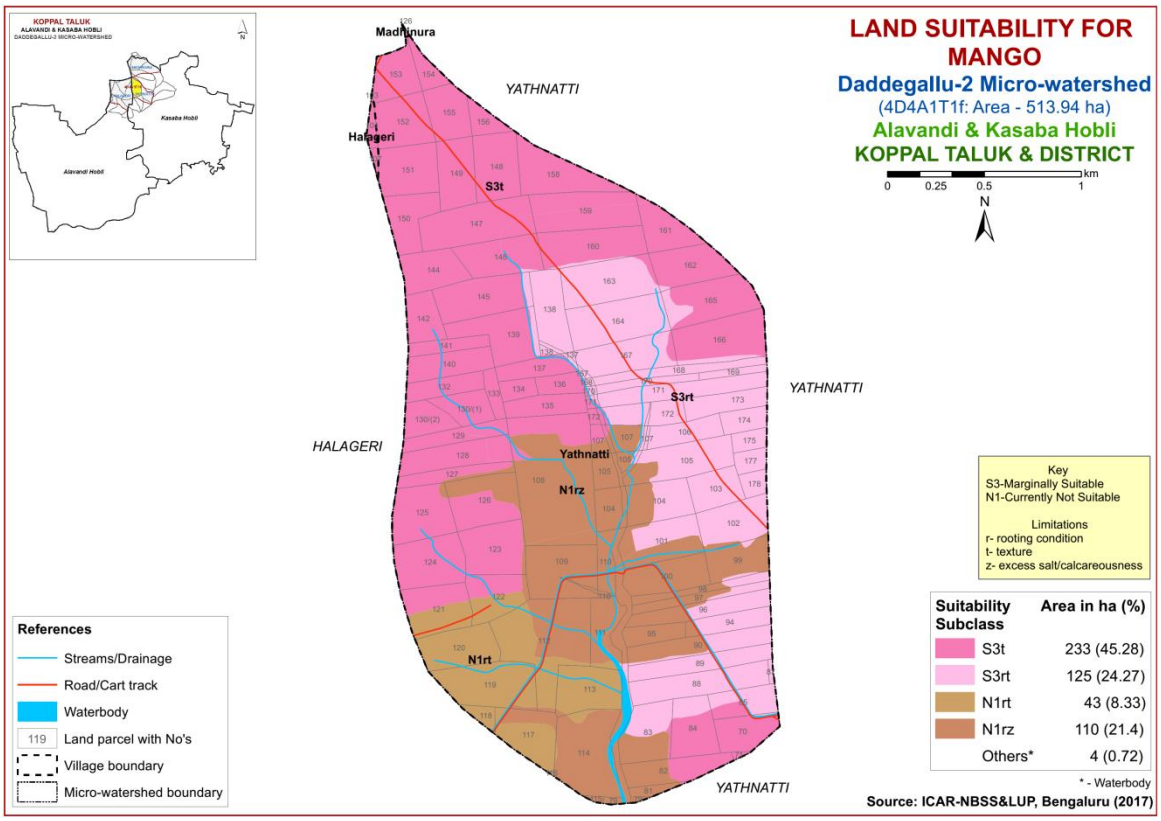


Fig. 7.13 Land Suitability map of Mango

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.

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands for growing sapota in the microwatershed. Marginally suitable (Class S3) cover a maximum area of 468 ha (91%) and occur in all parts of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness. An area of 43 ha (8%) is not suitable (Class N1) for growing sapota and occur in the southwestern part of the microwatershed with severe limitations of calcareousness and rooting condition.

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	Mod.well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	scl, l, cl, sil	sl, sicl, sc	c (<60%)	ls, s,c (>60%)
	pH	1:2.5	6.0-7.5	7.6-8.0,5.0-5.9	8.1-9.0,4.5-4.9	>9.0,<4.5
	$CaCO_3$ in root zone	%	Non calcareous	<10	10-15	>15
Rooting conditions	Soil depth	cm	>150	75-150	50-75	<50
	Gravel content	% vol.	Non gravelly	<15	15-35	<35
Soil toxicity	Salinity	dS/m	Non saline	Up to 1.0	1.0-2.0	2.0-4.0
	Sodicity	%	Non sodic	10-15	15-25	>25
Erosion	Slope	%	<3	3-5	5-10	>10

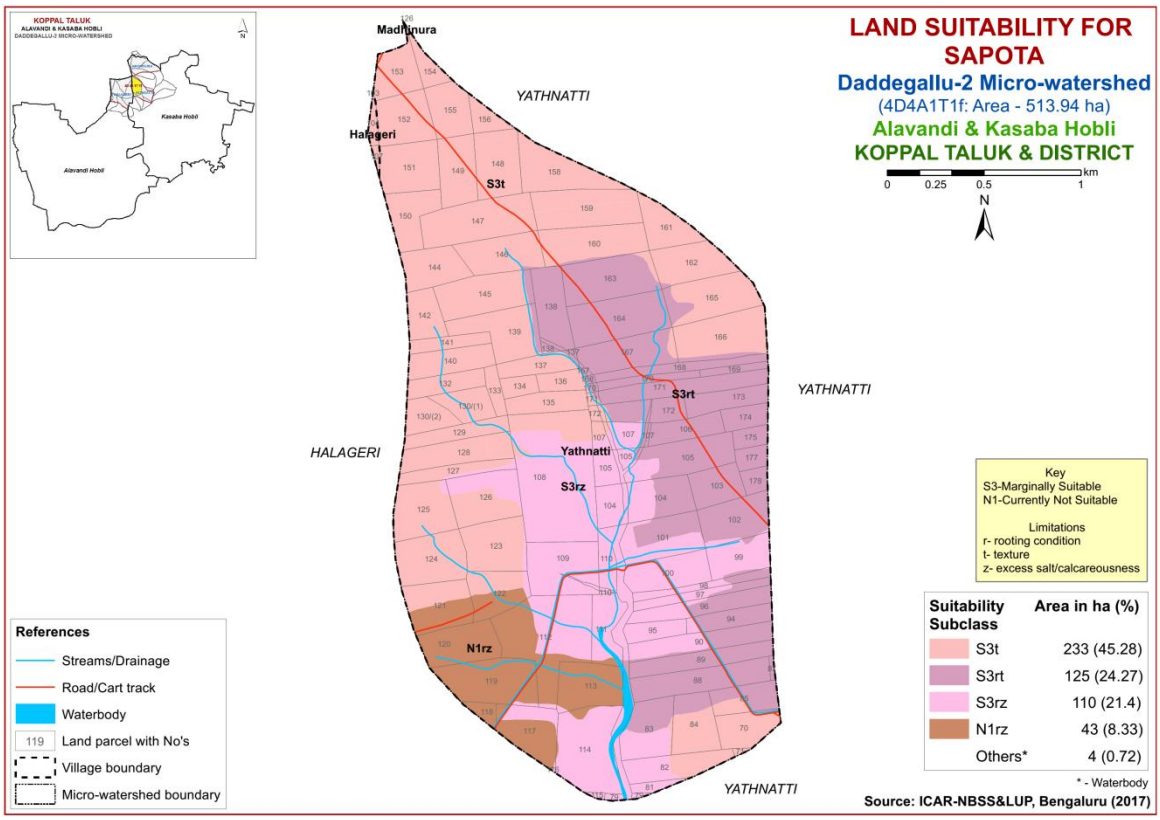


Fig. 7.14 Land Suitability map of Sapota

7.15 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the commercially grown fruit crop in an area of about 18488 ha in Karnataka mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing pomegranate (Table 7.16) 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.

There are no highly suitable (Class S1) lands for growing pomegranate in the microwatershed. An area of 358 ha (70%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed with minor limitations of texture, rooting condition and gravelliness. Marginally suitable (Class S3) occupy an area of about 110 (21%) for growing pomegranate and are distributed in the southern and central part of the microwatershed. They have moderate limitations of rooting condition and calcareousness. An area of 43 ha (8%) is not suitable (Class N1) for growing pomegranate and are distributed in the southwestern part of the microwatershed with severe limitations of calcareousness and rooting condition.

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	cl, scl, l, cl	c, sic, sicl	cl, s, ls	s, fragmental
Rooting conditions	pH	1:2.5	5.5-7.5	7.6-8.5	8.6-9.0	
	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	%vol.	nil	15-35	35-60	>60
Soil toxicity	Salinity	dS/m	Nil	<9	>9	<50
	Sodicity	%	nil			
Erosion	Slope	%	<3	3-5	5-10	

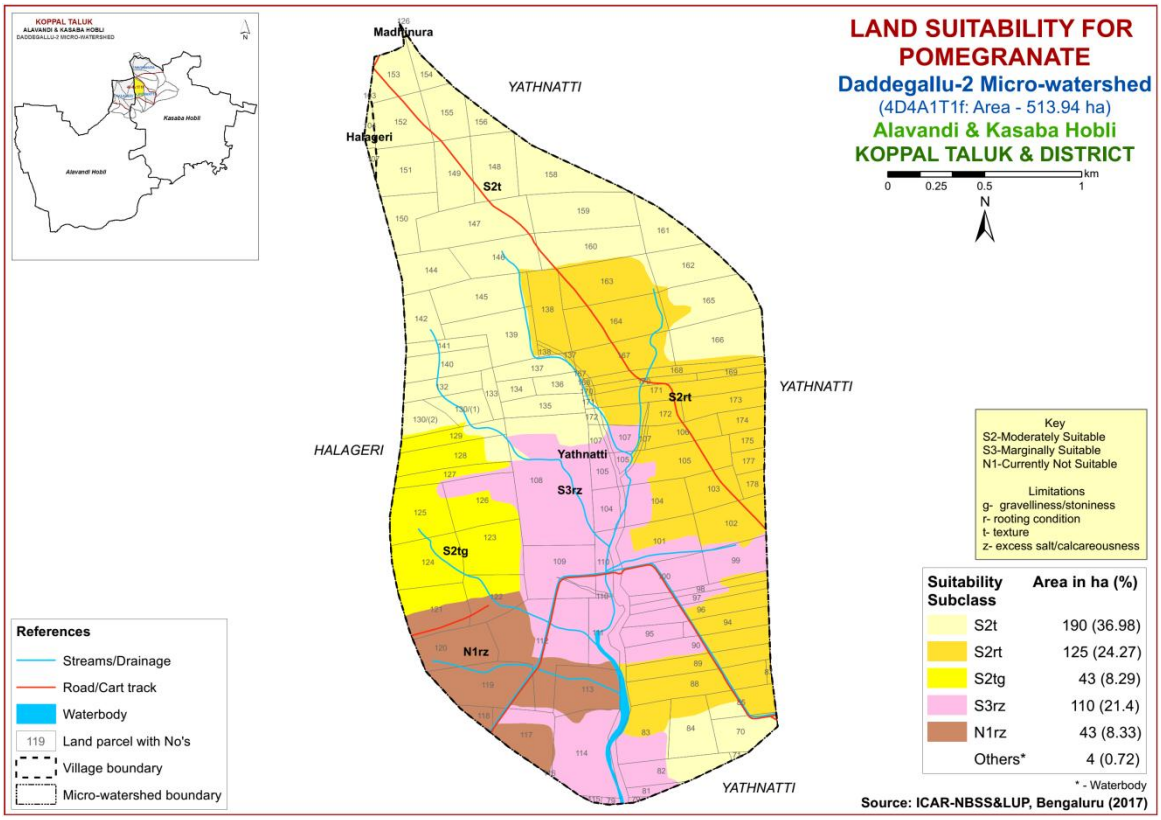


Fig. 7.15 Land Suitability map of Pomegranate

7.16 Land suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in an area of about 0.64 lakh ha in almost all the districts of the State. The crop requirements (Table 7.17) 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.

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands for growing guava in the microwatershed. Marginally suitable (Class S3) cover a maximum area of 467 ha (91%) and occur in the major part of the microwatershed. They have moderate limitations of texture and calcareousness. An area of about 43 ha (8%) is not suitable (Class N1) for growing guava and occur in the southwestern part of the microwatershed with severe limitations of rooting condition and texture.

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

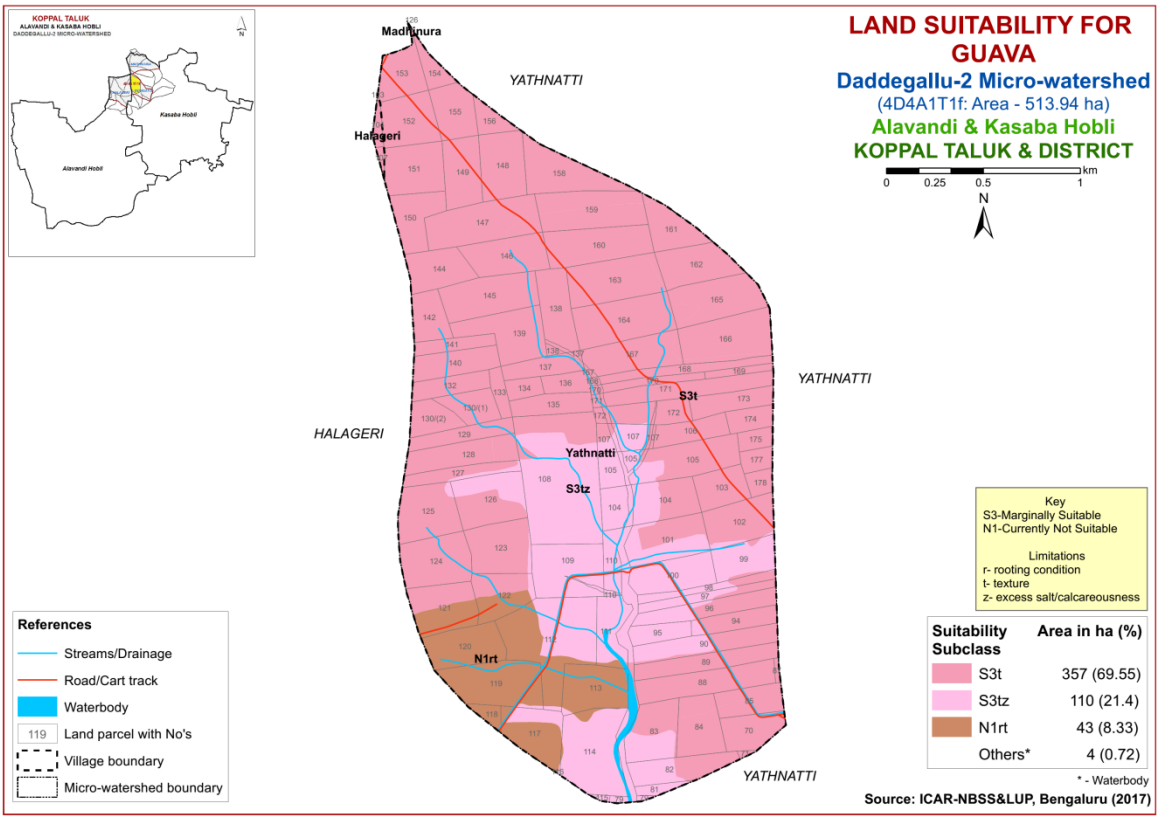


Fig. 7.16 Land Suitability map of Guava

7.17 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is one of the most important fruit crop grown in 5368 ha in all the districts of the State. The crop requirements for growing jackfruit (Table 7.18) 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.

Table 7.18 Crop suitability criteria for Jackfruit

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

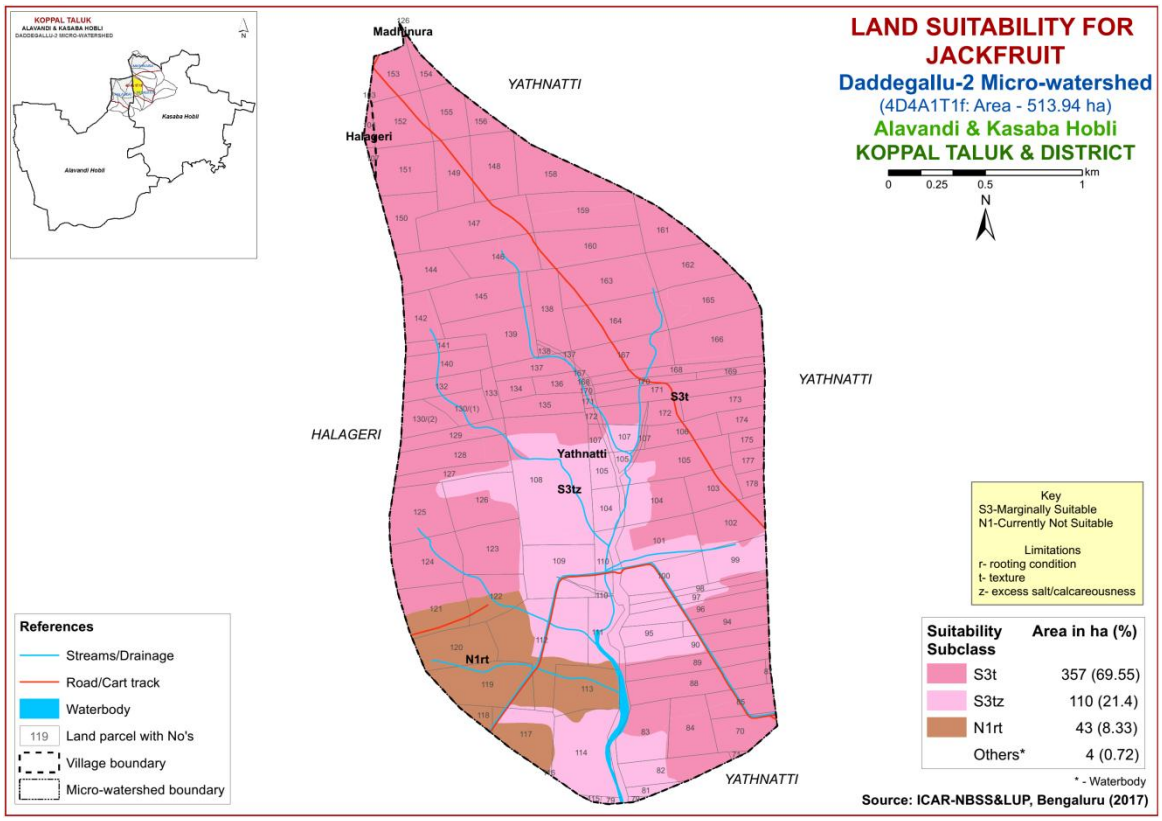


Fig. 7.17 Land Suitability map of Jackfruit

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands for growing jackfruit in the microwatershed. Marginally suitable (Class S3) lands cover a maximum area of 467 ha (91%) and are distributed in the major part of the microwatershed. They have moderate limitations of texture and calcareousness. An area of 43 ha (8%) is not suitable (Class N1) for growing jackfruit and occur in the central and southwestern part of the microwatershed with severe limitations of texture and rooting condition.

7.18 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun (Table 7.19) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jamun was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.18.

There are no highly suitable (Class S1) lands for growing jamun in the microwatershed. An area of 232 ha (45%) is moderately suitable (Class S2) and are distributed in the western, northeastern and northern part of the microwatershed. They have minor limitations of rooting condition and texture. Marginally suitable (Class S3) lands cover maximum area of 235 ha (46%) and are distributed in the southern, central and eastern part of the microwatershed with moderate limitations of rooting condition, texture and calcareousness. An area of 43 ha (8%) is not suitable (Class N1) for growing jamun and are distributed in the southwestern part of the microwatershed with severe limitations of texture and rooting condition.

Table 7.19 Crop suitability criteria for Jamun

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

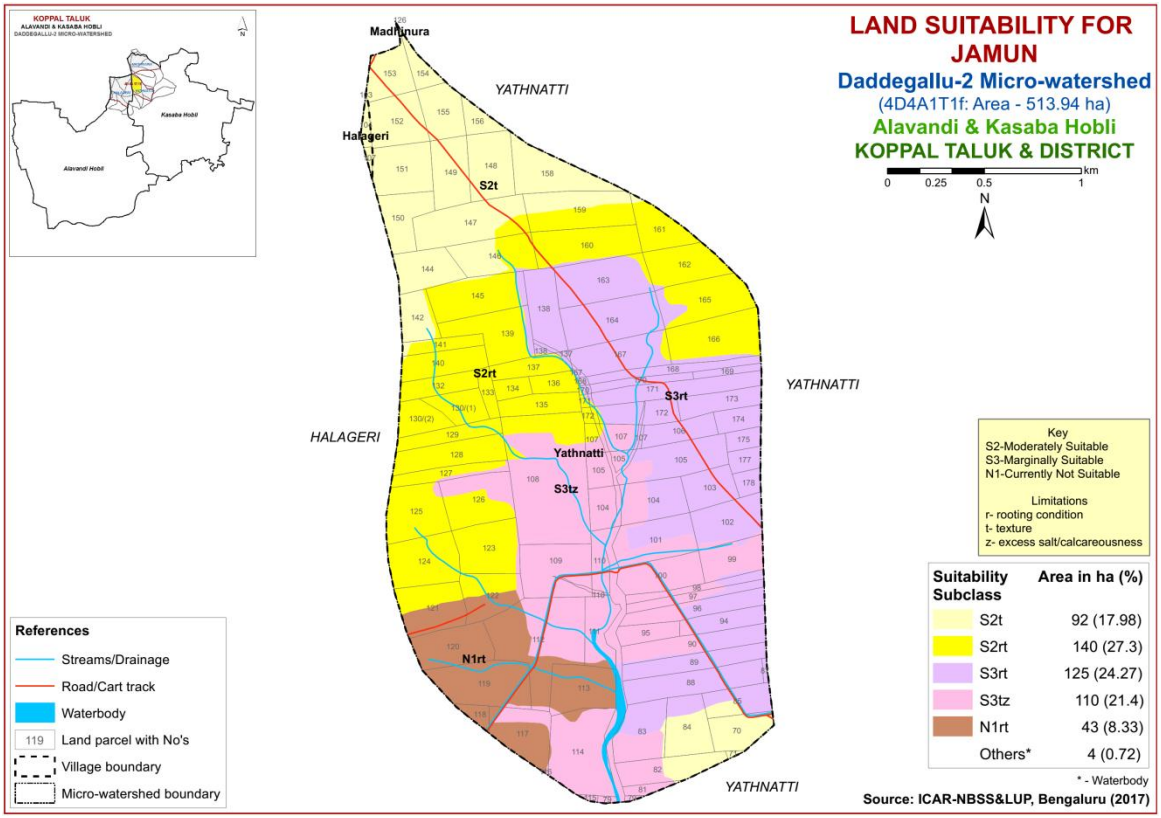


Fig. 7.18 Land Suitability map of Jamun

7.19 Land Suitability for Musambi (*Citrus limetta*)

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

Highly suitable (Class S1) lands occur in an area of 190 ha (37%) for growing musambi and are distributed in the southern, northwestern, northeastern and northern part of the microwatershed. An area of 168 ha (33%) is moderately suitable (Class S2) for growing musambi and are distributed in the western, southeastern, eastern and northern part of the microwatershed. They have minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands occur in an area of 110 ha (21%) for growing musambi and are distributed in the central and southern part of the microwatershed with moderate limitations of rooting condition and calcareousness. An area of 43 ha (8%) is not suitable (Class N1) for growing musambi and are distributed in the southwestern part of the microwatershed. They have severe limitations of calcareousness and rooting condition.

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 growing season	^{0}C	28-30	31-35 24-27	36-40 20-23	>40 <20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imp.drained	Poorly	Very poorly
Nutrient availability	Texture	Class	scl, l, sicl, cl, s	sc, sc, c	c (>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.4,7.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
	$CaCO_3$ in root zone	%	Non calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

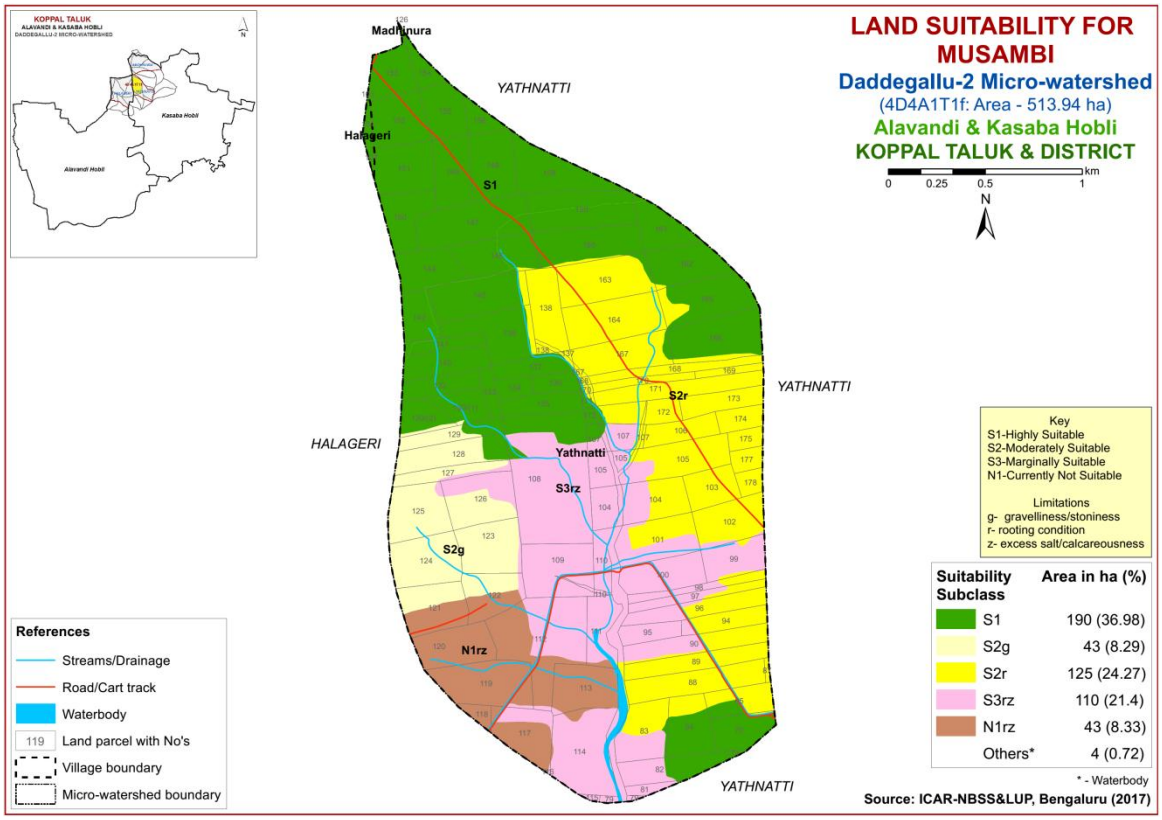


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 0.11 lakh ha in almost all the districts of the State. The crop requirements for growing lime (Table 7.21) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.20.

Highly suitable (Class S1) lands occupy an area of 190 ha (37%) for growing lime and are distributed in the southern, northern, northwestern and northeastern part of the microwatershed. An area of 168 ha (33%) is moderately suitable (Class S2) and are distributed in the western, southeastern, eastern and northern part of the microwatershed. They have minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands occur in an area of 110 ha (21%) for growing lime and distributed in the central and southern part of the microwatershed with moderate limitations of rooting condition and calcareousness. An area of 43 ha (8%) is not suitable (Class N1) for growing lime with severe limitations of rooting condition and calcareousness. They are distributed in the southwestern part of the microwatershed

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	^{0}C	28-30	31-35 24-27	36-40 20-23	>40 <20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imperfectly drained	Poorly	Very poorly
Nutrient availability	Texture	Class	scl, l, sicl, cl, s	sc, sc, c	c (>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.47.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
	$CaCO_3$ in root zone	%	Non calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

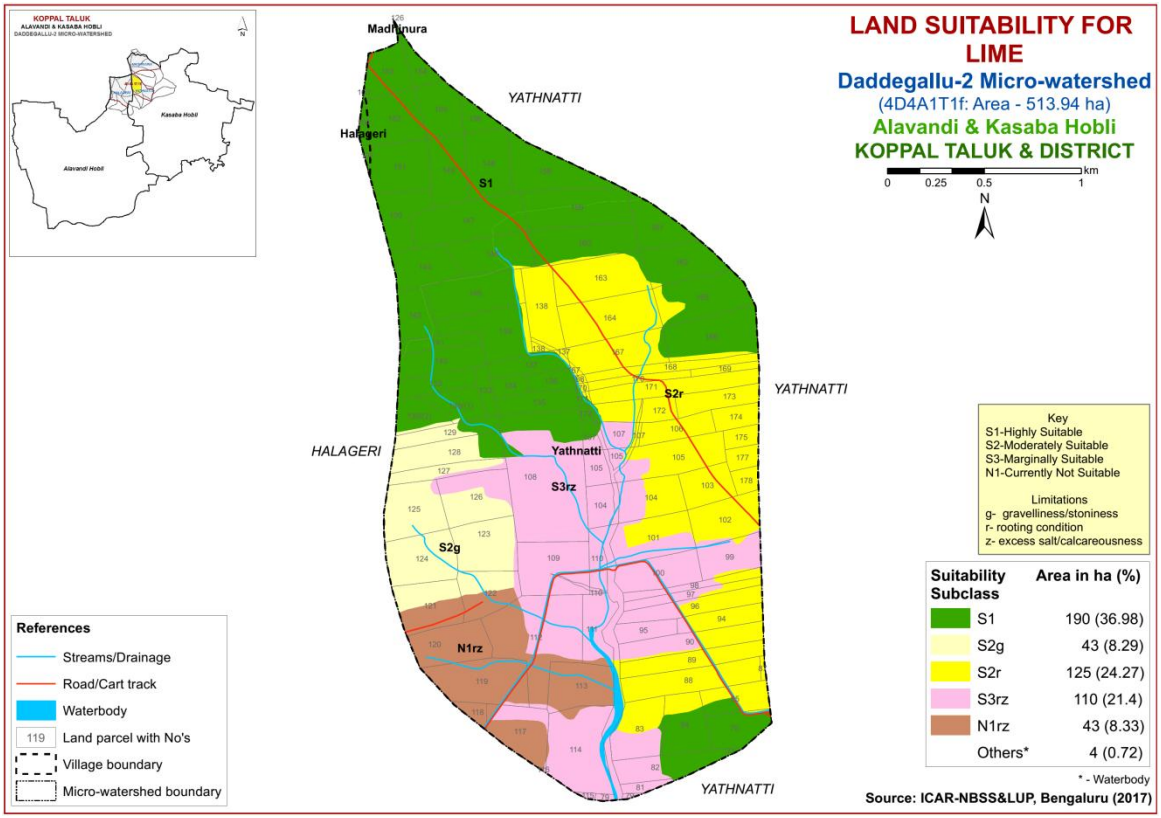


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

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

There are no highly (Class S1) and moderately (Class S2) and marginally suitable (Class S3) lands for growing cashew in the microwatershed. Entire area of about 510 ha (99%) is not suitable (Class N1) for growing cashew with severe limitations of texture, rooting condition and calcareousness.

Table 7.22 Crop suitability criteria for Cashew

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

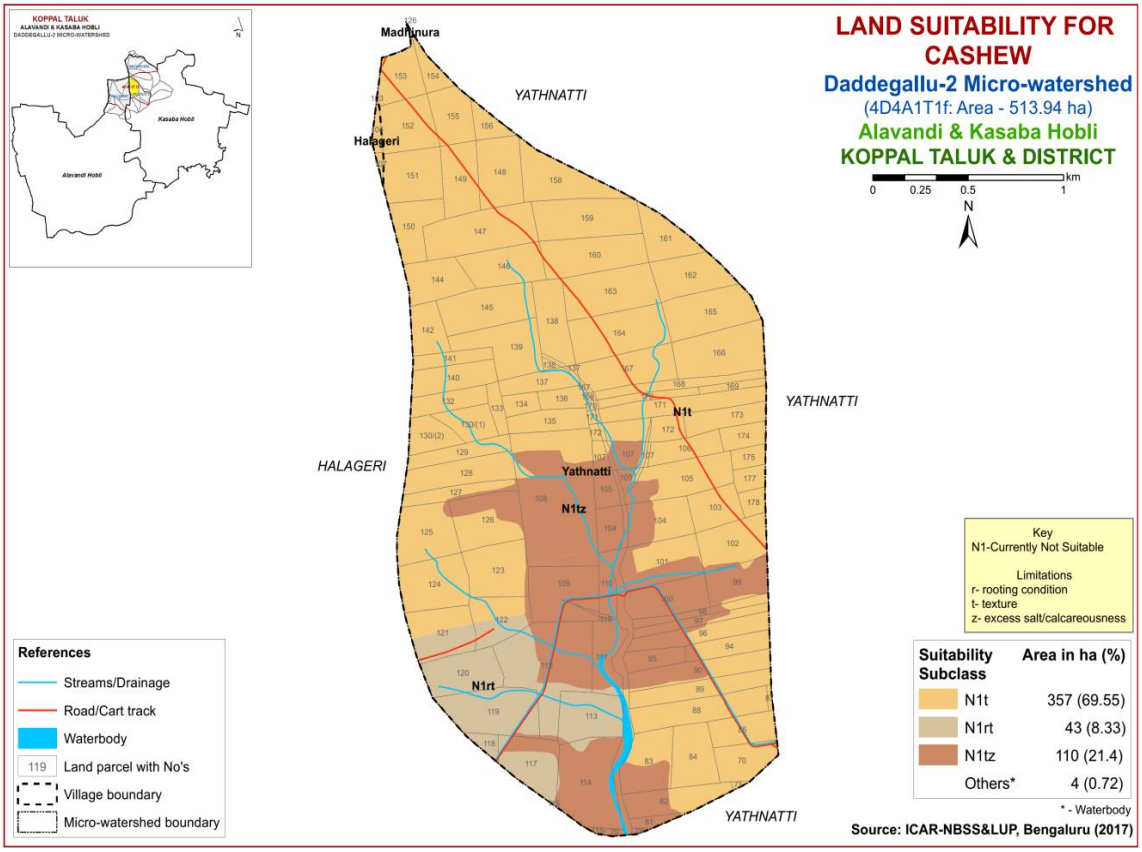


Fig. 7.21 Land Suitability map of Cashew

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

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing custard apple (Table 7.23) 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.

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	-

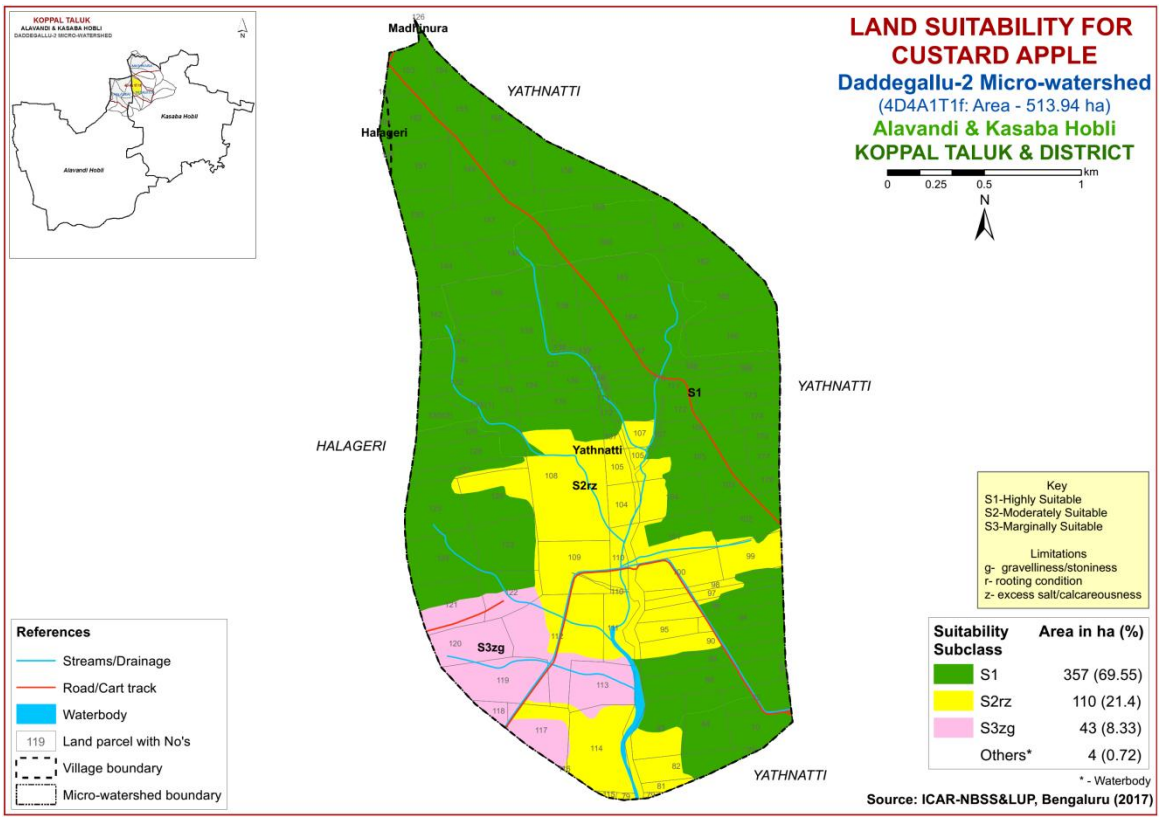


Fig. 7.22 Land Suitability map of Custard Apple

An area of 357 ha (70%) is highly suitable (Class S1) for growing custard apple and are distributed in the major part of the microwatershed. An area of 110 ha (21%) is moderately suitable (Class S2) and are distributed in the southern and central part of the microwatershed. They have minor limitations of rooting condition and calcareousness. An area of 43 ha (8%) is marginally suitable (Class S3) for growing custard apple and are distributed in the southwestern part of the microwatershed with moderate limitations of gravelliness and calcareousness.

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

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

There are no highly suitable (Class S1) lands for growing amla in the microwatershed. Major area of 467 ha (91%) has soils that are moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of rooting condition, texture and calcareousness. The marginally suitable (Class S3) cover an area of 43 ha (8%) and occur in the southwestern part of the microwatershed with moderate limitations of texture and calcareousness.

Table 7.24 Crop suitability criteria for Amla

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

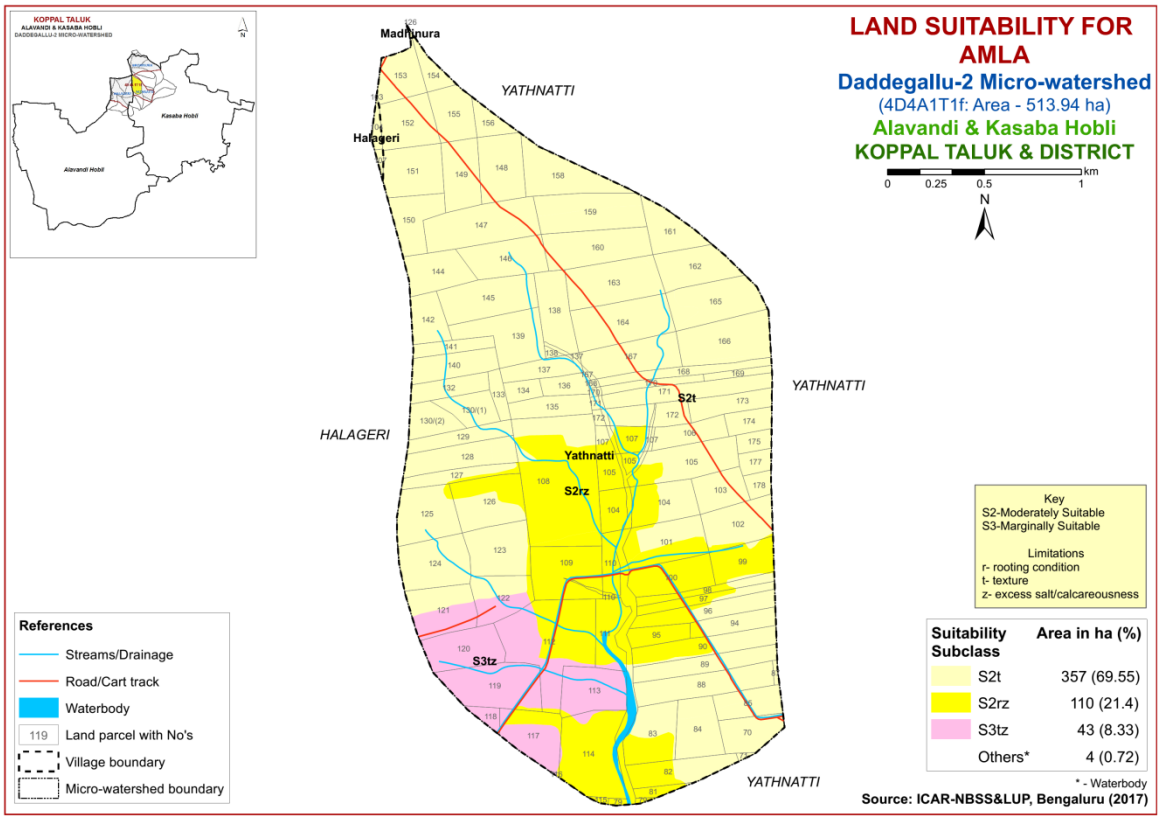


Fig. 7.23 Land Suitability map of Amla

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

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

There are no highly suitable (Class S1) lands for growing tamarind in the microwatershed. An area of 232 ha (45%) is moderately suitable (Class S2) and occur in the northern, western and northeastern part of the microwatershed. They have minor limitations of rooting condition and texture. An area of 125 ha (24%) is marginally

suitable (Class S3) and are distributed in the eastern and northern part of the microwatershed. They have moderate limitation of rooting condition. An area of 153 ha (30%) is not suitable (Class N1) for growing tamarind and are distributed in the central and southwestern part of the microwatershed with severe limitations of calcareousness and rooting condition.

Table 7.25 Crop suitability criteria for Tamarind

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

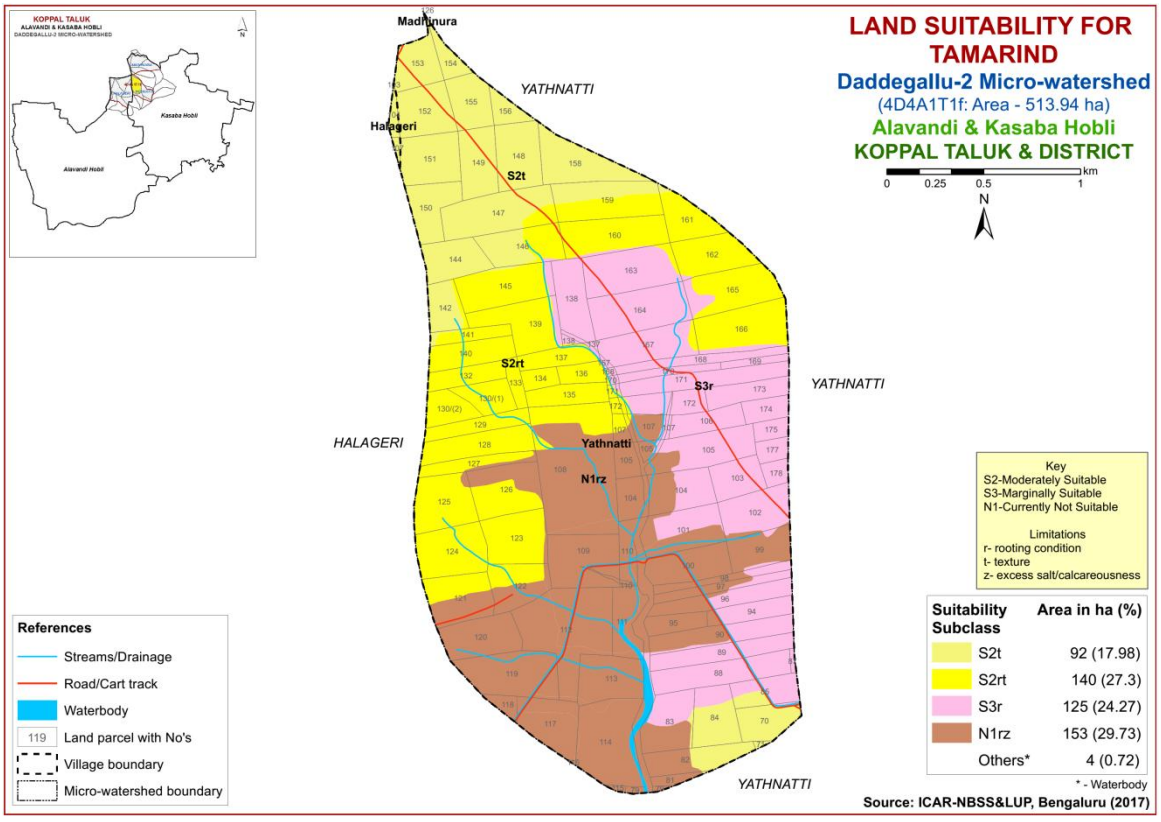


Fig. 7.24 Land Suitability map of Tamarind

7.25 Land Suitability for Marigold (*Tagetes erecta*)

Marigold is one of the most important flower crop grown in an area of 1858 ha in almost all the districts of the State. The crop requirements for growing marigold (Table 7.26) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

Table 7.26 Crop suitability criteria for Marigold

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N)
Climate	Temperature in growing season		18-23	17-15 24-35	35-40 10-14	>40 <10
Soil aeration	Soil drainage	Class	Well drained	Mod. well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l,sl,scl,cl,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	-

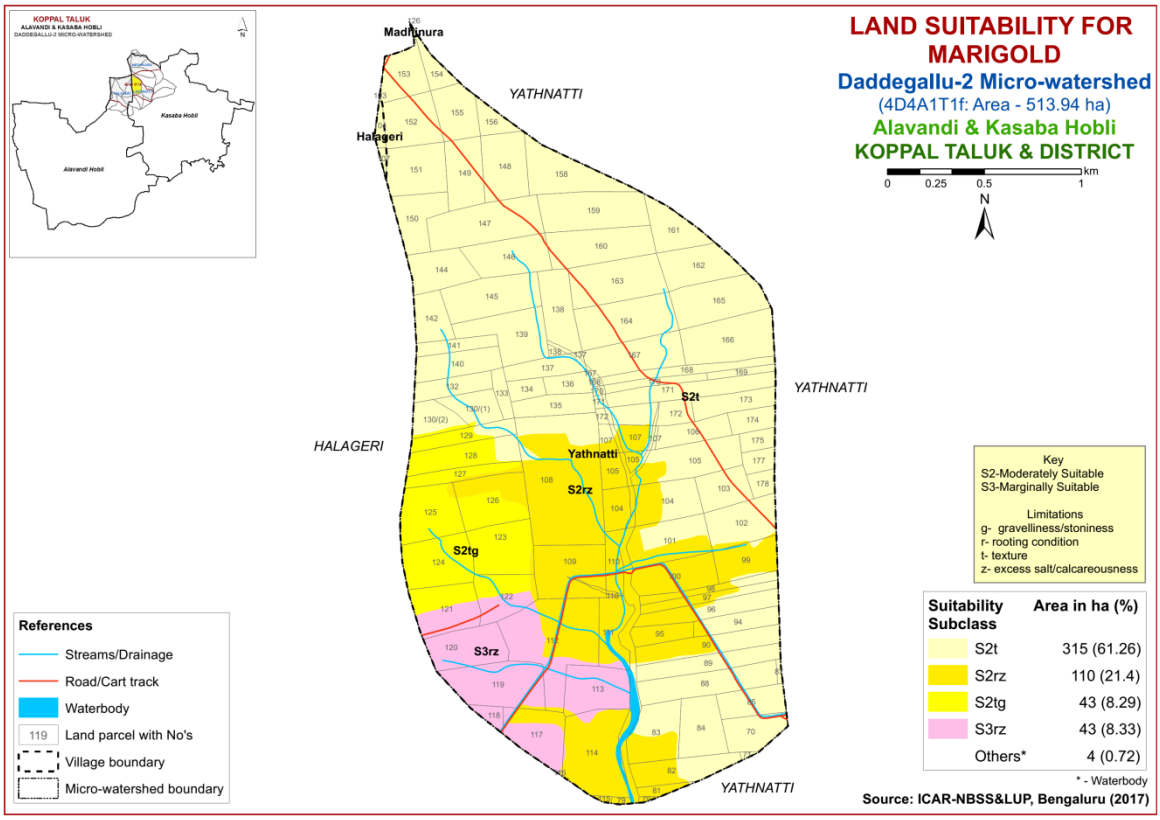


Fig. 7.25 Land Suitability map of Marigold

There are no highly suitable (Class S1) lands for growing marigold in the microwatershed. A Major area of 468 ha (91%) is moderately suitable (Class S2) for growing marigold and are distributed in all parts of the microwatershed. They have minor limitations of rooting condition, texture, gravelliness and calcareousness. An area of 43 ha (8%) is marginally suitable (Class S3) for growing marigold and occur in the southwestern part of the microwatershed with moderate limitations of calcareousness and rooting condition.

7.26 Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

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

There are no highly suitable (Class S1) lands for growing chrysanthemum in the microwatershed. Major area of 468 ha (91%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in the major part of the microwatershed. They have minor limitations of rooting condition, calcareousness, gravelliness and texture. An area of 43 ha (8%) is marginally suitable (Class S3) for growing chrysanthemum and occur in the southwestern part of the microwatershed. They have moderate limitations of rooting condition and calcareousness.

Table 7.27 Crop suitability criteria for Chrysanthemum

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

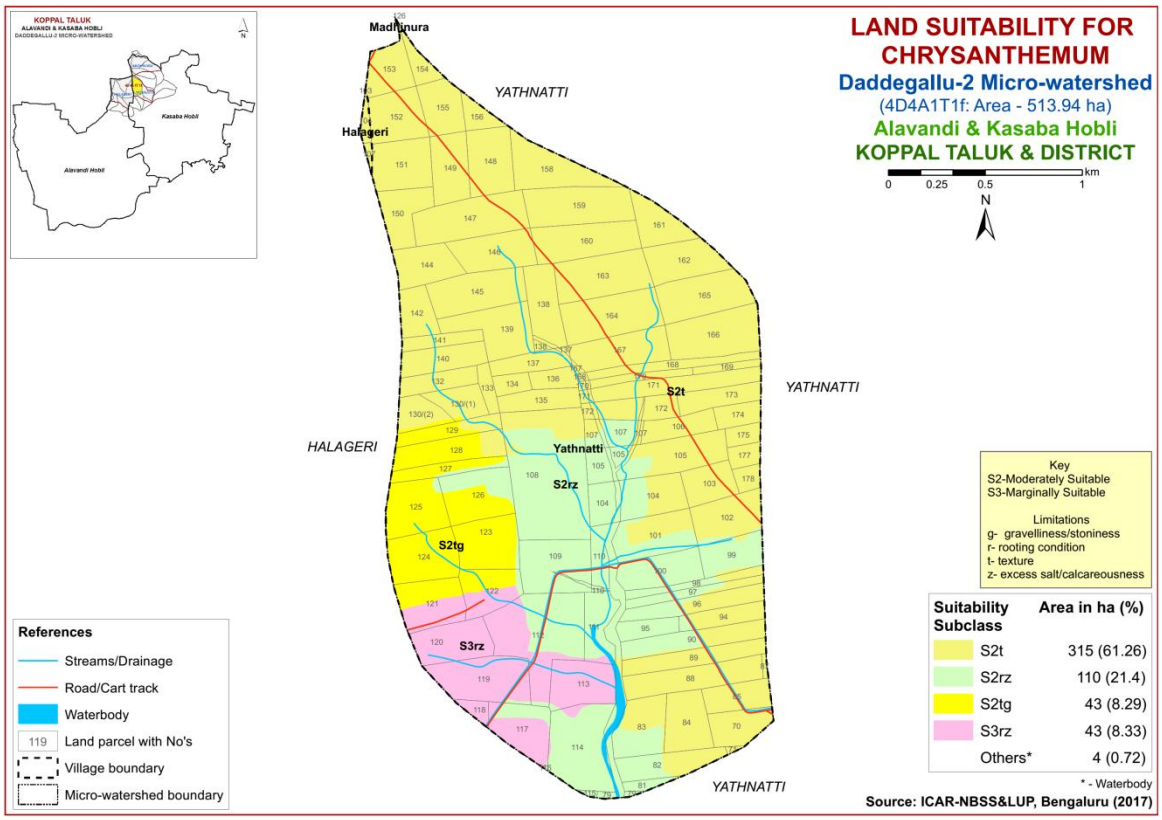


Fig. 7.26 Land Suitability map of Chrysanthemum

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

Jasmine is one of the most important flower crop grown in an area of 6146 ha in almost all the districts of the State. The crop requirements (Table 7.28) 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.

There are no highly suitable (Class S1) lands for growing jasmine in the microwatershed. An area of 110 ha (21%) is moderately suitable (Class S2) and are distributed in the southern and central part of the microwatershed. They have minor limitations of rooting condition and calcareousness. Major area of 400 ha (78%) is marginally suitable (Class S3) for growing jasmine and are distributed in all parts of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness.

Table 7.28 Crop suitability criteria for jasmine (irrigated)

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

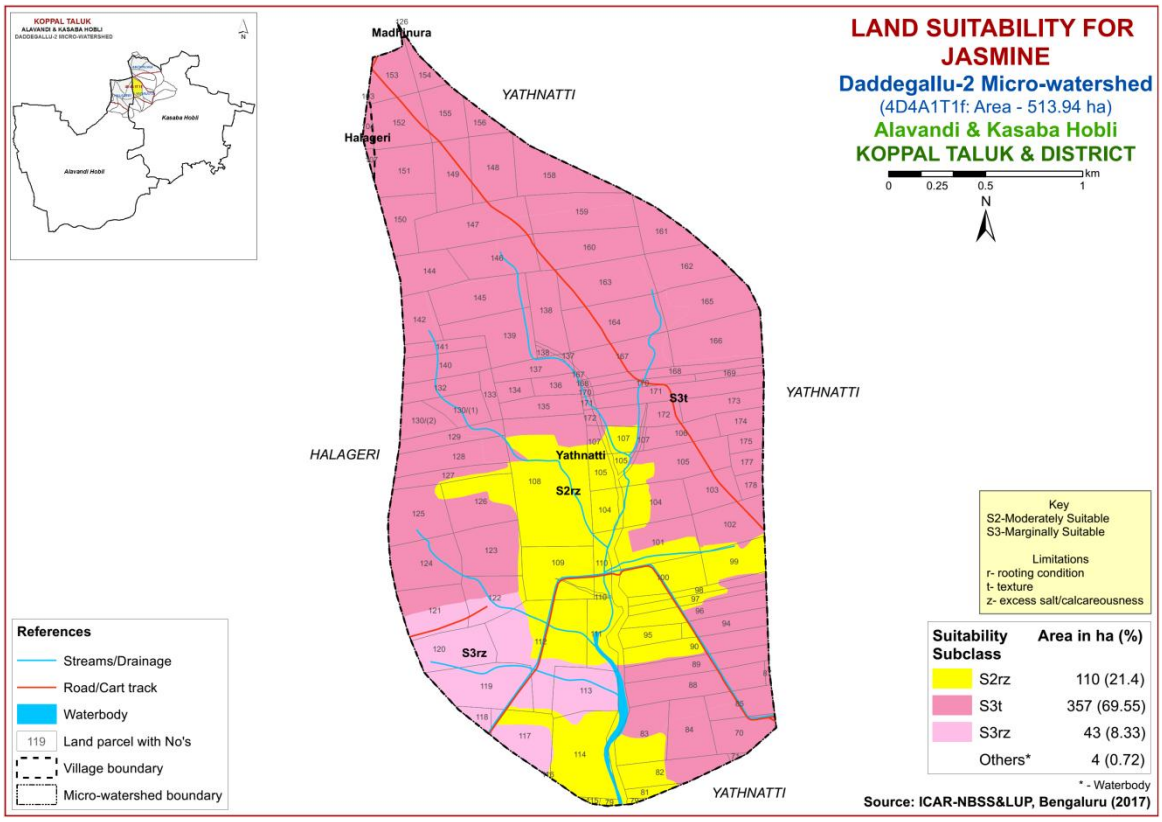


Fig. 7.27 Land Suitability map of Jasmine

7. 28 Land Suitability for Crossandra *(Crossandra in fundibuliformis)*

Crossandra is one of the most important flower crop grown in an area of 6146 ha in almost all the districts of the State. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.28.

There are no highly suitable lands (Class S1) for growing Crossandra in the microwatershed. An area of 233 ha (45%) is moderately suitable (Class S2) for growing crossandra and are distributed in the western, southern, northern and northeastern part of

the microwatershed. They have minor limitation of texture. An area of 278 ha (54%) is marginally suitable (Class S3) for growing crossandra and are distributed in the eastern, central and southwestern part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness.

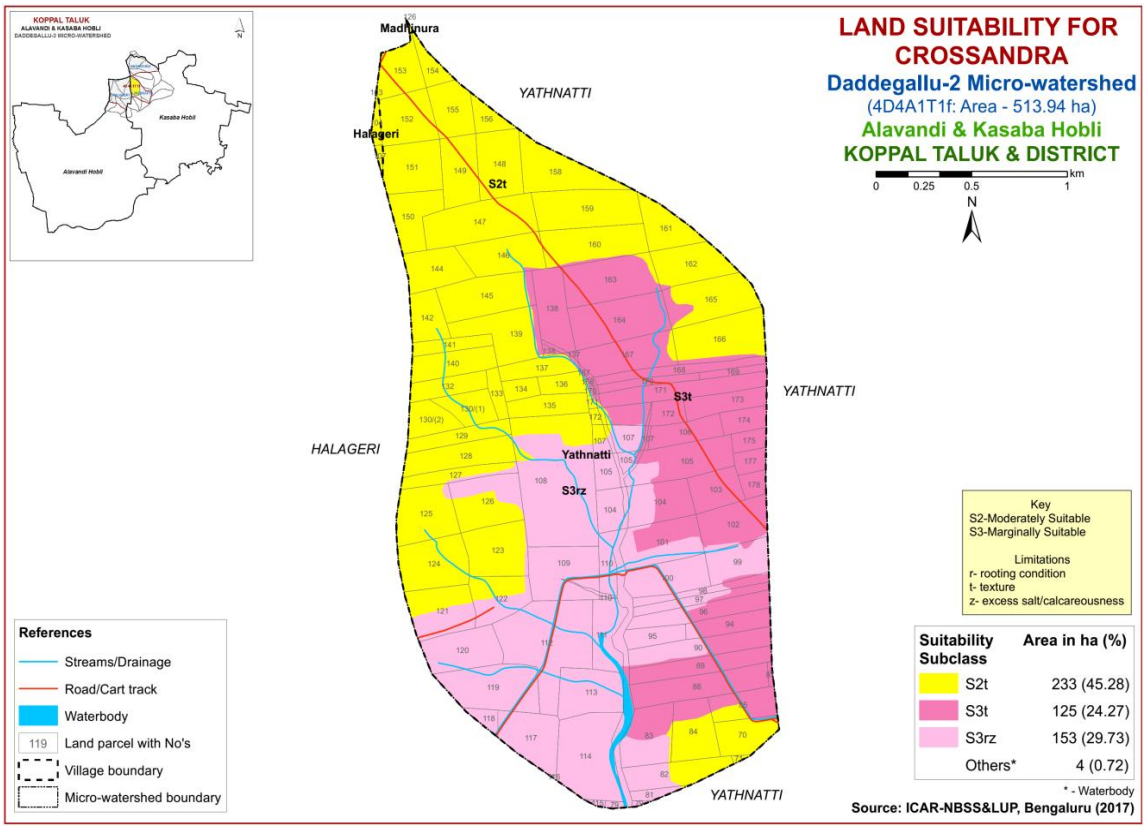


Fig. 7.28 Land Suitability map of Crossandra

7.29 Land Management Units (LMU)

The 9 soil map units identified in Daddegallu-2 microwatershed have been grouped into 3 Land Management Units (LMU) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig. 7.29) 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 three Land Management Units along with brief description of soil and site characteristics are given below.

LUC No.	Soil map unit number	Mapping unit	Soil and site characteristics
1	360, 380, 381, 428, 430.	NSPmB1, HDLmB1, HDLmB1g1, BDRmA1, BDRmB1	Moderately deep to very deep, black clay soils
2	333, 334, 337	RNKmB1, RNKmB1g1, RNKmB2g1	Moderately shallow, black calcareous clay soil
3	307	MTLmB1	Shallow, calcareous black gravelly sandy clay to clay soils

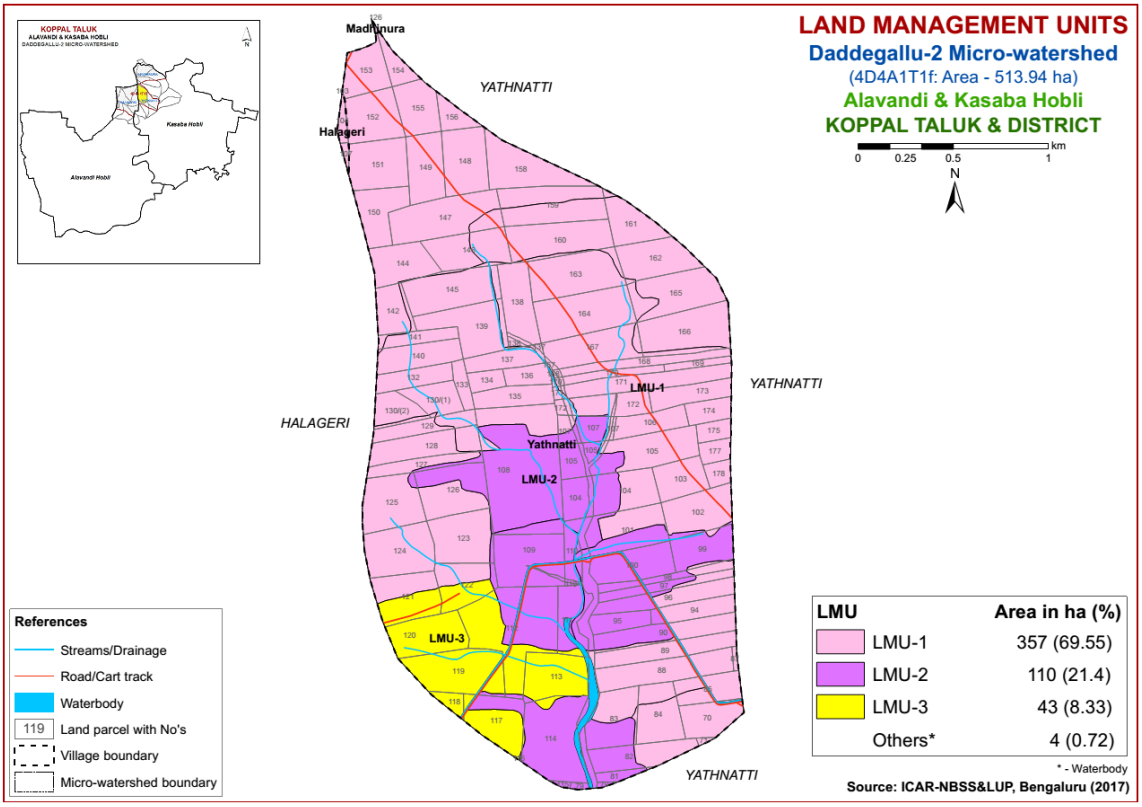


Fig 7.29 Land Use Classes map of Daddegallu-2 microwatershed

7.29 Proposed Crop Plan for Daddegallu-2 Microwatershed

After assessing the land suitability for the 28 crops, the proposed crop plan has been prepared for the 3 identified LUCs 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 7.29.

Table 7.29 Proposed Crop Plan for Daddegallu-2 Microwatershed

Proposed Land Use Class	Soil Map Units	Survey Number	Soil characters	Field Crops	Horticulture Crops	Suitable Interventions
LUC 1 357 ha (70%)	360. NSPmB1 380. HDLmB1 381.HDLmB1g1 428. BDRmA1 430. BDRmB1	**Madhinura:** 126 **Yathnatti:**70,71,82,84,85,87,88,89,90,94,96,101,102,103,105,106,123,124,125,126,127,128,129,130/(1),130/(2),132,133,134,135,136,137,138,139,140,141,142,144,145,146,147,148,149,150,151,152,153,154,155,156,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,177,178	Moderately deep to very deep, black clay soils	Sorghum, Sunflower, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Pomegranate, Jamun, Lime, Musambi, Tamarind, Amla, Custard apple **Vegetables:** Drumstick, Chilli, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
LUC 2 110 ha (21%)	333. RNKmB1 334. RNKmB1g1 337. RNKmB2g1	**Yathnatti:**79,81,83,95,97,98,99,100,104,107,108,109,110,111,112,114,115	Moderately shallow, black calcareous clay soils	Sorghum, Bajra, Bengal gram	**Fruit crops:** Amla, Custard apple **Flowers:** Marigold, Jasmine Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
LUC 3 43 ha (8%)	307. MTLmB1	**Yathnatti:** 113,116,117,118,119,120,121,122	Shallow, calcareous black gravelly sandy clay to clay soils	Bengal gram, Linseed, Safflower	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	Sowing across the slope, drip irrigation and mulching is recommended

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Daddegallu-2Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series Handrala (HDL) occupying maximum area of 141 ha (27%), Narasapura (NSP) 125 ha (24%), Ravanaki (RNK) 110 ha (21%), Bardur (BDR) 92 ha (18%) and Muttal (MTL) 43 ha (8%) area in the microwatershed.
- As per land capability classification, entire area in the microwatershed falls under arable land category (Class II & III). The major limitations identified in the arable lands were soil and erosion.

- ❖ On the basis of soil reaction, an area of about 304 ha (59%) is strongly alkaline (pH 8.4-9.0) and about 206 ha (40%) is under very strongly alkaline (pH >9.0) in the microwatershed. Entire area in the microwatershed is alkaline 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

(Strongly alkaline to very 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 factor affecting the soil health in the microwatershed. Out of total 514 ha area in the microwatershed, an area of about 466 ha (91%) is suffering from slightly and 44 ha (9%) is suffering from 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 (Saturation plan) in IWMP is focusing on preparation of

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

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

- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.
- **Surface Soil Texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.
- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Daddegallu-2Microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is medium (0.5-0.75%) in an area of 189 ha (37%) and low (<0.5%) in 322 ha (63%). The areas that are low and medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops costs Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be

supplemented by 25% in addition to the recommended level in 511 ha area where OC is low and medium. For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.

- **Available Phosphorus:** Entire area of 510 ha (99%) is low (<23 kg/ha) in available phosphorus in the microwatershed. Hence for all the crops, 25% additional P-needs to be applied
- **Available Potassium:** Available potassium is high (>337 kg/ha) in an entire area of the microwatershed.
- **Available Sulphur:** Available sulphur content is a very critical nutrient for oilseed crops. Available sulphur content is low (<10 ppm) in 413 ha (80%), medium (10-20 ppm) in 97 ha (19%) in the microwatershed. These areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected. It is high in 0.02 ha (<1%) area of the microwatershed**.**
- **Available Boron:** Small area of about 42 ha (8%) is low (<0.5 ppm) in available boron. An area of 443 ha (86%) is medium (0.5-1.0 ppm) in available boron content. It is high in 25 ha (5%) area of the microwatershed. These areas that are low and medium need to be applied with sodium borate @ 10kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency.
- **Available iron:** It is sufficient in (>4.5 ppm) 173 ha (34%) and deficient (<4.5 ppm) in 337 ha (66%) in the microwatershed. To manage iron deficiency, iron sulphate @25 kg/ha needs to be applied 2-3 years.

  Available manganese: Entire area in the microwatershed is sufficient (>1.0 ppm) in available manganese.

  Available copper: Entire area is sufficient (>0.2 ppm) in available copper in the microwatershed.
- **Available Zinc:** It is deficient (<0.6 ppm) in 379 ha (26%) and sufficient (>0.6 ppm) in 131 ha (26%) area in the microwatershed. Application of zinc sulphate @ 25kg/ha is to be followed in areas that are deficient in available zinc.
- **Soil alkalinity:** The entire microwatershed has soils that are strongly to very strongly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

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

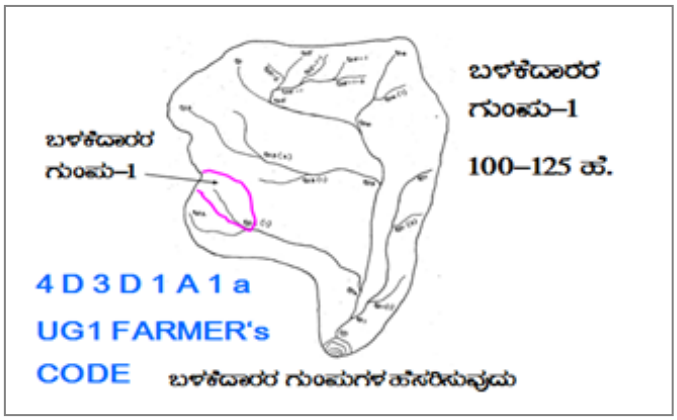
Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Daddegallu-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.

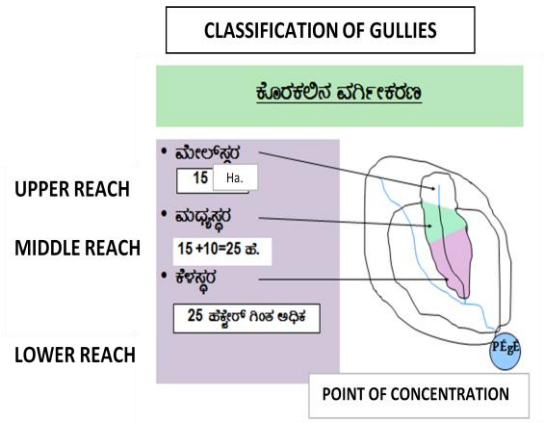
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

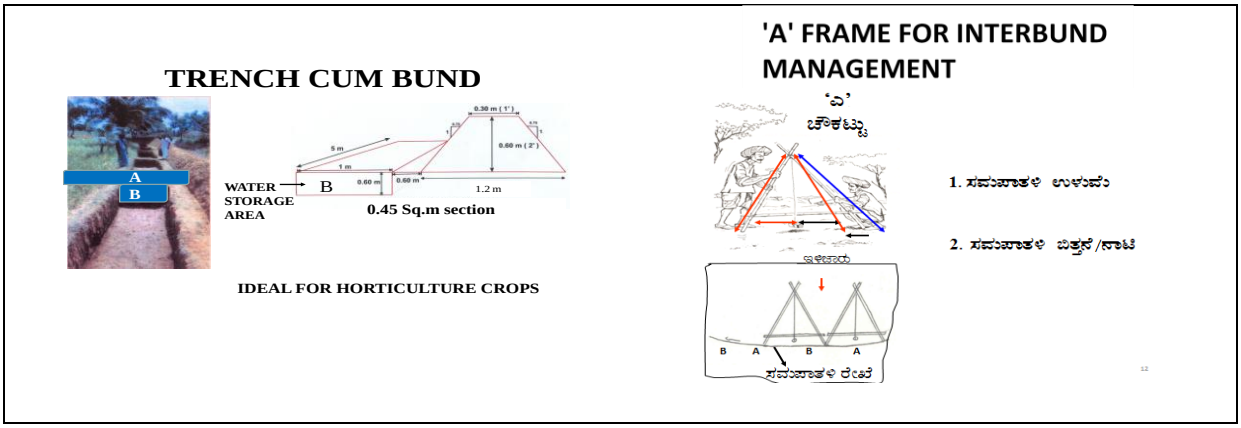
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below



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

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

B. Waterways

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

a) The cadastral map has to be updated as regards the network of drainage lines (gullies/ *nalas/ hallas*) and existing structures are marked to the scale and storage capacity of the existing water bodies are documented.
b) The drainage line will be demarcated into Upper Reach, Middle Reach and Lower Reach.
c) Considering the Catchment, *Nala* bed and bank conditions, suitable structures are decided.
d) Number of storage structures (Check dam/ *Nala* bund/ Percolation tank) will be decided considering the commitments and available runoff in water budgeting and quality of water in the wells and site suitability.
e) Detailed 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.

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 510 ha (99%) requires graded Bunding and about 0.08 ha (<1%) area requires strengthening of existing Bunds / Bunding in the microwatershed. The conservation plan prepared may be presented to all the stakeholders including farmers and after including their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

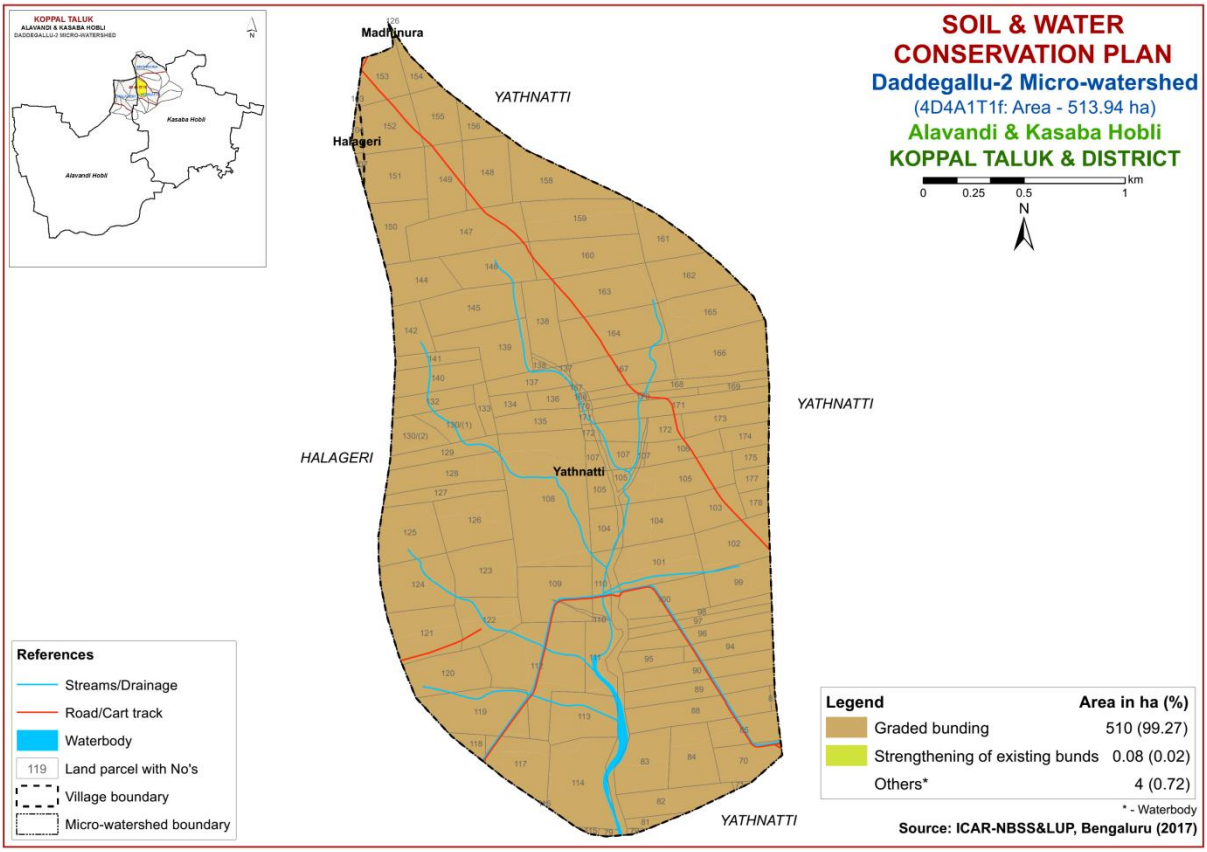


Fig. 9.1 Soil and Water Conservation Plan map of Daddegallu-2 Microwatershed

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

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

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

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; Reaserch 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 Karntaka for Optimising 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

Daddegallu-2 Microwatershed

Soil Phase Information

Village	Sy. No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface SoilTexture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Madhinura	126	0.08	BDRmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIs	Field bunds/ bunding
Yathnatti	70	4.48	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Jowar (Mz+Jw)	Not Available	IIs	Graded bunding
Yathnatti	71	0.21	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	79	0.49	RNKmB1g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Maize (Rg+Mz)	Not Available	IIs	Graded bunding
Yathnatti	81	1.04	RNKmB2g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yathnatti	82	5.48	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	83	6.49	RNKmB2g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yathnatti	84	5.94	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	85	4.26	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram+Maize (Rg+Mz)	Not Available	IIs	Graded bunding
Yathnatti	87	0.27	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow +Bengalgram (Cf+Bg)	Not Available	IIs	Graded bunding
Yathnatti	88	7.71	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+ Fallow land+Jowar (Cf+Fl+Jw)	Not Available	IIs	Graded bunding
Yathnatti	89	5.64	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Currentfallow+Maize (Cf+Mz)	Not Available	IIs	Graded bunding
Yathnatti	90	6.38	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower+Current fallow (Sf+Cf)	Not Available	IIs	Graded bunding
Yathnatti	94	3.57	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Maize (Jw+Mz)	Not Available	IIs	Graded bunding
Yathnatti	95	2.57	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bengalgram (Bg)	Not Available	IIs	Graded bunding
Yathnatti	96	5.31	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Bengalgram (Jw+Bg)	Not Available	IIs	Graded bunding
Yathnatti	97	2.84	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Current fallow +Fallow land(Mz+Cf+Fl)	Not Available	IIs	Graded bunding
Yathnatti	98	2.43	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Fallow land+ Currentfallow(Mz+Fl+Cf)	Not Available	IIs	Graded bunding
Yathnatti	99	4.97	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Subabulu (Su)	Not Available	IIs	Graded bunding
Yathnatti	100	6.17	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Eucalyptus+Maize (Eu+Mz)	Not Available	IIs	Graded bunding
Yathnatti	101	7.48	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land+Maize (Fl+Mz)	Not Available	IIs	Graded bunding
Yathnatti	102	6.58	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Bengalgram+Redgram (Bg+Rg)	Not Available	IIs	Graded bunding
Yathnatti	103	4.33	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Subabulu (Su)	Not Available	IIs	Graded bunding

Village	Sy. No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface SoilTexture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Yathnatti	104	9.32	RNKmB2g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Yathnatti	105	10.57	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Fallow land (Mz+Fl)	Not Available	IIs	Graded bunding
Yathnatti	106	3.71	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Bengalgram (Jw+Bg)	Not Available	IIs	Graded bunding
Yathnatti	107	3.54	RNKmB2g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Bengalgram (Jw+Bg)	Not Available	IIes	Graded bunding
Yathnatti	108	23.42	RNKmB2g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Yathnatti	109	8.64	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land+ Subabulu (Fl+Su)	Not Available	IIs	Graded bunding
Yathnatti	110	2.56	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIs	Graded bunding
Yathnatti	111	4.67	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIs	Graded bunding
Yathnatti	112	15.91	RNKmB1	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Subabula+Bengalgram (Jw+Su+Bg)	Not Available	IIs	Graded bunding
Yathnatti	113	6.72	MTLmB1	LMU-3	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Graded bunding
Yathnatti	114	11.4	RNKmB1g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Yathnatti	115	0.22	RNKmB1g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Jowar +Maize (Cf+Jw+Mz)	Not Available	IIs	Graded bunding
Yathnatti	116	0.05	MTLmB1	LMU-3	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Graded bunding
Yathnatti	117	6.59	MTLmB1	LMU-3	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Fallow land (Jw+Fl)	Not Available	IIIs	Graded bunding
Yathnatti	118	1.18	MTLmB1	LMU-3	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Graded bunding
Yathnatti	119	9.29	MTLmB1	LMU-3	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower+Fallow land (Sf+Fl)	Not Available	IIIs	Graded bunding
Yathnatti	120	6.67	MTLmB1	LMU-3	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Graded bunding
Yathnatti	121	7.06	MTLmB1	LMU-3	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIIs	Graded bunding
Yathnatti	122	5.69	MTLmB1	LMU-3	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Redgram (Jw+Rg)	Not Available	IIIs	Graded bunding
Yathnatti	123	7.3	HDLmB1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	124	7.71	HDLmB1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	125	7.27	HDLmB1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	126	7.92	HDLmB1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	127	3.39	HDLmB1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding

Village	Sy. No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface SoilTexture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Yathnatti	128	6.34	HDLmB1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	129	3.65	HDLmB1g1	LMU-1	Deep (100-150 cm)	Clay	Gravelly (15-35%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	130 /(1)	3.56	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	130 /(2)	3.36	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	132	3.41	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Yathnatti	133	1.56	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	134	1.67	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	135	3.77	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land+Jowar (Fl+Jw)	Not Available	IIs	Graded bunding
Yathnatti	136	2.12	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	137	3.29	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Bengalgram (Bg)	Not Available	IIs	Graded bunding
Yathnatti	138	6.01	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower+Current fallow (Sf+Cf)	Not Available	IIs	Graded bunding
Yathnatti	139	7.61	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower+Jowar (Sf+Jw)	Not Available	IIs	Graded bunding
Yathnatti	140	4.89	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	141	2.44	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	142	3.84	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	144	5.39	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	145	8.29	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Fallow land (Jw+Fl)	Not Available	IIs	Graded bunding
Yathnatti	146	6.63	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	147	10.16	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower+Jowar (Sf+Jw)	Not Available	IIs	Graded bunding
Yathnatti	148	6.82	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Yathnatti	149	5.86	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	150	5.21	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Yathnatti	151	6.73	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Yathnatti	152	6.21	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding

Village	Sy. No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface SoilTexture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Yathnatti	153	4.72	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower+Jowar (Sf+Jw)	Not Available	IIs	Graded bunding
Yathnatti	154	1.98	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Fallow land (Jw+Fl)	Not Available	IIs	Graded bunding
Yathnatti	155	4.89	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	156	2.02	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Yathnatti	158	7.54	BDRmB1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Bengalgram+Jowar (Bg+Jw)	Not Available	IIs	Graded bunding
Yathnatti	159	9.19	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Current fallow (Jw+Cf)	Not Available	IIs	Graded bunding
Yathnatti	160	8.29	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Yathnatti	161	4.68	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Jowar (Cf+Jw)	Not Available	IIs	Graded bunding
Yathnatti	162	6.24	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Jowar (Cf+Jw)	Not Available	IIs	Graded bunding
Yathnatti	163	8.95	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Sunflower (Jw+Sf)	Not Available	IIs	Graded bunding
Yathnatti	164	9.41	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	165	8.3	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	166	9.18	HDLmB1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Bengalgram+Jowar (Bg+Jw)	Not Available	IIs	Graded bunding
Yathnatti	167	7.14	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land+Maize (Fl+Mz)	Not Available	IIs	Graded bunding
Yathnatti	168	3.61	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land+Jowar (Fl+Jw)	Not Available	IIs	Graded bunding
Yathnatti	169	1.17	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Yathnatti	170	2.06	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land (Fl)	Not Available	IIs	Graded bunding
Yathnatti	171	6.62	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land+Jowar (Fl+Jw)	Not Available	IIs	Graded bunding
Yathnatti	172	4.46	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Yathnatti	173	3.85	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Bengalgram (Bg)	Not Available	IIs	Graded bunding
Yathnatti	174	2.39	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Fallow land+Jowar (Fl+Jw)	Not Available	IIs	Graded bunding
Yathnatti	175	1.58	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Bengalgram (Bg)	Not Available	IIs	Graded bunding
Yathnatti	177	1.63	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Eucalyptus+Current fallow (Eu+Cf)	Not Available	IIs	Graded bunding
Yathnatti	178	1.43	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Subabulu (Su)	Not Available	IIs	Graded bunding

Appendix II

Daddegallu-2 Microwatershed

Soil Fertility Information

Village	Sy. No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Madhinura	126	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	70	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	71	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	79	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	81	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	82	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	83	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	84	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	85	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	87	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	88	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	89	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	90	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	94	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	95	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	96	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	97	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	98	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	99	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	100	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	101	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	102	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	103	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Sy. No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Yathnatti	104	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	105	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	106	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	107	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	108	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	109	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	110	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	111	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	112	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	113	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	114	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	115	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yathnatti	116	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	117	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	118	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	119	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	120	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	121	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	122	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	123	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 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)
Yathnatti	124	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 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)
Yathnatti	125	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	126	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 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)
Yathnatti	127	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Sy. No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Yathnatti	128	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	129	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	130 /(1)	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	130 /(2)	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	132	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	133	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	134	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	135	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	136	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	137	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	138	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	139	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	140	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	141	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	142	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	144	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	145	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	146	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	147	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	148	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	149	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	150	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	151	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	152	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Sy. No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Yathnatti	153	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	154	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	155	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	156	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	158	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	159	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	160	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	161	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 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)
Yathnatti	162	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 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)
Yathnatti	163	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	164	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	165	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 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)
Yathnatti	166	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	167	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	168	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	169	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	170	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	171	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	172	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	173	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	174	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	175	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	177	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yathnatti	178	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 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)

Appendix III

Daddegallu-2 Microwatershed
Soil Suitability Information

Village	Sy.No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Redgram	Amla	Jack fruit	Custard apple	Ca shew	Jam un	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pome granate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
Madhinura	126	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	70	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	71	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	79	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	81	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	82	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	83	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	84	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	85	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	87	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	88	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	89	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	90	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	94	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	95	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	96	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	97	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	98	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	99	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	100	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	101	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	102	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	103	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	104	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	105	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	106	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	107	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz

Village	Sy.No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Redgram	Amla	Jack fruit	Custard apple	Ca shew	Jam un	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pome granate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
Yathnatti	108	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	109	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	110	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	111	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	112	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	113	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Yathnatti	114	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	115	N1rz	S3tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S3tz	S2rz	S3rz	S3rz	S3rz
Yathnatti	116	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Yathnatti	117	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Yathnatti	118	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Yathnatti	119	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Yathnatti	120	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Yathnatti	121	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Yathnatti	122	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Yathnatti	123	S3t	S3t	S3t	S2g	S3t	S1	S2rt	S2g	S1	S2g	S2t	S2t	S3t	S1	N1t	S2rt	S2g	S3t	S3t	S3t	S2tg	S2tg	S2tg	S3t	S3t	S2t	S2tg	S2tg
Yathnatti	124	S3t	S3t	S3t	S2g	S3t	S1	S2rt	S2g	S1	S2g	S2t	S2t	S3t	S1	N1t	S2rt	S2g	S3t	S3t	S3t	S2tg	S2tg	S2tg	S3t	S3t	S2t	S2tg	S2tg
Yathnatti	125	S3t	S3t	S3t	S2g	S3t	S1	S2rt	S2g	S1	S2g	S2t	S2t	S3t	S1	N1t	S2rt	S2g	S3t	S3t	S3t	S2tg	S2tg	S2tg	S3t	S3t	S2t	S2tg	S2tg
Yathnatti	126	S3t	S3t	S3t	S2g	S3t	S1	S2rt	S2g	S1	S2g	S2t	S2t	S3t	S1	N1t	S2rt	S2g	S3t	S3t	S3t	S2tg	S2tg	S2tg	S3t	S3t	S2t	S2tg	S2tg
Yathnatti	127	S3t	S3t	S3t	S2g	S3t	S1	S2rt	S2g	S1	S2g	S2t	S2t	S3t	S1	N1t	S2rt	S2g	S3t	S3t	S3t	S2tg	S2tg	S2tg	S3t	S3t	S2t	S2tg	S2tg
Yathnatti	128	S3t	S3t	S3t	S2g	S3t	S1	S2rt	S2g	S1	S2g	S2t	S2t	S3t	S1	N1t	S2rt	S2g	S3t	S3t	S3t	S2tg	S2tg	S2tg	S3t	S3t	S2t	S2tg	S2tg
Yathnatti	129	S3t	S3t	S3t	S2g	S3t	S1	S2rt	S2g	S1	S2g	S2t	S2t	S3t	S1	N1t	S2rt	S2g	S3t	S3t	S3t	S2tg	S2tg	S2tg	S3t	S3t	S2t	S2tg	S2tg
Yathnatti	130/(1)	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	130/(2)	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	132	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	133	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	134	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	135	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	136	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t

Village	Sy.No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Redgram	Amla	Jack fruit	Custard apple	Ca shew	Jam un	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pome granate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
Yathnatti	137	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	138	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	139	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	140	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	141	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	142	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	144	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	145	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	146	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	147	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	148	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	149	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	150	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	151	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	152	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	153	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	154	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	155	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	156	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	158	S3t	S3t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S3t
Yathnatti	159	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	160	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	161	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	162	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	163	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	164	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	165	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	166	S3t	S3t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S3t	S3t	S2t	S2t	S2t
Yathnatti	167	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t

Village	Sy.No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Redgram	Amla	Jack fruit	Custard apple	Ca shew	Jam un	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pome granate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
Yathnatti	168	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	169	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	170	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	171	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	172	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	173	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	174	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	175	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	177	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t
Yathnatti	178	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S3t	S3t	S3t	S2rt	S2t

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 95 (57.23%) men and 71(42.77%) women among the sampled households.*
- *The average family size of landless farmers' was 3.6, marginal farmers' was 5.4, small farmers' was 4.5, semi medium farmers' was 3, medium farmers' was 6.6 and large farmers' were 3.*
- *The data indicated that, 28 (16.87%) people were in 0-15 years of age, 73 (43.98%) were in 16-35 years of age, 53 (31.93%) were in 36-60 years of age and 12 (7.23%) were above 61 years of age.*
- *The results indicated that Daddegallu-2 had 22.89 per cent illiterates, 25.90 per cent of them had primary school education, 13.86 per cent of them had middle school education, 18.67 per cent of them had high school education, 7.83 per cent of them had PUC education, 0.60 per cent had ITI, 4.82 per cent had degree and 1.20 per cent had masters education.*
- *The results indicate that, 85.71 per cent of household heads were practicing agriculture and 14.29 per cent of household heads were practicing agriculture labour.*
- *The results indicate that agriculture was the major occupation for 32.53 per cent of the household members, 39.76 per cent were agricultural labourers, 1.20 per cent were in private service, trade and business and housewives, 18.07 per cent were in students and 4.22 per cent were in children.*
- *The results show that, 0.60 per cent of the population has participated in gram panchayat, sthree shakthi sangha and user group and 98.19 per cent of the population has not participated in any local institutions.*
- *The results indicate that 5.71 per cent of the households possess thatched house, 65.71 per cent of the households possess katcha house, 8.57 per cent of the households possess pucca/RCC house and 20 per cent of them possess semi pacca house.*
- *The results show that 91.43 per cent of the households possess TV, 2.86 per cent of them possess DVD/VCD player, 82.86 per cent of them possess mixer/grinder player, 8.57 per cent of them possess refrigerator, 20 per cent of them possess bicycle, 40 per cent o f the households possess motor cycle and 91.43 per cent of them possess mobile phones.*
- *The results show that the average value of television was Rs. 5,187, DVD/VCD player was Rs.1,500, mixer grinder was Rs. 2,172, refrigerator was 13,666, bicycle was 1,033, motor cycle was Rs. 29,235 and mobile phone was Rs. 2,053.*
- *About 22.86 per cent of the households possess bullock cart, 34.29 per cent of them possess plough, 2.86 per cent of them possess power tiller and earth*

mover/duster, 8.57 per cent of them possess tractor, 17.14 per cent of them possess sprayer, 62.86 per cent of them possess weeder and 11.43 per cent of them possess chaff cutter.

- *The results show that the average value of bullock cart was Rs. 13,625, plough was Rs. 2,208, power tiller was Rs.6,000, tractor was Rs. 266,666, sprayer was Rs. 2,266, weeder was Rs.34, chaff cutter was Rs.1,575, and the average value of harvester was Rs. 9,000.*
- *The results indicate that, 37.14 per cent of the households possess bullocks, 20 per cent of the households possess local cow and 8.57 per cent possess buffalo.*
- *The results indicate that, average own labour men available in the micro watershed was 1.64, average own labour (women) available was 1.44, average hired labour (men) available was 6.26 and average hired labour (women) available was 6.83.*
- *The results indicate that, 37.14 per cent of the households opined that the hired labour was adequate and 65.71 per cent of the households opined that the hired labour was inadequate.*
- *The results indicate that, households of the Daddegallu-2 micro-watershed possess 43.91 ha (89.15%) of dry land and 5.34 ha (10.85%) of irrigated land. Marginal farmers possess 4.70 ha (100%) of dry land. Small farmers possess 114.31 ha (100%) of dry land. Semi medium farmers possess 19.35 ha (100%) of dry land. Medium farmers possess 4.55 ha (46.01%) of dry land and 5.34 ha (53.99%) of irrigated land. Large farmers possess 1 ha (100%).*
- *The results indicate that, the average value of dry land was Rs. 293,641.14 and the average value of irrigated land was Rs. 168,409.09. In case of marginal famers, the average land value was Rs. 658,950.09 for dry land. In case of small famers, the average land value was Rs. 286,478.08 for dry land. In case of semi medium famers, the average land value was Rs. 201,442.91 for dry land. In case of medium farmers, the average land value was Rs. 219,555.56 for dry land and Rs. 168,409.09 for irrigated land. In case of large farmers, the average land value was Rs. 799,999.98 for dry land.*
- *The results indicate that, there were 2 functioning bore wells in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 5.71 per cent of the farmers.*
- *The results indicate that, the depth of bore well was found to be 3.66 meters.*
- *The results indicate that medium farmers had an irrigated area of 5.34 ha respectively.*
- *The results indicate that, farmers have grown bajra (0.45 ha), Bengal gram (18.93 ha), maize (21.68 ha), red gram (0.83 ha), sugarcane (2.91 ha), sunflower (2.43 ha) and sorghum (1.58 ha). Marginal farmers have grown bajra, maize, red gram, and Bengal gram. Small farmers have grown maize, Bengal gram and*

sorghum. Semi medium farmers have grown Bengal gram, maize and sunflower. Medium farmers have grown maize, sugarcane and Bengal gram. Large farmers have grown maize.

- *The results indicate that, the cropping intensity in Daddegallu-2 micro-watershed was found to be 88.24 per cent.*
- *The results indicate that, 25.71 per cent of the households have bank account and savings.*
- *The results indicate that, 25.71 per cent of the households have availed credit from different sources.*
- *The results indicate that, 33.33 per cent of the households have borrowed from commercial bank and 11.11 per cent of the households borrowed from grameena bank.*
- *The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 20,555.56.*
- *The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production.*
- *The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources.*
- *The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations.*
- *The results indicate that, the total cost of cultivation for bajra was Rs. 52976.53. The gross income realized by the farmers was Rs. 27566.96. The net income from bajra cultivation was Rs. -25409.57. Thus the benefit cost ratio was found to be 1:0.52.*
- *The total cost of cultivation for Bengal gram was Rs. 31340.80. The gross income realized by the farmers was Rs. 48747.50. The net income from Bengal gram cultivation was Rs. 17406.70. Thus the benefit cost ratio was found to be 1:1.56.*
- *The total cost of cultivation for maize was Rs. 33306.05. The gross income realized by the farmers was Rs. 31811.29. The net income from maize cultivation was Rs. -1494.76. Thus the benefit cost ratio was found to be 1:0.96.*
- *The total cost of cultivation for sugarcane was Rs. 23431.09. The gross income realized by the farmers was Rs. 120069.45. The net income from sugarcane cultivation was Rs. 96638.36. Thus the benefit cost ratio was found to be 1:5.12.*
- *The total cost of cultivation for sunflower was Rs. 33305.25. The gross income realized by the farmers was Rs. 43032.89. The net income from sunflower cultivation was Rs. 9727.64. Thus the benefit cost ratio was found to be 1:1.29.*
- *The total cost of cultivation for sorghum was Rs. 13117.18. The gross income realized by the farmers was Rs. 21660. The net income from sorghum cultivation was Rs. 8542.82. Thus the benefit cost ratio was found to be 1:1.65.*

- *The results indicate that, 20 per cent of the households opined that dry fodder was adequate, 2.86 per cent of the households opined that green fodder was adequate and 5.71 per cent of the households opined that dry fodder was inadequate.*
- *The results indicate that the annual gross income was Rs. 47,000 for landless farmers, for marginal farmers it was Rs. 62,800, for small farmers it was Rs. 80,880, for semi medium farmers it was Rs. 166,400, for medium farmers it was Rs.309,533.33 and large farmers it was Rs. 50,000.*
- *The results indicate that the average annual expenditure is Rs. 13,197.07. For landless households it was Rs. 3,480, for marginal farmers it was Rs. 6,950, for small farmers it was Rs. 6,740, for semi medium farmers it was Rs. 13,221.09, for medium farmers it was Rs. 66,666.67 and for large farmers Rs. 22,000.*
- *The results indicate that, households have planted 36 neem trees in their field.*
- *The results indicated that, bajra, sorghum, sugarcane and sunflower was sold to the extent of 100 per cent, Bengal gram was sold to the extent of 111.03 per cent and maize was sold to the extent of 98.58 per cent.*
- *The results indicated that, about 20 per cent of the farmers sold their produce to agent/traders. 17.14 per cent of the farmers sold their produce to local/village merchant, 54.29 per cent of them sold their produce through regulated market and 2.86 per cent of them sold their produce through cooperative marketing society.*
- *The results indicated that, 11.43 per cent of the households used cart, 80 per cent of the households used tractor and 2.86 per cent of them used truck as a mode of transportation for their agricultural produce.*
- *The results indicated that, 20 per cent of the households have experienced soil and water erosion problems in the farm.*
- *The results indicated that, 48.57 per cent have shown interest in soil test.*
- *The results indicated that, 100 per cent of the households used firewood as a source of fuel.*
- *The results indicated that, piped supply was the major source of drinking water for 37.14 per cent of the households, bore well was the source of drinking water for 45.71 per cent of the households and 17.14 per cent of the households used open well in micro watershed.*
- *Electricity was the major source of light for 100 per cent of the households in micro watershed.*
- *The results indicated that, 51.43 per cent of the households possess sanitary toilet facility.*
- *The results indicated that, 97.14 per cent of the sampled households possessed BPL card and 2.86 per cent of the sampled households not possessed PDS card.*
- *The results indicated that, 60 per cent of the households participated in NREGA programme.*

- *The results indicated that, cereals were adequate for 88.57 per cent of the households, pulses were adequate for 62.86 per cent, oilseeds were adequate for 34.29 per cent, vegetables were adequate for 42.86 per cent, fruits were adequate for 48.57 per cent, milk were adequate for 51.43 per cent, egg were adequate for 28.57 per cent and meat was adequate for 25.71 per cent.*
- *The results indicated that, cereals were inadequate for 11.43 per cent, pulses were inadequate for 37.14 per cent of the households, oilseeds were inadequate for 62.86 per cent, vegetables were inadequate for 57.14 per cent, fruits were inadequate for 37.14 per cent, milk were inadequate for 42.86 per cent, egg were inadequate for 60 per cent and meat were inadequate for 51.43 per cent of the households.*
- *The results indicated that, lower fertility status of the soil was the constraint experienced by 65.71 per cent of the households, wild animal menace on farm field, frequent incidence of pest and diseases and high rate of interest on credit (48.57%), inadequacy of irrigation water (42.86%), high cost of fertilizers and plant protection chemicals (57.14%), low price for the agricultural commodities (28.57%), lack of marketing facilities in the area and source of Agri-technology information (37.14%), inadequate extension services (34.29%), lack of transport for safe transport of the agricultural produce to the market (40%) and less rainfall (60%).*

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

Daddegallu-2 micro-watershed in Halageri sub-watershed (Koppal taluk and district) is located in between $15^0$24’18.913’’ to 15^0 22’16.905”North latitudes and 76^0 7’6.965’’ to $76^0$6’3.24’’ East longitudes, covering an area of about 387.01 ha, bounded by Madhinura, Naregalla, Halageri and Yathnatti villages.

Methodology followed in assessing socio-economic status of households

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 35 households located in the micro-watershed were interviewed for the survey.

Chapter 3

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Hatti-1 micro-watershed is presented in Table 1 and it indicated that 35 farmers were sampled in Hatti-1 micro-watershed among them 5 (14.29%) were landless, 9 (25.71%) were marginal farmers, 10 (28.57%) were small farmers, 7 (20%) were semi medium farmers, 3 (8.57%) were medium farmers and 1 (2.86%) were large farmers.

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

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	14.29	9	25.71	10	28.57	7	20.00	3	8.57	1	2.86	35	100.00

Population characteristics: The population characteristics of households sampled for socio-economic survey in Daddegallu-2 micro-watershed is presented in Table 2. The data indicated that there were 95 (57.23%) men and 71(42.77%) women among the sampled households. The average family size of landless farmers' was 3.6, marginal farmers' was 5.4, small farmers' was 4.5, semi medium farmers' was 3, medium farmers' was 6.6 and large farmers' were 3.

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

Sl. No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Men	9	50.00	26	53.06	25	55.56	21	67.74	12	60.00	2	66.67	95	57.23
2	Women	9	50.00	23	46.94	20	44.44	10	32.26	8	40.00	1	33.33	71	42.77
Total		18	100.00	49	100.00	45	100.00	31	100.00	20	100.00	3	100.00	166	100.00
Average		3.6		5.4		4.5		3		6.6		3		4.74	

Age wise classification of population: The age wise classification of household members in Daddegallu-2 micro-watershed is presented in Table 3. The data indicated that, 28 (16.87%) people were in 0-15 years of age, 73 (43.98%) were in 16-35 years of age, 53 (31.93%) were in 36-60 years of age and 12 (7.23%) were above 61 years of age.

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

Sl. No.	Particulars	LL (18)		MF (49)		SF (45)		SMF (31)		MDF(20)		LF (3)		All (166)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	1	5.56	12	24.49	8	17.78	5	16.13	2	10	0	0	28	16.87
2	16-35 years of age	11	61.11	20	40.82	19	42.22	14	45.16	7	35	2	66.67	73	43.98
3	36-60 years of age	6	33.33	14	28.57	12	26.67	12	38.71	9	45	0	0	53	31.93
4	> 61 years	0	0	3	6.12	6	13.33	0	0	2	10	1	33.33	12	7.23
Total		18	100	49	100	45	100	31	100	20	100	3	100	166	100

Education level of household members: Education level of household members in Daddegallu-2 micro-watershed is presented in Table 4. The results indicated that Daddegallu-2 had 22.89 per cent illiterates, 25.90 per cent of them had primary school education, 13.86 per cent of them had middle school education, 18.67 per cent of them had high school education, 7.83 per cent of them had PUC education, 0.60 per cent had ITI, 4.82 per cent had degree and 1.20 per cent had masters education.

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

Sl.No.	Particulars	LL (18)		MF (49)		SF (45)		SMF (31)		MDF (20)		LF (3)		All (166)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	8	44.44	15	30.61	11	24.44	3	9.68	0	0	1	33.33	38	22.89
3	Primary School	2	11.11	14	28.57	12	26.67	8	25.81	5	25	2	66.67	43	25.90
4	Middle school	2	11.11	6	12.24	4	8.89	7	22.58	4	20	0	0	23	13.86
5	High School	4	22.22	5	10.20	8	17.78	6	19.35	8	40	0	0	31	18.67
6	PUC	0	0	3	6.12	4	8.89	4	12.90	2	10	0	0	13	7.83
7	ITI	0	0	0	0	1	2.22	0	0	0	0	0	0	1	0.60
8	Degree	1	5.56	3	6.12	1	2.22	3	9.68	0	0	0	0	8	4.82
9	Masters	0	0	0	0	1	2.22	0	0	1	5	0	0	2	1.20
10	Others	1	5.56	3	6.12	3	6.67	0	0	0	0	0	0	7	4.22
Total		18	100	49	100	45	100	31	100	20	100	3	100	166	100

Occupation of household heads: The data regarding the occupation of the household heads in Daddegallu-2 micro-watershed is presented in Table 5. The results indicate that, 85.71 per cent of household heads were practicing agriculture and 14.29 per cent of household heads were practicing agriculture labour.

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

Sl. No.	Particulars	LL(18)		MF(49)		SF(45)		SMF(31)		MDF(20)		LF(3)		All(166)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	2	40	8	88.89	10	100	6	85.71	3	100	1	100	30	85.71
2	Agricultural Labour	3	60	1	11.11	0	0	1	14.29	0	0	0	0	5	14.29
Total		5	100	9	100	10	100	7	100	3	100	1	100	35	100

Occupation of the household members: The data regarding the occupation of the household members in Daddegallu-2 micro-watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 32.53 per cent of the household members, 39.76 per cent were agricultural labourers, 1.20 per cent were in private service, trade and business and housewives, 18.07 per cent were in students and 4.22 per cent were in children.

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

Sl. No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF(3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	2	11.11	14	28.57	18	40	14	45.16	5	25	1	33.33	54	32.53
2	Agricultural Labour	15	83.33	17	34.69	18	40	8	25.81	7	35	1	33.33	66	39.76
3	Private Service	0	0	0	0	0	0	2	6.45	0	0	0	0	2	1.20
4	Trade & Business	0	0	0	0	0	0	0	0	2	10	0	0	2	1.20
5	Student	0	0	14	28.57	6	13.33	7	22.58	2	10	1	33.33	30	18.07
6	Others	0	0	1	2.04	0	0	0	0	2	10	0	0	3	1.81
7	Housewife	0	0	0	0	0	0	0	0	2	10	0	0	2	1.20
8	Children	1	5.56	3	6.12	3	6.67	0	0	0	0	0	0	7	4.22
Total		18	100	49	100	45	100	31	100	20	100	3	100	166	100

Institutional participation of the household members: The data regarding the institutional participation of the household members in Daddegallu-2 micro-watershed is presented in Table 7. The results show that, 0.60 per cent of the population has participated in gram panchayat, sthree shakthi sangha and user group and 98.19 per cent of the population has not participated in any local institutions.

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

Sl. No.	Particulars	LL (18)		MF (49)		SF (45)		SMF (31)		MDF (20)		LF (3)		All (166)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Gram Panchayat	0	0	0	0	1	2.22	0	0	0	0	0	0	1	0.60
2	Sthree Shakthi Sangha	0	0	0	0	1	2.22	0	0	0	0	0	0	1	0.60
3	User Group	0	0	0	0	1	2.22	0	0	0	0	0	0	1	0.60
4	No Participation	18	100	49	100	42	93.33	31	100	20	100	3	100	163	98.19
Total		18	100	49	100	45	100	31	100	20	100	3	100	166	100

Type of house owned: The data regarding the type of house owned by the households in Daddegallu-2 micro-watershed is presented in Table 8. The results indicate that 5.71 per cent of the households possess thatched house, 65.71 per cent of the households possess katcha house, 8.57 per cent of the households possess pucca/RCC house and 20 per cent of them possess semi pacca house.

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

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	0	0.00	0	0.00	0	0.00	0	0.00	1	33.33	1	100.00	2	5.71
2	Katcha	4	80.00	5	55.56	7	70.00	5	71.43	2	66.67	0	0.00	23	65.71
3	Pucca/RCC	1	20.00	1	11.11	1	10.00	0	0.00	0	0.00	0	0.00	3	8.57
4	Semi pacca	0	0.00	3	33.33	2	20.00	2	28.57	0	0.00	0	0.00	7	20.00
Total		5	100.00	9	100.00	10	100.00	7	100.00	3	100.00	1	100.00	35	100.00

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Daddegallu-2 micro-watershed is presented in Table 9. The results show that 91.43 per cent of the households possess TV, 2.86 per cent of them possess DVD/VCD player, 82.86 per cent of them possess mixer/grinder player, 8.57 per cent of them possess refrigerator, 20 per cent of them possess bicycle, 40 per cent o f the households possess motor cycle and 91.43 per cent of them possess mobile phones.

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

Sl. No.	Particulars	LL (5)		MF (9)		SF (10)		SMF(7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Television	5	100.00	8	88.89	9	90.00	6	85.71	3	100.00	1	100.00	32	91.43
2	DVD/VCD Player	0	0.00	0	0.00	0	0.00	0	0.00	1	33.33	0	0.00	1	2.86
3	Mixer/Grinder	5	100.00	6	66.67	9	90.00	5	71.43	3	100.00	1	100.00	29	82.86
4	Refrigerator	0	0.00	0	0.00	2	20.00	0	0.00	1	33.33	0	0.00	3	8.57
5	Bicycle	0	0.00	2	22.22	3	30.00	1	14.29	1	33.33	0	0.00	7	20.00
6	Motor Cycle	1	20.00	3	33.33	4	40.00	4	57.14	2	66.67	0	0.00	14	40.00
7	Mobile Phone	4	80.00	8	88.89	10	100.00	6	85.71	3	100.00	1	100.00	32	91.43

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Daddegallu-2 micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 5,187, DVD/VCD player was Rs.1,500, mixer grinder was Rs. 2,172, refrigerator was 13,666, bicycle was 1,033, motor cycle was Rs. 29,235 and mobile phone was Rs. 2,053.

Table 10. Average value of durable assets owned by households in Daddegallu-2 micro-watershed **Average value (Rs.)**

Sl.No.	Particulars	LL (5)	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Television	3,800	5,000	5,833	5,750	4,666	6,000	5,187
2	DVD/VCD Player	0	0	0	0	1,500	0	1,500
3	Mixer/Grinder	5,300	1,800	1,355	1,660	1,233	1,500	2,172
4	Refrigerator	0	0	14,000	0	13,000	0	13,666
5	Bicycle	0	1,333	1,433	400	300	0	1,033
6	Motor Cycle	40,000	31,666	33,250	28,800	21,250	0	29,235
7	Mobile Phone	2,000	1,921	2,000	2,700	1,625	2,000	2,053

Farm Implements owned: The data regarding the farm implements owned by the households in Daddegallu-2 micro-watershed is presented in Table 11. About 22.86 per cent of the households possess bullock cart, 34.29 per cent of them possess plough, 2.86 per cent of them possess power tiller and earth mover/duster, 8.57 per cent of them possess tractor, 17.14 per cent of them possess sprayer, 62.86 per cent of them possess weeder and 11.43 per cent of them possess chaff cutter.

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Daddegallu-2 micro-watershed is presented in Table 12. The results show that the average value of bullock cart was Rs. 13,625, plough

was Rs. 2,208, power tiller was Rs.6,000, tractor was Rs. 266,666, sprayer was Rs. 2,266, weeder was Rs.34, chaff cutter was Rs.1,575, and the average value of harvester was Rs. 9,000.

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

Sl. No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0.00	1	11.11	2	20.00	3	42.86	1	33.33	1	100.00	8	22.86
2	Plough	0	0.00	1	11.11	4	40.00	5	71.43	1	33.33	1	100.00	12	34.29
3	Power Tiller	0	0.00	0	0.00	1	10.00	0	0.00	0	0.00	0	0.00	1	2.86
4	Tractor	0	0.00	1	11.11	2	20.00	0	0.00	0	0.00	0	0.00	3	8.57
5	Sprayer	0	0.00	1	11.11	1	10.00	2	28.57	1	33.33	1	100.00	6	17.14
6	Weeder	3	60.00	7	77.78	4	40.00	4	57.14	3	100.00	1	100.00	22	62.86
7	Chaff Cutter	0	0.00	1	11.11	1	10.00	2	28.57	0	0.00	0	0.00	4	11.43
8	Blank	2	40.00	2	22.22	3	30.00	1	14.29	0	0.00	0	0.00	8	22.86
9	Earth remover/Duster	0	0.00	1	11.11	0	0.00	0	0.00	0	0.00	0	0.00	1	2.86

Table 12. Average value of farm implements owned by households in Daddegallu-2 micro-watershed **Average Value (Rs.)**

Sl.No.	Particulars	LL (5)	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Bullock Cart	0	9,000	13,000	12,666	18,000	18,000	13,625
2	Plough	0	1,000	2,875	2,200	1,500	1,500	2,208
3	Power Tiller	0	0	6,000	0	0	0	6,000
4	Tractor	0	150,000	325,000	0	0	0	266,666
5	Sprayer	0	1,800	1,500	1,750	1,800	5,000	2,266
6	Weeder	15	48	39	42	16	16	34
7	Chaff Cutter	0	1,500	1,500	1,650	0	0	1,575
8	Earth remover/Duster	0	9,000	0	0	0	0	9,000

Livestock possession by the households: The data regarding the Livestock possession by the households in Daddegallu-2 micro-watershed is presented in Table 13. The results indicate that, 37.14 per cent of the households possess bullocks, 20 per cent of the households possess local cow and 8.57 per cent possess buffalo.

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

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0.00	2	22.22	4	40.00	5	71.43	1	33.33	1	100.00	13	37.14
2	Local cow	0	0.00	2	22.22	2	20.00	2	28.57	1	33.33	0	0.00	7	20.00
3	Buffalo	0	0.00	1	11.11	1	10.00	1	14.29	0	0.00	0	0.00	3	8.57
4	blank	5	100.00	5	55.56	4	40.00	1	14.29	2	66.67	0	0.00	17	48.57

Average Labour availability: The data regarding the average labour availability in Daddegallu-2 micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.64, average own labour (women) available was 1.44, average hired labour (men) available was 6.26 and average hired labour (women) available was 6.83.

In case of marginal farmers, average own labour men available was 1.78 in the micro watershed and average own labour (women) available was 1.67, average hired labour (men) available and average hired labour (women) available was 5.11. In case of small farmers, average own labour men available was 1.6, average own labour (women) was 1.3, average hired labour (men) available was 7 and average hired labour (women) available was 7.6. In case of semi medium farmers, average own labour men available was 1.63, average own labour (women) was 1.38, average hired labour (men) was 7.43 and average hired labour (women) available was 8.57. In case of medium farmers, average own labour men available was 2.33 and average own labour (women) was 1.33, average hired labour (men) was 9.67 and average hired labour (women) available was 11.33. In case of large farmers, average own labour men and average own labour (women) was 1, average hired labour (men) was 7 and average hired labour (women) available was 8.

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

Sl.No.	Particulars	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Hired labour Female	5.11	7.60	8.57	11.33	8.00	6.83
2	Own Labour Female	1.67	1.30	1.38	1.33	1.00	1.44
3	Own labour Male	1.78	1.60	1.63	2.33	1.00	1.64
4	Hired labour Male	5.11	7.00	7.43	9.67	7.00	6.26

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Daddegallu-2 micro-watershed is presented in Table 15. The results indicate that, 37.14 per cent of the households opined that the hired labour was adequate and 65.71 per cent of the households opined that the hired labour was inadequate.

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

Sl.No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	4	44.44	4	40.00	4	57.14	1	33.33	0	0.00	13	37.14
2	Inadequate	5	55.56	6	60.00	4	57.14	2	66.67	1	100.00	23	65.71

Distribution of land (ha): The data regarding the distribution of land (ha) in Daddegallu-2 micro-watershed is presented in Table 16. The results indicate that, households of the Daddegallu-2 micro-watershed possess 43.91 ha (89.15%) of dry land and 5.34 ha (10.85%) of irrigated land. Marginal farmers possess 4.70 ha (100%) of dry land. Small farmers possess 114.31 ha (100%) of dry land. Semi medium farmers possess 19.35 ha (100%) of dry land. Medium farmers possess 4.55 ha (46.01%) of dry land and 5.34 ha (53.99%) of irrigated land. Large farmers possess 1 ha (100%).

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

Sl.No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	4.70	100	14.31	100	19.35	100	4.55	46.01	1	100	43.91	89.15
2	Irrigated	0	0	0	0	0	0	5.34	53.99	0	0	5.34	10.85
Total		4.70	100	14.31	100	19.35	100	9.89	100	1	100	49.26	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Daddegallu-2 micro-watershed is presented in Table 17. The results indicate that, the average value of dry land was Rs. 293,641.14 and the average value of irrigated land was Rs. 168,409.09. In case of marginal famers, the average land value was Rs. 658,950.09 for dry land. In case of small famers, the average land value was Rs. 286,478.08 for dry land. In case of semi medium famers, the average land value was Rs. 201,442.91 for dry land. In case of medium farmers, the average land value was Rs. 219,555.56 for dry land and Rs. 168,409.09 for irrigated land. In case of large farmers, the average land value was Rs. 799,999.98 for dry land.

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

Sl.No.	Particulars	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Dry	658,950.09	286,478.08	201,442.91	219,555.56	799,999.98	293,641.14
2	Irrigated	0.00	0.00	0.00	168,409.09	0.00	168,409.09

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

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

Sl.No.	Particulars	LL (5)	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Functioning	0	0	0	0	2	0	2

Source of irrigation: The data regarding the source of irrigation in Daddegallu-2 micro-watershed is presented in Table 19. The results indicate that, bore well was the major irrigation source in the micro water shed for 5.71 per cent of the farmers.

Table 19. Source of irrigation in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0.00	0	0.00	0	0.00	0	0.00	2	66.67	0	0.00	2	5.71

Depth of water (Avg in meters): The data regarding the depth of water in Daddegallu-2 micro-watershed is presented in Table 20. The results indicate that, the depth of bore well was found to be 3.66 meters

Table 20. Depth of water (Avg in meters) in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Bore Well	0.00	0.00	0.00	0.00	42.67	0.00	3.66

Irrigated Area (ha): The data regarding the irrigated area (ha) in Daddegallu-2 micro-watershed is presented in Table 21. The results indicate that medium farmers had an irrigated area of 5.34 ha respectively.

Table 21. Irrigated Area (ha) in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Kharif	0.00	0.00	0.00	0.00	5.34	0.00	5.34
Total		0.00	0.00	0.00	0.00	5.34	0.00	5.34

Cropping pattern: The data regarding the cropping pattern in Daddegallu-2 micro-watershed is presented in Table 22. The results indicate that, farmers have grown bajra (0.45 ha), Bengal gram (18.93 ha), maize (21.68 ha), red gram (0.83 ha), sugarcane (2.91 ha), sunflower (2.43 ha) and sorghum (1.58 ha). Marginal farmers have grown bajra, maize, red gram, and Bengal gram. Small farmers have grown maize, Bengal gram and sorghum. Semi medium farmers have grown Bengal gram, maize and sunflower. Medium farmers have grown maize, sugarcane and Bengal gram. Large farmers have grown maize.

Table 22. Cropping pattern in Daddegallu-2 micro-watershed (Area in ha)

Sl.No.	Particulars	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
6	Kharif - Bajra	0.45	0.00	0.00	0.00	0.00	0.45
12	Kharif - Bengal gram	0.00	0.00	7.82	0.00	0.00	7.82
59	Kharif - Maize	1.96	8.27	6.15	2.43	1.21	20.02
83	Kharif - Red gram	0.83	0.00	0.00	0.00	0.00	0.83
93	Kharif - Sugarcane	0.00	0.00	0.00	2.91	0.00	2.91
94	Kharif - Sunflower	0.00	0.00	2.43	0.00	0.00	2.43
113	Rabi - Bengal gram	0.81	2.85	2.89	4.55	0.00	11.11
160	Rabi - Maize	0.25	1.42	0.00	0.00	0.00	1.66
191	Rabi - Sorghum	0.00	1.58	0.00	0.00	0.00	1.58
Total		4.70	14.11	19.30	9.90	1.21	49.22

Cropping intensity: The data regarding the cropping intensity in Daddegallu-2 micro-watershed is presented in Table 23. The results indicate that, the cropping intensity in Daddegallu-2 micro-watershed was found to be 88.24 per cent.

Table 23. Cropping intensity (%) in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Cropping Intensity	0.00	100.00	100.00	74.63	100.00	100.00	88.24

Possession of Bank account and savings: The data regarding the possession of bank account and saving in Daddegallu-2 micro-watershed is presented in Table 24. The results indicate that, 25.71 per cent of the households have bank account and savings.

Table 24. Possession of Bank account and savings in Daddegallu-2 micro-watershed

Sl.No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	1	11.11	4	40.00	1	14.29	2	66.67	1	100.00	9	25.71
2	Savings	1	11.11	4	40.00	1	14.29	2	66.67	1	100.00	9	25.71

Borrowing status: The data regarding the borrowing status in Daddegallu-2 micro-watershed is presented in Table 25. The results indicate that, 25.71 per cent of the households have availed credit from different sources.

Table 25. Borrowing status in Daddegallu-2 micro-watershed

Sl.No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	1	11.11	4	40.00	1	14.29	2	66.67	1	100.00	9	25.71

Source of credit availed by households: The data regarding the borrowing status in Daddegallu-2 micro-watershed is presented in Table 26. The results indicate that, 33.33 per cent of the households have borrowed from commercial bank and 11.11 per cent of the households borrowed from grameena bank.

Table 26. Source of credit availed by households in Daddegallu-2 micro-watershed

Sl.No.	Particulars	MF (1)		SF (4)		SMF (1)		MDF (2)		LF (1)		All (9)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Commercial Bank	0	0.00	2	50.00	0	0.00	1	50.00	0	0.00	3	33.33
2	Grameena Bank	0	0.00	0	0.00	0	0.00	1	50.00	0	0.00	1	11.11

Avg. Credit amount: The data regarding the avg. Credit amount in Daddegallu-2 micro-watershed is presented in Table 27. The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 20,555.56.

Table 27. Avg. credit amount by household in Daddegallu-2 micro-watershed

Sl.No.	Particulars	MF (1)	SF (4)	SMF (1)	MDF (2)	LF (1)	All (9)
1	Average Credit	0.00	16,250.00	0.00	60,000.00	0.00	20,555.56

Purpose of credit borrowed - Institutional Credit: The data regarding the purpose of credit borrowed - Institutional Credit in Daddegallu-2 micro-watershed is presented in Table 28. The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production.

Table 28. Purpose of credit borrowed - Institutional Credit by household in Daddegallu-2 micro-watershed

Sl.No.	Particulars	SF (2)		MDF (2)		All (4)	
		N	%	N	%	N	%
1	Agriculture production	2	100.00	2	100.00	4	100.00

Repayment status of households – Institutional: The data regarding the repayment status of credit borrowed from institutional sources by households in Daddegallu-2 micro watershed is presented in Table 29. The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources.

Table 29. Repayment status of households – Institutional Credit in Daddegallu-2 micro-watershed

Sl.No.	Particulars	SF (2)		MDF (2)		All (4)	
		N	%	N	%	N	%
1	Un paid	2	100.00	2	100.00	4	100.00

Opinion on institutional sources of credit: The data regarding the opinion on institutional sources of credit in Daddegallu-2 micro watershed is presented in Table 30.

The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations.

Table 30. Opinion on institutional sources of credit in Daddegallu-2 micro watershed

Sl.No.	Particulars	SF (2)		MDF (2)		All (4)	
		N	%	N	%	N	%
1	Helped to perform timely agricultural operations	2	100	2	100	4	100

Cost of cultivation of Bajra: The data regarding the cost of cultivation of bajra in Daddegallu-2 micro-watershed is presented in Table 31. The results indicate that, the total cost of cultivation for bajra was Rs. 52976.53. The gross income realized by the farmers was Rs. 27566.96. The net income from bajra cultivation was Rs. -25409.57. Thus the benefit cost ratio was found to be 1:0.52.

Table 31. Cost of Cultivation of bajra in Daddegallu-2 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	46.31	9703.57	18.32
2	Bullock	Pairs/day	0.00	0.00	0.00
3	Tractor	Hours	4.41	3308.04	6.24
4	Machinery	Hours	2.21	1323.21	2.50
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	11.03	1102.68	2.08
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	0.00	0.00	0.00
8	Fertilizer + micronutrients	Quintal	8.82	8380.36	15.82
9	Pesticides (PPC)	Kgs / liters	4.41	4410.71	8.33
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	2.87	0.01
14	Land revenue and Taxes		0.00	0.00	0.00
II	**Cost B1**				
16	Interest on working capital			1668.45	3.15
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			29899.89	56.44
III	**Cost B2**				
18	Rental Value of Land			166.67	0.31
19	**Cost B2 = (Cost B1 + Rental value)**			30066.55	56.75
IV	**Cost C1**				
20	Family Human Labour		72.78	18083.93	34.14
21	**Cost C1 = (Cost B2 + Family Labour)**			48150.48	90.89
V	**Cost C2**				
22	Risk Premium			10.00	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**			48160.48	90.91
VI	**Cost C3**				
24	Managerial Cost			4816.05	9.09

25	**Cost C3 = (Cost C2 + Managerial Cost)**			52976.53	100.00
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	15.44	23156.25	
		b) Main Crop Sales Price (Rs.)		1500.00	
	By Product	e) Main Product (q)	44.11	4410.71	
		f) Main Crop Sales Price (Rs.)		100.00	
b.	Gross Income (Rs.)			27566.96	
c.	Net Income (Rs.)			-25409.57	
d.	Cost per Quintal (Rs./q.)			3431.68	
e.	Benefit Cost Ratio (BC Ratio)			1:0.52	

Cost of cultivation of Bengal gram: The data regarding the cost of cultivation of Bengal gram in Daddegallu-2 micro-watershed is presented in Table 32. The results indicate that, the total cost of cultivation for Bengal gram was Rs. 31340.80. The gross income realized by the farmers was Rs. 48747.50. The net income from Bengal gram cultivation was Rs. 17406.70. Thus the benefit cost ratio was found to be 1:1.56.

Table 32. Cost of Cultivation of Bengal gram in Daddegallu-2 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	28.19	3884.93	12.40
2	Bullock	Pairs/day	1.75	986.52	3.15
3	Tractor	Hours	1.04	826.10	2.64
4	Machinery	Hours	0.27	216.07	0.69
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	98.47	12776.47	40.77
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	3.94	894.34	2.85
8	Fertilizer + micronutrients	Quintal	1.89	2034.70	6.49
9	Pesticides (PPC)	Kgs / liters	0.67	1747.98	5.58
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	1125.00	3.59
13	Depreciation charges		0.00	77.16	0.25
14	Land revenue and Taxes		0.00	3.40	0.01
II	**Cost B1**				
16	Interest on working capital			2094.48	6.68
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			26667.13	85.09
III	**Cost B2**				
18	Rental Value of Land			241.67	0.77
19	**Cost B2 = (Cost B1 + Rental value)**			26908.80	85.86
IV	**Cost C1**				
20	Family Human Labour		8.73	1582.33	5.05
21	**Cost C1 = (Cost B2 + Family Labour)**			28491.13	90.91
V	**Cost C2**				
22	Risk Premium			0.50	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**			28491.63	90.91
VI	**Cost C3**				
24	Managerial Cost			2849.16	9.09

25	**Cost C3 = (Cost C2 + Managerial Cost)**			31340.80	100.00
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	14.34	48747.50	
		b) Main Crop Sales Price (Rs.)		3400.00	
b.	Gross Income (Rs.)			48747.50	
c.	Net Income (Rs.)			17406.70	
d.	Cost per Quintal (Rs./q.)			2185.93	
e.	Benefit Cost Ratio (BC Ratio)			1:1.56	

Cost of cultivation of Maize: The data regarding the cost of cultivation of maize in Daddegallu-2 micro-watershed is presented in Table 33. The results indicate that, the total cost of cultivation for maize was Rs. 33306.05. The gross income realized by the farmers was Rs. 31811.29. The net income from maize cultivation was Rs. -1494.76. Thus the benefit cost ratio was found to be 1:0.96.

Table 33. Cost of Cultivation of maize in Daddegallu-2 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	36.64	6874.10	20.64
2	Bullock	Pairs/day	4.66	2755.17	8.27
3	Tractor	Hours	2.50	1886.50	5.66
4	Machinery	Hours	0.52	338.98	1.02
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	18.66	2273.59	6.83
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	9.78	1995.10	5.99
8	Fertilizer + micronutrients	Quintal	3.58	3642.99	10.94
9	Pesticides (PPC)	Kgs / liters	2.20	2461.94	7.39
10	Irrigation	Number	2.06	0.00	0.00
11	Repairs		0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)		0.00	111.11	0.33
13	Depreciation charges		0.00	432.01	1.30
14	Land revenue and Taxes		0.00	0.59	0.00
II	**Cost B1**				
16	Interest on working capital			1245.85	3.74
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			24017.94	72.11
III	**Cost B2**				
18	Rental Value of Land			211.11	0.63
19	**Cost B2 = (Cost B1 + Rental value)**			24229.05	72.75
IV	**Cost C1**				
20	Family Human Labour		27.40	6040.73	18.14
21	**Cost C1 = (Cost B2 + Family Labour)**			30269.78	90.88
V	**Cost C2**				
22	Risk Premium			8.44	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**			30278.23	90.91
VI	**Cost C3**				
24	Managerial Cost			3027.82	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			33306.05	100.00

VII	Economics of the Crop				
a.	Main Product	a) Main Product (q)	25.16	30052.96	
		b) Main Crop Sales Price (Rs.)		1194.44	
	By Product	e) Main Product (q)	15.82	1758.33	
		f) Main Crop Sales Price (Rs.)		111.11	
b.	Gross Income (Rs.)			31811.29	
c.	Net Income (Rs.)			-1494.76	
d.	Cost per Quintal (Rs./q.)			1323.74	
e.	Benefit Cost Ratio (BC Ratio)			1:0.96	

Cost of Cultivation of Sugarcane: The data regarding the cost of cultivation of sugarcane in Daddegallu-2 micro-watershed is presented in Table 34. The results indicate that, the total cost of cultivation for sugarcane was Rs. 23431.09. The gross income realized by the farmers was Rs. 120069.45. The net income from sugarcane cultivation was Rs. 96638.36. Thus the benefit cost ratio was found to be 1:5.12.

Table 34. Cost of Cultivation of Sugarcane in Daddegallu-2 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	18.87	3876.53	16.54
2	Bullock	Pairs/day	0.00	0.00	0.00
3	Tractor	Hours	2.40	1801.04	7.69
4	Machinery	Hours	0.69	411.67	1.76
5	Seed Main Crop (Establishment and Maintenence)	Kgs (Rs.)	2744.44	5488.89	23.43
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	24.01	2401.39	10.25
8	Fertilizer + micronutrients	Quintal	1.37	1509.44	6.44
9	Pesticides (PPC)	Kgs / liters	1.72	2058.33	8.78
10	Irrigation	Number	3.43	0.00	0.00
11	Repairs		0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)		0.00	0.00	0.00
13	Depreciation charges		0.00	0.45	0.00
14	Land revenue and Taxes		0.00	0.00	0.00
II	**Cost B1**				
16	Interest on working capital			1376.17	5.87
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			18923.90	80.76
III	**Cost B2**				
18	Rental Value of Land			0.00	0.00
19	**Cost B2 = (Cost B1 + Rental value)**			18923.90	80.76
IV	**Cost C1**				
20	Family Human Labour		9.26	2367.08	10.10
21	**Cost C1 = (Cost B2 + Family Labour)**			21290.99	90.87
V	**Cost C2**				
22	Risk Premium			10.00	0.04
23	**Cost C2 = (Cost C1 + Risk Premium)**			21300.99	90.91
VI	**Cost C3**				
24	Managerial Cost			2130.10	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			23431.09	100.00

VII	Economics of the Crop				
a.	Main Product	a) Main Product (q)	480.28	120069.45	
		b) Main Crop Sales Price (Rs.)		250.00	
b.	Gross Income (Rs.)			120069.45	
c.	Net Income (Rs.)			96638.36	
d.	Cost per Quintal (Rs./q.)			48.79	
e.	Benefit Cost Ratio (BC Ratio)			1:5.12	

Cost of Cultivation of Sunflower: The data regarding the cost of cultivation of sunflower in Daddegallu-2 micro-watershed is presented in Table 35. The results indicate that, the total cost of cultivation for sunflower was Rs. 33305.25. The gross income realized by the farmers was Rs. 43032.89. The net income from sunflower cultivation was Rs. 9727.64. Thus the benefit cost ratio was found to be 1:1.29.

Table 35. Cost of Cultivation of Sunflower in Daddegallu-2 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	40.62	7410.00	22.25
2	Bullock	Pairs/day	5.76	2881.67	8.65
3	Tractor	Hours	1.65	1235.00	3.71
4	Machinery	Hours	0.27	164.67	0.49
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	4.94	1729.00	5.19
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	5.76	1646.67	4.94
8	Fertilizer + micronutrients	Quintal	2.74	3084.76	9.26
9	Pesticides (PPC)	Kgs / liters	0.82	1235.00	3.71
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	333.33	1.00
13	Depreciation charges		0.00	2866.43	8.61
14	Land revenue and Taxes		0.00	1.37	0.00
II	**Cost B1**				
16	Interest on working capital			924.25	2.78
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			23512.15	70.60
III	**Cost B2**				
18	Rental Value of Land			155.56	0.47
19	**Cost B2 = (Cost B1 + Rental value)**			23667.70	71.06
IV	**Cost C1**				
20	Family Human Labour		31.56	6603.13	19.83
21	**Cost C1 = (Cost B2 + Family Labour)**			30270.84	90.89
V	**Cost C2**				
22	Risk Premium			6.67	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**			30277.50	90.91
VI	**Cost C3**				
24	Managerial Cost			3027.75	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			33305.25	100.00
VII	**Economics of the Crop**				

a.	Main Product	a) Main Product (q)	13.17	43032.89	
		b) Main Crop Sales Price (Rs.)		3266.67	
b.	Gross Income (Rs.)			43032.89	
c.	Net Income (Rs.)			9727.64	
d.	Cost per Quintal (Rs./q.)			2528.23	
e.	Benefit Cost Ratio (BC Ratio)			1:1.29	

Cost of Cultivation of Sorghum: The data regarding the cost of cultivation of sorghum in Daddegallu-2 micro-watershed is presented in Table 36. The results indicate that, the total cost of cultivation for sorghum was Rs. 13117.18. The gross income realized by the farmers was Rs. 21660. The net income from sorghum cultivation was Rs. 8542.82. Thus the benefit cost ratio was found to be 1:1.65.

Table 36. Cost of Cultivation of Sorghum in Daddegallu-2 micro-watershed

Sl. No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	31.03	5066.67	38.63
2	Bullock	Pairs/day	0.00	0.00	0.00
3	Tractor	Hours	1.90	1330.00	10.14
4	Machinery	Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	5.07	608.00	4.64
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	3.17	633.33	4.83
8	Fertilizer + micronutrients	Quintal	0.00	0.00	0.00
9	Pesticides (PPC)	Kgs / liters	0.63	633.33	4.83
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	2837.33	21.63
14	Land revenue and Taxes		0.00	3.29	0.03
II	**Cost B1**				
16	Interest on working capital			225.08	1.72
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			11337.04	86.43
III	**Cost B2**				
18	Rental Value of Land			333.33	2.54
19	**Cost B2 = (Cost B1 + Rental value)**			11670.37	88.97
IV	**Cost C1**				
20	Family Human Labour		1.27	253.33	1.93
21	**Cost C1 = (Cost B2 + Family Labour)**			11923.71	90.90
V	**Cost C2**				
22	Risk Premium			1.00	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**			11924.71	90.91
VI	**Cost C3**				
24	Managerial Cost			1192.47	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			13117.18	100.00
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	12.03	21660.00	

		b) Main Crop Sales Price (Rs.)		1800.00	
b.	Gross Income (Rs.)			21660.00	
c.	Net Income (Rs.)			8542.82	
d.	Cost per Quintal (Rs./q.)			1090.07	
e.	Benefit Cost Ratio (BC Ratio)			1:1.65	

Adequacy of fodder: The data regarding the adequacy of fodder in Daddegallu-2 micro-watershed is presented in Table 37. The results indicate that, 20 per cent of the households opined that dry fodder was adequate, 2.86 per cent of the households opined that green fodder was adequate and 5.71 per cent of the households opined that dry fodder was inadequate.

Table 37. Adequacy of fodder in Daddegallu-2 micro-watershed

Sl.No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0.00	3	30.00	2	28.57	1	33.33	1	100.00	7	20.00
2	Inadequate-Dry Fodder	1	11.11	0	0.00	1	14.29	0	0.00	0	0.00	2	5.71
3	Adequate-Green Fodder	0	0.00	0	0.00	1	14.29	0	0.00	0	0.00	1	2.86

Annual gross income: The data regarding the annual gross income in Daddegallu-2 micro-watershed is presented in Table 38. The results indicate that the annual gross income was Rs. 47,000 for landless farmers, for marginal farmers it was Rs. 62,800, for small farmers it was Rs. 80,880, for semi medium farmers it was Rs. 166,400, for medium farmers it was Rs.309,533.33 and large farmers it was Rs. 50,000.

Table 38. Annual gross income in Daddegallu-2 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Service/salary	0	8,888.89	10,440	40,285.71	0	0	13,325.71
2	Business	0	7,222.22	11,000	0	66,666.67	0	10,714.29
3	Wage	47,000	11,155.56	7,300	7,428.57	20,000	15,000	15,297.14
4	Agriculture	0	33,088.89	46,240	101,771.43	222,866.67	35,000	62,177.14
5	Non Farm income	0	2,444.44	5,300	3,285.71	0	0	2,800
6	Dairy Farm	0	0	600	13,628.57	0	0	2,897.14
Income(Rs.)		47,000	62,800	80,880	166,400	309,533.33	50,000	107,211.43

Average annual expenditure: The data regarding the average annual expenditure in Daddegallu-2 micro-watershed is presented in Table 39. The results indicate that the average annual expenditure is Rs. 13,197.07. For landless households it was Rs. 3,480, for marginal farmers it was Rs. 6,950, for small farmers it was Rs. 6,740, for semi medium farmers it was Rs. 13,221.09, for medium farmers it was Rs. 66,666.67 and for large farmers Rs. 22,000.

Table 39. Average annual expenditure in Daddegallu-2 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (9)	SF (10)	SMF (7)	MDF (3)	LF (1)	All (35)
1	Service/salary	0	19,000	20,000	30,000	0	0	3,371.43
2	Business	0	25,000	22,500	0	100,000	0	4,857.14
3	Wage	17,400	6,200	6,600	8,333.33	10,000	2,000	6,011.43
4	Agriculture	0	12,350	16,300	45,714.29	90,000	20,000	25,614.29
5	Dairy Farm	0	0	2,000	8,500	0	0	542.86
Total		17,400	62,550	67,400	92,547.62	200,000	22,000	461,897.62
Average		3,480	6,950	6,740	13,221.09	66,666.67	22,000	13,197.07

Forest species grown: The data regarding forest species grown in Daddegallu-2 micro-watershed is presented in Table 40. The results indicate that, households have planted 36 neem trees in their field.

Table 40: Forest species grown in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B	F	B
1	Neem	0	0	9	0	14	0	6	0	5	0	2	0	36	0

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

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Daddegallu-2 micro-watershed is presented in Table 41. The results indicated that, bajra, sorghum, sugarcane and sunflower was sold to the extent of 100 per cent, Bengal gram was sold to the extent of 111.03 per cent and maize was sold to the extent of 98.58 per cent.

Table 41. Marketing of the agricultural produce in Daddegallu-2 micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	7.0	0.0	7.0	100.0	1500.0
2	Bengalgram	272.0	-30.0	302.0	111.03	3022.22
3	Maize	493.0	7.0	486.0	98.58	1194.44
4	Sorghum	19.0	0.0	19.0	100.0	1800.0
5	Sugarcane	1400.0	0.0	1400.0	100.0	250.0
6	Sunflower	30.0	0.0	30.0	100.0	3266.67

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Daddegallu-2 micro-watershed is presented in Table 42. The results indicated that, about 20 per cent of the farmers sold their produce to agent/traders. 17.14 per cent of the farmers sold their produce to local/village merchant, 54.29 per cent of them sold their produce through regulated market and 2.86 per cent of them sold their produce through cooperative marketing society.

Table 42. Marketing Channels used for sale of agricultural produce in Daddegallu-2 micro-watershed

Sl. No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agent/Traders	3	33.33	2	20.00	2	28.57	0	0.00	0	0.00	7	20.00
2	Local/village Merchant	3	33.33	2	20.00	1	14.29	0	0.00	0	0.00	6	17.14
3	Regulated Market	3	33.33	6	60.00	7	100.00	2	66.67	1	100.00	19	54.29
4	Cooperative marketing Society	0	0.00	0	0.00	0	0.00	1	33.33	0	0.00	1	2.86

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Daddegallu-2 micro-watershed is presented in Table 43. The results indicated that, 11.43 per cent of the households used cart, 80 per cent of the households used tractor and 2.86 per cent of them used truck as a mode of transportation for their agricultural produce.

Table 43. Mode of transport of agricultural produce in Daddegallu-2 micro-watershed

Sl.No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cart	3	33.33	1	10.00	0	0.00	0	0.00	0	0.00	4	11.43
2	Tractor	6	66.67	9	90.00	10	142.86	2	66.67	1	100.00	28	80.00
3	Truck	0	0.00	0	0.00	0	0.00	1	33.33	0	0.00	1	2.86

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Daddegallu-2 micro-watershed is presented in Table 44. The results indicated that, 20 per cent of the households have experienced soil and water erosion problems in the farm.

Table 44. Incidence of soil and water erosion problems in Daddegallu-2 micro-watershed

Sl. No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	3	33.33	3	30	1	14.29	0	0	0	0	7	20

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Daddegallu-2 micro-watershed is presented in Table 45. The results indicated that, 48.57 per cent have shown interest in soil test.

Table 45. Interest shown towards soil testing in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0.00	5	55.56	6	60.00	3	42.86	2	66.67	1	100.00	17	48.57

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Daddegallu-2 micro-watershed is presented in Table 46. The results indicated that, 100 per cent of the households used firewood as a source of fuel.

Table 46. Usage pattern of fuel for domestic use in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	5	100.00	9	100.00	10	100.00	8	100.00	3	100.00	1	100.00	36	100.00

Source of drinking water: The data regarding source of drinking water in Daddegallu-2 micro-watershed is presented in Table 47. The results indicated that, piped supply was the major source of drinking water for 37.14 per cent of the households, bore well was the source of drinking water for 45.71 per cent of the households and 17.14 per cent of the households used open well in micro watershed.

Table 47. Source of drinking water in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	1	20.00	4	44.44	3	30.00	3	42.86	2	66.67	0	0.00	13	37.14
2	Bore Well	4	80.00	4	44.44	5	50.00	2	28.57	0	0.00	1	100.00	16	45.71
3	Open well	0	0.00	1	11.11	2	20.00	2	28.57	1	33.33	0	0.00	6	17.14

Source of light: The data regarding source of light in Daddegallu-2 micro-watershed is presented in Table 48. The results indicated that, Electricity was the major source of light for 100 per cent of the households in micro watershed.

Table 48. Source of light in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100.00	9	100.00	10	100.00	7	100.00	3	100.00	1	100.00	35	100.00

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facilit**y** in Daddegallu-2 micro-watershed is presented in Table 49. The results indicated that, 51.43 per cent of the households possess sanitary toilet facility.

Table 49. Existence of Sanitary toilet facility in Daddegallu-2 micro-watershed

Sl. No.	Particulars	LL (5)		MF (9)		SF (10)		SMF(7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	5	100.00	3	33.33	2	20.00	4	57.14	3	100.00	1	100.00	18	51.43

Possession of PDS card: The data regarding possession of PDS card in Daddegallu-2 micro-watershed is presented in Table 50. The results indicated that, 97.14 per cent of the sampled households possessed BPL card and 2.86 per cent of the sampled households not possessed PDS card.

Table 50. Possession of PDS card in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100.00	9	100.00	9	90.00	7	100.00	3	100.00	1	100.00	34	97.14
2	Not Possessed	0	0.00	0	0.00	1	10.00	0	0.00	0	0.00	0	0.00	1	2.86

Participation in NREGA program: The data regarding participation in NREGA programme in Daddegallu-2 micro-watershed is presented in Table 51. The results indicated that, 60 per cent of the households participated in NREGA programme.

Table 51. Participation in NREGA programme in Daddegallu-2 micro-watershed

Sl. No.	Particulars	LL (5)		MF (9)		SF(10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	3	60	4	44.44	5	50	6	85.71	2	66.67	1	100	21	60

Adequacy of food items: The data regarding adequacy of food items in Daddegallu-2 micro-watershed is presented in Table 52. The results indicated that, cereals were adequate for 88.57 per cent of the households, pulses were adequate for 62.86 per cent, oilseeds were adequate for 34.29 per cent, vegetables were adequate for 42.86 per cent, fruits were adequate for 48.57 per cent, milk were adequate for 51.43 per cent, egg were adequate for 28.57 per cent and meat was adequate for 25.71 per cent.

Table 52. Adequacy of food items in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	2	40.00	9	100.00	10	100.00	6	85.71	3	100.00	1	100.00	31	88.57
2	Pulses	2	40.00	4	44.44	8	80.00	4	57.14	3	100.00	1	100.00	22	62.86
3	Oilseed	0	0.00	5	55.56	2	20.00	2	28.57	2	66.67	1	100.00	12	34.29
4	Vegetables	0	0.00	6	66.67	4	40.00	4	57.14	1	33.33	0	0.00	15	42.86
5	Fruits	2	40.00	4	44.44	6	60.00	2	28.57	3	100.00	0	0.00	17	48.57
6	Milk	0	0.00	5	55.56	6	60.00	5	71.43	2	66.67	0	0.00	18	51.43
7	Egg	0	0.00	5	55.56	3	30.00	2	28.57	0	0.00	0	0.00	10	28.57
8	Meat	0	0.00	4	44.44	3	30.00	2	28.57	0	0.00	0	0.00	9	25.71

Response on Inadequacy of food items: The data regarding inadequacy of food items in Daddegallu-2 micro-watershed is presented in Table 53. The results indicated that, cereals were inadequate for 11.43 per cent, pulses were inadequate for 37.14 per cent of the households, oilseeds were inadequate for 62.86 per cent, vegetables were inadequate for 57.14 per cent, fruits were inadequate for 37.14 per cent, milk were inadequate for 42.86 per cent, egg were inadequate for 60 per cent and meat were inadequate for 51.43 per cent of the households.

Table 53. Response on Inadequacy of food items in Daddegallu-2 micro-watershed

Sl.No.	Particulars	LL (5)		MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	3	60.00	0	0.00	0	0.00	1	14.29	0	0.00	0	0.00	4	11.43
2	Pulses	3	60.00	5	55.56	2	20.00	3	42.86	0	0.00	0	0.00	13	37.14
3	Oilseed	4	80.00	4	44.44	8	80.00	5	71.43	1	33.33	0	0.00	22	62.86
4	Vegetables	5	100.00	3	33.33	6	60.00	3	42.86	2	66.67	1	100.00	20	57.14
5	Fruits	3	60.00	4	44.44	2	20.00	3	42.86	0	0.00	1	100.00	13	37.14
6	Milk	5	100.00	4	44.44	3	30.00	2	28.57	0	0.00	1	100.00	15	42.86
7	Egg	5	100.00	3	33.33	7	70.00	3	42.86	2	66.67	1	100.00	21	60.00
8	Meat	5	100.00	4	44.44	4	40.00	3	42.86	1	33.33	1	100.00	18	51.43

Farming constraints: The data regarding farming constraints experienced by households in Daddegallu-2 micro-watershed is presented in Table 54. The results indicated that, lower fertility status of the soil was the constraint experienced by 65.71 per cent of the households, wild animal menace on farm field, frequent incidence of pest and diseases and high rate of interest on credit (48.57%), inadequacy of irrigation water (42.86%), high cost of fertilizers and plant protection chemicals (57.14%), low price for the agricultural commodities (28.57%), lack of marketing facilities in the area and source of Agri-technology information (37.14%), inadequate extension services (34.29%), lack of transport for safe transport of the agricultural produce to the market (40%) and less rainfall (60%).

Table 54. Farming constraints Experienced in Daddegallu-2 micro-watershed

Sl. No.	Particulars	MF (9)		SF (10)		SMF (7)		MDF (3)		LF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	6	66.67	8	80	5	71.43	3	100	1	100	23	65.71
2	Wild animal menace on farm field	6	66.67	5	50	4	57.14	1	33.33	1	100	17	48.57
3	Frequent incidence of pest and diseases	5	55.56	6	60	4	57.14	2	66.67	0	0	17	48.57
4	Inadequacy of irrigation water	4	44.44	4	40	3	42.86	3	100	1	100	15	42.86
5	High cost of Fertilizers and plant protection chemicals	7	77.78	4	40	6	85.71	3	100	0	0	20	57.14
6	High rate of interest on credit	4	44.44	6	60	5	71.43	2	66.67	0	0	17	48.57
7	Low price for the agricultural commodities	2	22.22	4	40	2	28.57	1	33.33	1	100	10	28.57
8	Lack of marketing facilities in the area	3	33.33	4	40	5	71.43	1	33.33	0	0	13	37.14
9	Inadequate extension services	3	33.33	4	40	2	28.57	2	66.67	1	100	12	34.29
10	Lack of transport for safe transport of the Agril produce to the market.	4	44.44	5	50	4	57.14	1	33.33	0	0	14	40
11	Less rainfall	6	66.67	7	70	6	85.71	2	66.67	0	0	21	60
12	Source of Agri-technology information(Newspaper/TV/Mobile)	5	55.56	5	50	2	28.57	0	0	1	100	13	37.14

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 analyse the data. About 35 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 95 (57.23%) men and 71(42.77%) women among the sampled households. The average family size of landless farmers' was 3.6, marginal farmers' was 5.4, small farmers' was 4.5, semi medium farmers' was 3, medium farmers' was 6.6 and large farmers' were 3. The data indicated that, 28 (16.87%) people were in 0-15 years of age, 73 (43.98%) were in 16-35 years of age, 53 (31.93%) were in 36-60 years of age and 12 (7.23%) were above 61 years of age.

The results indicated that Daddegallu-2 had 22.89 per cent illiterates, 25.90 per cent of them had primary school education, 13.86 per cent of them had middle school education, 18.67 per cent of them had high school education, 7.83 per cent of them had PUC education, 0.60 per cent had ITI, 4.82 per cent had degree and 1.20 per cent had masters education.

The results indicate that, 85.71 per cent of household heads were practicing agriculture and 14.29 per cent of household heads were practicing agriculture labour. The results indicate that agriculture was the major occupation for 32.53 per cent of the household members, 39.76 per cent were agricultural labourers, 1.20 per cent were in private service, trade and business and housewives, 18.07 per cent were in students and 4.22 per cent were in children.

The results show that, 0.60 per cent of the population has participated in gram panchayat, sthree shakthi sangha and user group and 98.19 per cent of the population has not participated in any local institutions. The results indicate that 5.71 per cent of the households possess thatched house, 65.71 per cent of the households possess katcha house, 8.57 per cent of the households possess pucca/RCC house and 20 per cent of them possess semi pacca house.

The results show that 91.43 per cent of the households possess TV, 2.86 per cent of them possess DVD/VCD player, 82.86 per cent of them possess mixer/grinder player, 8.57 per cent of them possess refrigerator, 20 per cent of them possess bicycle, 40 per cent o f the households possess motor cycle and 91.43 per cent of them possess mobile phones. The results show that the average value of television was Rs. 5,187, DVD/VCD

player was Rs.1,500, mixer grinder was Rs. 2,172, refrigerator was 13,666, bicycle was 1,033, motor cycle was Rs. 29,235 and mobile phone was Rs. 2,053.

About 22.86 per cent of the households possess bullock cart, 34.29 per cent of them possess plough, 2.86 per cent of them possess power tiller and earth mover/duster, 8.57 per cent of them possess tractor, 17.14 per cent of them possess sprayer, 62.86 per cent of them possess weeder and 11.43 per cent of them possess chaff cutter. The results show that the average value of bullock cart was Rs. 13,625, plough was Rs. 2,208, power tiller was Rs.6,000, tractor was Rs. 266,666, sprayer was Rs. 2,266, weeder was Rs.34, chaff cutter was Rs.1,575, and the average value of harvester was Rs. 9,000.

The results indicate that, 37.14 per cent of the households possess bullocks, 20 per cent of the households possess local cow and 8.57 per cent possess buffalo.

The results indicate that, average own labour men available in the micro watershed was 1.64, average own labour (women) available was 1.44, average hired labour (men) available was 6.26 and average hired labour (women) available was 6.83. The results indicate that, 37.14 per cent of the households opined that the hired labour was adequate and 65.71 per cent of the households opined that the hired labour was inadequate.

The results indicate that, households of the Daddegallu-2 micro-watershed possess 43.91 ha (89.15%) of dry land and 5.34 ha (10.85%) of irrigated land. Marginal farmers possess 4.70 ha (100%) of dry land. Small farmers possess 114.31 ha (100%) of dry land. Semi medium farmers possess 19.35 ha (100%) of dry land. Medium farmers possess 4.55 ha (46.01%) of dry land and 5.34 ha (53.99%) of irrigated land. Large farmers possess 1 ha (100%).

The results indicate that, the average value of dry land was Rs. 293,641.14 and the average value of irrigated land was Rs. 168,409.09. In case of marginal famers, the average land value was Rs. 658,950.09 for dry land. In case of small famers, the average land value was Rs. 286,478.08 for dry land. In case of semi medium famers, the average land value was Rs. 201,442.91 for dry land. In case of medium farmers, the average land value was Rs. 219,555.56 for dry land and Rs. 168,409.09 for irrigated land. In case of large farmers, the average land value was Rs. 799,999.98 for dry land.

The results indicate that, there were 2 functioning bore wells in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 5.71 per cent of the farmers. The results indicate that, the depth of bore well was found to be 3.66 meters

The results indicate that medium farmers had an irrigated area of 5.34 ha respectively. The results indicate that, farmers have grown bajra (0.45 ha), Bengal gram (18.93 ha), maize (21.68 ha), red gram (0.83 ha), sugarcane (2.91 ha), sunflower (2.43 ha) and sorghum (1.58 ha). Marginal farmers have grown bajra, maize, red gram, and Bengal

gram. Small farmers have grown maize, Bengal gram and sorghum. Semi medium farmers have grown Bengal gram, maize and sunflower. Medium farmers have grown maize, sugarcane and Bengal gram. Large farmers have grown maize. The results indicate that, the cropping intensity in Daddegallu-2 micro-watershed was found to be 88.24 per cent.

The results indicate that, 25.71 per cent of the households have bank account and savings. The results indicate that, 25.71 per cent of the households have availed credit from different sources. The results indicate that, 33.33 per cent of the households have borrowed from commercial bank and 11.11 per cent of the households borrowed from grameena bank. The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 20,555.56. The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production. The results indicated that 100 per cent of the households did not repay their loan borrowed from institutional sources. The results indicate that, around 100 per cent opined that the loan amount borrowed from institutional sources helped to perform timely agricultural operations.

The results indicate that, the total cost of cultivation for bajra was Rs. 52976.53. The gross income realized by the farmers was Rs. 27566.96. The net income from bajra cultivation was Rs. -25409.57. Thus the benefit cost ratio was found to be 1:0.52. The total cost of cultivation for Bengal gram was Rs. 31340.80. The gross income realized by the farmers was Rs. 48747.50. The net income from Bengal gram cultivation was Rs. 17406.70. Thus the benefit cost ratio was found to be 1:1.56. The total cost of cultivation for maize was Rs. 33306.05. The gross income realized by the farmers was Rs. 31811.29. The net income from maize cultivation was Rs. -1494.76. Thus the benefit cost ratio was found to be 1:0.96. The total cost of cultivation for sugarcane was Rs. 23431.09. The gross income realized by the farmers was Rs. 120069.45. The net income from sugarcane cultivation was Rs. 96638.36. Thus the benefit cost ratio was found to be 1:5.12. The total cost of cultivation for sunflower was Rs. 33305.25. The gross income realized by the farmers was Rs. 43032.89. The net income from sunflower cultivation was Rs. 9727.64. Thus the benefit cost ratio was found to be 1:1.29. The total cost of cultivation for sorghum was Rs. 13117.18. The gross income realized by the farmers was Rs. 21660. The net income from sorghum cultivation was Rs. 8542.82. Thus the benefit cost ratio was found to be 1:1.65.

The results indicate that, 20 per cent of the households opined that dry fodder was adequate, 2.86 per cent of the households opined that green fodder was adequate and 5.71 per cent of the households opined that dry fodder was inadequate.

The results indicate that the annual gross income was Rs. 47,000 for landless farmers, for marginal farmers it was Rs. 62,800, for small farmers it was Rs. 80,880, for semi medium farmers it was Rs. 166,400, for medium farmers it was Rs.309,533.33 and

large farmers it was Rs. 50,000. The results indicate that the average annual expenditure is Rs. 13,197.07. For landless households it was Rs. 3,480, for marginal farmers it was Rs. 6,950, for small farmers it was Rs. 6,740, for semi medium farmers it was Rs. 13,221.09, for medium farmers it was Rs. 66,666.67 and for large farmers Rs. 22,000.The results indicate that, households have planted 36 neem trees in their field.

The results indicated that, bajra, sorghum, sugarcane and sunflower was sold to the extent of 100 per cent, Bengal gram was sold to the extent of 111.03 per cent and maize was sold to the extent of 98.58 per cent.

The results indicated that, about 20 per cent of the farmers sold their produce to agent/traders. 17.14 per cent of the farmers sold their produce to local/village merchant, 54.29 per cent of them sold their produce through regulated market and 2.86 per cent of them sold their produce through cooperative marketing society.

The results indicated that, 11.43 per cent of the households used cart, 80 per cent of the households used tractor and 2.86 per cent of them used truck as a mode of transportation for their agricultural produce.

The results indicated that, 20 per cent of the households have experienced soil and water erosion problems in the farm. The results indicated that, 48.57 per cent have shown interest in soil test.

The results indicated that, 100 per cent of the households used firewood as a source of fuel. The results indicated that, piped supply was the major source of drinking water for 37.14 per cent of the households, bore well was the source of drinking water for 45.71 per cent of the households and 17.14 per cent of the households used open well in micro watershed.

Electricity was the major source of light for 100 per cent of the households in micro watershed. The results indicated that, 51.43 per cent of the households possess sanitary toilet facility. The results indicated that, 97.14 per cent of the sampled households possessed BPL card and 2.86 per cent of the sampled households not possessed PDS card. The results indicated that, 60 per cent of the households participated in NREGA programme.

The results indicated that, cereals were adequate for 88.57 per cent of the households, pulses were adequate for 62.86 per cent, oilseeds were adequate for 34.29 per cent, vegetables were adequate for 42.86 per cent, fruits were adequate for 48.57 per cent, milk were adequate for 51.43 per cent, egg were adequate for 28.57 per cent and meat was adequate for 25.71 per cent.

The results indicated that, cereals were inadequate for 11.43 per cent, pulses were inadequate for 37.14 per cent of the households, oilseeds were inadequate for 62.86 per cent, vegetables were inadequate for 57.14 per cent, fruits were inadequate for 37.14 per

cent, milk were inadequate for 42.86 per cent, egg were inadequate for 60 per cent and meat were inadequate for 51.43 per cent of the households.

The results indicated that, lower fertility status of the soil was the constraint experienced by 65.71 per cent of the households, wild animal menace on farm field, frequent incidence of pest and diseases and high rate of interest on credit (48.57%), inadequacy of irrigation water (42.86%), high cost of fertilizers and plant protection chemicals (57.14%), low price for the agricultural commodities (28.57%), lack of marketing facilities in the area and source of Agri-technology information (37.14%), inadequate extension services (34.29%), lack of transport for safe transport of the agricultural produce to the market (40%) and less rainfall (60%).