ICAR-NBSS&LUP Sujala MWS Publ.356

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

NAZARAPUR-1 (4D5B6D2e) MICROWATERSHED

Gurumitkal Hobli, Yadgir Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

The Bureau has been engaged in carrying out soil resource survey, agro-ecological and soil degradation mapping at the country, state and district levels for qualitative assessment and monitoring the soil health towards viable land use planning. The research activities have resulted in identifying the soil potentials and problems, and the various applications of the soil surveys with the ultimate objective of sustainable agricultural development. The Bureau has the mandate to correlate and classify soils of the country and maintain a National Register of all the established soil series. The Institute is also imparting in-service training to staff of the soil survey agencies in the area of soil survey, land evaluation and soil survey interpretations for land use planning. The Bureau in collaboration with 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., B.A. Dhanorkar, S. Srinivas, M.Lalitha, K.V. Niranjana, R.S. Reddy and S.K. Singh (2019). "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of Nazarapur 1 (4D2D6D2e) Microwatershed, Gurmitkal Hobli, Yadgir Taluk and District, Karnataka", ICAR-NBSS&LUP Sujala MWS Publ.356, ICAR – NBSS & LUP, RC, Bangalore. p.127 & 35.

TO OBTAIN COPIES,

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

Amaravati Road, NAGPUR - 440 033, India

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

Telefax : 0712-2522534

E-Mail : director@nbsslup.ernet.in

Website URL : nbsslup.in

Or

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

Phone : (080) 23412242, 23510350 (O)

Telefax : 080-23510350

E-Mail : nbssrcb@gmail.com

ICAR-NBSS&LUP Sujala MWS Publ.356

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

NAZARAPUR-1 (4D5B6D2e) MICROWATERSHED

Gurumitkal Hobli, Yadgir Taluk and District, Karnataka

Karnataka Watershed Development Project – II

Sujala-III

World Bank funded Project

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

WATERSHED DEVELOPMENT DEPARTMENT, GOVT. OF KARNATAKA, BANGALORE

PREFACE

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

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

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

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

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

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

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

Nagpur
Date: 11-09-2019

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

Contributors

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

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

PART-A

LAND RESOURCE INVENTORY

Contents

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

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

The present study covers an area of 539 ha in Yadgir taluk & district, Karnataka. The climate is semiarid and categorized as drought-prone with an average annual rainfall of 866 mm, of which about 652 mm is received during south-west monsoon, 138 mm during north-east and the remaining 76 mm during the rest of the year. An area of 404 ha in the microwatershed is covered by soils, 123 ha by rock outcrops and 12 ha by others (habitation and water body). 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 4 land management units.*
- *The length of crop growing period is about 120-150 days starting from 1st week of June to 4th week of October.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 29 major agricultural and horticultural crops was assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area in the microwatershed is suitable for agriculture.*
- *About 6 per cent area is very shallow (<25 cm), 39 per cent area is shallow (25-50 cm), 27 per cent area is deep (100-150 cm) and 3 per cent area is very deep (>150 cm) in the microwatershed.*
- *About 10 per cent area in the microwatershed has sandy soils, 51 per cent loamy soils and 14 per cent clayey soils at the surface*
- *An area of 30 per cent is non gravelly (<15%) and 45 per cent gravelly (15-35%) in the microwatershed.*

- *About 45 per cent area of the microwatershed is very low (<50 mm/m) in available water capacity, 11 per cent is low (51-100 mm/m) and 20 per cent is high (>200 mm/m) in available water capacity.*
- *About 11 per cent area in the microwatershed has nearly level (0-1% slope) lands, 29 per cent has very gently sloping (1-3% slope) and 35 per cent has gently sloping (3-5%) lands.*
- *An area of about 64 per cent is moderately (e2) eroded and 11 per cent area is slightly (e1) eroded.*
- *An area of about 3 per cent area is slightly acid (pH 6.0-6.5) in soil reaction, 8 per cent area is neutral (pH 6.5-7.3) and 63 per cent soils is slightly to moderately alkaline (pH 7.3-8.4)*
- *The Electrical Conductivity (EC) of entire soils of the microwatershed is dominantly <2 dsm^{-1}indicating that the soils are non-saline.*
- *About 29 per cent of the soils are medium (0.5-0.75%) in organic carbon and 46 per cent high (>0.75%).*
- *42 per cent area is medium (23-57 kg/ha)in available phosphorus and 33 per cent area is high (> 57 kg/ha).*
- *About 63 per cent is medium (145-337 kg/ha) in available potassium and 12 per cent is high (>337 kg/ha).*
- *Available sulphur is medium (10-20 ppm) in the entire area of the microwatershed*
- *Available boron is medium (0.5-1.0 ppm) in the entire area of the microwatershed*
- *Available iron is sufficient (>4.5 ppm) in the entire area of the microwatershed.*
- *Available manganese and copper are sufficient in all the soils of the microwatershed.*
- *Available zinc is deficient (<0.6 ppm) in 67 per cent and sufficient (>0.6 ppm) in 8 per cent area of the microwatershed.*
- *The land suitability for 29 major crops grown in the microwatershed were assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the Microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*106 (20)*	-		*Guava*	-	-
Maize	-	*106 (20)*		*Sapota*	-	-
Bajra	-	*106 (20)*		*Pomegranate*	-	*106 (20)*
Groundnut	-	-		*Musambi*	*106 (20)*	-
Sunflower	*106 (20)*	-		*Lime*	*106 (20)*	-
Redgram	-	*105 (20)*		*Amla*	*19 (3)*	*87 (16)*
Bengal gram	*106 (20)*	-		*Cashew*	-	-
Cotton	*106 (20)*	-		*Jackfruit*	-	-
Chilli	-	*105 (20)*		*Jamun*	-	*106 (20)*
Tomato	-	*87 (16)*		*Custard apple*	*106 (20)*	-
Brinjal	*87 (16)*	*19 (3)*		*Tamarind*	-	-
Onion	60 (11)	-		*Mulberry*	-	-
Bhendi	87 (16)	*19 (3)*		*Marigold*	-	*105 (20)*
Drumstick	-	*105 (20)*		*Chrysanthemum*	-	*105 (20)*
Mango	-	*87 (16)*				

- *Apart from the individual crop suitability, a proposed crop plan has been prepared for the identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and other horticulture crops.*
- *Maintaining soil-health is vital for crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested for these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation treatment plan has been prepared that would help in identifying the sites to be treated and also the type of structures required.*
- *As part of the greening programme, several tree species have been suggested to be planted in marginal and submarginal lands, field bunds and also in the hillocks, mounds and ridges. This would help in not only supplementing the farm income but also provide fodder and fuel and generate lot of biomass which would help in maintaining an ecological balance and also contribute to mitigating the climate change.*

Chapter 1

INTRODUCTION

Soil being a vital natural resource on whose proper use depends the life supporting systems of a country and the socioeconomic development of its people. Soils provide food, fodder, fibre and fuel for meeting the basic human and animal needs. With the ever increasing growth in human and animal population, the demand on soil for more food and fodder production is on the increase. The area available for agriculture is about 51 per cent of the total geographical area and more than 60 per cent of the people are still dependant on agriculture for their livelihood. However, the capacity of a soil to produce is limited and the limits to the production are set by its intrinsic characteristics, agro-climatic setting, and, use and management. There is, therefore, tremendous pressure on land and water resources, which is causing decline in soil-health and stagnation in productivity. The soils have been degrading at an estimated rate of one million hectares per year and ground water levels have been receding at an alarming rate resulting in decline in the ground water resource. 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 situation 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. Added to this, every year there is a significant diversion of farm lands and water resources for non-agricultural purposes. Thus, developing strategies to slow down the degradation process or reclaim the soils to normal condition and ensure sustainability of production system are the major issues today. This demands a systematic appraisal of our soil and land resources with respect to their extent, geographic distribution, characteristics, behaviour and use potential, which is very important for developing an effective land use and cropping systems for augmenting agricultural production on a sustainable basis.

The soil and land resource inventories made so far in Karnataka had limited utility because the surveys were of different types, scales and intensities carried out at different times with specific objectives. Hence, there is an urgent need to generate 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 all the parameters which are critical for productivity *viz.*, soils, site characteristics like slope, erosion, gravelliness and stoniness, climate, water, 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 has already been made to upscale the soil resource information from 1:250000 and 1:50000 scale to the LEU map in Goa and in some other states.

The land resource inventory aims to provide site-specific database for Nazarapur-1microwatershed in Yadgir Taluk and Yadgir 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 Nazarapur-1microwatershed is located in the northern part of Karnataka in Yadgir Taluk & District, Karnataka State (Fig.2.1). It comprises parts of Sutharahosalli, Honagera and Belagera villages. It lies between 16^0 48' and 16^0 50' North latitudes and 77^0 10' and 77^0 12' East longitudes covering an area of about 539 ha. It is about 8 km southeast of Yadgir town and is surrounded by Honagera on the north, south and southwest, Sutharahosalli on the northeast and Belagera village on the southeastern part.

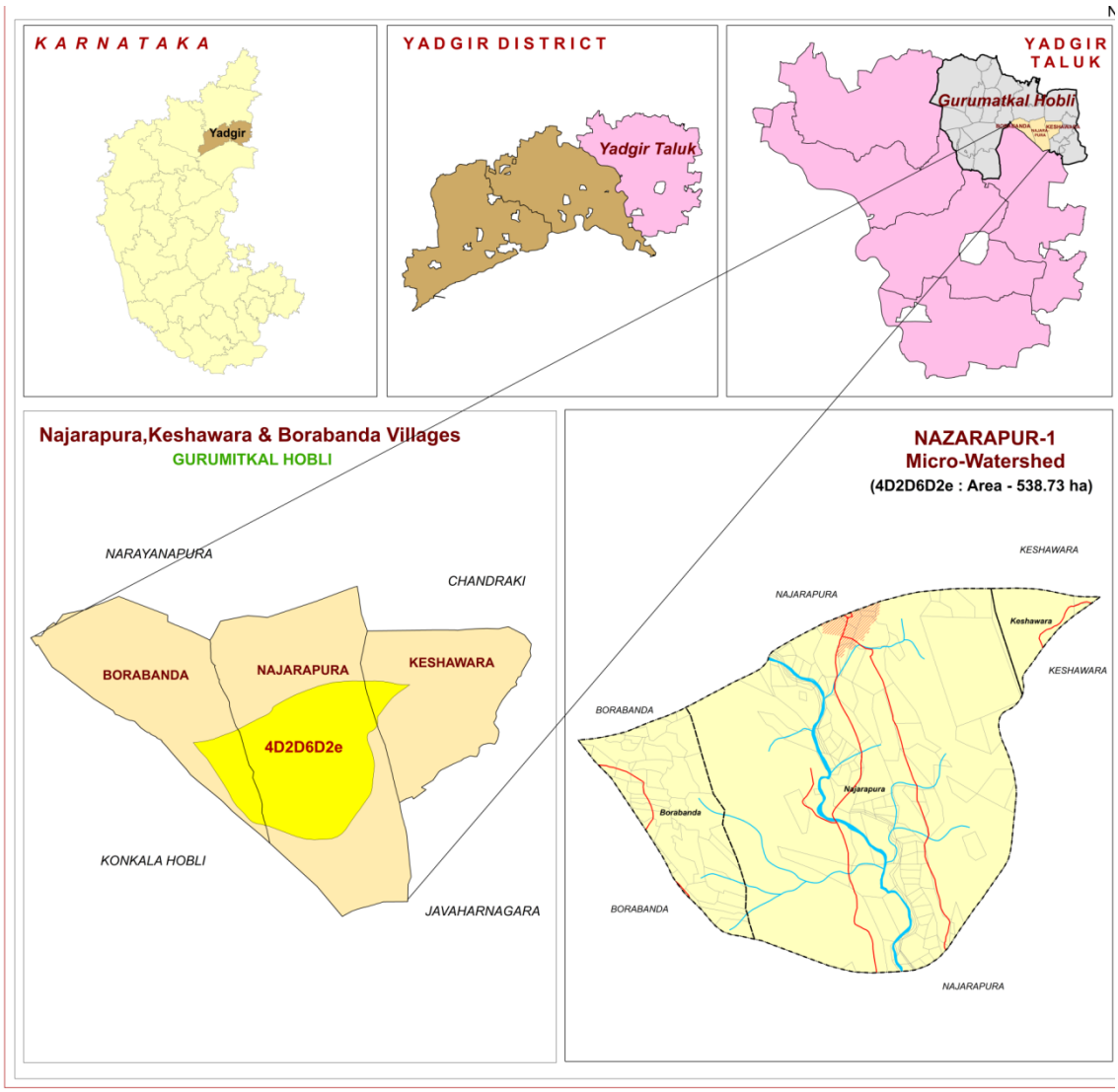


Fig.2.1 Location map of Nazarapur-1Microwatershed

2.2 Geology

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

weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in Nazarapur-1microwatershed.

Fig.2.2a Granite and granite gneiss rocks

Fig. 2.2b Alluvium

2.3 Physiography

Physiographically, the area has been identified as granite gneiss landscape based on geology. The area has been further subdivided into five landforms, *viz;* mounds/ridges, summits, side slopes and very gently sloping uplands, plains and valleys based on slope and its relief features. The elevation ranges from 432-526 m above MSL. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

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

2.5 Climate

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

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

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

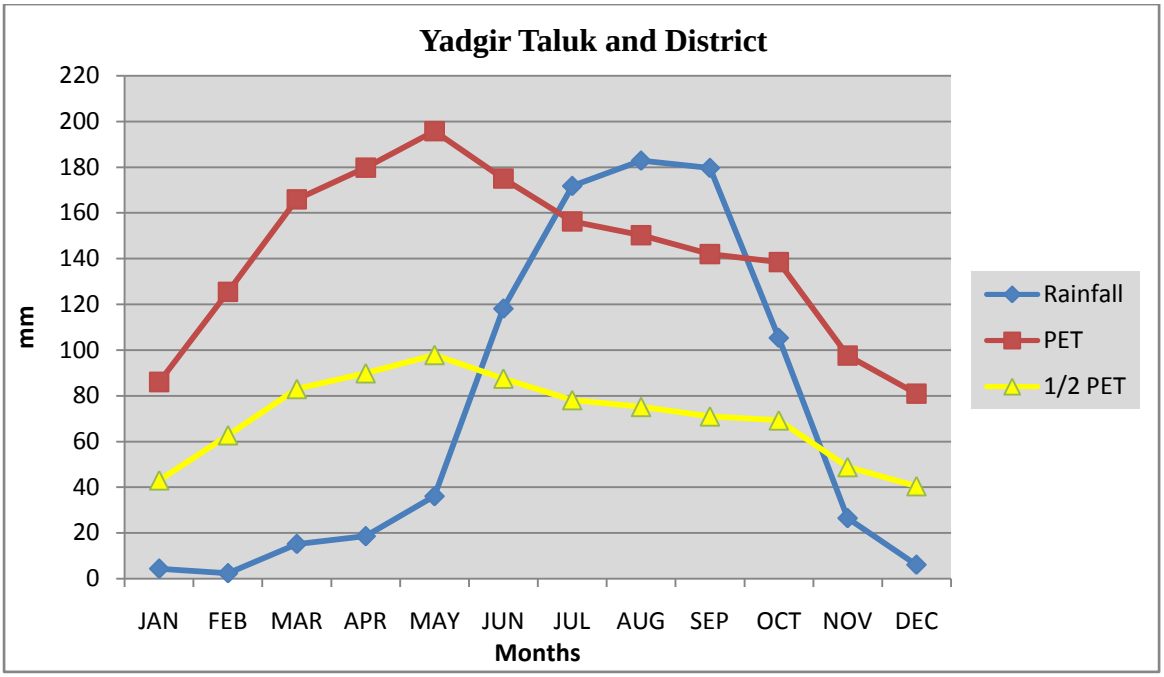


Fig 2.3 Rainfall distribution in Yadgir Taluk, Yadgir District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Nazarapur-1microwatershed

2.7 Land Utilization

About 72 per cent area (Table 2.2) in Yadgir district is cultivated at present. An area of about 2 per cent is permanently under pasture, 20 per cent under current fallows and 6 per cent under non-agricultural land and 5 per cent under currently barren. Forests occupy an area of about 7 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, cotton, sunflower, groundnut, red gram, mango, pomegranate, marigold and sapota. While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Nazarapur-1 microwatershed is presented in Fig.2.5. The different crops and cropping systems adopted in the microwatershed is presented in Figures 2.6a & b.

Table 2.2 Land Utilization in Yadgir District

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

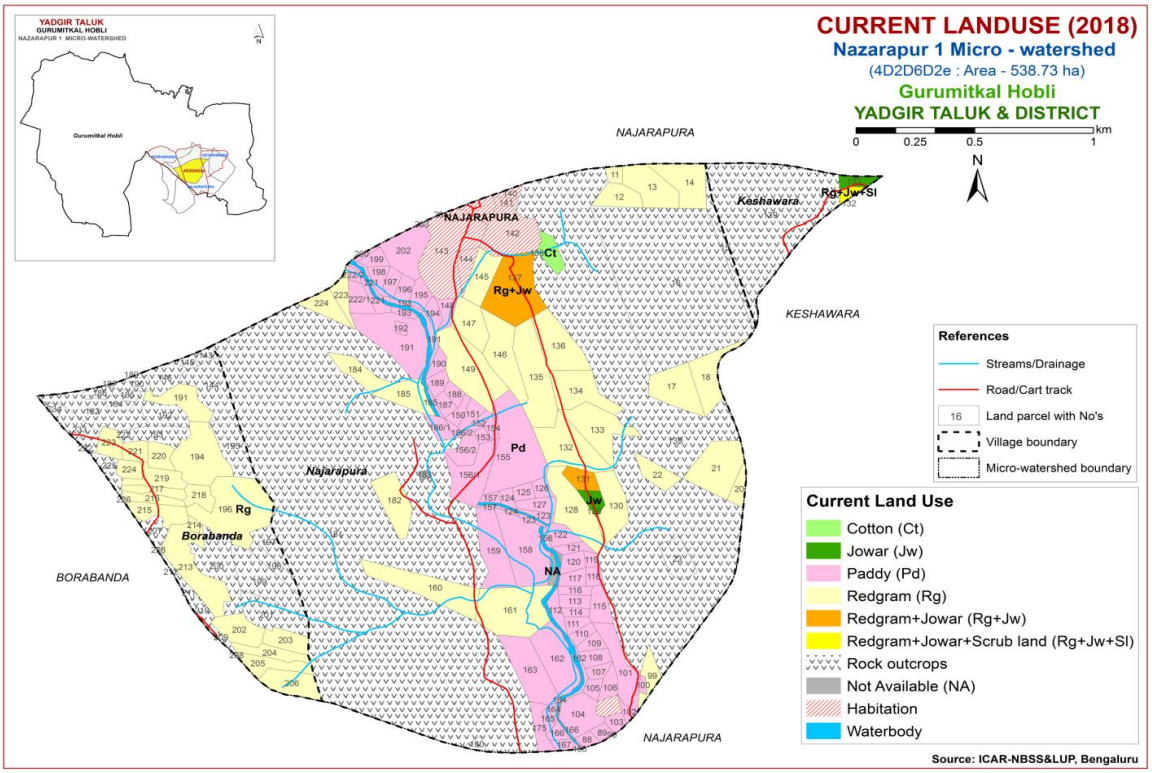


Fig.2.5 Current Land Use map of Nazarapur-1 microwatershed

Fig. 2.6 a. Different Crops and Cropping Systems in Nazarapur-1 microwatershed

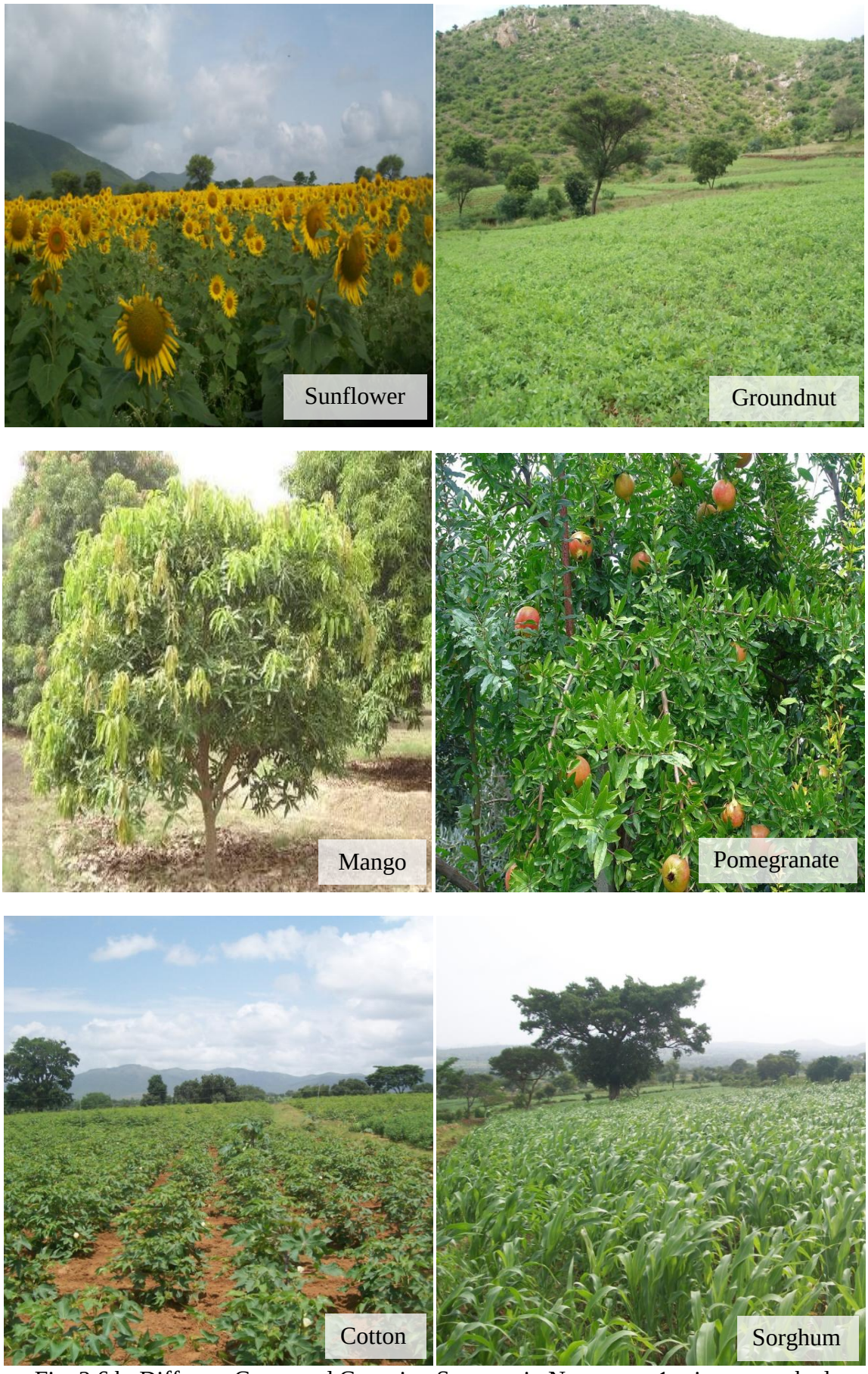


Fig. 2.6 b. Different Crops and Cropping Systems in Nazarapur-1 microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly for a given level of management. This was achieved in Nazarapur-1microwatershed by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site characteristics (slope of the land, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units, and showing the area extent and their geographic distribution on the microwatershed cadastral map. The detailed survey at 1:7920 scale was carried out in an area of 539 ha. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

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

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

Image Interpretation Legend for Physiography

G- Granite Gneiss Landscape

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

DSe – Alluvial landscape

DSe1 – Summit

DSe11 –

DSe12 –

DSe2 – Very genetly sloping

DSe21 – Very gently sloping, dark gray tone

DSe22 – Very gently sloping, medium gray tone

DSe23 – Very gently sloping, yellowish grey tone

DSe24 – Very gently sloping, whitish grey tone

DSe25 – Very gently sloping, whitish/ eroded/ calcareous tone

DSe 26 –Very gently sloping, medium pink

DSe3 – Valley/ Lowland

DSe31 – Whitish gray/Calcareous

DSe32 – Gray with pink patches

DSe 33 – Medium gray tone

DSe 34 – Lightishgray tone

DSe 35 – Dark gray tone

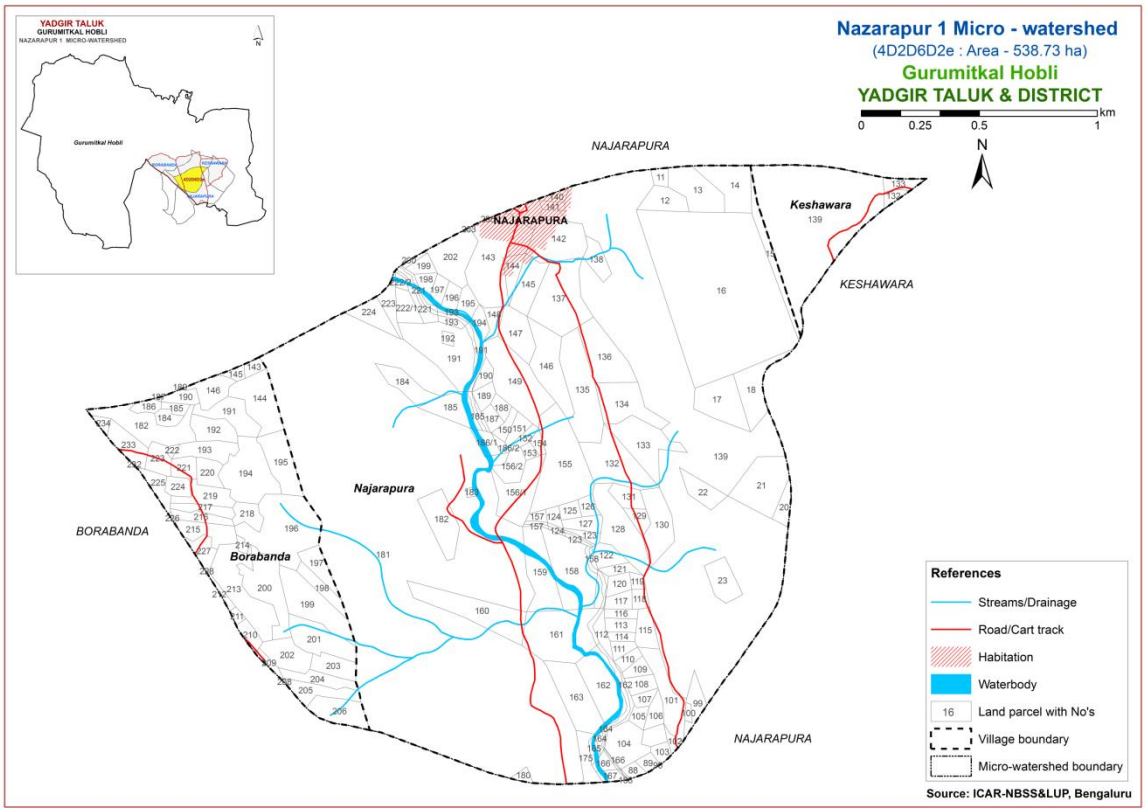


Fig 3.1 Scanned and Digitized Cadastral map of Nazarapur-1 microwatershed

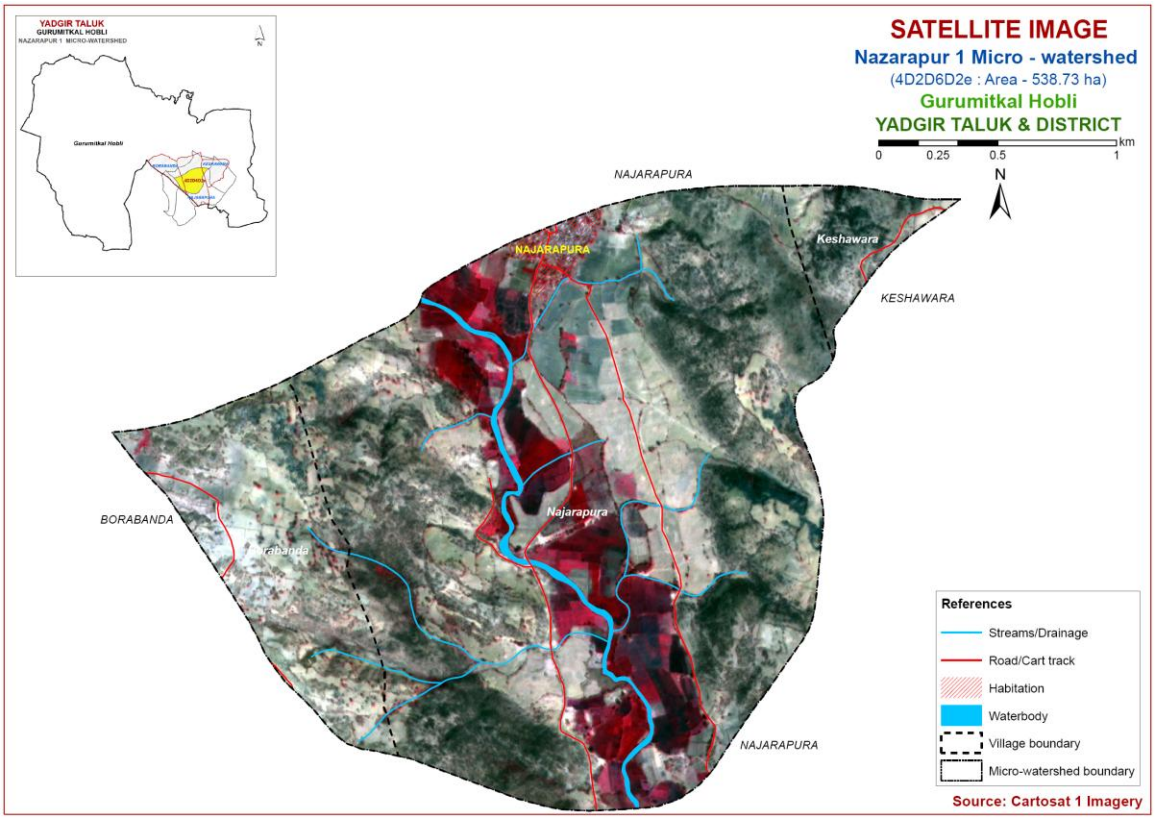


Fig.3.2 Satellite Image of Nazarapur-1Microwatershed

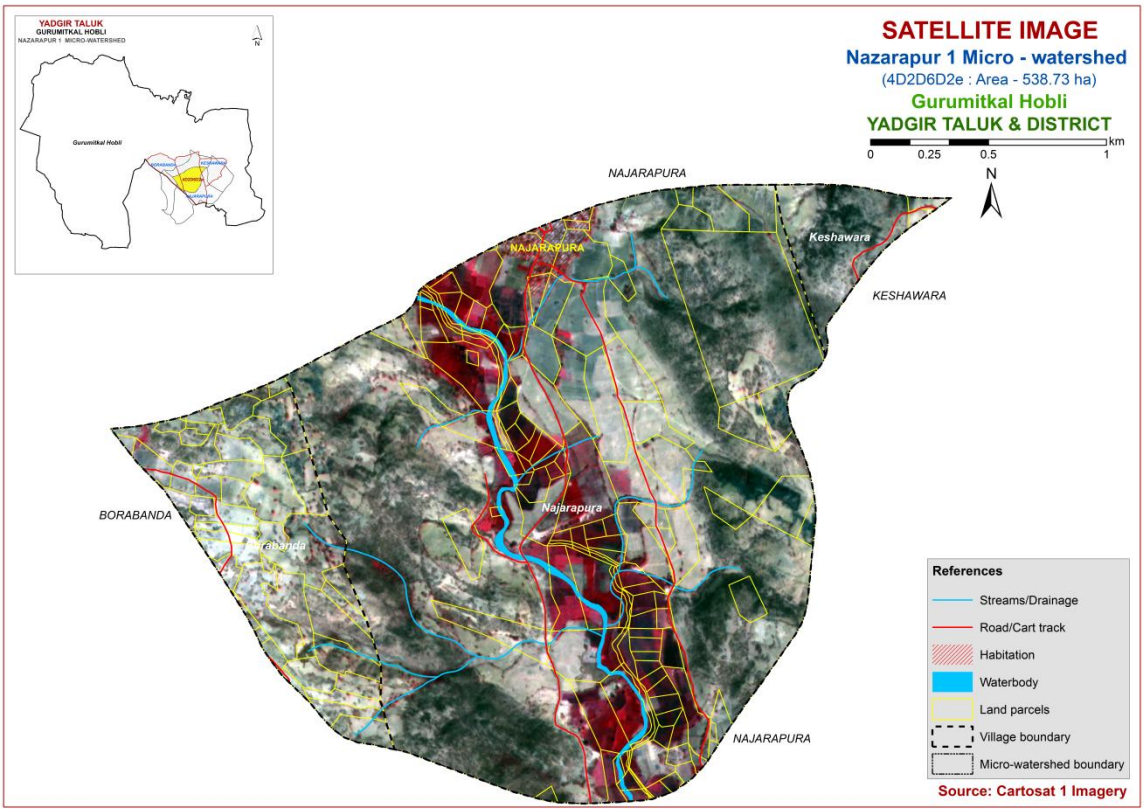


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Nazarapur-1Microwatershed

3.3 Field Investigation

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

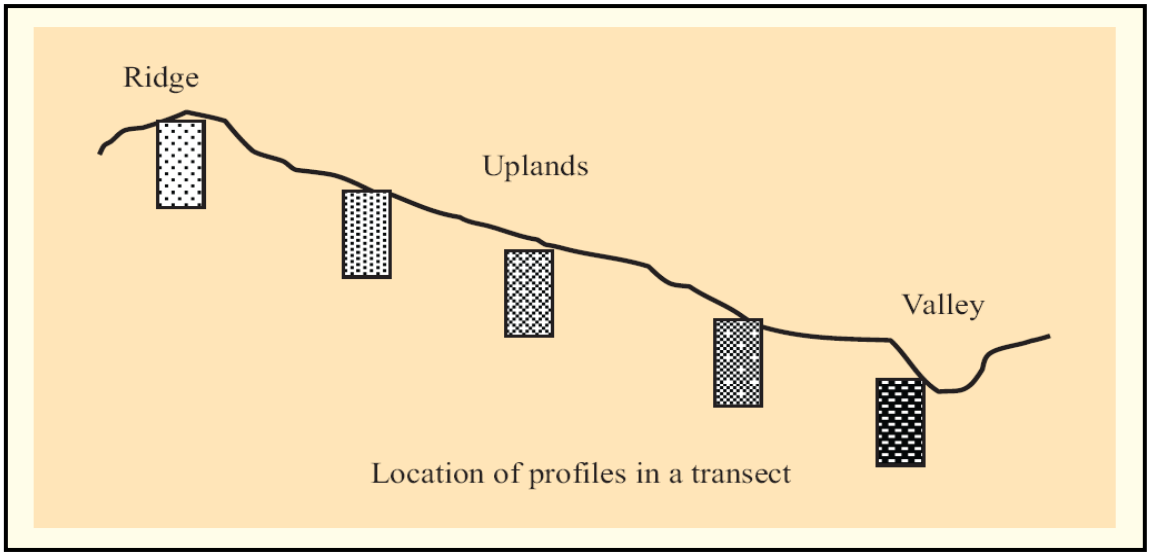


Fig: 3.4. Location of profiles in a transect

In the selected transect, soil profiles were located (Fig. 3.4) at closely spaced intervals to take care of any change in the land features like break in slope, erosion, gravel, stones etc. In the selected sites, 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.

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, calcareousness, amount and nature of gravel present, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 5 soil series were identified in the Nazarapur-1microwatershed.

Table 3.1 Differentiating Characteristics used for identifying Soil Series

(Characteristics are of Series Control Section)

Soils of Granite gneiss Landscape							
Sl. no	**Soil Series**	**Depth (cm)**	**Colour (moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcareous-ness**
1	KKR (Kakalwar)	<25	7.5 YR 4/3, 10 YR 6/3	sl	10-25	Ap-Ac	-
2	HTK (Hattikuni)	25-50	10YR4/6,4/4 7.5YR34/4,3/3	sl	10-25	Ap-Ac	-
3	MDG (Mundargi)	100-150	10YR 4/4,3/3 7.5YR 4/4	scl	-	Ap-Bw	-
4	YDR (Yadgir)	100-150	10YR4/3,4/4 2.5Y4/3,5/3	lsl	-	Ap-Ac	es
Soils of Alluvial Landscape							
5	HGN (Hegganakera)	>150	10YR4/2,4/1,3/1	c	-	Ap-Bss	e

3.4 Soil Mapping

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

3.5 Land Management Units (LMU's)

The 9 soil phases identified and mapped in the microwatershed were grouped into 4 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been chosen for identification and delineation of LMUs. For Nazarapur-1microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope, erosion and gravel content have been considered for defining LMUs. The

Land Management Units are expected to behave similarly for a given level of management.

3.6 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 from farmer's fields (53 samples) for fertility status (major and micronutrients) at 320 m grid interval in the year 2018 were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated by using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Nazarapur-1Microwatershed

*Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite Gneiss Landscape				
	KKR	Kakalawar soils are very shallow (<25 cm), well drained, have dark brown sandy loam soils occurring on very gently sloping uplands under cultivation		30 (5.51)
153		KKRbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	30 (5.51)
	HTK	Hattikuni soils are shallow (25-50 cm), well drained, have dark yellowish brown sandy loam soils occurring on very gently sloping uplands under cultivation		**210 (38.99)**
161		HTKbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	22 (4.17)
113		HTKcC2g1	Sandy loam surface, slope 3-5%, moderate erosion, gravelly (15-35%)	188 (34.82)
	MDG	Mundargi soils are deep (100-150 cm), well drained, have brown to dark yellowish brown, sandy clay loam soils occurring on very gently sloping uplands under cultivation		**87 (16.18)**
169		MDGcA1	Sandy loam surface, slope 0-1%, slight erosion	38 (7.04)
57		MDGcB2	Sandy loam surface, slope 1-3%, moderate erosion	27 (5.1)
171		MDGhA1	Sandy clay loam surface, slope 0-1%, slight erosion	22 (4.04)
	YDR	Yadgir soils are deep (100-150 cm), well drained, have brown to dark yellowish brown and olive brown, calcareous, cracking clay soils occurring on very gently sloping uplands under cultivation		**58 (10.77)**
42		YDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	1 (0.17)
43		YDRiB2	Sandy clay surface, slope 1-3%,	57 (10.6)

*Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
			moderate erosion	
Soils of Alluvial Landscape				
	HGN	Hegganakera soils are very deep (>150 cm), moderately well drained, have very dark gray to dark grayish brown, slightly calcareous cracking clay soils occurring on very gently sloping plains under cultivation		**19 (3.44)**
95		HGNmB2	Clay surface, slope 1-3%, moderate erosion	19 (3.44)
999	**Rock outcrops**	Rock lands, both massive and boulder with little or no soil		**123 (22.8)**
1000	**Others**	Habitation and Water body		**12 (2.3)**

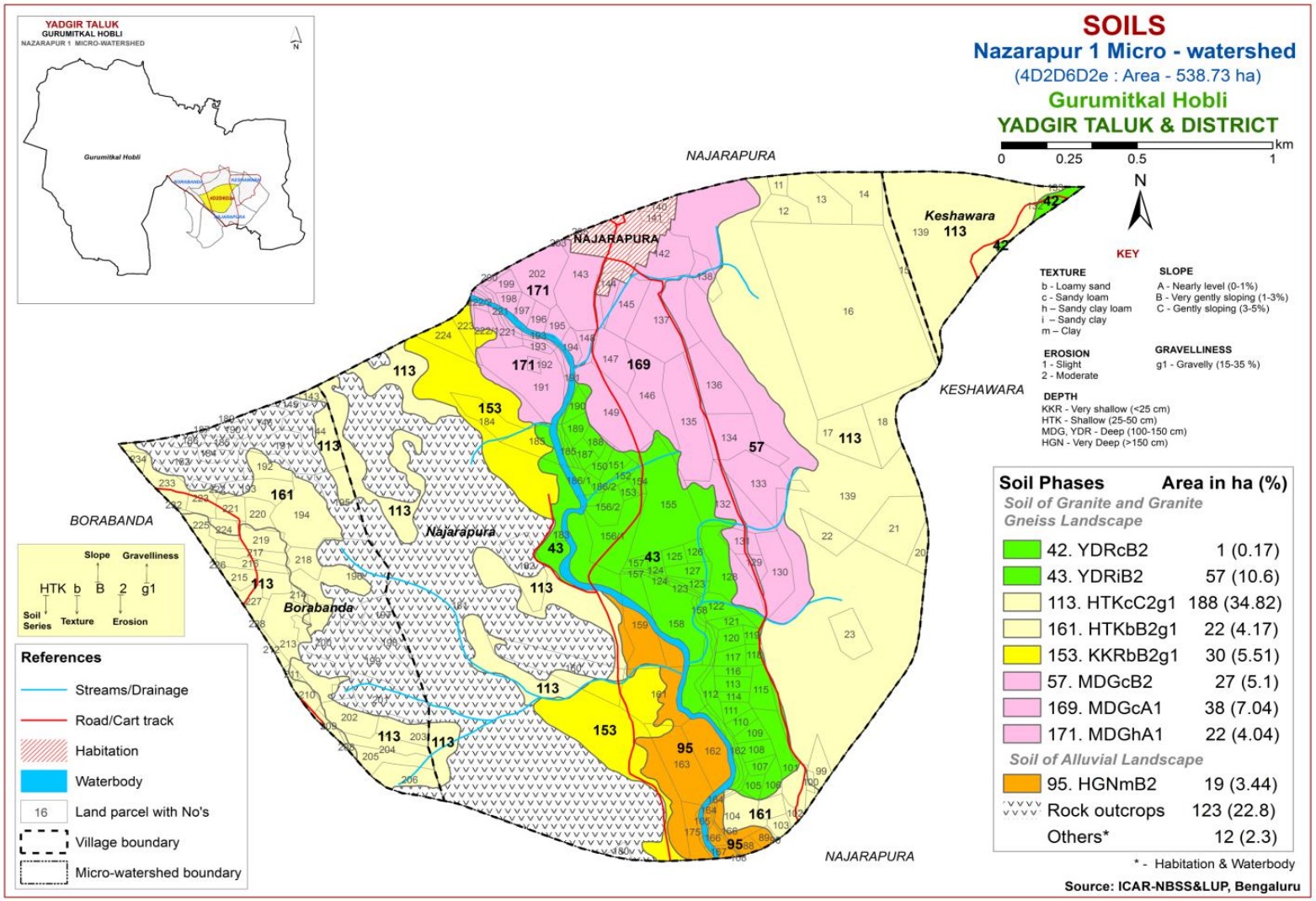


Fig 3.5 Soil Phase or Management Units - Nazarapur-1Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and their distribution of different kinds of soils occurring in Nazarapur-1microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss 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. In the granite gneiss landscape, it is by parent material, relief and climate.

A brief description of each of the 5 soil series identified followed by 9 soil phases (management units) mapped are furnished below. The physical and chemical characteristics of soil series identified in Nazarapur-1microwatershed are given in Table 4.1 along with soil classification. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of granite gneiss landscape

In this landscape, 4 soil series are identified and mapped. Of these, HTK series occupies a maximum area of 210 ha (39%) followed by MDG 87 ha (16%), YDR 58 ha (11%) and KKR 30 ha (6%). Brief description of each series identified and number of soil phases mapped is given below.

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

The thickness of the soil is less than 25 cm. Its colour is in 10 YR and 7.5 YR hue with value 4 to 6 and chroma 3 to 4. The texture varies from loamy sand to sand. The available water capacity is very low (<50 mm/m). Two phases were identified and mapped. Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Kakalawar (KKR) Series

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

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

Landscape and Soil Profile characteristics of Hattikuni (HTK) Series

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

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

Landscape and Soil Profile characteristics of Mundargi (MDG) Series

4.1.4 Yadgir (YDR) Series: Yadgir soils are deep (100-150 cm), well drained, have very dark yellowish brown to light olive brown, sodic sandy loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Yadgir series has been classified as a member of the coarse-loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the soil ranges from 105 to 145 cm. The thickness of A horizon ranges from 6 to 10 cm. Its colour is in 10 YR hue with value 4 and chroma 3. The texture is loamy sand. The thickness of subsurface horizons range from 95 to 130 cm. Its colour is in 10 YR and 2.5 Y hue with value 4 to 5 and chroma 3 to 4. Texture is loamy sand to sandy loam and sandy clay loam and are sodic soils. The available water capacity is low (51-100 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Yadgir (YDR) Series

4.2 Soils of Alluvial landscape

In this landscape, only one soil series is identified and mapped. HGN series occupies an area of 19 ha (3%). Brief description of this series identified and soil phases mapped is given below.

4.2.1 Hegganakera (HGN) Series: Hegganakera soils are very deep (>150 cm), moderately well drained, have very dark gray to dark grayish brown, slightly calcareous cracking clay soils. They have developed from alluvium and occur on very gently sloping plains under cultivation. The Hegganakera series has been classified as a member of the very fine, smectic, isohypermetric family of Typic Haplusterts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 7 to 9 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 3 with clay texture. The thickness of B horizon ranges from 152 to 175 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 3. Its texture is clay. The available water capacity is very high (>200 mm/m).Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Hegganakera (HGN) Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Nazarapur-1microwatershed

Soil Series: Kakalawar (KKR), Pedon**:** R-7

Location: $16^0$50'25.9"N $77^0$15'97.1"E, Yampada village, Gurumitkal hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-22	Ap	83.81	10.37	5.82	17.31	20.65	17.91	5.67	22.27	10-20	ls	9.77	4.65

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}							%	%
0-22	5.85	-	-	0.027	0.19	-	0.72	0.21	0.62	0.03	1.58	2.6	0.45	60.90	1.17

Contd...

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

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

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-12	Ap	90.89	5.62	3.49	8.50	13.46	29.86	29.55	9.51	20	s	7.73	3.16
12-22	A1	89.97	6.53	3.50	7.19	13.48	29.48	29.79	10.03	20	s	8.00	3.05
22-45	A2	87.20	6.43	6.38	11.09	14.42	31.55	7.16	22.98	40	ls	7.67	3.96

Contd…

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-12	6.81	-	-	0.062	0.07	-	2.35	0.50	0.16	0.01	3.02	3.0	0.86	100	0.38
12-22	6.80	-	-	0.050	0.21	-	1.67	0.30	0.09	0.01	2.07	2.4	0.69	86.30	0.45
22-45	6.85	-	-	0.044	0.19	-	1.82	0.42	0.10	0.06	2.40	2.6	0.41	92.41	2.17

Contd...

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

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

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

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-9	8.2	-	-	0.399	0.44	0.78	-	-	0.16	0.38	-	4.90	0.84	100	3.08
9-20	8.44	-	-	0.075	0.29	1.82	-	-	0.05	0.35	-	4.90	0.70	100	2.88
20-46	9.39	-	-	0.451	0.32	2.73	-	-	0.12	5.22	-	20.77	0.52	100	10.06
46-90	9.75	-	-	0.616	0.24	3.25	-	-	0.12	5.72	-	16.56	0.57	100	13.82
90-110	9.72	-	-	0.725	0.24	3.64	-	-	0.14	6.84	-	19.76	0.56	100	13.836

Contd…

Soil Series: Yadgir **(**YDR) **Pedon:** R-5

Location: $16^0$35'43.6"N $77^0$17'06.4"E, Kanikal village, Balichakra hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-14	Ap	80.41	3.75	15.84	8.06	13.47	36.73	15.71	6.43	-	sl	22.84	10.18
14-43	A2	86.59	8.77	4.64	23.19	26.92	14.11	15.22	7.16	-	ls	6.97	2.68
43-89	Bw1	73.39	11.31	15.30	6.76	20.27	24.87	15.66	5.83	-	sl	12.14	7.22
89-110	Bw2	63.55	5.40	31.05	8.10	23.05	19.00	9.87	3.53	15-35	scl	38.46	17.70

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}							%	%
0-14	9.47	-	-	0.371	0.32	1.30	14.71	4.28	0.38	1.54	20.91	12.70	0.83	165	4.86
14-43	7.25	-	-	0.114	0.56	0.00	2.29	0.86	0.07	0.03	3.25	3.40	0.73	96	0.31
43-89	10.30	-	-	0.820	0.16	0.52	1.70	0.98	0.15	6.62	9.45	8.61	0.54	110	30.77
89-110	10.80	-	-	1.440	0.12	0.91	1.02	2.00	0.29	14.43	17.74	16.17	0.52	110	35.688

Contd…

Soil Series: Hegganakera (HGN) **Pedon:** R-12

Location: $16^0$46'19.9"N $77^0$04'34.0"E, Thumakura village, Yadgirhobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **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
0-8	Ap	20.20	25.22	54.58	2.32	2.76	3.53	8.17	3.42	-	c	42.47	25.59
8-24	BA	21.18	21.70	57.12	2.07	3.28	4.69	7.31	3.82	-	c	41.88	24.67
24-50	Bss1	18.76	21.67	59.57	1.20	2.51	3.93	7.09	4.03	-	c	40.46	23.34
50-86	Bss2	16.74	22.24	61.02	0.88	1.53	4.27	6.02	4.05	-	c	42.18	24.76
86-146	Bss3	18.64	20.20	61.16	2.30	2.41	3.73	6.36	3.84	-	c	40.03	28.61
146-170	Bss4	16.08	19.33	64.59	0.88	2.75	3.41	5.95	3.08	-	c	40.28	29.90

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}							%	%
0-8	8.77	-	-	1.33	1.16	8.19	-	-	1.10	5.21	-	36.23	0.66	100	14.38
8-24	8.93	-	-	1.11	0.64	5.46	-	-	0.87	4.23	-	35.50	0.62	100	11.93
24-50	8.85	-	-	0.984	0.32	3.38	-	-	0.71	3.78	-	36.69	0.62	100	10.30
50-86	8.54	-	-	0.562	0.24	3.38	-	-	0.58	3.07	-	39.16	0.64	100	7.84
86-146	8.45	-	-	0.526	0.24	3.38	-	-	0.62	2.82	-	38.52	0.63	100	7.31
146-170	8.64	-	-	0.517	0.20	4.29	-	-	0.60	2.99	-	36.87	0.57	100	8.12

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 interpretative and thematic maps generated are described below.

5.1 Land Capability Classification

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

Soil Characteristics: Depth, texture, gravelliness, calcareousness.

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

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

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

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

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

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

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

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

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

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

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

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

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

The 9 soil map units identified in Nazarapur-1microwatershed are grouped under 3 land capability class and 4 land capability subclasses. An entire cultivated area of 404 ha (75%) in the microwatershed is suitable for agriculture. About 123 ha (23%) area is having rock outcrops and about 12 ha (2%) is covered by others (water body & habitation) (Fig. 5.1).

Good cultivable lands (Class II) cover an area of about 30 per cent and are distributed in the northern, southern, northeastern and central part of the microwatershed with minor problems of soil and erosion. Moderately good cultivable lands (Class III) cover an area of about 39 per cent and are distributed in the major part of the microwatershed with moderate problems of soil and erosion. Fairly good cultivable lands (Class IV) covers a small area of about 6 per cent and is distributed in the southern, central and northwestern part of the microwatershed with moderate problems of soil and erosion.

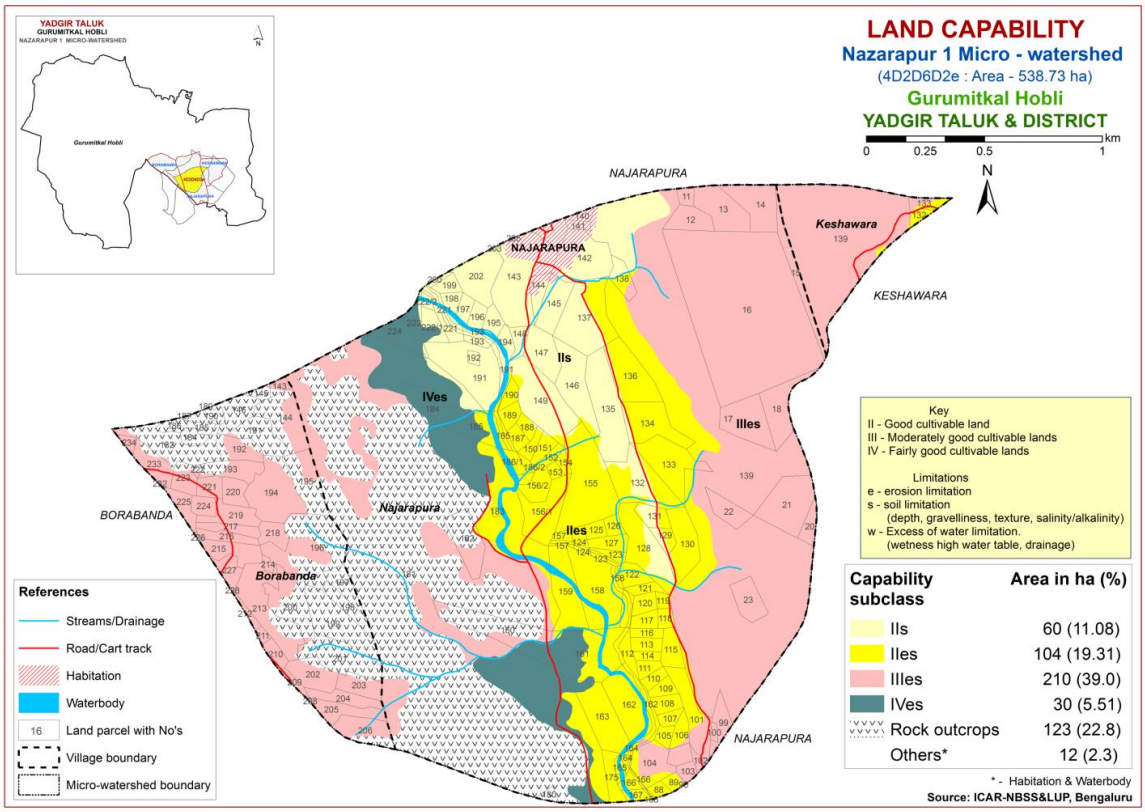


Fig. 5.1 Land Capability map of Nazarapur-1Microwatershed

5.2 Soil Depth

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

Very shallow (<25 cm) soils occupy an area of about 30 ha (6%) and are distributed in the southern, central and northwestern part of the microwatershed. shallow (25-50 cm) soils occupy an area of about 210 ha (39%) and are distributed in the major part of the microwatershed. Deep (100-150 cm) soils occupy an area of 145 ha (27%) and are distributed in the northern, southern and central part of the microwatershed. very deep (>150 cm) soils occupy an area of 19 ha (3%) and are distributed in the southern part of the microwatershed.

The most productive lands 164 ha (31%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep to very deep (100 to >150 cm depth) soils occurring in the eastern, southern, northern and central part

of the microwatershed. The problematic soils cover about 240 ha (45%) area where the soils are shallow and are suitable for short duration crops.

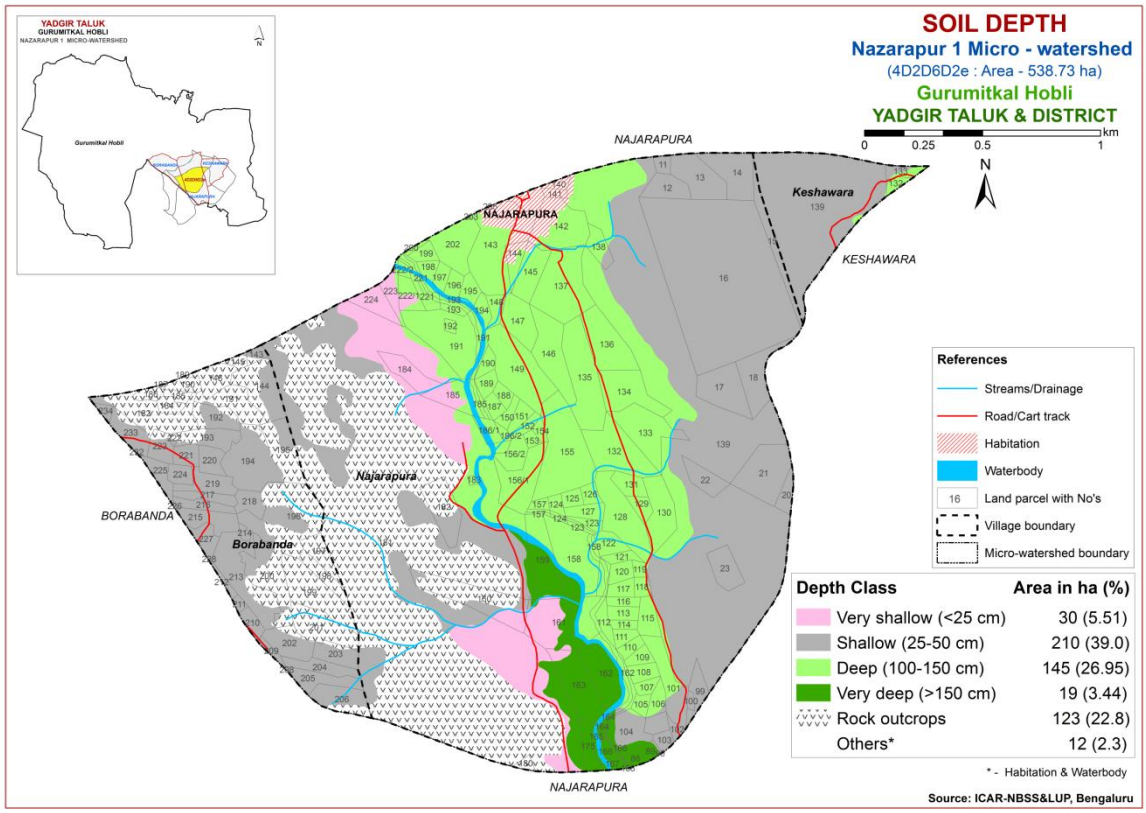


Fig. 5.2 Soil Depth map of Nazarapur-1Microwatershed

5.3 Surface Soil Texture

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

An area of about 52 ha (10%) of the microwatershed has sandy soils at the surface and are distributed in the southern, central and western part of the microwatershed. Maximum area of 276 ha (51%) has soils that are loamy and are distributed in the major part of the microwatershed. An area of 76 ha (14%) has soils that are clayey and occur in the central and southern part of the microwatershed. Clayey and loamy soils have high potential for soil-water retention and availability, and nutrient retention and availability, but clay soils have more problems of drainage, infiltration, workability and other physical

problems. The sandy soils are productive for root and tuber crops, but these soils have the major limitations of moisture and nutrient retention capacity, hence frequent and shallow irrigation with balanced fertilizer application is to be followed in order to get better crop yields.

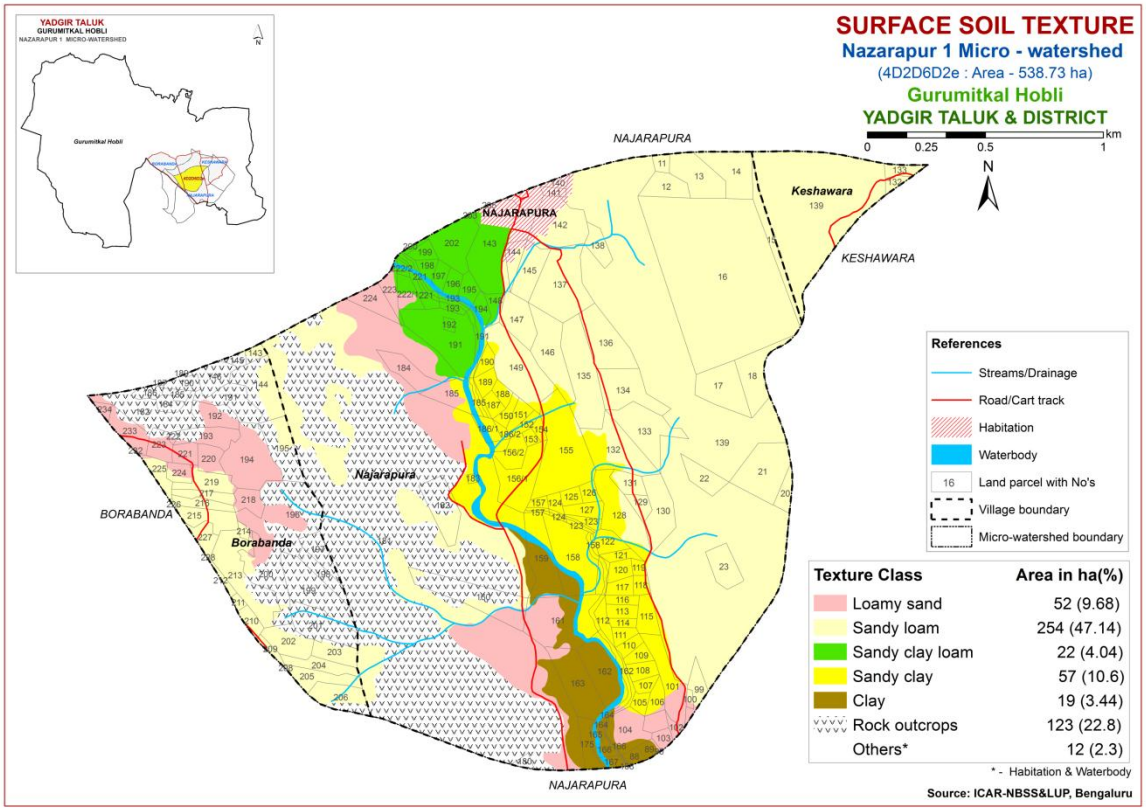


Fig. 5.3 Surface Soil Texture map of Nazarapur-1Microwatershed

5.4 Soil Gravelliness

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

Non gravelly (<15%) soils cover an area of 164 ha (30%) and are distributed in the central, southern and northern part of the microwatershed. Maximum area of about 240 ha (45%) is gravelly (15-35%) and are distributed in the major part of the microwatershed.

The problem soils (45%) that are gravelly (15-35%), where only short or medium duration crops can be grown. The most productive soils (30%) that are non gravelly (<15%), where all climatically adapted long duration crops can be grown.

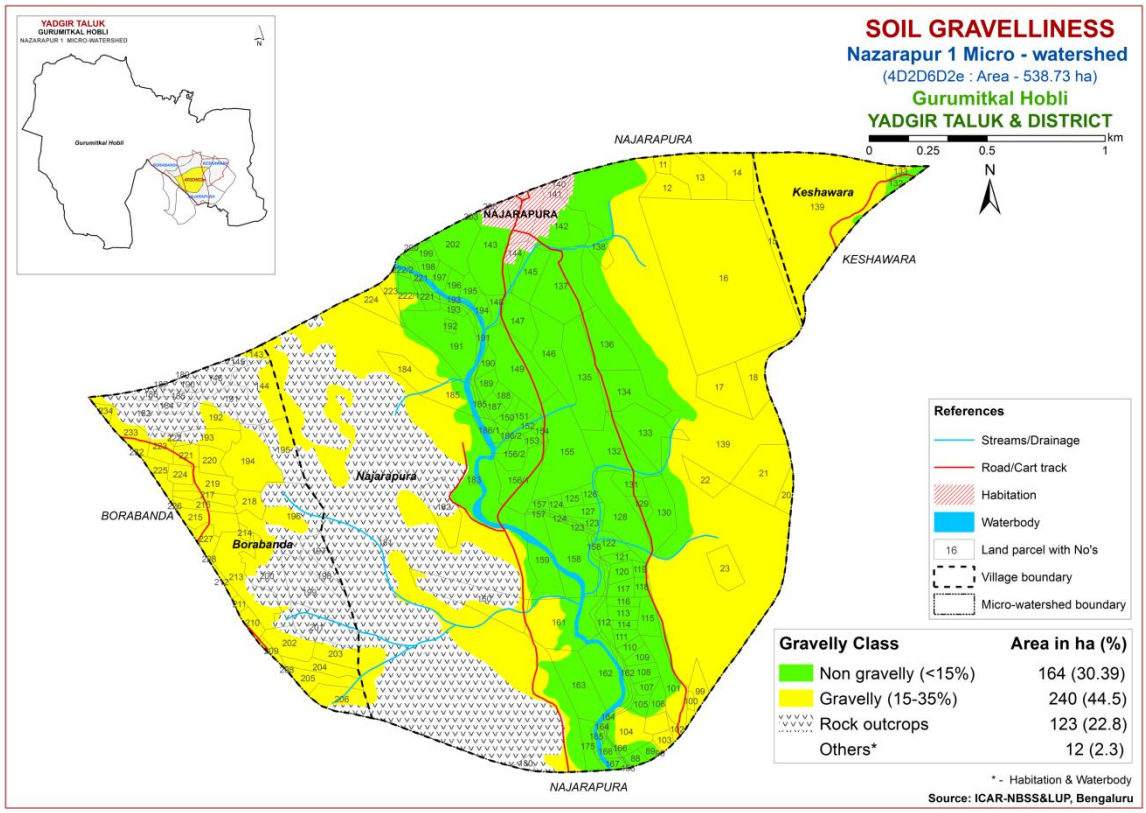


Fig. 5.4 Soil Gravelliness map of Nazarapur-1Microwatershed

5.5 Available Water Capacity

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

Maximum area of about 240 ha (45%) in the microwatershed has soils that are very low (<51 mm/m) in available water capacity and is distributed in the major part of the microwatershed. An area of about 58 ha (11%) in the microwatershed has soils that are low (<51-100 mm/m) in available water capacity and is distributed in the central and southern part of the microwatershed. Very high (>200 mm/m) in 106 ha (20%) and are distributed in the northern, central and southern part of the microwatershed.

An area of about 298 ha (56%) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and probability of the crop failure is very high. These areas are best put to other alternative uses. An area of 106 ha (20%) are potential areas with regard to AWC where all climatically adapted annual and perennial crops can be grown.

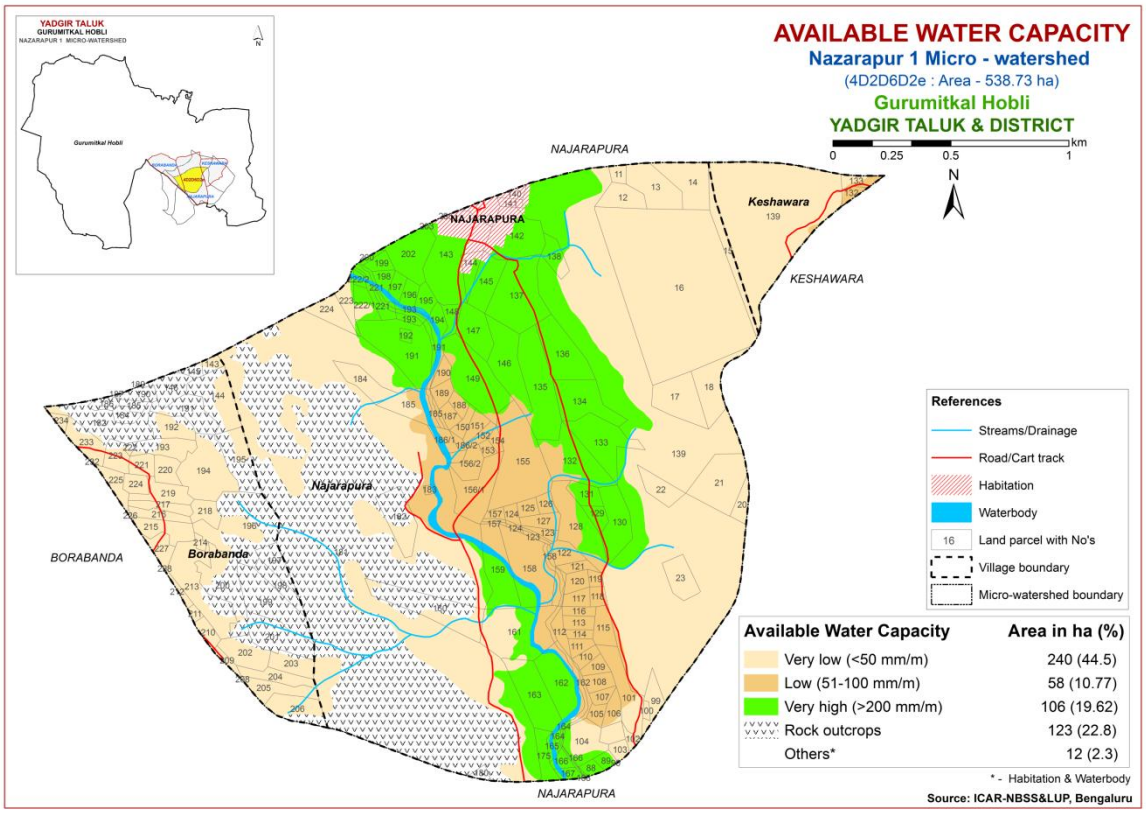


Fig. 5.5 Soil Available Water Capacity map of Nazarapur-1Microwatershed

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

An area of about 60 ha (11%) of the microwatershed falls under nearly level (0-1% slope), 156 ha (29%) under very gently sloping (1-3% slope) and 188 ha (35%) gently sloping (3-5% slope). An area of 188 ha is problematic with respect to slopes that require soil and water conservation and other land development measures. The other soils are potential that do not require conservation measures.

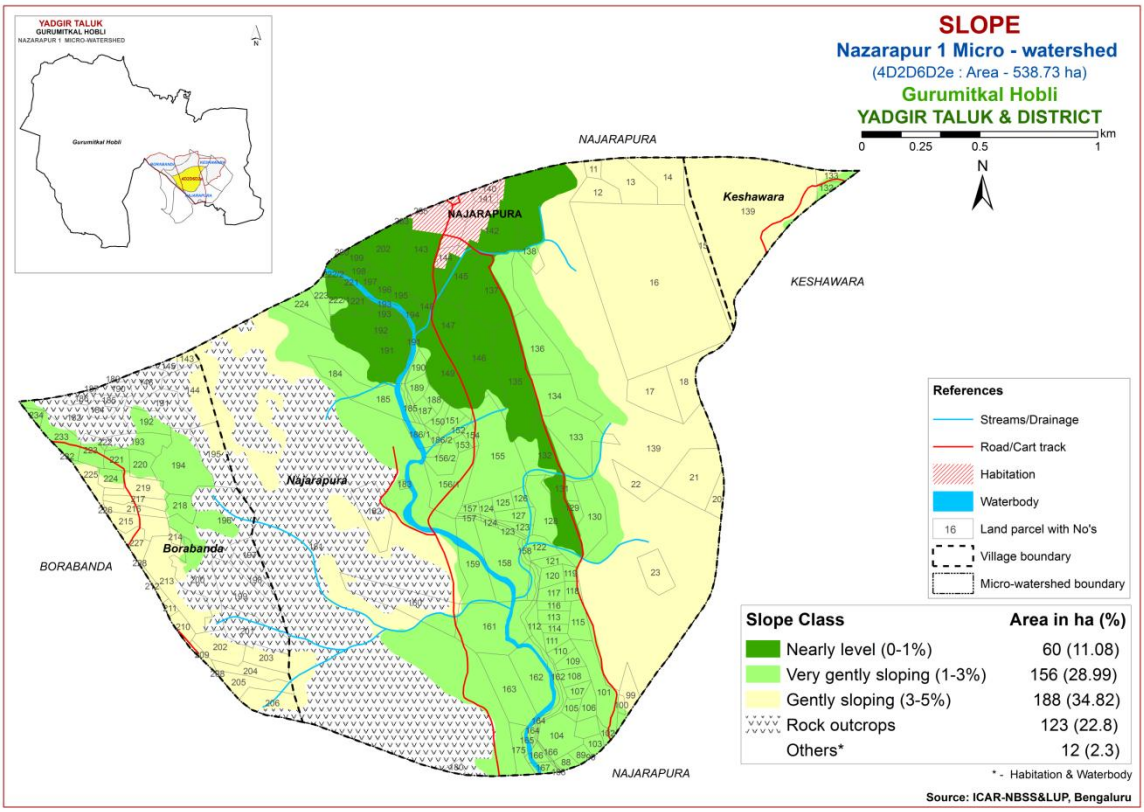


Fig. 5.6 Soil Slope map of Nazarapur-1Microwatershed

5.7 Soil Erosion

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

Soils that are slightly eroded (e1 class) cover an area of 60 ha (11%) and are distributed in the central and northern part of the microwatershed. Moderately eroded (e2 class) soils cover a maximum area of 344 ha (64%) and are distributed in the major part of the microwatershed.

An area of about 344 ha of the microwatershed is problematic because of moderate erosion. For these areas, taking up of soil and water conservation and other land development measures are needed.

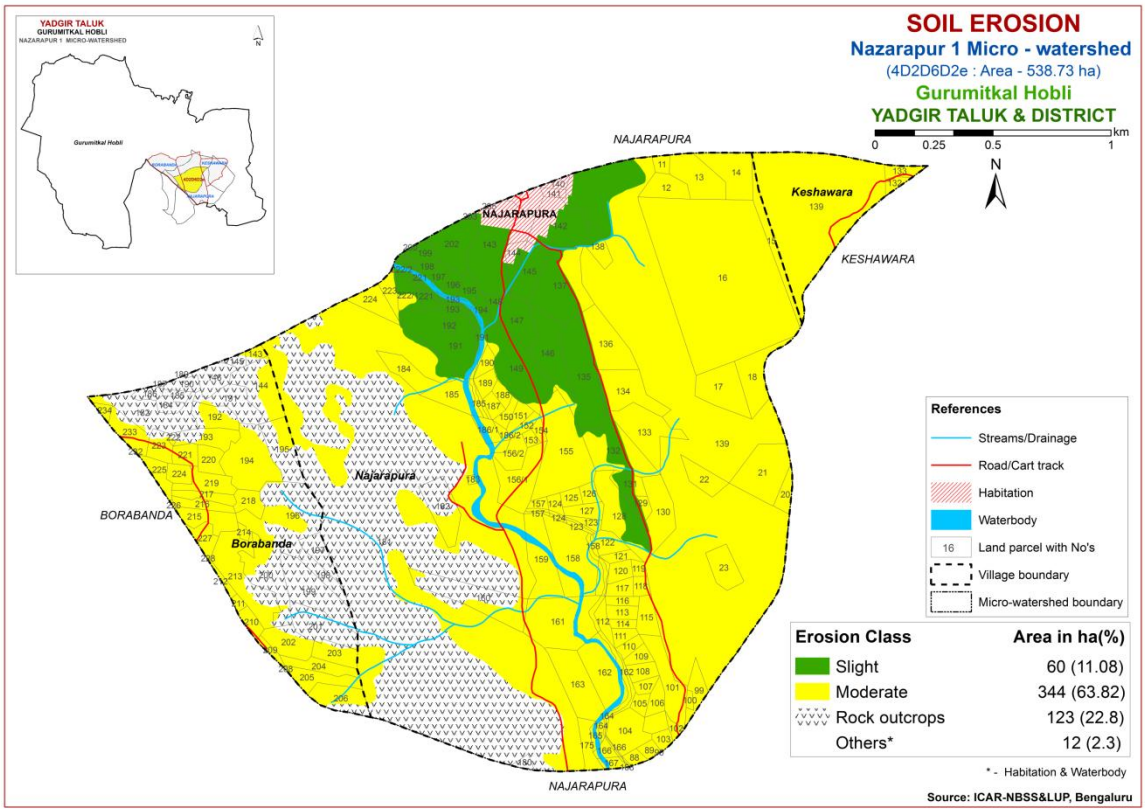


Fig. 5.7 Soil Erosion map of Nazarapur-1Microwatershed

Chapter 6

FERTILITY STATUS

Soil fertility plays an important role in increasing crop yield. The adoption of high yielding varieties that require high amounts of nutrients has resulted in deficiency symptoms in crops and plants due to imbalanced fertilization and poor inherent fertility status as these areas are characterised by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 320 m interval) all over the microwatershed through land resource inventory in the year 2018 were analysed for pH, EC, organic carbon, available phosphorus and potassium, and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

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

6.1 Soil Reaction (pH)

The soil analysis of the Nazarapur-1microwatershed for soil reaction (pH) showed that an area of 18 ha (3%) is slightly acid (pH 6.0-6.5) and is distributed in the southwestern part of the microwatershed. An area of 45 ha (8%) is neutral (pH 6.5-7.3) and are distributed in the northeastern, western and southwestern part of the microwatersh ed. Slightly alkaline (pH 7.3-7.8) occur in a maximum area of about 257 ha (48%) area and are distributed in the major part of the microwatershed. An area of about 83 ha (15%) is moderately alkaline (pH 7.8-8.4) and are distributed in the central and southeastern part of the microwatershed (Fig. 6.1).

6.2 Electrical Conductivity (EC)

The Electrical Conductivity in the entire area of the microwatershed is non saline (<2 dS/m) (Fig. 6.2) and as such the soils are non saline.

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is medium (0.5-0.75%) in about 156 ha (29%) and are distributed in the central, southern and western part of the microwatershed and high (>0.75%) in an area of about 247 ha (46%) and are distributed in the major part of the microwatershed (Fig. 6.3).

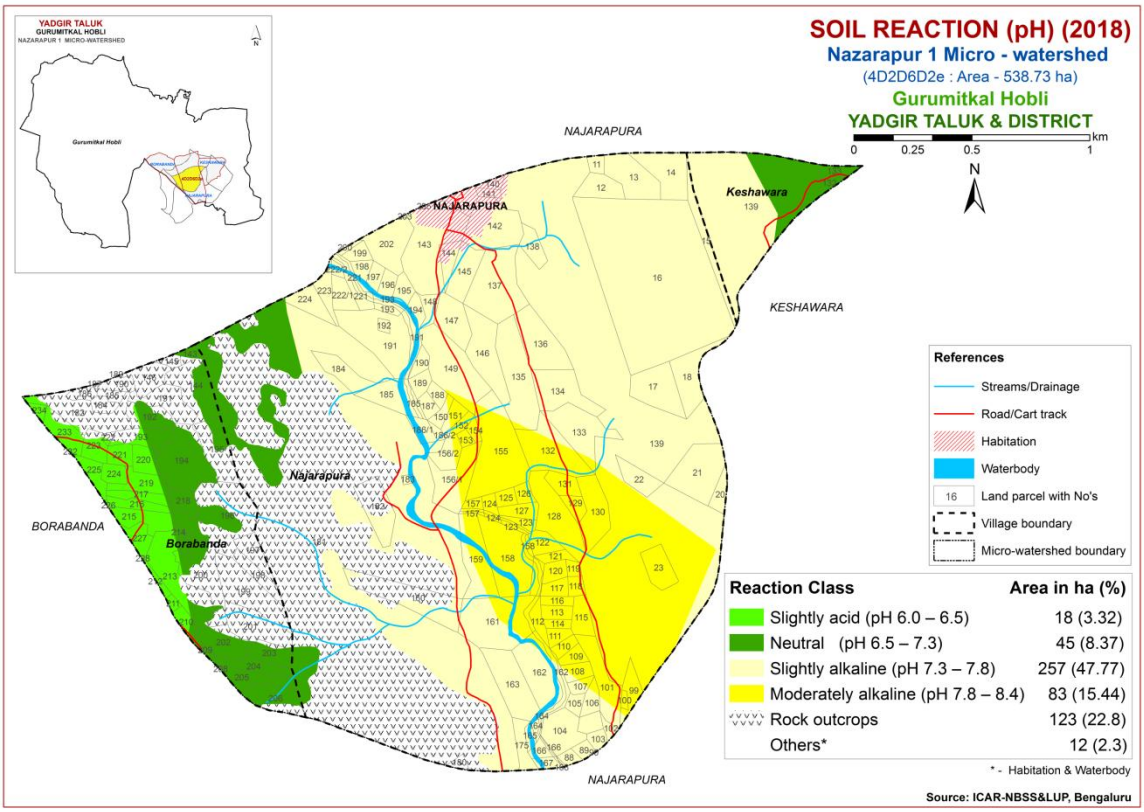


Fig.6.1 Soil Reaction (pH) map of Nazarapur-1Microwatershed

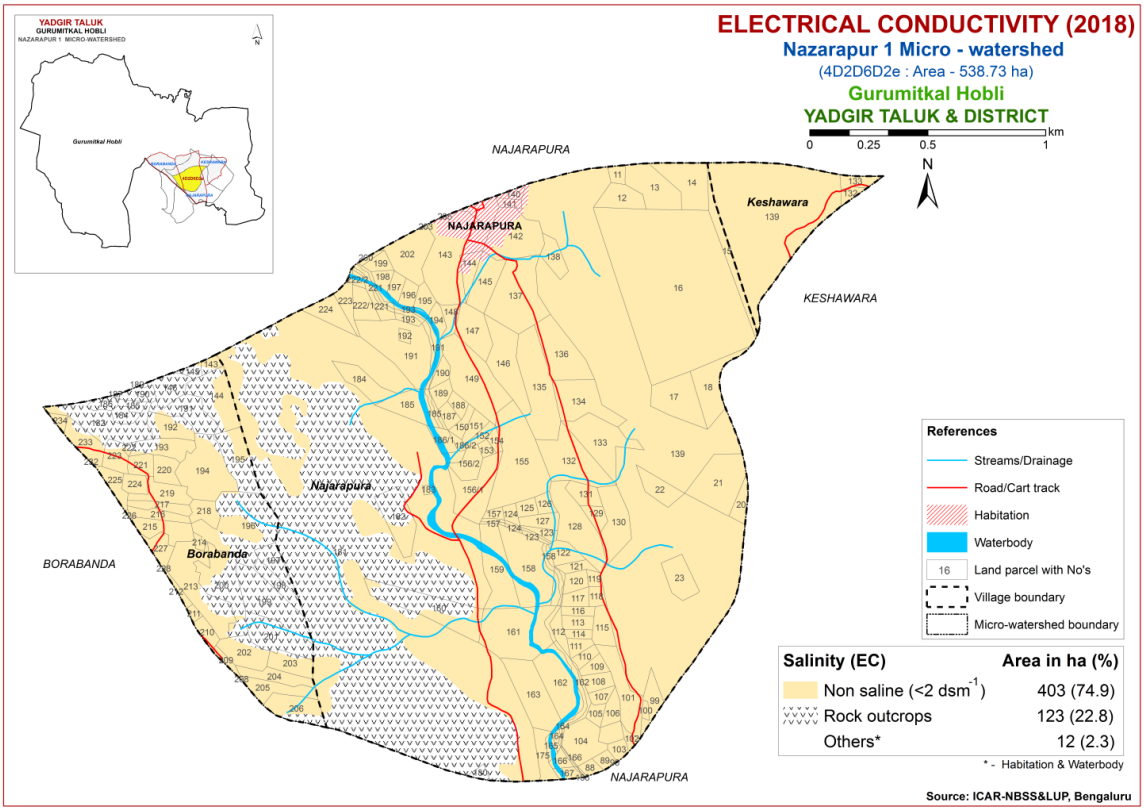


Fig.6.2 Electrical Conductivity (EC) map of Nazarapur-1Microwatershed

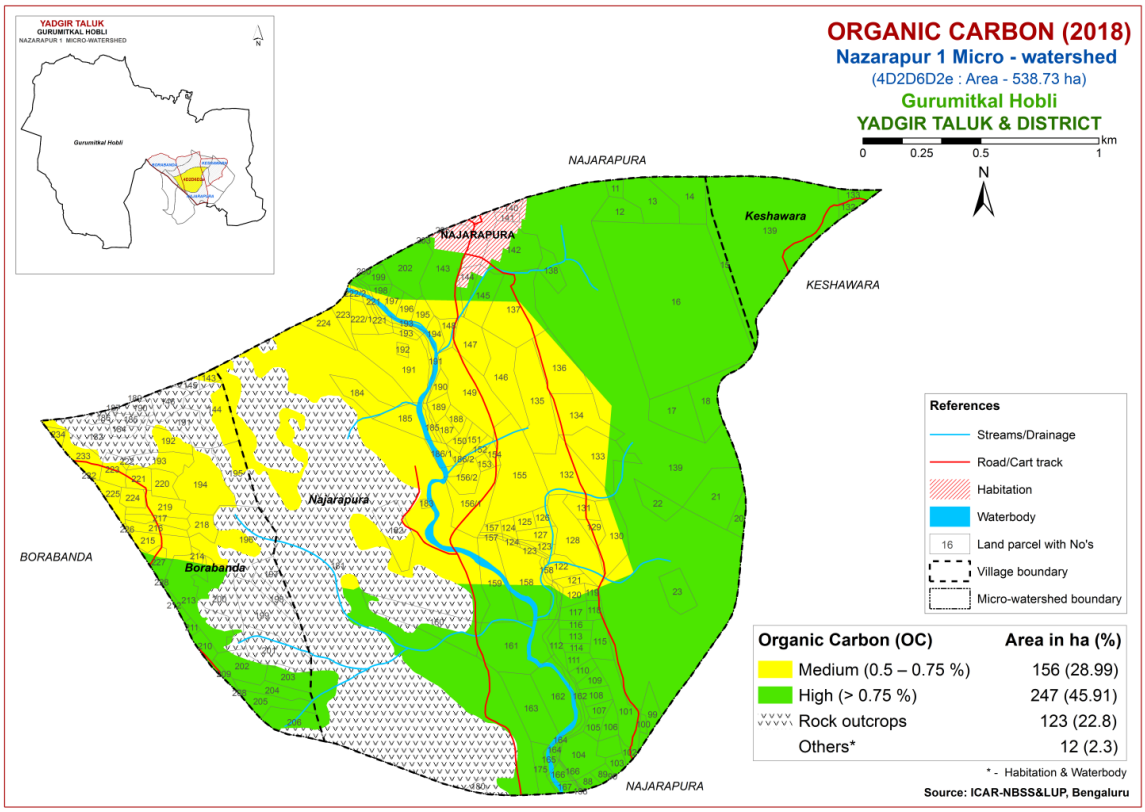


Fig.6.3 Soil Organic Carbon map of Nazarapur-1Microwatershed

6.4 Available Phosphorus

Available phosphorus content is medium (23-57 kg/ha) in an area of about 224 ha (42%) and occur in the major part of the microwatershed. An area of 179 ha (33%) is high (>57 kg/ha) and occur in the southern, southeastern, southwestern and western part of the microwatershed (Fig. 6.4).

6.5 Available Potassium

Available potassium content is medium (145-337 kg/ha) in a maximum area of about 338 ha (63%) and are distributed in the major part of the microwatershed. High (>337 kg/ha) in an area of 66 ha (12%) and are distributed in the southern part of the microwatershed (Fig. 6.5).

6.6 Available Sulphur

Maximum area of about 403 ha (75%) is Medium (10-20 ppm) in available sulphur content and are distributed in all parts of the microwatershed (Fig. 6.6).

6.7 Available Boron

Available boron content is low (<0.5 ppm) in a very small area of 0.3 ha (<1%) in the western part of the microwatershed. Maximum area of about 403 ha (75%) available boron content is medium (>0.5-1ppm) (Fig. 6.7).

6.8 Available Iron

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

6.9 Available Manganese

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

6.10 Available Copper

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

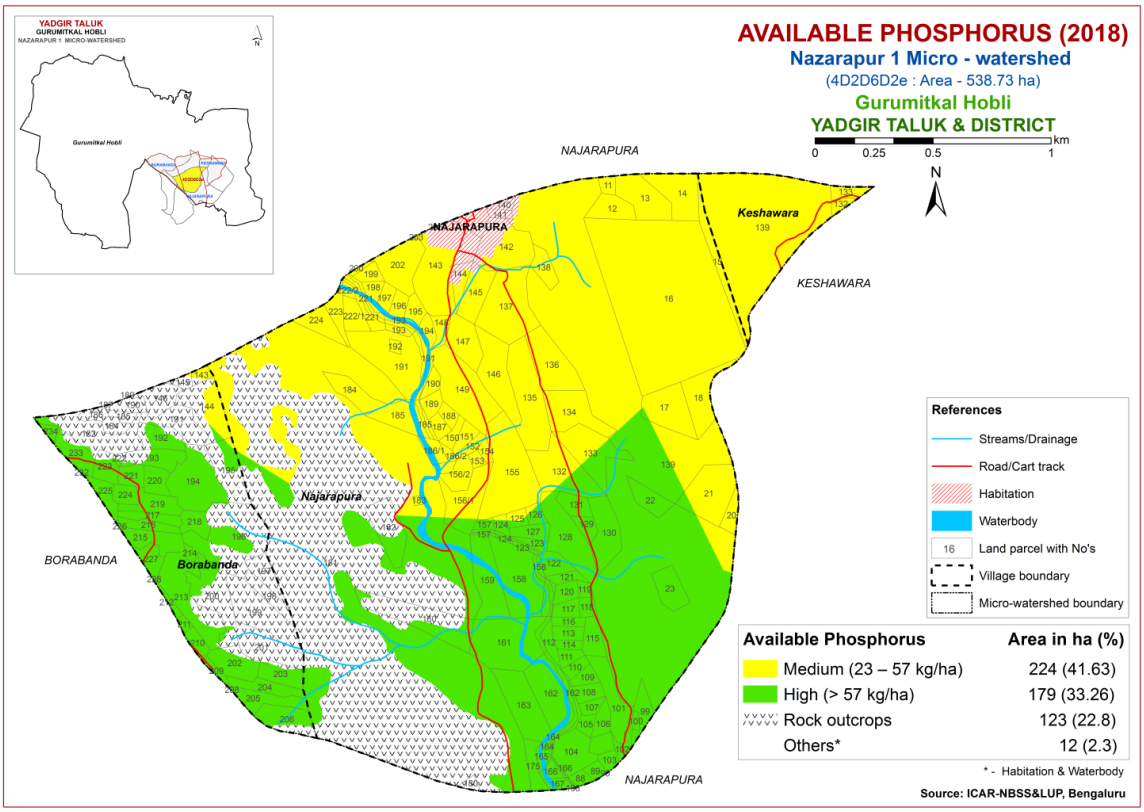


Fig.6.4 Soil Available Phosphorus map of Nazarapur-1Microwatershed

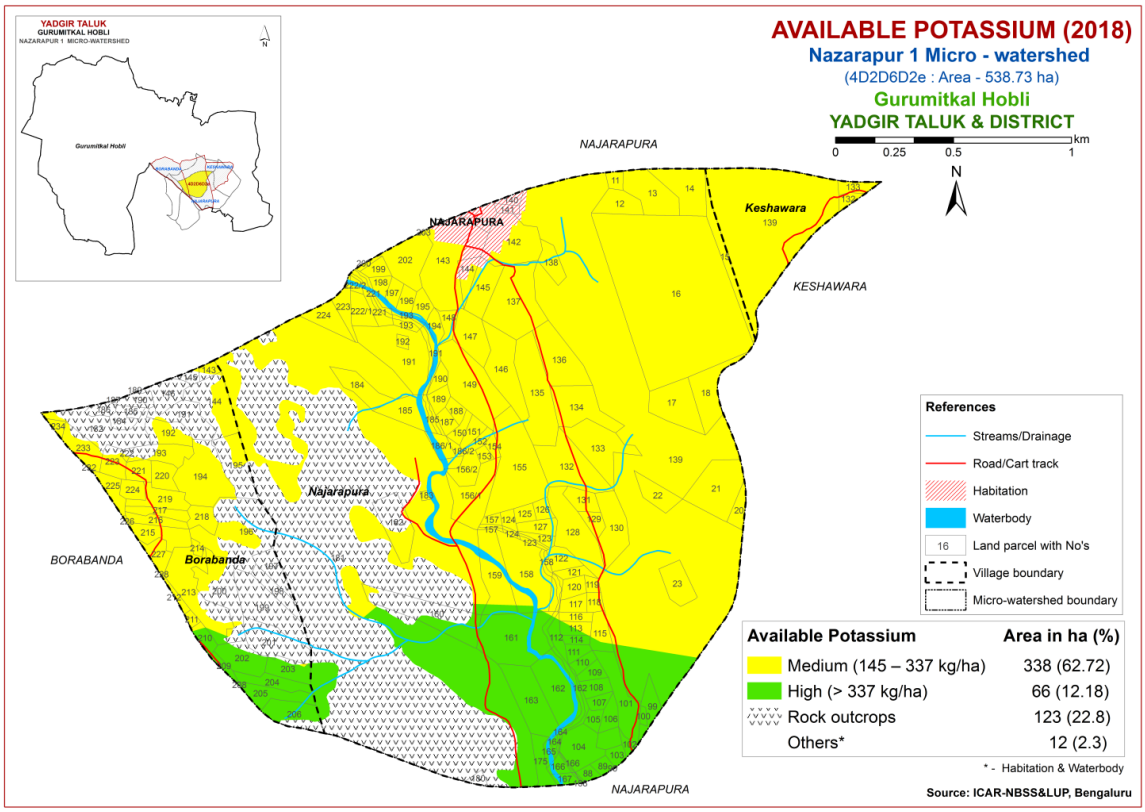


Fig.6.5 Soil Available Potassium map of Nazarapur-1Microwatershed

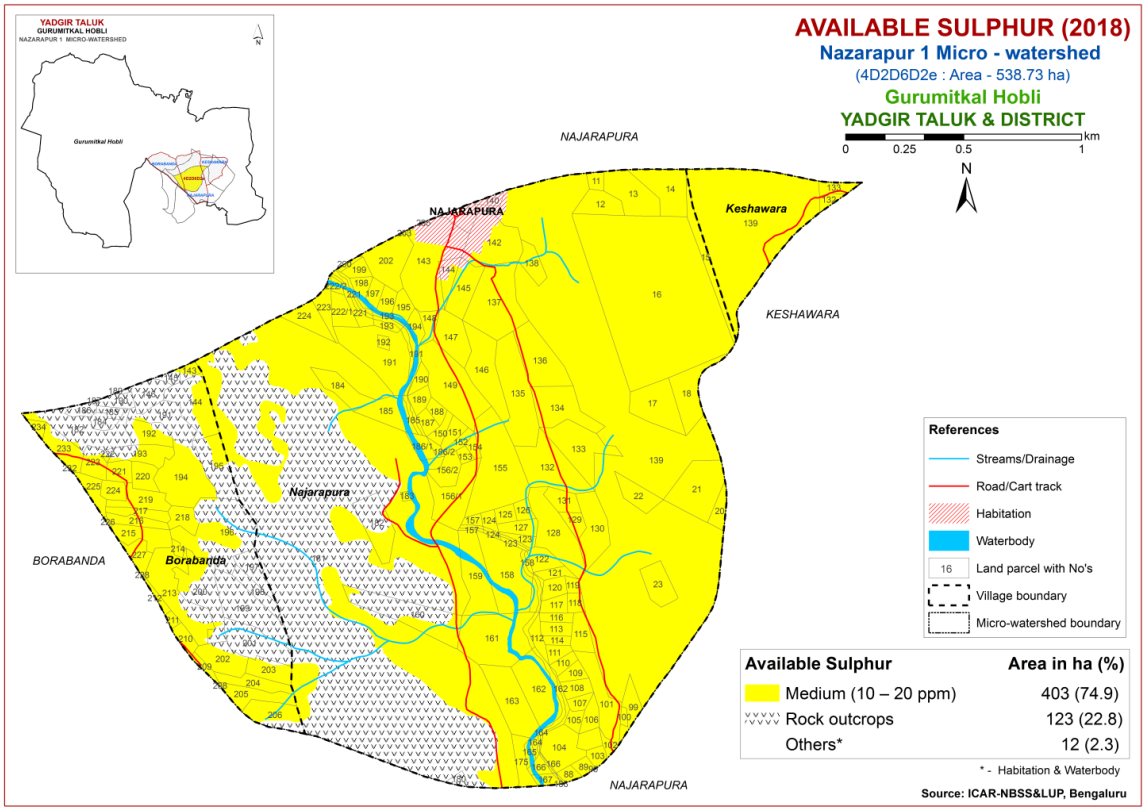


Fig.6.6 Soil Available Sulphur map of Nazarapur-1Microwatershed

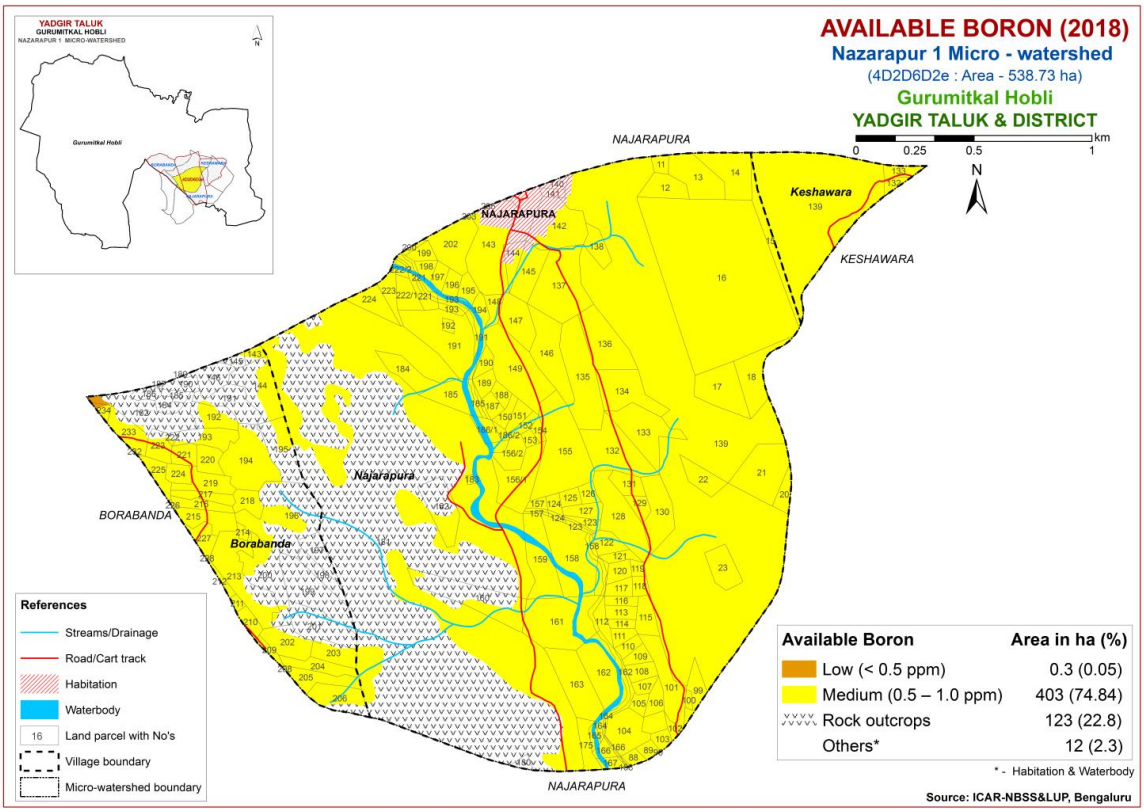


Fig.6.7 Soil Available Boron map of Nazarapur-1Microwatershed

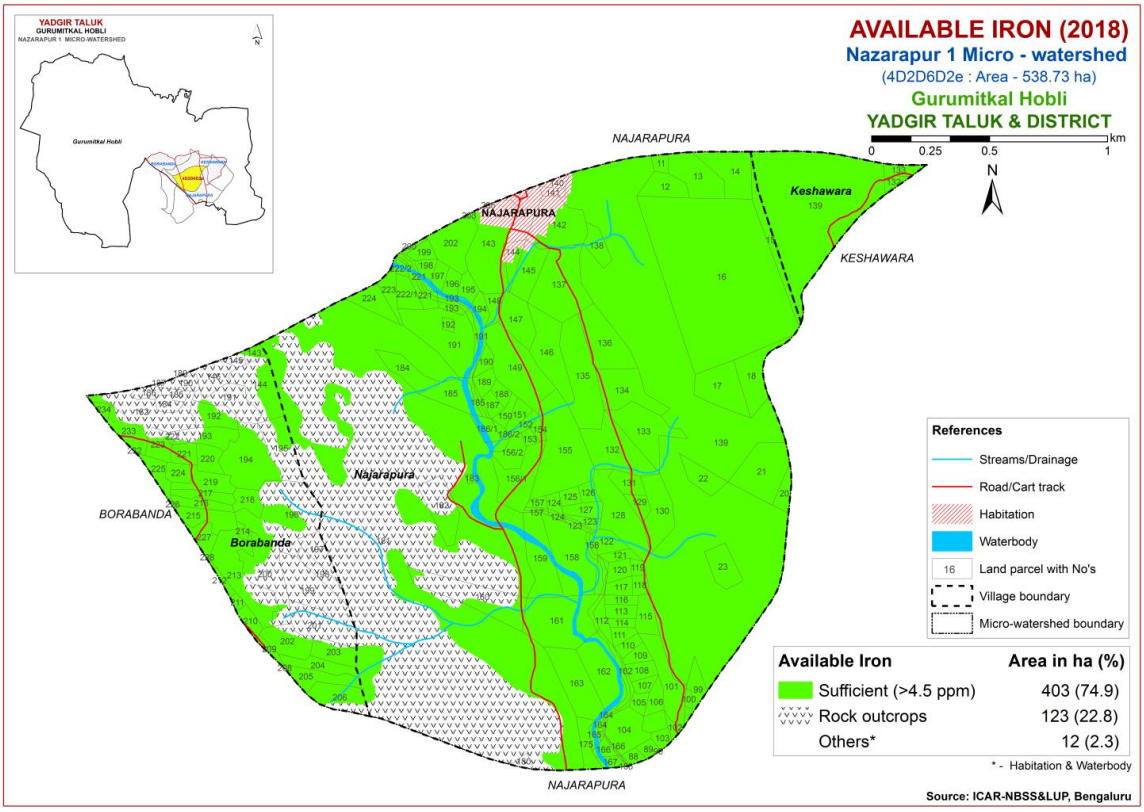


Fig.6.8 Soil Available Iron map of Nazarapur-1Microwatershed

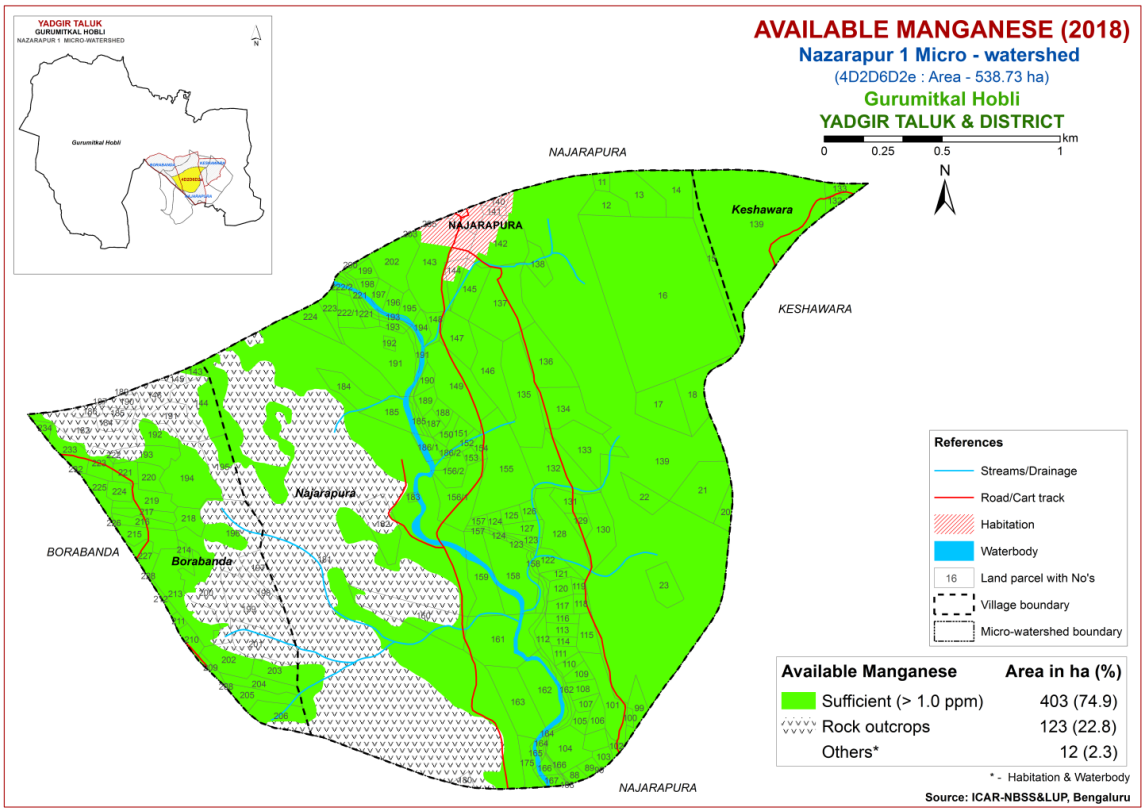


Fig.6.9 Soil Available Manganese map of Nazarapur-1Microwatershed

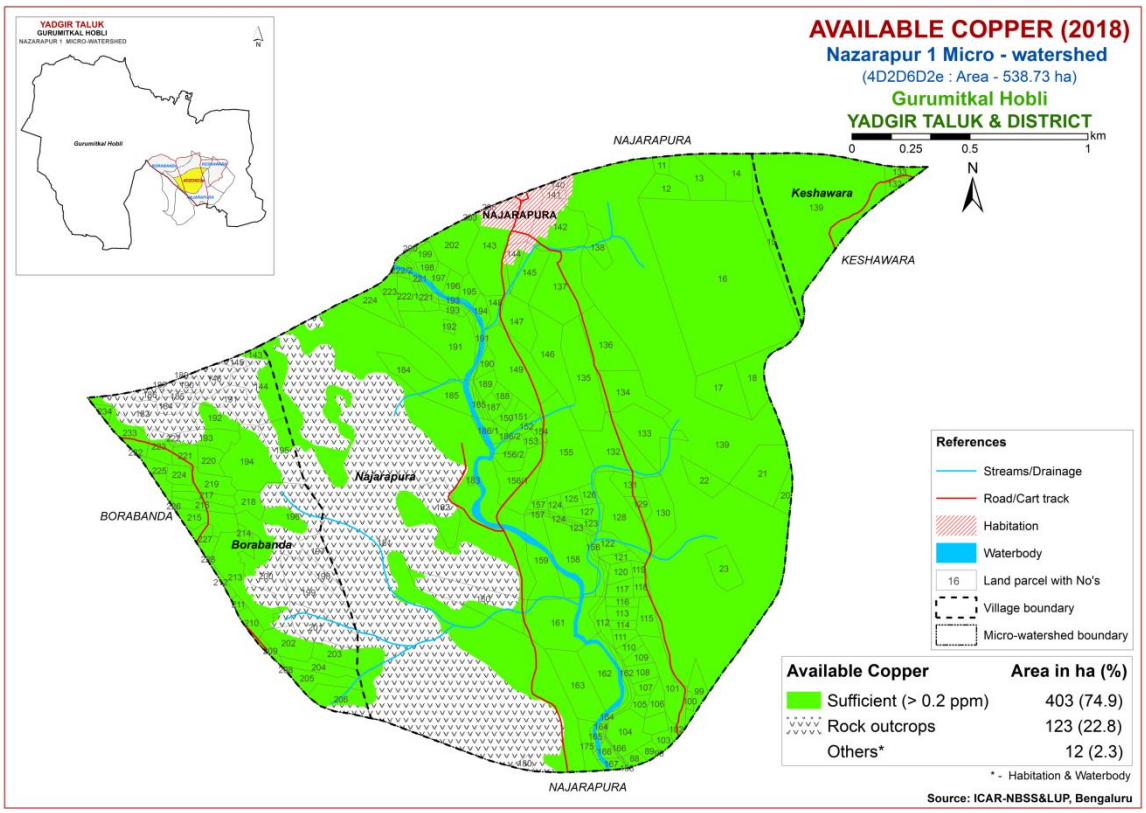


Fig.6.10 Soil Available Copper map of Nazarapur-1Microwatershed

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in a maximum area of 363 ha (67%) and is distributed in the major part of the microwatershed. An area of 40 ha (8%) is sufficient (>0.6 ppm) and are distributed in the western and southwestern part of the microwatershed (Fig 6.11).

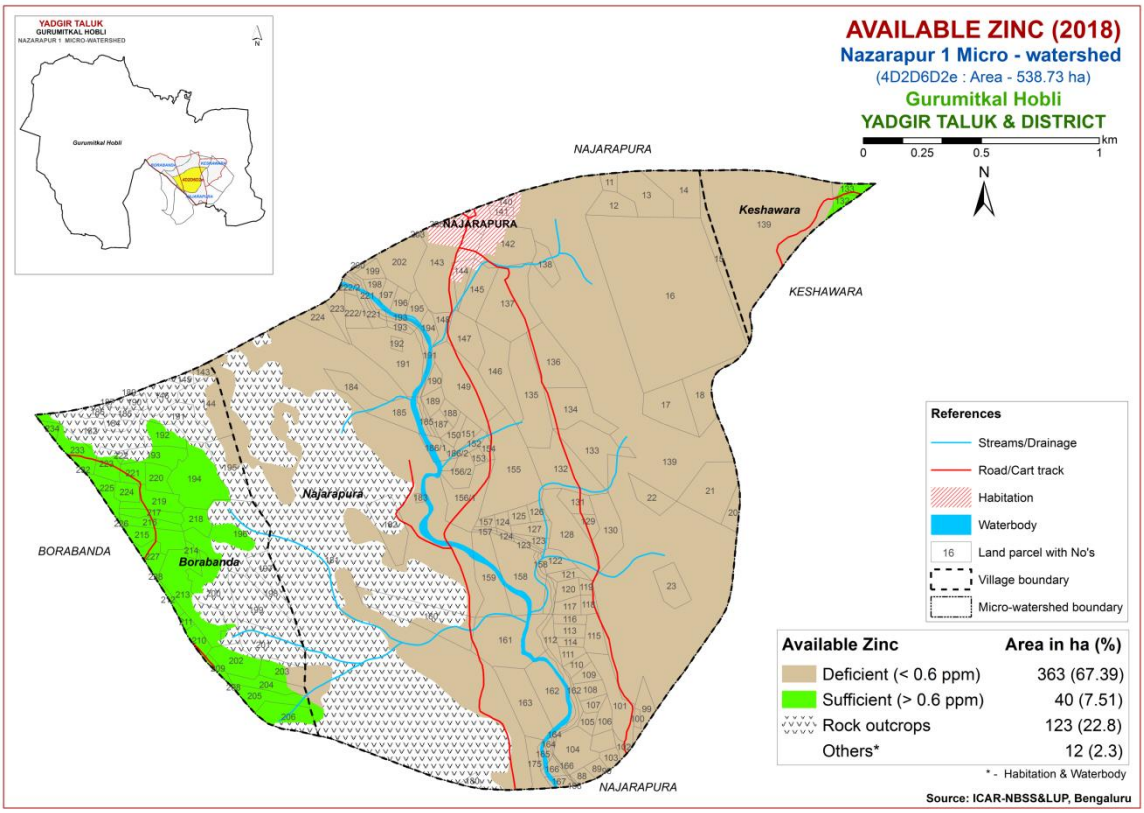


Fig.6.11 Soil Available Zinc map of Nazarapur-1Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Nazarapur-1microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The soil and land characteristics were matched with the crop requirement to arrive at the crop suitability. The soil and land characteristics table and crop requirement tables are given at the end. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3- Marginally Suitable. Order N has two classes, N1-Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3, N1 and N2 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'w' for drainage, 's' for sodium and 'z' for calcareousness. These limitations are indicated as lower case letters to the Class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 29 major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

Highly suitable (Class S1) lands for growing sorghum occur in an area of 106 ha (20%) and are distributed in the northern, central and southern part of the microwatershed. An area of about 268 ha (50%) is marginally suitable (Class S3) for growing sorghum and are distributed in the major part of the microwatershed. They

have moderate limitations of nutrient availability, rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 30 ha (6%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth.

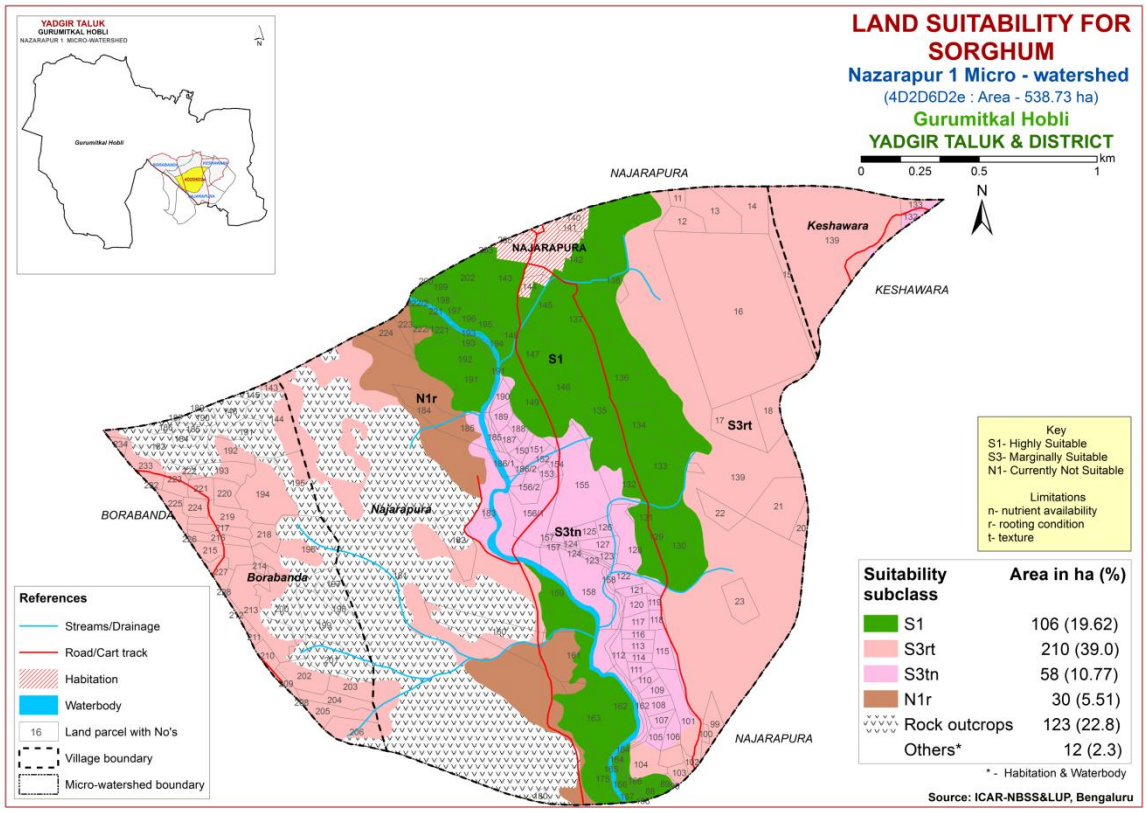


Fig. 7.1 Land Suitability map of Sorghum

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.

No highly suitable (Class S1) lands available for growing maize in the microwatershed. Moderately suitable (Class S2) lands occur in an area of 106 ha (20%) and are distributed in the central, northern and southern part of the microwatershed with minor limitation of texture. Marginally suitable lands (Class S3) for growing maize occupy a maximum area of 268 ha (50%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, nutrient availability and texture. Currently not suitable (Class N1) lands occur in an area of 30 ha (6%) and are distributed in the southern, central and western part of the microwatershed with severe limitation of rooting depth.

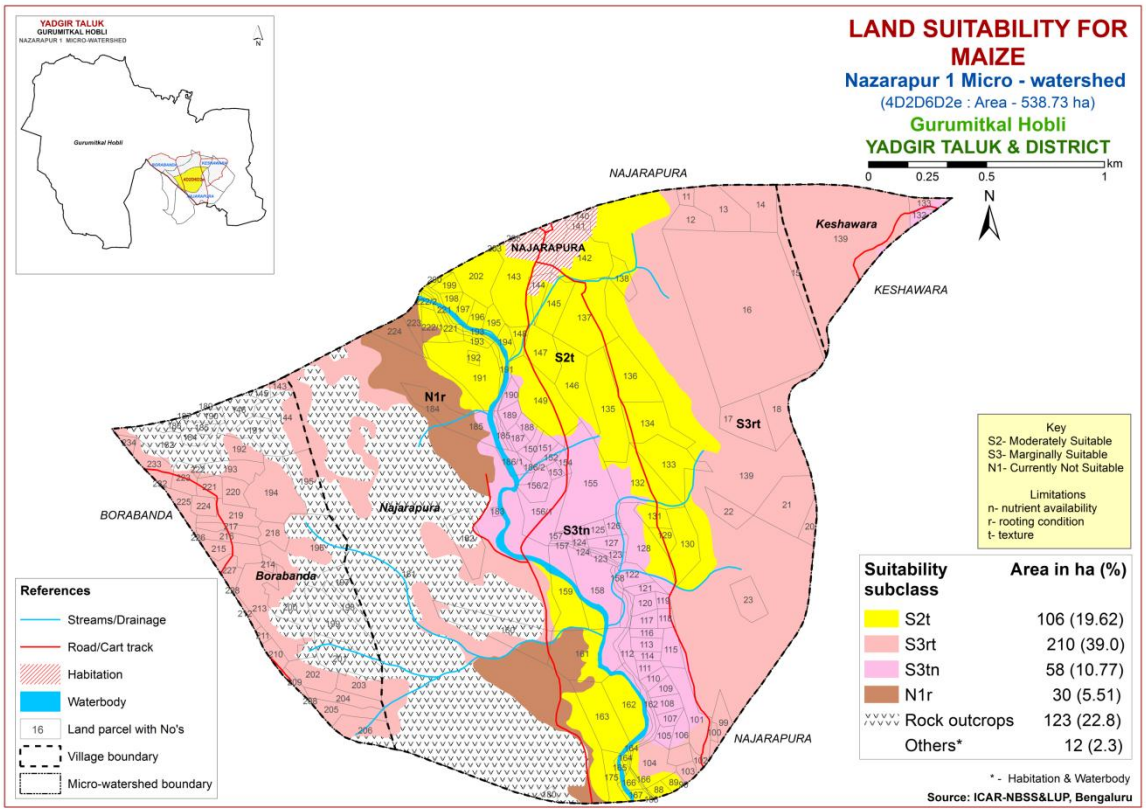


Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

No Highly (Class S1) suitable lands available for growing bajra in the microwatershed. An area of about 106 ha (20%) is moderately suitable (Class S2) for growing bajra and are distributed in the southern, northern and central part of the microwatershed. They have minor limitation of texture. Marginally suitable lands (Class S3) for growing maize occupy a maximum area of 268 ha (50%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, nutrient availability and texture. Currently not suitable (Class N1) lands occur in an area of 30 ha (6%) and are distributed in the southern, central and western part of the microwatershed with severe limitation of rooting depth.

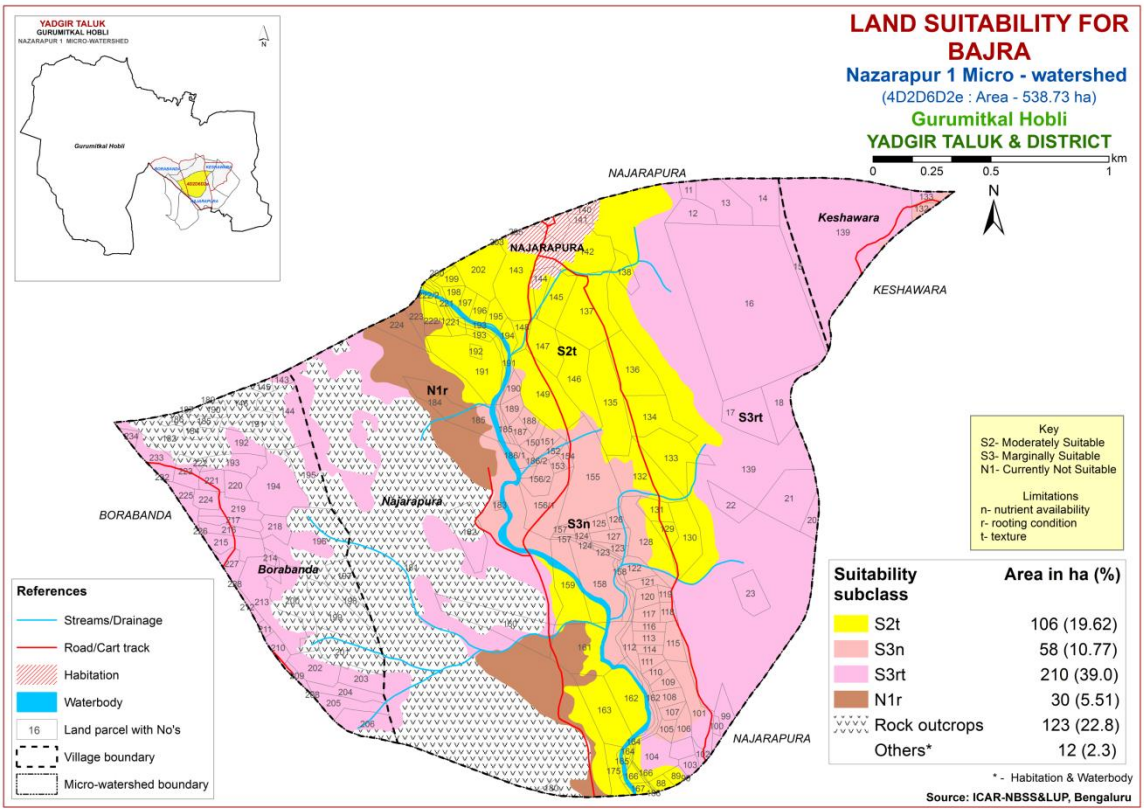


Fig. 7.3 Land Suitability map of Bajra

7.4 Land Suitability for Groundnut (*Arachis hypogaea*)

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

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands available for growing groundnut in the microwatershed. Marginally suitable lands (Class S3) for growing groundnut occupy a maximum area of about 315 ha (59%) with moderate limitations of rooting depth, texture and drainage. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

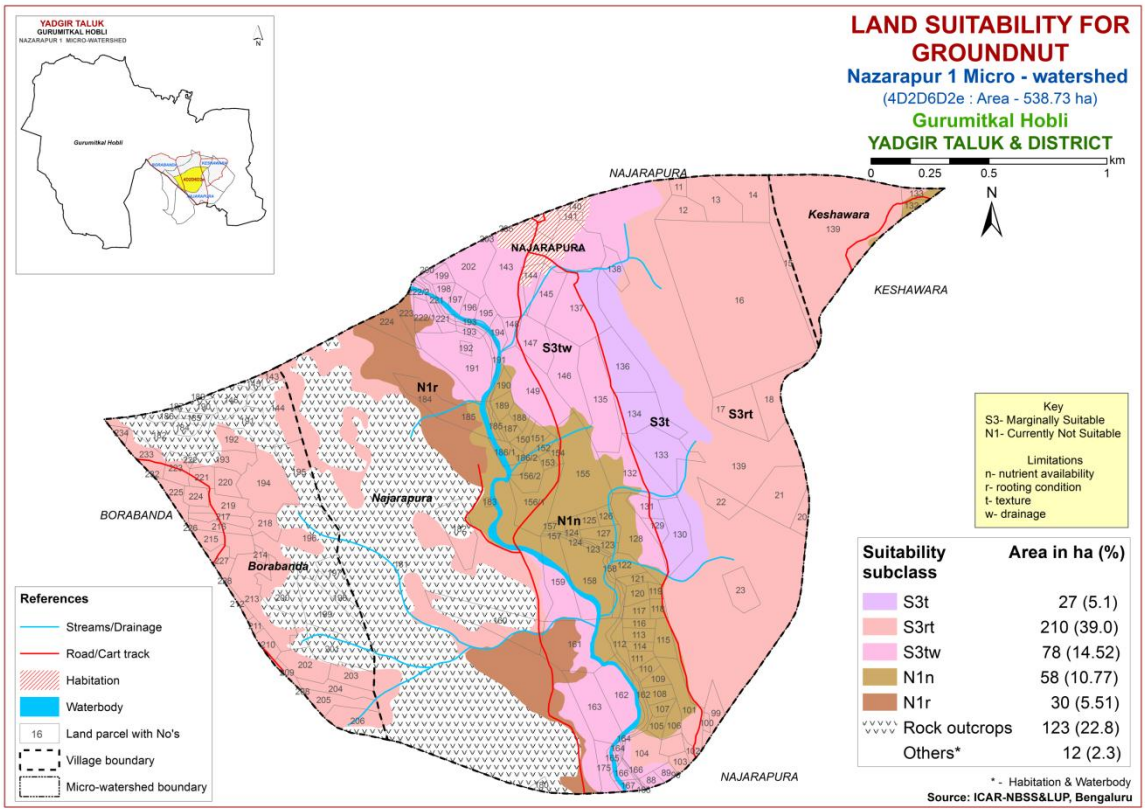


Fig. 7.4 Land Suitability map of Groundnut

7.5 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is one of the most important oilseed crop grown in an area of 4.1 lakh ha in the State in all the districts. The crop requirements for growing sunflower (Table 7.6) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sunflower was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.5.

Highly suitable (Class S1) lands for growing sunflower occupy an area of 106 ha (20%) and are distributed in the southern, northern and central part of the microwatershed. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

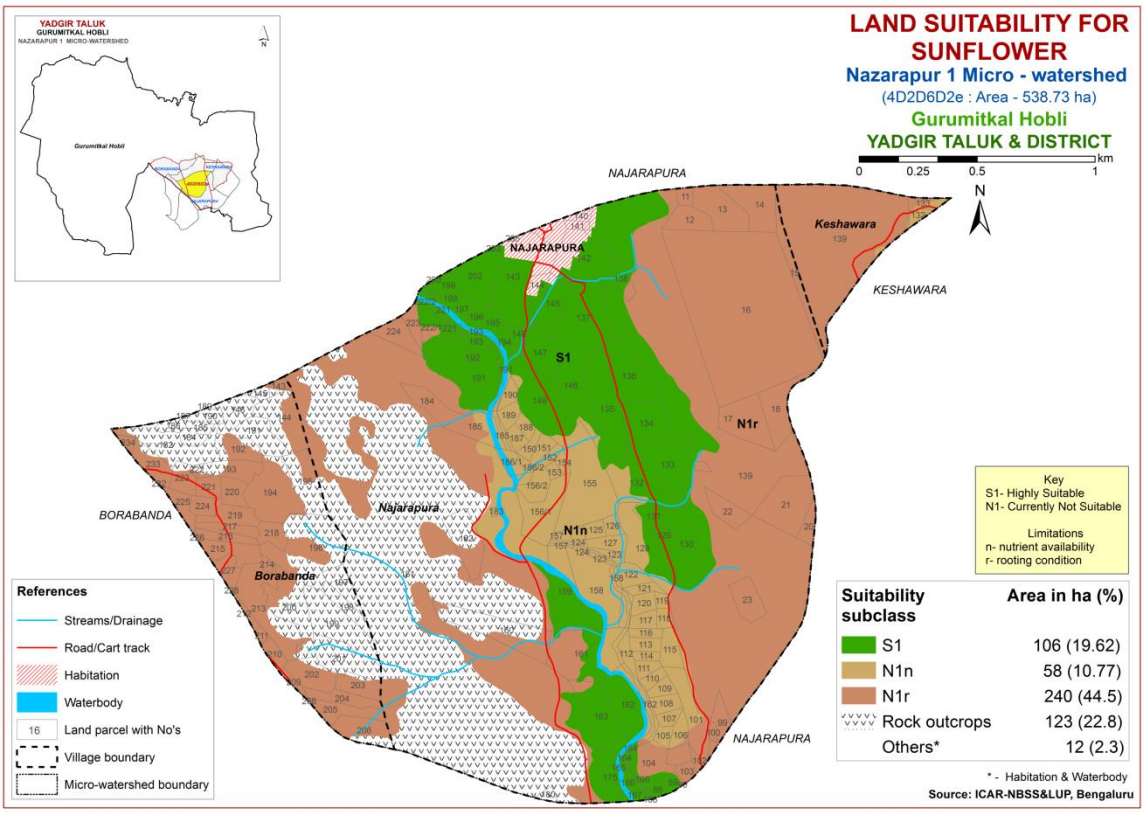


Fig. 7.5 Land Suitability map of Sunflower

7.6 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 red gram (Table 7.7) 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 7.6.

No highly suitable (Class S1) lands are available for growing redgram in the microwatershed. An area of about 105 ha (20%) is moderately suitable (Class S2) for growing redgram and are distributed in the northern, central and southern part of the microwatershed. They have minor limitations of texture and drainage. Marginally suitable lands (Class S3) for growing redgram occupy an area of about 58 ha (11%) and occur in the central and southern part of the microwatershed. They have moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 240 ha (45%) and are distributed in the major part of the microwatershed with severe limitation of rooting depth.

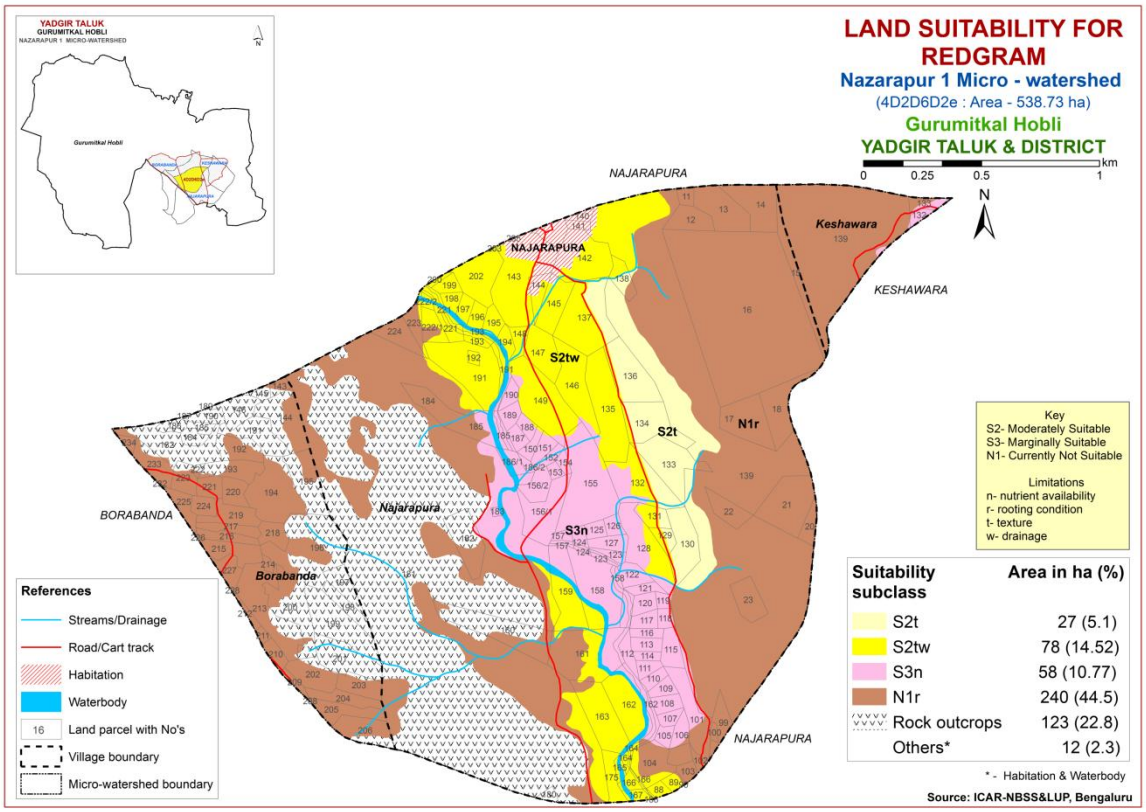


Fig. 7.6 Land Suitability map of Redgram

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

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

Highly suitable (Class S1) lands for growing Bengal gram occupy an area of 106 ha (20%) and are distributed in the southern, northern and central part of the microwatershed. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and texture.

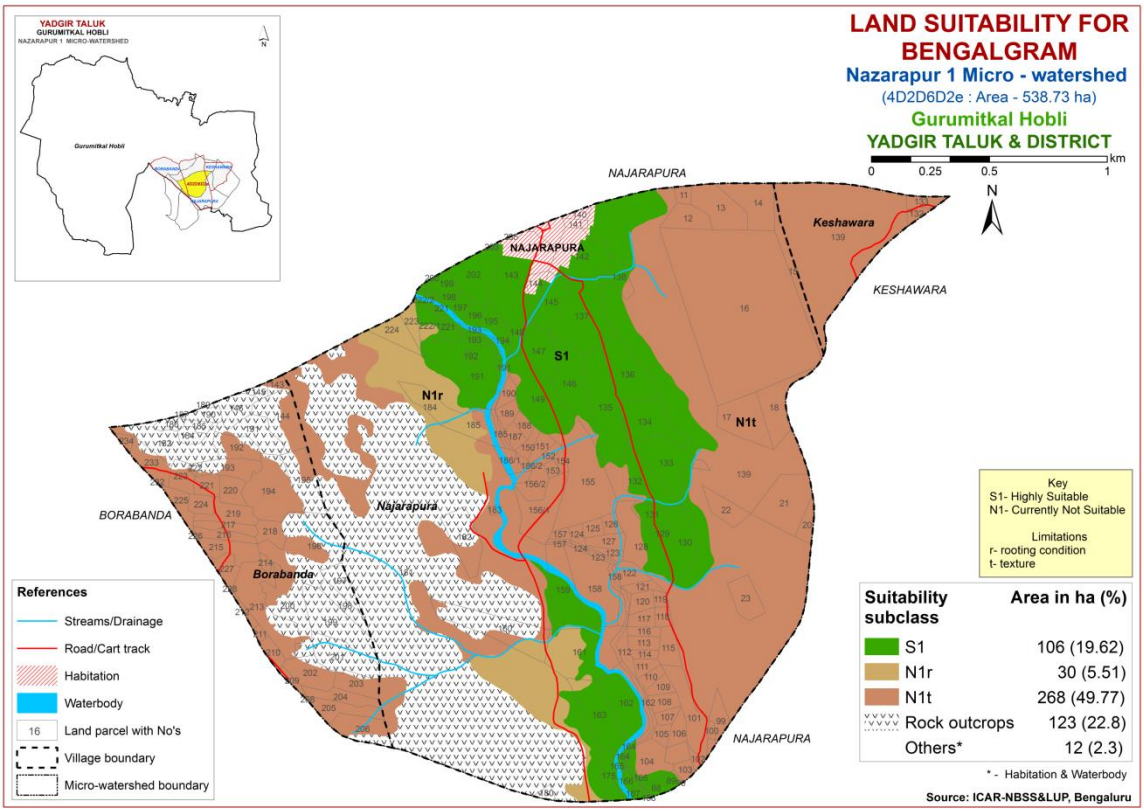


Fig. 7.7 Land Suitability map of Bengal gram

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

Cotton is one of the most important fibre crop grown in the State in about 8.75 lakh ha area in Raichur, Dharwad, Belgaum, Kalaburgi, Bijapur, Bidar, Bellary, Chitradurga and Chamarajnagar districts. The crop requirements for growing cotton (Table 7.9) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cotton was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.8.

Highly suitable (Class S1) lands for growing cotton occupy an area of 106 ha (20%) and are distributed in the southern, northern and central part of the microwatershed. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and texture.

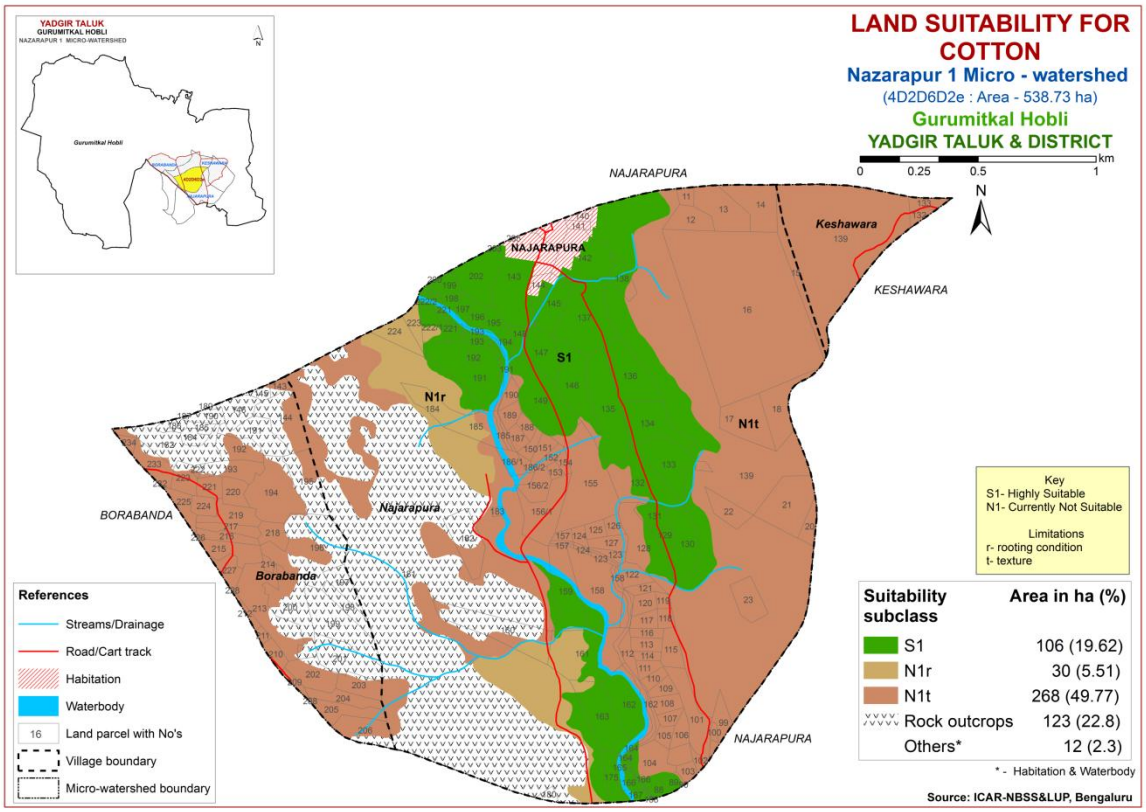


Fig. 7.8 Land Suitability map of Cotton

7.9 Land Suitability for Chilli (*Capsicum annuum)*

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

There are no highly (Class S1) suitable lands available for growing chilli crop in the microwatershed. An area of about 105 ha (20%) is moderately suitable (Class S2) for growing chilli and are distributed in the central, northern and southern part of the microwatershed. They have minor limitations of texture and drainage. Marginally suitable lands (Class S3) for growing chilli occupy a maximum area of about 210 ha (39%) with moderate limitations of rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

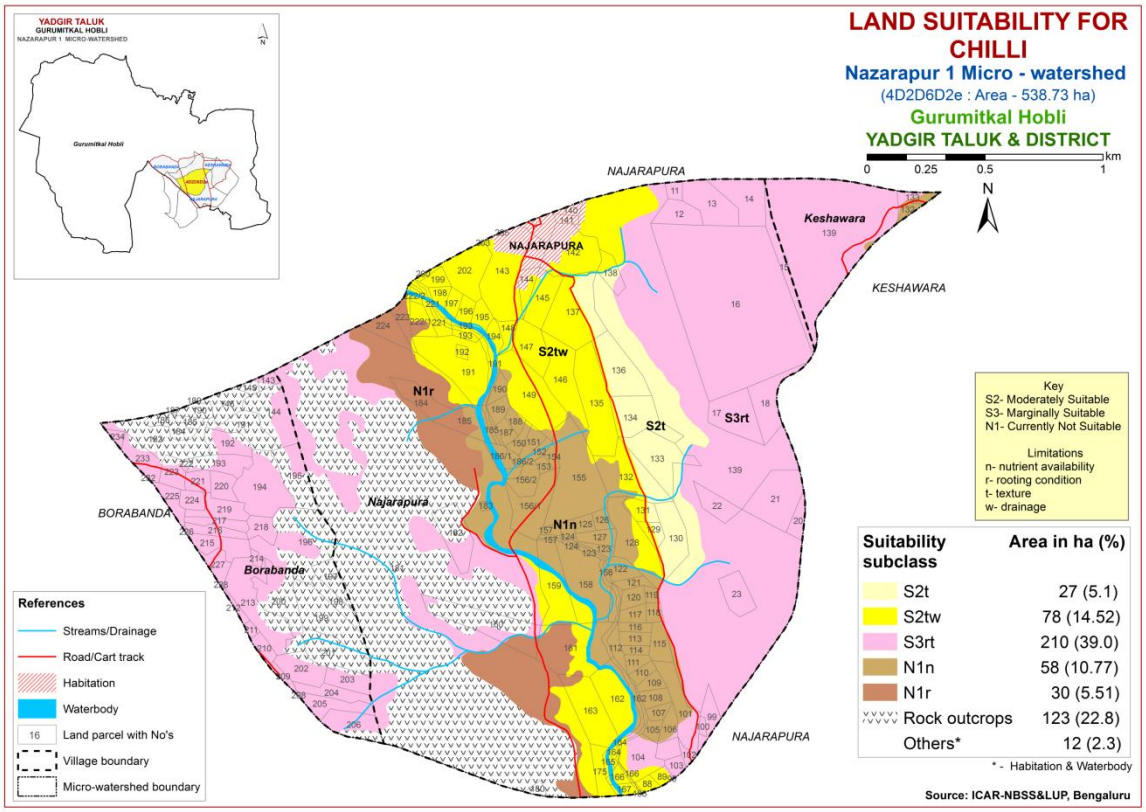


Fig 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato (*Lycopersicon esculentum*)

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

There are no highly (Class S1) suitable lands available for growing tomato crop in the microwatershed. An area of about 87 ha (16%) is moderately suitable (Class S2) for growing tomato and are distributed in the central and northern part of the microwatershed. They have minor limitations of texture and drainage. Marginally suitable lands (Class S3) for growing tomato occupy a maximum area of about 229 ha (42%) with moderate limitations of rooting depth, drainage and texture. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

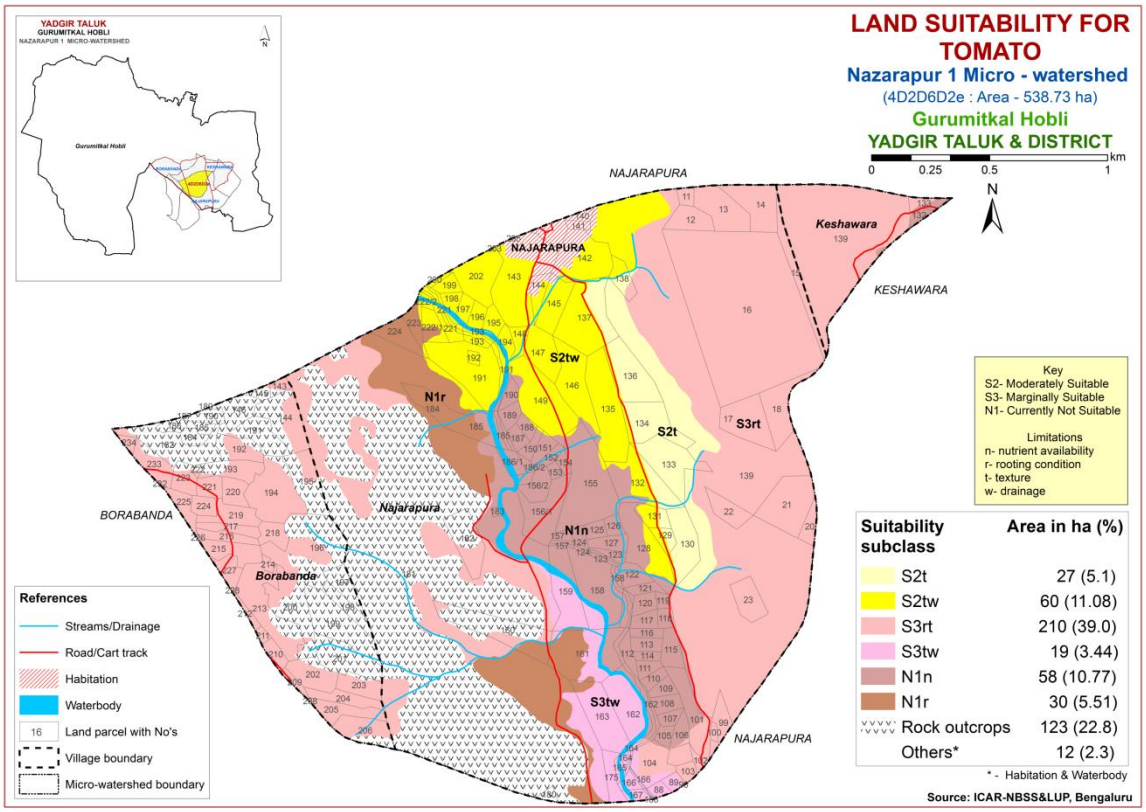


Fig 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Brinjal (*Solanum melongena*)

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

Highly (Class S1) suitable lands for growing brinjal occur in an area of 87 ha (16%) and are distributed in the central and northern part of the microwatershed. An area of about 19 ha (3%) is moderately suitable (Class S2) for brinjal and is distributed in the southern part of the microwatershed. They have minor limitation of texture. Marginally suitable lands (Class S3) for growing brinjal occupy a maximum area of about 210 ha (39%) with moderate limitations of rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

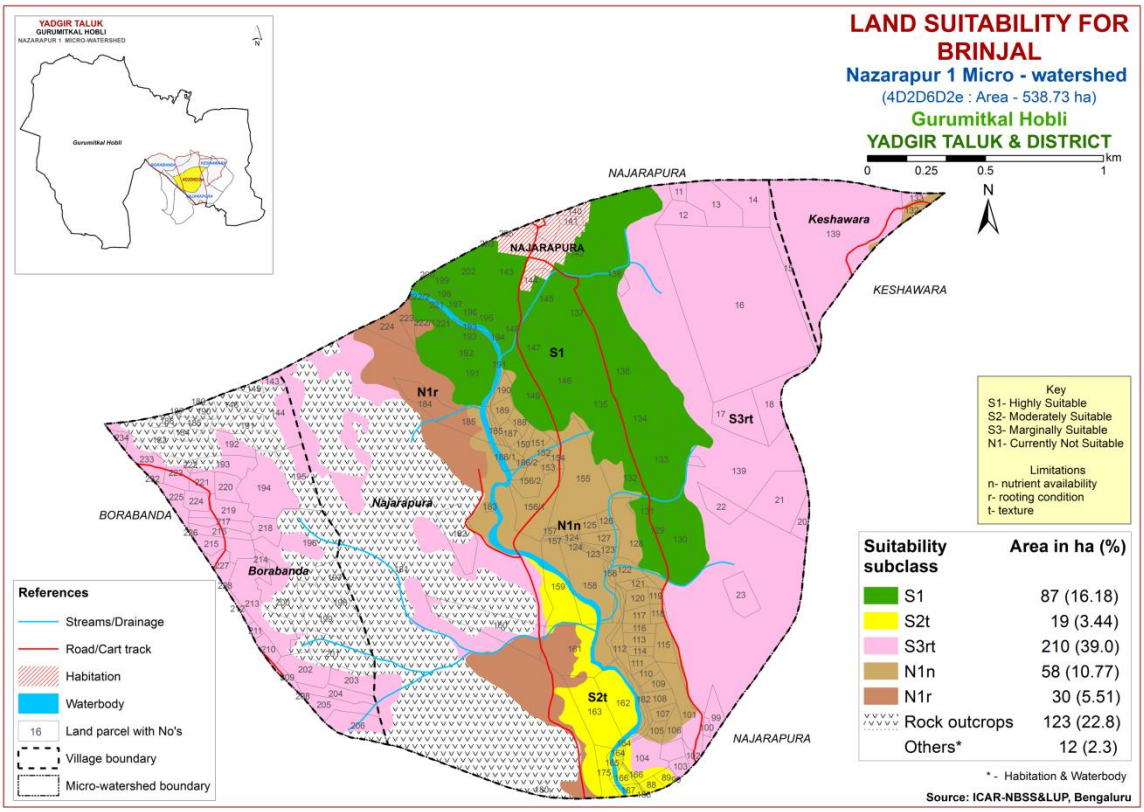


Fig 7.11 Land Suitability map of Brinjal

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

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

Highly (Class S1) suitable lands for growing onion occur in an area of 60 ha (11%) and are distributed in the central and northern part of the microwatershed. Marginally suitable lands (Class S3) for growing onion occupy a maximum area of about 256 ha (48%) with moderate limitations of rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

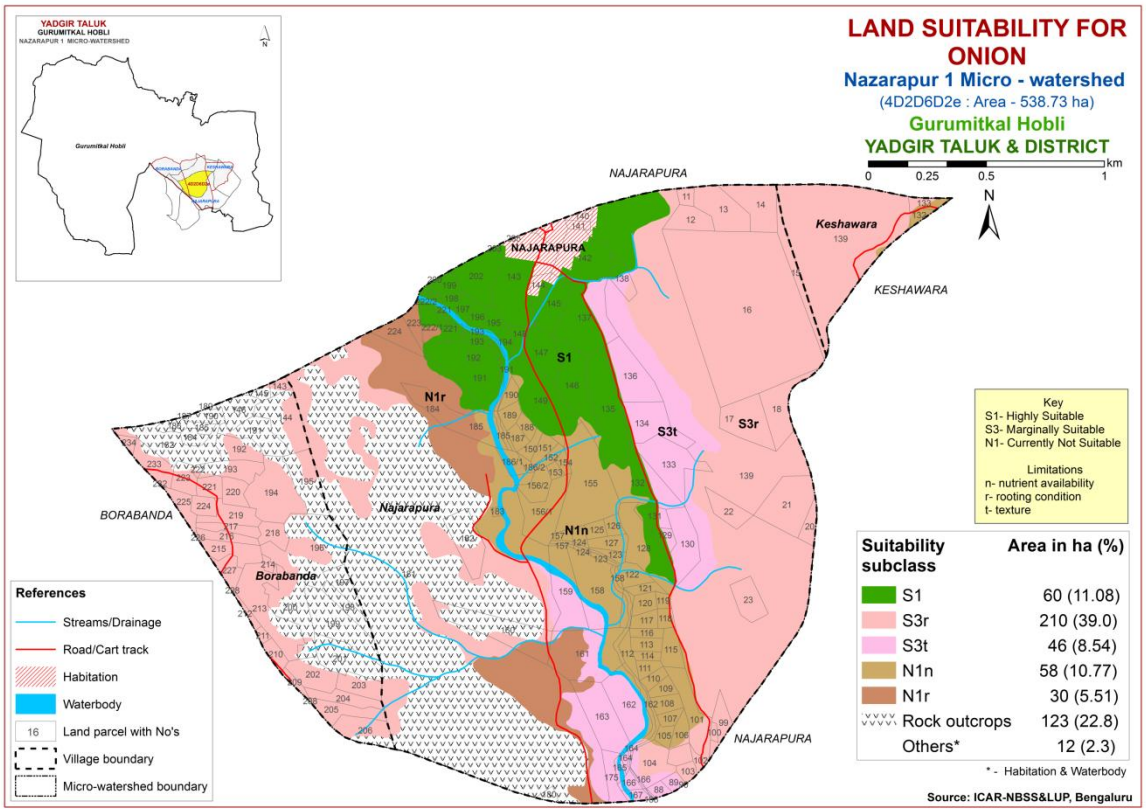


Fig 7.12 Land Suitability map of Onion

7.13 Land Suitability for Bhendi (*Abelmoschus esculentus*)

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

Highly (Class S1) suitable lands for growing bhendi occur in an area of 87 ha (16%) and are distributed in the central and northern part of the microwatershed. An area of about 19 ha (3%) is moderately suitable (Class S2) for bhendi and is distributed in the southern part of the microwatershed. They have minor limitation of texture. Marginally suitable lands (Class S3) for growing bhendi occupy a maximum area of about 210 ha (39%) with moderate limitations of rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

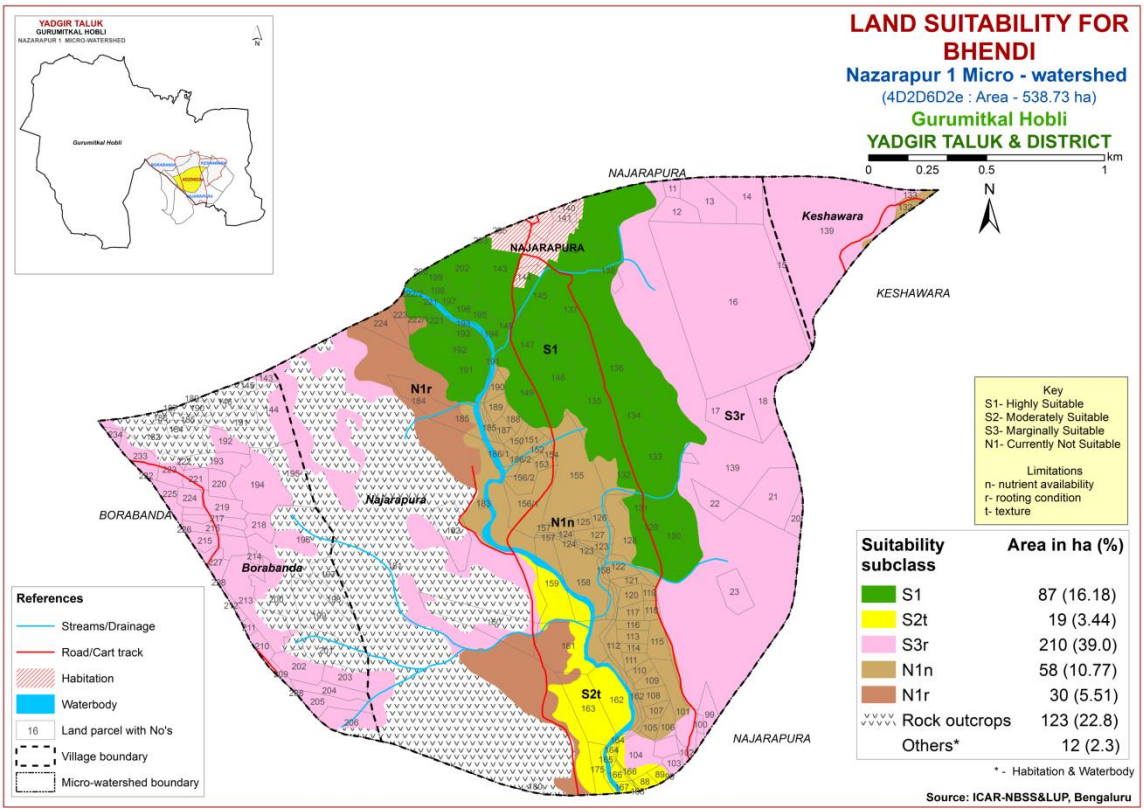


Fig 7.13 Land Suitability map of Bhendi

7.14 Land Suitability for Drumstick (*Moringa oleifera*)

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

There are no highly (Class S1) suitable lands available for growing drumstick crop in the microwatershed. An area of about 105 ha (20%) is moderately suitable (Class S2) for growing drumstick and are distributed in central, northern and southern part of the microwatershed. They have minor limitations of texture and drainage. Currently not suitable (Class N1) lands occur in a maximum area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

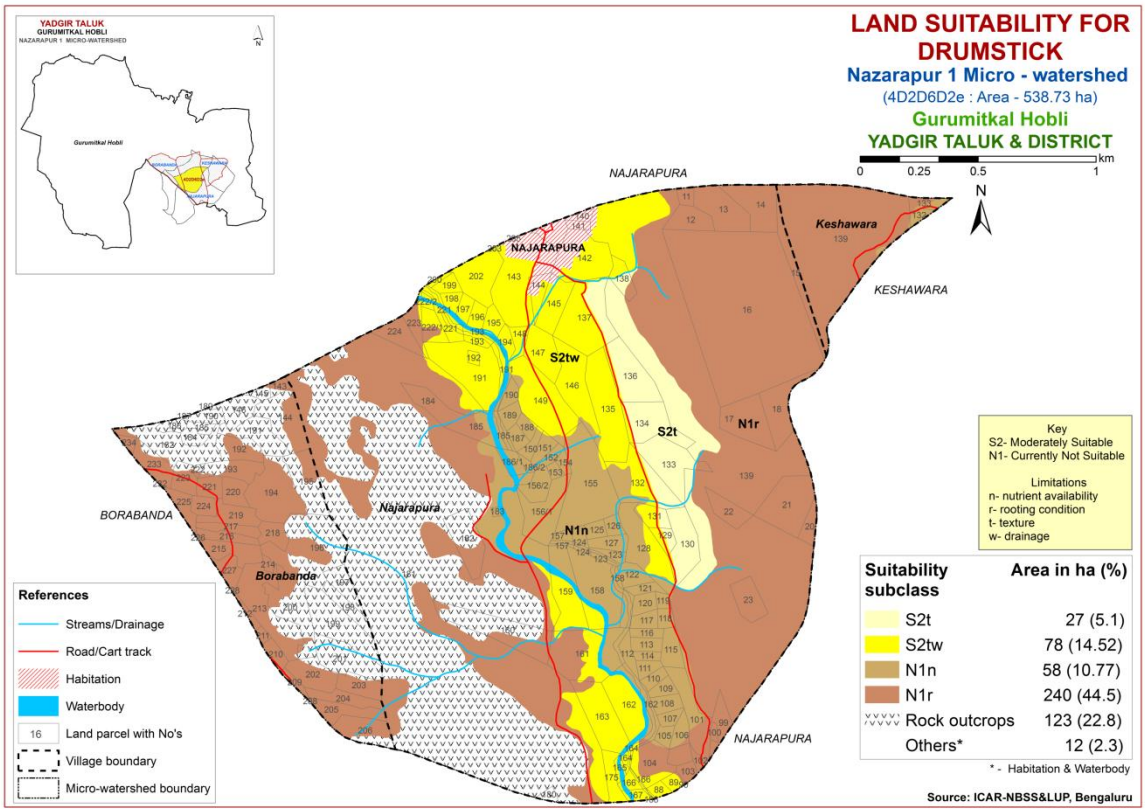


Fig 7.14 Land Suitability map of Drumstick

7.15 Land suitability for Mango (*Mangifera indica*)

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

No highly suitable (Class S1) lands are available for growing mango in the microwatershed. An area of about 87 ha (16%) is moderately suitable (Class S2) for growing mango and are distributed in the northern, central and southern part of the microwatershed. They have minor limitation of rooting depth. Marginally suitable lands (Class S3) for growing mango occupy an area of about 19 ha (3%) and occur in the southern part of the microwatershed. They have moderate limitation of texture. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

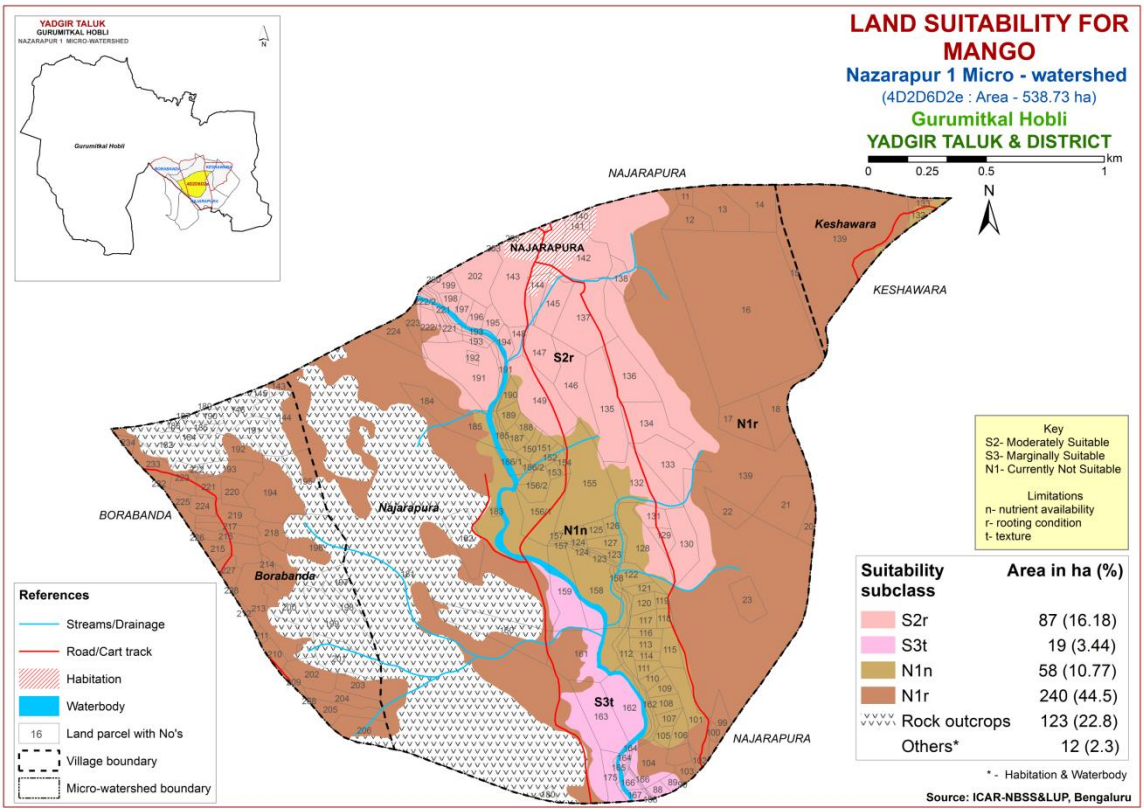


Fig. 7.15 Land Suitability map of Mango

7.16 Land suitability for Guava (*Psidium guajava*)

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

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands available for growing guava in the microwatershed. Marginally suitable lands (Class S3) for growing guava occupy an area of about 106 ha (20%) with moderate limitation of texture. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

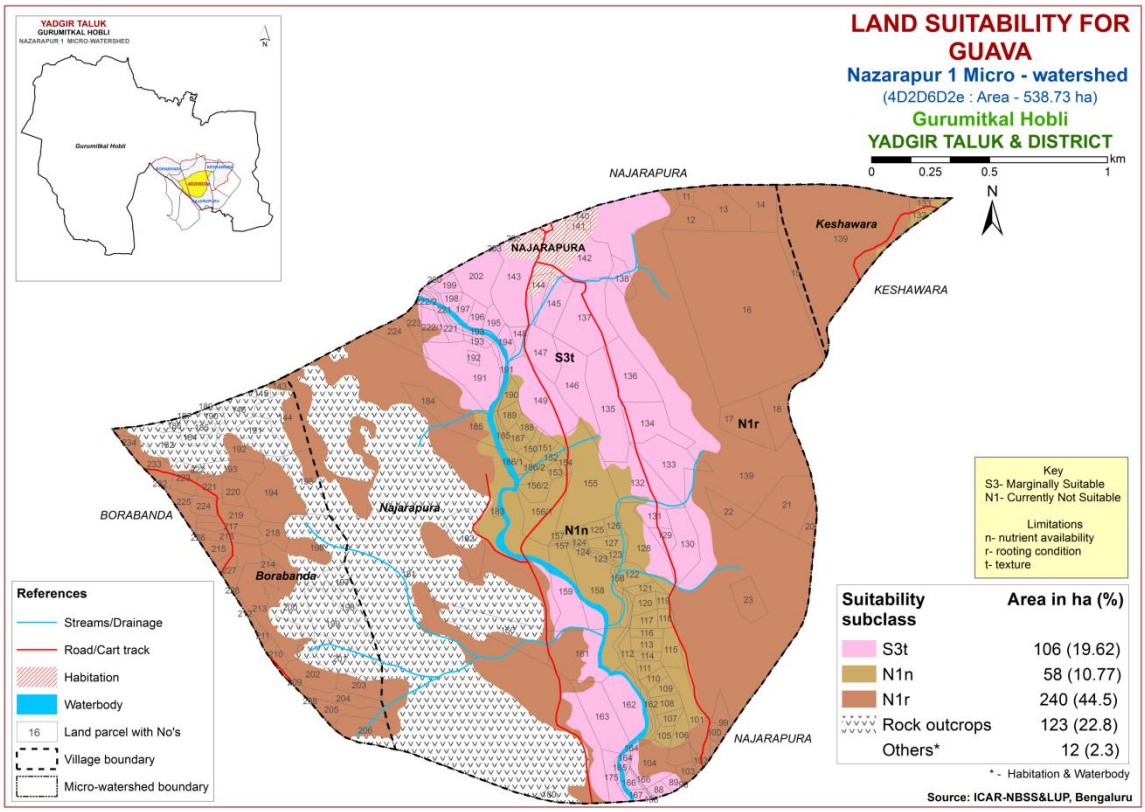


Fig. 7.16 Land Suitability map of Guava

7.17 Land suitability for Sapota (*Manilkara zapota*)

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

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands available for growing sapota in the microwatershed. Marginally suitable lands (Class S3) for growing sapota occupy an area of about 106 ha (20%) with moderate limitation of texture. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

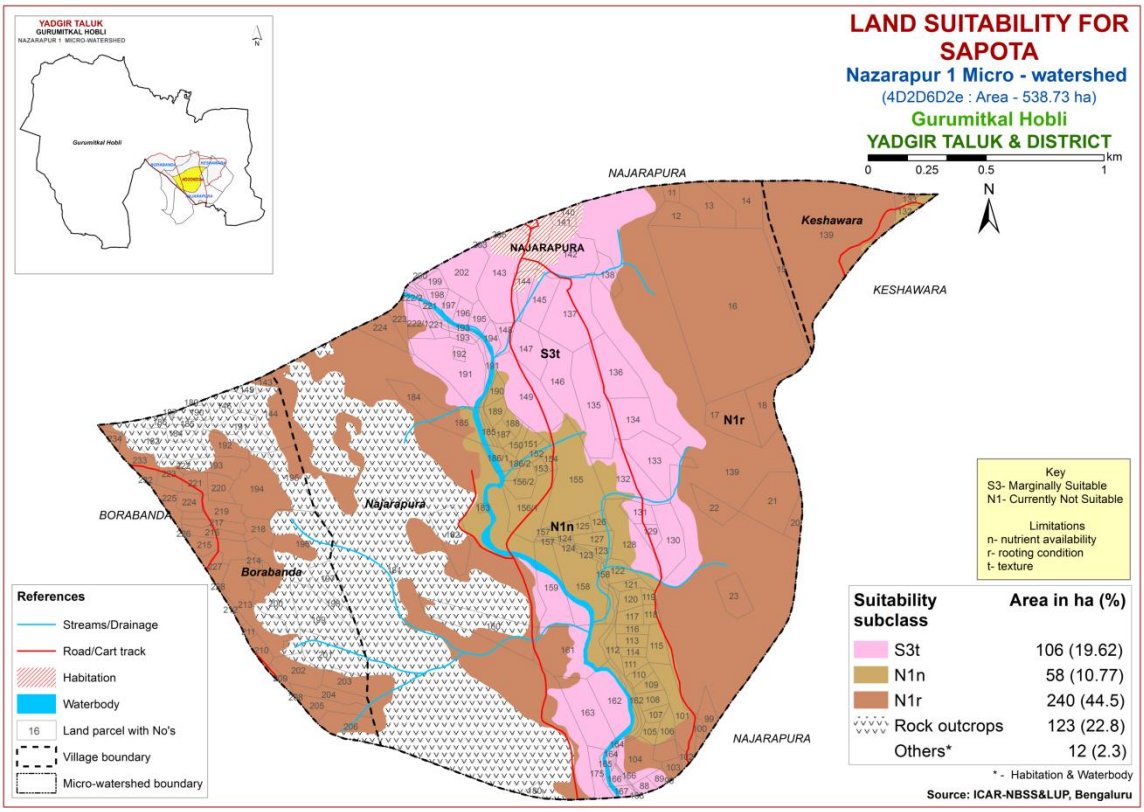


Fig. 7.17 Land Suitability map of Sapota

7.18 Land Suitability for Pomegranate (*Punica granatum*)

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

No highly suitable (Class S1) lands are available for growing pomegranate in the microwatershed. An area of about 106 ha (20%) is moderately suitable (Class S2) for growing pomegranate and are distributed in the northern, central and southern part of the microwatershed. They have minor limitation of rooting depth. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

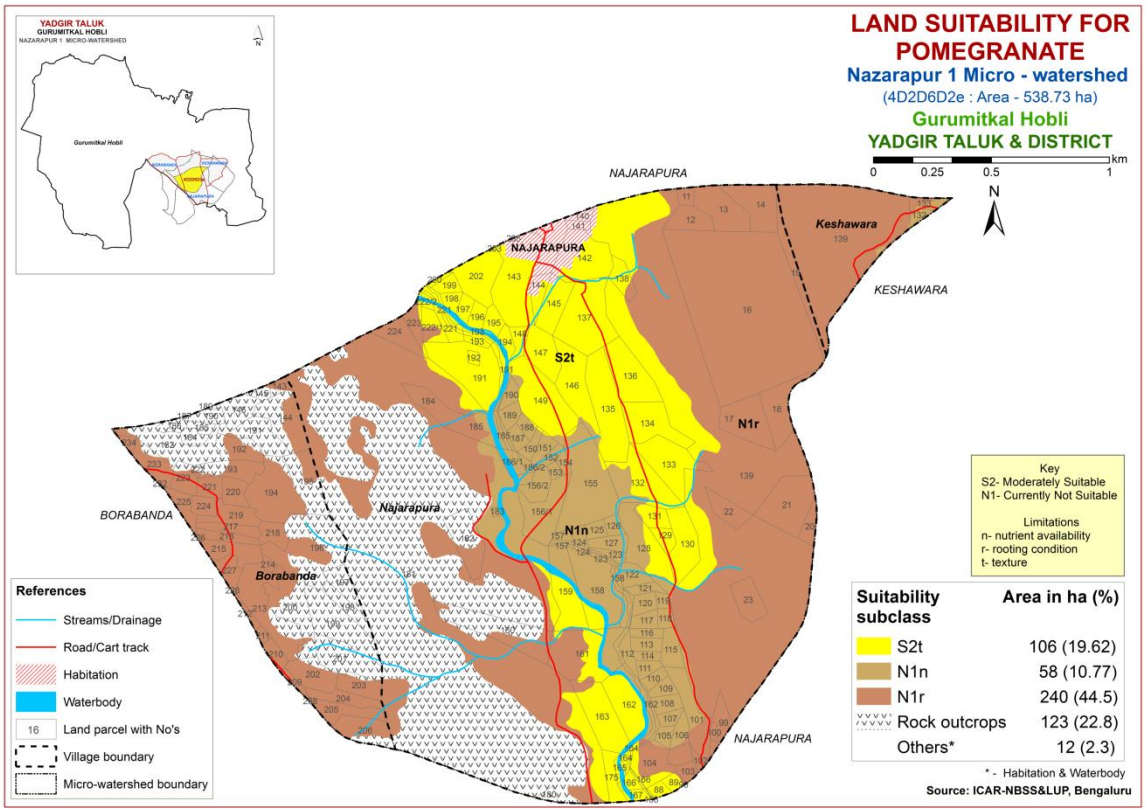


Fig 7.18 Land Suitability map of Pomegranate

7.19 Land Suitability for Musambi (*Citrus limetta*)

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

Highly suitable (Class S1) lands for growing musambi occupy an area of 106 ha (20%) and are distributed in the southern, northern and central part of the microwatershed. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

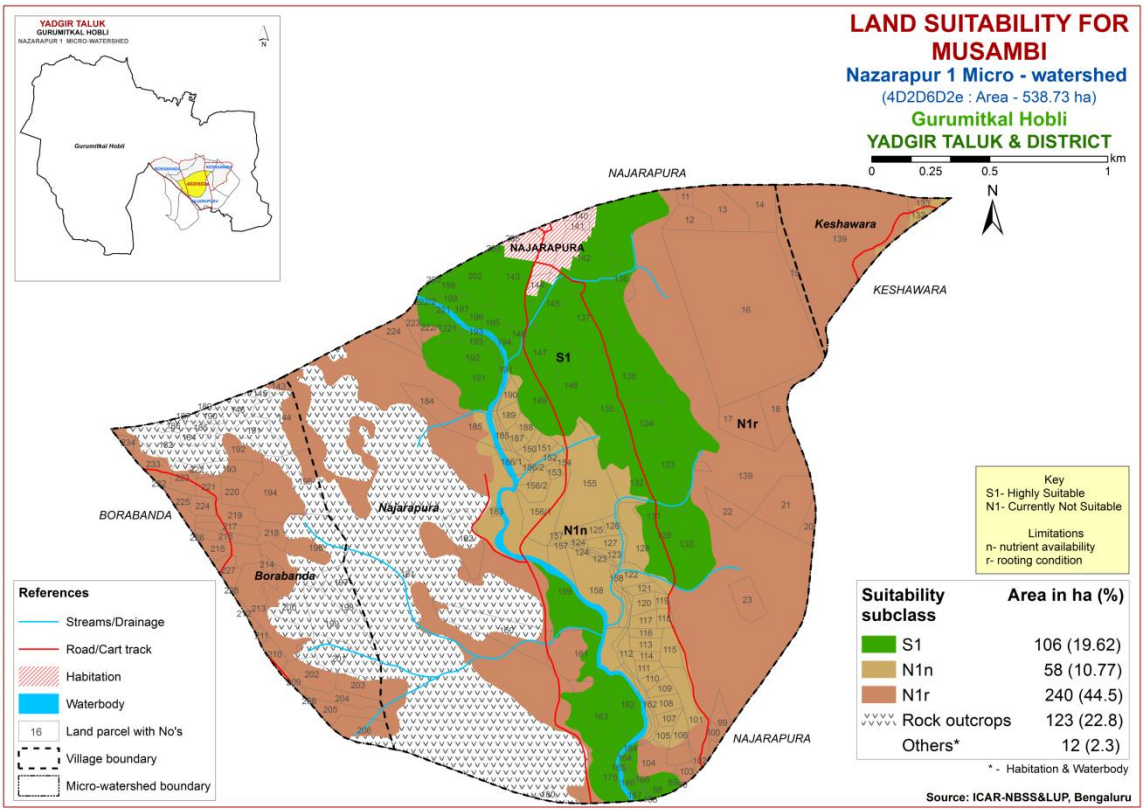


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

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

Highly suitable (Class S1) lands for growing lime occupy an area of 106 ha (20%) and are distributed in the southern, northern and central part of the microwatershed. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

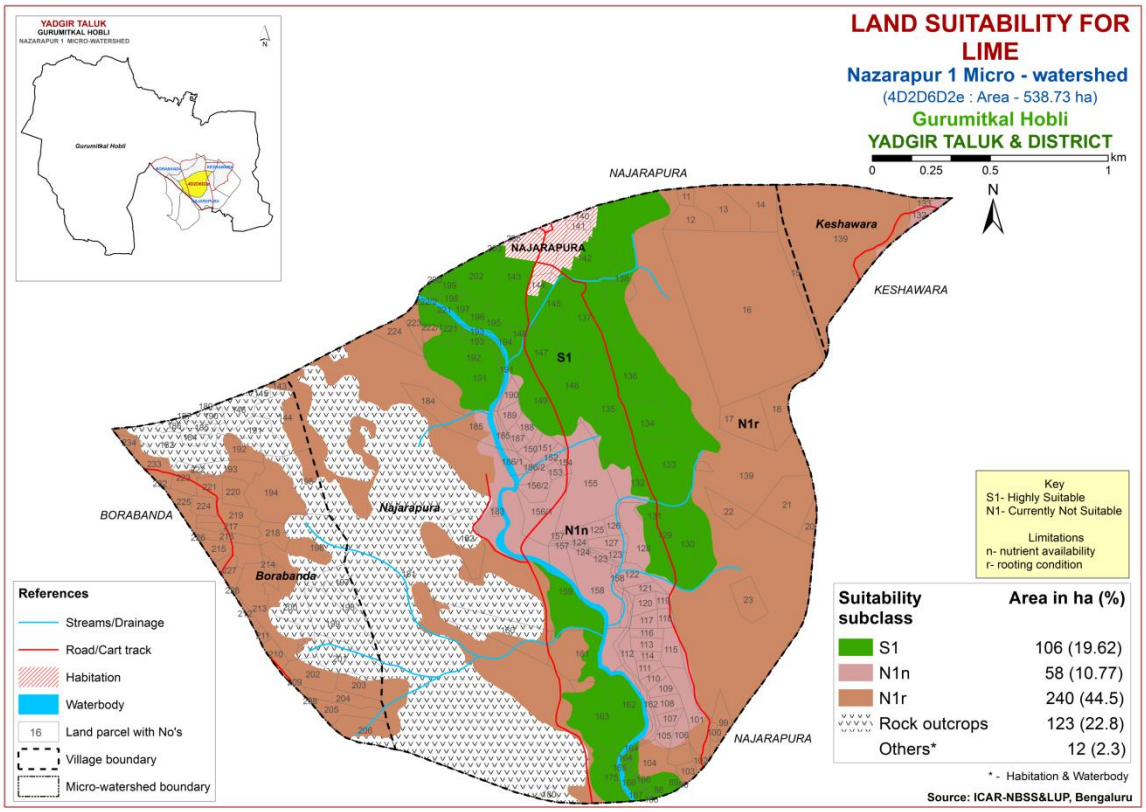


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Amla (*Phyllanthus emblica*)

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

Highly (Class S1) suitable lands available for growing amla crop occur in an area of 19 ha (3%) and are distributed in the southern part of the microwatershed. An area of about 87 ha (16%) is moderately suitable (Class S2) for growing amla and are distributed in the central and northern part of the microwatershed. They have minor limitation of texture. Marginally suitable lands (Class S3) for growing amla occupy a maximum area of about 210 ha (39%) with moderate limitations of rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

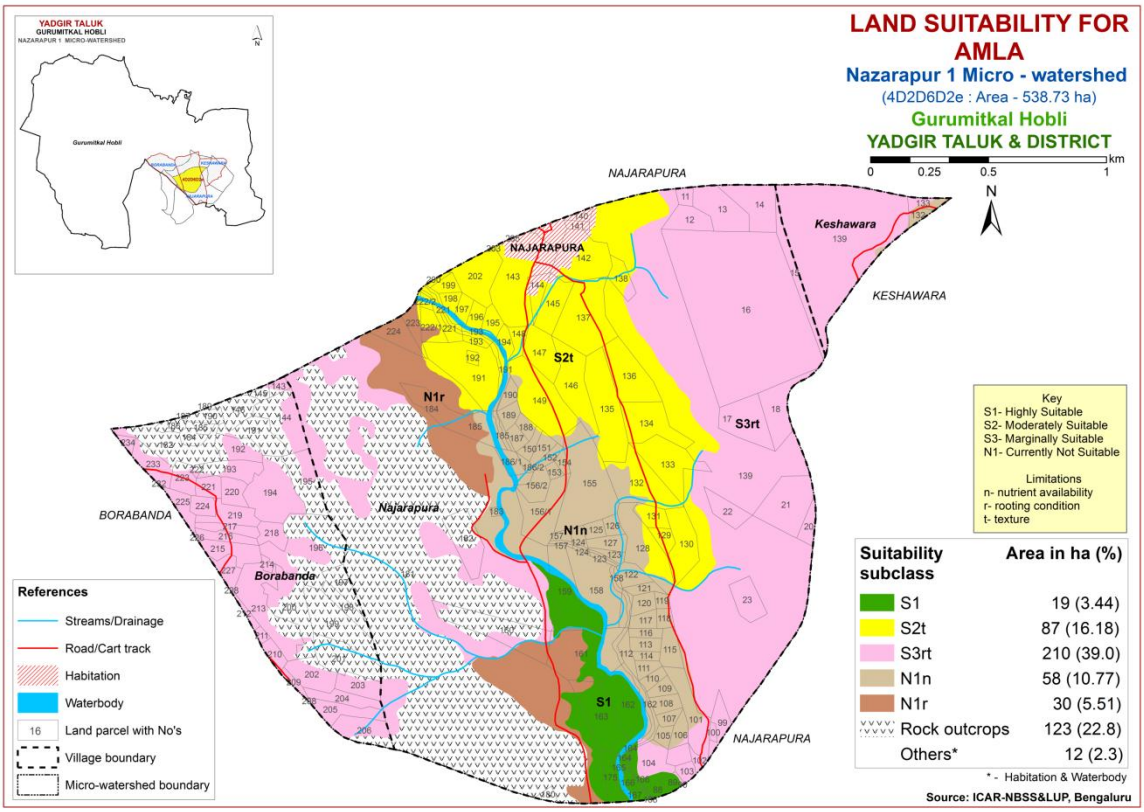


Fig. 7.21 Land Suitability map of Amla

7.22 Land Suitability for Cashew (*Anacardium occidentale)*

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

Highly suitable (Class S1), moderately suitable (Class S2) and marginally suitable (Class S3) lands are not available for cashew in the microwatershed. Currently not suitable (Class N1) lands occur in an area of 404 ha (75%) and are distributed in all parts of the microwatershed with severe limitations of rooting depth, texture, calcareous and nutrient availability.

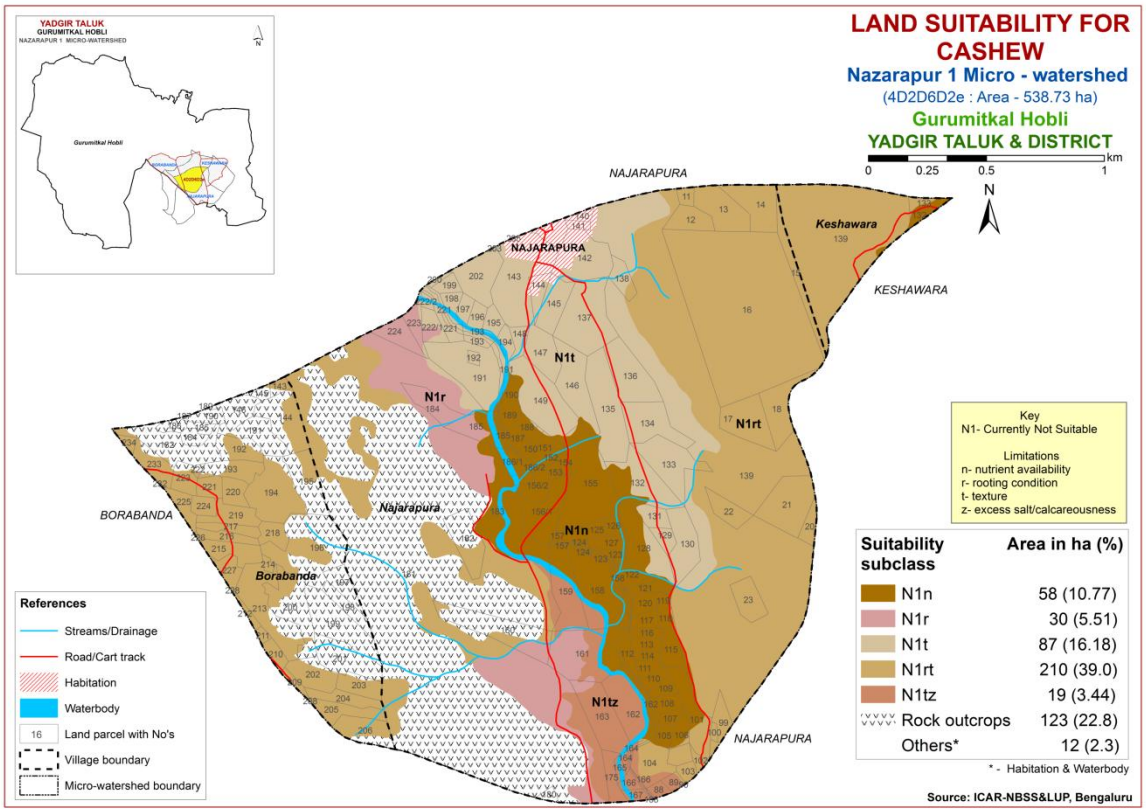


Fig. 7.22 Land Suitability map of Cashew

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

Jackfruit is one of the most important fruit crop grown in an area of 5368 ha in almost all the districts of the State. The crop requirements for growing jackfruit (Table 7.24) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jackfruit was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.23.

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands available for growing jackfruit in the microwatershed. Marginally suitable lands (Class S3) for growing jackfruit occupy an area of about 106 ha (20%) and are distributed in the northern, central and southern part of the microwatershed with moderate limitation of texture. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

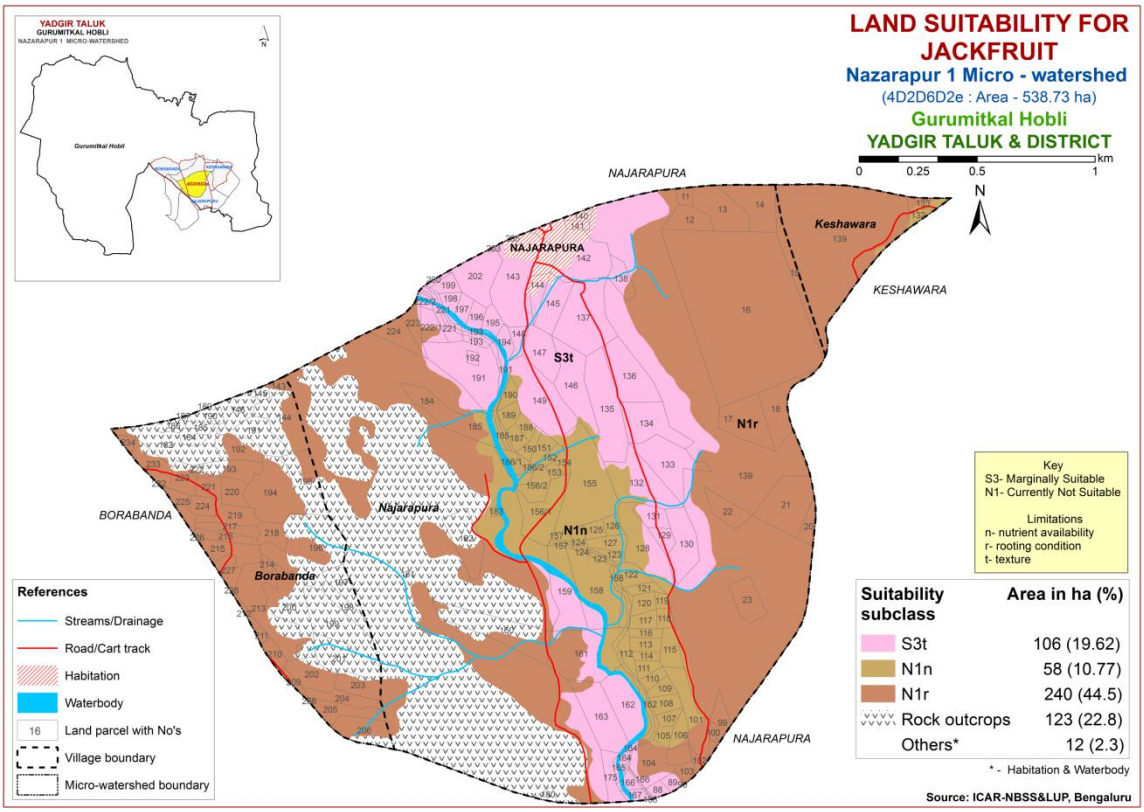


Fig. 7.23 Land Suitability map of Jackfruit

7.24 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 25) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jamun was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.24.

No highly suitable (Class S1) lands are available for growing jamun in the microwatershed. An area of about 106 ha (20%) is moderately suitable (Class S2) for growing jamun and are distributed in the northern, central and southern part of the microwatershed. They have minor limitation of texture. Currently not suitable (Class N1) lands occur in an area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

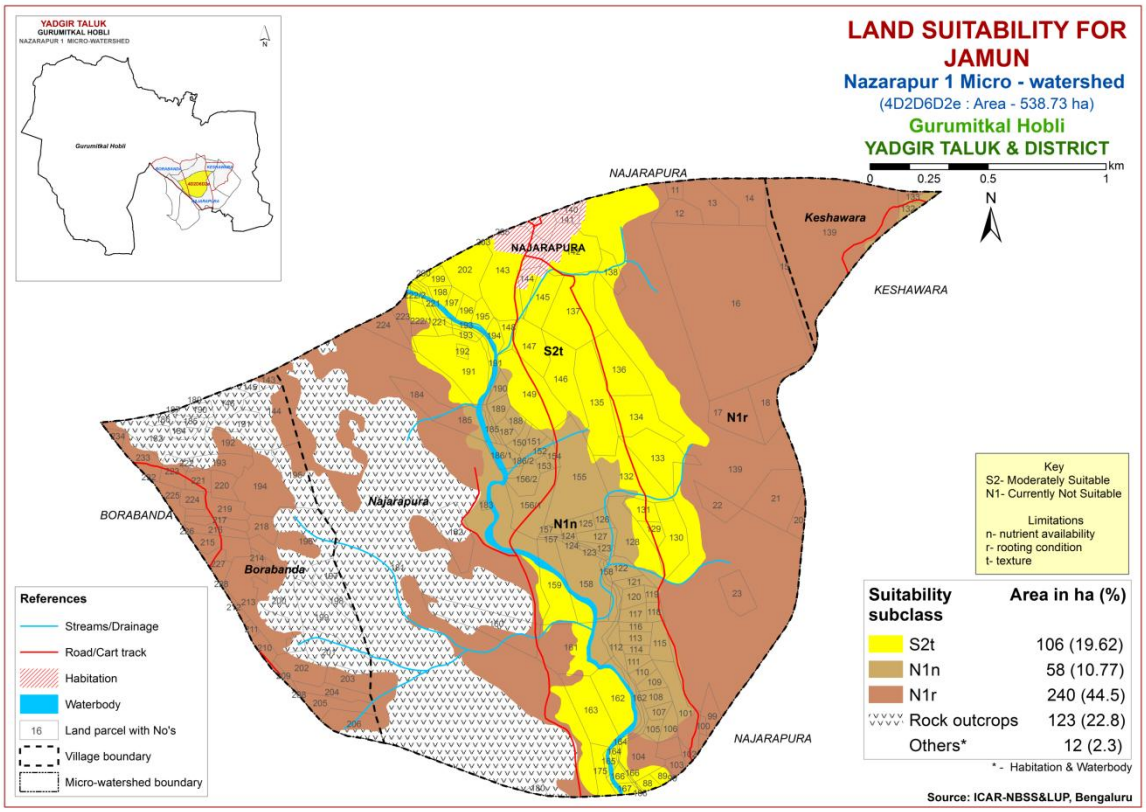


Fig. 7.24 Land Suitability map of Jamun

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

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing custard apple (Table7.26) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

Highly (Class S1) suitable lands for growing custard apple occur in an area of 106 ha (20%) and are distributed in the central and northern part of the microwatershed. Marginally suitable lands (Class S3) for growing custard apple occupy a maximum area of about 210 ha (39%) with moderate limitations of rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the western, central and southern part of the microwatershed with severe limitations of rooting depth and nutrient availability.

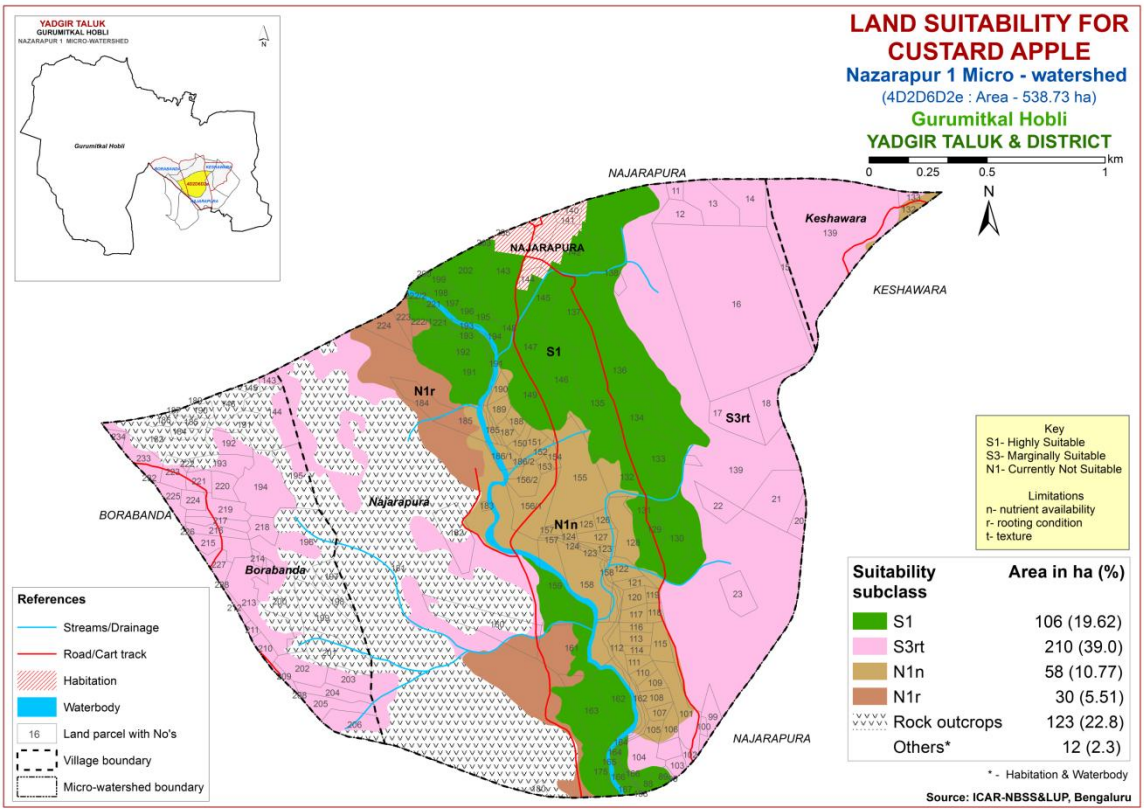


Fig. 7.25 Land Suitability map of Custard Apple

7.26 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the most important spice crop grown in almost all the districts of the state. The crop requirements for growing tamarind (Table 7.27) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tamarind was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.26.

There are no highly (Class S1) suitable lands available for growing tamarind crop in the microwatershed. An area of about 106 ha (20%) is moderately suitable (Class S2) for growing tamarind and are distributed in the central, northern and southern part of the microwatershed. They have minor limitations of texture and drainage. Currently not suitable (Class N1) lands occur in a maximum area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

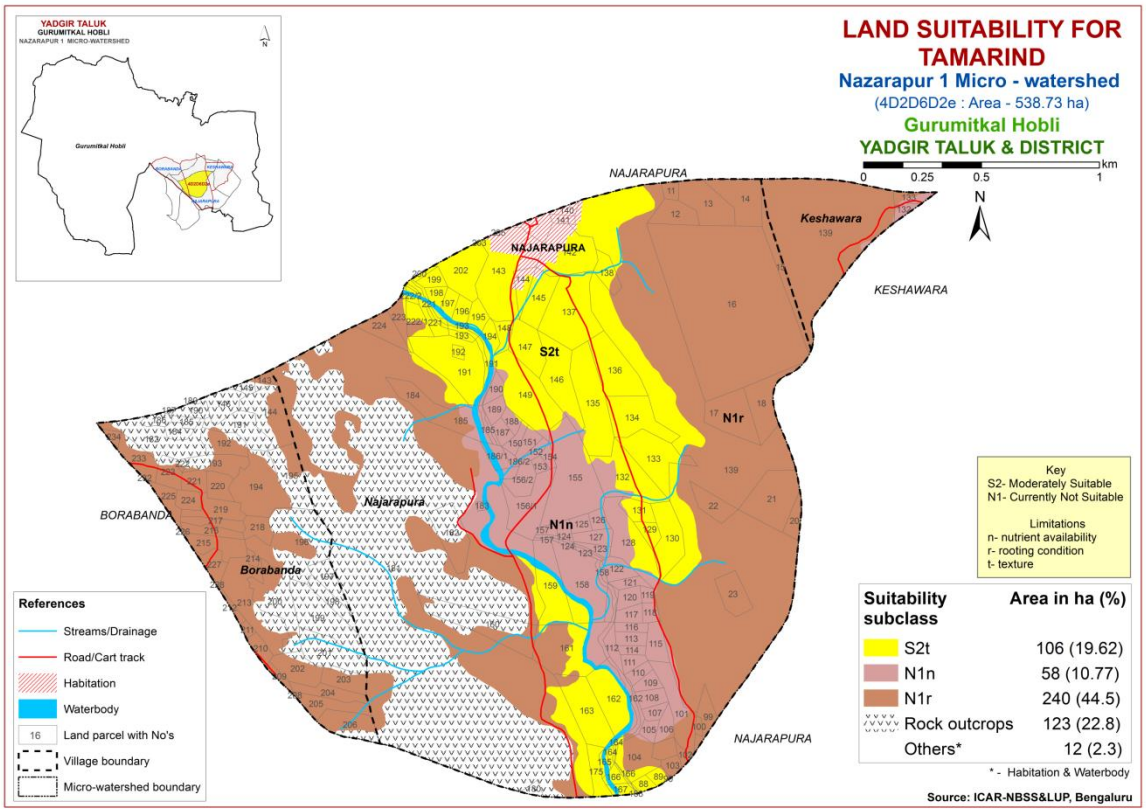


Fig. 7.26 Land Suitability map of Tamarind

7.27 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is one of the important leaf crop grown for rearing silk worms in about 1.6 lakh ha area in all the districts of the state. The crop requirements for growing mulberry (Table 7.28) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mulberry was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.27.

There are no highly suitable (Class S1) and moderately suitable (Class S2) lands available for growing mulberry in the microwatershed. Marginally suitable lands (Class S3) for growing mulberry occupy an area of about 105 ha (20%) and are distributed in the northern, central and southern part of the microwatershed with moderate limitations of texture and drainage. Currently not suitable (Class N1) lands occur in a maximum area of 298 ha (55%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

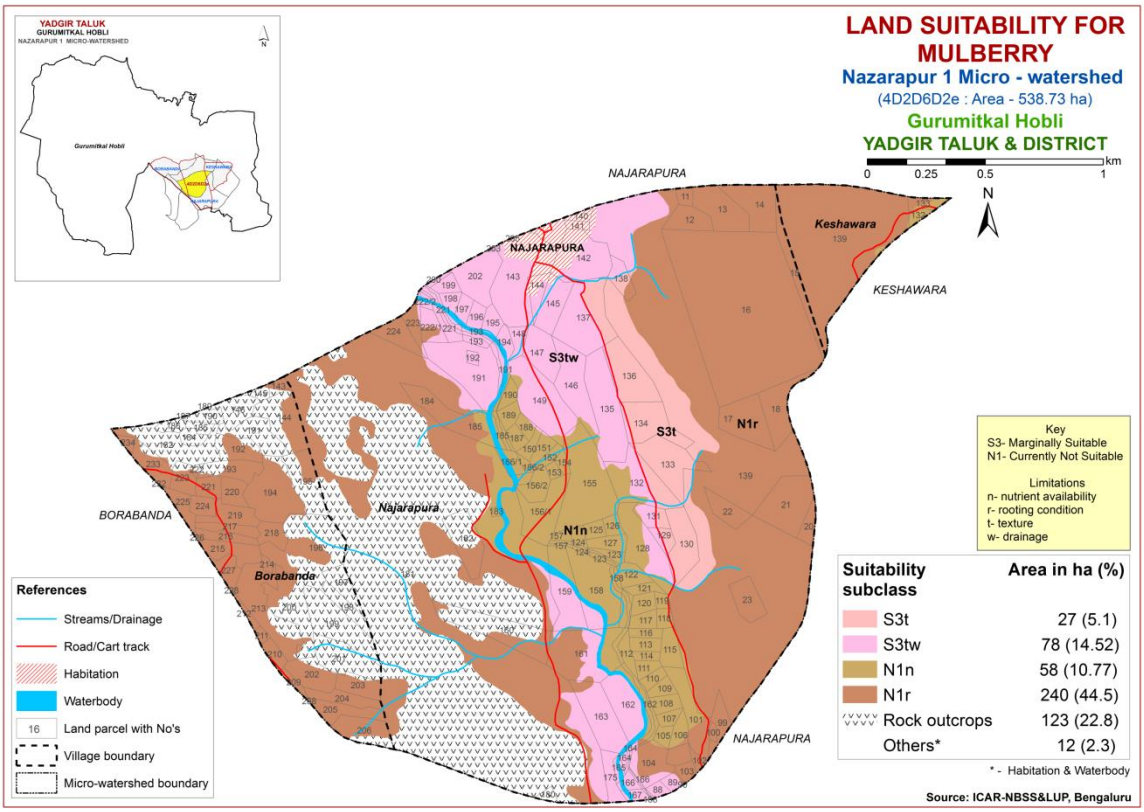


Fig 7.27 Land Suitability map of Mulberry

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

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

No highly suitable (Class S1) lands are available for growing marigold in the microwatershed. An area of about 105 ha (20%) is moderately suitable (Class S2) for growing marigold and are distributed in the northern, central and southern part of the microwatershed with minor limitations of texture and drainage. Marginally suitable lands (Class S3) for growing marigold occupy a maximum area of about 210 ha (39%) with moderate limitation of rooting depth. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

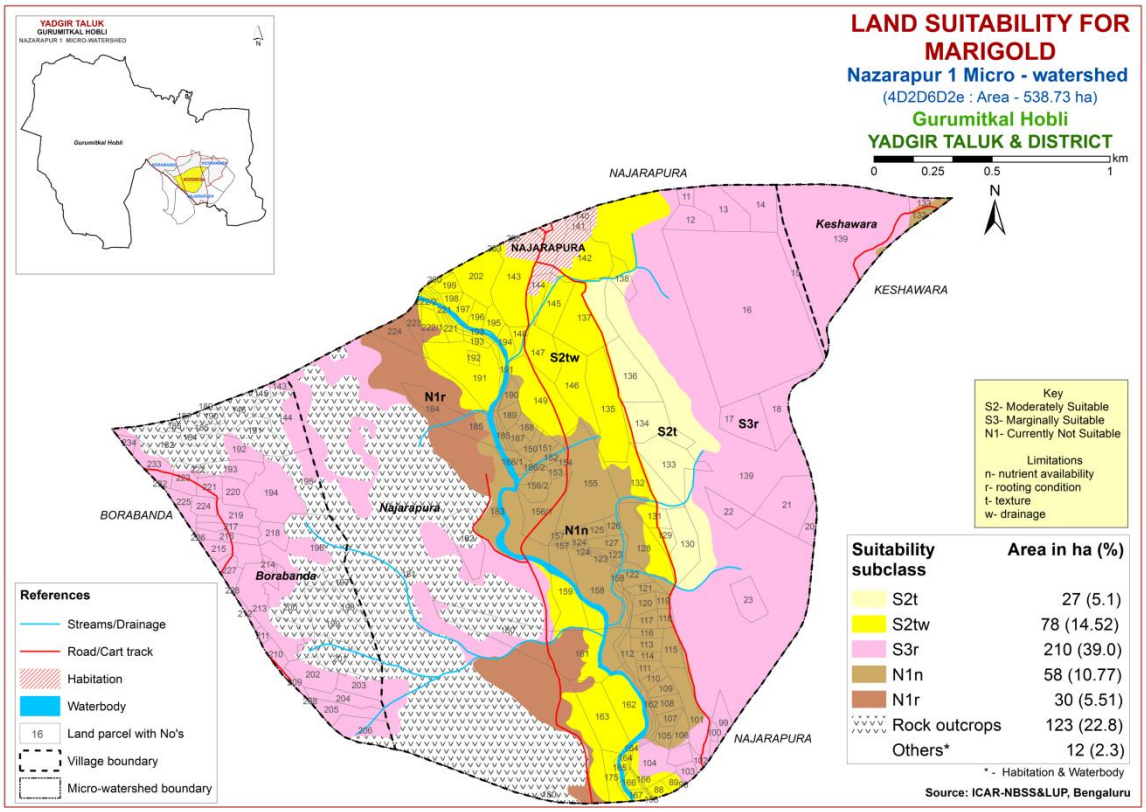


Fig. 7.28 Land Suitability map of Marigold

7.29 Land Suitability for Chrysanthemum (*Dendranthema grandiflora*)

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

No highly suitable (Class S1) lands are available for growing chrysanthemum in the microwatershed. An area of about 105 ha (20%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in the northern, central and southern part of the microwatershed with minor limitations of texture and drainage. Marginally suitable lands (Class S3) for growing chrysanthemum occupy a maximum area of about 210 ha (39%) with moderate limitation of rooting depth. Currently not suitable (Class N1) lands occur in an area of 88 ha (16%) and are distributed in the southern, central and western part of the microwatershed with severe limitations of rooting depth and nutrient availability.

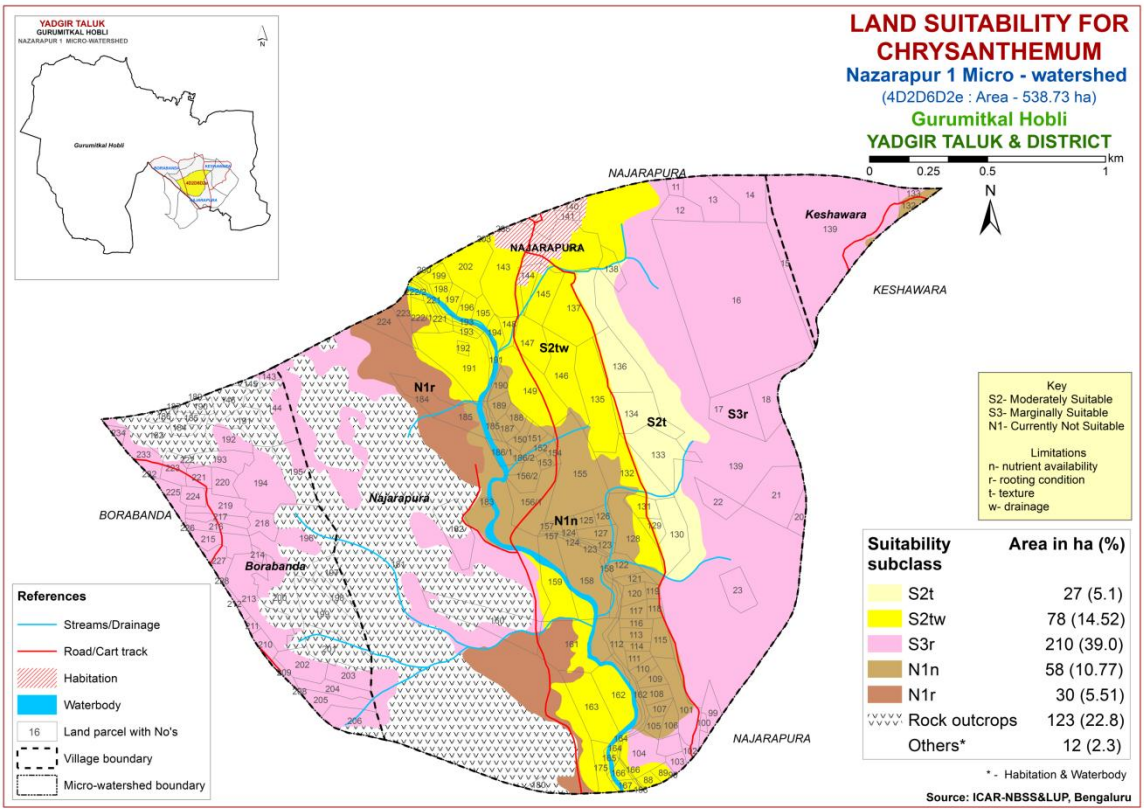


Fig. 7.29 Land Suitability map of Chrysanthemum

Table 7.1 Soil-Site Characteristics of Nazarapur-1Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drain-age Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP (%)	CEC [Cmol (p^{+})kg^{-1}]	BS (%)
					Sur-face	Sub-surface	Surface (%)	Sub-surface (%)								
KKRbB2g1	866	150	WD	25-50	ls	sl	15-35	10-15	<50	1-3	moderate	5.85	0.03	1.17	2.6	61
HTKbB2g1	866	150	WD	25-50	ls	sl	15-35	10-25	<50	1-3	moderate	6.81	0.06	0.38	3	97
HTKcC2g1	866	150	WD	25-50	sl	sl	15-35	10-25	<50	3-5	moderate	6.81	0.06	0.38	3	92
MDGcA1	866	150	WD	100-150	sl	scl	<15	<15	>200	0-1	slight	8.2	0.39	3.08	4.90	100
MDGcB2	866	150	WD	100-150	sl	scl	<15	<15	>200	1-3	moderate	8.2	0.39	3.08	4.90	100
MDGhA1	866	150	WD	100-150	scl	scl	<15	<15	>200	0-1	slight	8.2	0.39	3.08	4.90	100
YDRcB2	866	150	WD	100-150	sl	sl	<15	<15	51-100	1-3	moderate	7.25	0.11	0.31	3.40	96
YDRiB2	866	150	WD	100-150	sc	sl	<15	<15	51-100	1-3	moderate	7.25	0.11	0.31	3.40	96
HGNmB2	866	150	MW	>150	c	c	<15	<15	>200	1-3	moderate	8.77	1.33	14.38	36.23	100

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

Table 7.2 Land suitability criteria for Sorghum

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

Table 7.3 Land suitability criteria for Maize

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

Table 7.4 Land suitability criteria for Bajra

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

Table 7.5 Land suitability criteria for Groundnut

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

Table 7.6 Land suitability criteria for Sunflower

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

Table 7.7 Land suitability criteria for Redgram

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

Table 7.8 Land suitability criteria for Bengal gram

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

Table 7.9 Land suitability criteria for Cotton

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

Table 7.10 Land suitability criteria for Chilli

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

Table 7.11 Land suitability criteria for Tomato

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

Table 7.12 Land suitability criteria for Brinjal

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

Table 7.13 Land suitability criteria for Onion

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

Table 7.14 Land suitability criteria for Bhendi

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

Table 7.15 Land suitability criteria for Drumstick

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

Table 7.16 Land suitability criteria for Mango

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

Table 7.17 Land suitability criteria for Guava

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

Table 7.18 Land suitability criteria for Sapota

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

Table 7.19 Land suitability criteria for Pomegranate

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

Table 7.20 Land suitability criteria for Musambi

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

Table 7.21 Land suitability criteria for Lime

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

Table 7.22 Land suitability criteria for Amla

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

Table 7.23 Land suitability criteria for Cashew

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

Table 7.24 Land suitability criteria for Jackfruit

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

Table 7.25 Land suitability criteria for Jamun

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

Table 7.26 Land suitability criteria for Custard apple

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

Table 7.27 Land suitability criteria for Tamarind

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

Table 7.28 Land suitability criteria for Mulberry

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

Table 7.29 Land suitability criteria for Marigold

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

Table 7.30 Land suitability criteria for Chrysanthemum

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

7.30 Land Management Units (LMUs)

The 9 soil map units identified in Nazarapur-1microwatershed have been grouped into 4 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig. 7.30) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

The 9 map units that have been grouped into 4 Land Management Units along with brief description of soil and site characteristics are given below.

LMU	Soil map units	Soil and site characteristics
1	42.YDRcB2 43.YDRiB2	Deep (100 -150 cm), sandy loam soils, 1-3% slopes, non gravelly (<15%), moderate erosion.
2	169.MDGcA1 57.MDGcB2 171.MDGhA1	Deep (100 -150 cm), sandy clay loam soils, 0-3% slopes, non gravelly (<15%), slight to moderate erosion.
3	95.HGNmB2	Very deep (>150 cm), black clay soils, 1-3% slopes, non gravelly (<15%), moderate erosion.
4	153.KKRbB2g1 161.HTKbB2g1 113.HTKcC2g1	Very shallow to shallow (<25-50 cm), sandy loam soils, 1-5% slopes, gravelly (15-35%), moderate to severe erosion

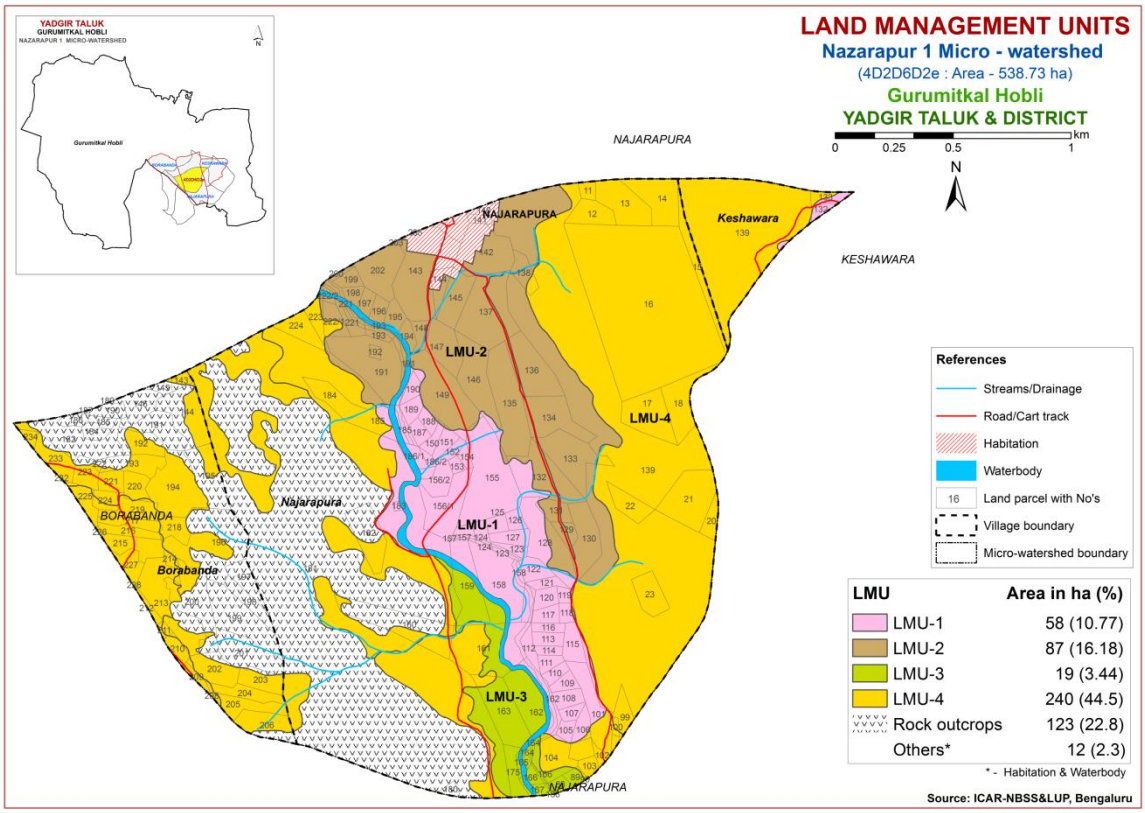


Fig. 7.30 Land Management Units Map- Nazarapur-1Microwatershed

7.31 Proposed Crop Plan for Nazarapur-1Microwatershed

After assessing the land suitability for the 29 crops, the Proposed Crop Plan has been prepared for the 4 identified LMUs by considering only the highly (Class S1), moderately (Class S2) and marginally (Class S3) suitable lands for each of the 29 crops. The resultant proposed crop plan is presented below in Table 7.31.

Table 7.31 Proposed Crop Plan for Nazarapur-1Microwatershed

LMU	Soil Map Units	Survey Number	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	42.YDRcB2 43.YDRiB2 (Deep, sodic sandy loam soils)	**Keshawara :** 132,133 **Najarapura:**101,105,106,107,108, 109,110,111,112,113,114,115,116, 117,118,119,120,121,122,123,124, 125,126,127,128,150,151,152,153, 154,155,156/1,156/2,157,158,183, 186/1,186/2,187,188, 189,190	-	**Agri-Silvi-Pasture** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass	Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manures, green manures and providing subsurface drainage
2	169.MDGcA1 57.MDGcB2 171.MDGhA1 (Deep, sandy clay loam soils)	**Najarapura:**129,130,131,132,133, 134,135,136,137,138,142,143,144, 145,146,147,148,149,191,192,193, 194,195,196,197,198,199,200,202, 203,221, 222/1,222/2	Sunflower, Sorghum, Maize, Groundnut, Red gram, Bajra	**Fruit crops:** Mango, Musambi, Sapota, Tamarind, Pomegranate, Amla, Custard apple, Guava, Jackfruit, Jamun, Lime **Vegetables:** Tomato, Onion, Bhendi, Chilli, Brinjal, Coriander Drumstick,, **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
3	95.HGNmB2 (Very deep black clay soils)	**Najarapura:**88,89,159,162,163,16 4,165,166, 167,168,175	Sorghum, Maize, Sunflower, Red gram,Bajra, Bengal gram, safflower, linseed	**Fruit crops:** Musambi, Sapota, Pomegranate, Amla, Custard apple, Guava, Jackfruit, Lime **Vegetables:** Tomato, Onion, Bhendi, Chilli, Brinjal, Drumstick,, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
4	153.KKRbB2g1 161.HTKbB2g1 113.HTKcC2g1 (Shallow to very shallow sandy loam soils)	**Borabanda:**143,192,193,194,202, 203,204,205,206,208,209,210,211, 212,213,214,215,216,217,218,219, 220,221,223,224,225,226,227,228, 232, 233,234 **Keshawara :** 139 **Najarapura:**11,12,13,14,15,16,17, 18,,20,21,22,23,90,99,100,102,103 ,104,139,161,184,185, 223,224	-	**Agri-Silvi-Pasture:** Custard apple, Hybrid Napier, *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

Soil health is basic to plant health and plant health is basic to human 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 Nazarapur-1Microwatershed

The soil phases identified in the microwatershed belonged to the soil series of HTK series occupies a maximum area of 210 ha (39%) followed by MDG 87 ha (16%), YDR 58 ha (11%), KKR 30 ha (6%) and HGN 22 ha (4%). Brief description of each series identified and number of soil phases mapped is given below.

- As per land capability classification entire area of the microwatershed falls under arable land category (Class II, III &IV). The major limitations identified in the arable lands were soil and erosion.

- On the basis of soil reaction, about 18 ha (3%) is slightly acid (pH 6.0-6.5), 45 ha (8%) is neutral and 340 ha (63%) area is slightly to moderately alkaline (pH 7.3-8.4).
- **Soil Health Management**

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

Acid soils

Acid soils cover about 18 ha area in the microwatershed.

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

Liming materials:

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

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

Alkaline soils

Slightly alkaline to moderately alkaline soils cover about 340 ha area in the microwatershed.

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

Neutral soils

Neutral soils occur in 45 ha area in the microwatershed.

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

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

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. Out of total 539 ha area in the microwatershed, an area of about 60 ha (11%) is suffering from slight erosion and about 344 ha (64%) is suffering from moderate erosion. In areas of moderate erosion immediate soil and water conservation and, other land development and land husbandry practices are required for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

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

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

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

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

developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Nazarapur-1microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is medium (0.5-0.75%) in 156 ha (29%) area and high (>0.75%) in 247 ha (46%). The areas that are medium in OC needs to be further improved by applying farmyard manure and crop rotation 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 502 ha area where OC is low and medium (<0.5 - 0.75%). For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus**: Available Phosphorus is medium (23-57 kg/ha) in an area of 224 ha (42%) and high (>57 kg/ha) in an area of 179 ha (33%) of the microwatershed. In medium areas, for all the crops 25% additional P needs to be applied.
- **Available Potassium:** Available potassium is medium (145-337 kg/ha) in an area of 338 ha (63%) of the microwatershed and high (>337 kg/ha) in 66 ha (12%). All the plots, where available potassium is medium, for all the crops, additional 25% potassium may be applied.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. It is medium (10-20 ppm) in the entire area of about 403 ha (75%). Medium areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** Available boron content is medium in the entire area of 403 ha (75%) of the microwatershed. Application of sodium tetra borate @ 10 kg/ha as soil application or 0.2 % borax as foliar spray is recommended for low boron content soils.
- **Available Iron:** Entire area of the microwatershed is sufficient (>4.5 ppm) in available iron content.

- **Available Manganese:** All the soils in the microwatershed are sufficient (>1.0 ppm) in available manganese.
- **Available Copper:** All the soils in the microwatershed are sufficient (>0.2 ppm) in available copper.
- **Available Zinc:** Maximum area of about 363 ha (67%) is deficient (<0.6 ppm) in available zinc content and low (>0.6 ppm) in an area of 40 ha (8%). Application of zinc sulphate @25 kg/ha is recommended for deficient areas.
- **Soil Alkalinity**: Maximum area of 340 ha (63%) in the microwatershed has soils that are slightly to moderately alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acacia, Neem, Ber etc, are recommended.

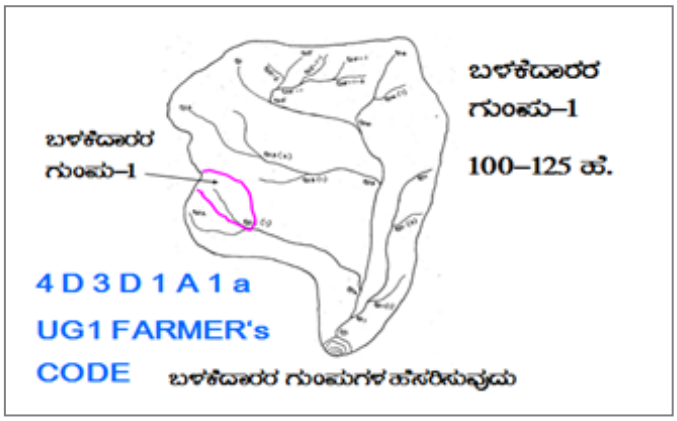
Land Suitability for various crops: Areas that are highly, moderately and marginally suitable and not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content,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

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

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

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



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

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

Steps for Survey and Preparation of Treatment Plan

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

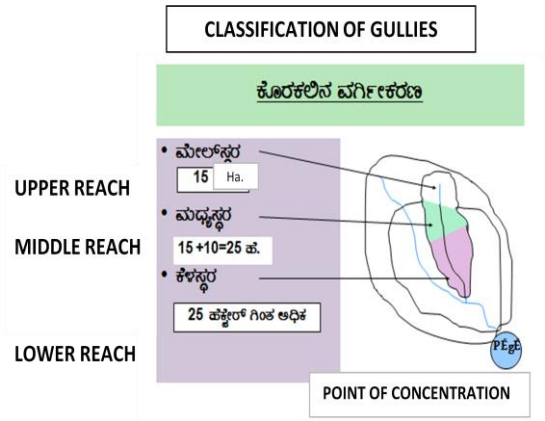
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below

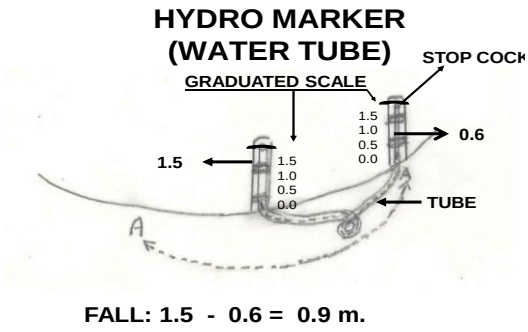
9.1.1 Arable Land Treatment

A. BUNDING

Steps for Survey and Preparation of Treatment Plan		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.



FALL: 1.5 - 0.6 = 0.9 m.

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.

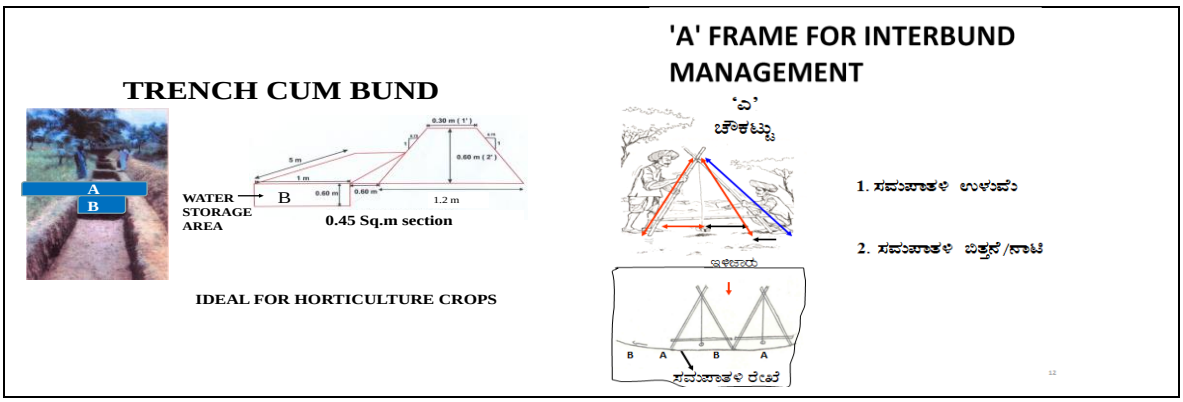
Recommended Bund Section

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. Water Ways

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

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. Maximum area of about 344 ha (64%) needs Graded Bunding and 60 ha (11%) needs strengthening of existing bunds.

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

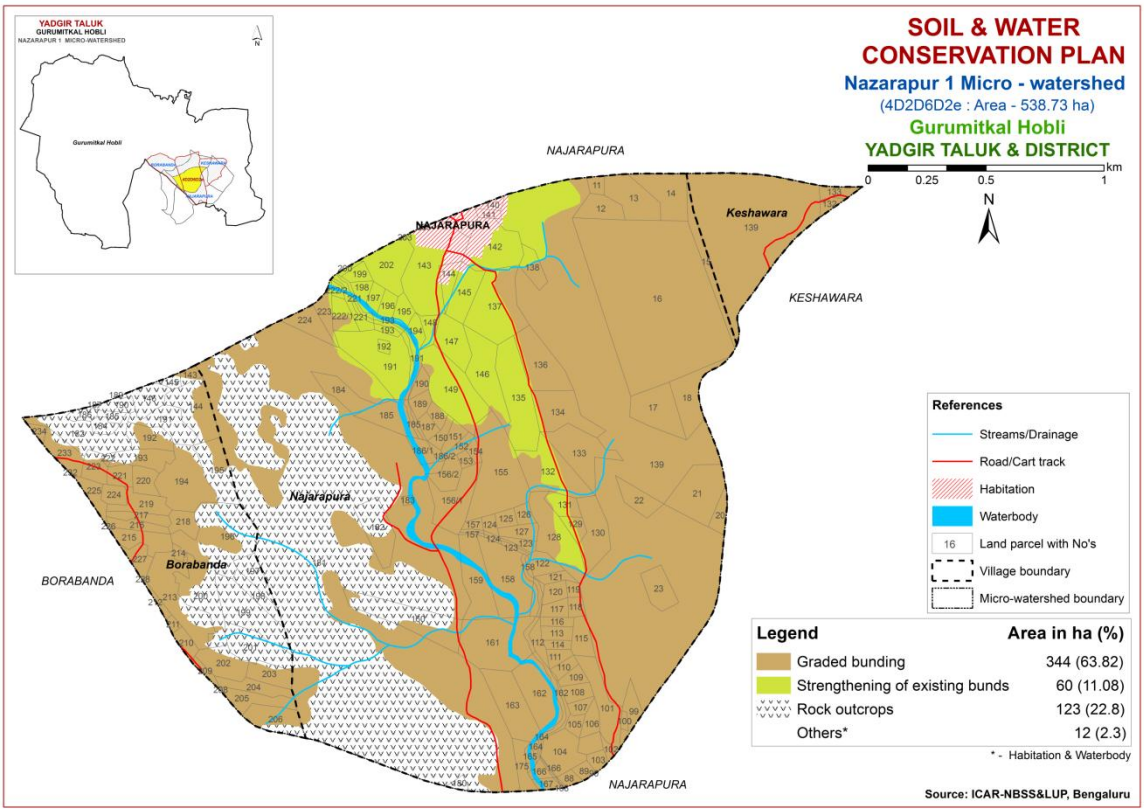


Fig. 9.1 Soil and Water Conservation Plan map of Nazarapur-1Microwatershed

9.3 Greening of Microwatershed

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

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

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

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

References

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

Appendix-I

Nazarapur-1 (6D2e) Microwatershed

Soil Phase Information

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Borabanda	143	0.48	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	144	3.5	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	145	0.42	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	146	1.67	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	182	3.95	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	184	0.65	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	185	0.44	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	186	0.59	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	187	0.04	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	189	0	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	190	0.81	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	191	2.31	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Borabanda	192	1.77	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	193	1.85	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	194	4.68	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	195	2.86	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	196	6.96	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Borabanda	197	1.36	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	198	1.19	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	199	4.14	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	200	4.04	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	201	3.09	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Borabanda	202	2.16	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	203	1.55	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	204	1.43	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	205	1.74	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	206	2.39	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	208	0.02	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	209	0.41	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	210	0.75	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	211	0.27	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	212	0.36	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	213	4.83	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	214	0.26	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	215	1.85	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	216	1	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	217	0.98	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	218	1.13	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	219	1.72	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	220	1.17	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	221	0.94	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	222	0.17	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Borabanda	223	1.21	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	224	0.82	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Borabanda	225	1.05	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	226	0.06	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Borabanda	227	1.06	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	228	0.01	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	232	0.02	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	233	1.74	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Borabanda	234	0.34	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Keshawara	132	0.45	YDRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Jowar+Scrub land (Rg+Jw+Sl)	Not Available	IIes	Graded bunding
Keshawara	133	0.74	YDRcB2	LMU-1	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Keshawara	139	20.84	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Najarapura	11	0.5	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	12	1.68	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	13	3.09	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	14	3.14	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	15	1.78	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Najarapura	16	32.85	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Najarapura	17	3.35	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	18	2.83	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	20	0.86	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	21	4.22	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	22	1.48	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Najarapura	23	1.81	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Najarapura	88	0.43	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	89	0.48	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	90	0.01	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIIes	Graded bunding
Najarapura	99	1.16	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Najarapura	100	0.21	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	Paddy (Pd)	Not Available	IIIes	Graded bunding
Najarapura	101	2.88	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	102	0.36	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIIes	Graded bunding
Najarapura	103	0.54	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIIes	Graded bunding
Najarapura	104	2.5	HTKbB2g1	LMU-4	Shallow (25-50 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIIes	Graded bunding
Najarapura	105	0.55	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	106	0.84	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	107	0.54	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	108	0.86	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	109	0.67	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	110	0.57	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	111	0.6	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	112	0.72	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	113	0.78	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	114	0.44	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	115	1.29	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	116	0.56	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	117	0.76	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	118	0.56	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	119	0.39	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	120	0.81	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	121	0.59	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	122	1.05	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	123	0.63	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Najarapura	124	0.57	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	125	0.59	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	126	0.6	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	127	0.95	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	128	4.22	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Najarapura	129	0.76	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Jowar (Jw)	Not Available	IIs	Graded bunding
Najarapura	130	3.01	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Najarapura	131	1.13	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram+Jowar (Rg+Jw)	Not Available	IIs	Graded bunding
Najarapura	132	4.49	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Najarapura	133	3.79	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Najarapura	134	3.47	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Najarapura	135	5.4	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Najarapura	136	3.76	MDGcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Najarapura	137	5.67	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram+Jowar (Rg+Jw)	Not Available	IIs	Graded bunding
Najarapura	138	1.18	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Cotton (Ct)	Not Available	IIs	Graded bunding
Najarapura	139	74.31	HTKcC2g1	LMU-4	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very low (<50 mm/m)	Gently sloping (3-5%)	Moderate	RO (Rc)	Not Available	IIIes	Graded bunding
Najarapura	140	0.41	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Najarapura	141	0.37	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Najarapura	142	4.2	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Habitation	Not Available	IIs	Graded bunding
Najarapura	143	6.92	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Habitation	Not Available	IIs	Graded bunding
Najarapura	144	1.02	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Habitation	Not Available	IIs	Graded bunding
Najarapura	145	2.25	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Najarapura	146	3.89	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Najarapura	147	2.38	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Najarapura	148	0.79	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	149	5.44	MDGcA1	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Najarapura	150	0.59	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	151	0.75	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	152	0.53	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	153	0.35	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	154	0.4	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	155	7.28	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	156/1	3.42	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	156/2	1.31	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	157	0.44	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	158	5.2	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	159	3.78	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	160	4.84	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Najarapura	161	5.89	KKRbB2g1	LMU-4	Very shallow (<25 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Najarapura	162	4.19	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	163	3.9	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	164	0.26	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	165	0.38	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	166	0.54	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	167	0.47	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	168	0.04	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	175	1.17	HGNmB2	LMU-3	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	180	0.33	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Najarapura	181	135.85	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	Not Available	RO	RO
Najarapura	182	2.8	RO	RO	RO	RO	RO	RO	RO	RO	Redgram (Rg)	Not Available	RO	RO
Najarapura	183	0.17	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Najarapura	184	1.8	KKRbB2g1	LMU-4	Very shallow (<25 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Najarapura	185	2.4	KKRbB2g1	LMU-4	Very shallow (<25 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Najarapura	186/1	0.84	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	186/2	0.26	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	187	0.61	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	188	0.55	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	189	0.73	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	190	0.62	YDRiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Najarapura	191	5.78	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	192	0.26	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	193	0.51	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	194	0.68	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	195	0.89	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	196	0.74	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	197	0.65	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	198	0.77	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	199	0.67	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	200	0.19	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	202	3.09	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	203	0.05	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	221	0.99	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Najarapura	222/1	1.19	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	222/2	0.28	MDGhA1	LMU-2	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Graded bunding
Najarapura	223	1.06	KKRbB2g1	LMU-4	Very shallow (<25 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Najarapura	224	1.57	KKRbB2g1	LMU-4	Very shallow (<25 cm)	Loamy sand	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Najarapura	295	0	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others

Appendix II

Nazarapur-1 (6D2e) Microwatershed

Soil Fertility Information

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Borabanda	143	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Borabanda	144	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	145	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	146	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	182	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	184	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	185	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	186	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	187	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	189	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	190	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	191	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	192	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	193	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	194	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	195	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	196	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	197	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	198	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	199	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	200	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	201	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borab	202	Neutral (pH 6.5 –	Non saline	High (> 0.75	High (> 57	High (> 337	Medium (10 –	Medium (0.5 –	Sufficient	Sufficient (>	Sufficient (>	Sufficient (>

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
anda		7.3)	(<2 dsm)	%)	kg/ha)	kg/ha)	20 ppm)	1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Borabanda	203	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	204	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	205	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	206	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	208	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	209	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	210	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	211	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	212	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	213	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	214	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	215	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	216	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	217	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	218	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	219	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	220	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	221	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	222	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	223	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	224	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	225	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borabanda	226	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borab	227	Slightly acid (pH 6.0	Non saline	High (> 0.75	High (> 57	Medium (145 –	Medium (10 –	Medium (0.5 –	Sufficient	Sufficient (>	Sufficient (>	Sufficient (>

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
anda		– 6.5)	(<2 dsm)	%)	kg/ha)	337 kg/ha)	20 ppm)	1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Borab anda	228	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borab anda	232	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borab anda	233	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Borab anda	234	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kesha wara	132	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kesha wara	133	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Kesha wara	139	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	11	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	12	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	13	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	14	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	15	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	16	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	17	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	18	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	20	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	21	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	22	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	23	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	88	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	89	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	90	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	99	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara	100	Moderately alkaline	Non saline	High (> 0.75	High (> 57	High (> 337	Medium (10 –	Medium (0.5 –	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
pura		(pH 7.8 – 8.4)	(<2 dsm)	%)	kg/ha)	kg/ha)	20 ppm)	1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Najara pura	101	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	102	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	103	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	104	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	105	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	106	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	107	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	108	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	109	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	110	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	111	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	112	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	113	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	114	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	115	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	116	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	117	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	118	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	119	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	120	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	121	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	122	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	123	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara	124	Moderately alkaline	Non saline	Medium (0.5	High (> 57	Medium (145 –	Medium (10 –	Medium (0.5 –	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
pura		(pH 7.8 – 8.4)	(<2 dsm)	– 0.75 %)	kg/ha)	337 kg/ha)	20 ppm)	1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Najara pura	125	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	126	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	127	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	128	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	129	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	130	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	131	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	132	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	133	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	134	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	135	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	136	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	137	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	138	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	139	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	140	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Najara pura	141	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Najara pura	142	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	143	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	144	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	145	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	146	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	147	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara	148	Slightly alkaline (pH	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Medium (10 –	Medium (0.5 –	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
pura		7.3 – 7.8)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	20 ppm)	1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Najara pura	149	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	150	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	151	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	152	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	153	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	154	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	155	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	156/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	156/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	157	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	158	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	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)
Najara pura	159	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	160	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Najara pura	161	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	162	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	163	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	164	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	165	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	166	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	167	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	168	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	175	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	180	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Najara	181	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
pura												
Najara pura	182	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Najara pura	183	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	184	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	185	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	186/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	186/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	187	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	188	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	189	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	190	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	191	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	192	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	193	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	194	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	195	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	196	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	197	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	198	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	199	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	200	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	202	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	203	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	221	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara	222/1	Slightly alkaline (pH	Non saline	Medium (0.5	Medium (23 –	Medium (145 –	Medium (10 –	Medium (0.5 –	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
pura		7.3 – 7.8)	(<2 dsm)	– 0.75 %)	57 kg/ha)	337 kg/ha)	20 ppm)	1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Najara pura	222/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	223	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	224	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Najara pura	295	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

Appendix III

Nazarapur-1 (6D2e) Microwatershed

Soil Suitability Information

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Borabanda	143	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	144	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	145	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	146	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	182	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	184	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	185	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	186	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	187	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	189	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	190	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	191	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	192	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	193	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	194	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	195	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	196	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	197	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	198	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	199	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	200	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	201	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	202	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Borabanda	203	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	204	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	205	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	206	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	208	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	209	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	210	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	211	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	212	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	213	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	214	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	215	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	216	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	217	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	218	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	219	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	220	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	221	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	222	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Borabanda	223	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	224	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	225	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	226	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	227	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	228	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Borabanda	232	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	233	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Borabanda	234	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Keshawara	132	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Keshawara	133	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Keshawara	139	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	11	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	12	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	13	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	14	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	15	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	16	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	17	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	18	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	20	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	21	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	22	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	23	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	88	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	89	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	90	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	99	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	100	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	101	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	102	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Najarapura	103	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	104	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	105	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	106	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	107	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	108	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	109	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	110	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	111	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	112	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	113	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	114	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	115	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	116	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	117	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	118	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	119	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	120	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	121	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	122	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	123	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	124	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	125	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	126	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	127	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Najarapura	128	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	129	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	130	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S1	S1	S2t	S3t
Najarapura	131	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	132	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	133	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S1	S1	S2t	S3t
Najarapura	134	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S1	S1	S2t	S3t
Najarapura	135	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	136	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2t	S1	S3t	S3t	S2t	S2t	S2t	S2t	S2t	S2t	S1	S1	S2t	S3t
Najarapura	137	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	138	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	139	N1r	S3rt	N1r	S3rt	N1r	N1t	N1r	N1r	N1t	N1r	N1r	S3rt	N1r	S3rt	N1rt	N1r	N1r	S3rt	S3r	S3rt	S3rt	S3r	S3r	N1r	S3rt	S3rt	S3r	N1r	N1r
Najarapura	140	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Najarapura	141	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Najarapura	142	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	143	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	144	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	145	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	146	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	147	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	148	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	149	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	150	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	151	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	152	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Najarapura	153	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	154	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	155	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	156/1	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	156/2	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	157	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	158	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	159	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	160	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Najarapura	161	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Najarapura	162	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	163	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	164	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	165	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	166	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	167	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	168	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	175	S3t	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S1	S3t	S1	N1tz	S2t	S1	S3tw	S3t	S2tw	S3tw	S2tw	S2tw	S2t	S2t	S2t	S2t	S2tw	S3tw
Najarapura	180	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Najarapura	181	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Najarapura	182	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Najarapura	183	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	184	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Najarapura	185	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Najarapura	186/1	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Najarapura	186/2	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	187	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	188	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	189	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	190	N1n	S3tn	N1n	S3tn	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Najarapura	191	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	192	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	193	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	194	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	195	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	196	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	197	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	198	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	199	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	200	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	202	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	203	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	221	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	222/1	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	222/2	S2r	S2t	S3t	S1	S3t	S1	S2t	S1	S1	S1	S2tw	S2t	S3t	S1	N1t	S2t	S1	S3tw	S1	S2tw	S2tw	S2tw	S2tw	S2t	S2t	S1	S1	S2tw	S3tw
Najarapura	223	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Najarapura	224	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Najarapura	295	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

Rock outcrops

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

FINDINGS OF THE SOCIO-ECONOMIC SURVEY

- *The survey was conducted in Nazarapur-1 is located at North latitude 16^0 50' 1.92" and 16^0 48'28.869" and East longitude 77^0 25' 14.222" and 77^0 23' 14.268" covering an area of about 538.42 ha coming under under Najarapura, Keshawar and Borabanda Villages of Yadagiri taluk.*
- *Socio-economic analysis of Nazarapur-1 micro watersheds of Gurmatkal sub-watershed, Yadgiri taluk & District indicated that, out of the total sample of 34 total respondents, 19 (55.88 %) were marginal and 12 (35.29%) were small farmers.*
- *The population characteristics of households indicated that, there were 86 (55.84%) men and 68 (44.16 %) were women.*
- *Majority of the respondents (47.40%) were in the age group of 16-35 years.*
- *Education level of the sample households indicated that, there were 61.04 per cent of illiterates, 14.94 per cent of them had primary school education, 9.09 per cent middle school education, and 8.44 per cent high school education, 3.25 per cent of them had PUC education and 2.60 per cent attained graduation*
- *About, 85.29 per cent of household heads practicing agriculture and 14.71 per cent of the household heads were engaged as agricultural labourers.*
- *Agriculture was the major occupation for 62.99 per cent of the household members.*
- *In the study area, 61.76 per cent of the households possess katcha house and 17.65 per cent possess pucca house.*
- *The durable assets owned by the households showed that, 70.59 per cent possess TV, 14.71 per cent possess mixer grinder, 91.18 per cent possess mobile phones and 17.65 per cent possess motor cycles.*
- *Farm implements owned by the households indicated that, 32.35 per cent of the households possess plough, 14.71 per cent possess bullock cart and 17.65 per cent possess sprayer.*
- *Regarding livestock possession by the households, 23.53 per cent possess local cow and 26.47 per cent possess buffalo.*
- *The average labour availability in the study area showed that, own men and women labour availability in the micro watershed was 6.73 each, while the hired labour (men) availability was 1.59.*
- *Further, 2.94 per cent of the households opined that hired labour was inadequate during the agricultural season.*
- *Out of the total land holding of the sample respondents 84.58 per cent (27.27 ha) of the area is under dry condition and the remaining 15.42 per cent area is irrigated land.*
- *There were 7.00 live bore wells and 5.00 dry bore wells among the sampled households.*

- *Bore/open well was the major source of irrigation for 20.59 per cent of the households.*
- *The major crops grown by sample farmers are Red gram, Groundnut, Cotton, Paddy and Green gram and cropping intensity was recorded as 100.00 per cent.*
- *Out of the sample households 100.00 percent possessed bank account and 70.59 per cent of them have savings in the account.*
- *About 20.59 per cent of the respondents borrowed credit from various sources.*
- *Among the credit borrowed by households, 52.63 per cent have borrowed loan from commercial banks and 26.32 per cent from co-operative/Grameena bank.*
- *Majority of the respondents (100.00%) have borrowed loan for agriculture purpose.*
- *Regarding the opinion on institutional sources of credit, 89.47 per cent of the households opined that credit helped to perform timely agricultural operations.*
- *The per hectare cost of cultivation for Red gram, Groundnut, Cotton, Paddy and Green gram was Rs.40948.74, 74253.61, 57058.51, 89347.24 and 39386.59 with benefit cost ratio of 1:1.30, 1: 3.40, 1: 2.00, 1: 1.50 and 1:1.30 respectively.*
- *Further, 52.94 per cent of the households opined that dry fodder was adequate and 0.00 per cent of the households have opined that the green fodder was adequate.*
- *The average annual gross income of the farmers was Rs. 123908.82 in micro-watershed, of which Rs. 49932.35 comes from agriculture.*
- *Sampled households have grown 4 horticulture trees and 65 forestry trees together in the fields and back yards.*
- *Households have an average investment capacity of Rs. 10617.65 for land development and Rs. 4411.76 for irrigation facility.*
- *Source of funds for additional investment is concerned, 23.53 per cent depends on own funds and 11.76 per cent depends on bank loan for land development activities.*
- *Regarding marketing channels, 64.71 per cent of the households have sold agricultural produce to the local/village merchants, while, 32.35 per cent have sold in regulated markets.*
- *Further, 73.53 per cent of the households have used tractor for the transport of agriculture commodity.*
- *Majority of the farmers (58.82%) have experienced soil and water erosion problems in the watershed and 91.18 per cent of the households were interested towards soil testing.*
- *Fire was the major source of fuel for domestic use for 73.53 per cent of the households and 38.24 per cent households has LPG connection.*
- *Piped supply was the major source for drinking water for 100.00 per cent of the households.*
- *Electricity was the major source of light for 100.00 per cent of the households.*
- *In the study area, 55.88 per cent of the households possess toilet facility.*

- ❖*Regarding possession of PDS card, 100.00 per cent of the households possessed BPL card.*
- ❖*Households opined that, the requirement of cereals (94.12%), pulses (97.06%) and oilseeds (79.41%) are adequate for consumption.*
- ❖*Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (105.88%) wild animal menace on farm field (91.18%), frequent incidence of pest and diseases (97.06%), inadequacy of irrigation water (76.47%), high cost of fertilizers and plant protection chemicals (91.18%), high rate of interest on credit (91.18%), low price for the agricultural commodities (91.18%), lack of marketing facilities in the area (55.88%), inadequate extension services (50.00%), lack of transport for safe transport of the agricultural produce to the market (88.24%).*

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, labor force, and levels of education; land ownership and asset position (including livestock and other household assets) of surveyed households; and cropping patterns, input intensities, and average crop yields from farmers' fields. It also discusses crop utilization and the degree of commercialization of production in the areas; farmers' access to and utilization of credit from formal and informal sources; and the level of adoption and use of soil, water, and pest management technologies.

Chapter 3

METHODOLOGY

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

1. Description of the study area

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

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

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

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

The study was conducted in Nazarapur-1 micro-watershed (Gurmatkal sub-watershed, Yadgiri taluk & District) is located at North latitude 16^0 50’ 1.92” and 16^0 48’28.869” and East longitude 77^0 25’ 14.222" and 77^0 23’ 14.268”covering an area of about 538.42 ha bounded by under under Najarapura, Keshawar and Borabanda Villages.

3. Selection of the respondents for the study

The micro-watershed is marked with 320 square meters grids. One farmer from every alternate grid in the micro-watershed was selected for the study and interviewed for socio-economic data. Totally 34 households were interviewed for the survey.

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

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

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

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

5. Development of interview schedule and data collection

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

6. Tools used to analyze the data

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

Abbreviations used in the report

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

Chapter 4

FINDINGS OF THE SURVEY

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

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Nazarapur-1 Micro watershed is presented in Table 1 and it indicated that 34 farmers were sampled in Nazarapur-1 micro-watershed among households surveyed 19 (55.88%) were marginal, 12(35.29%) were small farmers. 3 landless farmers were also interviewed for the survey.

Table 1. Households sampled for socio economic survey in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Farmers	3	8.82	19	55.9	12	35.3	34	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Nazarapur-1 Micro watershed is presented in Table 2. The data indicated that, there were 86 (55.84%) men and 68 (44.16%) were women.

Table 2. Population characteristics in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (11)		MF (91)		SF (52)		All (154)	
		N	%	N	%	N	%	N	%
1	Men	7	63.6	52	57	27	52	86	55.8
2	Women	4	36.4	39	43	25	48	68	44.2
Total		11	100	91	100	52	100	154	100
Average		3.7		4.8		4.3		4.5	

Age wise classification of population: The age wise classification of household members in Nazarapur-1 Micro watershed is presented in Table 3. The indicated that, 27 (17.53%) of population were 0-15 years of age, 73 (47.40%) were 16-35 years of age, 45(29.22%) were 36-60 years of age and 9 (5.84 %) were above 61 years of age.

Table 3: Age wise classification of members of the household in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (11)		MF (91)		SF (52)		All (154)	
		N	%	N	%	N	%	N	%
1	0-15 years of age	5	45.5	13	14.3	9	17.3	27	17.53
2	16-35 years of age	6	54.6	46	50.6	21	40.4	73	47.4
3	36-60 years of age	0	0	26	28.6	19	36.5	45	29.22
4	> 61 years	0	0	6	6.59	3	5.77	9	5.84
Total		11	100	91	100	52	100	154	100

Education level of household members: Education level of household members in Nazarapur-1 Micro watershed is presented in Table 4. The results indicated that, there

were 61.04 per cent of illiterates, 14.94 per cent of them had primary school education, 9.09 per cent middle school education, and 8.44 per cent high school education, 3.25 per cent of them had PUC education and 2.60 per cent attained graduation.

Table 4. Education level of members of the household in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (11)		MF (91)		SF (52)		All (154)	
		N	%	N	%	N	%	N	%
1	Illiterate	6	54.6	55	60.4	33	63.5	94	61
2	Primary School	2	18.2	14	15.4	7	13.5	23	14.9
3	Middle School	1	9.09	6	6.59	7	13.5	14	9.09
4	High School	2	18.2	8	8.79	3	5.77	13	8.44
5	PUC	0	0	3	3.3	2	3.85	5	3.25
6	ITI	0	0	1	1.1	0	0	1	0.65
7	Degree	0	0	4	4.4	0	0	4	2.6
Total		11	100	91	100	52	100	154	100

Occupation of head of households: The data regarding the occupation of the household heads in Nazarapur-1 Micro watershed is presented in Table 5. The results indicate that, 85.29 per cent of households heads were practicing agriculture, 14.71 per cent of the household heads were agricultural Labour.

Table 5: Occupation of heads of households in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Agriculture	0	0	18	95	11	91.67	29	85.29
2	Agricultural Labour	3	100	1	5.3	1	8.33	5	14.71
Total		3	100	19	100	12	100	34	100

Occupation of the members of the household: The data regarding the occupation of the household members in Nazarapur-1 Micro watershed is presented in Table 6. The results indicate that, agriculture was the major occupation for 62.99 per cent of the household members, 9.74 per cent were agricultural labour, 23.38 per cent were working in pursuing education, 2.60 per cent were involved as housewife and 0.65 per cent were childrens.

Table 6: Occupation of members of the household in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (11)		MF (91)		SF (52)		All (154)	
		N	%	N	%	N	%	N	%
1	Agriculture	0	0	60	65.9	37	71.15	97	63
2	Agricultural Labour	6	54.6	7	7.69	2	3.85	15	9.74
3	Private Service	0	0	1	1.1	0	0	1	0.65
4	Student	5	45.5	21	23.1	10	19.23	36	23.4
5	Housewife	0	0	2	2.2	2	3.85	4	2.6
6	Children	0	0	0	0	1	1.92	1	0.65
Total		11	100	91	100	52	100	154	100

Institutional Participation of household members: The data regarding the institutional participation of the household members in Nazarapur-1 Micro watershed is presented in

Table 7. The results show that, out of the total family members in the households were not participating in any of the institutions.

Table 7: Institutional Participation of household member in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (11)		MF (91)		SF (52)		All (154)	
		N	%	N	%	N	%	N	%
1	No Participation	11	100	91	100	52	100	154	100
Total		11	100	91	100	52	100	154	100

Type of house owned: The data regarding the type of house owned by the households in Nazarapur-1 Micro watershed is presented in Table 8. The results indicate that, 20.59 percent possess thatched house, 61.76 per cent of the households possess katcha house and 17.65 per cent possess pacca house.

Table 8. Type of house owned by households in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Thatched	0	0	5	26	2	16.67	7	20.59
2	Katcha	3	100	10	53	8	66.67	21	61.76
3	Pucca/RCC	0	0	4	21	2	16.67	6	17.65
Total		3	100	19	100	12	100	34	100

Durable assets owned by the households: The data regarding the Durable Assets owned by the households in Nazarapur-1 Micro watershed is presented in Table 9. The results shows that, 70.59 per cent possess TV, 14.71 per cent possess mixer grinder, 2.94 per cent possess Bicycle, 17.65 per cent possess motor cycle, 91.18 per cent possess mobile phones.

Table 9. Durable assets owned by households in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Television	3	100	13	68	8	66.7	24	70.59
2	Mixer/Grinder	0	0	2	11	3	25	5	14.71
3	Bicycle	0	0	0	0	1	8.33	1	2.94
4	Motor Cycle	0	0	4	21	2	16.7	6	17.65
5	Mobile Phone	3	100	17	89	11	91.7	31	91.18
6	Blank	0	0	0	0	1	8.33	1	2.94

Table 10. Average value of durable assets owned in Nazarapur-1 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
1	Television	5333	6615	5750	6166
2	Mixer/Grinder	0	1666	1066	1366
3	Bicycle	0	0	1000	1000
4	Motor Cycle	0	33750	45000	37500
5	Mobile Phone	3166	2236	3031	2644

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Nazarapur-1 Micro watershed is presented in Table 10. The result shows that, the average value of television was Rs.6166.00, mixer grinder was Rs.1366.00, bicycle was Rs.1000.00, motor cycle was Rs. 37500.00 and mobile phone was Rs.2644.00.

Farm implements owned: The data regarding the farm implements owned by the households in Nazarapur-1 Micro watershed is presented in Table 11. About 14.71 per cent of the households possess Bullock Cart, 32.35 per cent possess plough, 17.65 per cent possess Sprayer and 52.94 per cent possess Weeder.

Table 11. Farm implements owned in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	3	15.8	2	16.67	5	14.71
2	Plough	0	0	7	36.8	4	33.33	11	32.35
3	Sprayer	0	0	2	10.5	4	33.33	6	17.65
4	Weeder	0	0	12	63.2	6	50	18	52.94
5	Chaff Cutter	0	0	0	0	1	8.33	1	2.94
6	Blank	3	100	6	31.6	5	41.67	14	41.18

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Nazarapur-1 Micro watershed is presented in Table 12. The results show that the average value of plough was Rs.3818.00, bullock Cart was Rs.10250.00, seed/fertilizer drill was Rs.2600.00, sprayer and weeder was Rs.204.00.

Table 12. Average value of farm implements in Nazarapur-1 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
1	Bullock Cart	0	20000	4400	10250
2	Plough	0	3857	3750	3818
3	Sprayer	0	2400	2700	2600
4	Weeder	0	252	102	204
5	Chaff Cutter	0	0	3000	3000

Table 13. Livestock possession by households in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Bullock	0	0	9	47	7	58.33	16	47.06
2	Local cow	0	0	6	32	2	16.67	8	23.53
3	Buffalo	0	0	6	32	3	25	9	26.47
4	Sheep	0	0	0	0	1	8.33	1	2.94
5	Goat	0	0	0	0	1	8.33	1	2.94
6	blank	3	100	6	32	4	33.33	13	38.24

Livestock possession by the households: The data regarding the Livestock possession by the households in Nazarapur-1 Micro watershed is presented in Table 13. The indicate that, 47.06 per cent of the households possess bullocks, 23.53 per cent possess local cow,

26.47 per cent possess buffalo, 2.94 per cent possess sheep and 2.94 per cent possess goat,

Average Labour availability: The data regarding the average labour availability in Nazarapur-1 Micro watershed is presented in Table 14. The indicated that, own labour men available in the micro watershed was 5.35, women available in the micro watershed was 1.38, hired labour (men) available was 1.59 and hired labour (women) available was 6.26.

Table 14. Average labour availability in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
		N	N	N	N
1	Hired labour Female	0	5	7.25	5.35
2	Own Labour Female	0	1.42	1.67	1.38
3	Own labour Male	0	1.79	1.67	1.59
4	Hired labour Male	0	5.84	8.5	6.26

Adequacy of hired labour: The data regarding the adequacy of hired labour in Nazarapur-1 Micro watershed is presented in Table 15. The results indicate that, 88.24 per cent of the household opined that hired labour was adequate, 2.94 per cent of the household opined that hired labour was Inadequate.

Table 15. Adequacy of hired labour in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Adequate	0	0	18	94.7	12	100	30	88.2
2	Inadequate	0	0	1	5.26	0	0	1	2.94

Distribution of land (ha): The data regarding the distribution of land (ha) in Nazarapur-1 Micro watershed is presented in Table 16. The results indicate that, 23.07 ha (84.58%) of dry land and 4.20 ha (15.42 %) of irrigated land.

Table 16. Distribution of land (ha) in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Dry	0	0	10.8	86.91	12.32	82.65	23.07	84.58
2	Irrigated	0	0	1.62	13.09	2.59	17.35	4.2	15.42
Total		0	100	12.4	100	14.91	100	27.27	100

Table 17. Average value of land (ha) in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
		N	N	N	N
1	Dry	0	688177.7	365144.6	515666.7
2	Irrigated	0	1358500	811737.1	1022233

Average value of land (ha): The data regarding the average land value (Rs./ha) in Nazarapur-1 Micro watershed is presented in Table 17. The results show that the average value of dry land was Rs.515666.67 and the average value of irrigated land was Rs.1022232.91.

Status of bore wells: The data regarding the status of bore wells in Nazarapur-1 Micro watershed is presented in Table 18. The results indicate that, there were 5 De-functioning bore wells and 7 functioning bore wells among the sampled households in micro watershed.

Table 18. Status of bore wells in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
		N	N	N	N
1	De-functioning	0	2	3	5
2	Functioning	0	4	3	7

Source of irrigation: The data regarding the source of irrigation in Nazarapur-1 Micro watershed is presented in Table 19. The results that bore well were major source of irrigation for 20.59 per cent of the households.

Table 19. Source of irrigation in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Bore Well	0	0	4	21.1	3	25	7	20.59

Depth of water (Avg. In meters): The data regarding the depth of water in Nazarapur-1 Micro watershed is presented in Table 20. The results revealed that, the depth of bore well was 7.29 meter.

Table 20. Depth of water (Avg. In meters) in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
		N	N	N	N
1	Bore Well	0	9.79	5.16	7.29

Irrigated Area (ha): The data regarding the irrigated area (ha) in Nazarapur-1 Micro watershed is presented in Table 21. The results indicate that, the availability of irrigation water was used for kharif crops was 0.81 ha and 3.40 ha for rabi crop.

Table 21. Irrigated Area (ha) in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
1	Kharif	0	0.81	0	0.81
2	Rabi	0	0.81	2.59	3.4
Total		0	1.62	2.59	4.21

Table 22. Cropping pattern in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
1	Kharif - Red gram (togari)	0	8.9	11.11	20.01
2	Kharif - Greengram	0	1.36	1.21	2.58
3	Rabi - Paddy	0	0.81	1.7	2.51
4	Kharif - Groundnut	0	0.89	0	0.89
5	Rabi - Cotton	0	0	0.89	0.89
6	Kharif - Paddy	0	0.81	0	0.81
Total		0	12.78	14.91	27.69

Cropping pattern: The data regarding the cropping pattern in Nazarapur-1 Micro watershed is presented in Table 22. The results indicate that, farmers have grown Red gram (togari) (20.01 ha), Paddy (3.32 ha), Green gram (2.58 ha), Cotton (0.89 ha) and Groundnut (0.89 ha),

Cropping intensity: The data regarding the cropping intensity in Nazarapur-1 Micro watershed is presented in Table 23. The results indicate that, the cropping intensity was 100.00 per cent.

Table 23. Cropping intensity (%) in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
1	Cropping Intensity	0	100	100	100

Possession of bank account and savings: The data regarding the possession of bank account and saving in Nazarapur-1 micro-watershed is presented in Table 24. The results indicate that, 100.00 cent of the households posses bank account and 70.59 per cent of them have savings.

Table 24. Possession of Bank account and savings in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Account	3	100	19	100	12	100	34	100
2	Savings	2	66.67	13	68.42	9	75	24	70.59

Borrowing status: The data regarding the borrowing status in Nazarapur-1 micro-watershed is presented in Table 25. The results indicate that, 20.59 percent of the sample farmers have borrowed credit from different sources.

Table 25. Borrowing status in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Credit Availed	2	66.67	4	21.05	1	8.33	7	20.59

Source of credit: The data regarding the source of credit availed by households in Nazarapur-1 micro-watershed is presented in Table 26. The results shows that, 52.63 per cent have borrowed loan from commercial banks and 21.05 per cent have borrowed loan from Cooperative bank and 26.32 per cent have borrowed loan from Grameena Bank, 31.58 per cent have borrowed loan from money lender, 5.26 per cent have borrowed loan from SHGs/CBOs.

Table 26. Source of credit borrowed by households in Nazarapur-1 micro-watershed

Sl.No.	Particulars	MF (11)		SF (8)		All (19)	
		N	%	N	%	N	%
1	Commercial Bank	3	27.3	7	87.5	10	52.63
2	Cooperative Bank	2	18.2	2	25	4	21.05
3	Grameena Bank	5	45.5	0	0	5	26.32
4	Money Lender	5	45.5	1	12.5	6	31.58
5	SHGs/CBOs	0	0	1	12.5	1	5.26

Avg. Credit amount: The data regarding the avg. Credit amount in Nazarapur-1 micro-watershed is presented in Table 27. The results show that, farmers have borrowed Avg. Credit of Rs.240265.42 from different sources.

Table 27. Avg. Credit amount in Nazarapur-1 micro-watershed

Sl.No.	Particulars	MF (11)	SF (8)	All (19)
		N	N	N
1	Average Credit	265004	206250	240265

Purpose of credit borrowed (institutional Source): The data regarding the purpose of credit borrowed - Institutional Credit in Nazarapur-1 micro-watershed is presented in Table 28. The results indicate that, 100.00 per cent of the households have borrowed loan for agriculture.

Table 28. Purpose of credit borrowed (institutional Source) by households in Nazarapur-1 micro-watershed

SN	Particulars	MF (10)		SF (9)		All (19)	
		N	%	N	%	N	%
1	Agriculture production	10	100	9	100	19	100

Purpose of credit borrowed (Private Source): The data regarding the purpose of credit borrowed – Private Source in Nazarapur-1 micro-watershed is presented in Table 29. The results indicate that, 71.43 per cent of the households have borrowed loan for agriculture and household consumption (28.57 %).

Table 29. Purpose of credit borrowed (Private Source) by households in Nazarapur-1 micro-watershed

Sl.No.	Particulars	MF (5)		SF (2)		All (7)	
		N	%	N	%	N	%
1	Agriculture production	3	60	2	100	5	71.43
2	Household consumption	2	40	0	0	2	28.57

Repayment status of household (institutional Source): The data regarding the repayment status of credit borrowed from institutional Source by households in Nazarapur-1 micro watershed is presented in Table 30. The results indicate that, 100.00 per cent have unpaid.

Table 30. Repayment status of household (institutional Source) in Nazarapur-1 micro-watershed

Sl.No.	Particulars	MF (10)		SF (9)		All (19)	
		N	%	N	%	N	%
1	Un paid	10	100	9	100	19	100

Repayment status of household (Private Source): The data regarding the repayment status of credit borrowed from private sources by households in Nazarapur-1 micro watershed is presented in Table 31. The results indicate that, 14.29 per cent of the households have partially paid and 14.29 percent have fully paid.

Table 31. Repayment status of household (Private Source) in Nazarapur-1 micro-watershed

Sl.No.	Particulars	MF (5)		SF (2)		All (7)	
		N	%	N	%	N	%
1	Partially paid	0	0	1	50	1	14.3
2	Un paid	5	100	1	50	6	85.7

Opinion regarding institutional sources of credit: The data regarding the opinion on institutional sources of credit in Nazarapur-1 micro watershed is presented in Table 32. The results indicate that, 89.47 per cent of the households opined that credit helped to perform timely agricultural operations and 10.5 per cent Easy accessibility of credit.

Table 32. Opinion regarding institutional sources of credit in Nazarapur-1 micro-watershed

Sl.No.	Particulars	MF (10)		SF (9)		All (19)	
		N	%	N	%	N	%
1	Helped to perform timely agricultural operations	9	90	8	88.9	17	89.5
2	Easy accessibility of credit	1	10	1	11.1	2	10.5

Opinion regarding Non- institutional sources of credit: The data regarding the opinion on non-institutional sources of credit in Nazarapur-1 micro watershed is presented in Table 33. The results indicate that, 89.47 per cent of the households opined that credit helped to perform timely agricultural operations, 57.14 per cent Higher rate of interest.

Table 33. Opinion regarding Non- institutional sources of credit in Nazarapur-1 micro-watershed

Sl.No.	Particulars	MF (5)		SF (2)		All (7)	
		N	%	N	%	N	%
1	Helped to perform timely agricultural operations	1	20	1	50	2	29
2	Loan amount was adequate to fulfil the requirement	0	0	1	50	1	14
3	Higher rate of interest	4	80	0	0	4	57

Cost of Cultivation of Red gram: The data regarding the cost of cultivation (Rs/ha) of Red gram in Nazarapur-1 micro watershed is presented in Table 34.a. The results indicate that, the total cost of cultivation (Rs/ha) for Red gram was Rs. 40948.74. The gross income realized by the farmers was Rs. 54837.79. The net income from Red gram cultivation was Rs.13889.06, thus the benefit cost ratio was found to be 1:1.30.

Table 34(a). Cost of Cultivation of Red gram in Nazarapur-1 micro-watershed

SN	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	46.6	8866.27	21.65
2	Bullock		Pairs/day	2.18	1770.41	4.32
3	Tractor		Hours	3.91	3166.88	7.73
4	Machinery		Hours	0.21	123.5	0.3
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	13.46	1178.78	2.88
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	3.4	8217.49	20.07
8	Fertilizer + micronutrients		Quintal	4.82	4699.69	11.48
9	Pesticides (PPC)		Kgs/liters	1.93	1231.12	3.01
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	184.73	0.45
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				1839.93	4.49
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				31278.8	76.39
III	**Cost B2**					
18	Rental Value of Land				186.96	0.46
19	**Cost B2 = (Cost B1 + Rental value)**				31465.76	76.84
IV	**Cost C1**					
20	Family Human Labour			24.28	5754.72	14.05
21	**Cost C1 = (Cost B2 + Family Labour)**				37220.47	90.9
V	**Cost C2**					
22	Risk Premium				5.65	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**				37226.12	90.91
VI	**Cost C3**					
24	Managerial Cost				3722.61	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				40948.74	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		11.43	53985.21	
		b) Main Crop Sales Price (Rs.)			4725	
	By Product	e) Main Product (q)		1.36	852.58	
		f) Main Crop Sales Price (Rs.)			625	
b.	Gross Income (Rs.)				54837.79	
c.	Net Income (Rs.)				13889.06	
d.	Cost per Quintal (Rs./q.)				3584	
e.	Benefit Cost Ratio (BC Ratio)				1:1.3	

Cost of Cultivation of Groundnut: The data regarding the cost of cultivation (Rs/ha) of Groundnut in Nazarapur-1 micro watershed is presented in Table 34.b. The results indicate that, the total cost of cultivation (Rs/ha) for Groundnut was Rs. 74253.61. The gross income realized by the farmers was Rs. 255308.18. The net income from Groundnut cultivation was Rs.181054.57, thus the benefit cost ratio was found to be 1:3.40.

Table 34(b). Cost of Cultivation of Groundnut in Nazarapur-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	19.09	4041.82	5.44
2	Bullock		Pairs/day	0	0	0
3	Tractor		Hours	3.37	3031.36	4.08
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	224.55	44909.09	60.48
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	0	0	0
8	Fertilizer + micronutrients		Quintal	3.37	3761.14	5.07
9	Pesticides (PPC)		Kgs / liters	1.12	1122.73	1.51
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	0.02	0
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				5975.15	8.05
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				62841.31	84.63
III	**Cost B2**					
18	Rental Value of Land				283.33	0.38
19	**Cost B2 = (Cost B1 + Rental value)**				63124.65	85.01
IV	**Cost C1**					
20	Family Human Labour			16.84	4378.64	5.9
21	**Cost C1 = (Cost B2 + Family Labour)**				67503.28	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				67503.28	90.91
VI	**Cost C3**					
24	Managerial Cost				6750.33	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				74253.61	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		56.14	252613.63	
		b) Main Crop Sales Price (Rs.)			4500	
	By Product	e) Main Product (q)		3.37	2694.55	
		f) Main Crop Sales Price (Rs.)			800	
b.	Gross Income (Rs.)				255308.18	
c.	Net Income (Rs.)				181054.57	
d.	Cost per Quintal (Rs./q.)				1322.74	
e.	Benefit Cost Ratio (BC Ratio)				1:3.4	

Cost of Cultivation of Cotton: The data regarding the cost of cultivation (Rs/ha) of Cotton in Nazarapur-1 micro watershed is presented in Table 34.c. The results indicate, the total cost of cultivation (Rs/ha) for Cotton was Rs.57058.51. The gross income realized by the farmers was Rs. 116202.27. The net income from Cotton cultivation was Rs. 59143.76, thus the benefit cost ratio was found to be 1:2.00.

Table 34(c). Cost of Cultivation of Cotton in Nazarapur-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	66.24	10946.59	19.18
2	Bullock		Pairs/day	2.25	2245.45	3.94
3	Tractor		Hours	5.61	3368.18	5.9
4	Machinery		Hours	3.37	2020.91	3.54
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	2.81	392.95	0.69
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	4.49	11227.27	19.68
8	Fertilizer + micronutrients		Quintal	8.98	8296.95	14.54
9	Pesticides (PPC)		Kgs / liters	4.49	4490.91	7.87
10	Irrigation		Number	1.12	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	49.4	0.09
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				2930.17	5.14
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				45968.8	80.56
III	**Cost B2**					
18	Rental Value of Land				166.67	0.29
19	**Cost B2 = (Cost B1 + Rental value)**				46135.46	80.86
IV	**Cost C1**					
20	Family Human Labour			21.33	5725.91	10.04
21	**Cost C1 = (Cost B2 + Family Labour)**				51861.37	90.89
V	**Cost C2**					
22	Risk Premium				10	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**				51871.37	90.91
VI	**Cost C3**					
24	Managerial Cost				5187.14	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				57058.51	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		25.82	116202.27	
		b) Main Crop Sales Price (Rs.)			4500	
b.	Gross Income (Rs.)				116202.27	
c.	Net Income (Rs.)				59143.76	
d.	Cost per Quintal (Rs./q.)				2209.62	
e.	Benefit Cost Ratio (BC Ratio)				1:2	

Cost of Cultivation of Paddy: The data regarding the cost of cultivation (Rs/ha) of Paddy in Nazarapur-1 micro watershed is presented in Table 34.d. The results indicate that, the total cost of cultivation (Rs/ha) for Paddy was Rs. 89347.24. The gross income realized by the farmers was Rs.135579.78. The net income from Paddy cultivation was Rs. 46232.54, thus the benefit cost ratio was found to be 1:1.50.

Table 34(d). Cost of Cultivation of Paddy in Nazarapur-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	66.7	12191.11	13.64
2	Bullock		Pairs/day	1.65	1564.33	1.75
3	Tractor		Hours	12.44	7958.14	8.91
4	Machinery		Hours	0.82	494	0.55
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	57.46	3425.22	3.83
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	7.68	17344.51	19.41
8	Fertilizer + micronutrients		Quintal	19.95	19419.54	21.73
9	Pesticides (PPC)		Kgs / liters	3.8	3000.94	3.36
10	Irrigation		Number	4.42	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	7.42	0.01
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				5183.63	5.8
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				70588.84	79.01
III	**Cost B2**					
18	Rental Value of Land				144.44	0.16
19	**Cost B2 = (Cost B1 + Rental value)**				70733.28	79.17
IV	**Cost C1**					
20	Family Human Labour			44.15	10484.81	11.73
21	**Cost C1 = (Cost B2 + Family Labour)**				81218.1	90.9
V	**Cost C2**					
22	Risk Premium				6.67	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**				81224.76	90.91
VI	**Cost C3**					
24	Managerial Cost				8122.48	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				89347.24	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		74.02	127059.79	
		b) Main Crop Sales Price (Rs.)			1716.67	
	By Product	e) Main Product (q)		4.87	8520	
		f) Main Crop Sales Price (Rs.)			1750	
b.	Gross Income (Rs.)				135579.78	
c.	Net Income (Rs.)				46232.54	
d.	Cost per Quintal (Rs./q.)				1207.14	
e.	Benefit Cost Ratio (BC Ratio)				1:1.5	

Cost of Cultivation of Green gram: The data regarding the cost of cultivation (Rs/ha) of Green gram in Nazarapur-1 micro watershed is presented in Table 34.e. The results indicate that, the total cost of cultivation (Rs/ha) for Green gram was Rs.39386.59. The gross income realized by the farmers was Rs. 52002.35. The net income from Green gram cultivation was Rs. 12615.76, thus the benefit cost ratio was found to be 1:1.30.

Table 34(e). Cost of Cultivation of Green gram in Nazarapur-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	43.58	8186.61	20.79
2	Bullock		Pairs/day	1.78	1783.89	4.53
3	Tractor		Hours	3.23	2986.84	7.58
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	16.3	1376.98	3.5
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	3.09	7718.75	19.6
8	Fertilizer + micronutrients		Quintal	6.42	5814.41	14.76
9	Pesticides (PPC)		Kgs/liters	1.29	1016.65	2.58
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	25.54	0.06
14	Land revenue and Taxes			0	2.74	0.01
II	**Cost B1**					
16	Interest on working capital				1912.01	4.85
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				30824.42	78.26
III	**Cost B2**					
18	Rental Value of Land				161.11	0.41
19	**Cost B2 = (Cost B1 + Rental value)**				30985.53	78.67
IV	**Cost C1**					
20	Family Human Labour			21.28	4813.8	12.22
21	**Cost C1 = (Cost B2 + Family Labour)**				35799.32	90.89
V	**Cost C2**					
22	Risk Premium				6.67	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**				35805.99	90.91
VI	**Cost C3**					
24	Managerial Cost				3580.6	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				39386.59	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		10.26	52002.35	
		b) Main Crop Sales Price (Rs.)			5066.67	
b.	Gross Income (Rs.)				52002.35	
c.	Net Income (Rs.)				12615.76	
d.	Cost per Quintal (Rs./q.)				3837.49	
e.	Benefit Cost Ratio (BC Ratio)				1:1.3	

Adequacy of fodder: The data regarding the adequacy of fodder in Nazarapur-1 Micro watershed is presented in Table 35. The results indicate that, 52.94 per cent of the households opined that dry fodder was adequate and 5.88 per cent of them opined dry fodder was inadequate.

Table 35. Adequacy of fodder in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	13	68.42	5	41.67	18	52.94
2	Inadequate-Dry Fodder	0	0	1	5.26	1	8.33	2	5.88

Average annual gross income: The data regarding the annual gross income in Nazarapur-1 Micro watershed is presented in Table 36. The results indicate that, the farmers have annual gross income of Rs. 123908.82 in micro-watershed, of which Rs. 49932.35 is from agriculture itself.

Table 36. Average annual gross income in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
		Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	10526.3	0	5882.35
2	Wage	69333.3	72000	34750	58617.7
3	Agriculture	0	45457.9	69500	49932.4
4	Dairy Farm	0	7368.42	11850	8300
8	Goat Farming	0	0	3333.33	1176.47
	Income(Rs.)	69333.3	135353	119433	123909

Average annual Expenditure: The data regarding the average annual expenditure in Nazarapur-1 Micro watershed is presented in Table 37. The results indicate that, the farmers have annual gross expenditure of Rs. 247528.46 in micro-watershed, of which Rs. 23500.00 is from agriculture itself.

Table 37. Average annual Expenditure in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
		Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	47500	0	2794.12
2	Wage	35333.3	39906.3	18545.5	27897.1
3	Agriculture	0	20868.4	33541.7	23500
4	Dairy Farm	0	14500	17333.3	3235.29
5	Goat Farming	0	0	20000	588.24
Total		35333.3	122775	89420.5	247528

Table 38. Horticulture species grown in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		F	B	F	B	F	B	F	B
1	Coconut	0	0	2	0	2	0	4	0

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

Horticulture species grown: The data regarding horticulture species grown in Nazarapur-1 Micro watershed is presented in Table 38. The results indicate that, the total

number of horticultural trees grown (both field and backyard) by the sampled households were coconut (4).

Forest species grown: The data regarding forest species grown in Nazarapur-1 Micro watershed is presented in Table 39. The results indicate that, households have planted 7 teak trees, 53 neem trees, 5 tamarind trees together in both field and backyard.

Table 39. Forest species grown in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		F	B	F	B	F	B	F	B
1	Teak	0	0	6	0	1	0	7	0
2	Neem	0	0	22	0	23	8	45	8
3	Tamarind	0	0	0	0	5	0	5	0

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

Average additional investment capacity: The data regarding average additional investment capacity in Nazarapur-1 Micro watershed is presented in Table 40. The results indicate that, households have an average investment capacity of Rs. 10617.65 for land development, Rs. 4411.76 for creation of irrigation facility, Rs.1117.65 for adoption of improved crop production activities and Rs.352.94 for adoption of improved livestock breeds.

Table 40. Average additional investment capacity of households in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)	MF (19)	SF (12)	All (34)
		Rs.	Rs.	Rs.	Rs.
1	Land development	0	13210.5	9166.67	10617.7
2	Irrigation facility	0	5789.47	3333.33	4411.76
3	Improved crop production	0	1368.42	1000	1117.65
4	Improved livestock management	0	526.32	166.67	352.94

Source of funds for additional investment: The data regarding source of funds for additional investment in Nazarapur-1 Micro watershed is presented in Table 41. The results indicate that, the sources of finance raised from government subsidy and from own sources for land development was 11.8 and 23.53 per cent, for irrigation facility was 5.88 and 1.47 per cent, the sources of finance raised from own sources for improved crop production 24.58 per cent and the sources of finance raised from own sources for improved livestock adoption 8.78 per cent.

Table 41. Source of funds for additional investment in Nazarapur-1 micro-watershed

Sl. No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Government subsidy	4	11.8	2	5.88	0	0	0	0
2	Own funds	9	26.1	0.5	1.47	8.5	24.58	3	8.78

Marketing of agricultural produce: The data regarding marketing of the agricultural produce in Nazarapur-1 Micro watershed is presented in Table 42. The results indicated that, 100.00 percent of output of Cotton was sold in the market with average price of Rs. 4500.00; 78.26 percent of output of Green gram was sold in the market with average price of Rs. 5066.67; 16.00 percent of output of Groundnut was sold in the market with average price of Rs. 4500.00; 115.47 percent of output of Paddy was sold in the market with average price of Rs. 1287.50 and 87.50 percent of output of Red gram was sold in the market with average price of Rs. 4725.00.

Table 42. Marketing of agricultural produce in Nazarapur-1 micro-watershed

Sl. No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Cotton	23	0	23	100	4500
2	Greengram	23	5	18	78	5067
3	Groundnut	50	42	8	16	4500
4	Paddy	265	41	224	84.5	1288
5	Redgram	204	25.5	178.5	88	4725

Marketing channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Nazarapur-1 Micro watershed is presented in Table 43. The results indicated that, 64.71 cent of the households have sold agricultural produce to the local/village merchants and 32.35 per cent of regulated market.

Table 43. Marketing channels used for sale of agricultural produce in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0	14	74	8	66.7	22	64.71
2	Regulated Market	0	0	5	26	6	50	11	32.35

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Nazarapur-1 Micro watershed is presented in Table 44. The results indicated that, 73.53 cent of the households have used tractor and 2.94 per cent have used cart the transport of agriculture commodity.

Table 44. Mode of transport of agricultural produce in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Cart	0	0	0	0	1	8.33	1	2.94
2	Tractor	0	0	14	74	11	91.7	25	73.53
3	Truck	0	0	5	26	2	16.7	7	20.59

Incidence of soil and water erosion problems: The data regarding incidence of incidence of soil and water erosion problems in Nazarapur-1 Micro watershed is

presented in Table 45. The results indicate that, 58.82 per cent of the households have experienced soil and water erosion problems.

Table 45. Incidence of soil and water erosion problems in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	14	74	6	50	20	58.82

Interest towards soil testing: The data regarding Interest shown towards soil testing in Nazarapur-1 Micro watershed is presented in Table 46. The results indicated that, 91.18 per cent of the households were interested towards soil testing.

Table 46. Interest regarding soil testing in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	18	95	13	108	31	91.18

Soil and water conservation practices and structures adopted: The data regarding soil and water conservation practices and structures adopted in Nazarapur-1 Micro watershed is presented in Table 47. The results indicated that 2.94 per cent of farmers practicing Graded bund as soil and water conservation practice.

Table 47. Soil and water conservation practices and structures adopted in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Graded Bund	0	0	1	5.3	0	0	1	2.94

Status of soil and water conservation structures: The data regarding status soil and water conservation structures adopted in Nazarapur-1 Micro watershed is presented in Table 48. The results indicated that, the households have adopted graded bund as a soil and water conservation structures out of which 100.00 per cent was in good condition.

Table 48. Status of soil and water conservation structures in Nazarapur-1 micro-watershed

Sl.No	Item	Good	
		N	%
1	Graded Bund	1	100

Table 49. Agencies involved in the soil and water conservation structures in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Own	0	0	1	5.3	0	0	1	2.94

Agencies involved in the soil and water conservation structures: The data regarding Agencies involved in the soil and water conservation structures adopted in Nazarapur-1

Micro watershed is presented in Table 49. The results indicated that, 2.94 per cent of the households have adopted by their own.

Usage pattern of fuel for domestic use: The data on usage pattern of fuel for domestic use in Nazarapur-1 Micro watershed is presented in Table 50. The results indicated that, firewood was the major source of fuel for domestic use for 73.53 per cent of the households followed by LPG (38.24%).

Table 50. Usage pattern of fuel for domestic use in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Fire Wood	3	100	10	52.6	12	100	25	73.53
2	LPG	0	0	9	47.4	4	33.3	13	38.24

Source of drinking water: The data on source of drinking water in Nazarapur-1 Micro watershed is presented in Table 51. The results indicated that, piped supply of water was the major source for drinking water for 100.0 per cent of the households.

Table 51. Source of drinking water in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Piped supply	3	100	19	100	12	100	34	100

Source of light: The data on source of light in Nazarapur-1 Micro watershed is presented in Table 52. The results indicated that, electricity was the major source of light for 100.00 per cent of the households.

Table 52. Source of light in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Electricity	3	100	19	100	12	100	34	100

Existence of sanitary toilet facility: The data on availability of toilet facility in Nazarapur-1 Micro watershed is presented in Table 53. The results indicated that, 55.88 per cent of the households possess toilets.

Table 53. Existence of sanitary toilet facility in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Sanitary toilet facility	2	66.7	11	58	6	50	19	55.9

Possession of PDS card: The data regarding possession of PDS card in Nazarapur-1 Micro watershed is presented in Table 54. The results indicated that, 100.00 per cent of the households possessed BPL card.

Table 54. Possession of PDS card in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	BPL	3	100	19	100	12	100	34	100

Participation in NREGA programme: The data regarding Participation in NREGA programme in Nazarapur-1 Micro watershed is presented in Table 55. The results indicated that, only 17.65 percent of the participate have participated in NREGA programme.

Table 55. Participation in NREGA programme in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Participation in NREGA programme	0	0	3	15.8	3	25	6	17.7

Adequacy of food items: The data regarding adequacy of food items in Nazarapur-1 Micro watershed is presented in Table 56. The results indicated that, the extent of adequacy of food items for cereals, pulses, Oilseeds and vegetables were 94.12, 97.06, 79.41, 55.88 per cent respectively, similarly for Fruits (2.94%), milk (41.18%).

Table 56. Adequacy of food items in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Cereals	0	0	20	105	12	100	32	94.12
2	Pulses	0	0	19	100	14	116.7	33	97.06
3	Oilseed	0	0	17	89.5	10	83.33	27	79.41
4	Vegetables	0	0	11	57.9	8	66.67	19	55.88
5	Fruits	0	0	0	0	1	8.33	1	2.94
6	Milk	0	0	7	36.8	7	58.33	14	41.18

Inadequacy of food items: The data regarding in adequacy of food items in Nazarapur-1 Micro watershed is presented in Table 57. The results indicated that, the extent of in adequacy of food items for cereals, pulses, Oilseeds and vegetables were 8.82, 11.76, 20.59, 47.06 and 100.00 per cent respectively, similarly for fruits (94.12%), milk (64.71%), egg (88.24%) and meat (100.00%).

Table 57. Inadequacy of food items in Nazarapur-1 micro-watershed

Sl.No.	Particulars	LL (3)		MF (19)		SF (12)		All (34)	
		N	%	N	%	N	%	N	%
1	Cereals	3	100	0	0	0	0	3	8.82
2	Pulses	3	100	0	0	1	8.33	4	11.76
3	Oilseed	3	100	2	10.5	2	16.67	7	20.59
4	Vegetables	3	100	9	47.4	4	33.33	16	47.06
5	Fruits	3	100	17	89.5	12	100	32	94.12
6	Milk	3	100	12	63.2	7	58.33	22	64.71
7	Egg	3	100	17	89.5	10	83.33	30	88.24
8	Meat	3	100	19	100	12	100	34	100

Farming constraints: The data regarding farming constraints experienced by households in Nazarapur-1 Micro watershed is presented in Table 58. The results indicated that, lower fertility status of the soil was the constraint experienced by (105.88 %) per cent of the households, wild animal menace on farm field (91.18%), frequent incidence of pest and diseases (97.06%), inadequacy of irrigation water (76.47%), high cost of fertilizers

and plant protection chemicals (91.18%), high rate of interest on credit (91.18%), low price for the agricultural commodities (91.18 %), lack of marketing facilities in the area (55.88%), inadequate extension services (50.00 %) and lack of transport for safe transport of the agricultural produce to the market (88.24%).

Table 58. Farming constraints experienced in Nazarapur-1 micro-watershed

SN	Particulars	**MF** (19)		**SF** (12)		**All (34)**	
		N	**%**	**N**	**%**	**N**	**%**
1	Lower fertility status of the soil	22	115.79	14	116.67	36	105.88
2	Wild animal menace on farm field	18	94.74	13	108.33	31	91.18
3	Frequent incidence of pest and diseases	19	100	14	116.67	33	97.06
4	Inadequacy of irrigation water	17	89.47	9	75	26	76.47
5	High cost of Fertilizers and plant protection chemicals	19	100	12	100	31	91.18
6	High rate of interest on credit	18	94.74	13	108.33	31	91.18
7	Low price for the agricultural commodities	19	100	12	100	31	91.18
8	Lack of marketing facilities in the area	10	52.63	9	75	19	55.88
9	Inadequate extension services	10	52.63	7	58.33	17	50
10	Lack of transport for safe transport of the Agril produce to the market.	18	94.74	12	100	30	88.24

Chapter 5

SUMMARY AND IMPLICATIONS

In order to assess the socio-economic condition of the farmers in the watershed 34 households located in the micro watershed were interviewed for the survey. The study was conducted in Nazarapur-1 micro-watershed (Gurmatkal sub-watershed, Yadgiri taluk & District) is located at North latitude 16^0 50' 1.92" and 16^0 48'28.869" and East longitude 77^0 25' 14.222" and 77^0 23' 14.268"covering an area of about 538.42 ha bounded by under under Najarapura, Keshawar and Borabanda Villages.

Socio-economic analysis indicated that, out of the total sample of 34 respondents, 19 (55.88%) were marginal and 12 (35.29%) were small farmers. The population characteristics of households indicated that, there were 86 (55.84%) men and 68 (44.16%) were women. Majority of the respondents (47.40%) were in the age group of 35-60 years. Education level of the sample households indicated that, majority there were 61.04 per cent of illiterates, 14.94 per cent of them had primary school education, 9.09 per cent middle school education, and 8.44 per cent high school education, 3.25 per cent of them had PUC education and 2.60 per cent attained graduation. About, 85.29 per cent of household heads practicing agriculture and 14.71 per cent of the household heads were engaged as agricultural labourers. Agriculture was the major occupation for 62.99 per cent of the household members.

In the study area, 61.76 per cent of the households possess katcha house and 17.65 per cent possess pucca house. The durable assets owned by the households showed that, 70.59 per cent possess TV, 14.71 per cent possess mixer grinder and 91.18 per cent possess mobile phones. Farm implements owned by the households indicated that, 32.35 per cent of the households possess plough and only 17.65 per cent sprayer. Regarding livestock possession by the households, 23.53 per cent possess local cow and 26.47 per cent possess buffalo respectively.

The average labour availability in the study area showed that**,** own men and women labour availability in the micro watershed was 6.73 each, while the hired labour (men) availability was 1.59. Further, 2.94 per cent of the households opined that hired labour was inadequate during the agricultural season.

Out of the total land holding of the sample respondents (27.27 ha), 84.58 per cent of the area is under dry condition and the remaining 15.42 per cent area is irrigated land. There were 7.00 bore wells among the sampled households. Bore well was the major source of irrigation for 20.59 per cent of the households. The major crops grown by sample farmers are Red gram, Groundnut, Cotton, Paddy and Green gram and cropping intensity was recorded as 100.00 per cent.

The sample households possessed 100.00 per cent bank account and 70.59 per cent of them have savings in the account. About 20.59 per cent of the respondents

borrowed credit from various sources. Among the credit borrowed by households, 52.63 per cent have borrowed loan from commercial banks and 26.32 per cent from Cooperative bank. Majority of the respondents (100.00 %) have borrowed loan for agriculture purpose. Regarding the opinion on institutional sources of credit, 89.47 per cent of the households opined that credit helped to perform timely agricultural operations.

The per hectare cost of cultivation for Red gram, Groundnut, Cotton, Paddy and Green gram was Rs.40948.74, 74253.61, 57058.51, 89347.24 and 39386.59 with benefit cost ratio of 1:1.30, 1: 3.40, 1: 2.00, 1: 1.50 and 1:1.30, respectively. Further, 52.94 per cent of the households opined that dry fodder was adequate.

The average annual gross income of the farmers was Rs. 123908.82 in micro-watershed, of which Rs. 49932.35 comes from agriculture.

Sampled households have grown Coconut trees in the fields, Further, Cashew, Lemon, Coconut, Guava and Jamun trees were also planted in the farm fields. None of the households shown interest to cultivate horticultural crops.

Households have an average investment capacity of Rs Rs. 10617.65 for land development, Rs. 4411.76 for creation of irrigation facility, Rs.1117.65 for adoption of improved crop production activities and Rs.352.94 for adoption of improved livestock breeds. the sources of finance raised from government subsidy and from own sources for land development was 11.8 and 23.53 per cent, for irrigation facility was 5.88 and 1.47 per cent, the sources of finance raised from own sources for improved crop production 24.58 per cent and the sources of finance raised from own sources for improved livestock adoption 8.78 per cent.

Regarding marketing channels, 64.71 per cent of the households have sold agricultural produce to the local/village merchants, while, 32.35 per cent have sold by Agents/Traders. Further, 73.53 per cent of the households have used tractor for the transport of agriculture commodity.

Majority of the farmers (58.82 %) have experienced soil and water erosion problems in the watershed and 91.18 per cent of the households were interested towards soil testing. About, 2.94 per cent of farmers practicing graded bunding as soil and water conservation practice.

Firewood connection was the major source of fuel for domestic use for 73.53 per cent of the households and 38.24 per cent households has LPG. Piped supply was the major source for drinking water for 100.00 per cent of the households. Electricity was the major source of light for 100.00 per cent of the households. In the study area, 55.88 per cent of the households possess toilet facility. Regarding possession of PDS card, 100.00 per cent of the households possessed BPL card. Cereals (94.12%), pulses (97.06%), oilseeds (79.41%) were adequate for consumption.

Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (105.88%) wild animal menace on farm field (91.18%), frequent incidence of pest and diseases (97.06%), inadequacy of irrigation water (76.47%), high cost of fertilizers and plant protection chemicals (91.18%), high rate of interest on credit (91.18%), low price for the agricultural commodities (91.18%), lack of marketing facilities in the area (55.88%), inadequate extension services (50.00%), lack of transport for safe transport of the agricultural produce to the market (88.24%).

Implications of the survey

- ✓ Result indicated that, there were 61.04 per cent were illiterate hence, extension methodologies such as demonstration, street play, drama, video shows will be effective in dissemination of the technologies in the micro watershed.
- ✓ The data indicate that, 61.76 per cent of the households possess katcha house. Hence, the development department while implementing the watershed plan should focus on agriculture to enhance the productivity of major crops in the area to increase the income of the farmers.
- ✓ Results indicated that the local institutional participation of the household members in the micro watershed is minimal hence, activities like membership campaign, awareness creation about the benefits of membership in local institutions and strengths of organized groups must be conveyed.
- ✓ Majority of the households in the watershed have experience in use of mobile phones, and television hence, these mass media can be effectively utilized for transfer of technology as well as for information dissemination.
- ✓ The farm machinery/implement possession in the micro watershed was found to be minimum the reasons may lack of knowledge or lack of financial ability which can be addressed through training on use of different farm implements, providing information on different sources of finance for purchase of farm implements.
- ✓ The possession of livestock such as crossbred cow found is less hence, farmers must be made aware of the benefits of crossbred cow in increased milk production.
- ✓ The possession of livestock such as sheep, goat and poultry was found to be low hence, farmers may be informed the role of subsidiary enterprises in enhancing the income and information on financial support for subsidiary activities.
- ✓ The data indicate that, job/work was the reason for all the migrants hence, farmers may be trained on profitable agriculture or self employment such has animal husbandry, plate making, sheep rearing, goat rearing, rabbit rearing with suitable information on sources of financial support.
- ✓ The results indicate that there was a change in quality of life due to migration hence, the developmental departments should take actions to arrest migration and to improve the quality of the life in rural areas.

- ✓ Households possess 23.07ha (84.58 %) of dry land and 4.20ha (15.42 %) of irrigated land hence, the availability of the dryland agricultural technologies such as short duration crops, high yielding drought resistance crop varieties, drip irrigation technology and subsidy information will be helpful for the farmers to enhance the productivity of land and as well as farmers income.
- ✓ Few of the bore well in micro watershed found non functional hence, farmers may be trained on possibility of bore well rejuvenation.
- ✓ Bore well was major source of irrigation for 20.59 per cent of the households. hence, in order to increase the area under irrigation as well as to increase the water use efficiency farmers may trained on drip irrigation and provide the information on subsidy for drip irrigation equipment's along with the information on different agencies which provides the financial assistance for drip irrigation.
- ✓ Farmers have grown 4 coconut trees in the fields. Hence, production technologies related to these crops can be made available to the farmers for better adoption.
- ✓ The cropping intensity in the micro watershed was found to be (100.00 %) hence, care must be taken by the implementing agency to bring uncultivated land into cultivation through suitable measures.
- ✓ Many of the household members have borrowed loan from cooperative banks which has higher rate of interest hence, farmers may be sensitized on the different sources of credit with lesser interest rate such SHGs etc.
- ✓ The results indicated the non availability of both green and dry fodder throughout the year hence, fodder development activities can be taken up in the micro watershed.
- ✓ The average annual gross income of the households Rs.49932.35 from agriculture and Rs. 58617.65 from wages and. Agriculture was found to be the major source of income for households hence; the development activities should focus on productivity enhancement, marketing arrangements and agricultural technology dissemination to have a direct impact on the farmers.
- ✓ The cultivation of forest species is found minimal hence, information and production technology related to agro-forestry and integrated farming system.
- ✓ The data indicated that, 58.82 per cent of the households have experienced soil and water erosion problems. Hence, those farmers who reported the soil and water erosion problems may be given attention while implementation of the watershed development plan.
- ✓ The data indicated that, 91.18 per cent of the households have interest in soil testing hence, farmers must be provided with the information on various institutions which are involved in soil testing for the benefit of the farmers.
- ✓ Except summer ploughing the adoption of other soil and water conservation structures is minimum hence, the farmers in the micro watershed should be sensitized on the use of different conservation structures for soil water conservation.

- ✓ Cereals and pulses found be adequate for per cent of the households respectively hence, farm households and the farm women must be trained on importance of balanced nutrition and role of vegetable, milk, egg, meat in balanced diet.
- ✓ Lower fertility status of the soil (105.88%), wild animal menace on farm field (91.18%), frequent incidence of pest and diseases (97.06%), high cost of fertilizers and plant protection chemicals (91.18%), high rate of interest on credit (91.18%), low price for the agricultural commodities (91.18%), lack of marketing facilities in the area (55.88%), inadequate extension services (50.00%), lack of transport for safe transport of the agricultural produce to the market (88.24%) were the major farming constraints experienced hence, these constraints must be addressed immediately for the welfare of the farmers. Awareness to be created among the farmers to approach nearest KVKs/RSKs and other developmental departments for technical and for subsidized inputs and utilize the well established regulated markets, approaching the contract firms, direct markets to avoid the involvement of middlemen.