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

ASHANAL-3 (4D5B1G2c) MICROWATERSHED

Hatthakuni & Yadgir 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

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.

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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 Ashanal-3 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   **S.K. SINGH**

Date: 24-08-2019   Director, ICAR - NBSS&LUP Nagpur

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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Ashanal-3 Microwatershed was conducted using village cadastral maps and IRS satellite imagery on 1:7920 scale. The false colour composites of IRS imagery were interpreted for physiography and the physiographic delineations were used as base for mapping soils. The soils were studied in several transects and a soil map was prepared with phases of soil series as mapping units. Random checks were made all over the area outside the transects to confirm and validate the soil map unit boundaries. The soil map shows the geographic distribution and extent, characteristics, classification, behavior and use potentials of the soils in the microwatershed.

The present study covers an area of 513 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 384 ha in the microwatershed is covered by soils, 49 ha by rock outcrops and about 20 ha by others (habitation and water bodies). The salient findings from the land resource inventory are summarized briefly below.

❖ The soils belong to 10 soil series and 15 soil phases (management units) and 9 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 19 per cent area of the microwatershed has soils that are moderately deep to deep (75 - 150 cm), 64 per cent soils are shallow to moderately shallow (25-75 cm) and 4 per cent soils are very shallow (<25cm).

❖ About 4 per cent area in the microwatershed has sandy soils, 64 per cent loamy soils and 18 per cent clayey soils.

❖ About 75 per cent area is non gravelly (<15%) and 11 per cent is gravelly (15-35%).

❖ Less than 1 per cent area of the microwatershed is very high (>200 mm/m) in available water capacity, 1 per cent area medium (101-150 mm/m), 15 per cent area low (51-100 mm/m) and 70 per cent area very low (<50 mm/m) in available water capacity.

❖ Entire area of microwatershed has very gently sloping (1-3% slope) lands.

- *An area of about less than 1 per cent is slightly (e1) eroded, 86 per cent area is moderately (e2) eroded.*
- *An area of about 42 per cent soils are neutral (pH 6.5-7.3) in soil reaction, 32 per cent soil are slightly to moderately alkaline (pH 7.3-8.4) and an area of about 13% is slightly acid (pH 6.0-6.5).*
- *The Electrical Conductivity (EC) of the soils in the entire area of the microwatershed is dominantly <2 dsm^{-1} indicating that the soils are non-saline.*
- *About 82 per cent medium (0.5-0.75%) in organic carbon content and 5 per cent high (>0.75).*
- *About 45 per cent area is low (<23kg/ha), 37 per area is medium (23-57 kg/ha) and 4 per cent area is high in available phosphorus (>57 kg/ha).*
- *About 49 per cent is low (145 kg/ha) is low in available potassium and 37 per cent medium (145-337 kg/ha).*
- *Available sulphur is low (<10 ppm) in an area of about 76 per cent and medium (10 -20 ppm) in 10 per cent.*
- *Available boron is low (<0.5 ppm) in an entire area of the microwatershed.*
- *Available iron is sufficient (>4.5 ppm) in the whole 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 73 per cent and sufficient (>0.6 ppm) in 14 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	21(4)	63(12)	Guava	-	79(15)
Maize	19(4)	64(13)	Sapota	-	79(15)
Bajra	19(4)	79(16)	Pomegranate	-	80(16)
Groundnut	-	94(18)	Musambi	-	80(16)
Sunflower	01(<1)	79(15)	Lime	-	80(16)
Redgram	-	80(16)	Amla	19(4)	79(15)
Bengal gram	01(<1)	22(4)	Cashew	-	19(4)
Cotton	01(<1)	23(4)	Jackfruit	-	79(15)
Chilli	-	83(16)	Jamun	-	1 (<1)
Tomato	19(4)	63(12)	Custard apple	80(16)	18(4)
Brinjal	21(4)	78(15)	Tamarind	-	1(<1)
Onion	61(12)	37(7)	Mulberry	-	94(17)
Bhendi	61(12)	37(7)	Marigold	-	83(16)
Drumstick	-	95(19)	Chrysanthemum	-	83(16)
Mango	-	-			

❖ *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 horticulture crops.*

❖ *Maintaining soil-health is vital to crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested to these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*

❖ *Soil and water conservation treatment plan has been prepared that would help in identifying the sites to be treated and also the type of structures required.*

❖ *As part of the greening programme, several tree species have been suggested to be planted in marginal and sub marginal 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.*

INTRODUCTION

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

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

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

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

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

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

The land resource inventory aims to provide site-specific database for Ashanal-3 microwatershed in Yadgir Taluk & District, Karnataka State for the Karnataka Watershed Development Department. The database was generated by using cadastral map of the village as a base along with high resolution IRS LISS IV and Cartosat-1 merged satellite imagery. Later, an attempt will be made to uplink this LRI data generated at 1:7920 scale under Sujala-III Project to the proposed Landscape Ecological Units (LEUs) map.

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

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Ashanal-3 microwatershed is located in the northern part of Karnataka in Yadgir Taluk & District, Karnataka State (Fig.2.1). It comprises parts of Ashinala, Kurakumbala, Mundargi & Ramasamudra Villages. It lies between $16^0 45$'- $16^0 47$' North latitudes and $77^0 12$'-$77^0 14$' East longitudes covering an area of about 513.01 ha. It is about 8 km northwest of Yadgir town and is surrounded by Kurakumbala on the North, Mundargi on the west, Ramasamudra on the East and Ashinala village on the northeast and southern side.
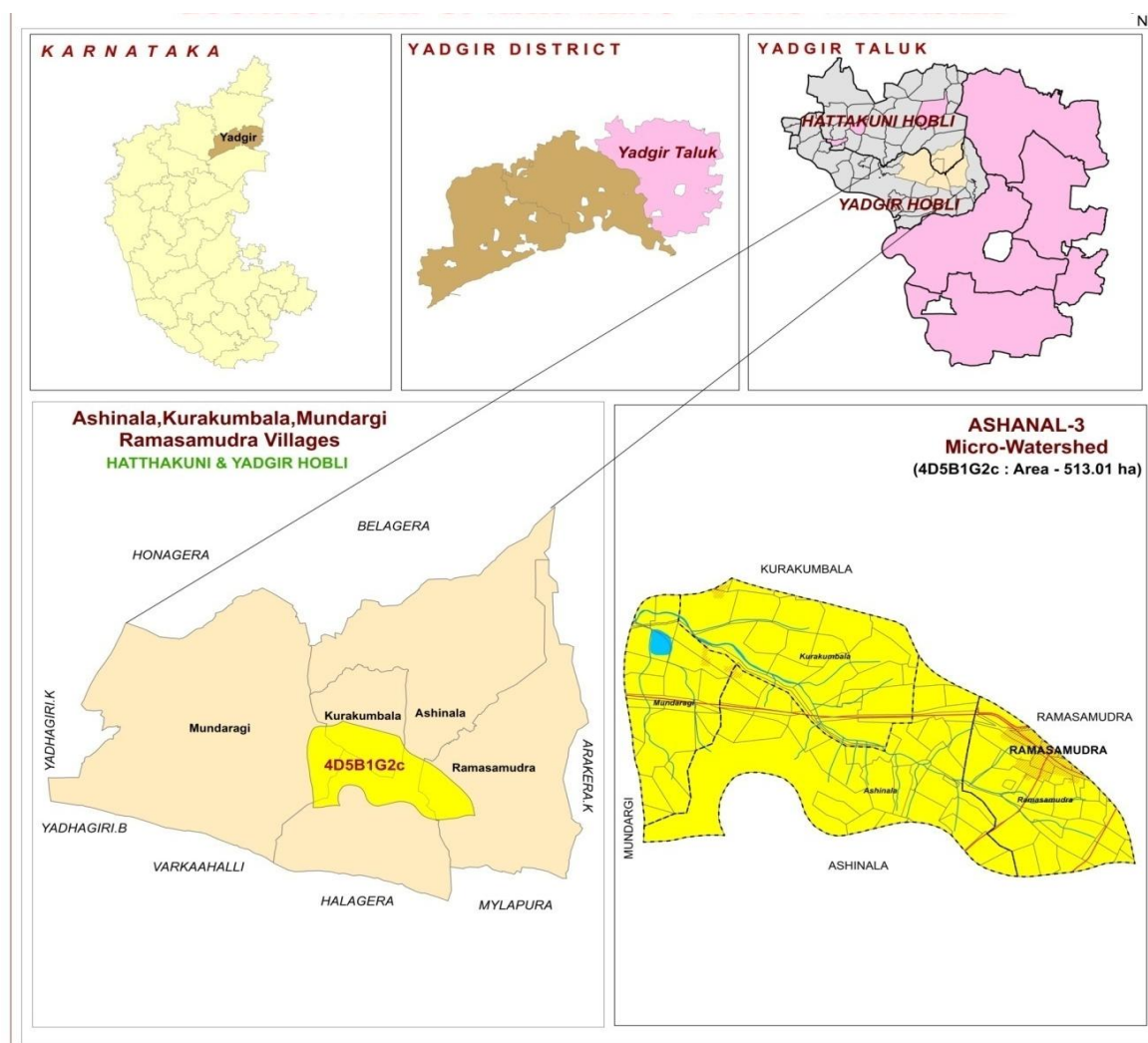
Fig.2.1 Location map of Ashanal-3 Microwatershed

2.2 Geology

Major rock formation observed in the microwatershed are granite gneiss (Fig.2.2). Granite gneisses are essentially pink to gray and are coarse to medium grained. They consist primarily of quartz, feldspar, biotite and hornblende. The gray granite gneisses are highly weathered, fractured and fissured up to a depth of about 10 m. Dolerite dykes and

quartz veins are common with variable width and found to occur in Ashanal-3 microwatershed. Underlying formation is gneiss soils occur over gneiss, limestone and shale.

Fig.2.2 Granite and granite gneiss rocks

2.3 Physiography

Physiographically, the area has been identified as granite and 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 300-450 m above MSL. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

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

2.5 Climate

The Yadgir district lies in the northern plains of Karnataka and falls under semiarid tract of the state and is categorized as drought- prone with total annual rainfall of 866 mm (Table 2.1). Of the total rainfall, maximum of 652 mm is received during the south–west monsoon period from June to September, the north-east monsoon from October to early December contributes about 138 mm and the remaining 76 mm during

the rest of the year. The summer season starts during the middle of February and continues up to the first week of June. The period from December to the middle of February is the coldest season. December is the coldest month with mean daily maximum and minimum temperatures being 29.5^0C and 10^0C respectively. During peak summer, temperature shoots up to 45^0C. Relative humidity varies from 26% in summer to 62% in winter. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo-Transpiration (PET) is 141 mm and varies from a low of 81 mm in December to 199 mm in the month of May. The PET is always higher than precipitation in all the months except end of June to end of September. Generally, the Length of crop Growing Period (LGP) is 120-150 days and starts from 1st week of June to 4th week of October.

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

Sl. No.	Months	Rainfall	PET	1/2 PET
1	January	4.30	86.0	43.0
2	February	2.30	125.5	62.7
3	March	15.10	166.0	83.0
4	April	18.50	179.8	89.9
5	May	36.0	198.8	97.9
6	June	118.0	175.1	87.5
7	July	171.80	156.3	78.1
8	August	182.9	150.3	75.1
9	September	179.7	142.0	71.0
10	October	105.3	138.5	69.2
11	November	26.4	97.60	48.6
12	December	6.0	80.90	40.4
Total		**866.3**		
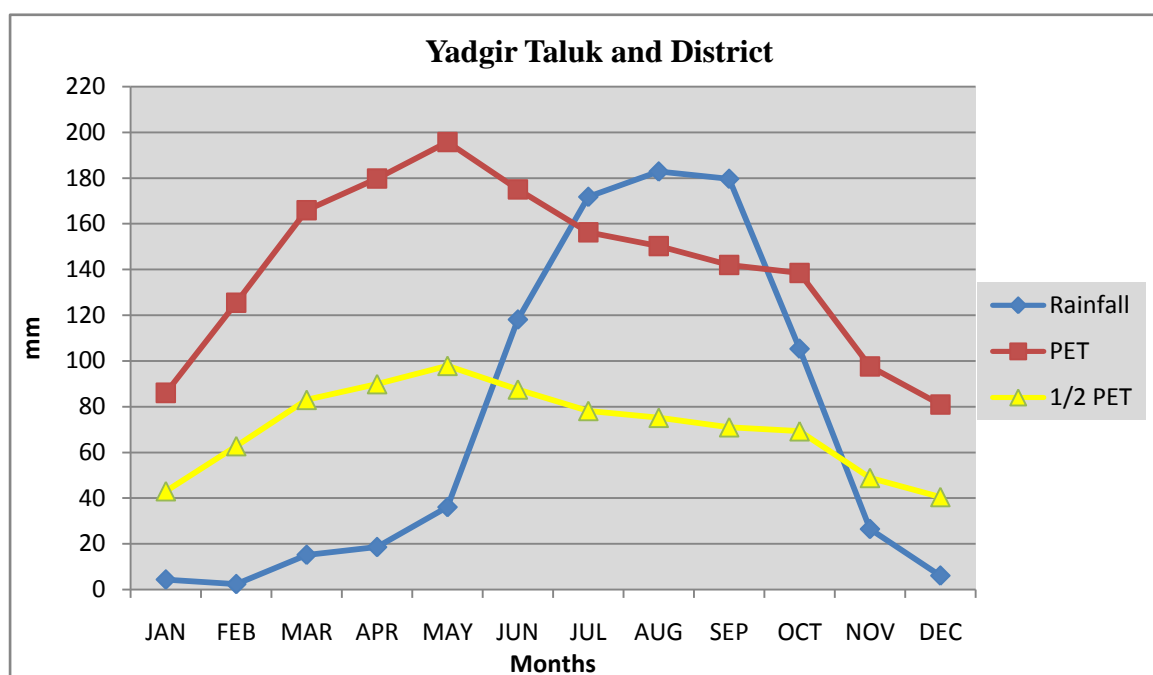
Fig 2.3 Rainfall distribution in Yadgir Taluk, Yadgir District

2.6 Natural Vegetation

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

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

Fig 2.4 Natural vegetation of Ashanal-3 Microwatershed

2.7 Land Utilization

About 72 per cent area (Table 2.2) in Yadgir district is cultivated at present. An area of about 2 per cent is permanently under pasture, 20 per cent under current fallows and 6 per cent under non-agricultural land and 5 per cent under currently barren. Forests occupy an area of about 7 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are banana, bengalgram, paddy, cotton, groundnut and red gram. 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 Ashanal-3 microwatershed is presented in Fig.2.5. The different crops and cropping

systems adopted in the microwatershed is presented in the Figures 2.6 a & b. The location of wells in the Ashinal-3 microwatershed is given in fig 2.7.

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
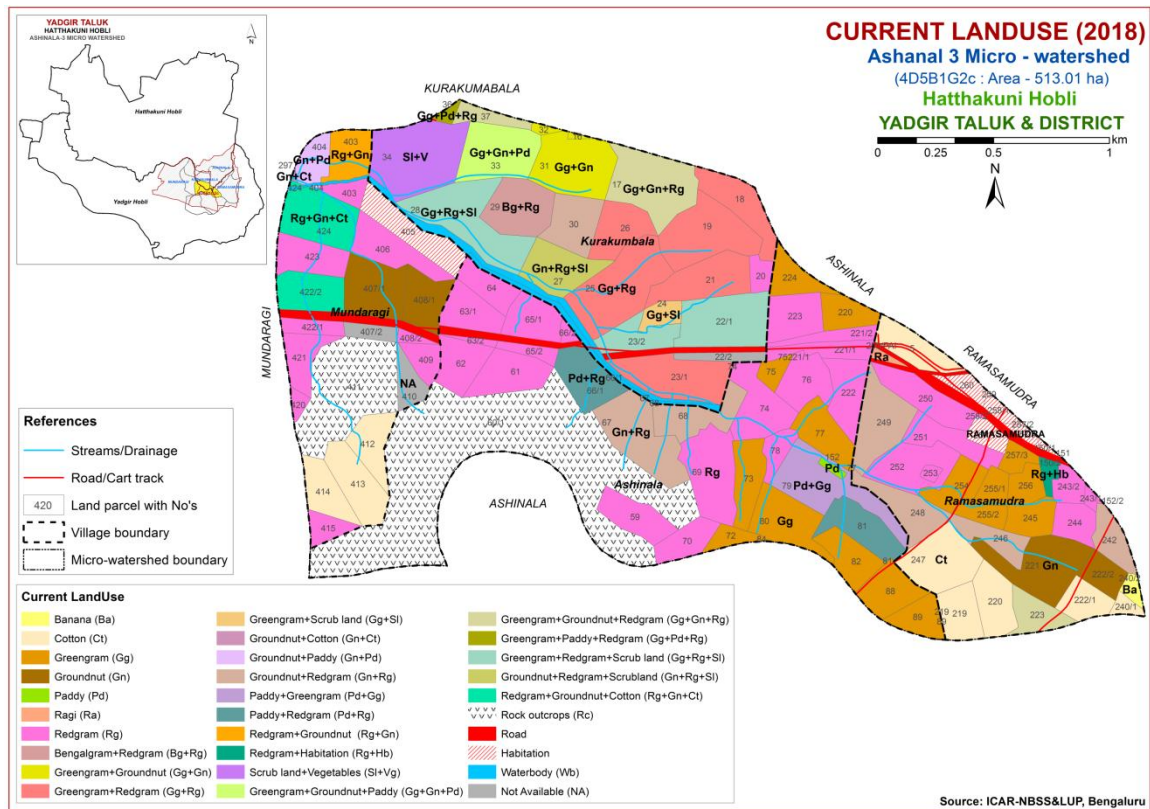
Fig.2.5 Current Land Use map of Ashanal-3 Microwatershed
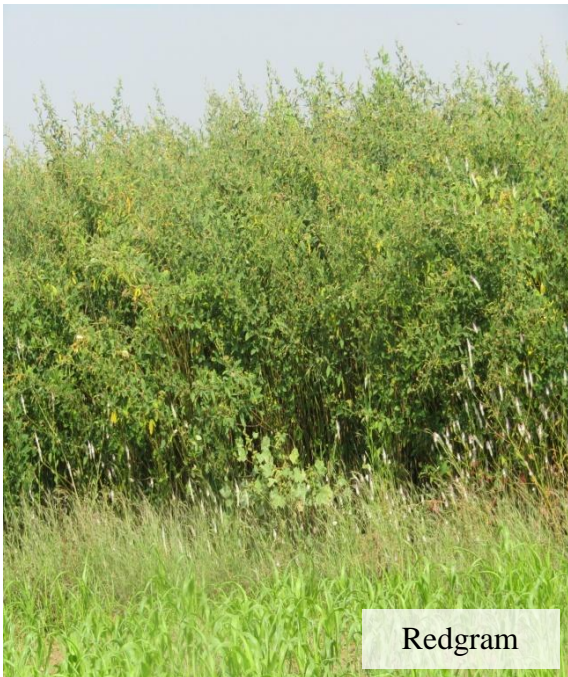
Fig. 2.6 a. Different Crops and Cropping Systems in Ashanal-3 Microwatershed
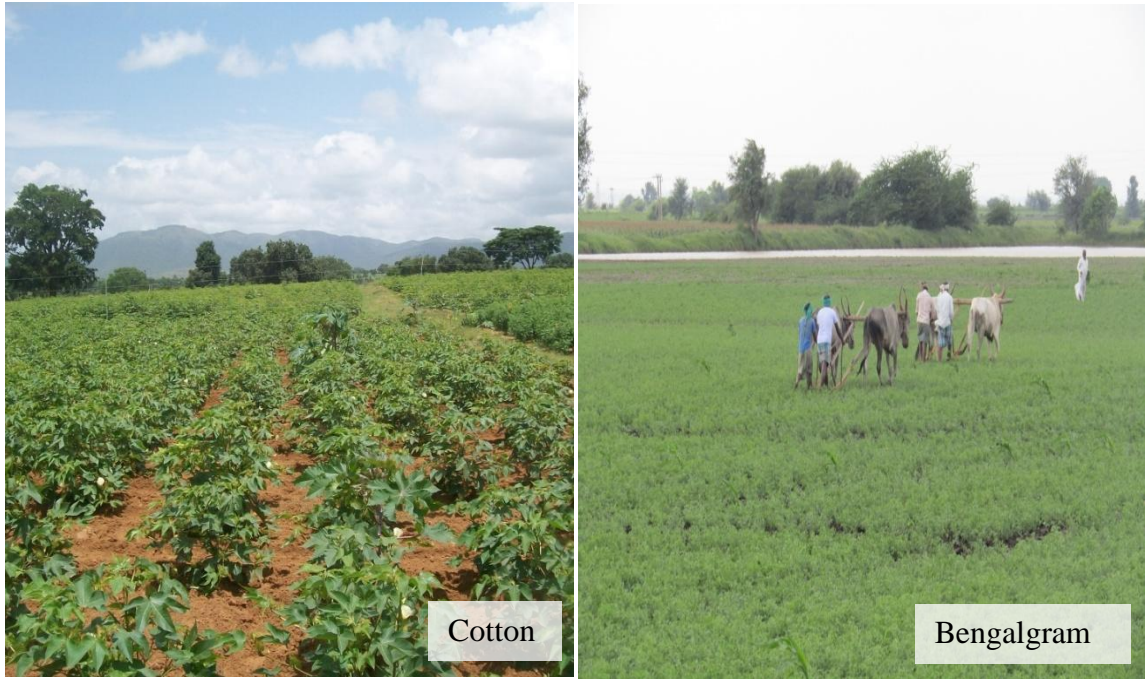
Fig. 2.6 b. Different Crops and Cropping Systems in Ashanal-3 Microwatershed
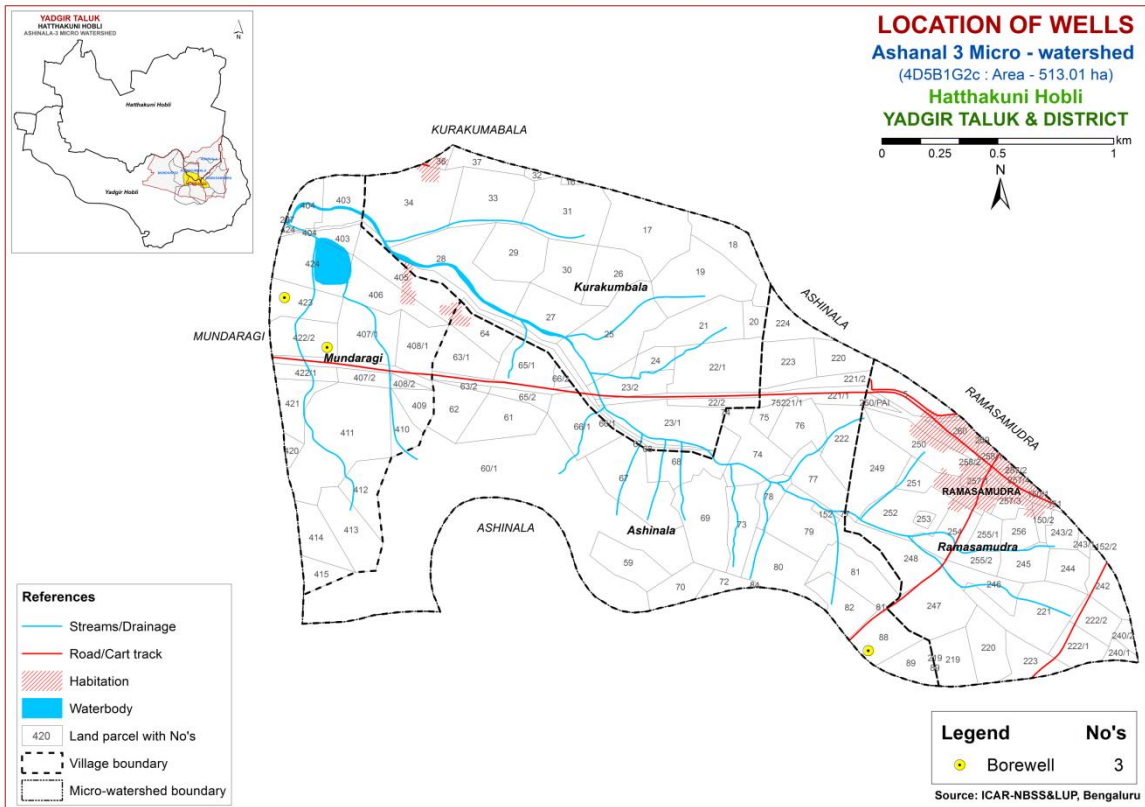
Fig. 2.7 Location of wells – Ashinal-3 microwatershed

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly to a given level of management. This was achieved in Ashanal-3 microwatershed by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site characteristics (slope of the land, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units, and showing the area extent and their geographic distribution on the microwatershed cadastral map. The detailed survey at 1:7920 scale was carried out in an area of 513 ha. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

False Colour Composites (FCCs) of Cartosat-I and LISS-IV merged satellite data covering microwatershed area was visually interpreted using image interpretation elements and all the available collateral data with local knowledge. The delineated physiographic boundaries were transferred on to a cadastral map overlaid on satellite imagery. Physiographically, the area has been identified as granite and granite gneiss landscape. It was divided into five landforms, *viz;* ridges and mounds, gently and very gently sloping uplands and lowlands based on slope 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
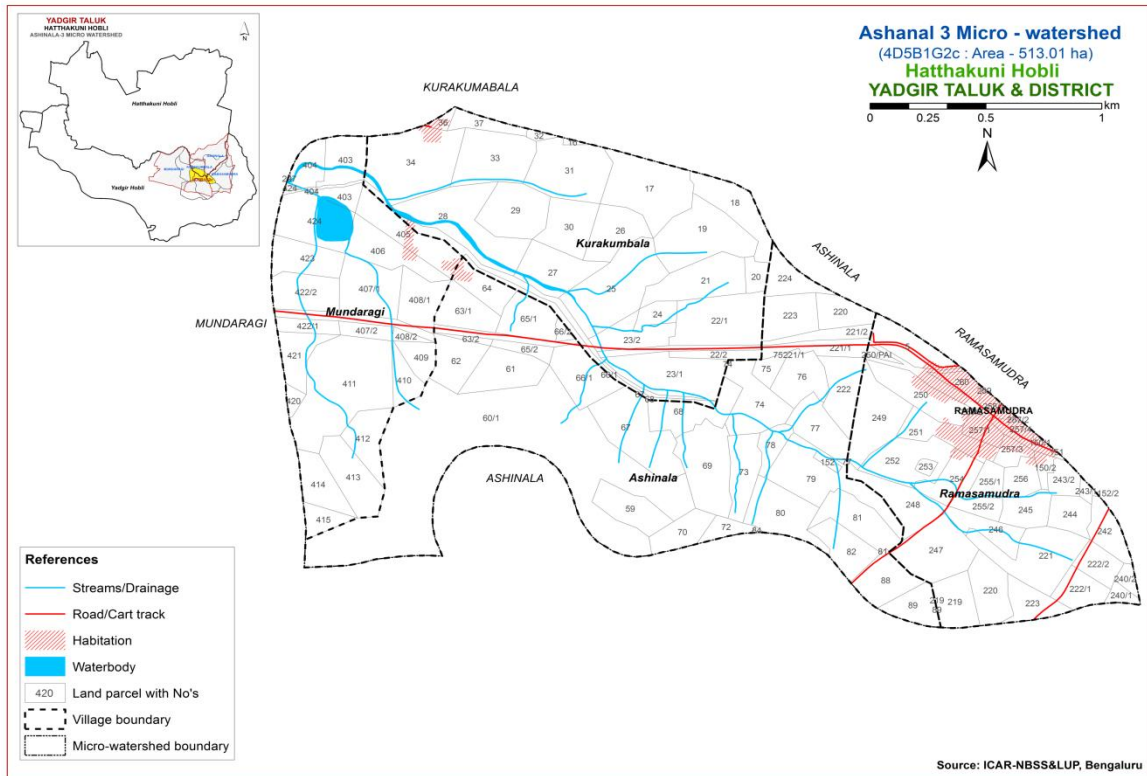
Fig 3.1 Scanned and Digitized Cadastral map of Ashanal-3 Microwatershed
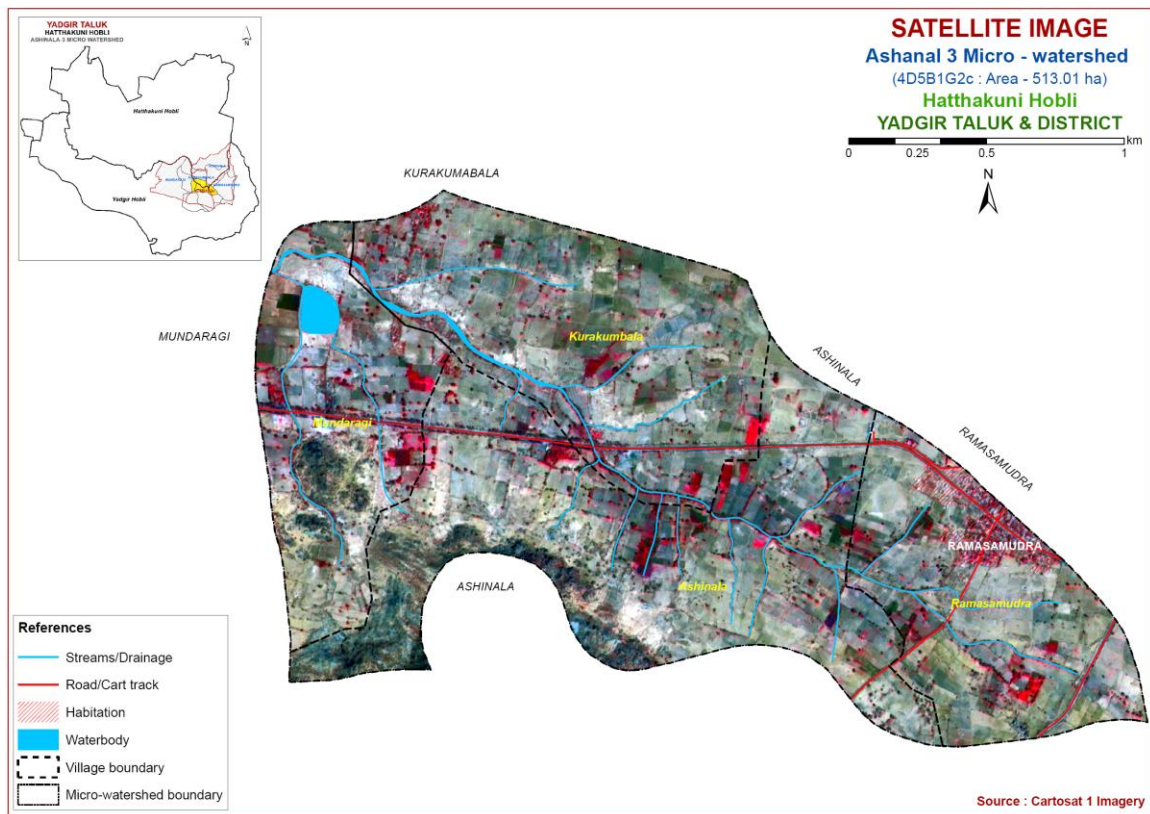
Fig.3.2 Satellite Image of Ashanal-3 Microwatershed
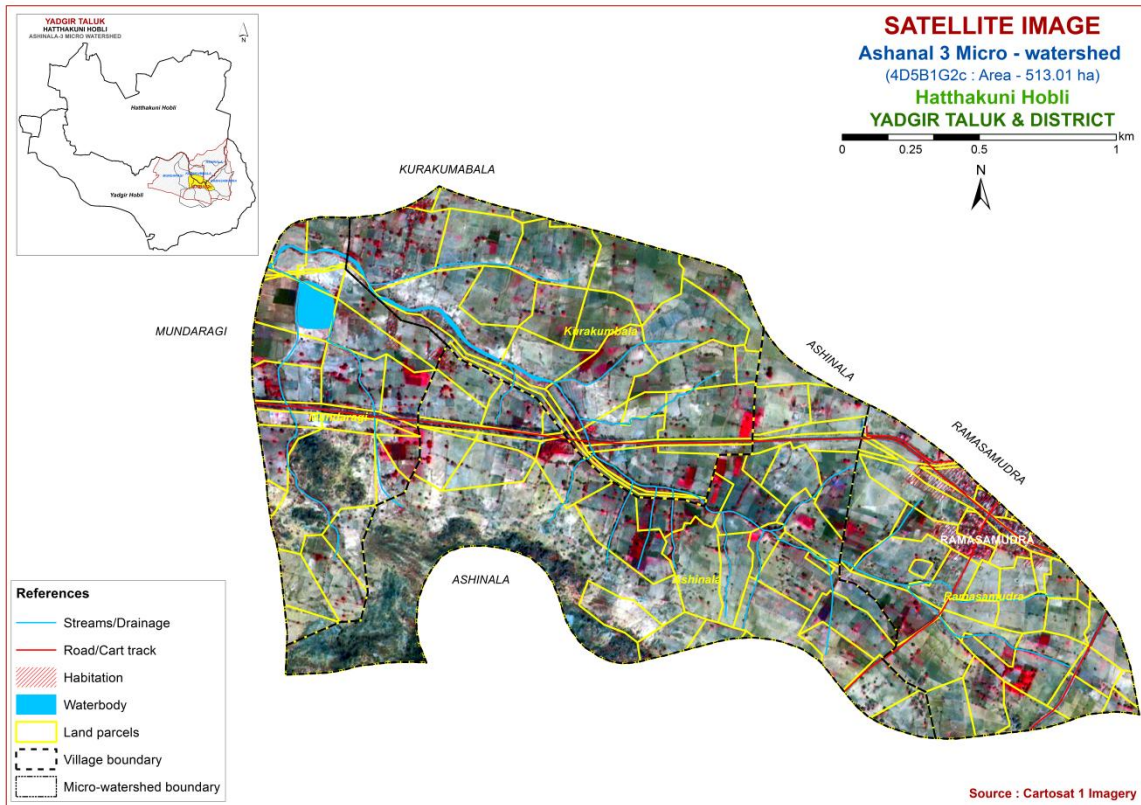
Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Ashanal-3 Microwatershed

3.3 Field Investigation

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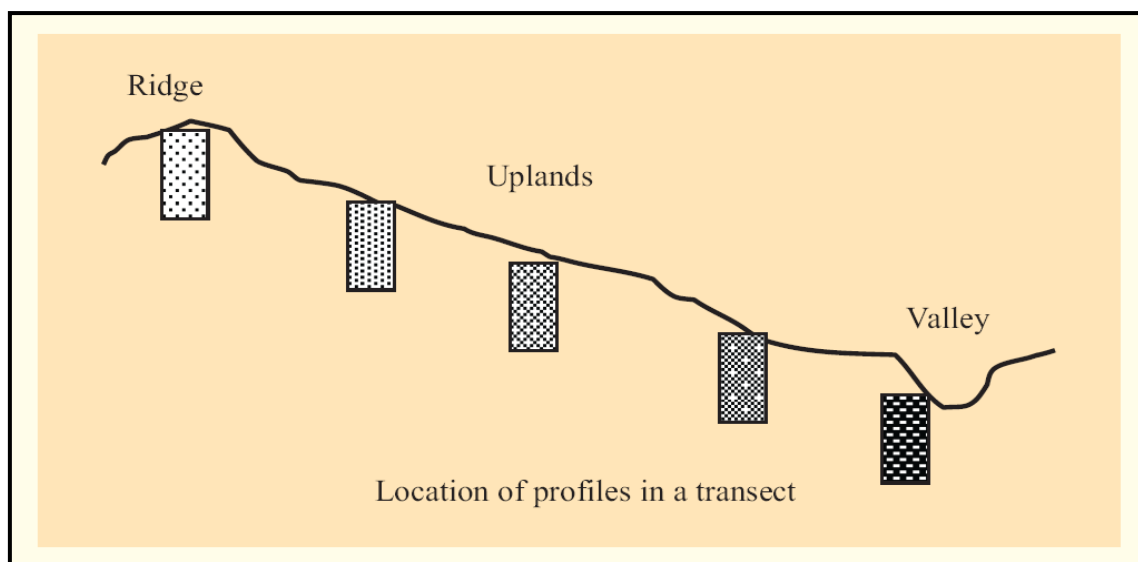
Fig: 3.4. Location of profiles in a transect

In the selected transect, soil profiles were located (Fig. 3.4) at closely spaced intervals to take care of any change in the land features like break in slope, erosion, gravel, stones etc. In the selected sites, profiles (vertical cut showing the soil layers from surface to the rock) were opened up to 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, 10 soil series were identified in the Ashanal-3 microwatershed.

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

Soils of Granite gneiss Landscape							
Sl. no	Soil Series	Depth (cm)	Colour (moist)	Texture	Gravel (%)	Horizon sequence	Calcareous-ness
1	BDL (Badiyala)	25-50	7.5YR 2.5/3,2.5/2,3/3 10YR 3/4,4/3	sl	-	Ap-Bw	e
2	VNK	25-50	2.5YR 3/4	sc	-	Ap-Bt	-

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	(Vanakanahalli)						
3	SBR (Sambra)	50-75	10YR 7/1 7.5YR 7/4	ls-s	-	Ap-AC	-
4	HSL (Hosalli)	75-100	10YR 5/4,4/4,4/6	sc	-	Ap-Bw	e
5	Pogalapur (PGP)	75-100	5YR 4/6,3/3 7.5YR 4/4	sc	-	Ap-Bt	e
6	DSB (Dastharabad)	25-50	7.5YR 3/3	gc	35-60	Ap-Bt-Cr	-
7	JNK (Jinkera)	50-75	10YR5/3,3/2 7.5YR3/4	scl	-	Ap-Bw	e
8	BDP (Baddeppalli)	<25	7.5YR 3/2,3/4 5YR 3/4	scl	-	Ap-Ac	es
9	KBD (Kalebelagundi)	75-100	2.5YR4/4,3/4 5Y4/2,4/3	gscl	35-60	Ap-Bt	-
10	NHL (Neelahalli)	100-150	10YR5/3,4/2	sl	-	Ap-Bw	-

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 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 15 mapping units representing 10 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 15 soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

3.5 Land Management Units

The 15 soil phases identified and mapped in the microwatershed were grouped into 9 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

Ashanal-3 microwatershed, 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 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 (48 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 Ashanal-3 Microwatershed

*Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite Gneiss Landscape				
	BDL		Badiyala soils are shallow (25-50 cm), well drained, have dark brown to very dark brown and dark yellowish brown, slightly calcareous sandy loam soils occurring on very gently to gently sloping uplands under cultivation	**172(33.49)**
2		BDLbB2	Loamy sand surface, slope 1-3%, moderate erosion	21 (4.09)
4		BDLhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	101(19.66)
162		BDLhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	50 (9.74)
	VNK		Vanakanahalli soils are shallow (25-50 cm), well drained, have dark reddish brown, sandy clay red soils occurring on very gently to moderately sloping uplands under cultivation	**48 (9.39)**
9		VNKcB2	Sandy loam surface, slope 1-3%, moderate erosion	48 (9.39)
	SBR		Sambara soils are moderately shallow (50-75 cm), somewhat excessively drained, have light gray to pink, loamy sand soils occurring on very gently to gently sloping uplands under cultivation	**59 (11.47)**
11		SBRcB2	Sandy loam surface, slope 1-3%, moderate erosion	59 (11.47)
	HSL		Hosalli soils are moderately deep (75-100 cm), moderately well drained, have yellowish brown to dark yellowish brown, slightly calcareous sandy clay soils occurring on very gently sloping uplands under cultivation	**60 (11.65)**

33		HSLiB2	Sandy clay surface, slope 1-3, moderate erosion	53 (10.34)
160		HSLcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	7 (1.31)
	PGP		Poglapur soils are moderately deep (75-100 cm), well drained, have dark brown, dark reddish brown to yellowish red, slightly calcareous, sandy clay soils occurring on very gently sloping uplands under cultivation	**19 (3.78)**
41		PGPiB2	Sandy clay surface, slope 1-3%, moderate erosion	19 (3.78)
	DSB		Dastharabad soils are shallow (25-50 cm), well drained, have dark brown to very dark brown, gravelly clay soils occurring on very gently to gently sloping uplands under cultivation	**44(8.57)**
107		DSBhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	39 (7.51)
108		DSBiB2	Sandy clay surface, slope 1-3, moderate erosion	5 (1.06)
	JNK		Jinkera soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark grayish brown, slightly calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation	**3 (0.67)**
110		JNKhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	3 (0.67)
	BDP		Baddeppalli soils are very shallow (<25 cm), well drained, have dark brown to dark reddish brown, calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation	**22(4.26)**
118		BDPcB2	Sandy loam surface, slope 1-3%, moderate erosion	16 (3.09)
120		BDPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	6 (1.17)
	KBD		Kalabelagundi soils are moderately deep (75-100 cm), well drained, have reddish brown to dark reddish brown and dark reddish gray, gravelly sandy clay loam soils occurring on very gently sloping uplands under cultivation	**15 (2.93)**
131		KBDiB2	Sandy clay surface, slope 1-3, moderate erosion	15 (2.93)
	NHL		Neelahalli soils are deep (100-150 cm), well drained, have brown to dark grayish brown, sandy loam soils occurring on very gently sloping lowlands under cultivation	**1 (0.25)**
101		NHLmB1	Clay surface, slope 1-3%, slight erosion	1 (0.25)
999	Rock outcrops	Rock lands, both massive and bouldery with little or no soil		**49 (9.65)**
1000	Others	Habitation and Water body		**20 (3.87)**
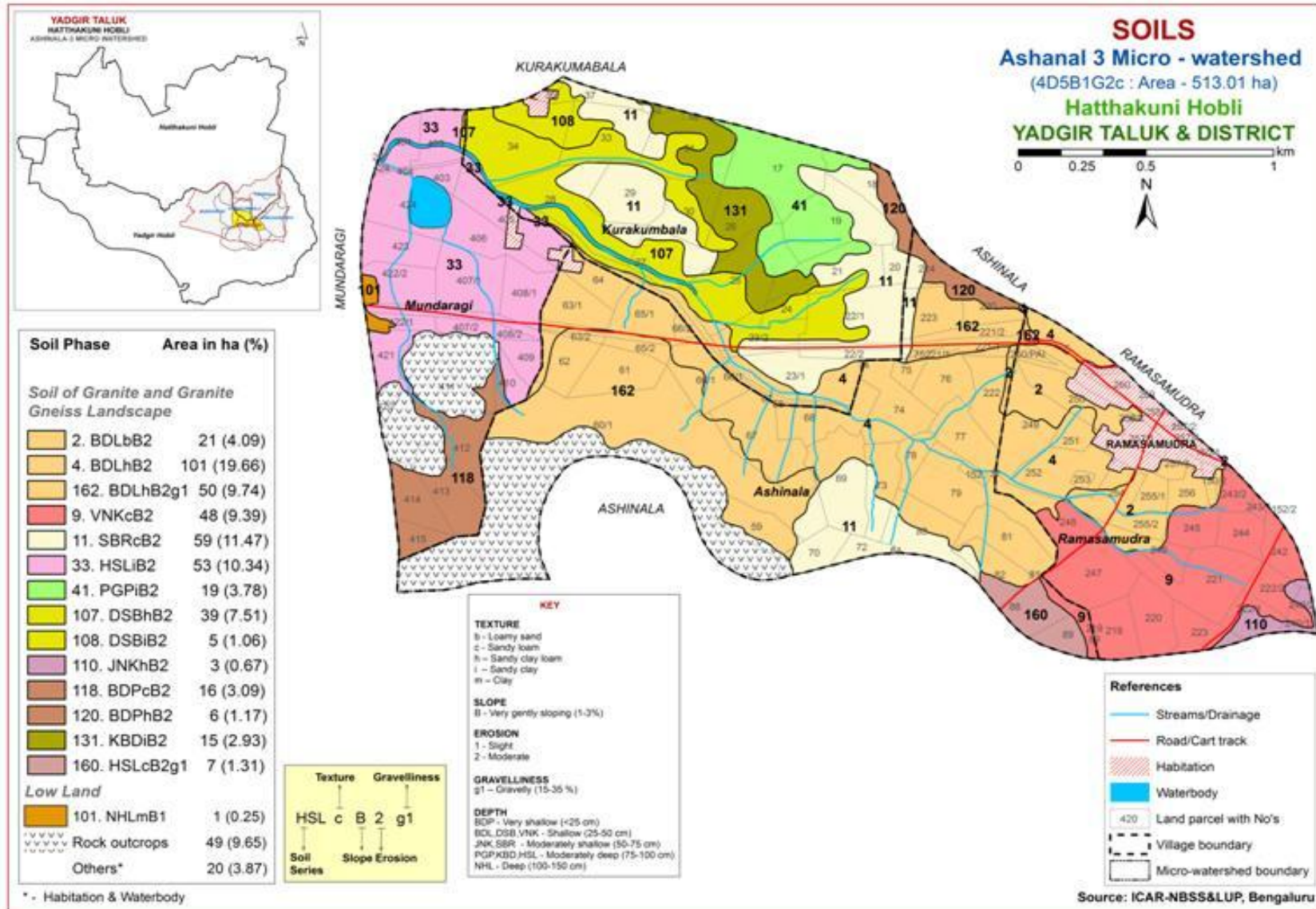
Fig 3.5 Soil Phase or Management Units - Ashanal-3 Microwatershed

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THE SOILS

Detailed information pertaining to the nature, extent and their distribution of different kinds of soils occurring in Ashanal-3 microwatershed is provided in this chapter. The microwatershed area has been identified as granite and gneiss landscape based on geology. In all, 10 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 10 soil series identified followed by 15 soil phases (management units) mapped under each series are furnished below. The physical and chemical characteristics of soil series identified in Ashanal-3 microwatershed 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, 10 soil series are identified and mapped. Of these, BDL series occupies maximum area of 172 ha (33%) followed by HSL 60 ha (12%), SBR 59 ha (11%), VNK 48 ha (9%) and DSB 44 ha (9%). The other series occupy minor area in the microwatershed. Brief description of each series identified and number of soil phases mapped is given below.

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

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

Landscape and Soil Profile characteristics of Badiyala (BDL) Series

4.1.2 Vanakanahalli (VNK) Series: Vanakanahalli soils are shallow (25-50 cm), well drained, have dark reddish brown sandy clay red soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Vanakanahalli series has been classified as a member of the clayey mixed, isohyperthermic family of Typic Haplustalfs.

The thickness of the solum ranges from 25 to 49 cm. The thickness of A horizon ranges from 7 to 16 cm. Its colour is in 2.5 YR and 5 YR with value 3 and chroma 2 to 4. The texture is sandy loam to sandy clay loam and sandy clay. The thickness of B horizon ranges from 20 to 40 cm. Its colour is in 2.5 YR and 5 YR hue with value 3 to 4 and chroma 3 to 4. Its texture is sandy clay. The available water capacity is very low (<50 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Vanakanahalli (VNK) Series

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

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

Landscape and Soil Profile characteristics of Sambra (SBR) Series

4.1.4 Hosalli (HSL) Series: Hosalli soils are moderately deep (75-100 cm), moderately well drained, have dark yellowish brown to yellowish brown, slightly calcareous sandy clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Hosalli series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 76 to 100 cm. The thickness of A horizon ranges from 6 to 15 cm. Its colour is in hue 10 YR and 7.5 YR with value 3 to 5 and chroma 2 to 4. Its texture varies from loamy sand to sandy loam and sandy clay loam. The thickness of B horizon ranges from 62 to 93 cm. Its colour is in hue 10 YR with value 3 to 4 and chroma 2 to 4. Its texture varies from sandy clay loam to sandy clay and clay and is slightly calcareous. The available water capacity is medium (101-150 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Hosalli (HSL) Series

4.1.5 Poglapur (PGP) Series: Poglapur soils are moderately deep (75-100 cm), well drained, dark brown, dark reddish brown to yellowish red, slightly calcareous, sandy clay red soils. They have developed from granite gneiss and occur on very gently sloping uplands under cultivation. The Poglapur series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 78 to 100 cm. The thickness of A horizon ranges from 8 to 17 cm. Its colour is in 7.5 YR hue with value 3 and chroma 3 to 4. Its texture varies from loamy sand to sandy clay loam and sandy clay. The thickness of B horizon ranges from 65 to 92 cm. Its colour is in 2.5 YR, 5 YR and 7.5 YR hue with value 2 to 4 and chroma 2 to 4. Its texture is sandy clay and clay. The available water capacity is medium (101-150 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Poglapur (PGP) Series

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4.1.6 Dastharabad (DSB) Series: Dastharabad soils are shallow (25-50 cm), well drained, have dark brown, gravelly clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Dastharabad series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Paralithic Haplustalfs.

The thickness of the solum ranges from 28 to 50 cm. The thickness of A horizon ranges from 9 to 14 cm. Its colour is in 10 YR and 7.5 YR hue with value and chroma of 3 to 4. The texture varies from sandy loam to sandy clay. The thickness of B horizon ranges from 28 to 40 cm. Its colour is in 7.5 YR hue with value 3 and chroma 3 to 4. The texture is sandy clay to clay with 35-60 per cent gravel. The available water capacity is very low (<50 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Dastharabad (DSB) Series

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

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

Landscape and Soil Profile characteristics of Jinkera (JNK) Series

4.1.8 Baddeppalli (BDP) Series: Baddeppalli soils are very shallow (<25cm), well drained, have dark brown to dark reddish brown, calcareous sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Baddepalli series has been classified as a member of the loamy, mixed, calcareous, isohyperthermic family of Lithic Ustorthents.

The thickness of the soil is less than 25 cm. Its colour is in 7.5 YR and 5 YR hue with value 3 and chroma 2 to 4. The texture varies from sandy clay loam to sandy clay and is calcareous. The available water capacity is very low (<50 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Baddeppalli (BDP) Series

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

The thickness of the solum ranges from 75 to 98 cm. The thickness of A horizon ranges from 10 to 19 cm. Its colour is in hue 5 YR and 7.5 YR with value 3 to 4 and chroma 2 to 4. Its texture varies from loamy sand to sandy loam and sandy clay loam. The thickness of B horizon ranges from 70 to 84 cm. Its colour is in hue 5 YR and 2.5YR with value 3 to 4 and chroma 2 to 4. Its texture is sandy clay loam to sandy clay with gravel content of 35-60 per cent. The available water capacity is very low (<50 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Kalabelagundi (KBD) Series

4.1.10 Neelahalli (NHL) Series: Neelahalli soils are deep (100-150 cm), well drained, have dark grayish brown to brown sandy loam soils. They are developed from weathered granite gneiss and occur on nearly level to very gently sloping lowlands under cultivation. The Neelahalli series has been classified as a member of the coarse-loamy, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 105 to 144 cm. The thickness of A horizon ranges from 8 to 16 cm. Its colour is in 10 YR hue with value 4 to 5 and chroma 2 to 3. The texture ranges from sandy clay loam to sandy clay. The thickness of B horizon ranges from 125 to 134 cm. Its colour is in 10 YR hue with value 4 to 5 and chroma 1 to 3. The texture is dominantly sandy loam. The available water capacity is very high (>200 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Neelahalli (NHL) Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Ashanal-3 microwatershed

Soil Series: Badiyala (BDL) **Pedon:** R-5
Location: $16^0 37'10.0''N$ $77^0 20'21.5''$, Gudalagunta village, Balichakra hobli, Yadgir taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Coarse-loamy, mixed, isohyperthermic, Fluventic Haplustepts

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

| Depth (cm) | pH (1:2.5) | | | E.C. (1:2.5) | O.C. | CaCO$_3$ | Exchangeable bases | | | | | CEC | CEC/ Clay | Base saturation | ESP |
| | Water | CaCl$_2$ | M KCl | dS m^{-1} | % | % | Ca | Mg | K | Na | Total | | | % | % |
							cmol kg^{-1}								
0-12	6.20	-	-	0.074	1.00	0.00	2.80	0.98	0.14	0.01	3.92	4.20	0.72	93	0.20
12-28	9.04	-	-	0.253	0.80	3.20	-	-	0.16	0.69	-	16.90	0.77	100	4.09
28-52	9.41	-	-	0.364	1.10	3.60	-	-	0.16	1.39	-	11.10	0.75	100	12.52

Contd...

Soil Series: Vanakanahalli (VNK) **Pedon:** R-15
Location: $16^0 43'49.5"$N $77^0 17'17.9"$E, Yaleri village, Balichakra hobli, Yadgiri taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Clayey mixed isohyperthermic Typic Haplustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	82.61	8.09	9.30	6.77	8.59	21.13	34.58	11.53	-	ls	8.85	3.53
18-50	Bt	54.51	8.73	36.77	4.93	6.18	14.15	20.75	8.49	-	sc	18.88	11.63

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	CaCO$_3$	Exchangeable bases					CEC	CEC/ Clay	Base satura tion	ESP
							Ca	Mg	K	Na	Total				
	Water	CaCl$_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	5.37	-	-	0.11	0.60	0.00	2.96	1.45	0.13	0.14	4.68	6.27	0.67	75	2.22
18-50	4.71	-	-	0.05	0.81	0.00	5.56	2.24	0.10	0.05	7.95	13.31	0.36	60	0.38

Contd...

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

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

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

| Depth (cm) | Horizon | Size class and particle diameter (mm) | | | | | | | | Coarse fragments w/w (%) | Texture Class (USDA) | % Moisture | |
| | | Total | | | Sand | | | | | | | | |
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-9	Ap	81.90	8.22	9.88	23.76	14.05	23.76	10.62	9.71	-	ls	9.45	2.69
9-17	C1	84.08	6.59	9.33	21.30	20.69	17.65	17.65	6.80	-	ls	7.84	2.65
17-60	C2	86.86	6.17	6.98	11.53	21.54	25.08	23.46	5.26	-	ls	5.48	2.62
60-78	C3	87.27	6.92	5.81	15.05	20.91	26.36	19.29	5.66	-	ls	5.19	2.81

| Depth (cm) | pH (1:2.5) | | | E.C. (1:2.5) | O.C. | CaCO$_3$ | Exchangeable bases | | | | | CEC | CEC/ Clay | Base saturation | ESP |
| | Water | CaCl$_2$ | M KCl | dS m^{-1} | % | % | Ca | Mg | K | Na | Total | | | % | % |
							cmol kg^{-1}								
0-9	8.24	-	-	0.145	0.61	0.91	-	-	0.12	0.09	-	7.50	0.76	100	1.15
9-17	8.21	-	-	0.068	0.57	0.39	-	-	0.06	0.12	-	6.70	0.72	100	1.82
17-60	8.47	-	-	0.080	0.38	0.48	-	-	0.03	0.17	-	2.70	0.39	100	6.34
60-78	8.50	-	-	0.081	0.30	0.52	-	-	0.03	0.17	-	2.70	0.46	100	6.43

Soil Series: Hosalli (HSL) **Pedon:** R-3
Location: 16⁰46'60.3"N 77⁰05'47.6"E, Mudhanala village, Yadgir hobli, Yadgir taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Fine, mixed, isohyperthermic Typic Haplustepts

| Depth (cm) | Horizon | Size class and particle diameter (mm) | | | | | | | | Coarse fragments w/w (%) | Texture Class (USDA) | % Moisture | |
| | | Total | | | Sand | | | | | | | | |
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-10	Ap	88.43	5.15	6.42	5.69	6.40	36.04	27.31	12.99	-	s	7.40	2.74
10-30	Bw1	58.47	7.24	34.29	4.26	9.37	19.91	19.28	5.64	-	scl	19.07	11.57
30-50	Bw2	51.43	12.67	35.90	3.49	8.89	16.72	15.87	6.46	<15	sc	21.64	12.44
50-90	Bw3	49.89	13.64	36.47	2.43	2.96	20.61	16.17	7.72	<15	sc	21.12	12.95

| Depth (cm) | pH (1:2.5) | | | E.C. (1:2.5) | O.C. | CaCO₃ | Exchangeable bases | | | | | CEC | CEC/ Clay | Base satura tion | ESP |
	Water	CaCl₂	M KCl	dS m⁻¹	%	%	Ca	Mg	K	Na	Total	cmol kg⁻¹		%	%
0-10	7.16	-	-	0.117	0.48	0.00	2.83	1.50	0.15	0.29	4.76	4.90	0.76	97	5.94
10-30	6.91	-	-	0.040	0.36	0.00	10.64	5.43	0.10	0.26	16.43	17.80	0.52	92	1.47
30-50	8.17	-	-	0.182	0.24	1.43	-	-	0.12	0.22	-	19.90	0.55	100	1.08
50-90	8.60	-	-	0.148	0.20	4.29	-	-	0.13	0.16	-	19.70	0.54	100	0.81

Contd...

Soil Series: Poglapur (PGP) **Pedon:** R-6

Location: 16⁰34'45.2"N 77⁰10'96.4"E, Anura B village, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Fine, mixed, isohyperthermic Rhodic Paleustalfs

| Depth (cm) | Horizon | Size class and particle diameter (mm) | | | | | | | | Coarse fragments w/w (%) | Texture Class (USDA) | % Moisture | |
| | | Total | | | Sand | | | | | | | | |
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-15	Ap	91.81	4.70	3.49	17.80	30.23	15.57	20.93	7.28	-	s	4.94	2.29
15-50	Bt1	46.83	4.99	48.17	11.92	16.22	8.59	6.77	3.33	10	sc	24.59	17.37
50-90	Bt2	45.81	4.73	49.46	17.10	14.09	6.45	5.16	3.01	15	sc	24.44	16.57
90-125	Bt3	58.92	5.86	35.22	28.51	10.45	10.98	5.49	3.48	15	sc	21.73	10.30

| Depth (cm) | pH (1:2.5) | | | E.C. (1:2.5) | O.C. | CaCO₃ | Exchangeable bases | | | | | CEC | CEC/ Clay | Base satura tion | ESP |
	Water	CaCl₂	M KCl	dS m⁻¹	%	%	Ca	Mg	K	Na	Total			%	%
0-15	6.83	-	-	0.210	0.76	0.00	1.79	0.88	0.41	0.09	3.16	3.15	0.90	100	2.83
15-50	6.20	-	-	0.105	0.48	0.00	12.27	4.45	0.30	0.39	17.40	17.54	0.36	99	2.22
50-90	6.23	-	-	0.080	0.40	0.00	11.51	3.92	0.28	0.37	16.09	17.33	0.35	93	2.16
90-125	6.49	-	-	0.068	0.20	0.00	11.19	3.62	0.27	0.40	15.49	17.43	0.49	89	2.29

Contd...

Soil Series: Dastharabad (DSB) **Pedon:** R-17

Location: $16^0 31'$ 98.6"N $77^0 22'$93.0"E, Duppalli village, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Clayey-skeletal, mixed, isohyperthermic Paralithic Haplustalfs

Depth (cm)	Horizon	Total			Sand					Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		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
0-6	Ap	90.51	4.84	4.64	7.06	8.07	37.24	26.03	12.11	35	s	5.32	1.59
6-17	Bt1	49.11	8.08	42.81	10.67	15.44	10.00	8.44	4.56	20	sc	20.68	13.16
17-43	Bt2	39.54	2.84	57.63	12.89	9.14	7.71	6.83	2.97	50	c	26.69	18.50

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	CaCO$_3$	Exchangeable bases					CEC	CEC/ Clay	Base satura tion	ESP
	Water	CaCl$_2$	M KCl	dS m^{-1}	%	%	Ca	Mg	K	Na	Total			%	%
							cmol kg^{-1}								
0-6	5.93	-	-	0.04	0.67	0.00	2.00	0.54	0.07	0.01	2.61	3.60	0.78	73	0.14
6-17	7.31	-	-	0.110	0.91	0.91	11.19	3.37	0.12	0.49	15.00	15.20	0.36	100	3.22
17-43	6.64	-	-	0.048	0.76	0.00	18.81	5.57	0.23	0.09	24.70	24.90	0.43	99	0.38

Contd...

Soil Series: Jinkera (JNK) **Pedon:** R-1
Location: $16^0$45'13.5"N $77^0$10'59.8"E, Varkanahalli village, Yadgir hobli, Yadgir taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Fine-loamy, mixed, isohyperthermic Typic Haplustepts

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

| Depth (cm) | pH (1:2.5) | | | E.C. (1:2.5) | O.C. | CaCO$_3$ | Exchangeable bases | | | | | CEC | CEC/ Clay | Base saturation | ESP |
| | Water | CaCl$_2$ | M KCl | dS m^{-1} | % | % | Ca | Mg | K | Na | Total | | | % | % |
							cmol kg^{-1}								
0-15	8.42	-	-	0.148	0.70	0.65	-	-	0.15	0.03	-	14.50	0.74	100	0.18
15-38	8.38	-	-	0.226	0.31	2.21	-	-	0.09	0.23	-	21.70	0.75	100	1.05
38-50	8.40	-	-	0.195	0.25	1.17	-	-	0.07	0.19	-	15.90	0.79	100	1.23

Contd...

Soil Series: Baddeppalli (BDP) **Pedon:** R-11
Location: 16⁰43'84.4"N 77⁰14'06.4"E, Halagera village, Yadgir hobli, Yadgir taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Loamy, mixed (calcareous), isohyperthermic, Lithic Ustorthents

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
0-16	Ap	58.67	17.02	24.31	19.03	13.74	9.62	10.57	5.71	<15	scl	16.19	8.18

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	CaCO₃	Exchangeable bases					CEC	CEC/ Clay	Base satura tion	ESP
	Water	CaCl₂	M KCl	dS m⁻¹	%	%	Ca	Mg	K	Na	Total			%	%
							cmol kg⁻¹								
0-16	8.58	-	-	0.262	1.60	7.67	-	-	0.24	0.06	-	18.10	0.74	100	0.35

Contd...

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

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

Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Loamy-skeletal, mixed, isohyperthermic Typic Haplustalfs

| Depth (cm) | Horizon | Size class and particle diameter (mm) | | | | | | | | Coarse fragments w/w (%) | Texture Class (USDA) | % Moisture | |
| | | Total | | | Sand | | | | | | | | |
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-11	Ap	72.35	5.19	22.46	7.19	14.29	19.01	25.28	6.58	15	scl	15.12	8.16
11-35	Bt1	73.20	5.81	20.99	13.66	18.67	16.79	17.62	6.47	20	scl	11.58	7.29
35-64	Bt2	51.68	7.30	41.03	29.41	8.00	4.86	5.62	3.78	40	sc	19.86	14.24
64-89	BC	64.35	3.51	32.15	21.84	12.03	14.87	10.23	5.38	40	scl	16.72	10.36

| Depth (cm) | pH (1:2.5) | | | E.C. (1:2.5) | O.C. | CaCO$_3$ | Exchangeable bases | | | | | CEC | CEC/ Clay | Base satura tion | ESP |
| | Water | CaCl$_2$ | M KCl | dS m^{-1} | % | % | Ca | Mg | K | Na | Total | | | % | % |
							cmol kg^{-1}								
0-11	7.84	-	-	0.604	0.88	0.52	8.69	2.17	0.44	0.49	11.78	11.50	0.51	100	4.27
11-35	5.57	-	-	0.181	0.68	0.00	6.40	1.63	0.18	0.14	8.36	9.10	0.43	92	1.57
35-64	7.42	-	-	0.098	0.44	1.05	15.82	2.34	0.12	0.76	19.04	19.60	0.48	97	3.90
64-89	6.66	-	-	0.165	0.56	0.65	10.45	4.00	0.09	0.43	14.97	15.10	0.47	99	2.86

Contd...

Soil Series: Neelahalli (NHL) **Pedon:** R-17
Location: $16^0 41'38.9"$N $77^0 12'20.2"$E, Jinatera village, Balichakra hobli, Yadgir taluka and district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru   **Classification:** Coarse-loamy, mixed, isohyperthermic Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-15	Ap	54.59	17.20	28.21	1.57	2.51	20.35	19.42	10.75	-	scl	21.01	12.13
15-45	Bw1	75.66	10.87	13.47	6.72	14.15	23.12	22.40	9.27	-	sl	10.80	5.85
45-93	Bw2	70.73	13.38	15.89	3.58	14.33	22.93	22.42	7.47	-	sl	13.76	7.93
93-125	Bw3	71.60	10.65	17.75	4.42	5.97	30.35	20.99	9.88	-	sl	14.72	8.60

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	CaCO₃	Exchangeable bases					CEC	CEC/ Clay	Base satura tion	ESP
							Ca	Mg	K	Na	Total				
	Water	CaCl₂	M KCl	dS m⁻¹	%	%	cmol kg⁻¹							%	%
0-15	5.41	-	-	0.121	1.24	0.00	7.10	2.90	0.25	0.48	10.73	14.28	0.51	75	3.36
15-45	7.72	-	-	0.051	0.24	0.91	-	-	0.11	0.27	-	7.23	0.54	100	3.69
45-93	7.66	-	-	0.047	0.08	1.04	-	-	0.12	0.35	-	8.78	0.55	100	3.96
93-125	8.86	-	-	0.11	0.08	2.08	-	-	0.11	0.28	-	9.88	0.56	100	2.83

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

The most important soil and site characteristics that affect the land use and conservation needs of an area are land capability, soil depth, soil texture, coarse fragments, available water capacity, soil slope, soil erosion, soil reaction etc. These are interpreted from the data base generated through land resource inventory and several thematic maps are generated. These would help in identifying the areas suitable for growing crops, 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 up to l and capability subclass level.

The 15 soil map units identified in the Ashanal-3 microwatershed are grouped under 3 land capability classes and 4 subclasses. Entire area in the microwatershed is suitable for agriculture (Fig. 5.1).

Good cultivable lands (Class II) cover an area of about 28 per cent and are distributed in the northern, southern, western, northwestern and southeastern part of the microwatershed with minor problems of soil, drainage and erosion. Moderately good cultivable lands (Class III) cover an area of about 46 per cent and are distributed in the major part of the microwatershed with moderate problems of soil and erosion. Fairly good lands cover about 13 per cent area with very severe problems and are distributed in the northern, western, eastern and central part of the microwatershed.
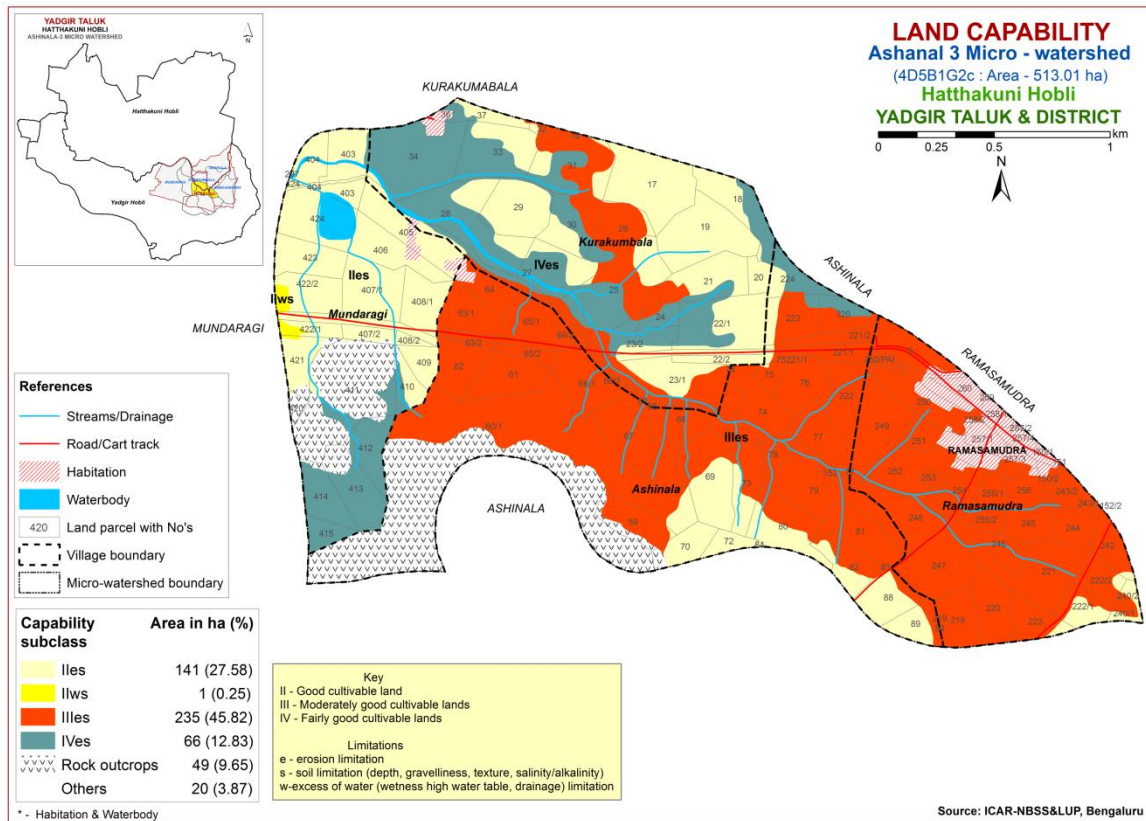
Fig. 5.1 Land Capability map of Ashanal-3 Microwatershed

5.2 Soil Depth

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

Very shallow (<25 cm) soils occur in an area of 22 ha (4%) and are distributed in the eastern, western, central and northern part of the microwatershed. Shallow (25-50 cm) soils occur in an area of 264 ha (51%) and are distributed in the major part of the microwatershed. Moderately shallow (50-75 cm) and moderately deep (75-100 cm) soils occupy an area of about 62 ha (12%) and 94 ha (18%) respectively of the microwatershed and are distributed in the northern, southern, central, western, northwestern and southeastern part of the microwatershed. Deep (100-150 cm) soils cover an area of 1 ha (<1%) and are distributed in the western part of the microwatershed.
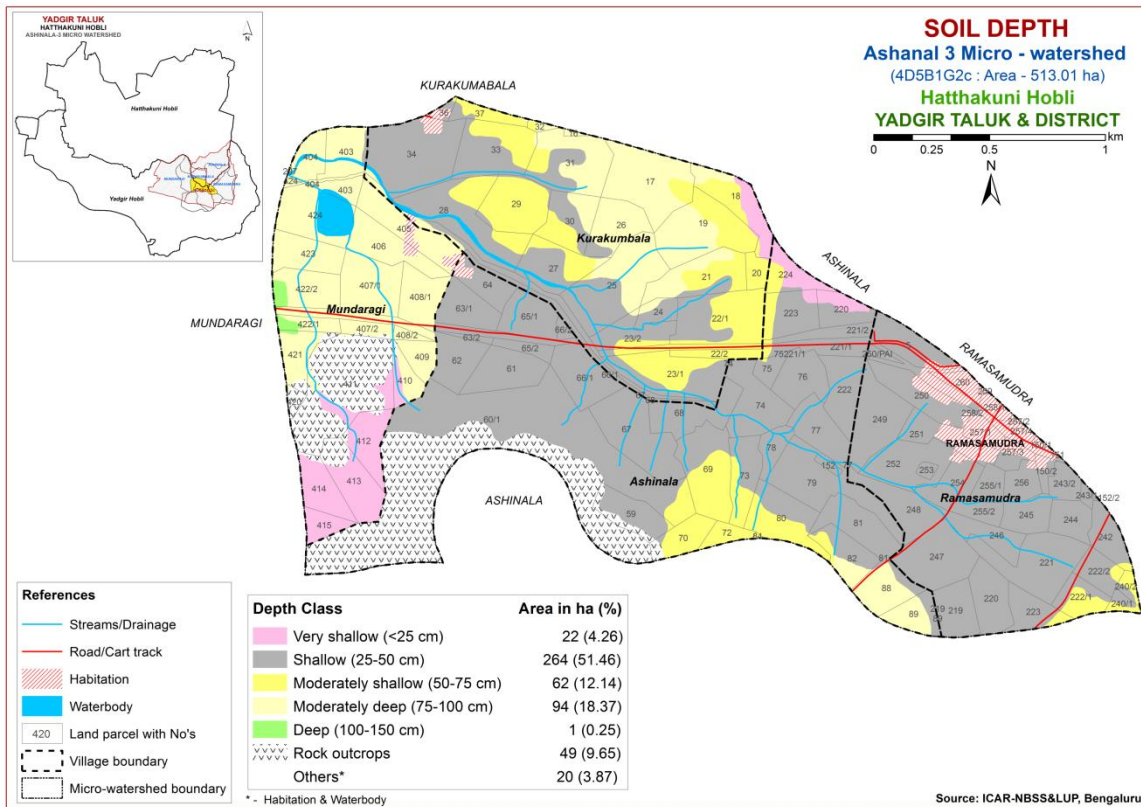
Fig. 5.2 Soil Depth map of Ashanal-3 Microwatershed

The most productive lands cover only 1 ha (<1%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep (100-150 cm depth) soils occurring in the western part of the microwatershed. The problematic soils cover about 56 per cent area where the soils are shallow and very shallow which are suitable for short duration crops and probability of crop failure is high.

5.3 Surface Soil Texture

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

An area of about 21 ha (4%) has soils that are sandy at the surface and are distributed in the central, northern and eastern part of the microwatershed. An area of about 329 ha (64%) is loamy and are distributed in all parts of the microwatershed. An area of 94 ha (18%) has soils that are clayey at the surface and occur in the northern, western and northwestern part of the microwatershed.

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Entire area has most productive lands with respect to surface soil texture. The clayey soils (18%) have high potential for soil-water retention and availability, and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other productive lands are loamy soils which occur in (64%) area which also have high potential for soil-water retention and nutrient availability but have no drainage or other physical problems. The problematic soils cover 4 per cent area with limitations of nutrient availability and moisture.
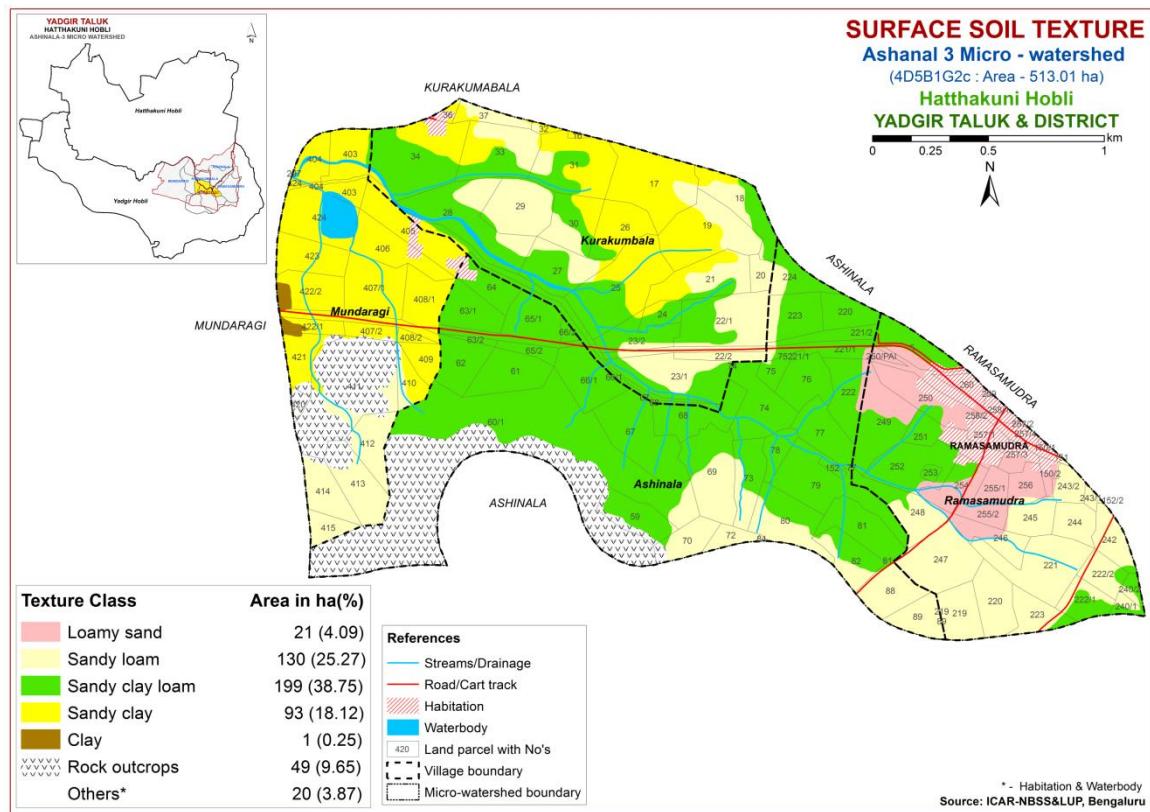
Fig. 5.3 Surface Soil Texture map of Ashanal-3 Microwatershed

5.4 Soil Gravelliness

Gravel is the term used for describing coarse fragments between 2 mm and 7.5 cm diameter and stones for those between 7.5 cm and 25 cm. The presence of gravel and stones in soil reduces the volume of soil responsible for moisture and nutrient storage, drainage, infiltration and runoff, and hinders plant growth by impeding root growth and seedling emergence, intercultural operations and farm mechanization. The 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 a maximum area of about 387 ha (75%) and are distributed in the major part of the microwatershed. An area of about 57 ha (11%) is gravelly (15-35%) and are distributed in the central, eastern and southern part of the microwatershed.

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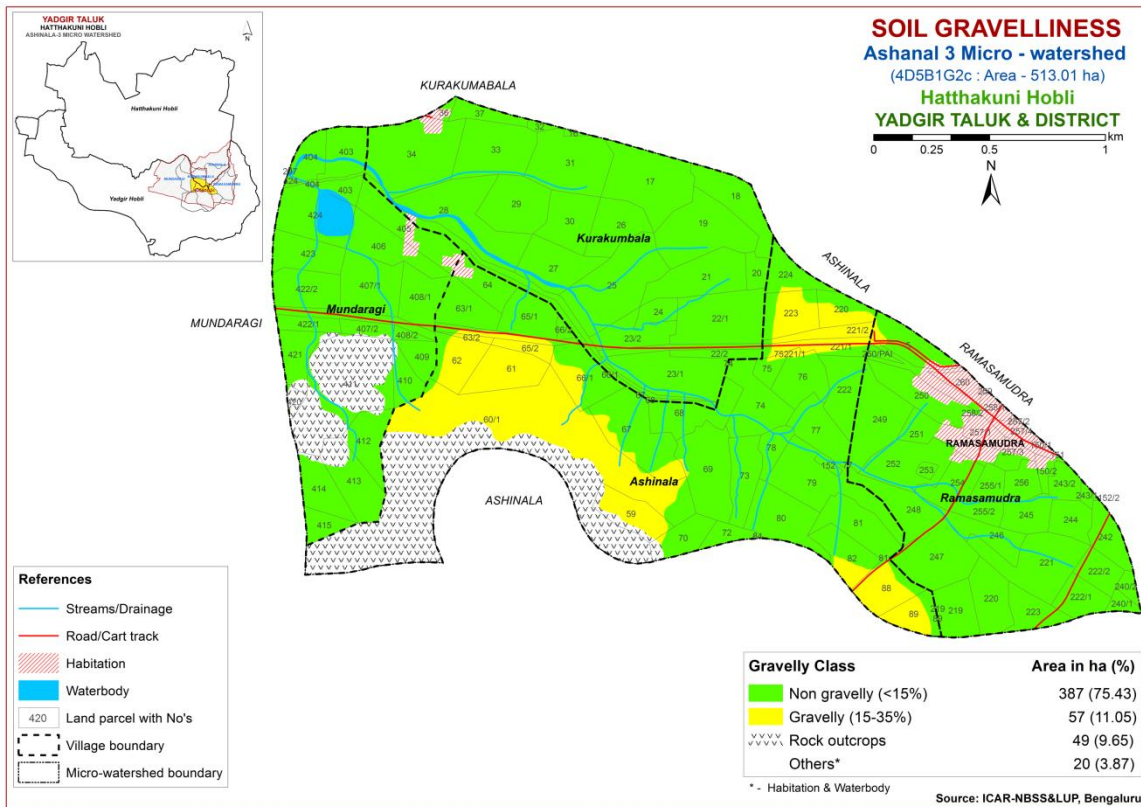
Fig. 5.4 Soil Gravelliness map of Ashanal-3 Microwatershed

The problem soils (11%) that are gravelly (15-35%), where only short or medium duration crops can be grown. The most productive soils (75%) that are non gravelly (<15%), where all climatically adapted long duration crops can be grown.

5.5 Available Water Capacity

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

An area of about 360 ha (70%) and 76 ha (15%) in the microwatershed has soils that are very low (<50 mm/m) and low (51-100 mm/m) in available water capacity respectively and are distributed in all parts of the microwatershed. Medium (101-150 mm/m) in 7 ha (1%) and are distributed in the southern part of the microwatershed. Very high (>200 mm/m) in 1 ha (<1%) and are distributed in the western part of the microwatershed.
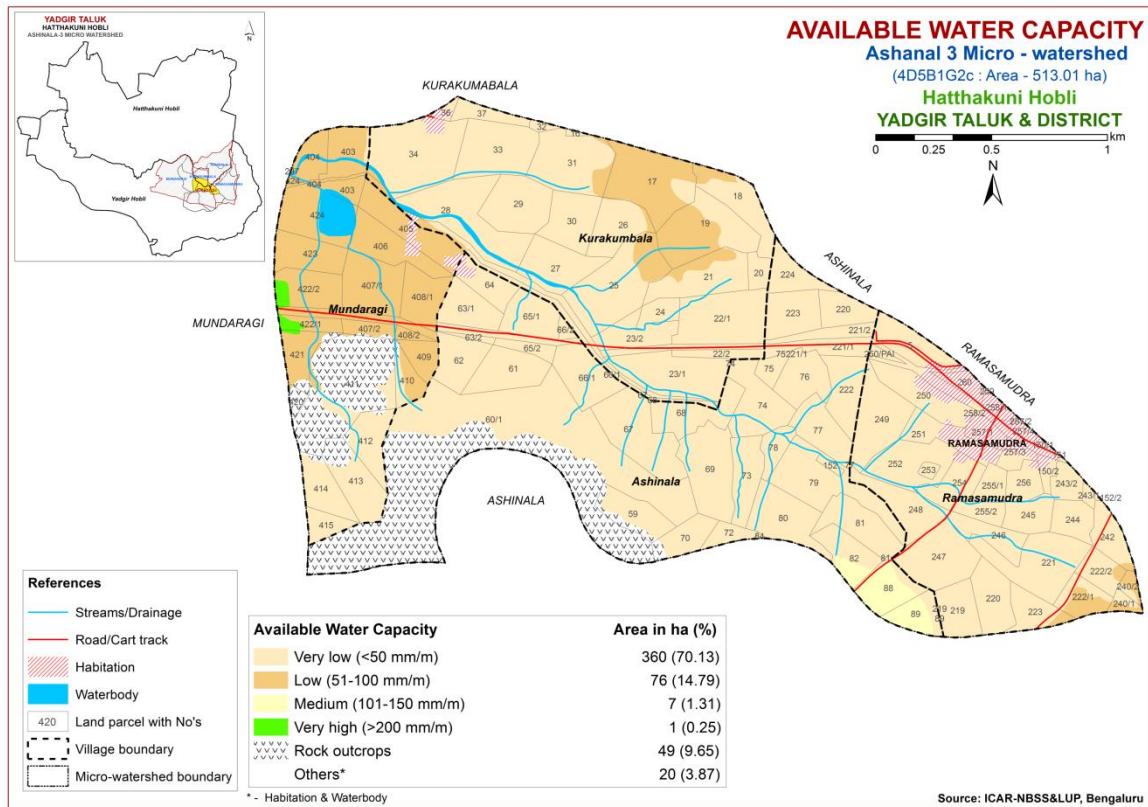
Fig. 5.5 Soil Available Water Capacity map of Ashanal-3 Microwatershed

About 436 ha (85%) area in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. An area of 8 ha (2%) are potential with regard to AWC where all climatically adapted annual and perennial crops can be grown.

5.6 Soil Slope

Soil slope refers to the inclination of the surface of the land. It is defined by gradient, shape and length, and is an integral feature of any soil as a natural body. Slope is considered important in soil genesis, land use and land development. The length and gradient of slope influences the rate of runoff, infiltration, erosion and deposition. The soil map units were grouped into two slope classes and a slope map was generated showing the area extent and their geographic distribution in the microwatershed (Fig. 5.6).

Entire area of the microwatershed falls under very gently sloping (1-3% slope) lands and are distributed in all parts of the microwatershed.

An area of 444 ha (86%) in the microwatershed which are very gently sloping (1-3%) has soils that have high potential in respect of soil slopes. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.
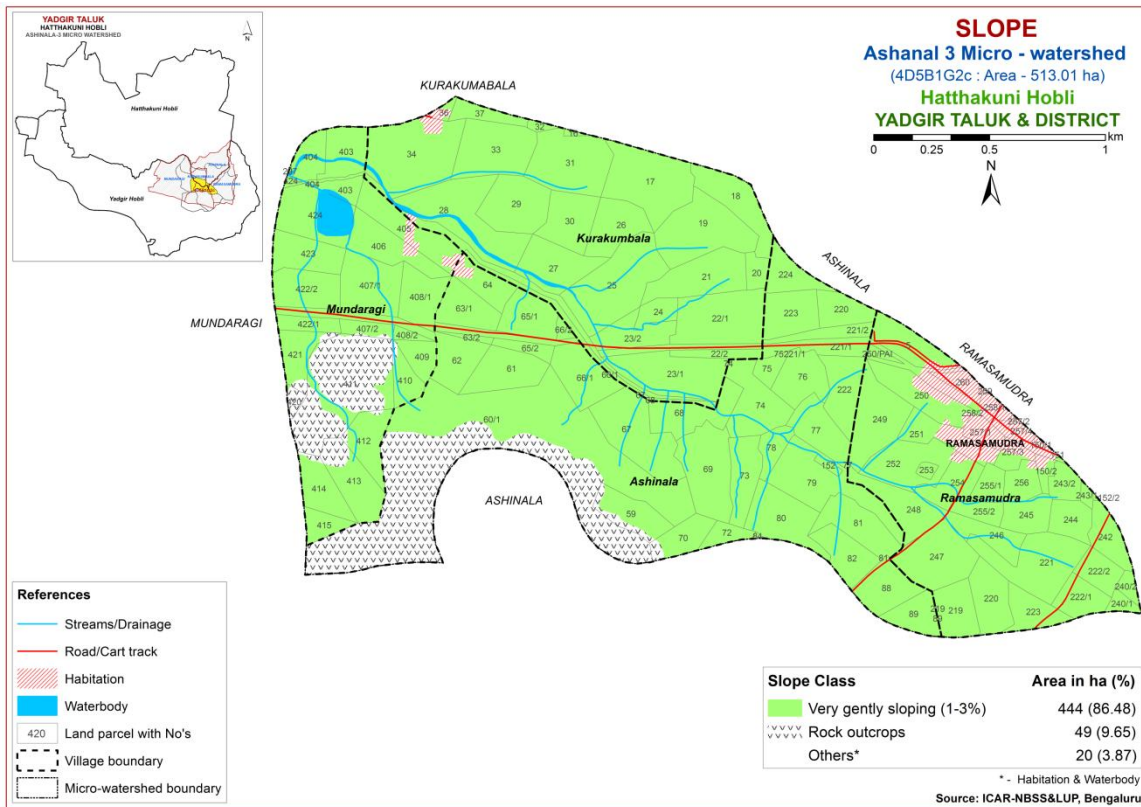
Fig. 5.6 Soil Slope map of Ashanal-3 Microwatershed

5.7 Soil Erosion

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

Soils that are slightly eroded (e1 class) cover an area of 1 ha (<1%) and are distributed in the western part of the microwatershed. Moderately eroded (e2 class) cover an area of 442 ha (86%) and are distributed in all parts of the microwatershed.

Entire area in the microwatershed is problematic because of moderate. For these areas, taking up soil and water conservation and other land development measures are needed.
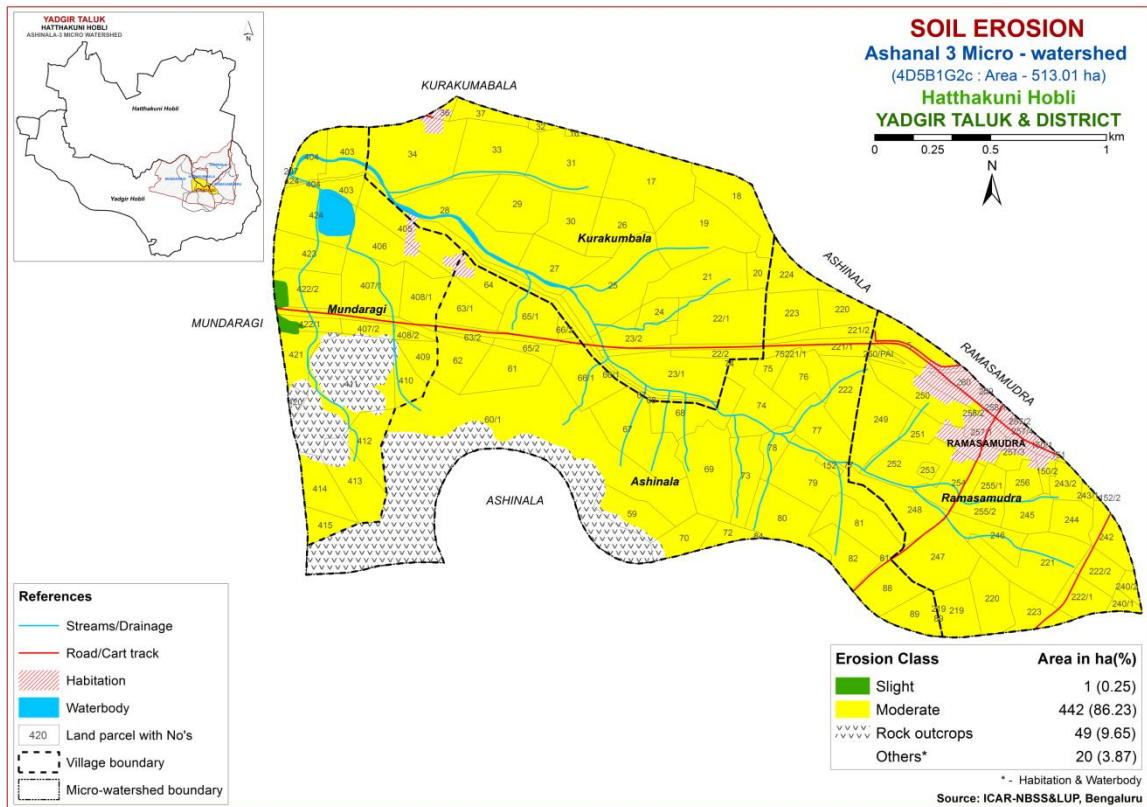
Fig. 5.7 Soil Erosion map of Ashanal-3 Microwatershed

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 Ashanal-3 microwatershed for soil reaction (pH) showed that an area of about 213 ha (42%) is neutral (pH 6.5-7.3) and are distributed in the major part of the microwatershed. An area of about 67 ha (13%) is slightly acid (pH 6.0-6.5) and are distributed in the eastern, southeastern and southern part of the microwatershed. An area of about 135 ha (26%) is slightly alkaline (pH 7.3-7.8) and are distributed in the central, northern and western part of the microwatershed. An area of about 29 ha (6%) are moderately alkaline (pH 7.8-8.4) and are distributed in the northern and northwestern part of the microwatershed. In all, major area of about 213 ha is neutral and 164 ha is alkaline and 67 ha is acidic.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is high (>0.75) in an area of about 24 ha (5%) and are distributed in southeastern part of the microwatershed and medium (0.5-0.75%) covering a maximum area of about 419 ha (82%) and are distributed in the major part of the microwatershed (Fig. 6.3).
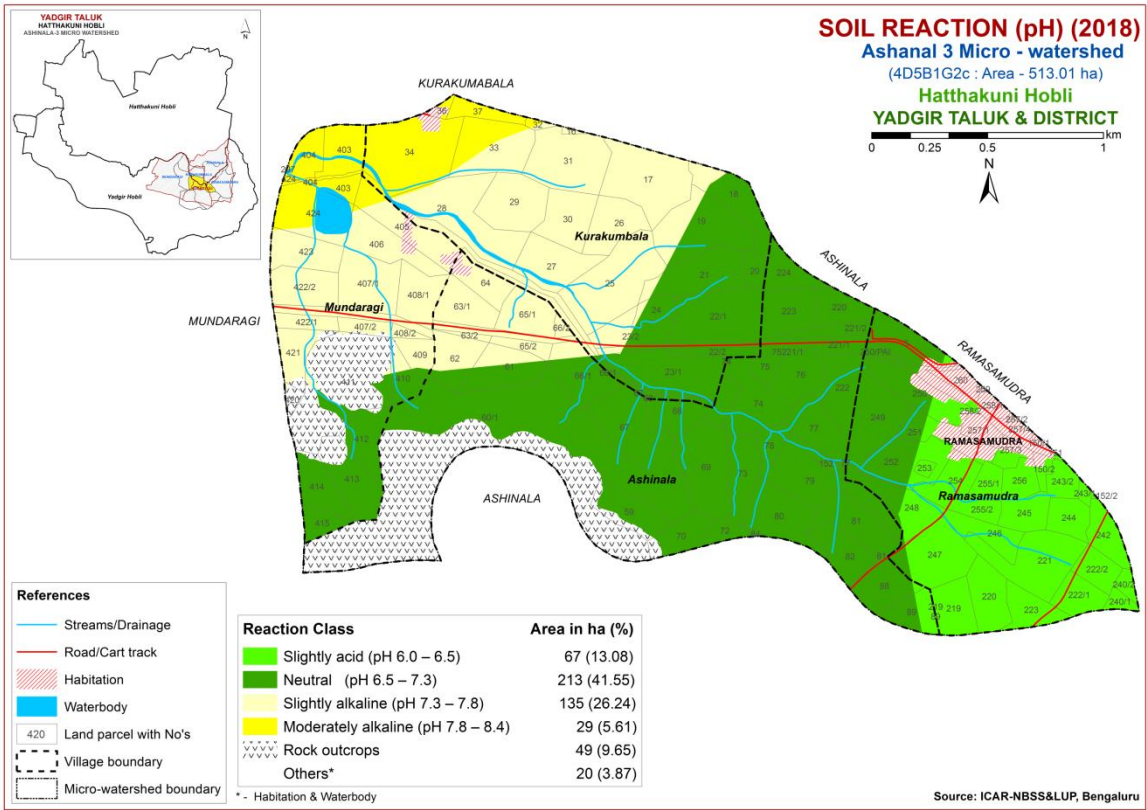
Fig.6.1 Soil Reaction (pH) map of Ashanal-3 Microwatershed
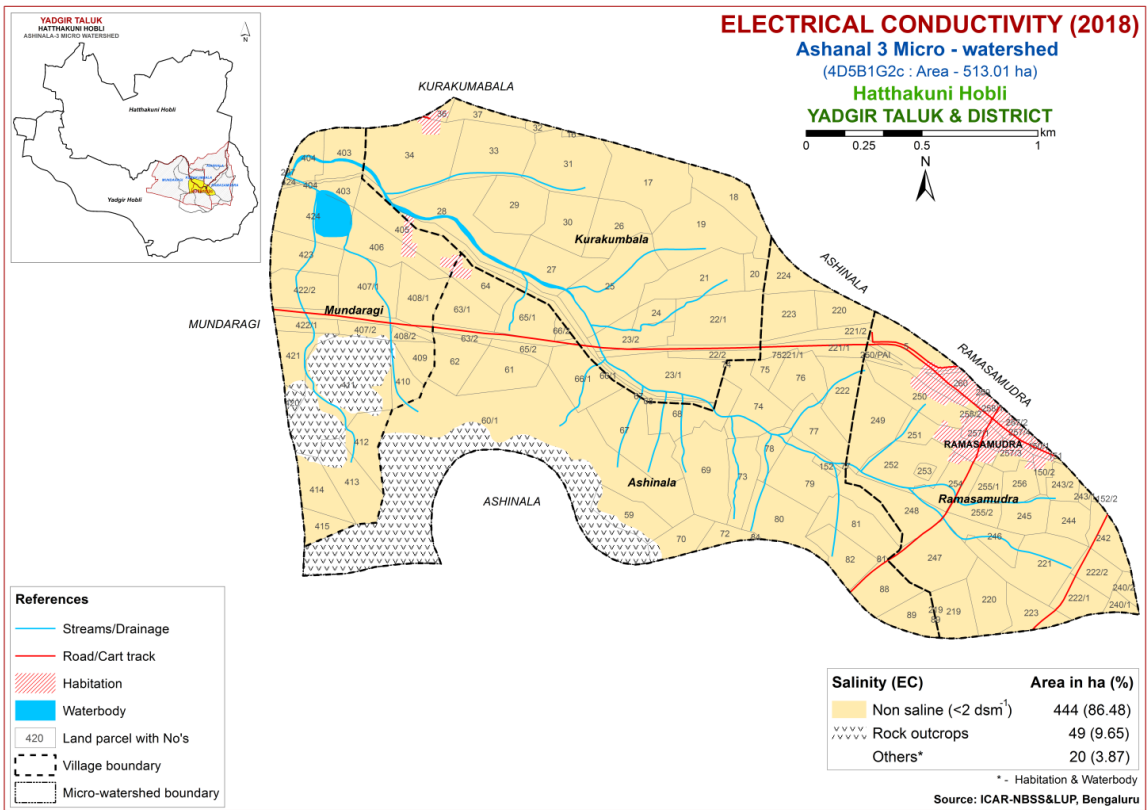
Fig.6.2 Electrical Conductivity (EC) map of Ashanal-3 Microwatershed
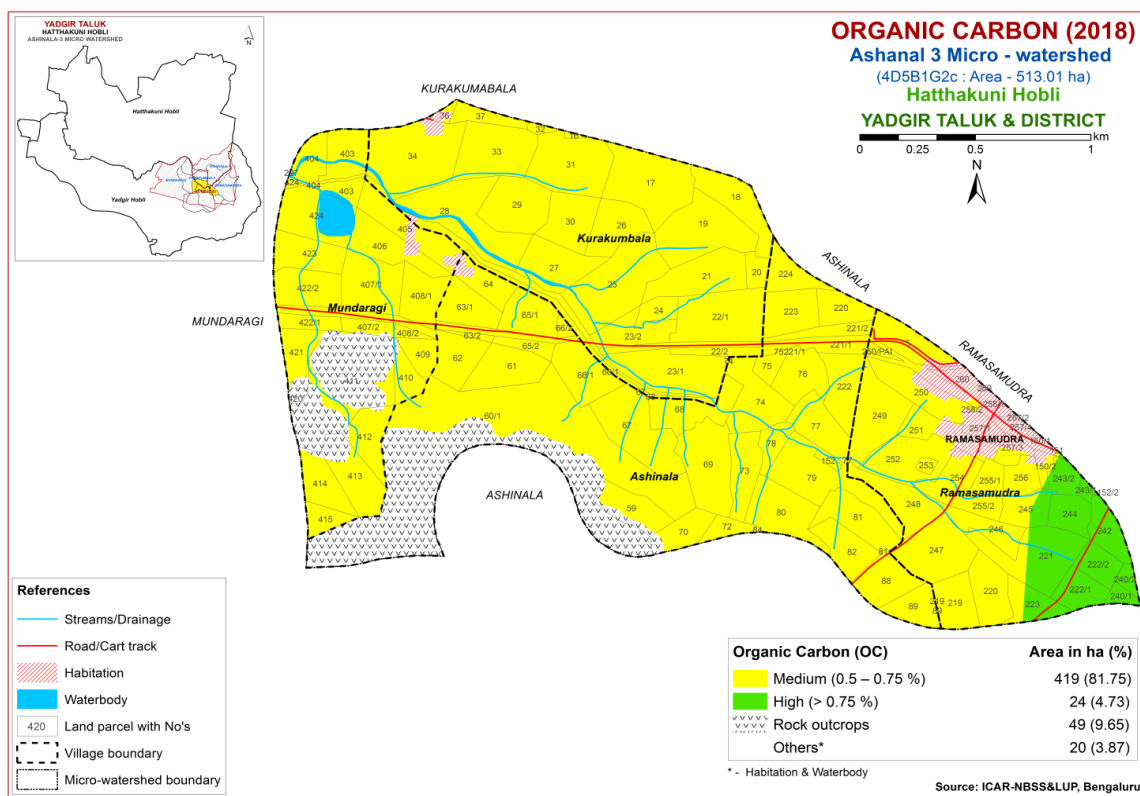
Fig.6.3 Soil Organic Carbon map of Ashanal-3 Microwatershed

6.4 Available Phosphorus

Available phosphorus content is low (<23 kg/ha) in a maximum area of 231 ha (45%) and are distributed in the major part of the microwatershed. Medium (23-57 kg/ha) in an area of about 190 ha (37%) and are distributed in the central, northern, northeastern, southeastern, northwestern and southern part of the microwatershed. High (>57 kg/ha) in an area of about 23 ha (4%) and are distributed in the southeastern part of the microwatershed (Fig. 6.4).

6.5 Available Potassium

Available potassium content is low (<145 kg/ha) in a maximum area of about 252 ha (49%) and are distributed in the major part of the microwatershed. Medium (145-337 kg/ha) in an area of about 192 ha (37%) and are distributed in the northwestern, western, eastern, southern and southeastern part of the microwatershed (Fig. 6.5).

6.6 Available Sulphur

Maximum area of about 392 ha (76%) is low (<10 ppm) in available sulphur content and are distributed in all parts of the microwatershed and medium (10-20 ppm) in an area of about 52 ha (10%) and are distributed in the northern part of the microwatershed (Fig. 6.6).

6.7 Available Boron

Available boron content is low (<0.5 ppm) in the entire microwatershed (Fig. 6.7).

6.8 Available Iron

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

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in a maximum area of about 373 ha (73%) and are distributed in all parts of the microwatershed. An area of about 71 ha (14%) is sufficient (>0.6 ppm) in available zinc content and are distributed in the eastern and southeastern part of the microwatershed (Fig 6.11).
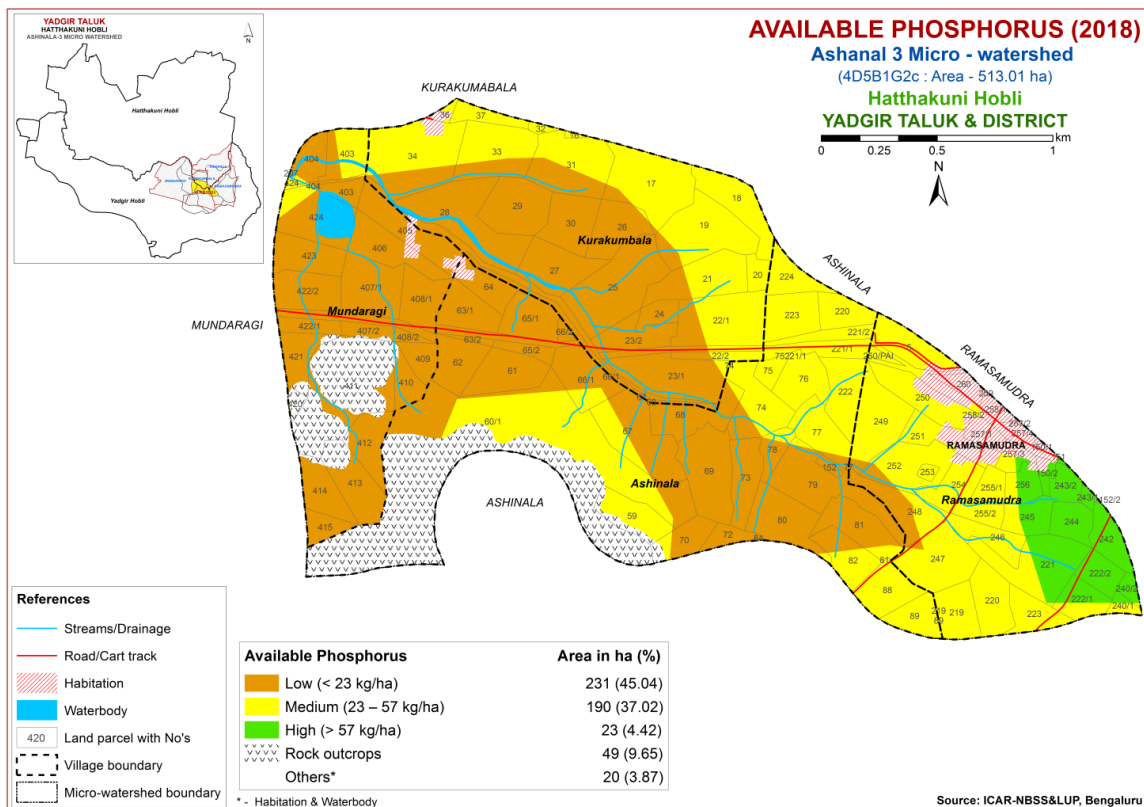
Fig.6.4 Soil Available Phosphorus map of Ashanal-3 Microwatershed
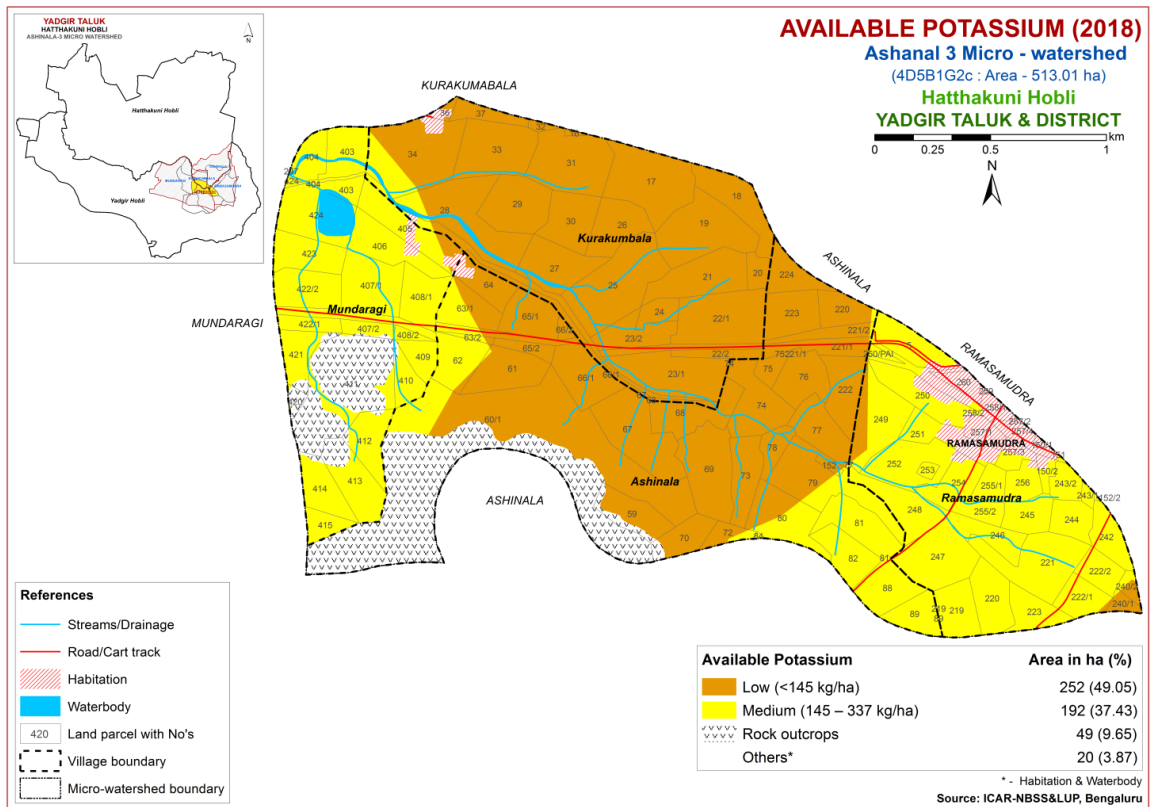
Fig.6.5 Soil Available Potassium map of Ashanal-3 Microwatershed
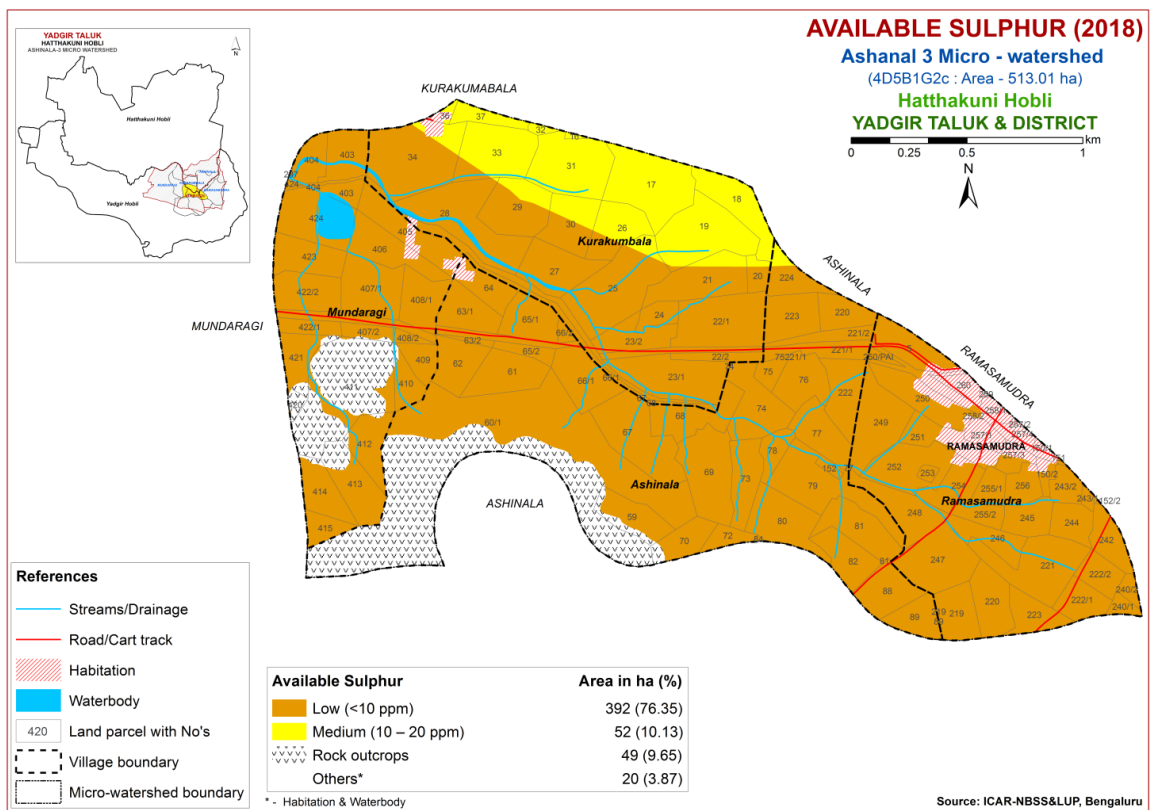
Fig.6.6 Soil Available Sulphur map of Ashanal-3 Microwatershed

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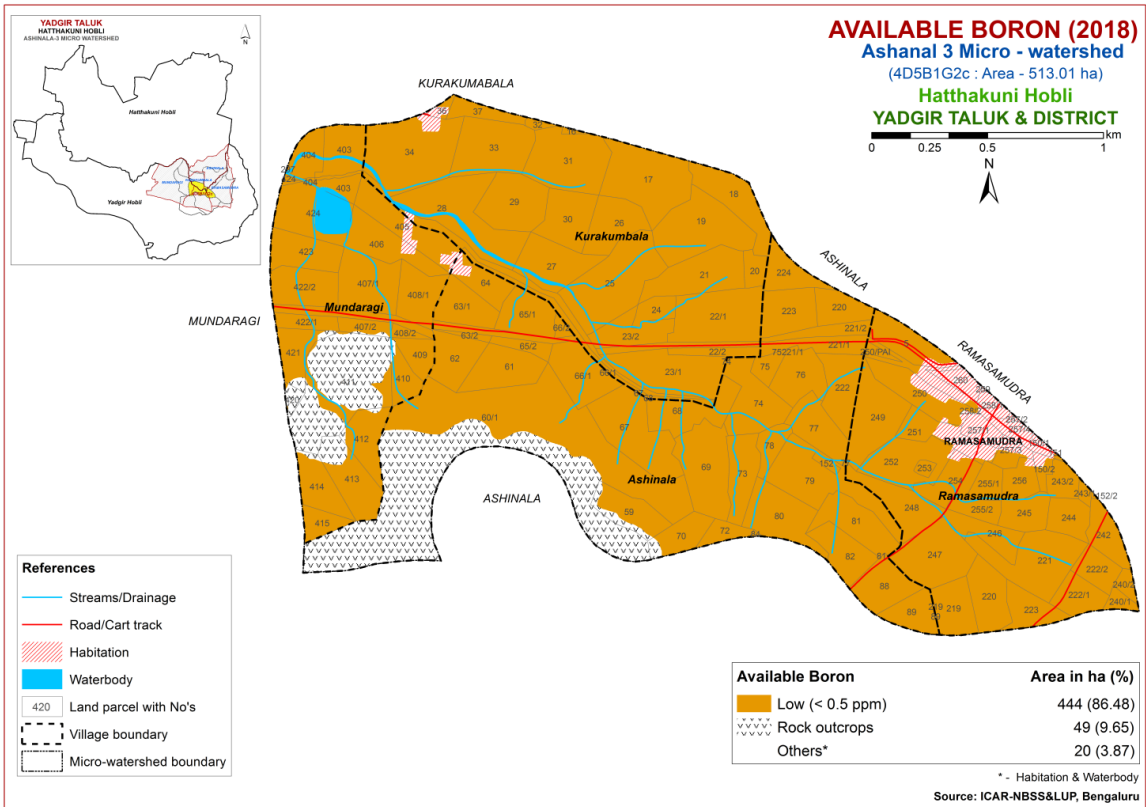
Fig.6.7 Soil Available Boron map of Ashanal-3 Microwatershed
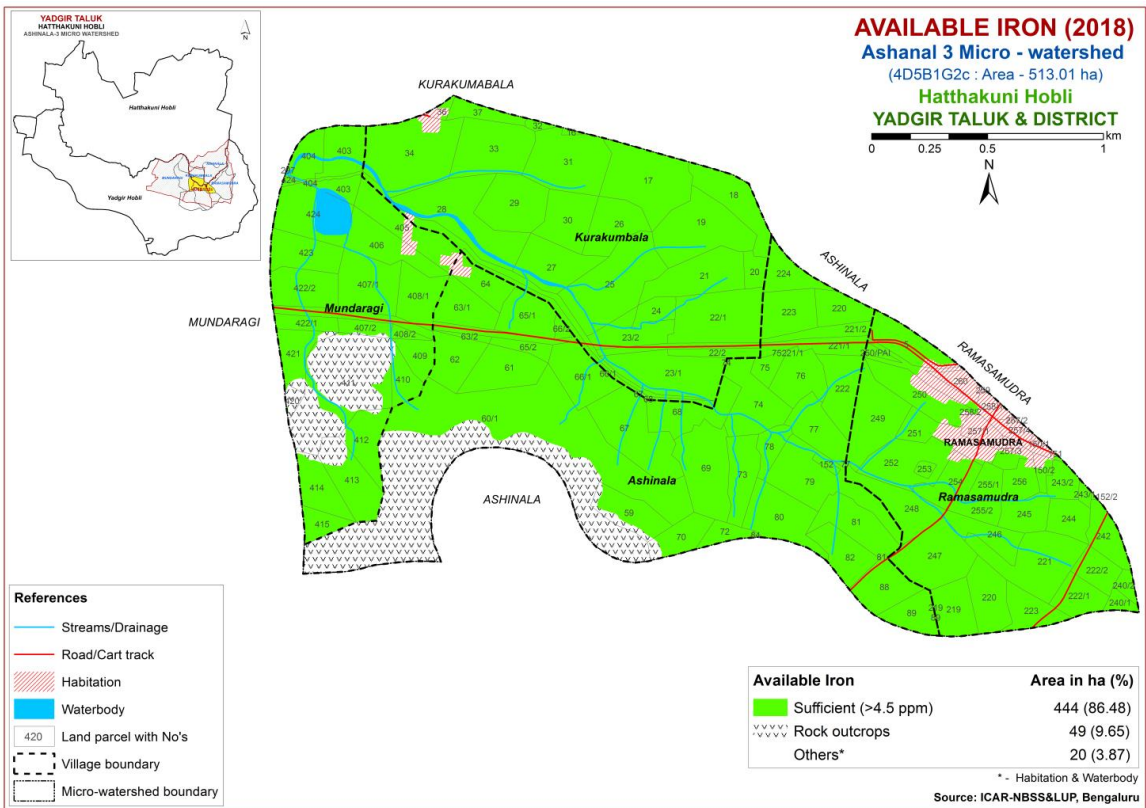
Fig.6.8 Soil Available Iron map of Ashanal-3 Microwatershed
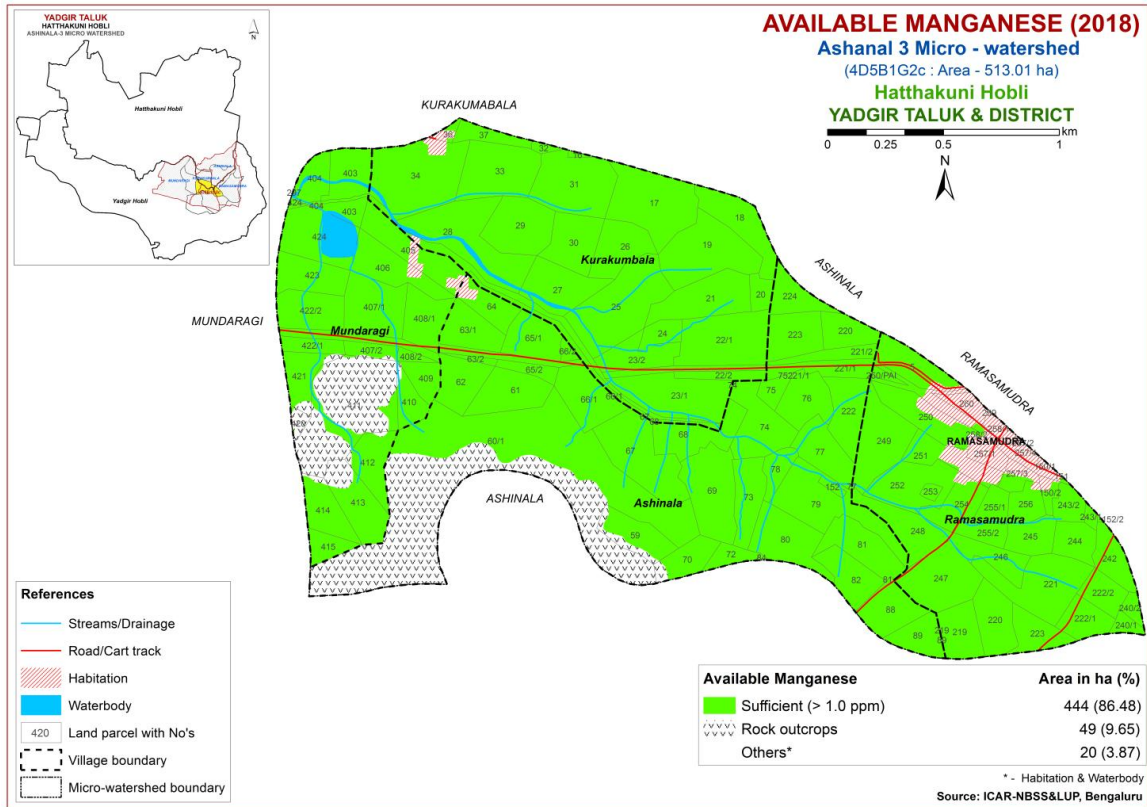
Fig.6.9 Soil Available Manganese map of Ashanal-3 Microwatershed
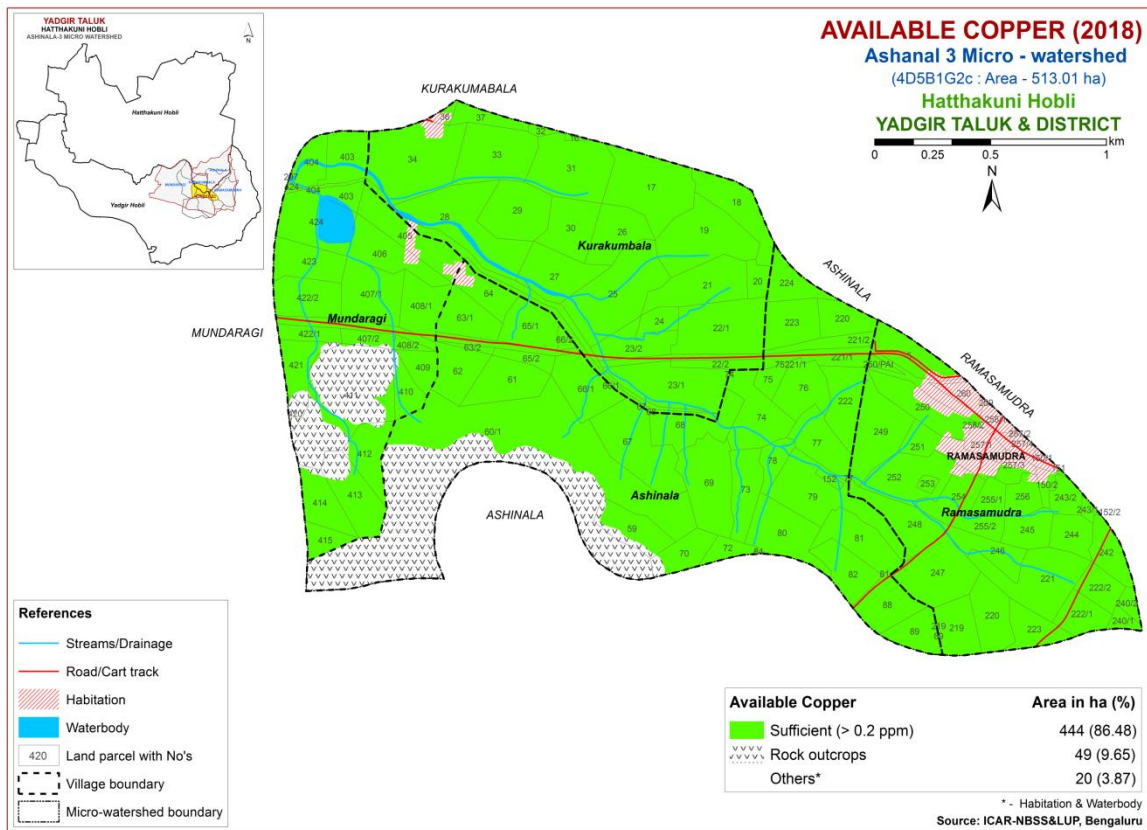
Fig.6.10 Soil Available Copper map of Ashanal-3 Microwatershed
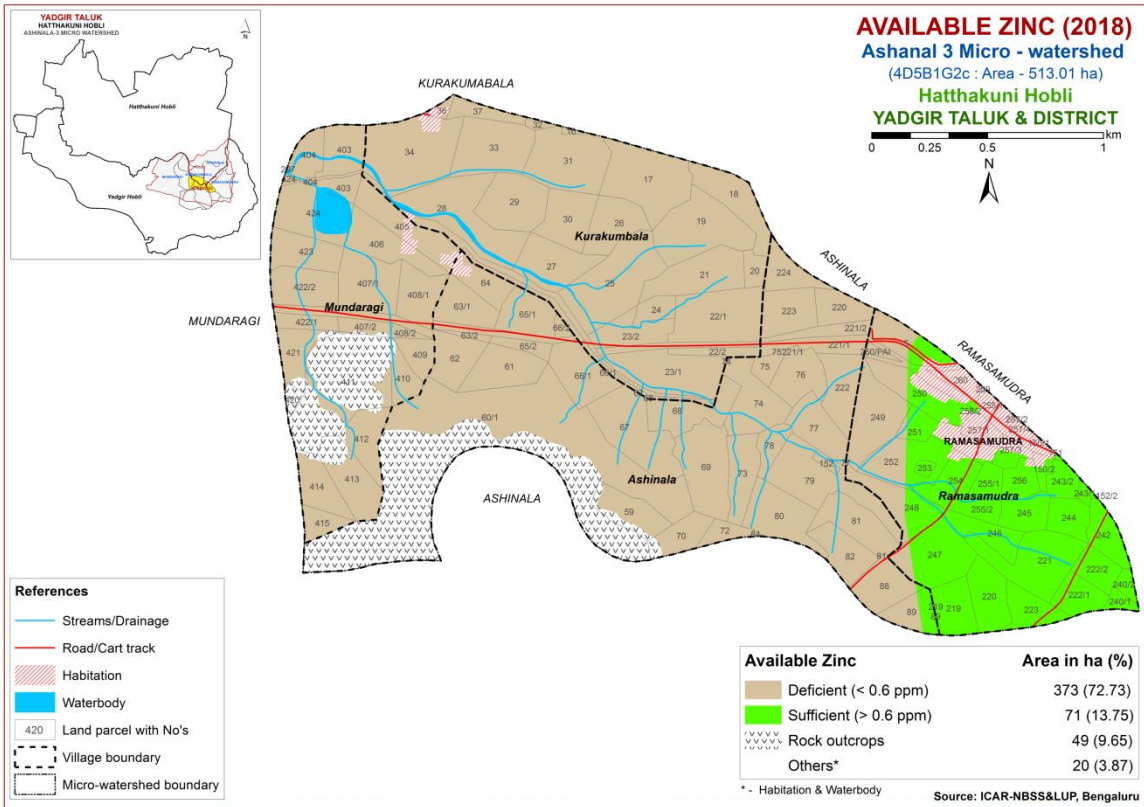
Fig.6.11 Soil Available Zinc map of Ashanal-3 Microwatershed

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Ashanal-3 microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The soil and land characteristics were matched with the crop requirement to arrive at the crop suitability. The soil and land characteristics table (Table 7.1) and crop requirement tables (Tables 7.2 to Tables 7.30) are given at the end. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3- Marginally Suitable. Order N has two classes, N1-Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'w' for drainage and 'z' for calcareousness. These limitations are indicated as lower case letters to the Class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

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

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.

An area of about 21 ha (4%) is highly suitable (Class S1) for growing sorghum and are distributed in the northern and western part of the microwatershed with no limitations. An area of about 63 ha (12%) is moderately suitable (Class S2) for growing sorghum and are distributed in the southeastern part of the microwatershed. They have

minor limitations of texture, calcareousness and rooting depth. Maximum area of about 338 ha (66%) is marginally suitable (Class S3) for growing sorghum and are distributed in the major part of the microwatershed with moderate limitations rooting depth, texture and gravelliness. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the southwestern and northeastern part of the microwatershed with severe limitation 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.

An area of about 19 ha (4%) is highly suitable (Class S1) for growing maize and are distributed in the northern part of the microwatershed with no limitations. An area of about 64 ha (13%) is moderately suitable (Class S2) and occur in the northwestern, western, southern and southeastern part of the microwatershed. They have minor limitations of texture, calcareousness and drainage. Marginally suitable lands (Class S3) for growing maize occupy a maximum area of about 338 ha (66%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness

and texture. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the northeastern and southwestern 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.

An area of about 19 ha (4%) is highly suitable (Class S1) for growing bajra and are distributed in the northern part of the microwatershed with no limitations. An area of about 79 ha (16%) is moderately suitable (Class S2) for growing bajra and are distributed in the central, northern, northwestern, western, southern and southeastern part of the microwatershed. They have minor limitations of texture, gravelliness, calcareousness and rooting depth. Marginally suitable lands (Class S3) occupy a maximum area of about 323 ha (63%) and distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and texture. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the northeastern and southwestern part of the microwatershed with severe limitation of rooting depth.

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Fig. 7.3 Land Suitability map of Bajra

7.4 Land Suitability for Groundnut (*Arachis hypogaea*)

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

An area of about 94 ha (18%) is moderately suitable (Class S2) for groundnut and are distributed in the northwestern, northern and southern part of the microwatershed. They have minor limitations of texture, calcareousness and gravelliness. Marginally suitable lands (Class S3) for growing groundnut occupy a maximum area of about 265 ha (64%) and are distributed in the major part of the microwatershed. They have moderate limitations of texture, drainage, gravelliness and rooting depth. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the northeastern and southwestern part of the microwatershed with severe limitation of rooting depth.
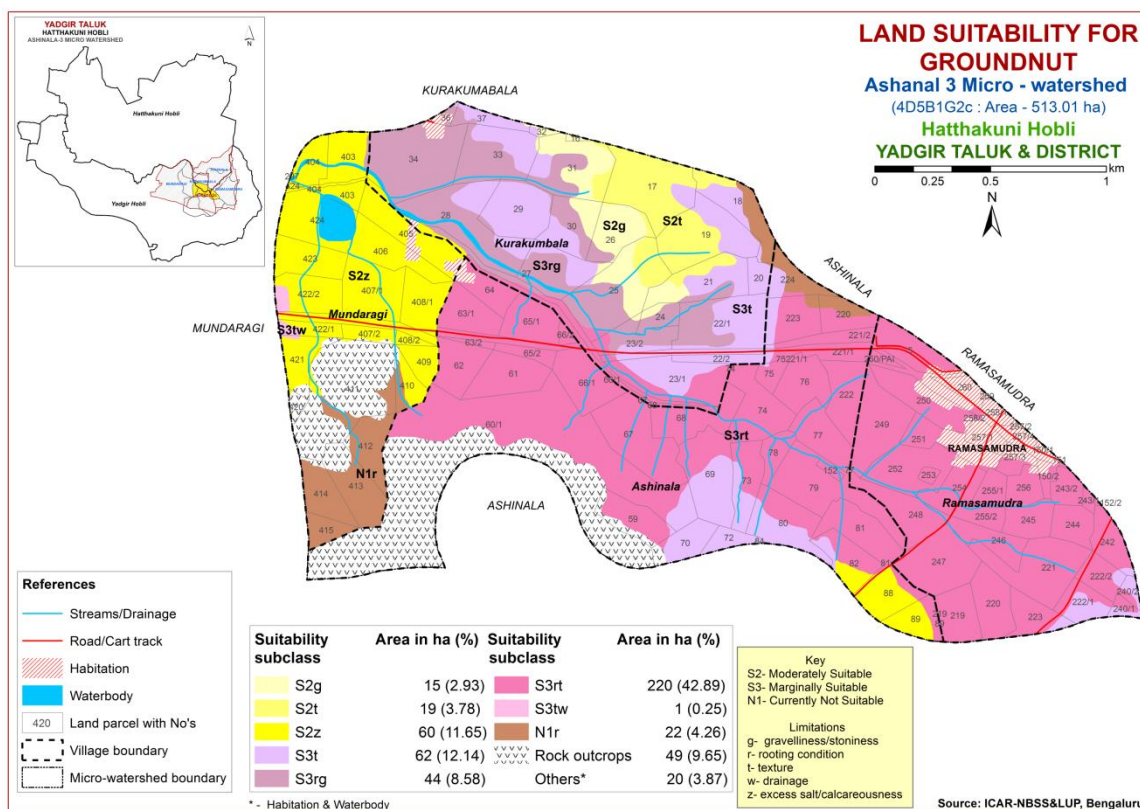
Fig. 7.4 Land Suitability map of Groundnut

7.5 Land Suitability for Sunflower (*Helianthus annus*)

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

A small area of about 1 ha (<1%) is highly suitable (Class S1) for growing sunflower and is distributed in the western part of the microwatershed. An area of about 79 ha (15%) is moderately suitable (Class S2) for sunflower and are distributed in the northern, northwestern, southern and western part of the microwatershed. It has minor limitations of rooting depth and calcareousness. Marginally suitable (Class S3) lands for sunflower are found to occur in a maximum area of about 77 ha (15%) with moderate limitations of rooting depth, texture and gravelliness and are distributed in the northern, southern, central, eastern and southeastern part of the microwatershed. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and gravelliness.

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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.

An area of about 80 ha (16%) is moderately suitable (Class S2) for growing redgram and are distributed in the northern, southern, western and northwestern part of the microwatershed. They have minor limitations of rooting depth, calcareousness, texture and drainage. Maximum area is marginally suitable (Class S3) for growing redgram and occupy an area of about 342 ha (67%) and occur in all parts of the microwatershed. They have moderate limitations of rooting depth, texture and gravelliness. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the northeastern and southwestern part of the microwatershed with severe limitation of rooting depth.
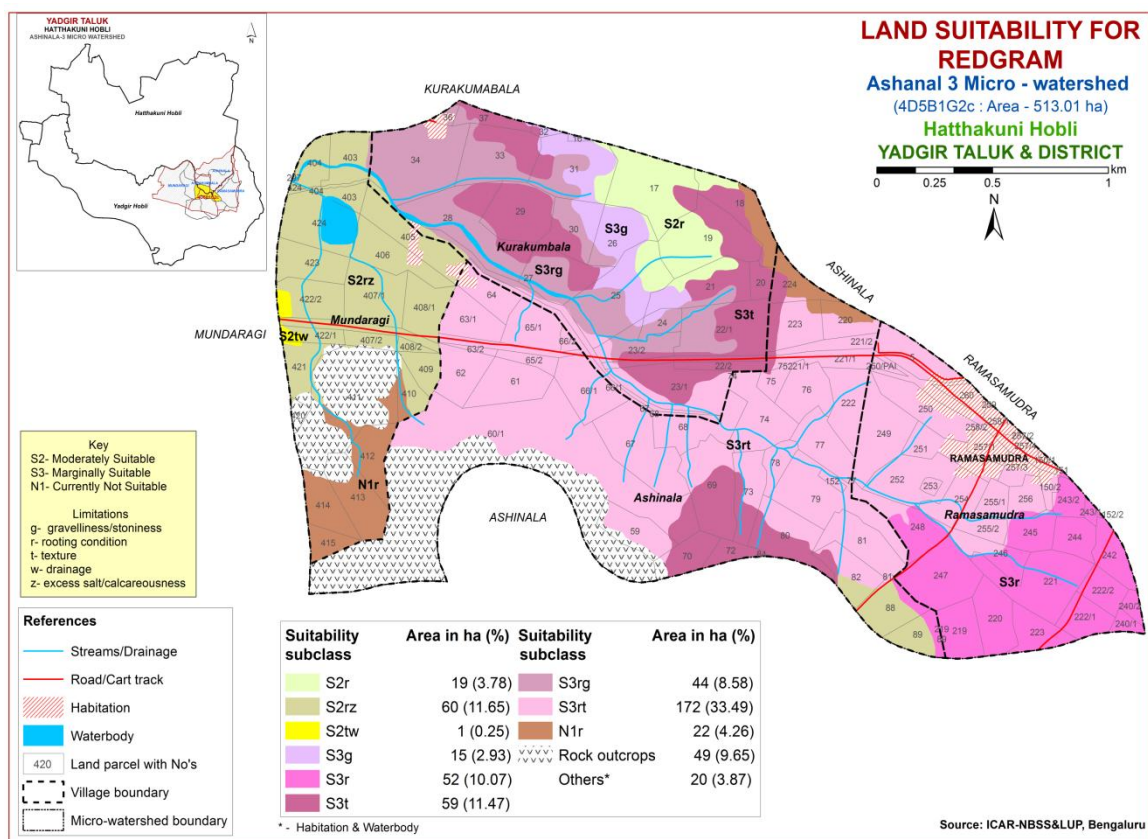
Fig. 7.6 Land Suitability map of Redgram

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

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

Highly (Class S1) suitable lands for growing Bengal gram occur in a small area of 1 ha (<1%) and are distributed in the western part of the microwatershed. An area of about 22 ha (4%) is moderately suitable (Class S2) for growing Bengal gram and are distributed in the northern and southeastern part of the microwatershed. They have minor limitations of texture and rooting depth. Marginally suitable lands (Class S3) occupy a maximum area of about 339 ha (66%) and are distributed in all parts of the microwatershed. They have moderate limitations of rooting depth, gravelliness, texture and calcareous. Currently not suitable (Class N1) lands occur in an area of 81 ha (16%) and are distributed in the northern, southern, western, central and northeastern part of the microwatershed with severe limitations of texture and rooting depth.
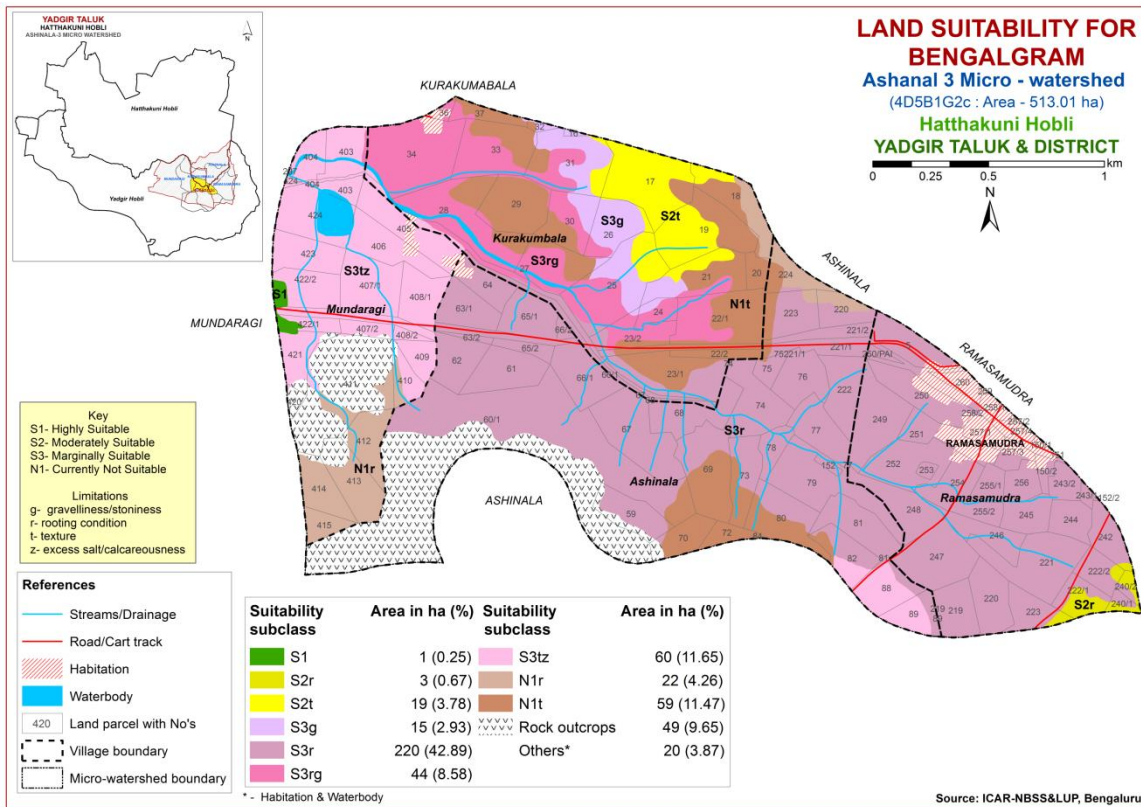
Fig. 7.7 Land Suitability map of Bengal gram.

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.

A small area of about 1 ha (<1%) in the microwatershed has soils that are highly suitable (Class S1) for growing cotton crop. They have no limitations for growing cotton and are distributed in the western part of the microwatershed. Moderately suitable (Class S2) lands are found to occur in an area of about 23 ha (4%). The soils have moderate limitation of rooting depth. They are distributed in the northern and southeastern part of the microwatershed. Marginally suitable (Class S3) lands for cotton are found to occur in a maximum area of about 329 ha (66%) with moderate limitations of rooting depth, texture, calcareousness and gravelliness and are distributed in the major part of the microwatershed. Currently not suitable (Class N1) lands occur in an area of 81 ha (16%) and are distributed in the northern, southern, western, central and northeastern part of the microwatershed with severe limitations of texture and rooting depth.
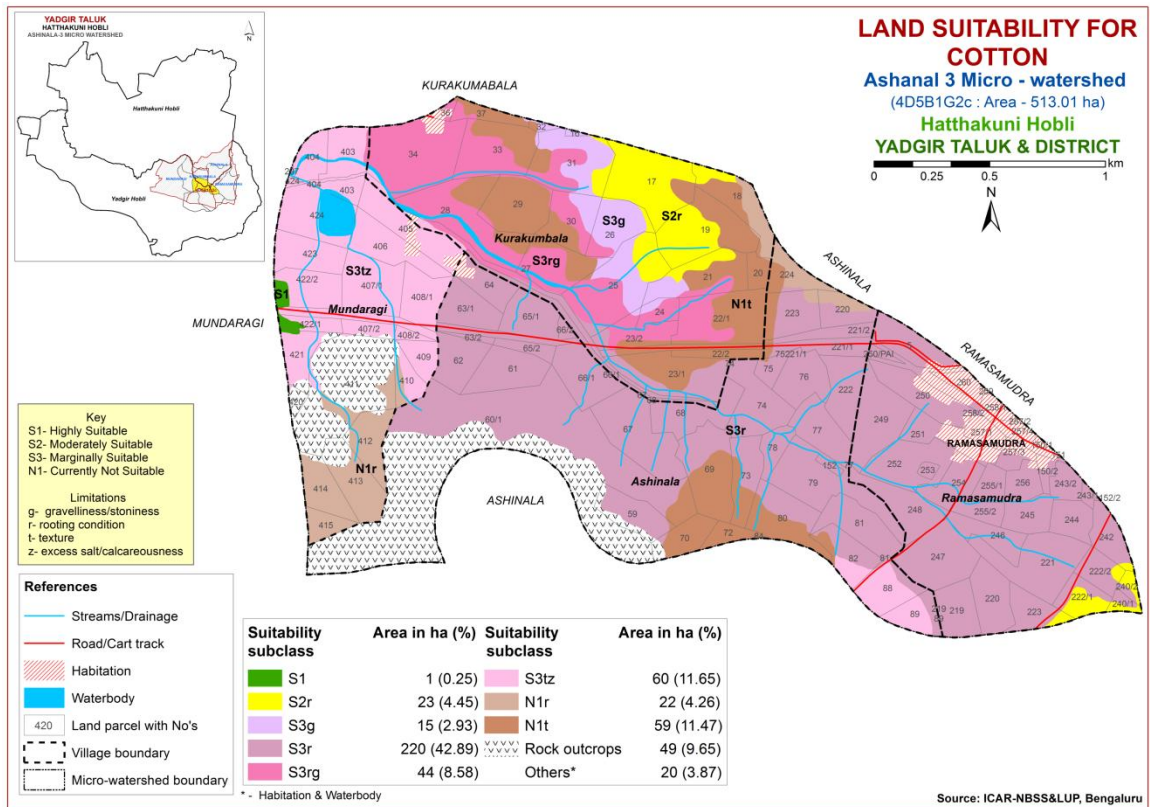
Fig. 7.8 Land Suitability map of Cotton

7.9 Land Suitability for Chilli (*Capsicum annuum*)

Chilli is one of the most important 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.

An area of about 83 ha (16%) is moderately suitable (Class S2) for growing chilli and are distributed in all parts of the microwatershed. They have minor limitations of texture, drainage, calcareousness and rooting depth. Marginally suitable lands (Class S3) occupy a maximum area of about 338 ha (66%) and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and texture. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the western and northeastern part of the microwatershed with severe limitation of rooting depth.

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.

A small area of about 19 ha (4%) in the microwatershed has soils that are highly suitable (Class S1) for growing tomato crop. They have no limitations for growing tomato and are distributed in the northern part of the microwatershed. An area of about 63 ha (12%) is moderately suitable (Class S2) for growing tomato and are distributed in the northwestern, western, southern and southeastern part of the microwatershed. They have minor limitations of calcareousness and rooting depth. Marginally suitable lands (Class S3) occupy a major area of about 339 ha (66%) and are distributed in all parts of the microwatershed. They have moderate limitations of rooting depth, drainage, gravelliness and texture. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the western and northeastern part of the microwatershed with severe limitation of rooting depth.

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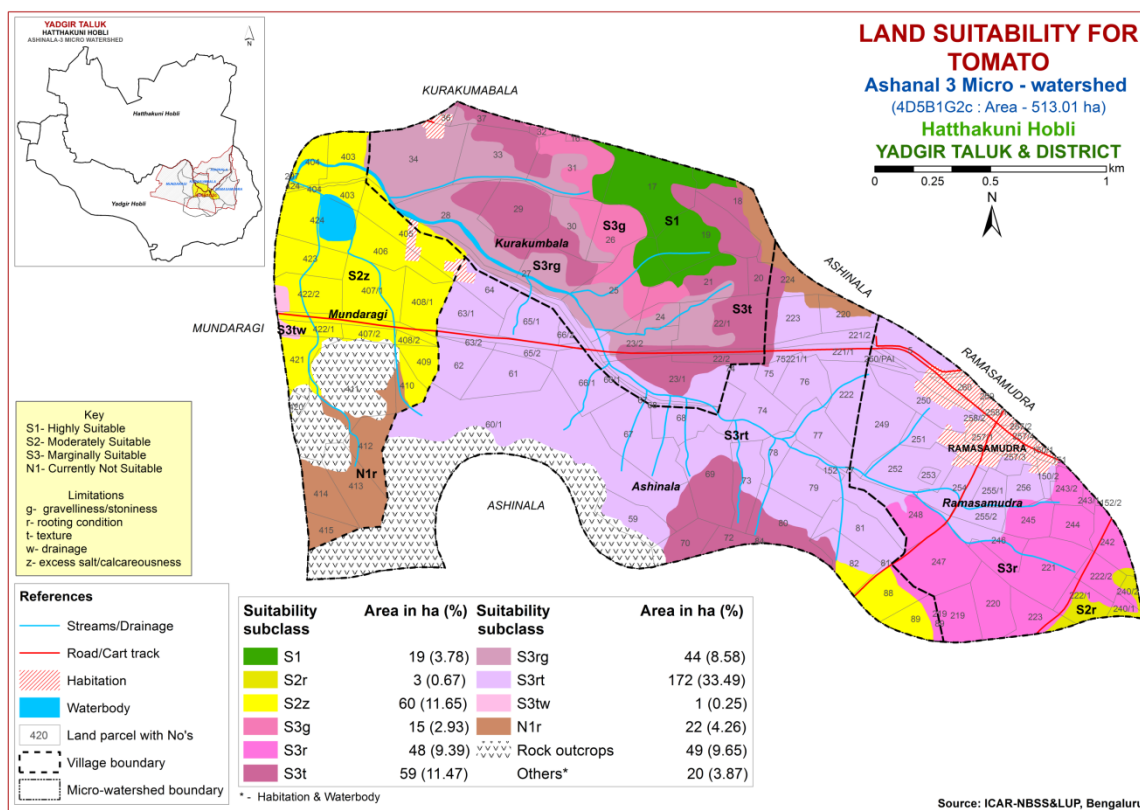
Fig 7.10 Land Suitability map of Tomato

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 21 ha (4%) and are distributed in the western and northern part of the microwatershed. An area of about 78 ha (15%) is moderately suitable (Class S2) for brinjal and is distributed in the northern, southern, western, northwestern and southeastern part of the microwatershed. They have minor limitations of texture, rooting depth and gravelliness. A maximum area of 323 ha (63%) is marginally suitable (Class S3) and is distributed in all parts of the microwatershed with moderate limitations of rooting depth, texture and gravelliness. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the western and northeastern part of the microwatershed with severe limitation of rooting depth.
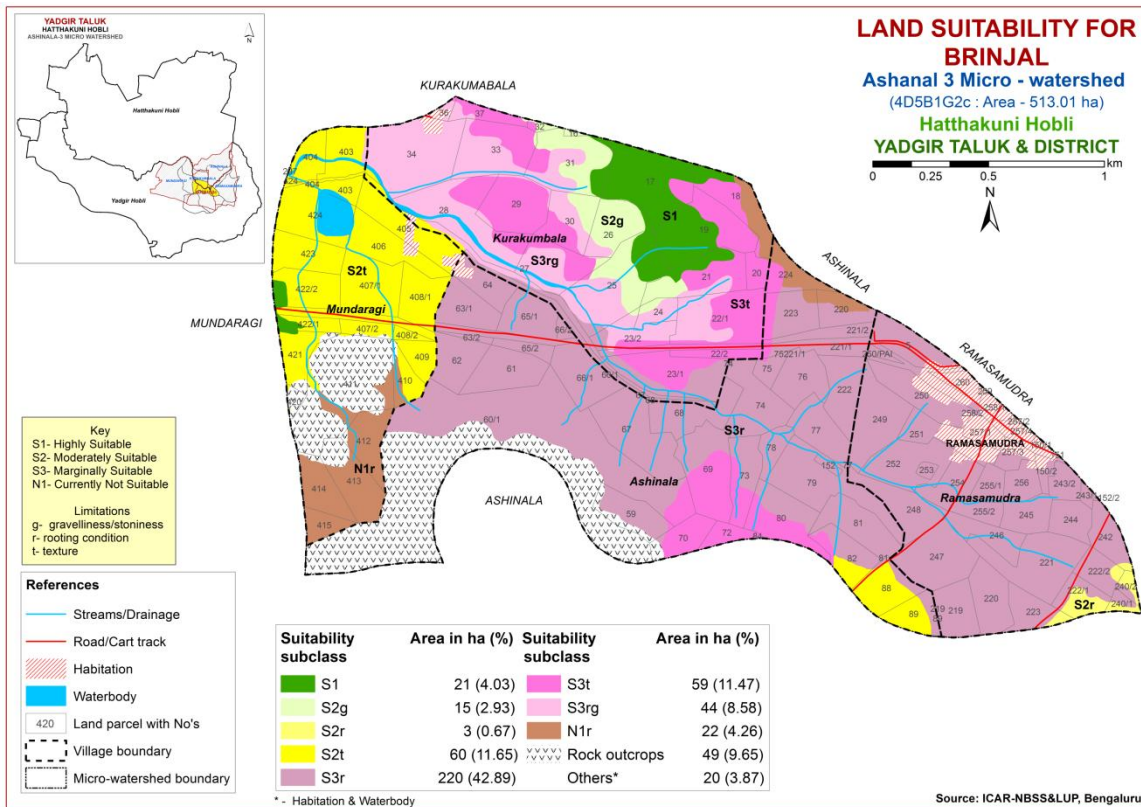
Fig 7.11 Land Suitability map of Brinjal

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 61 ha (12%) and are distributed in the western, northwestern and southern part of the microwatershed. An area of about 37 ha (7%) is moderately suitable (Class S2) for onion and is distributed in the central, northern and southestern part of the microwatershed. They have minor limitations of gravelliness, texture and rooting depth. A maximum area of 323 ha (63%) is marginally suitable (Class S3) and is distributed in the major part of the microwatershed with moderate limitations of rooting depth, gravelliness and texture. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the western and northeastern part of the microwatershed with severe limitation of rooting depth.
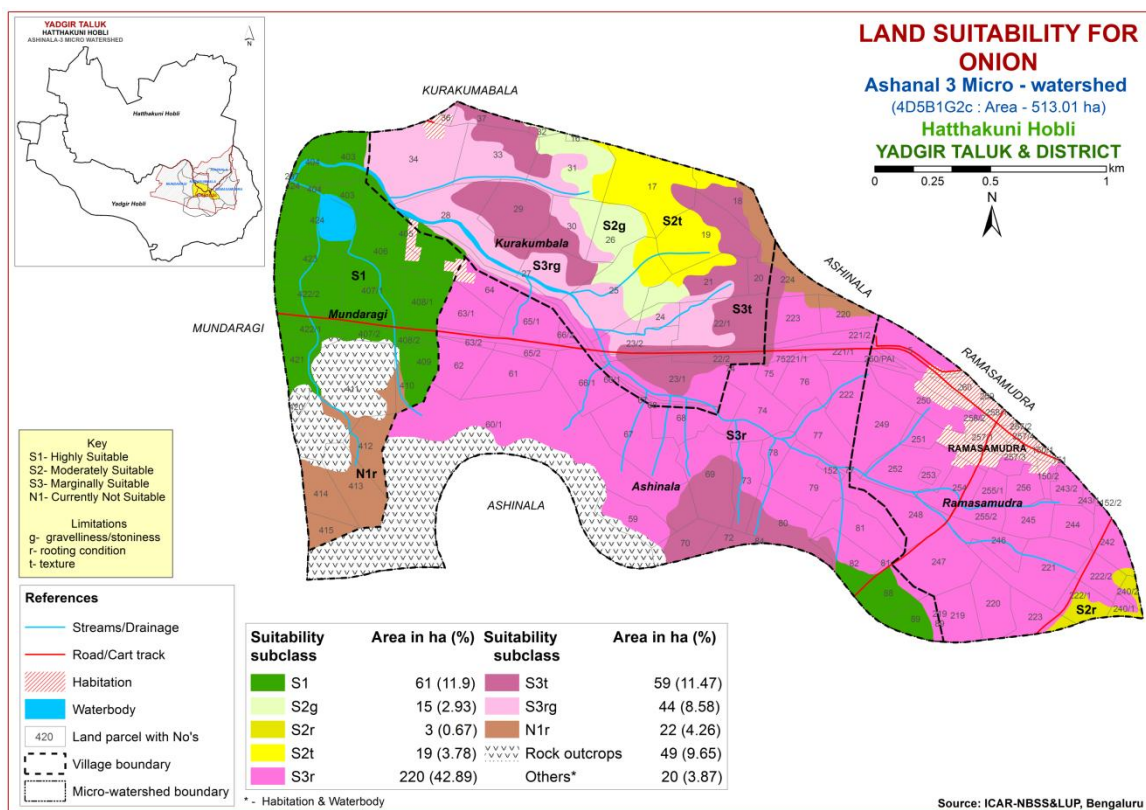
Fig 7.12 Land Suitability map of Onion

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 61 ha (12%) and are distributed in the northwestern and southern part of the microwatershed. An area of about 37 ha (7%) is moderately suitable (Class S2) for bhendi and is distributed in the northern, central and southeastern part of the microwatershed. They have minor limitations of texture, rooting depth and gravelliness. A maximum area of 323 ha (63%) is marginally suitable (Class S3) and is distributed in the major part of the microwatershed with moderate limitations of rooting depth, gravelliness and texture. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the western and northeastern part of the microwatershed with severe limitation of rooting depth.
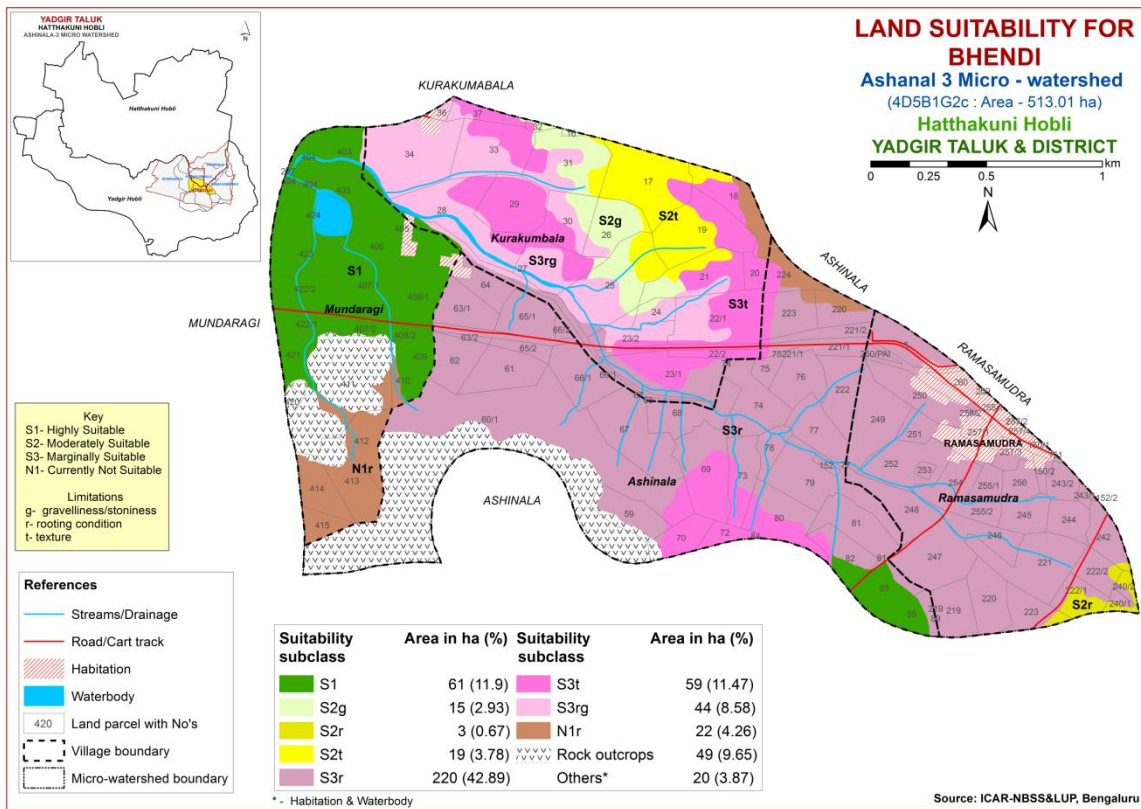
Fig 7.13 Land Suitability map of Bhendi

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.

An area of about 95 ha (19%) is moderately suitable (Class S2) for drumstick and is distributed in the central, western, northern, southern and northwestern part of the microwatershed. They have minor limitations of rooting depth, gravelliness, texture, calcareousness and drainage. An area of about 62 ha (12%) is marginally suitable (Class S3) for growing drumstick and are distributed in the central, northern, southern and southeastern part of the microwatershed. They have moderate limitations of rooting depth and texture. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) for growing drumstick and are distributed in the major part of the microwatershed. They have severe limitations of rooting depth, gravelliness and texture.
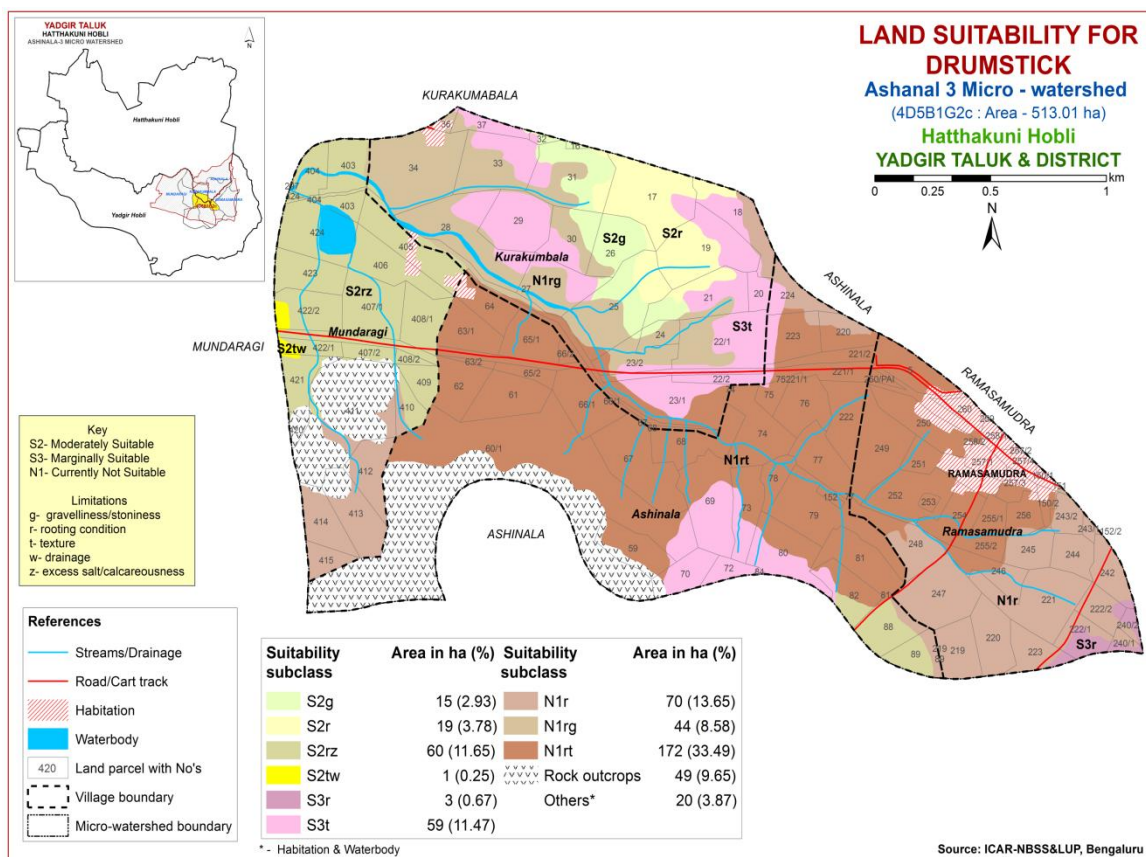
Fig 7.14 Land Suitability map of Drumstick

7.15 Land suitability for Mango (*Mangifera indica*)

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

An area of 95 ha (19%) is marginally suitable (Class S3) for growing mango with moderate limitations of calcareousness, drainage, texture, gravelliness and rooting depth and are distributed in the northern, southern, eastern, western and northwestern part of the microwatershed. Maximum area of about 348 ha (68%) is currently not suitable (Class N1) for growing mango and occur in all parts of the microwatershed with severe limitations of rooting depth and gravelliness.
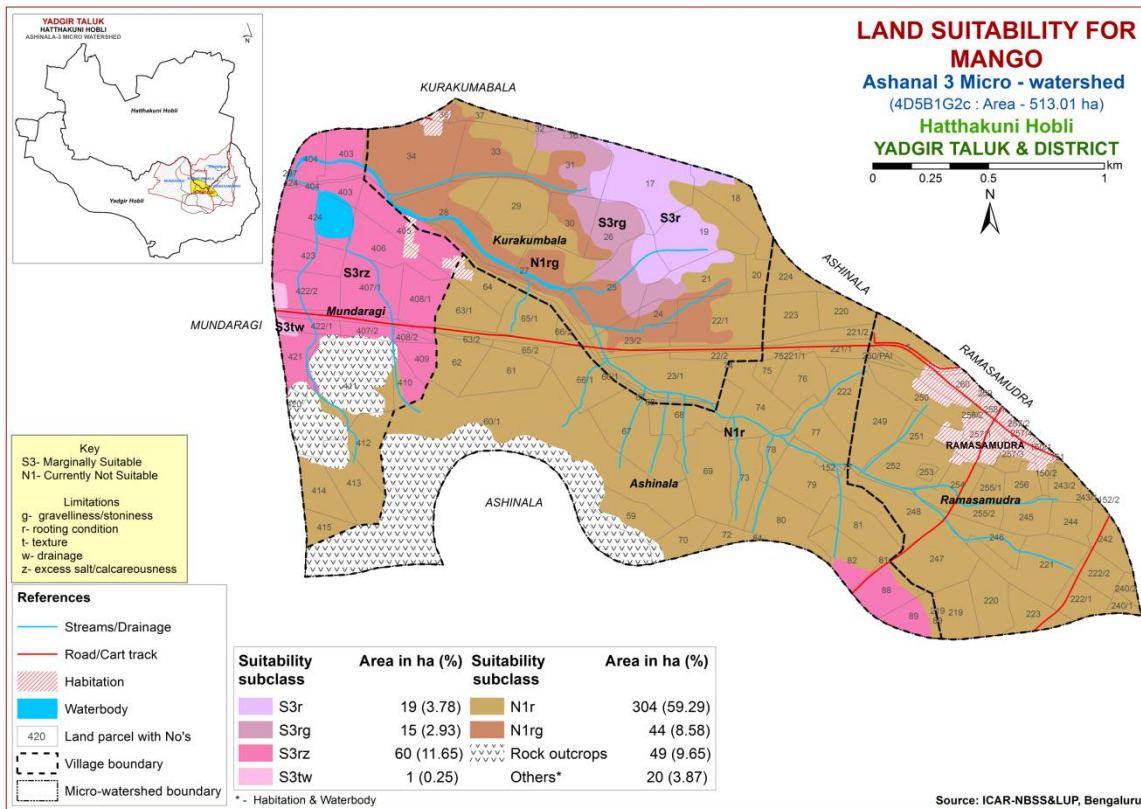
Fig. 7.15 Land Suitability map of Mango

7.16 Land suitability for Guava (*Psidium guajava*)

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

An area of about 79 ha (15%) is moderately suitable (Class S2) for guava and is distributed in the western, northern, southern and northwestern part of the microwatershed. They have minor limitations of rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 78 ha (15%) and are distributed in the central, northern, southern, western and southeastern part of the microwatershed. They have moderate limitations of gravelliness, rooting depth, texture and drainage. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) for growing guava and occur in the major part of the microwatershed with severe limitations of rooting depth, gravelliness and texture.
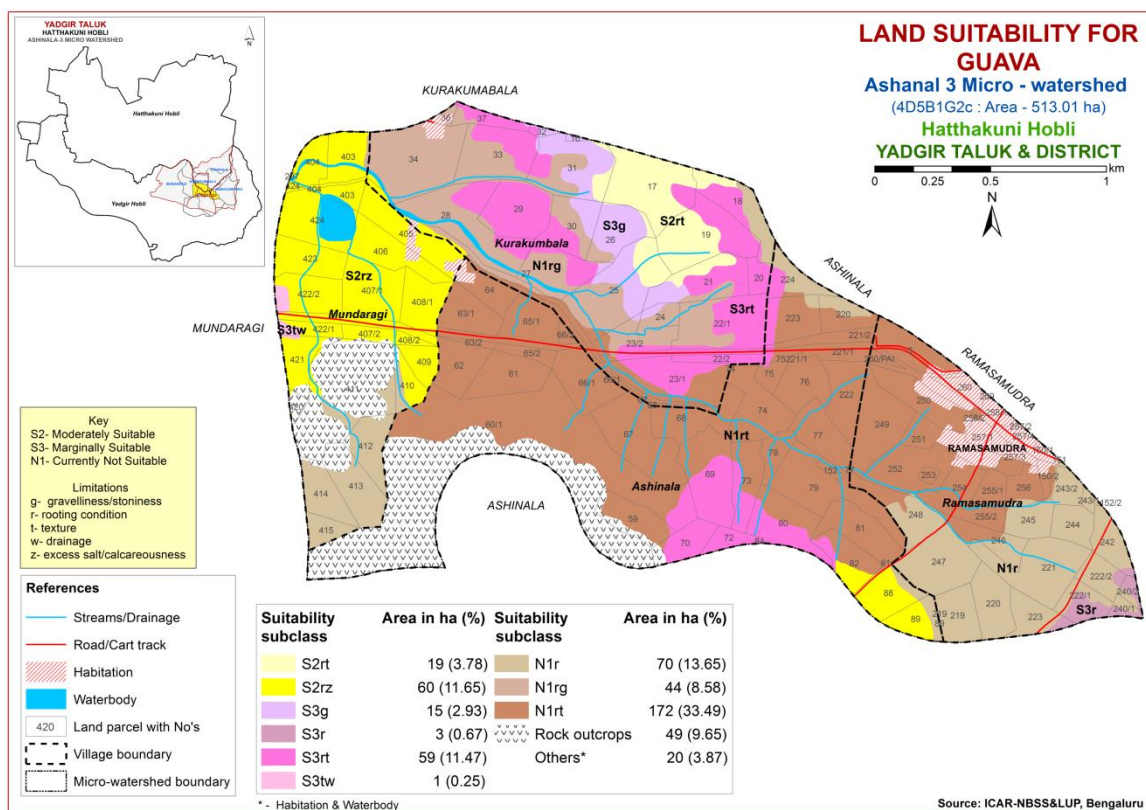
Fig. 7.16 Land Suitability map of Guava

7.17 Land suitability for Sapota (*Manilkara zapota*)

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

An area of about 79 ha (15%) is moderately suitable (Class S2) for sapota and is distributed in the western, northern, southern and northwestern part of the microwatershed. They have minor limitations of rooting depth and calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 78 ha (15%) and are distributed in the central, northern, southern, western and southeastern part of the microwatershed. They have moderate limitations of gravelliness, rooting depth, texture and drainage. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) for growing sapota and occur in the major part of the microwatershed with severe limitation of rooting depth and gravelliness.

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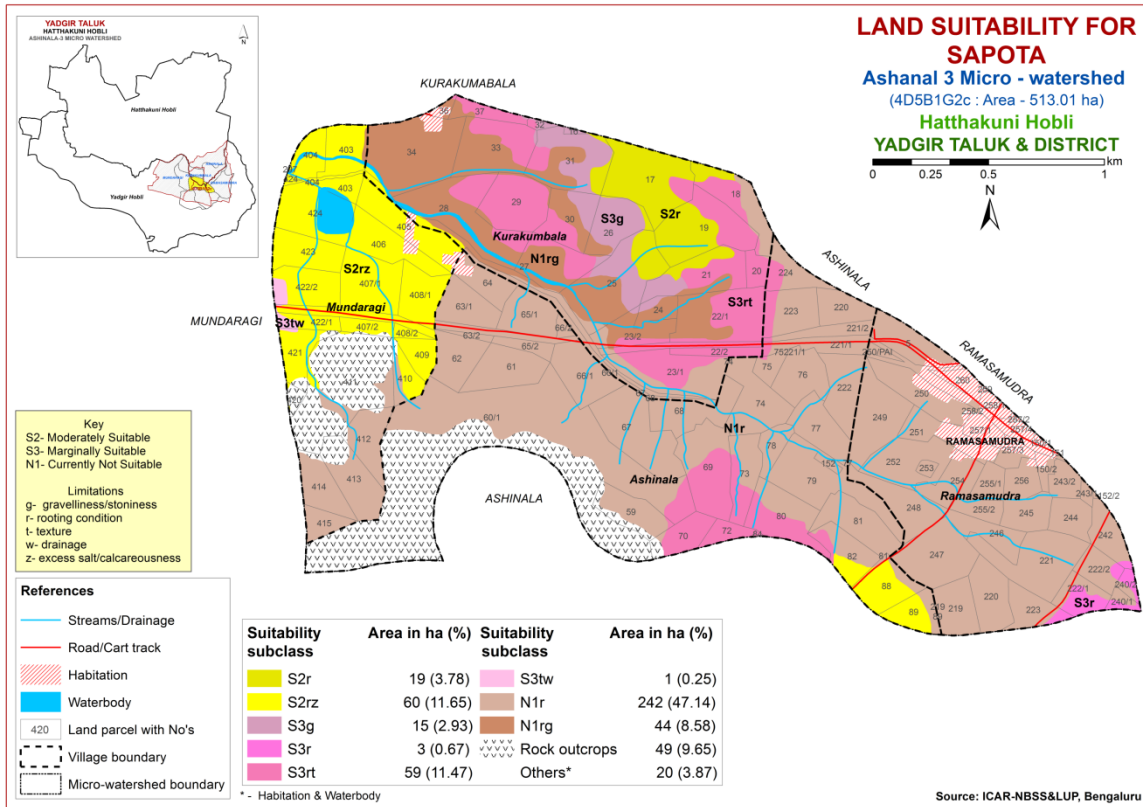
Fig. 7.17 Land Suitability map of Sapota

7.18 Land Suitability for Pomegranate (*Punica granatum*)

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

An area of about 80 ha (16%) is moderately suitable (Class S2) for growing pomegranate and are distributed in the northern, southern, western and northwestern part of the microwatershed. It has minor limitations of rooting depth, calcareousness, texture and drainage. An area of about 77 ha (15%) is marginally suitable (Class S3) for growing pomegranate and are distributed in the central, northern, southern, eastern and southeastern part of the microwatershed. They have moderate limitations of rooting depth, gravelliness and texture. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) for growing pomegranate and are distributed in the major part of the microwatershed. They have severe limitations of rooting depth and gravelliness.

Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

References

— Streams/Drainage
— Road/Cart track
Habitation
Waterbody
420 Land parcel with No's
Village boundary
Micro-watershed boundary

LAND SUITABILITY FOR POMEGRANATE
Ashanal 3 Micro - watershed
(4D5B1G2c : Area - 513.01 ha)
Hatthakuni Hobli
YADGIR TALUK & DISTRICT

Suitability subclass	Area in ha (%)	Suitability subclass	Area in ha (%)
S2r	19 (3.78)	S3rt	59 (11.47)
S2rz	60 (11.65)	N1r	242 (47.14)
S2tw	1 (0.25)	N1rg	44 (8.58)
S3g	15 (2.93)	Rock outcrops	49 (9.65)
S3r	3 (0.67)	Others*	20 (3.87)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

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.

An area of about 80 ha (16%) is moderately suitable (Class S2) for growing musambi and are distributed in the northern, southern, western and northwestern part of the microwatershed. It has minor limitations of drainage, rooting depth and calcareousness. Marginally suitable (Class S3) lands occupy an area of about 77 ha (15%) and are distributed in the central, northern, southern, eastern and southeastern part of the microwatershed. They have moderate limitations of gravelliness, rooting depth and texture. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) for growing musambi and are distributed in the major part of the microwatershed. They have severe limitations of rooting depth and gravelliness.
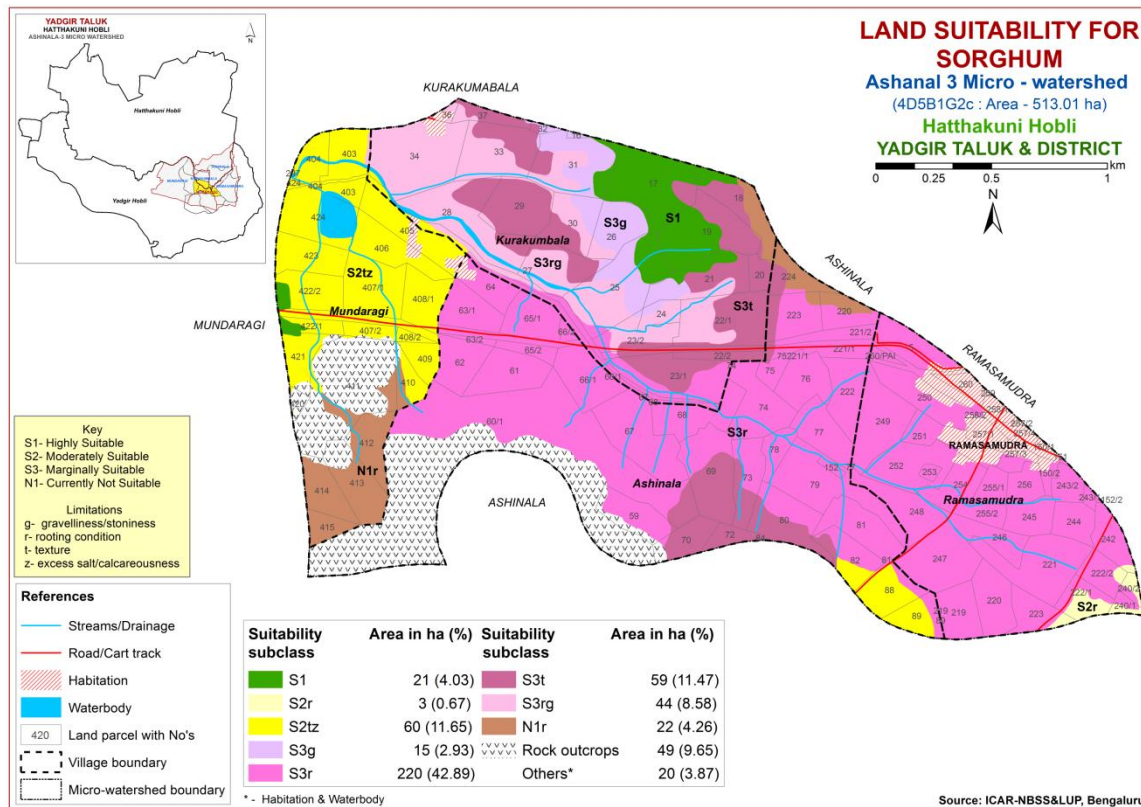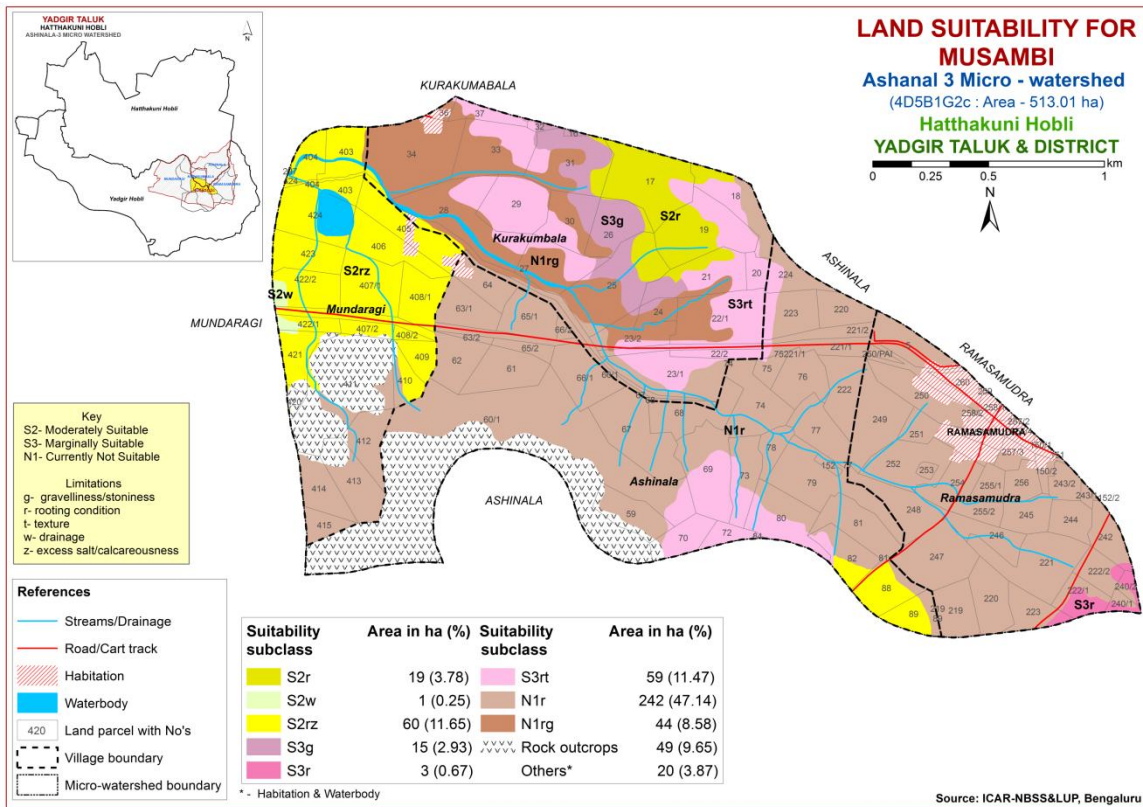
Fig. 7.19 Land Suitability map of Musambi

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.

An area of about 80 ha (16%) is moderately suitable (Class S2) for growing lime and are distributed in the northern, southern, western and northwestern part of the microwatershed. It has minor limitations of drainage, rooting depth and calcareousness. Marginally suitable (Class S3) lands occupy an area of about 77 ha (15%) and are distributed in the central, northern, southern, eastern and southeastern part of the microwatershed. They have moderate limitations of gravelliness, rooting depth and texture. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) for growing lime and are distributed in the major part of the microwatershed. They have severe limitations of rooting depth and gravelliness.
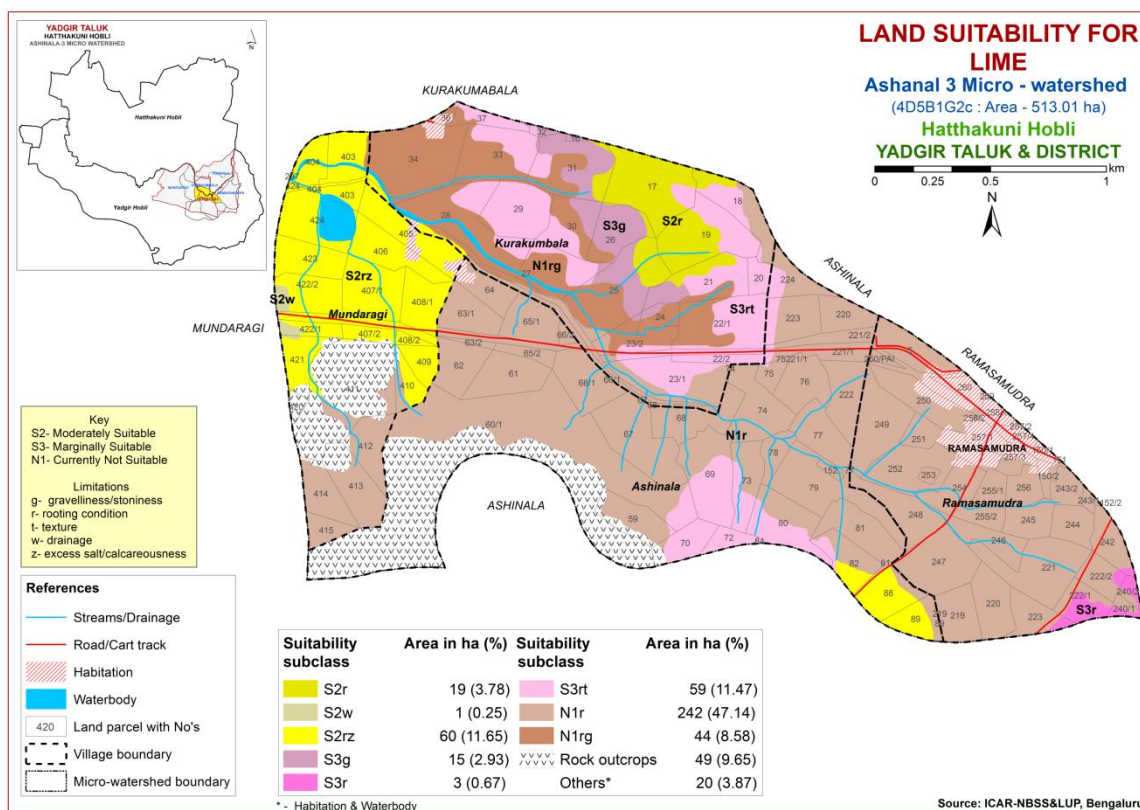
Fig. 7.20 Land Suitability map of Lime

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.

An area of about 19 ha (4%) is highly suitable (Class S1) for growing amla and are distributed in the northern part of the microwatershed. An area of about 79 ha (15%) has soils that are moderately suitable (Class S2) for growing amla with minor limitations of drainage, texture, calcareousness, rooting depth and gravelliness and are distributed in the northern, southern, western, northwestern and southeastern part of the microwatershed. A maximum area of 323 ha (63%) is marginally suitable (Class S3) with moderate limitations of rooting depth, texture and gravelliness and are distributed in the major part of the microwatershed. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the northeastern and southwestern part of the microwatershed. It has severe limitation of rooting depth.
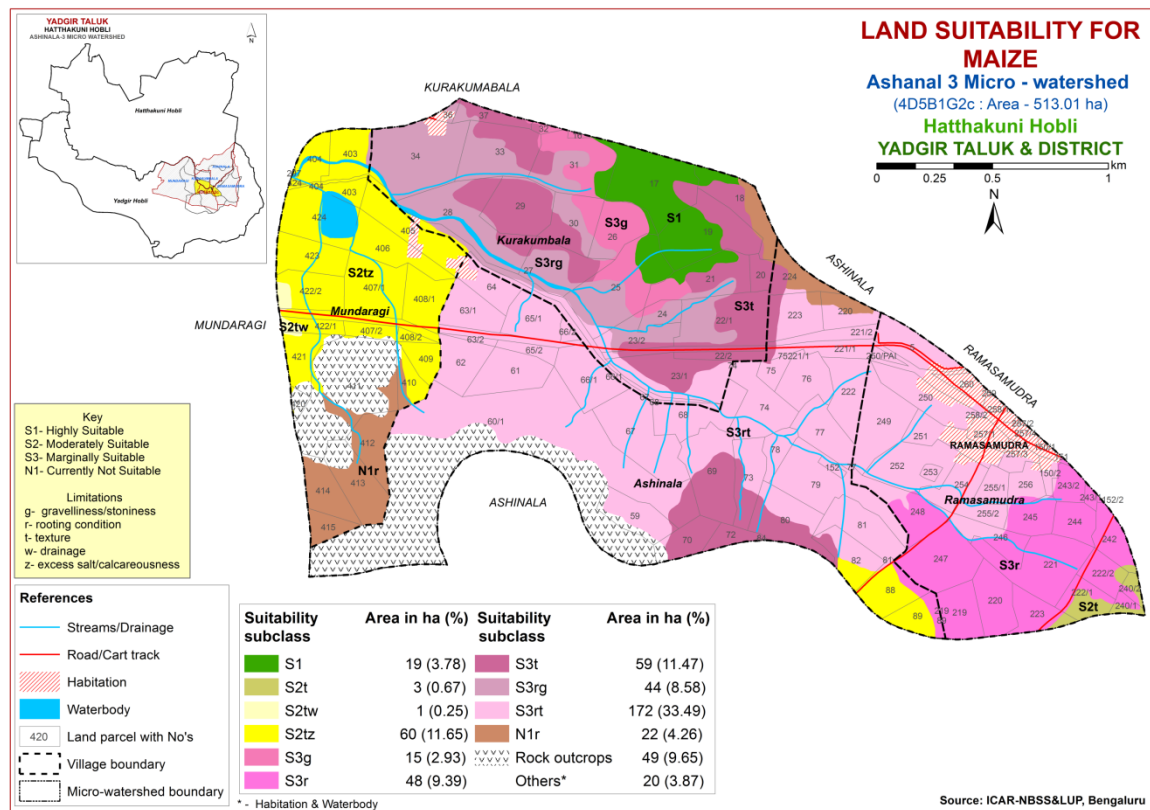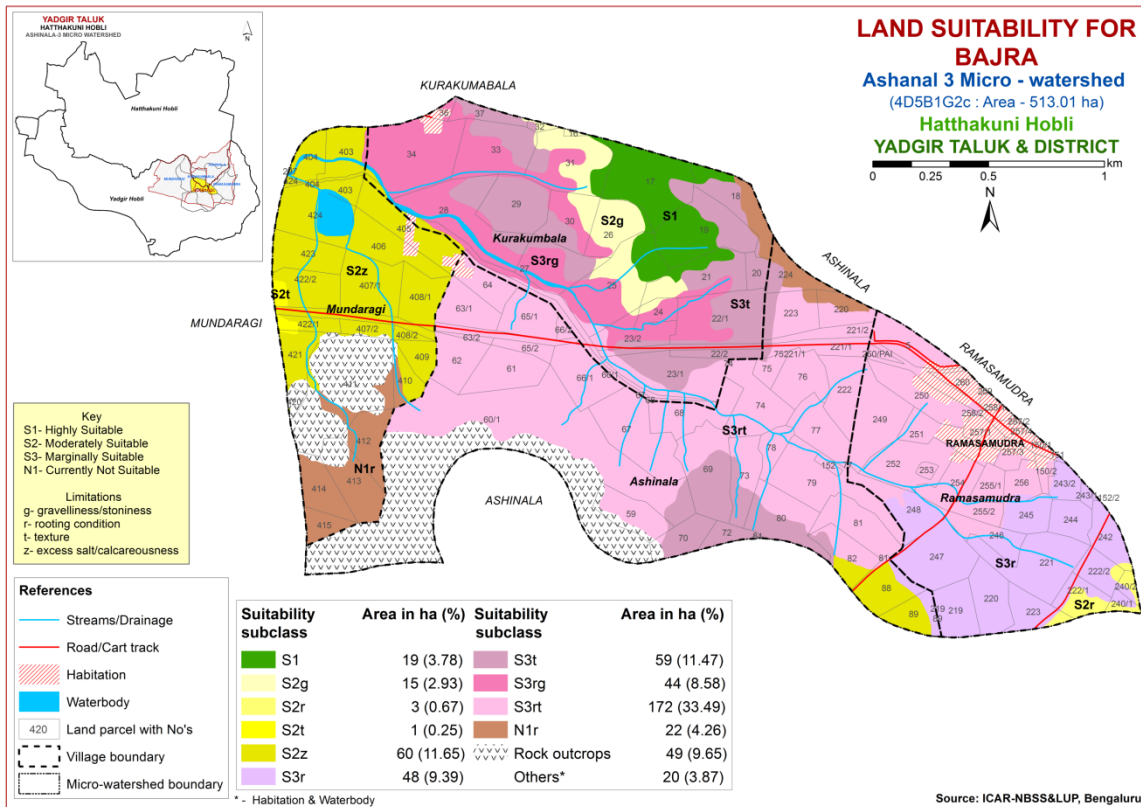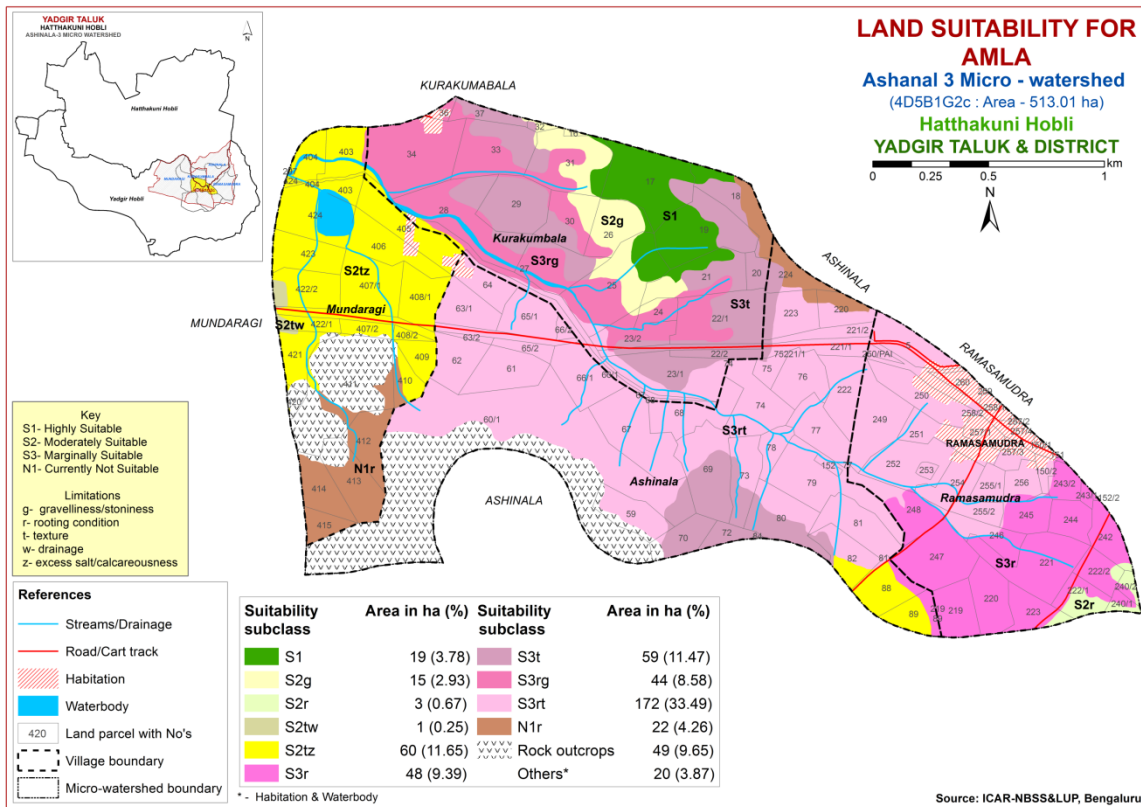
Fig. 7.21 Land Suitability map of Amla

7.22 Land Suitability for Cashew (*Anacardium occidentale)*

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

An area of about 19 ha (4%) has soils that are moderately suitable (Class S2) for growing cashew with minor limitations of texture and rooting depth and are distributed in the northern part of the microwatershed. The marginally suitable (Class S3) lands cover an area of about 74 ha (14%) and occur in the central, northern and southern part of the microwatershed. They have moderate limitations of rooting depth, texture and gravelliness. A maximum area of about 350 ha (68%) is currently not suitable (Class N1) and are distributed in all parts of the microwatershed with severe limitations of rooting depth, texture, calcareousness and drainage.
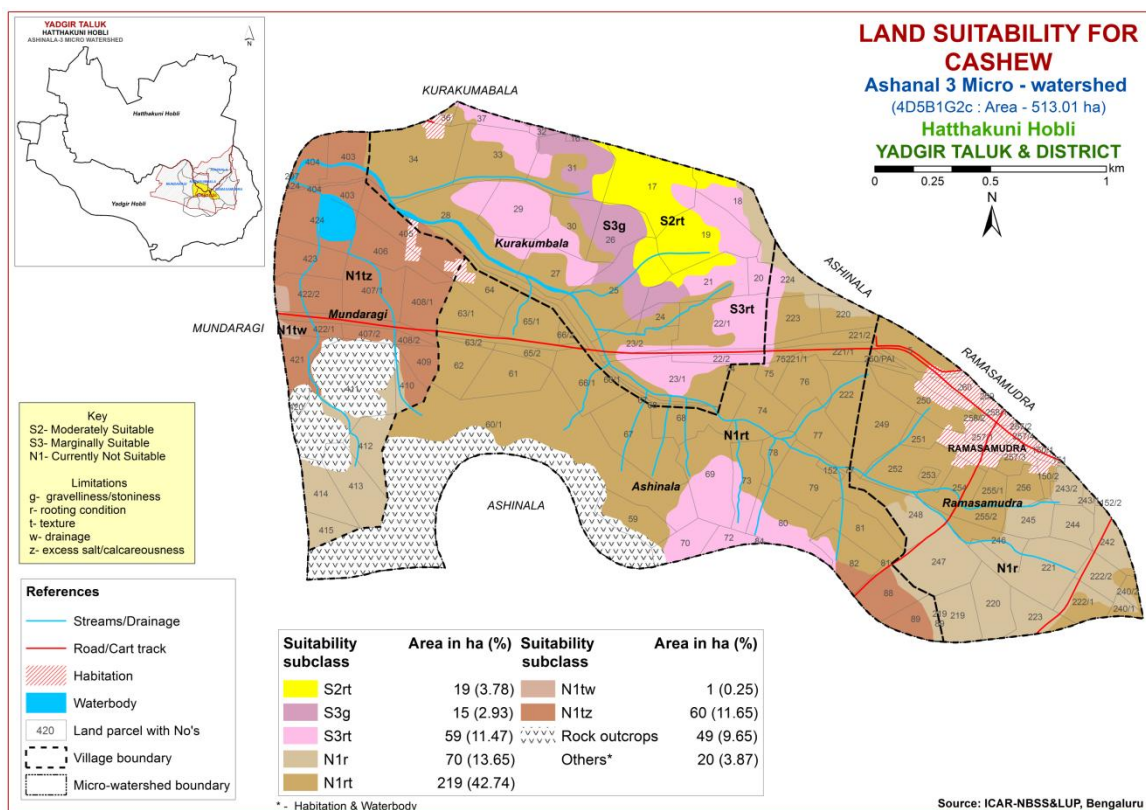
Fig. 7.22 Land Suitability map of Cashew

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.

An area of about 79 ha (15%) has soils that are moderately suitable (Class S2) for growing jackfruit with minor limitations of calcareousness and rooting depth and are distributed in the northern, southern, western and southeastern part of the microwatershed. Marginally suitable (Class S3) lands for growing jackfruit occupy an area of about 78 ha (15%) and are distributed in the central, northern, southern, western and southeastern part of the microwatershed. They have moderate limitations of rooting depth, drainage, texture and gravelliness. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) and are distributed in the major part of the microwatershed with severe limitations of rooting depth, gravelliness and texture.
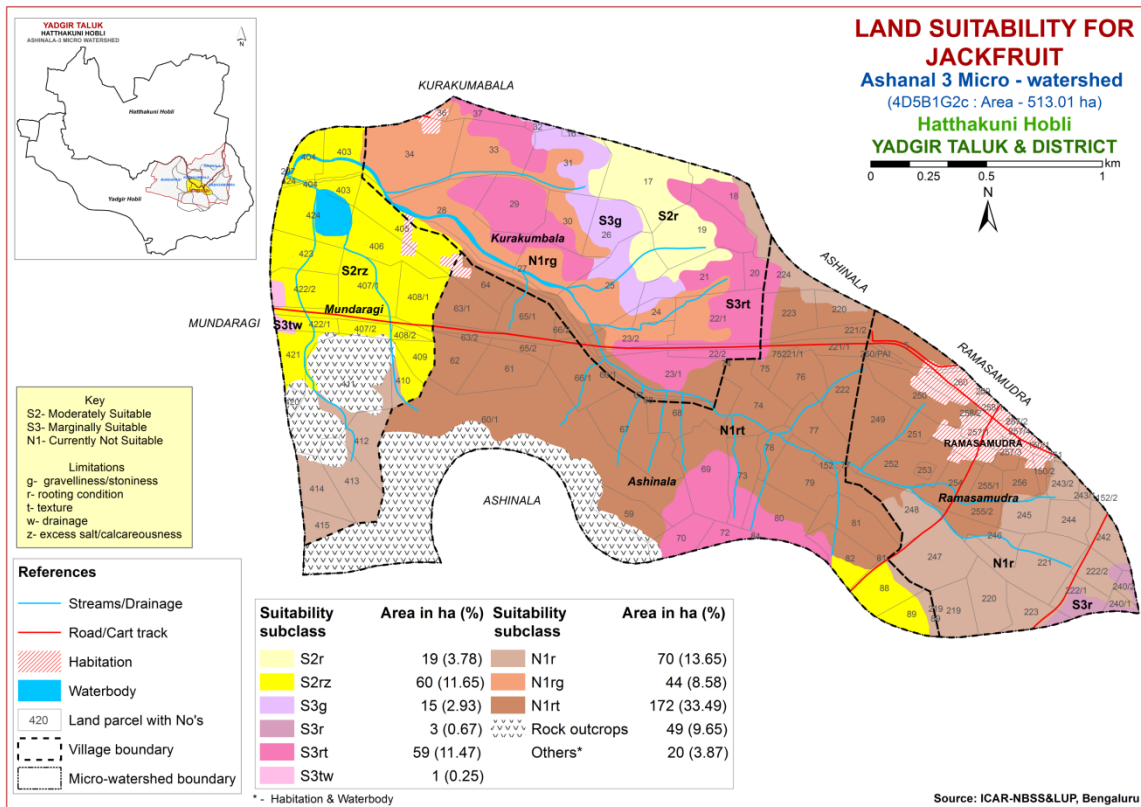
Fig. 7.23 Land Suitability map of Jackfruit

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 7.25) 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.

A small area of about 1 ha (<1%) is moderately suitable (Class S2) for growing jamun and are distributed in the western part of the microwatershed. It has minor limitations of texture and drainage. Maximum area of about 157 ha (30%) is marginally suitable (Class S3) for growing jamun and are distributed in the central, northern, southern, western, northwestern and southeastern part of the microwatershed. They have moderate limitations of texture, calcareousness, gravelliness and rooting depth. A maximum area of about 286 ha (56%) is currently not suitable (Class N1) and are distributed in the major part of the microwatershed with severe limitations of rooting depth, gravelliness and texture.
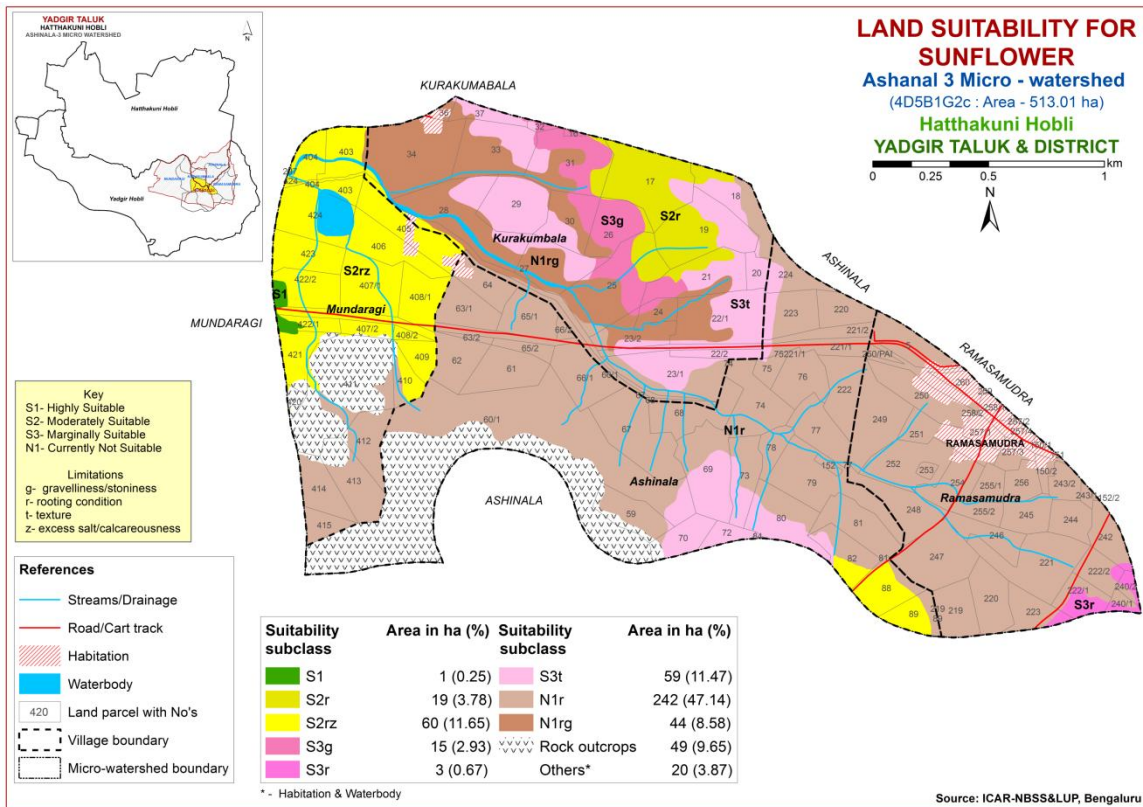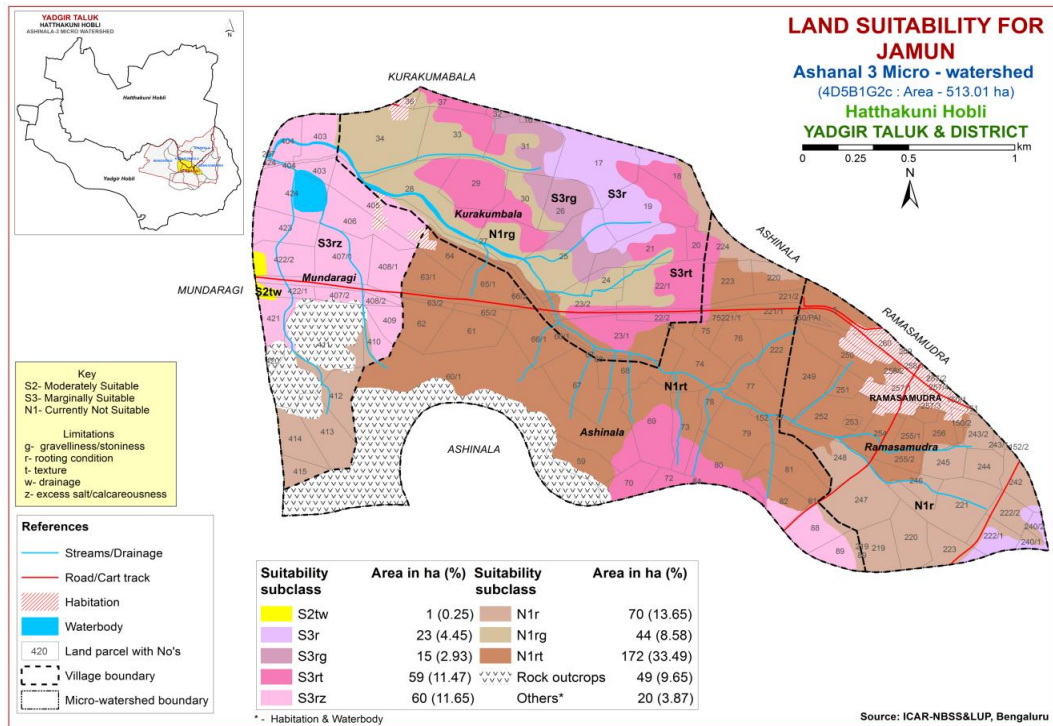
Fig. 7.24 Land Suitability map of Jamun

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

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

An area of 80 ha (16%) is highly suitable (Class S1) for growing custard apple and are distributed in the northern, southern, western and northwestern part of the microwatershed. An area of about 18 ha (4%) has soils that are moderately suitable (Class S2) for growing custard apple with minor limitations of gravelliness and rooting depth and are distributed in the northern and southeastern part of the microwatershed. A maximum area of about 323 ha (63%) is marginally suitable (Class S3) for growing custard apple and are distributed in the major part of the microwatershed with moderate limitations of rooting depth, texture and gravelliness. An area of about 22 ha (4%) is currently not suitable (Class N1) and are distributed in the western and northeastern part of the microwatershed with severe limitation of rooting depth.
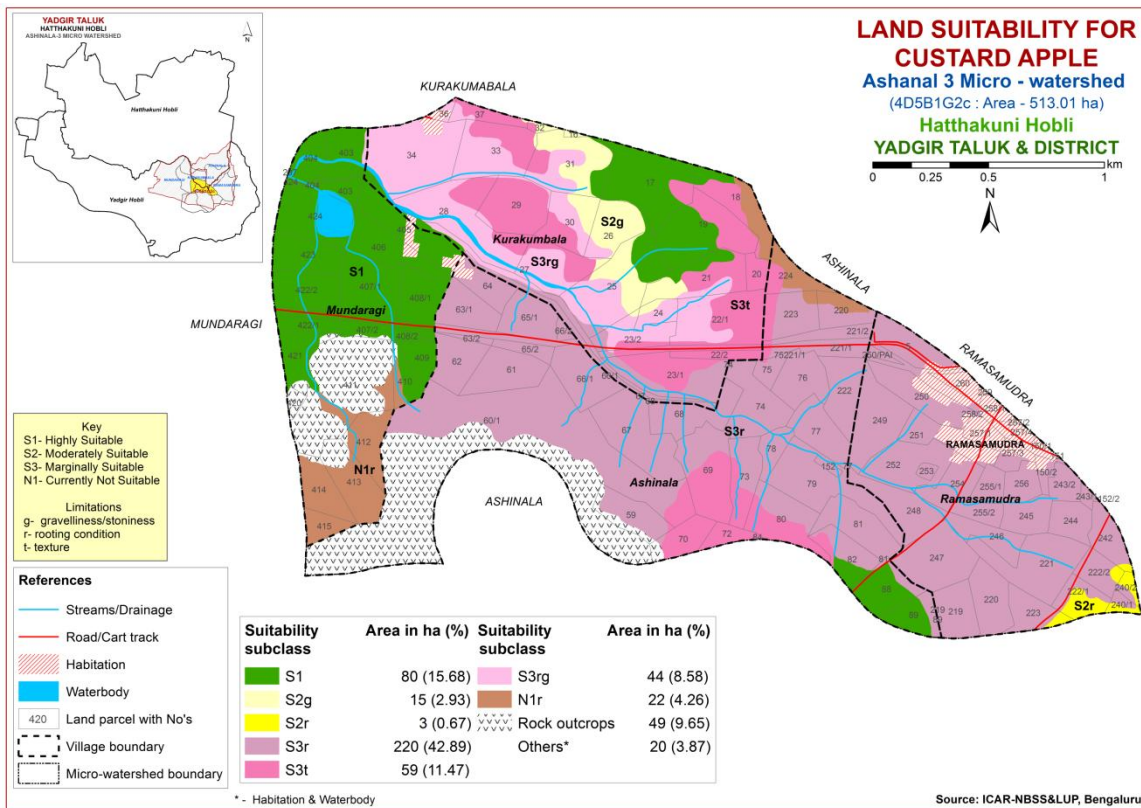
Fig. 7.25 Land Suitability map of Custard Apple

7.26 Land Suitability for Tamarind (*Tamarindus indica*)

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

A small area of about 1 ha (<1%) is moderately suitable (Class S2) for growing tamarind and are distributed in the western part of the microwatershed. It has minor limitations of texture and drainage. Marginally suitable (Class S3) lands for growing tamarind occupy an area of about 94 ha (18%) and are distributed in the northern, southern, western and northwestern part of the microwatershed. It has moderate limitations of rooting depth, calcareousness and gravelliness. Maximum area of about 348 ha (68%) is currently not suitable (Class N1) for growing tamarind and occur in the major part of the microwatershed with severe limitations of rooting depth, gravelliness and texture.
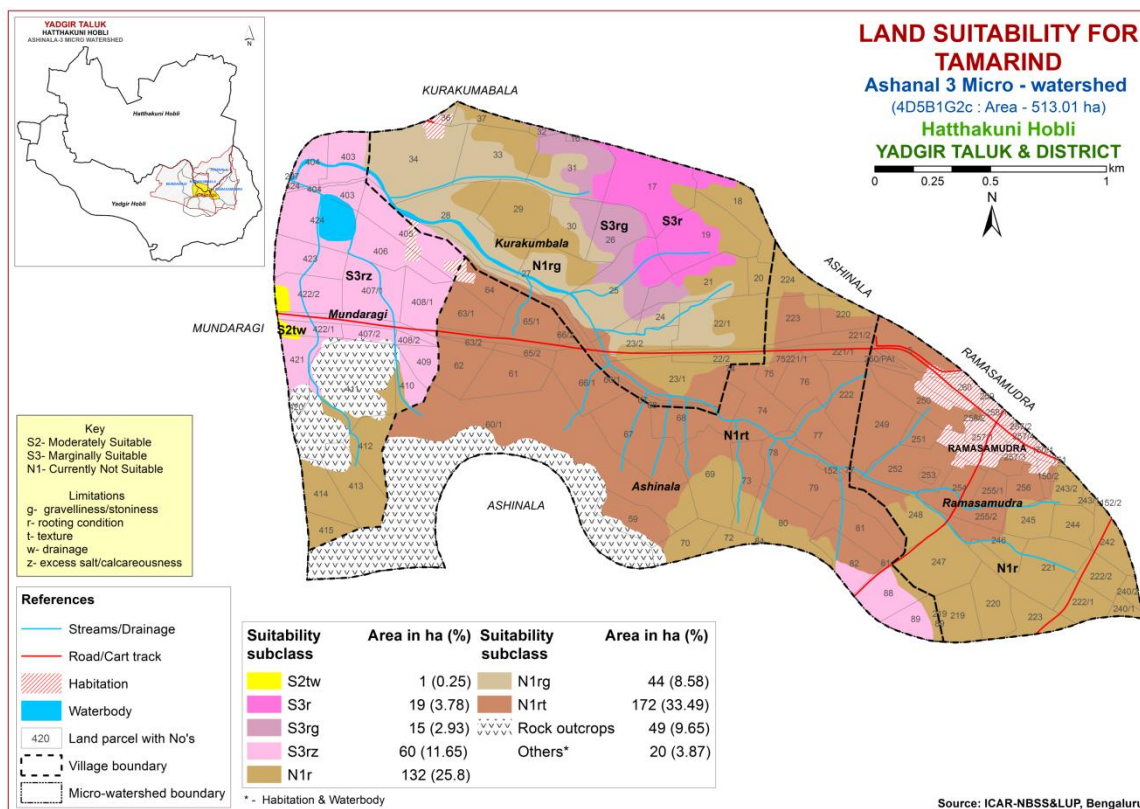
Fig. 7.26 Land Suitability map of Tamarind

7.27 Land Suitability for Mulberry (*Morus nigra*)

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

Moderately (Class S2) suitable lands for growing mulberry occur in 94 ha (17%) and are distributed in the northern, central, southern, western and northwestern part of the microwatershed with minor limitation of gravelliness, rooting depth and calcareousness. An area of about 63 ha (12%) is marginally suitable (Class S3) for growing mulberry and are distributed in the central, northern, western, southern and southeastern part of the microwatershed. They have moderate limitations of texture, drainage and rooting depth. Currently not suitable lands (Class N1) occupy a maximum area of about 286 ha (56%) and distributed in the major part of the microwatershed. They have severe limitations of rooting depth, gravelliness and texture.

Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

References

Streams/Drainage
Road/Cart track
Habitation
Waterbody
420 Land parcel with No's
Village boundary
Micro-watershed boundary

Suitability subclass	Area in ha (%)	Suitability subclass	Area in ha (%)
S2g	15 (2.93)	N1r	70 (13.65)
S2r	19 (3.78)	N1rg	44 (8.58)
S2rz	60 (11.65)	N1rt	172 (33.49)
S3r	3 (0.67)	Rock outcrops	49 (9.65)
S3t	59 (11.47)	Others*	20 (3.87)
S3tw	1 (0.25)		

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

Fig 7.27 Land Suitability map of Mulberry

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

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

An area of about 83 ha (16%) is moderately suitable (Class S2) for growing marigold and are distributed in the northern, southern, western, northwestern and southeastern part of the microwatershed. They have minor limitations of texture, drainage, rooting depth and calcareousness. Marginally suitable (Class S3) lands for growing Marigold occupy a maximum area of about 338 ha (66%) and are distributed in all parts of the microwatershed. They have moderate limitations of texture, gravelliness and rooting depth. Currently not suitable lands (Class N1) occupy an area of about 22 ha (4%) and distributed in the western and northeastern part of the microwatershed. It has severe limitation of rooting depth.
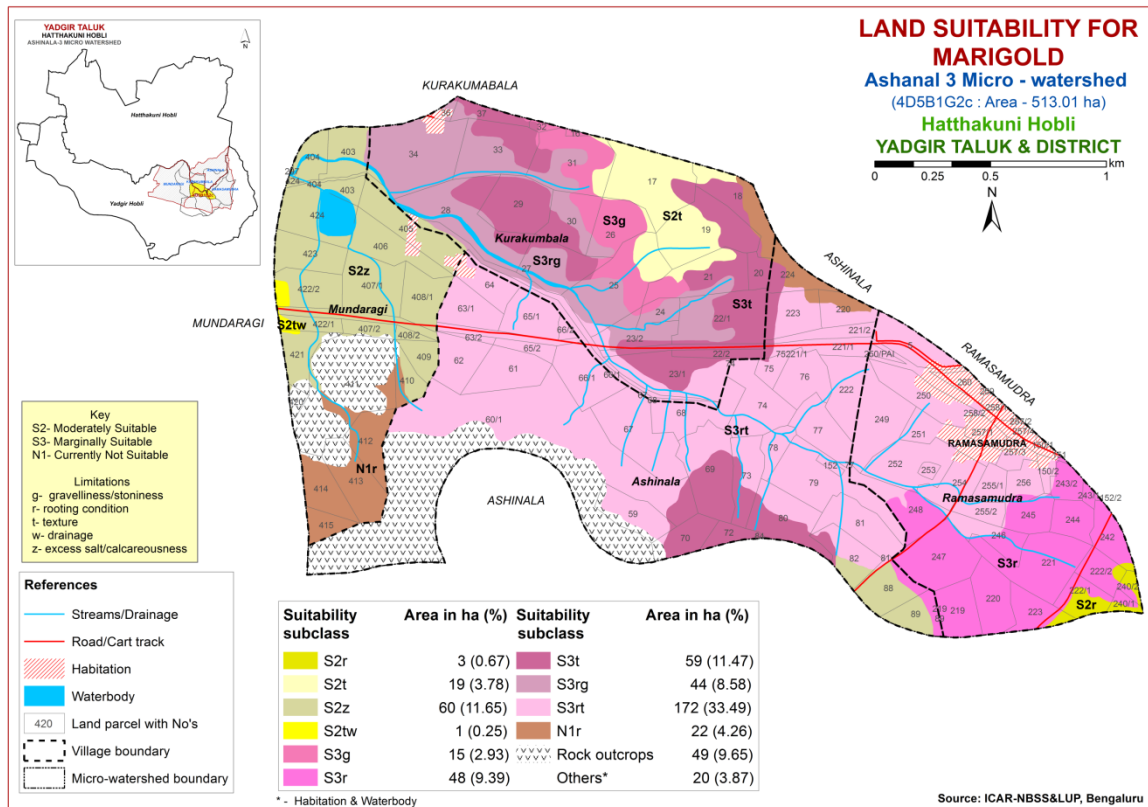
Fig. 7.28 Land Suitability map of Marigold

7.29 Land Suitability for Chrysanthemum (*Dendranthema grandiflora*)

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

An area of about 83 ha (16%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in the northern, southern, western, northwestern and southeastern part of the microwatershed. They have minor limitations of texture, drainage, rooting depth and calcareousness. Marginally suitable (Class S3) lands for growing chrysanthemum occupy a maximum area of about 338 ha (66%) and are distributed in all parts of the microwatershed. They have moderate limitations of texture, gravelliness and rooting depth. Currently not suitable lands (Class N1) occupy an area of about 22 ha (4%) and distributed in the western and northeastern part of the microwatershed. It has severe limitation of rooting depth.

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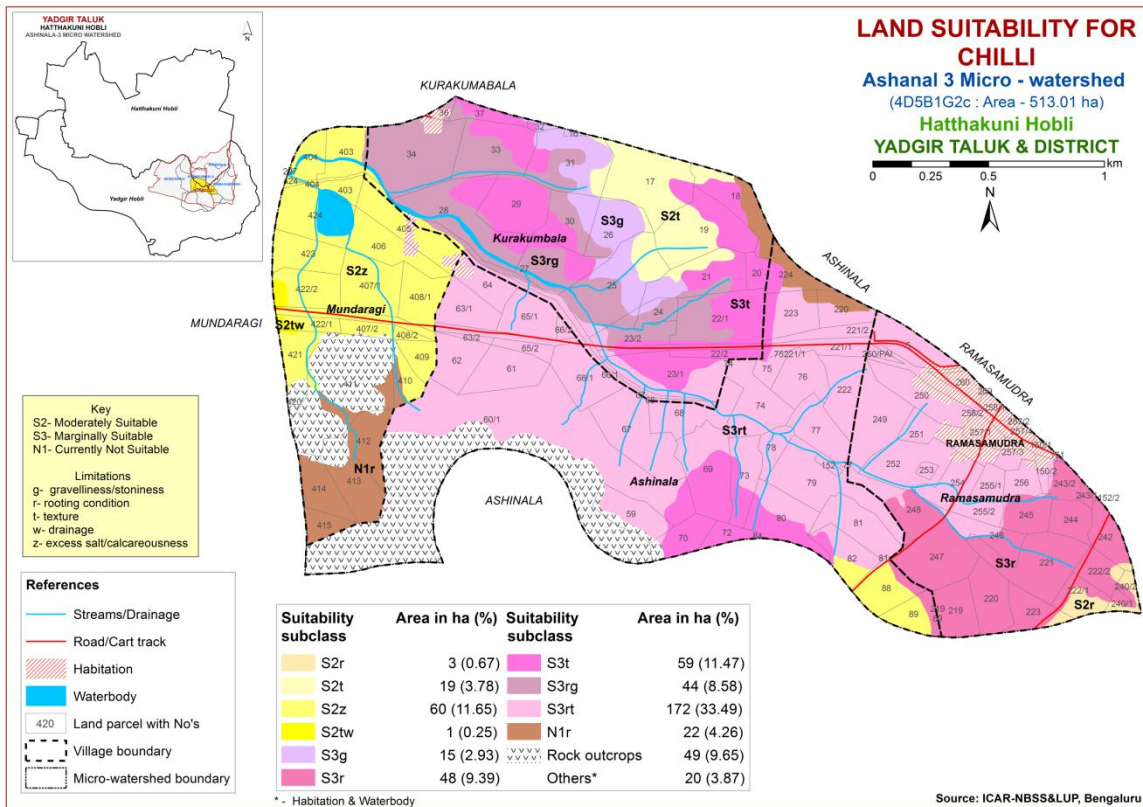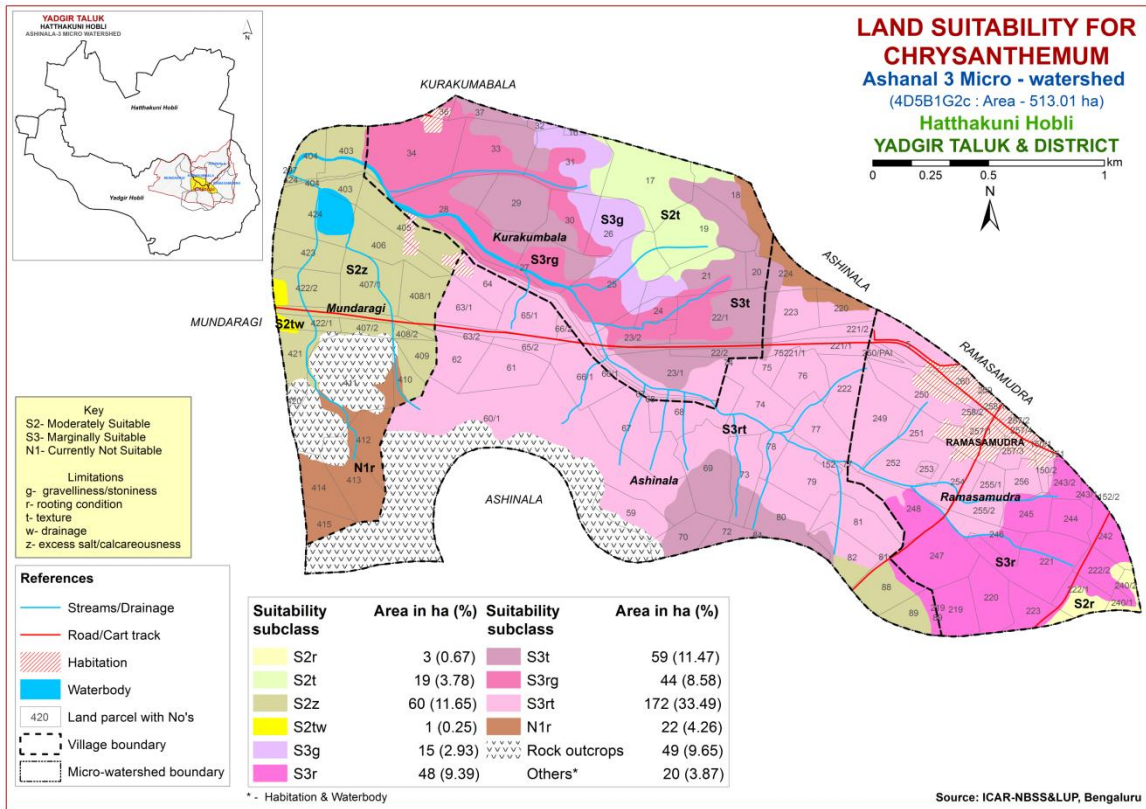Fig. 7.29 Land Suitability map of Chrysanthemum

Table 7.1 Soil-Site Characteristics of Ashanal-3 Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drain-age Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm⁻¹)	ESP (%)	CEC [Cmol (p⁺)kg⁻¹]	BS (%)
					Sur-face	Sub-surface	Surface (%)	Sub-surface (%)								
BDLbB2	866	150	WD	25-50	ls	sl	<15	<15	<50	1-3	moderate	6.20	0.074	0.20	4.20	93
BDLhB2	866	150	WD	25-50	scl	sl	<15	<15	<50	1-3	moderate	6.20	0.074	0.20	4.20	93
BDLhB2g1	866	150	WD	25-50	scl	sl	15-35	<15	<50	1-3	moderate	6.20	0.074	0.20	4.20	93
VNKcB2	866	150	WD	25-50	sl	sc	<15	<15	<50	1-3	moderate	5.37	0.11	2.22	6.27	75
SBRcB2	866	150	Sed	50-75	sl	ls	<15	<15	<50	1-3	moderate	8.24	0.145	1.15	7.50	100
HSLiB2	866	150	MW	75-100	sc	sc	<15	<15	101-150	1-3	moderate	7.16	0.117	5.94	4.90	97
HSLcB2g1	866	150	MW	50-75	sl	sc	15-35	<15	101-150	1-3	moderate	7.16	0.117	5.94	4.90	97
PGPiB2	866	150	WD	75-100	sc	sc	<15	<15	51-100	1-3	moderate	6.83	0.210	2.83	3.15	100
DSBhB2	866	150	WD	25-50	scl	g c	<15	35-60	<50	1-3	moderate	5.93	0.04	0.14	3.60	73
DSBiB2	866	150	WD	25-50	sc	g c	<15	35-60	<50	1-3	moderate	5.93	0.04	0.14	3.60	73
JNKhB2	866	150	WD	50-75	scl	scl	<15	<15	51-100	1-3	moderate	8.42	0.148	0.18	14.50	100
BDPcB2	866	150	WD	<25	sl	scl	<15	<15	<50	1-3	moderate	8.58	0.262	0.35	18.10	100
BDPhB2	866	150	WD	<25	scl	scl	<15	<15	<50	1-3	moderate	8.58	0.262	0.35	18.10	100
KBDiB2	866	150	WD	75-100	sc	gscl	<15	35-60	<50	1-3	moderate	7.84	0.604	4.27	11.50	100
NHLmB1	866	150	WD	100-150	c	sl	<15	<15	>200	1-3	moderate	5.41	0.121	3.36	14.28	75

*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		Unit	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/exce ssively 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		Unit	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		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Soil –site characteristics						
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	-

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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		Unit	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 15 soil map units identified in Ashanal-3 microwatershed have been grouped into 9 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 map units that have been grouped into 9 Land Management Units along with brief description of soil and site characteristics are given below.

LMU No.	Soil map units	Soil and site characteristics
1	160.HSLcB2g1 33.HSLiB2	Moderately deep (75 to 100), black sandy clay soils, 1-3 % slopes, gravelly (15 to 35%), moderate erosion.
2	131.KBDiB2	Moderately deep soils (75 to 100 cm), red gravelly loamy soils, 1-3 % slopes, non-gravelly (<15%), moderate erosion.
3	41.PGPiB2	Moderately deep soils (75 to 100 cm), red sandy clay, 1-3% slopes, non-gravelly (<15%), moderate erosion.
4	101.NHLmB1	Deep soils (100 to 150 cm), sandy loam low land, 1-3 % slopes, non-gravelly (<15%), slight erosion.
5	110.JNKhB2 11.SBRcB2	Moderately shallow soils (50 to 75cm), black sandy clay loam to loamy sand, 1-3 % slopes, non-gravelly (<15%), moderate erosion.
6	9.VNKcB2	Shallow soils (25 to 50 cm), red sandy clay, 1-3 % slopes, non-gravelly (<15 %), moderate erosion.
7	107.DSBhB2 108.DSBiB2	Shallow soils (25 to 50 cm), gravelly clay, 1-3 % slopes, non-gravelly (<15 %), moderate erosion.
8	118.BDPcB2 120.BDPhB2	Very shallow soils (<25 cm), loamy soils, 1-3 % slopes, non-gravelly (<15 %), moderate erosion.
9	2.BDLbB2 4.BDLhB2 162.BDLhB2g1	Shallow soils (25 to 50 cm), 1-3 % slopes, sandy loam soils, gravelly (15 to 35%), moderate erosion.
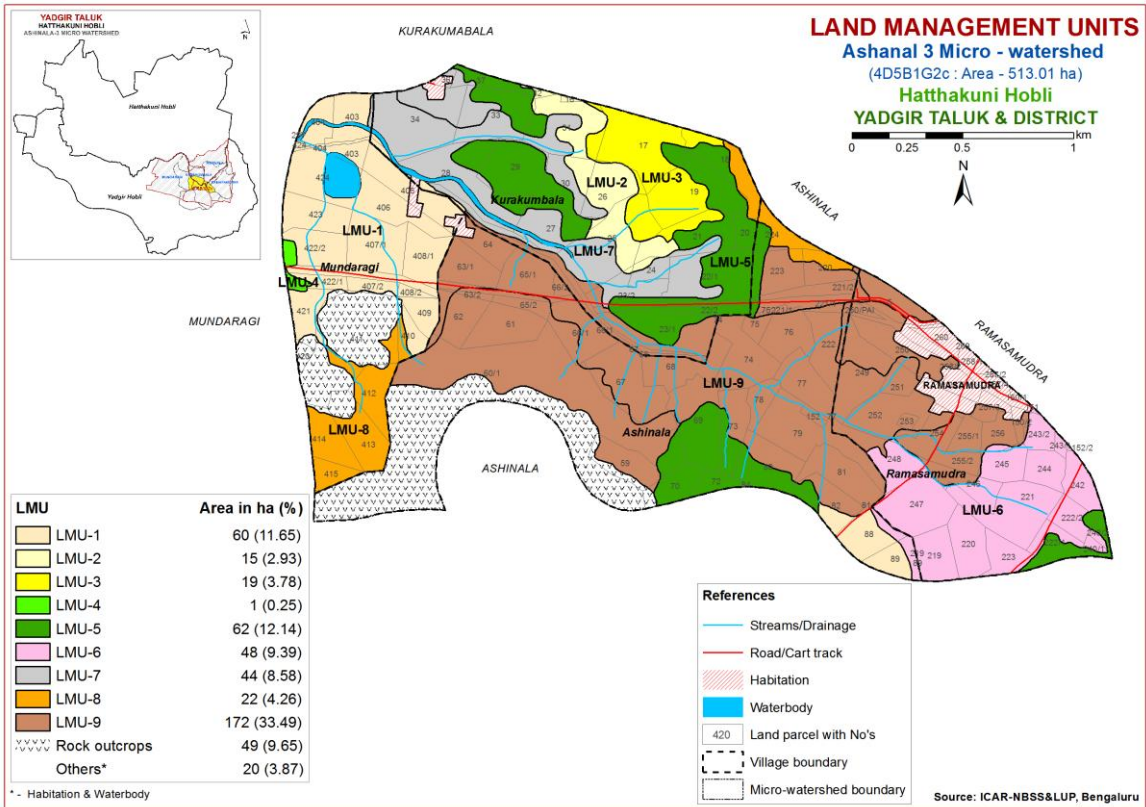
Fig. 7.30 Land Management Units Map- Ashanal-3 Microwatershed

7.31 Proposed Crop Plan for Ashanal-3 Microwatershed

After assessing the land suitability for the 29 crops, the Proposed Crop Plan has been prepared for the 9 identified LMUs by considering only highly (Class S1) and moderately (Class S2) suitable lands for each of the 29 crops. The resultant proposed crop plan is presented below in Table 7.31.

Table 7.31 Proposed Crop Plan for Ashanal-3 Microwatershed

LMU	Soil Map Units	Survey Number	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	160.HSLcB2g1 33.HSLiB2 (Moderately deep black sandy clay soils)	**Ashinala :** 88,89 **Mundaragi:**297,403,404,405, 406,407/1,407/2,408/1,408/2, 409,410,421,422/1,422/2,423, 424	Sunflower, Sorghum, Maize, Soybean, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Pomegranate, Lime, Musambi, Tamarind, Jamun, Amla, Custard apple **Vegetables:** Drumstick, Chilli, Bhendi, Cluster bean, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
2	131.KBDiB2 (Moderately deep, red gravelly loamy soils)	**Kurakumbala :**16,26,31,32	Groundnut, Bajra, Horse gram, Castor, Mulberry	**Fruit crops:** Musambi, Lime, Jackfruit Amla, Custard apple, Tamarind **Vegetable crops:** Drumstick, Curry leaves	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
3	41.PGPiB2 (Moderately deep, red sandy clay soils)	**Kurakumbala :**17,19	Maize, Sorghum, Sunflower, Bajra, Finger millet, Groundnut, Red gram, Cowpea, Field bean, Castor, Mulberry	**Fruit crops:** Pomegranate, Guava, Sapota, Jackfruit, Lime, Musambi, Amla, Custard apple, Cashew **Vegetable crops:** Drumstick, Tomato, Bhendi, Chilli, Brinjal, Onion, Curry leaves **Flower crops:** Marigold, Chrysanthemum, Jasmine, Crossandra	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
4	101.NHLmB1 (Deep, lowland sandy loam soils)	**Mundaragi:**421,422/1,422/2	Groundnut, Horse gram	**Fruit crops:** Custard Apple, Amla **Vegetable crops:** Brinjal, Tomato, Chillies, Drumstick, Coriander **Flower crops:** Marigold, Chrysanthemum, Jasmine	Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practices

5	110.JNKhB2 11.SBRcB2 (Moderately shallow, black sandy clay loam to loamy sand soils)	**Ashinala :** 69,70,72,80,84 **Kurakumbala:**20,21,22/1,22/2,29,33,37 **Ramasamudra:**222/1,240/2	Sorghum, Bajra, Coriander	**Fruit crops:** Amla, Custard apple **Vegetables**: Coriander, Bhendi **Flowers:** Marigold, Jasmine Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
6	9.VNKcB2 (Shallow, red sandy clay soils)	**Ramasamudra:**89,151,152/2,219,220,221,222/2,223,240/1,242,243/1,243/2,244,245,246,247,248	Horse gram	**Agri-Silvi-Pasture:** Custard apple, Amla, Hybrid Napier, *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers
7	107.DSBhB2 108.DSBiB2 (Shallow, gravelly clay soils)	**Kurakumbala:23/2,24,25,27,28,30,34**	-	**Agri-Silvi-Pasture:** Custard apple, Amla, Hybrid Napier, *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers
8	118.BDPcB2 120.BDPhB2 (Very shallow, loamy soils)	**Ashinala :** 224 **Kurakumbala :** 18 **Mundaragi:**412,413,414,415	-	**Agri-Silvi-Pasture:,** *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers
9	2.BDLbB2 4.BDLhB2 162.BDLhB2g1 (Shallow, sandy loam soils)	**Ashinala:**59,61,62,63/1,63/2,64,65/1,65/2,66/1,66/2,67,68,73,74,75,76,77,78,79,81,82,152, 220,221/1,221/2,222, 223 **Kurakumbala:**23/1,66/1,67,68,74 **Ramasamudra:**5,77,150/2,249,250,250/PAI,252,253,254,255/1,255/2,256,257/3,258/2	-	**Agri-Silvi-Pasture:** Custard apple, ,*Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers

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 Ashanal-3 Microwatershed

❖ The soil phases identified in the microwatershed belonged to the soil series of BDL 172 ha (33%), VNK 48 ha (9%), SBR 59 ha (11%), HSL 60 ha (12%), PGP 19 ha (4%), DSB 44 ha (9%), JNK 3 ha (1%), BDP 22 ha (4%), KBD 15 ha (3%) and NHL 1 ha (<1%).

❖ 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 erosion, soil limitation and wetness/drainage.

❖ On the basis of soil reaction, about 67 ha (13%) is slightly acid, 213 ha (42%) is neutral (pH 6.5 -7.3) and 164 ha (32%) 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

        Slightly acid soils occupy 67 ha (13%)

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

    Liming materials:

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

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

Alkaline soils

        Slightly alkaline to moderately alkaline soils cover about 164 ha area.

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 cover about 213 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 513 ha area in the microwatershed, an area of about 442 ha is suffering from moderate erosion. These areas need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning (Saturation Plan) in IWMP is focusing on preparation of
1. Soil and Water Conservation Plan for each plot or farm.
2. Productivity enhancement measures/ interventions for existing crops/livestock/other farm enterprises.
3. Diversification of farming mainly with perennial horticultural crops and livestock.
4. Improving livelihood opportunities and income generating activities.

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

❖ **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.

❖ **Surface Soil Texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.

- ❖ **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.

- ❖ **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion, wetness and soil are the major constraints in Ashanal-3 microwatershed.

- ❖ **Organic Carbon:** The OC content (an index of available Nitrogen) is medium (0.5-0.75%) in 419 ha (82%) and high (>0.75%) in 24 ha (5%). The areas that are medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.

- ❖ **Promoting green manuring:** Growing of green 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 419 ha area where OC is 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 low (<23 kg/ha) in an area of 231 ha (45%), medium (23-57 kg/ha) in 190 ha (37%) and high (>57 kg/ha) in 23 ha (4%) of the microwatershed. For all the crops 25% additional P needs to be applied where available P is low and medium.

- ❖ **Available Potassium:** Available potassium is low (<145 kg/ha) in an area of 252 ha (49%) and medium (145-337 kg/ha) in an area of 192 ha (37%) of the microwatershed. All the plots, where available potassium is low and 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 in 52 ha (10%) and low in 392 ha (76%). Low and medium areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

- ❖ **Available Boron:** An entire area of 444 ha (86%) is low. For these areas, application of sodium borate @ 10 kg/ha as soil application or 0.2 % borax as foliar spray is recommended.

- ❖ **Available Iron:** Entire area of 444 ha (86%) is sufficient in available iron in the microwatershed. For the deficient areas, iron sulphate @ 25 kg/ha need to be applied for 2-3 years.

❖ **Available Zinc:** An area of 373 (73%) in the microwatershed is deficient (<0.6 ppm) and 71 ha (14%) is sufficient (>0.6 ppm) in available zinc content. Application of zinc sulphate @25 kg/ha is recommended for the deficient areas.

❖ **Soil Alkalinity:** The microwatershed has 164 ha (32%) area under slightly to moderately alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

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

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Ashanal-3 microwatershed, the land resource inventory database generated under Sujala-III project has been transformed as information through series of interpretative (thematic) maps using soil phase map as a base. The various thematic maps (1:7920 scale) generated were

➢ Soil depth
➢ Surface soil texture
➢ Available water capacity
➢ Soil slope
➢ Soil gravelliness
➢ Land capability
➢ Present land use and land cover
➢ Crop suitability
➢ Rainfall
➢ Hydrology
➢ Water Resources
➢ Socio-economic data
➢ Contour plan with existing features- network of waterways, pothissa boundaries, cut up/ minor terraces etc.
➢ Cadastral map (1:7920 scale)
➢ Satellite imagery (1:7920 scale)
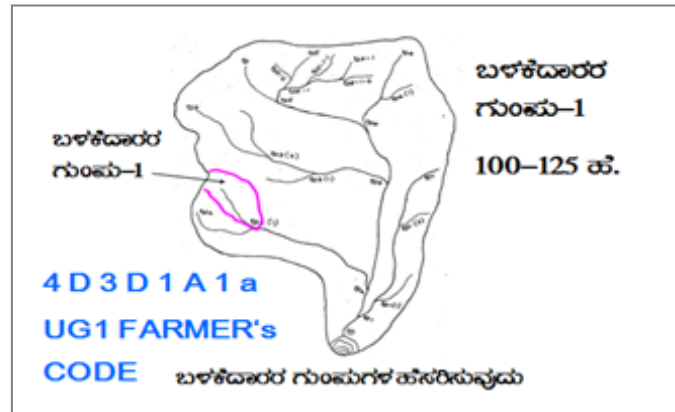
Apart from these, Hand Level/ Hydro Marker/ Dumpy Level/ Total Station and Kathedars' List to be collected.

Steps for Survey and Preparation of Treatment Plan

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

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

9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below

9.1.1 Arable Land Treatment

A. BUNDING

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

USER GROUP-1

CLASSIFICATION OF GULLIES

ಕೊರಕಲಿನ ವರ್ಗೀಕರಣ

UPPER REACH — • ಮೇಲ್ಸ್ತರ — 15 Ha.

MIDDLE REACH — • ಮಧ್ಯಸ್ತರ — 15 +10=25 ಹೆ.

LOWER REACH — • ಕೆಳಸ್ತರ — 25 ಹೆಕ್ಟೇರ್ ಗಿಂತ ಅಧಿಕ

POINT OF CONCENTRATION

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.

HAND LEVEL

SPIRIT LEVEL

EYE PIECE END

OBJECT END

HYDRO MARKER (WATER TUBE)

STOP COCK

GRADUATED SCALE

1.5

1.5 / 1.0 / 0.5 / 0.0

0.6

1.5 / 1.0 / 0.5 / 0.0

TUBE

A

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.

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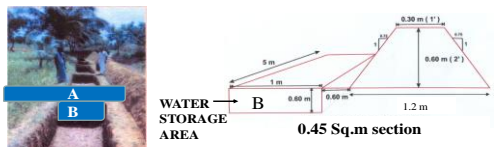
Top width (m)	Base width (m)	Height (m)	Side slope (Z:1;H:V)	Cross section (sq m)	Soil Texture	Remarks
0.3	0.9	0.3	01:01	0.18	Sandy loam	Vegetative bund
0.3	1.2	0.3	1.5:1	0.225	Sandy clay	
0.3	1.2	0.5	0.9:1	0.375	Red gravelly soils	
0.3	1.2	0.6	0.75:1	0.45		
0.3	1.5	0.6	01:01	0.54	Red sandy loam	
0.3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

Formation of Trench cum Bund

Dimensions of the Borrow Pits/Trenches to be excavated (machinery are decided considering the Bund Section).
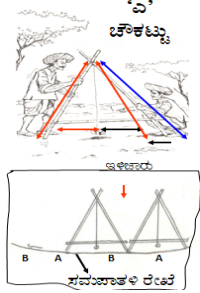
Details of Borrow Pit dimensions are given below:

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

Bund section	Bund length	Earth quantity	Pit				Berm (pit to pit)	Soil depth class
m²	m	m³	L(m)	W(m)	D(m)	Quantity (m³)	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 (1:792 scale) and their dimensions are recorded.
2. Considering the contour plan of the MWS, additional waterways/ modernization of the existing ones can be thought of.
3. The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion Channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

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

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

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

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

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

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

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

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. An area of about 148 ha (29%) needs Trench cum bunding and 295 ha (58%) needs Graded Bunding.

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.
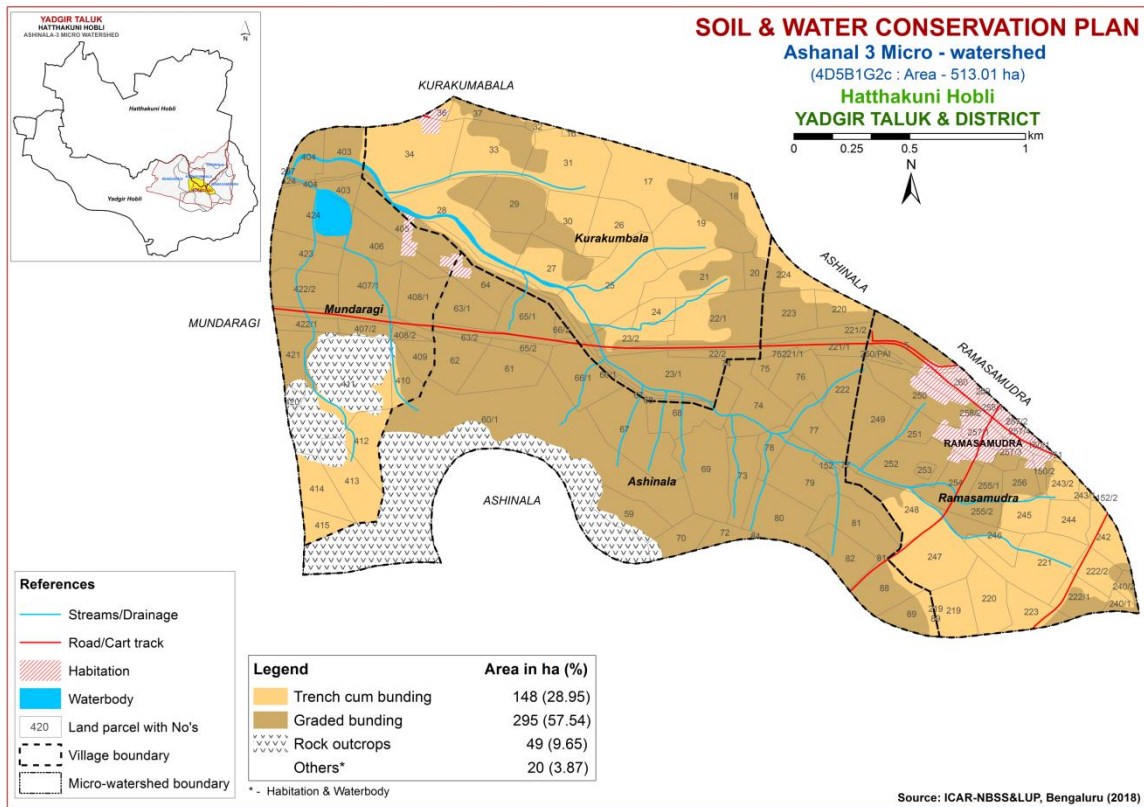
Fig. 9.1 Soil and Water Conservation Plan map of Ashanal-3 Microwatershed

9.3 Greening of Microwatershed

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

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

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

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	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

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Appendix-I
Ashanal-3 (1G2c) 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	Land Capability	Conservation Plan
Ashinala	59	4.22	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	60/1	55.95	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	RO	RO
Ashinala	61	5.03	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	62	4.07	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	63/1	3.95	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	63/2	0.44	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	64	3.03	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	65/1	4.06	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	65/2	1.31	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	66/1	5.11	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	IIIes	Graded bunding
Ashinala	66/2	0.52	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	67	8.55	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	IIIes	Graded bunding
Ashinala	68	4.97	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	IIIes	Graded bunding
Ashinala	69	7.6	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Ashinala	70	3.19	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Ashinala	72	1.51	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIes	Graded bunding
Ashinala	73	4.24	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ashinala	74	5.89	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	IIIes	Graded bunding
Ashinala	75	1.32	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ashinala	76	4.31	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	77	4.38	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ashinala	78	1.95	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	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	Land Capability	Conservation Plan
Ashinala	79	8.27	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Greengram (Pd+Gg)	IIIes	Graded bunding
Ashinala	80	6.08	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIes	Graded bunding
Ashinala	81	4.95	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Redgram (Pd+Rg)	IIIes	Graded bunding
Ashinala	82	3.99	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ashinala	84	0.09	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIes	Graded bunding
Ashinala	88	4.25	HSLcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIes	Graded bunding
Ashinala	89	3.05	HSLcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IIes	Graded bunding
Ashinala	152	0.42	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	IIIes	Graded bunding
Ashinala	220	2.97	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ashinala	221/1	2.87	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	221/2	1.97	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	222	4.52	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	223	4.4	BDLhB2g1	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Gravelly (15-35%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ashinala	224	3.07	BDPhB2	LMU-8	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IVes	Trench cum bunding
Kurakumbala	16	0.19	KBDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Groundnut (Gg+Gn)	IIIes	Trench cum bunding
Kurakumbala	17	9.26	PGPiB2	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Groundnut+Redgram (Gg+Gn+Rg)	IIes	Trench cum bunding
Kurakumbala	18	5.18	BDPhB2	LMU-8	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	IVes	Trench cum bunding
Kurakumbala	19	8.71	PGPiB2	LMU-3	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	IIes	Trench cum bunding
Kurakumbala	20	1.38	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Kurakumbala	21	6.51	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	IIes	Graded bunding
Kurakumbala	22/1	8.35	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram+Scrub land (Gg+Rg+Sl)	IIes	Graded bunding
Kurakumbala	22/2	1.49	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	IIes	Graded bunding
Kurakumbala	23/1	7.78	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	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	Land Capability	Conservation Plan
Kurakumbala	23/2	3.72	DSBhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram+Scrub land (Gg+Rg+Sl)	IVes	Trench cum bunding
Kurakumbala	24	1.72	DSBhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Scrub land (Gg+Sl)	IVes	Trench cum bunding
Kurakumbala	25	10.47	DSBhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	IVes	Trench cum bunding
Kurakumbala	26	4.64	KBDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram (Gg+Rg)	IIIes	Trench cum bunding
Kurakumbala	27	5.51	DSBhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram+Scrubland (Gn+Rg+Sl)	IVes	Trench cum bunding
Kurakumbala	28	10.22	DSBhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Redgram+Scrub land (Gg+Rg+Sl)	IVes	Trench cum bunding
Kurakumbala	29	6.15	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Bengalgram+Redgram (Bg+Rg)	IIes	Graded bunding
Kurakumbala	30	4.93	DSBhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	IVes	Trench cum bunding
Kurakumbala	31	8.22	KBDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Groundnut (Gg+Gn)	IIIes	Trench cum bunding
Kurakumbala	32	0.42	KBDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Groundnut (Gg+Gn)	IIIes	Trench cum bunding
Kurakumbala	33	7.33	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Groundnut+Paddy (Gg+Gn+Pd)	IIes	Graded bunding
Kurakumbala	34	11.18	DSBhB2	LMU-7	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrubland+Vegetables (Sl+Vg)	IVes	Trench cum bunding
Kurakumbala	36	0.61	Habitation	Others	Others	Others	Others	Others	Others	Others	Greengram+Paddy+Redgram (Gg+Pd+Rg)	Others	Others
Kurakumbala	37	1.91	SBRcB2	LMU-5	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Groundnut+Redgram (Gg+Gn+Rg)	IIes	Graded bunding
Mundaragi	297	0.09	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Cotton (Gn+Ct)	IIes	Graded bunding
Mundaragi	403	5.3	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	IIes	Graded bunding
Mundaragi	404	2.59	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Paddy (Gn+Pd)	IIes	Graded bunding
Mundaragi	405	5.45	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Habitation	IIes	Graded bunding
Mundaragi	406	5.03	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Mundaragi	407/1	6.19	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	IIes	Graded bunding
Mundaragi	407/2	1.46	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	IIes	Graded bunding
Mundaragi	408/1	4.13	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	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	Land Capability	Conservation Plan
Mundaragi	408/2	0.61	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Mundaragi	409	2.1	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Mundaragi	410	2.29	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	IIes	Graded bunding
Mundaragi	411	15.36	RO	RO	RO	RO	RO	RO	RO	RO	RO (Rc)	RO	RO
Mundaragi	412	3.96	BDPcB2	LMU-8	Very shallow (<25 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IVes	Trench cum bunding
Mundaragi	413	5.42	BDPcB2	LMU-8	Very shallow (<25 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IVes	Trench cum bunding
Mundaragi	414	3.85	BDPcB2	LMU-8	Very shallow (<25 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IVes	Trench cum bunding
Mundaragi	415	1.92	BDPcB2	LMU-8	Very shallow (<25 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IVes	Trench cum bunding
Mundaragi	420	0.73	RO	RO	RO	RO	RO	RO	RO	RO	Redgram (Rg)	RO	RO
Mundaragi	421	3.36	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Mundaragi	422/1	1.72	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Mundaragi	422/2	4.61	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut +Cotton (Rg+Gn+Ct)	IIes	Graded bunding
Mundaragi	423	4.32	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIes	Graded bunding
Mundaragi	424	6.77	HSLiB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut +Cotton (Rg+Gn+Ct)	IIes	Graded bunding
Ramasamudra	5	4.27	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IIIes	Graded bunding
Ramasamudra	150/1	0.28	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Others	Others
Ramasamudra	150/2	0.92	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Habitation (Rg+Hb)	IIIes	Graded bunding
Ramasamudra	151	0	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Trench cum bunding
Ramasamudra	152/2	0.05	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Trench cum bunding
Ramasamudra	219	3.85	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IIIes	Trench cum bunding
Ramasamudra	220	4.4	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IIIes	Trench cum bunding
Ramasamudra	221	8.02	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	IIIes	Trench cum bunding
Ramasamudra	222/1	2.99	JNKhB2	LMU-5	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IIes	Graded bunding
Ramasamudra	222/2	2.55	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	IIIes	Trench cum bunding

Village	Survey NO	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Land Capability	Conservation Plan
Ramasamudra	223	3.22	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Groundnut+Redgram (Gg+Gn+Rg)	IIIes	Trench cum bunding
Ramasamudra	240/1	0.89	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IIIes	Trench cum bunding
Ramasamudra	240/2	0.85	JNKhB2	LMU-5	Moderately shallow (50-75 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Banana (Ba)	IIes	Graded bunding
Ramasamudra	242	3.02	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	IIIes	Trench cum bunding
Ramasamudra	243/1	0.44	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Trench cum bunding
Ramasamudra	243/2	1.87	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Trench cum bunding
Ramasamudra	244	2.79	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Trench cum bunding
Ramasamudra	245	3	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Trench cum bunding
Ramasamudra	246	3.13	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	IIIes	Trench cum bunding
Ramasamudra	247	7.01	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	IIIes	Trench cum bunding
Ramasamudra	248	4.81	VNKcB2	LMU-6	Shallow (25-50 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	IIIes	Trench cum bunding
Ramasamudra	249	6.72	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	IIIes	Graded bunding
Ramasamudra	250	5.07	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ramasamudra	250/PAI	0.45	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Ragi (Ra)	IIIes	Graded bunding
Ramasamudra	251	4.02	Habitation	Others	Others	Others	Others	Others	Others	Others	Redgram (Rg)	Others	Others
Ramasamudra	252	5.77	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ramasamudra	253	0.48	BDLhB2	LMU-9	Shallow (25-50 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ramasamudra	254	3.6	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ramasamudra	255/1	1.88	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ramasamudra	255/2	1.78	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ramasamudra	256	2.27	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	IIIes	Graded bunding
Ramasamudra	257/1	1.65	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Others	Others
Ramasamudra	257/2	0.03	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Others	Others
Ramasamudra	257/3	1.48	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	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	Land Capability	Conservation Plan
Ramasamu dra	257/4	0.71	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Others	Others
Ramasamu dra	258/1	0.92	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Others	Others
Ramasamu dra	258/2	0.05	BDLbB2	LMU-9	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	IIIes	Graded bunding
Ramasamu dra	259	0.03	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Others	Others
Ramasamu dra	260	1.47	Habitation	Others	Others	Others	Others	Others	Others	Others	Habitation	Others	Others

Appendix II

Ashanal-3 (1G2c) 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
Ashinala	59	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	60/1	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Ashinala	61	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	62	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	63/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	63/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	64	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	65/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	65/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	66/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	66/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	67	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	68	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	69	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	70	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	72	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	73	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	74	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	75	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	76	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	77	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	78	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Ashinala	79	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	80	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	81	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	82	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	84	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	88	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	89	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	152	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	220	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	221/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	221/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	222	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	223	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ashinala	224	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	16	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	17	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	18	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	19	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	20	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	21	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	22/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	22/2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	23/1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	23/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

VIII

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Kurakumbala	24	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	25	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	26	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	27	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	28	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	29	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	30	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	31	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	32	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	33	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	34	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Kurakumbala	36	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Kurakumbala	37	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	297	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	403	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	404	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	405	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	406	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	407/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	407/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	408/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	408/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	409	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundaragi	410	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Mundar agi	411	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Mundar agi	412	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundar agi	413	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundar agi	414	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundar agi	415	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundar agi	420	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Mundar agi	421	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundar agi	422/1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundar agi	422/2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundar agi	423	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Mundar agi	424	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ramasa mudra	5	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ramasa mudra	150/1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ramasa mudra	150/2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	151	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	152/2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	219	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	220	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	221	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	222/1	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	222/2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	223	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	240/1	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	240/2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

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Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Ramasa mudra	242	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	243/1	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	243/2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	244	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (> 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	245	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	246	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	247	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	248	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ramasa mudra	249	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ramasa mudra	250	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	250/PAI	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ramasa mudra	251	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ramasa mudra	252	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Ramasa mudra	253	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	254	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	255/1	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	255/2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	256	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	257/1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ramasa mudra	257/2	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ramasa mudra	257/3	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Ramasa mudra	257/4	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ramasa mudra	258/1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ramasa mudra	258/2	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Ramasa mudra	259	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ramasa mudra	260	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

XII

Appendix III
Ashanal-3 (1G2c) 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
Ashinala	59	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	60/1	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
Ashinala	61	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	62	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	63/1	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	63/2	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	64	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	65/1	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	65/2	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	66/1	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	66/2	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	67	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	68	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	69	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Ashinala	70	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Ashinala	72	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Ashinala	73	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	74	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	75	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	76	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	77	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	78	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	79	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	80	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Ashinala	81	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	82	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	84	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Ashinala	88	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Ashinala	89	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Ashinala	152	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	220	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3r	S3r	S3r	N1rt	N1rt
Ashinala	221/1	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	221/2	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	222	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	223	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ashinala	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
Kurakumbala	16	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Kurakumbala	17	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S2t	S1	S2t	S2t	S2r	S1	S1	S2t	S2r	S2r
Kurakumbala	18	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
Kurakumbala	19	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S2t	S1	S2t	S2t	S2r	S1	S1	S2t	S2r	S2r
Kurakumbala	20	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Kurakumbala	21	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Kurakumbala	22/1	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Kurakumbala	22/2	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Kurakumbala	23/1	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Kurakumbala	23/2	N1rg	S3rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	S3rg	N1rg	S3rg	S3rg	N1rg	S3rg	N1rt	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg
Kurakumbala	24	N1rg	S3rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	S3rg	N1rg	S3rg	S3rg	N1rg	S3rg	N1rt	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	S3rg	N1rg	N1rg

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
Kurakumbala	25	N1rg	S3rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	S3rg	N1rg	S3rg	S3rg	N1rg	S3rg	N1rt	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	N1rg	N1rg
Kurakumbala	26	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Kurakumbala	27	N1rg	S3rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	S3rg	N1rg	S3rg	S3rg	N1rg	S3rg	N1rt	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	N1rg	N1rg
Kurakumbala	28	N1rg	S3rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	S3rg	N1rg	S3rg	S3rg	N1rg	S3rg	N1rt	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	N1rg	N1rg
Kurakumbala	29	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Kurakumbala	30	N1rg	S3rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	S3rg	N1rg	S3rg	S3rg	N1rg	S3rg	N1rt	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	N1rg	N1rg
Kurakumbala	31	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Kurakumbala	32	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S2g	S2g	S2g
Kurakumbala	33	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Kurakumbala	34	N1rg	S3rg	N1rg	S3rg	N1rg	S3rg	N1rg	N1rg	S3rg	N1rg	S3rg	S3rg	N1rg	S3rg	N1rt	N1rg	N1rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	S3rg	N1rg	S3rg	S3rg	N1rg	N1rg
Kurakumbala	36	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
Kurakumbala	37	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t	S3t	S3t
Mundaragi	297	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	403	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	404	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	405	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	406	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	407/1	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	407/2	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	408/1	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	408/2	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	409	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	410	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz

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
Mundaragi	411	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
Mundaragi	412	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
Mundaragi	413	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
Mundaragi	414	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
Mundaragi	415	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
Mundaragi	420	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
Mundaragi	421	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	422/1	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	422/2	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	423	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Mundaragi	424	S3rz	S2tz	S2rz	S2tz	S2rz	S3tz	S3rz	S2rz	S3tz	S2rz	S2rz	S2tz	S2rz	S1	N1tz	S3rz	S2rz	S2z	S1	S2z	S2z	S2z	S2z	S2rz	S2z	S2t	S1	S2rz	S2rz
Ramasamudra	5	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	150/1	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
Ramasamudra	150/2	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	151	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	152/2	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	219	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	220	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	221	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	222/1	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Ramasamudra	222/2	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	223	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	240/1	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	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
Ramasamudra	240/2	N1r	S2t	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	N1rt	S3r	S3r	S3t	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Ramasamudra	242	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	243/1	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	243/2	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	244	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	245	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	246	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	247	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	248	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	S3r	N1r	S3r	N1r	N1r	N1r	S3rt	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	N1r	N1r
Ramasamudra	249	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	250	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	250/PAI	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	251	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
Ramasamudra	252	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	253	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	254	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	255/1	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	255/2	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	256	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	257/1	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
Ramasamudra	257/2	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

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
Ramasamudra	257/3	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	257/4	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ramasamudra	258/1	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
Ramasamudra	258/2	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3r	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	S3r	S3r	N1rt	N1rt
Ramasamudra	259	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
Ramasamudra	260	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

Ro-Rock outcrops

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

SALIENT FINDINGS OF THE SURVEY

❖ *The data indicated that there were 84 (60.43%) men and 55 (39.57%) women among the sampled households.*

❖ *The average family size of landless farmers' was 3.5, marginal farmers' was 4.4, small farmers' was 3.5, semi medium farmers' was 3.1 and medium farmers' was 4.*

❖ *The data indicated that, 14 (10.07 %) people were in 0-15 years of age, 54 (38.85%) were in 16-35 years of age, 60 (43.17%) were in 36-60 years of age and 11 (7.91%) were above 61 years of age.*

❖ *The results indicated that Ashanal-3 had 68.35 per cent illiterates, 0.72 per cent of them had functional literate, 10.79 per cent of them had primary school, 2.16 per cent of them had middle school, 9.35 per cent of them had high school education, 4.32 per cent of them had PUC and 2.88 per cent of them had degree education.*

❖ *The results indicate that, 59.46 per cent of household heads were practicing agriculture, 29.73 per cent of the household heads were agricultural laborers and 5.41 cent of the household heads were General Labour and housewives.*

❖ *The results indicate that agriculture was the major occupation for 56.83 per cent of the household members, 14.39 per cent were agricultural laborers, 2.16 per cent were in general labour, 0.72 per cent were private service, 12.23 per cent were students and housewives, 1.44 per cent were children.*

❖ *The results show that, 0.72 per cent of the population in the micro watershed has participated in Raitha Sangha and 99.28 per cent of the population in the micro watershed has not participated in any local institutions.*

❖ *The results indicate that 2.70 per cent of the households possess thatched and pucca/RCC house and 94.59 per cent of the households possess katcha house.*

❖ *The results show that 81.08 per cent of the households possess TV, 56.76 per cent of the households possess mixer/grinder, 21.62 per cent of the households possess motor cycle and 97.3 per cent of the households possess mobile phones.*

❖ *The results show that the average value of television was Rs. 6,666, mixer/grinder was Rs. 1,938, motor cycle was Rs. 43,375 and mobile phone was Rs. 1,467.*

❖ *About 13.51 per cent each of the households possess bullock cart and sprayer, 10.81 per cent each of the households possess Plough, 2.7 per cent each of the households possess Sprinkler, 27.03 per cent each of the households possess weeder, 24.32 per cent each of the households possess harvester and 5.41 per cent each of the households possess chaff cutter.*

❖ *The results show that the average value of bullock cart was Rs. 20,800, plough was Rs. 1,400, sprayer was Rs.4,400, sprinkler was Rs. 200, weeder was Rs. 462, Harvester was Rs. 254, and the average value of chaff cutter was Rs. 150.*

❖ *The results indicate that, 32.43 per cent of the households possess bullocks, 8.11 per cent of the households possess local cow and Buffalo and 2.70 per cent of the households possess sheep and goat.*

❖ *The results indicate that, average own labour men available in the micro watershed was 1.7, average own labour (women) available was 1.39, average hired labour (men) available was 6.21 and average hired labour (women) available was 6.09.*

❖ *The results indicate that, 89.19 per cent of the households opined that the hired labour was adequate.*

❖ *The results indicate that, households of the Ashanal-3 micro-watershed possess 37.14 ha (80.62%) of dry land and 8.93 ha (19.38%) of irrigated land. Marginal farmers possess 9.25 ha (100 %) of dry land. Small farmers possess 14.47 ha (88.75%) of dry land and 1.83 ha (11.25%) of irrigated land. Semi medium farmers possess 9.22 ha (68.87%) of dry land and 4.16 ha (31.13%) of irrigated land. Medium farmers possess 4.21 ha (58.96%) and 2.93 ha (41.04%) of irrigated land.*

❖ *The results indicate that, the average value of dry land was Rs. 542,280.46 and the average value of irrigated land was Rs. 503,853.13. In case of marginal famers, the average land value was Rs. 842,782.16 for dry land. In case of small famers, the average land value was Rs. 504,363.63 for dry land the average land value was Rs. 708,830.03 for irrigated land. In case of semi medium famers, the average land value was Rs. 412,209.06 for dry land and Rs. 600,097.18 for irrigated land. In case of medium farmers, the average land value was Rs. 296,875 for dry land and Rs. 238,812.16 for irrigated land.*

❖ *The results indicate that, there were 6 functioning and 4 de-functioning bore wells in the micro watershed.*

❖ *The results indicate that, bore well was the major irrigation source in the micro water shed for 6.22 per cent of the farmers.*

❖ *The results indicate that, the depth of bore well was found to be 8.07 meters.*

❖ *The results indicate that, marginal, small, semi medium and medium farmers had an irrigated area of 0.89 ha, 2.11 ha, 2.95 ha and 2.93 ha respectively. The results indicate that, farmers have grown cotton (10.51 ha), red gram (9.16 ha), groundnut (8.64 ha), green gram (6.38 ha), sorghum (2.02 ha) and paddy (3.44 ha). Marginal farmers have grown cotton, red gram, groundnut, green gram and sorghum. Small farmers have grown cotton, red gram, groundnut, green gram, sorghum and paddy. Semi medium farmers have grown cotton, red gram, groundnut and paddy. Medium farmers have grown groundnut and green gram.*

❖ *The results indicate that, the cropping intensity in Ashanal-3 micro-watershed was found to be 97.17 per cent.*

❖ *The results indicate that, 78.38 per cent of the households have bank account. The results indicate that, 78.38 per cent of the households have availed credit from different sources.*

❖ *The results indicate that, 6.90 per cent of the households have borrowed from grameena bank.*

❖ *The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 6,206.90.*

❖ *The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production.*

❖ *The results indicated that 100 per cent of the households not repay their loan borrowed from institutional sources.*

❖ *The results indicate that, the total cost of cultivation for Cotton was Rs. 33381.76. The gross income realized by the farmers was Rs. 81397.81. The net income from Cotton cultivation was Rs. 48016.05. Thus the benefit cost ratio was found to be 1:2.44.*

❖ *The total cost of cultivation for groundnut was Rs. 23752.68. The gross income realized by the farmers was Rs. 60035.34. The net income from groundnut cultivation was Rs. 36282.66. Thus the benefit cost ratio was found to be 1:2.53.*

❖ *The total cost of cultivation for Red gram was Rs. 16907.43. The gross income realized by the farmers was Rs. 46958.85. The net income from Red gram cultivation was Rs. 30051.42. Thus the benefit cost ratio was found to be 1:2.78.*

❖ *The total cost of cultivation for Sorghum was Rs. 28471.79. The gross income realized by the farmers was Rs. 84979.76. The net income from Sorghum cultivation was Rs. 56507.97. Thus the benefit cost ratio was found to be 1:2.98.*

❖ *The total cost of cultivation for Paddy was Rs. 31715.06. The gross income realized by the farmers was Rs. 110018.21. The net income from Paddy cultivation was Rs. 78303.15. Thus the benefit cost ratio was found to be 1:3.47.*

❖ *The total cost of cultivation for Green gram was Rs. 18827.26. The gross income realized by the farmers was Rs. 51709.54. The net income from Green gram cultivation was Rs. 32882.28. Thus the benefit cost ratio was found to be 1:2.75.*

❖ *The results indicate that, 27.03 per cent of the households opined that dry fodder was adequate and 10.81 per cent of the households opined that green fodder was adequate.*

❖ *The results indicate that the annual gross income was Rs. 75,000, for landless farmers, for marginal farmers it was Rs. 103,750, for small farmers it was Rs. 143,416.67, semi medium farmers it was Rs. 156,428.57 and medium farmers it was Rs. 181,250.*

❖ *The results indicate that the average annual expenditure is Rs. 5,459.18. For landless households it was Rs. 11,250, for marginal farmers it was Rs. 5,618.69, for small farmers it was Rs. 3,349.49, for semi medium farmers it was Rs. 6,195.92 and medium farmers it was Rs. 3,000.*

❖ *The results indicate that, sampled households have grown 9 coconut, 4 lemon and 11 mango tree in their field and 2 coconut and 1 mango trees in backyard.*

❖ *The results indicate that, households have planted 26 teak, 63 neem, 7 tamarind and 1 banyan trees in their field and also 2 teak and 3 neem trees in their backyard.*

❖ *The results indicated that, households have an average investment capacity of Rs. 3,810.81 for land development and households have an average investment capacity of Rs. 405.41for improved livestock management, households have an average investment capacity of Rs.54.05 for orchard development/maintenance and households have an average investment capacity of Rs. 135.14 for Subsidiary enterprises.*

❖ *The results indicated that loan from bank was the source of additional investment for 35.14 per cent for land development, 8.11 per cent for improved livestock management and 2.7 per cent for orchard development/maintenance. Own funds was the source of additional investment for 2.7 per cent for land development and subsidiary enterprises. Soft loan was the source of additional investment for 2.7 per cent for land development.*

❖ *The results indicated that, cotton was sold to the extent of 100 per cent, green gram was sold to the extent of 91.3 per cent, groundnut was sold to the extent of 83.49 per cent, paddy was sold to the extent of 65.71 per cent, Red gram was sold to the extent of 86.76 per cent and sorghum to the extent of 92.73 per cent.*

❖ *The results indicated that, about 72.97 per cent of the farmers sold their produce to local/village merchant, 13.51 per cent of the farmers sold their produce to regulated markets and 2.70 per cent of the farmers sold their produce to contract marketing arrangement.*

❖ *The results indicated that, 89.19 per cent of the households have used tractor as a mode of transportation.*

❖ *The results indicated that, 83.78 per cent of the households have experienced soil and water erosion problems in the farm.*

❖ *The results indicated that, 83.78 per cent have shown interest in soil test.*

❖ *The results indicated that, 8.11 per cent of the households used LPG and 94.59 per cent of the households used firewood as a source of fuel.*

❖ *The results indicated that, piped supply was the major source of drinking water for 91.89 per cent of the households in the micro watershed and bore well was the source of drinking water for 8.11 per cent of the households in the micro watershed.*

❖ *Electricity was the major source of light for 100 per cent of the households in micro watershed.*

❖ *The results indicated that, 25.71 per cent of the households possess sanitary toilet facility.*

❖ *The results indicated that, 100 per cent of the sampled households possessed BPL cards.*

❖ *The results indicated that, 75.68 per cent of the households participated in NREGA programme.*

❖ *The results indicated that, cereals, pulses and oilseed were adequate for 100 per cent of the households, vegetables were adequate for 78.38 per cent, fruits were adequate for 8.11 per cent, milk were adequate for 86.49 per cent and Egg were adequate for 10.81 per cent.*

❖ *The results indicated that, vegetables were inadequate for 5.71 per cent of the households, fruits were inadequate for 89.19 per cent, milk were inadequate for 13.51 per cent, egg were inadequate for 86.49 per cent and meat were inadequate for 100 per cent of the households.*

❖ *The results indicated that, lower fertility status of the soil, wild animal menace on farm field and frequent incidence of pest and diseases was the constraint experienced by 89.19 per cent of the households, Inadequacy of irrigation water (16.22%), high cost of fertilizer and plant protection chemicals (86.49%), high rate of interest on credit (70.27%), low price for the agricultural commodities and lack of marketing facilities in the area (83.78%), inadequacy extension service and source of Agri-technology information (8.11%) and Lack of transport for safe transport of the Agril produce to the market (81.08%), less rainfall (13.51%)*

INTRODUCTION

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

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

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

Scope and importance of survey

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

METHODOLOGY

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

Description of the study area

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

Yadgir district is the second smallest district in the state, area wise is very rich in cultural traditions. The vast stretch of fertile black soil of the district is known for bumper red gram and 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%.

Description of the micro watershed

Ashanal-3 micro-watershed in Ramasamudram sub-watershed (Yadgir taluk and district) is located in between $16^0 47'3.074''$ to $16^0\ 45'52.516''$North latitudes and 77^0 $14'25.103''$ to $77^0 12'18.766''$ East longitudes, covering an area of about 512.79 ha, bounded by Ashinala, Ramasamudra, Mundargi and Kurakumbala villages.

Methodology followed in assessing socio-economic status of households

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 37 households located in the micro-watershed were interviewed for the survey.

Chapter 4

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Ashanal-3 micro-watershed is presented in Table 1 and it indicated that 37 farmers were sampled in Ashanal-3 micro-watershed among them 4 (10.81 %) were landless, 12 (14.29 %) were marginal and small farmers, 7 (18.92 %) were semi medium farmers and 2 (5.41%) were medium farmers.

Table 1: Households sampled for socio economic survey in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	4	10.81	12	32.43	12	32.43	7	18.92	2	5.41	37	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Ashanal-3 micro-watershed is presented in Table 2. The data indicated that there were 84 (60.43%) men and 55 (39.57%) women among the sampled households. The average family size of landless farmers' was 3.5, marginal farmers' was 4.4, small farmers' was 3.5, semi medium farmers' was 3.1 and medium farmers' was 4.

Table 2: Population characteristics of Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (14)		MF (53)		SF (42)		SMF (22)		MDF (8)		All (139)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	8	57.14	31	58.49	29	69.05	11	50	5	62.50	84	60.43
2	Women	6	42.86	22	41.51	13	30.95	11	50	3	37.50	55	39.57
	Total	14	100	53	100	42	100	22	100	8	100	139	100
	Average	3.5		4.4		3.5		3.1		4		3.7	

Age wise classification of population: The age wise classification of household members in Ashanal-3 micro-watershed is presented in Table 3. The data indicated that, 14 (10.07 %) people were in 0-15 years of age, 54 (38.85%) were in 16-35 years of age, 60 (43.17%) were in 36-60 years of age and 11 (7.91%) were above 61 years of age.

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

Sl.No.	Particulars	LL (14)		MF (53)		SF (42)		SMF (22)		MDF (8)		All (139)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	1	7.14	8	15.09	3	7.14	2	9.09	0	0	14	10.07
2	16-35 years of age	8	57.14	22	41.51	20	47.62	4	18.18	0	0	54	38.85
3	36-60 years of age	5	35.71	21	39.62	15	35.71	13	59.09	6	75	60	43.17
4	> 61 years	0	0	2	3.77	4	9.52	3	13.64	2	25	11	7.91
	Total	14	100	53	100	42	100	22	100	8	100	139	100

Education level of household members: Education level of household members in Ashanal-3 micro-watershed is presented in Table 4. The results indicated that Ashanal-3 had 68.35 per cent illiterates, 0.72 per cent of them had functional literate, 10.79 per cent of them had primary school, 2.16 per cent of them had middle school, 9.35 per cent of

them had high school education, 4.32 per cent of them had PUC and 2.88 per cent of them had degree education.

Table 4. Education level of household members in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (14)		MF (53)		SF (42)		SMF (22)		MDF (8)		All (139)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	10	71.43	38	71.70	29	69.05	13	59.09	5	62.50	95	68.35
2	Functional Literate	0	0	0	0	1	2.38	0	0	0	0	1	0.72
3	Primary School	2	14.29	5	9.43	5	11.90	2	9.09	1	12.50	15	10.79
4	Middle School	0	0	1	1.89	1	2.38	0	0	1	12.50	3	2.16
5	High School	1	7.14	2	3.77	3	7.14	6	27.27	1	12.50	13	9.35
6	PUC	1	7.14	3	5.66	1	2.38	1	4.55	0	0	6	4.32
7	Degree	0	0	2	3.77	2	4.76	0	0	0	0	4	2.88
8	Others	0	0	2	3.77	0	0	0	0	0	0	2	1.44
	Total	14	100	53	100	42	100	22	100	8	100	139	100

Occupation of household heads: The data regarding the occupation of the household heads in Ashanal-3 micro-watershed is presented in Table 5. The results indicate that, 59.46 per cent of household heads were practicing agriculture, 29.73 per cent of the household heads were agricultural labourers and 5.41 cent of the household heads were General Labour and housewives.

Table 5: Occupation of household heads in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	1	25	7	58.33	7	58.33	6	85.71	1	50	22	59.46
2	Agricultural Labour	1	25	4	33.33	4	33.33	1	14.29	1	50	11	29.73
3	General Labour	2	50	0	0	0	0	0	0	0	0	2	5.41
4	Housewife	0	0	1	8.33	1	8.33	0	0	0	0	2	5.41
	Total	4	100	12	100	12	100	7	100	2	100	37	100

Table 6: Occupation of family members in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (14)		MF (53)		SF (42)		SMF (22)		MDF (8)		All (139)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	2	14.29	27	50.94	27	64.29	17	77.27	6	75	79	56.83
2	Agricultural Labour	3	21.43	7	13.21	8	19.05	1	4.55	1	12.50	20	14.39
3	General Labour	3	21.43	0	0	0	0	0	0	0	0	3	2.16
4	Private Service	1	7.14	0	0	0	0	0	0	0	0	1	0.72
5	Student	2	14.29	8	15.09	4	9.52	3	13.64	0	0	17	12.23
6	Housewife	3	21.43	9	16.98	3	7.14	1	4.55	1	12.50	17	12.23
7	Children	0	0	2	3.77	0	0	0	0	0	0	2	1.44
	Total	14	100	53	100	42	100	22	100	8	100	139	100

Occupation of the household members: The data regarding the occupation of the household members in Ashanal-3 micro-watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 56.83 per cent of the household members, 14.39 per cent were agricultural laborers, 2.16 per cent were in general labour,

0.72 per cent were private service, 12.23 per cent were students and housewives, 1.44 per cent were children.

Institutional participation of the household members: The data regarding the institutional participation of the household members in Ashanal-3 micro-watershed is presented in Table 7. The results show that, 0.72 per cent of the population in the micro watershed has participated in Raitha Sangha and 99.28 per cent of the population in the micro watershed has not participated in any local institutions. .

Table 7. Institutional Participation of household members in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (14)		MF (53)		SF (42)		SMF (22)		MDF (8)		LF (0)		All (139)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Raitha Sangha	0	0	0	0	1	2.38	0	0	0	0	0	0	1	0.72
2	No Participation	14	100	53	100	41	97.62	22	100	8	100	0	0	138	99.28
	Total	14	100	53	100	42	100	22	100	8	100	0	100	139	100

Type of house owned: The data regarding the type of house owned by the households in Ashanal-3 micro-watershed is presented in Table 8. The results indicate that 2.70 per cent of the households possess thatched and pucca/RCC house and 94.59 per cent of the households possess katcha house.

Table 8. Type of house owned by households in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	0	0	0	0	1	8.33	0	0	0	0	1	2.70
2	Katcha	4	100	11	91.67	11	91.67	7	100	2	100	35	94.59
3	Pucca/RCC	0	0	1	8.33	0	0	0	0	0	0	1	2.70
	Total	4	100	12	100	12	100	7	100	2	100	37	100

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Ashanal-3 micro-watershed is presented in Table 9. The results show that 81.08 per cent of the households possess TV, 56.76 per cent of the households possess mixer/grinder, 21.62 per cent of the households possess motor cycle and 97.3 per cent of the households possess mobile phones.

Table 9. Durable Assets owned by households in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	4	100	10	83.33	9	75	6	85.71	1	50	30	81.08
2	Mixer/Grinder	1	25	9	75	6	50	4	57.14	1	50	21	56.76
3	Motor Cycle	0	0	4	33.33	4	33.33	0	0	0	0	8	21.62
4	Mobile Phone	4	100	11	91.67	12	100	7	100	2	100	36	97.30

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Ashanal-3 micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 6,666, mixer/grinder was Rs. 1,938, motor cycle was Rs. 43,375 and mobile phone was Rs. 1,467.

Table 10. Average value of durable assets owned by households in Ashanal-3 microwatershed

Average value (Rs.)

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Television	6,500	5,100	7,111	8,333	9,000	6,666
2	Mixer/Grinder	2,000	1,744	2,166	2,000	2,000	1,938
3	Motor Cycle	0	52,500	34,250	0	0	43,375
4	Mobile Phone	1,625	1,130	1,958	1,176	3,000	1,467

Farm Implements owned: The data regarding the farm implements owned by the households in Ashanal-3 micro-watershed is presented in Table 11. About 13.51 per cent each of the households possess bullock cart and sprayer, 10.81 per cent each of the households possess Plough, 2.7 per cent each of the households possess Sprinkler, 27.03 per cent each of the households possess weeder, 24.32 per cent each of the households possess harvester and 5.41 per cent each of the households possess chaff cutter.

Table 11. Farm Implements owned by households in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	1	8.33	1	8.33	2	28.57	1	50	5	13.51
2	Plough	0	0	1	8.33	0	0	2	28.57	1	50	4	10.81
3	Sprayer	0	0	2	16.67	1	8.33	2	28.57	0	0	5	13.51
4	Sprinkler	0	0	0	0	1	8.33	0	0	0	0	1	2.70
5	Weeder	0	0	6	50	3	25	1	14.29	0	0	10	27.03
6	Harvester	0	0	6	50	2	16.67	1	14.29	0	0	9	24.32
7	Chaff Cutter	0	0	1	8.33	1	8.33	0	0	0	0	2	5.41
8	Blank	4	100	4	33.33	8	66.67	4	57.14	1	50	21	56.76

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Ashanal-3 micro-watershed is presented in Table 12. The results show that the average value of bullock cart was Rs. 20,800, plough was Rs. 1,400, sprayer was Rs.4,400, sprinkler was Rs. 200, weeder was Rs. 462, Harvester was Rs. 254, and the average value of chaff cutter was Rs. 150.

Table 12. Average value of farm implements owned by households in Ashanal-3 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Bullock Cart	0	20,000	20,000	21,500	21,000	20,800
2	Plough	0	2,000	0	2,000	500	1,400
3	Sprayer	0	5,000	5,000	3,500	0	4,400
4	Sprinkler	0	0	200	0	0	200
5	Weeder	0	470	175	1,000	0	462
6	Harvester	0	446	22	50	0	254
7	Chaff Cutter	0	150	150	0	0	150

Livestock possession by the households: The data regarding the Livestock possession by the households in Ashanal-3 micro-watershed is presented in Table 13. The results indicate that, 32.43 per cent of the households possess bullocks, 8.11 per cent of the

households possess local cow and Buffalo and 2.70 per cent of the households possess sheep and goat.

Table 13. Livestock possession by households in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	8	66.67	3	25	1	14.29	0	0	12	32.43
2	Local cow	0	0	2	16.67	1	8.33	0	0	0	0	3	8.11
3	Buffalo	0	0	2	16.67	1	8.33	0	0	0	0	3	8.11
4	Sheep	0	0	0	0	0	0	1	14.29	0	0	1	2.70
5	Goat	0	0	0	0	0	0	1	14.29	0	0	1	2.70
6	blank	4	100	3	25	8	66.67	5	71.43	2	100	22	59.46

Average Labour availability: The data regarding the average labour availability in Ashanal-3 micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.7, average own labour (women) available was 1.39, average hired labour (men) available was 6.21 and average hired labour (women) available was 6.09.

In case of marginal farmers, average own labour men available was 1.58, average own labour (women) was 1.33, average hired labour (men) and average hired labour (women) available was 5.42. In case of small farmers, average own labour men available was 1.83, average own labour (women) was 1.33, average hired labour (men) and average hired labour (women) available was 5.42. In case of semi medium farmers, average own labour men available was 1.57, average own labour (women) was 1.43, average hired labour (men) was 8.57 and average hired labour (women) available was 8.33. In case of medium farmers, average own labour men available and average own labour (women) was 2, average hired labour (men) and average hired labour (women) available was 7.5.

Table 14. Average Labour availability in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Hired labour Female	0	5.42	5.42	8.33	7.50	6.09
2	Own Labour Female	0	1.33	1.33	1.43	2	1.39
3	Own labour Male	0	1.58	1.83	1.57	2	1.70
4	Hired labour Male	0	5.42	5.42	8.57	7.50	6.21

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Ashanal-3 micro-watershed is presented in Table 15. The results indicate that, 89.19 per cent of the households opined that the hired labour was adequate.

Table 15. Adequacy of Hired Labour in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0	12	100	12	100	7	100	2	100	33	89.19

Distribution of land (ha): The data regarding the distribution of land (ha) in Ashanal-3 micro-watershed is presented in Table 16. The results indicate that, households of the Ashanal-3 micro-watershed possess 37.14 ha (80.62%) of dry land and 8.93 ha (19.38%)

of irrigated land. Marginal farmers possess 9.25 ha (100 %) of dry land. Small farmers possess 14.47 ha (88.75%) of dry land and 1.83 ha (11.25%) of irrigated land. Semi medium farmers possess 9.22 ha (68.87%) of dry land and 4.16 ha (31.13%) of irrigated land. Medium farmers possess 4.21 ha (58.96%) and 2.93 ha (41.04%) of irrigated land.

Table 16. Distribution of land (Ha) in Ashanal-3 micro-watershed

Sl.No.	Particulars	MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	9.25	100	14.47	88.75	9.22	68.87	4.21	58.96	37.14	80.62
2	Irrigated	0	0	1.83	11.25	4.16	31.13	2.93	41.04	8.93	19.38
	Total	9.25	100	16.30	100	13.38	100	7.14	100	46.07	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Ashanal-3 micro-watershed is presented in Table 17. The results indicate that, the average value of dry land was Rs. 542,280.46 and the average value of irrigated land was Rs. 503,853.13. In case of marginal famers, the average land value was Rs. 842,782.16 for dry land. In case of small famers, the average land value was Rs. 504,363.63 for dry land the average land value was Rs. 708,830.03 for irrigated land. In case of semi medium famers, the average land value was Rs. 412,209.06 for dry land and Rs. 600,097.18 for irrigated land. In case of medium farmers, the average land value was Rs. 296,875 for dry land and Rs. 238,812.16 for irrigated land.

Table 17. Average land value (Rs./ha) in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Dry	0	842,782.16	504,363.63	412,209.06	296,875	542,280.46
2	Irrigated	0	0	708,830.03	600,097.18	238,812.16	503,853.13

Status of bore wells: The data regarding the status of bore wells in Ashanal-3 micro-watershed is presented in Table 18. The results indicate that, there were 6 functioning and 4 de-functioning bore wells in the micro watershed.

Table 18. Status of bore wells in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	De-functioning	0	1	2	1	0	4
2	Functioning	0	1	2	2	1	6

Source of irrigation: The data regarding the source of irrigation in Ashanal-3 micro-watershed is presented in Table 19. The results indicate that, bore well was the major irrigation source in the micro water shed for 6.22 per cent of the farmers.

Table 19. Source of irrigation in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	1	8.33	2	16.67	2	28.57	1	50	6	16.22

Depth of water (Avg in meters): The data regarding the depth of water in Ashanal-3 micro-watershed is presented in Table 20. The results indicate that, the depth of bore well was found to be 8.07 meters.

Table 20. Depth of water (Avg in meters) in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Bore Well	0	4.06	6.86	17.42	22.86	8.07

Irrigated Area (ha): The data regarding the irrigated area (ha) in Ashanal-3 micro-watershed is presented in Table 21. The results indicate that, marginal, small, semi medium and medium farmers had an irrigated area of 0.89 ha, 2.11 ha, 2.95 ha and 2.93 ha respectively.

Table 21. Irrigated Area (ha) in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Kharif	0	0.89	2.11	2.95	2.93	8.88

Cropping pattern: The data regarding the cropping pattern in Ashanal-3 micro-watershed is presented in Table 22. The results indicate that, farmers have grown cotton (10.51 ha), red gram (9.16 ha), groundnut (8.64 ha), green gram (6.38 ha), sorghum (2.02 ha) and paddy (3.44 ha). Marginal farmers have grown cotton, red gram, groundnut, green gram and sorghum. Small farmers have grown cotton, red gram, groundnut, green gram, sorghum and paddy. Semi medium farmers have grown cotton, red gram, groundnut and paddy. Medium farmers have grown groundnut and green gram.

Table 22. Cropping pattern in Ashanal-3 micro-watershed (Area in ha)

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Kharif - Cotton	0	5.44	3.45	1.62	0	10.51
2	Kharif - Red gram	0	0.82	3.03	5.31	0	9.16
3	Kharif - Groundnut	0	0.96	3.88	0.86	2.93	8.64
4	Kharif - Greengram	0	0.9	1.27	0	4.21	6.38
5	Kharif - Sorghum	0	0.81	3.79	0	0	4.6
6	Kharif - Paddy	0	0	0.89	2.55	0	3.44
	Total	0	8.93	16.31	10.34	7.14	42.72

Cropping intensity: The data regarding the cropping intensity in Ashanal-3 micro-watershed is presented in Table 23. The results indicate that, the cropping intensity in Ashanal-3 micro-watershed was found to be 97.17 per cent.

Table 23. Cropping intensity (%) in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF(2)	All (37)
1	Cropping intensity	0	96.50	100	100	100	99.25

Possession of Bank account and savings: The data regarding the possession of bank account and saving in Ashanal-3 micro-watershed is presented in Table 24. The results indicate that, 78.38 per cent of the households have bank account.

Table 24. Possession of bank account and savings in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	0	0	11	91.67	11	91.67	5	71.43	2	100	29	78.38

Borrowing status: The data regarding the borrowing status in Ashanal-3 micro-watershed is presented in Table 25. The results indicate that, 78.38 per cent of the households have availed credit from different sources.

Table 25. Borrowing status in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	0	0	11	91.67	11	91.67	5	71.43	2	100	29	78.38

Source of credit availed by households: The data regarding the source of credit availed by households in Ashanal-3 micro-watershed is presented in Table 26. The results indicate that, 6.90 per cent of the households have borrowed from grameena bank.

Table 26. Source of credit availed by households in Ashanal-3 micro-watershed

Sl.No.	Particulars	MF (11)		SF (11)		SMF (5)		MDF (2)		All (29)	
		N	%	N	%	N	%	N	%	N	%
1	Grameena Bank	1	9.09	0	0	1	20	0	0	2	6.90

Avg. Credit amount: The data regarding the avg. Credit amount in Ashanal-3 micro-watershed is presented in Table 27. The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 6,206.90.

Table 27. Avg. credit amount by household in Ashanal-3 micro-watershed

Sl.No.	Particulars	MF (11)	SF (11)	SMF (5)	MDF (2)	All (29)
1	Average Credit	7,272.73	0	20,000	0	6,206.90

Purpose of credit borrowed - Institutional Credit: The data regarding the purpose of credit borrowed - Institutional Credit in Ashanal-3 micro-watershed is presented in Table 28. The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production.

Table 28. Purpose of credit borrowed - Institutional Credit by household in Ashanal-3 micro-watershed

Sl.No.	Particulars	MF (1)		SMF (1)		All (2)	
		N	%	N	%	N	%
1	Agriculture production	1	100	1	100	2	100

Repayment status of households – Institutional: The data regarding the repayment status of credit borrowed from institutional sources by households in Ashanal-3 micro watershed is presented in Table 29. The results indicated that 100 per cent of the households not repay their loan borrowed from institutional sources.

Table 29. Repayment status of households – Institutional Credit in Ashanal-3 micro-watershed

Sl.No.	Particulars	MF (1)		SMF (1)		All (2)	
		N	%	N	%	N	%
1	Un paid	1	100	1	100	2	100

Cost of cultivation of Cotton: The data regarding the cost of cultivation of Cotton in Ashanal-3 micro-watershed is presented in Table 30. The results indicate that, the total cost of cultivation for Cotton was Rs. 33381.76. The gross income realized by the farmers was Rs. 81397.81. The net income from Cotton cultivation was Rs. 48016.05. Thus the benefit cost ratio was found to be 1:2.44.

Table 30. Cost of Cultivation of Cotton in Ashanal-3 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	32.58	5998.53	17.97
2	Bullock		Pairs/day	5.53	2763.87	8.28
3	Tractor		Hours	2.12	1596.12	4.78
4	Machinery		Hours	0.20	147.73	0.44
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	5.45	5333.18	15.98
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	28.18	3451.91	10.34
8	Fertilizer + micronutrients		Quintal	2.19	1826.90	5.47
9	Pesticides (PPC)		Kgs / liters	1.12	1161.03	3.48
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	144.08	0.43
14	Land revenue and Taxes			0	5.61	0.02
II	**Cost B1**					
16	Interest on working capital				1412.76	4.23
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				23841.73	71.42
III	**Cost B2**					
18	Rental Value of Land				418.18	1.25
19	**Cost B2 = (Cost B1 + Rental value)**				24259.91	72.67
IV	**Cost C1**					
20	Family Human Labour			29.22	6087.14	18.23
21	**Cost C1 = (Cost B2 + Family Labour)**				30347.05	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				30347.05	90.91
VI	**Cost C3**					
24	Managerial Cost				3034.71	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				33381.76	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		14.44	81397.81	
		b) Main Crop Sales Price (Rs.)			5636.36	
b.	Gross Income (Rs.)				81397.81	
c.	Net Income (Rs.)				48016.05	
d.	Cost per Quintal (Rs./q.)				2311.51	
e.	Benefit Cost Ratio (BC Ratio)				1:2.44	

Cost of cultivation of Groundnut: The data regarding the cost of cultivation of groundnut in Ashanal-3 micro-watershed is presented in Table 31. The results indicate that, the total cost of cultivation for groundnut was Rs. 23752.68. The gross income realized by the farmers was Rs. 60035.34. The net income from groundnut cultivation was Rs. 36282.66. Thus the benefit cost ratio was found to be 1:2.53.

Table 31. Cost of Cultivation of groundnut in Ashanal-3 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	43.54	8101.94	34.11
2	Bullock	Pairs/day	3.18	1591.65	6.70
3	Tractor	Hours	1.63	1221.71	5.14
4	Machinery	Hours	0.44	333.58	1.40
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	20.31	2167.76	9.13
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	14.07	1687.96	7.11
8	Fertilizer + micronutrients	Quintal	1.75	1429.78	6.02
9	Pesticides (PPC)	Kgs / liters	0.86	916.97	3.86
10	Irrigation	Number	0	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	38.83	0.16
14	Land revenue and Taxes		0	4.94	0.02
II	**Cost B1**				
16	Interest on working capital			744.30	3.13
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			18239.44	76.79
III	**Cost B2**				
18	Rental Value of Land			371.43	1.56
19	**Cost B2 = (Cost B1 + Rental value)**			18610.87	78.35
IV	**Cost C1**				
20	Family Human Labour		14.58	2982.48	12.56
21	**Cost C1 = (Cost B2 + Family Labour)**			21593.35	90.91
V	**Cost C2**				
22	Risk Premium			0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**			21593.35	90.91
VI	**Cost C3**				
24	Managerial Cost			2159.33	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			23752.68	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	12.73	60035.34	
		b) Main Crop Sales Price (Rs.)		4714.29	
b.	Gross Income (Rs.)			60035.34	
c.	Net Income (Rs.)			36282.66	
d.	Cost per Quintal (Rs./q.)			1865.18	
e.	Benefit Cost Ratio (BC Ratio)			1:2.53	

Cost of cultivation of Red gram: The data regarding the cost of cultivation of Red gram in Ashanal-3 micro-watershed is presented in Table 32. The results indicate that, the total cost of cultivation for Red gram was Rs. 16907.43. The gross income realized by the farmers was Rs. 46958.85. The net income from Red gram cultivation was Rs. 30051.42. Thus the benefit cost ratio was found to be 1:2.78.

Table 32. Cost of Cultivation of Red gram in Ashanal-3 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	32.82	6210.64	36.73
2	Bullock		Pairs/day	1.35	675.93	4
3	Tractor		Hours	1.81	1358.50	8.03
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	9.35	1003.22	5.93
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	17.17	2060.13	12.18
8	Fertilizer + micronutrients		Quintal	1.12	890.87	5.27
9	Pesticides (PPC)		Kgs / liters	0.55	558.04	3.30
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	36.84	0.22
14	Land revenue and Taxes			0	4.94	0.03
II	**Cost B1**					
16	Interest on working capital				541.47	3.20
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				13340.59	78.90
III	**Cost B2**					
18	Rental Value of Land				277.78	1.64
19	**Cost B2 = (Cost B1 + Rental value)**				13618.37	80.55
IV	**Cost C1**					
20	Family Human Labour			8.53	1752.02	10.36
21	**Cost C1 = (Cost B2 + Family Labour)**				15370.39	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				15370.39	90.91
VI	**Cost C3**					
24	Managerial Cost				1537.04	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				16907.43	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		10.06	46958.85	
		b) Main Crop Sales Price (Rs.)			4666.67	
b.	Gross Income (Rs.)				46958.85	
c.	Net Income (Rs.)				30051.42	
d.	Cost per Quintal (Rs./q.)				1680.22	
e.	Benefit Cost Ratio (BC Ratio)				1:2.78	

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Cost of Cultivation of Sorghum: The data regarding the cost of cultivation of Sorghum in Ashanal-3 micro-watershed is presented in Table 33. The results indicate that, the total cost of cultivation for Sorghum was Rs. 28471.79. The gross income realized by the farmers was Rs. 84979.76. The net income from Sorghum cultivation was Rs. 56507.97. Thus the benefit cost ratio was found to be 1:2.98.

Table 33. Cost of Cultivation of Sorghum in Ashanal-3 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	28.18	5165.31	18.14
2	Bullock		Pairs/day	4.44	2220.06	7.80
3	Tractor		Hours	3.09	2315.63	8.13
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	45.58	5222.29	18.34
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	15.58	1870.14	6.57
8	Fertilizer + micronutrients		Quintal	3	2446.48	8.59
9	Pesticides (PPC)		Kgs /liters	0.78	852.74	3
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	92.77	0.33
14	Land revenue and Taxes			0	4.94	0.02
II	**Cost B1**					
16	Interest on working capital				1247	4.38
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				21437.35	75.29
III	**Cost B2**					
18	Rental Value of Land				400	1.40
19	**Cost B2 = (Cost B1 + Rental value)**				21837.35	76.70
IV	**Cost C1**					
20	Family Human Labour			20.23	4046.10	14.21
21	**Cost C1 = (Cost B2 + Family Labour)**				25883.45	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				25883.45	90.91
VI	**Cost C3**					
24	Managerial Cost				2588.34	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				28471.79	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		42.49	84979.76	
		b) Main Crop Sales Price (Rs.)			2000	
b.	Gross Income (Rs.)				84979.76	
c.	Net Income (Rs.)				56507.97	
d.	Cost per Quintal (Rs./q.)				670.08	
e.	Benefit Cost Ratio (BC Ratio)				1:2.98	

Cost of Cultivation of Paddy: The data regarding the cost of cultivation of Paddy in Ashanal-3 micro-watershed is presented in Table 34. The results indicate that, the total cost of cultivation for Paddy was Rs. 31715.06. The gross income realized by the farmers was Rs. 110018.21. The net income from Paddy cultivation was Rs. 78303.15. Thus the benefit cost ratio was found to be 1:3.47.

Table 34. Cost of Cultivation of Paddy in Ashanal-3 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	63.75	11338.57	35.75
2	Bullock		Pairs/day	1.12	561.36	1.77
3	Tractor		Hours	5.02	3765.69	11.87
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	44.31	3472.80	10.95
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	15.02	1801.82	5.68
8	Fertilizer + micronutrients		Quintal	1.80	1424.58	4.49
9	Pesticides (PPC)		Kgs / liters	0.90	960.07	3.03
10	Irrigation		Number	4.50	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	149.33	0.47
14	Land revenue and Taxes			0	5.76	0.02
II	**Cost B1**					
16	Interest on working capital				919.11	2.90
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				24399.10	76.93
III	**Cost B2**					
18	Rental Value of Land				322.22	1.02
19	**Cost B2 = (Cost B1 + Rental value)**				24721.32	77.95
IV	**Cost C1**					
20	Family Human Labour			20.40	4110.55	12.96
21	**Cost C1 = (Cost B2 + Family Labour)**				28831.87	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				28831.87	90.91
VI	**Cost C3**					
24	Managerial Cost				2883.19	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				31715.06	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		62.68	100294.24	
		b) Main Crop Sales Price (Rs.)			1600	
	By Product	e) Main Product (q)		31.71	9723.97	
		f) Main Crop Sales Price (Rs.)			306.67	
b.	Gross Income (Rs.)				110018.21	
c.	Net Income (Rs.)				78303.15	
d.	Cost per Quintal (Rs./q.)				505.95	
e.	Benefit Cost Ratio (BC Ratio)				1:3.47	

Cost of cultivation of Green gram: The data regarding the cost of cultivation of Green gram in Ashanal-3 micro-watershed is presented in Table 35. The results indicate that, the total cost of cultivation for Green gram was Rs. 18827.26. The gross income realized by the farmers was Rs. 51709.54. The net income from Green gram cultivation was Rs. 32882.28. Thus the benefit cost ratio was found to be 1:2.75.

Table 35. Cost of Cultivation of Green gram in Ashanal-3 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	39.23	7336.98	38.97
2	Bullock	Pairs/day	2.44	1220.40	6.48
3	Tractor	Hours	0	0	0
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	10.24	1112.96	5.91
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	0	0	0
8	Fertilizer + micronutrients	Quintal	2.27	1758.45	9.34
9	Pesticides (PPC)	Kgs / liters	0.94	942.24	5
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	4.94	0.03
II	**Cost B1**				
16	Interest on working capital			457.64	2.43
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			12833.63	68.17
III	**Cost B2**				
18	Rental Value of Land			466.67	2.48
19	**Cost B2 = (Cost B1 + Rental value)**			13300.30	70.64
IV	**Cost C1**				
20	Family Human Labour		18.98	3815.39	20.27
21	**Cost C1 = (Cost B2 + Family Labour)**			17115.69	90.91
V	**Cost C2**				
22	Risk Premium			0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**			17115.69	90.91
VI	**Cost C3**				
24	Managerial Cost			1711.57	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			18827.26	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	10.24	51709.54	
		b) Main Crop Sales Price (Rs.)		5050	
b.	Gross Income (Rs.)			51709.54	
c.	Net Income (Rs.)			32882.28	
d.	Cost per Quintal (Rs./q.)			1838.69	
e.	Benefit Cost Ratio (BC Ratio)			1:2.75	

Adequacy of fodder: The data regarding the adequacy of fodder in Ashanal-3 micro-watershed is presented in Table 36. The results indicate that, 27.03 per cent of the households opined that dry fodder was adequate and 10.81 per cent of the households opined that green fodder was adequate

Table 36. Adequacy of fodder in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	5	41.67	3	25	1	14.29	1	50	10	27.03
2	Adequate-Green Fodder	0	0	2	16.67	1	8.33	0	0	1	50	4	10.81

Annual gross income: The data regarding the annual gross income in Ashanal-3 micro-watershed is presented in Table 37. The results indicate that the annual gross income was Rs. 75,000, for landless farmers, for marginal farmers it was Rs. 103,750, for small farmers it was Rs. 143,416.67, semi medium farmers it was Rs. 156,428.57 and medium farmers it was Rs. 181,250.

Table 37. Annual gross income in Ashanal-3 micro-watershed (Avg value in Rs.)

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Service/salary	20,000	5,000	5,833.33	0	0	5,675.68
2	Wage	55,000	43,333.33	58,333.33	47,142.86	70,000	51,621.62
3	Agriculture	0	55,416.67	79,250	109,285.71	111,250	70,364.86
	Income(Rs.)	75,000	103,750	143,416.67	156,428.57	181,250	127,662.16

Average annual expenditure: The data regarding the average annual expenditure in Ashanal-3 micro-watershed is presented in Table 38. The results indicate that the average annual expenditure is Rs. 5,459.18. For landless households it was Rs. 11,250, for marginal farmers it was Rs. 5,618.69, for small farmers it was Rs. 3,349.49, for semi medium farmers it was Rs. 6,195.92 and medium farmers it was Rs. 3,000.

Table 38. Average annual expenditure in Ashanal-3 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (4)	MF (12)	SF (12)	SMF (7)	MDF (2)	All (37)
1	Service/salary	0	30,000	15,000	0	0	1,216.22
2	Wage	45,000	13,333.33	6,666.67	4,800	0	9,567.57
3	Agriculture	0	24,090.91	18,527.27	38,571.43	6,000	20,291.89
	Total	45,000	67,424.24	40,193.94	43,371.43	6,000	201,989.61
	Average	11,250	5,618.69	3,349.49	6,195.92	3,000	5,459.18

Table 39. Horticulture species grown in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	4	1	4	0	1	1	0	0	9	2
2	Lemon	0	0	0	0	0	0	0	0	4	0	4	0
3	Mango	0	0	6	1	1	0	0	0	2	0	9	1

*F= Field B=Back Yard

Horticulture species grown: The data regarding horticulture species grown in Ashanal-3 micro-watershed is presented in Table 39. The results indicate that, sampled households

have grown 9 coconut, 4 lemon and 11 mango tree in their field and 2 coconut and 1 mango trees in backyard.

Forest species grown: The data regarding forest species grown in Ashanal-3 micro-watershed is presented in Table 40. The results indicate that, households have planted 26 teak, 63 neem, 7 tamarind and 1 banyan trees in their field and also 2 teak and 3 neem trees in their backyard.

Table 40: Forest species grown in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Teak	3	0	8	0	9	1	0	0	6	1	26	2
2	Neem	0	0	27	1	19	2	14	0	3	0	63	3
3	Tamarind	0	0	5	0	1	0	1	0	0	0	7	0
4	Banyan	0	0	1	0	0	0	0	0	0	0	1	0

*F= Field B=Back Yard

Average Additional investment capacity: The data regarding average additional investment capacity in Ashanal-3 micro-watershed is presented in Table 41. The results indicated that, households have an average investment capacity of Rs. 3,810.81 for land development and households have an average investment capacity of Rs. 405.41for improved livestock management, households have an average investment capacity of Rs.54.05 for orchard development/maintenance and households have an average investment capacity of Rs. 135.14 for Subsidiary enterprises.

Table 41: Source of funds for additional investment capacity in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL(4)	MF (12)	SF (12)	SMF (7)	MDF(2)	All (37)
1	Land development	0	5,083.33	2,500	7,142.86	0	3,810.81
2	Improved livestock management	0	0	833.33	714.29	0	405.41
3	Orchard development/ maintenance	0	166.67	0	0	0	54.05
4	Subsidiary enterprises	0	0	416.67	0	0	135.14

Table 42: Source of funds for additional investment capacity in Ashanal-3 micro watershed

Sl.No	Item	Land development		Improved livestock management		Orchard development/ maintenance		Subsidiary enterprises	
		N	%	N	%	N	%	N	%
1	Loan from bank	13	35.14	3	8.11	1	2.7	0	0.0
2	Own funds	1	2.7	0	0.0	0	0.0	1	2.7
3	Soft loan	1	2.7	0	0.0	0	0.0	0	0.0

Source of additional investment: The data regarding source of funds for additional investment in Ashanal-3 micro-watershed is presented in Table 42. The results indicated that loan from bank was the source of additional investment for 35.14 per cent for land

development, 8.11 per cent for improved livestock management and 2.7 per cent for orchard development/maintenance. Own funds was the source of additional investment for 2.7 per cent for land development and subsidiary enterprises. Soft loan was the source of additional investment for 2.7 per cent for land development.

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Ashanal-3 micro-watershed is presented in Table 43. The results indicated that, cotton was sold to the extent of 100 per cent, green gram was sold to the extent of 91.3 per cent, groundnut was sold to the extent of 83.49 per cent, paddy was sold to the extent of 65.71 per cent, Red gram was sold to the extent of 86.76 per cent and sorghum to the extent of 92.73 per cent.

Table 43. Marketing of the agricultural produce in Ashanal-3 micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Cotton	159.0	0.0	159.0	100.0	5636.36
2	Greengram	23.0	2.0	21.0	91.3	5050.0
3	Groundnut	109.0	18.0	91.0	83.49	4714.29
4	Paddy	210.0	72.0	138.0	65.71	1600.0
5	Redgram	136.0	18.0	118.0	86.76	4666.67
6	Sorghum	165.0	12.0	153.0	92.73	2000.0

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Ashanal-3 micro-watershed is presented in Table 44. The results indicated that, about 72.97 per cent of the farmers sold their produce to local/village merchant, 13.51 per cent of the farmers sold their produce to regulated markets and 2.70 per cent of the farmers sold their produce to contract marketing arrangement.

Table 44. Marketing Channels used for sale of agricultural produce in Ashanal-3 micro-watershed

Sl. No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0	11	91.67	7	58.33	7	100	2	100	27	72.97
2	Regulated Market	0	0	1	8.33	4	33.33	0	0	0	0	5	13.51
3	Contract marketing arrangement	0	0	0	0	1	8.33	0	0	0	0	1	2.70

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Ashanal-3 micro-watershed is presented in Table 45. The results indicated that, 89.19 per cent of the households have used tractor as a mode of transportation.

Table 45. Mode of transport of agricultural produce in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Tractor	0	0	12	100	12	100	7	100	2	100	33	89.19

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Ashanal-3 micro-watershed is presented in Table 46. The results indicated that, 83.78 per cent of the households have experienced soil and water erosion problems in the farm.

Table 46. Incidence of soil and water erosion problems in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	12	100	11	91.67	6	85.71	2	100	31	83.78

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Ashanal-3 micro-watershed is presented in Table 47. The results indicated that, 83.78 per cent have shown interest in soil test.

Table 47. Interest shown towards soil testing in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	11	91.67	11	91.67	7	100	2	100	31	83.78

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Ashanal-3 micro-watershed is presented in Table 48. The results indicated that, 8.11 per cent of the households used LPG and 94.59 per cent of the households used firewood as a source of fuel.

Table 48. Usage pattern of fuel for domestic use in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	LPG	0	0	0	0	1	8.33	1	14.29	1	50	3	8.11
2	Fire Wood	4	100	12	100	12	100	6	85.71	1	50	35	94.59

Source of drinking water: The data regarding source of drinking water in Ashanal-3 micro-watershed is presented in Table 49. The results indicated that, piped supply was the major source of drinking water for 91.89 per cent of the households in the micro watershed and bore well was the source of drinking water for 8.11 per cent of the households in the micro watershed.

Table 49. Source of drinking water in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	2	50	12	100	12	100	6	85.71	2	100	34	91.89
2	Bore Well	2	50	0	0	0	0	1	14.29	0	0	3	8.11

Source of light: The data regarding source of light in Ashanal-3 micro-watershed is presented in Table 50. The results indicated that, Electricity was the major source of light for 100 per cent of the households in micro watershed.

Table 50. Source of light in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	4	100	12	100	12	100	7	100	2	100	37	100

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facility in Ashanal-3 micro-watershed is presented in Table 51. The results indicated that, 45.95 per cent of the households possess sanitary toilet facility.

Table 51. Existence of Sanitary toilet facility in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	3	75	6	50	4	33.33	2	28.57	2	100	17	45.95

Possession of PDS card: The data regarding possession of PDS card in Ashanal-3 micro-watershed is presented in Table 52. The results indicated that, 100 per cent of the sampled households possessed BPL cards.

Table 52. Possession of PDS card in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	4	100	12	100	12	100	7	100	2	100	37	100

Participation in NREGA program: The data regarding participation in NREGA programme in Ashanal-3 micro-watershed is presented in Table 53 The results indicated that, 75.68 per cent of the households participated in NREGA programme.

Table 53. Participation in NREGA programme in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	2	50	10	83.33	10	83.33	5	71.43	1	50	28	75.68

Adequacy of food items: The data regarding adequacy of food items in Ashanal-3 micro-watershed is presented in Table 54. The results indicated that, cereals, pulses and oilseed were adequate for 100 per cent of the households, vegetables were adequate for 78.38 per cent, fruits were adequate for 8.11 per cent, milk were adequate for 86.49 per cent and Egg were adequate for 10.81 per cent.

Table 54. Adequacy of food items in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	4	100	12	100	12	100	7	100	2	100	37	100
2	Pulses	4	100	12	100	12	100	7	100	2	100	37	100
3	Oilseed	4	100	12	100	12	100	7	100	2	100	37	100
4	Vegetables	3	75	9	75	8	66.67	7	100	2	100	29	78.38
5	Fruits	0	0	1	8.33	1	8.33	1	14.29	0	0	3	8.11
6	Milk	4	100	10	83.33	10	83.33	6	85.71	2	100	32	86.49
7	Egg	0	0	1	8.33	2	16.67	1	14.29	0	0	4	10.81

Response on Inadequacy of food items: The data regarding inadequacy of food items in Ashanal-3 micro-watershed is presented in Table 55. The results indicated that, vegetables were inadequate for 5.71 per cent of the households, fruits were inadequate for 89.19 per cent, milk were inadequate for 13.51 per cent, egg were inadequate for 86.49 per cent and meat were inadequate for 100 per cent of the households.

Table 55. Response on Inadequacy of food items in Ashanal-3 micro-watershed

Sl.No.	Particulars	LL (4)		MF (12)		SF (12)		SMF (7)		MDF (2)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Vegetables	1	25	3	25	4	33.33	0	0	0	0	8	21.62
2	Fruits	4	100	10	83.33	11	91.67	6	85.71	2	100	33	89.19
3	Milk	0	0	2	16.67	2	16.67	1	14.29	0	0	5	13.51
4	Egg	3	75	11	91.67	10	83.33	6	85.71	2	100	32	86.49
5	Meat	4	100	12	100	12	100	7	100	2	100	37	100

Farming constraints: The data regarding farming constraints experienced by households in Ashanal-3 micro-watershed is presented in Table 56. The results indicated that, lower fertility status of the soil, wild animal menace on farm field and frequent incidence of pest and diseases was the constraint experienced by 89.19 per cent of the households, Inadequacy of irrigation water (16.22%), high cost of fertilizer and plant protection chemicals (86.49%), high rate of interest on credit (70.27%), low price for the agricultural commodities and lack of marketing facilities in the area (83.78%), inadequacy extension service and source of Agri-technology information (8.11%) and Lack of transport for safe transport of the Agril produce to the market (81.08%), less rainfall (13.51%)

Table 56. Farming constraints Experienced in Ashanal-3 micro-watershed

Sl.No.	Particulars	MF (12)		SF (12)		SMF (7)		MDF(2)		All (37)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	12	100	12	100	7	100	2	100	33	89.19
2	Wild animal menace on farm field	12	100	12	100	7	100	2	100	33	89.19
3	Frequent incidence of pest and diseases	12	100	11	91.67	7	100	2	100	32	86.49
4	Inadequacy of irrigation water	1	8.33	3	25	2	28.57	0	0	6	16.22
5	High cost of Fertilizers and plant protection chemicals	12	100	12	100	6	85.71	2	100	32	86.49
6	High rate of interest on credit	11	91.67	8	66.67	5	71.43	2	100	26	70.27
7	Low price for the agricultural commodities	11	91.67	11	91.67	7	100	2	100	31	83.78
8	Lack of marketing facilities in the area	11	91.67	10	83.33	8	114.29	2	100	31	83.78
9	Inadequate extension services	2	16.67	1	8.33	0	0	0	0	3	8.11
10	Lack of transport for safe transport of the Agril produce to the market.	11	91.67	11	91.67	6	85.71	2	100	30	81.08
11	Less rainfall	2	16.67	3	25	0	0	0	0	5	13.51
12	Source of Agri-technology information	0	0	1	8.33	2	28.57	0	0	3	8.11

SUMMARY

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 37 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 84 (60.43%) men and 55 (39.57%) women among the sampled households. The average family size of landless farmers' was 3.5, marginal farmers' was 4.4, small farmers' was 3.5, semi medium farmers' was 3.1 and medium farmers' was 4. The data indicated that, 14 (10.07 %) people were in 0-15 years of age, 54 (38.85%) were in 16-35 years of age, 60 (43.17%) were in 36-60 years of age and 11 (7.91%) were above 61 years of age.

The results indicated that Ashanal-3 had 68.35 per cent illiterates, 0.72 per cent of them had functional literate, 10.79 per cent of them had primary school, 2.16 per cent of them had middle school, 9.35 per cent of them had high school education, 4.32 per cent of them had PUC and 2.88 per cent of them had degree education.

The results indicate that, 59.46 per cent of household heads were practicing agriculture, 29.73 per cent of the household heads were agricultural laborers and 5.41 cent of the household heads were General Labour and housewives. The results indicate that agriculture was the major occupation for 56.83 per cent of the household members, 14.39 per cent were agricultural laborers, 2.16 per cent were in general labour, 0.72 per cent were private service, 12.23 per cent were students and housewives, 1.44 per cent were children.

The results show that, 0.72 per cent of the population in the micro watershed has participated in Raitha Sangha and 99.28 per cent of the population in the micro watershed has not participated in any local institutions.The results indicate that 2.70 per cent of the households possess thatched and pucca/RCC house and 94.59 per cent of the households possess katcha house.

The results show that 81.08 per cent of the households possess TV, 56.76 per cent of the households possess mixer/grinder, 21.62 per cent of the households possess motor cycle and 97.3 per cent of the households possess mobile phones. The results show that the average value of television was Rs. 6,666, mixer/grinder was Rs. 1,938, motor cycle was Rs. 43,375 and mobile phone was Rs. 1,467.

About 13.51 per cent each of the households possess bullock cart and sprayer, 10.81 per cent each of the households possess Plough, 2.7 per cent each of the households possess Sprinkler, 27.03 per cent each of the households possess weeder, 24.32 per cent each of the households possess harvester and 5.41 per cent each of the households possess chaff cutter. The results show that the average value of bullock cart was Rs. 20,800, plough was Rs. 1,400, sprayer was Rs.4,400, sprinkler was Rs. 200, weeder was Rs. 462, Harvester was Rs. 254, and the average value of chaff cutter was Rs. 150.

The results indicate that, 32.43 per cent of the households possess bullocks, 8.11 per cent of the households possess local cow and Buffalo and 2.70 per cent of the households possess sheep and goat.

The results indicate that, average own labour men available in the micro watershed was 1.7, average own labour (women) available was 1.39, average hired labour (men) available was 6.21 and average hired labour (women) available was 6.09. The results indicate that, 89.19 per cent of the households opined that the hired labour was adequate.

The results indicate that, households of the Ashanal-3 micro-watershed possess 37.14 ha (80.62%) of dry land and 8.93 ha (19.38%) of irrigated land. Marginal farmers possess 9.25 ha (100 %) of dry land. Small farmers possess 14.47 ha (88.75%) of dry land and 1.83 ha (11.25%) of irrigated land. Semi medium farmers possess 9.22 ha (68.87%) of dry land and 4.16 ha (31.13%) of irrigated land. Medium farmers possess 4.21 ha (58.96%) and 2.93 ha (41.04%) of irrigated land.

The results indicate that, the average value of dry land was Rs. 542,280.46 and the average value of irrigated land was Rs. 503,853.13. In case of marginal famers, the average land value was Rs. 842,782.16 for dry land. In case of small famers, the average land value was Rs. 504,363.63 for dry land the average land value was Rs. 708,830.03 for irrigated land. In case of semi medium famers, the average land value was Rs. 412,209.06 for dry land and Rs. 600,097.18 for irrigated land. In case of medium farmers, the average land value was Rs. 296,875 for dry land and Rs. 238,812.16 for irrigated land.

The results indicate that, there were 6 functioning and 4 de-functioning bore wells in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 6.22 per cent of the farmers. The results indicate that, the depth of bore well was found to be 8.07 meters.

The results indicate that, marginal, small, semi medium and medium farmers had an irrigated area of 0.89 ha, 2.11 ha, 2.95 ha and 2.93 ha respectively. The results indicate that, farmers have grown cotton (10.51 ha), red gram (9.16 ha), groundnut (8.64 ha), green gram (6.38 ha), sorghum (2.02 ha) and paddy (3.44 ha). Marginal farmers have grown cotton, red gram, groundnut, green gram and sorghum. Small farmers have grown

cotton, red gram, groundnut, green gram, sorghum and paddy. Semi medium farmers have grown cotton, red gram, groundnut and paddy. Medium farmers have grown groundnut and green gram. The results indicate that, the cropping intensity in Ashanal-3 micro-watershed was found to be 97.17 per cent.

The results indicate that, 78.38 per cent of the households have bank account. The results indicate that, 78.38 per cent of the households have availed credit from different sources. The results indicate that, 6.90 per cent of the households have borrowed from grameena bank. The results indicate that, the average credit amount borrowed by households in micro-watershed was Rs, 6,206.90. The results indicate that, 100 per cent of the households borrowed from institutional sources for the purpose of agricultural production. The results indicated that 100 per cent of the households not repay their loan borrowed from institutional sources.

The results indicate that, the total cost of cultivation for Cotton was Rs. 33381.76. The gross income realized by the farmers was Rs. 81397.81. The net income from Cotton cultivation was Rs. 48016.05. Thus the benefit cost ratio was found to be 1:2.44. The total cost of cultivation for groundnut was Rs. 23752.68. The gross income realized by the farmers was Rs. 60035.34. The net income from groundnut cultivation was Rs. 36282.66. Thus the benefit cost ratio was found to be 1:2.53. The total cost of cultivation for Red gram was Rs. 16907.43. The gross income realized by the farmers was Rs. 46958.85. The net income from Red gram cultivation was Rs. 30051.42. Thus the benefit cost ratio was found to be 1:2.78. The total cost of cultivation for Sorghum was Rs. 28471.79. The gross income realized by the farmers was Rs. 84979.76. The net income from Sorghum cultivation was Rs. 56507.97. Thus the benefit cost ratio was found to be 1:2.98. The total cost of cultivation for Paddy was Rs. 31715.06. The gross income realized by the farmers was Rs. 110018.21. The net income from Paddy cultivation was Rs. 78303.15. Thus the benefit cost ratio was found to be 1:3.47. The total cost of cultivation for Green gram was Rs. 18827.26. The gross income realized by the farmers was Rs. 51709.54. The net income from Green gram cultivation was Rs. 32882.28. Thus the benefit cost ratio was found to be 1:2.75.

The results indicate that, 27.03 per cent of the households opined that dry fodder was adequate and 10.81 per cent of the households opined that green fodder was adequate.

The results indicate that the annual gross income was Rs. 75,000, for landless farmers, for marginal farmers it was Rs. 103,750, for small farmers it was Rs. 143,416.67, semi medium farmers it was Rs. 156,428.57 and medium farmers it was Rs. 181,250. The results indicate that the average annual expenditure is Rs. 5,459.18. For landless households it was Rs. 11,250, for marginal farmers it was Rs. 5,618.69, for small farmers

it was Rs. 3,349.49, for semi medium farmers it was Rs. 6,195.92 and medium farmers it was Rs. 3,000.

The results indicate that, sampled households have grown 9 coconut, 4 lemon and 11 mango tree in their field and 2 coconut and 1 mango trees in backyard. The results indicate that, households have planted 26 teak, 63 neem, 7 tamarind and 1 banyan trees in their field and also 2 teak and 3 neem trees in their backyard.

The results indicated that, households have an average investment capacity of Rs. 3,810.81 for land development and households have an average investment capacity of Rs. 405.41for improved livestock management, households have an average investment capacity of Rs.54.05 for orchard development/maintenance and households have an average investment capacity of Rs. 135.14 for Subsidiary enterprises. The results indicated that loan from bank was the source of additional investment for 35.14 per cent for land development, 8.11 per cent for improved livestock management and 2.7 per cent for orchard development/maintenance. Own funds was the source of additional investment for 2.7 per cent for land development and subsidiary enterprises. Soft loan was the source of additional investment for 2.7 per cent for land development.

The results indicated that, cotton was sold to the extent of 100 per cent, green gram was sold to the extent of 91.3 per cent, groundnut was sold to the extent of 83.49 per cent, paddy was sold to the extent of 65.71 per cent, Red gram was sold to the extent of 86.76 per cent and sorghum to the extent of 92.73 per cent.

The results indicated that, about 72.97 per cent of the farmers sold their produce to local/village merchant, 13.51 per cent of the farmers sold their produce to regulated markets and 2.70 per cent of the farmers sold their produce to contract marketing arrangement. The results indicated that, 89.19 per cent of the households have used tractor as a mode of transportation.

The results indicated that, 83.78 per cent of the households have experienced soil and water erosion problems in the farm. The results indicated that, 83.78 per cent have shown interest in soil test.

The results indicated that, 8.11 per cent of the households used LPG and 94.59 per cent of thr households used firewood as a source of fuel. The results indicated that, piped supply was the major source of drinking water for 91.89 per cent of the households in the micro watershed and bore well was the source of drinking water for 8.11 per cent of the households in the micro watershed.

Electricity was the major source of light for 100 per cent of the households in micro watershed. The results indicated that, 45.95 per cent of the households possess sanitary toilet facility. The results indicated that, 100 per cent of the sampled households

possessed BPL cards. The results indicated that, 75.68 per cent of the households participated in NREGA programme.

The results indicated that, cereals, pulses and oilseed were adequate for 100 per cent of the households, vegetables were adequate for 78.38 per cent, fruits were adequate for 8.11 per cent, milk were adequate for 86.49 per cent and Egg were adequate for 10.81 per cent.

The results indicated that, vegetables were inadequate for 5.71 per cent of the households, fruits were inadequate for 89.19 per cent, milk were inadequate for 13.51 per cent, egg were inadequate for 86.49 per cent and meat were inadequate for 100 per cent of the households.

The results indicated that, lower fertility status of the soil, wild animal menace on farm field and frequent incidence of pest and diseases was the constraint experienced by 89.19 per cent of the households, Inadequacy of irrigation water (16.22%), high cost of fertilizer and plant protection chemicals (86.49%), high rate of interest on credit (70.27%), low price for the agricultural commodities and lack of marketing facilities in the area (83.78%), inadequacy extension service and source of Agri-technology information (8.11%) and Lack of transport for safe transport of the Agril produce to the market (81.08%), less rainfall (13.51%)