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

WANKASAMBAR-3 (4D2D6M2a) MICROWATERSHED

Balichakra Hobli, Yadgir Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

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

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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 Wankasambar-3 Microwatershed, Yadgir Taluk & 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
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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Wankasambar-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 583ha 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 577 ha (98%) in the microwatershed is covered by soils and <1 ha by rock outcrops and 6 ha (1%) by others (habitation and water bodies). The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 12 soil series and 17 soil phases (management units) and 7 land use class.*
- *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 250 m grid interval.*
- *Land suitability for growing 26 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 86 per cent area of the microwatershed has soils that are moderately deep to very deep (75 - >150 cm) and 13 per cent soils are moderately shallow (50-75 cm).*
- *About 47 per cent area in the microwatershed has loamy soils, 40 per cent clayey soils and 13 per cent are sandy at the surface.*
- *Entire area of the microwatershed is non gravelly (<15%) at the surface.*
- *About 3 per cent area of the microwatershed is very low (<50 mm/m) in available water capacity, 23 per cent low (51-100 mm/m), 43 per cent medium (101-150 mm/m) and 29 per cent area is very high (>200 mm/m) in available water capacity.*
- *Entire area in the microwatershed has very gently sloping (1-3% slope) lands.*

- *An area of about 1 per cent are slightly (e1) eroded, 91 per cent are moderately (e2) eroded and 7 per cent area severely (e3) eroded.*
- *An area of about 1 per cent soils are moderately acid (pH 5.5-6.0), 10 per cent soils are slightly acid (pH 6.0-6.5), 26 per cent soils are neutral (pH 6.5-7.3), 20 per cent soils are slightly alkaline (pH 7.3-7.8), 23 per cent soils are moderately alkaline (pH 7.8 - 8.4), 17 per cent soils are strongly alkaline (pH 8.4-9.0) and 2 per cent soils are very strongly alkaline.*
- *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 6 per cent of soils are low (<0.5%), 54 per cent of soils are medium (0.5-0.75%) and 40 per cent of soils are high (>0.75%) in organic carbon.*
- *About34 per cent area is low (<23 kg/ha), 46 per cent area is medium (23-57 kg/ha) and 19 per cent area is high (>57 kg/ha) in available phosphorus.*
- *About 24 per cent is low (<145 kg/ha) and 75 per cent medium (145-337 kg/ha) in available potassium.*
- *Available sulphur is low (<10 ppm) in an area of about 45 per cent, 47 per cent of the soils are medium (10 -20 ppm) and high (>20 ppm) in 7 per cent area of the microwatershed.*
- *Available boron is low (<0.5 ppm) in an area of about 22 per cent, medium (0.5-1.0 ppm) in an area of 54 per cent and high (>1.0 ppm) in 23 per cent area of the microwatershed.*
- *Available iron is sufficient (>4.5 ppm) in all the soils of the microwatershed.*
- *Available manganese and copper are sufficient in all the soils of the microwatershed.*
- *Available zinc is deficient (<0.6 ppm) in the entire area of the microwatershed.*
- *The land suitability for 26 major agricultural and horticultural 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	*97(17)*	*432(75)*		*Sapota*	*-*	*114(20)*
Maize	*97(17)*	*55(9)*		*Pomegranate*	*-*	*491(85)*
Bajra	*97(17)*	*461(79)*		*Musambi*	*-*	*491(85)*
Groundnut	*-*	*169(29)*		*Lime*	*-*	*491(85)*
Sunflower	*-*	*474(82)*		*Amla*	*97(17)*	*432(74)*
Redgram	*-*	*491(84)*		*Cashew*	*-*	*65(11)*
Bengal gram	*38 (7)*	*491(84)*		*Jackfruit*	*-*	*97(17)*
Cotton	*6(1)*	*523(90)*		*Jamun*	*-*	*187(32)*
Chilli	*-*	*546(94)*		*Custard apple*	*97(17)*	*432(74)*
Tomato	*97(17)*	*72(12)*		*Tamarind*	*-*	*187(32)*
Drumstick	*-*	*491(85)*		*Mulberry*	*-*	*97(17)*
Mango	*-*	*-*		*Marigold*	*-*	*546(94)*
Guava	*-*	*114(20)*		*Chrysanthemum*	*-*	*546(94)*

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

Chapter 1

INTRODUCTION

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 Wankasambar-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.

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Wankasambar-3 microwatershed is located in the southern part of Karnataka in Yadgir Taluk &District, Karnataka State (Fig.2.1). It lies between 16° 37’ and 16° 39’ North latitudes and 77° 20’ and 77° 22’East longitudes covering an area of about 583ha.It is about 45 km south of Yadgir town. It comprises and surrounded by Madhwara villages on the north and west, Vankasambara and Thoranathippa villages on the east and sambara village on the southern side.

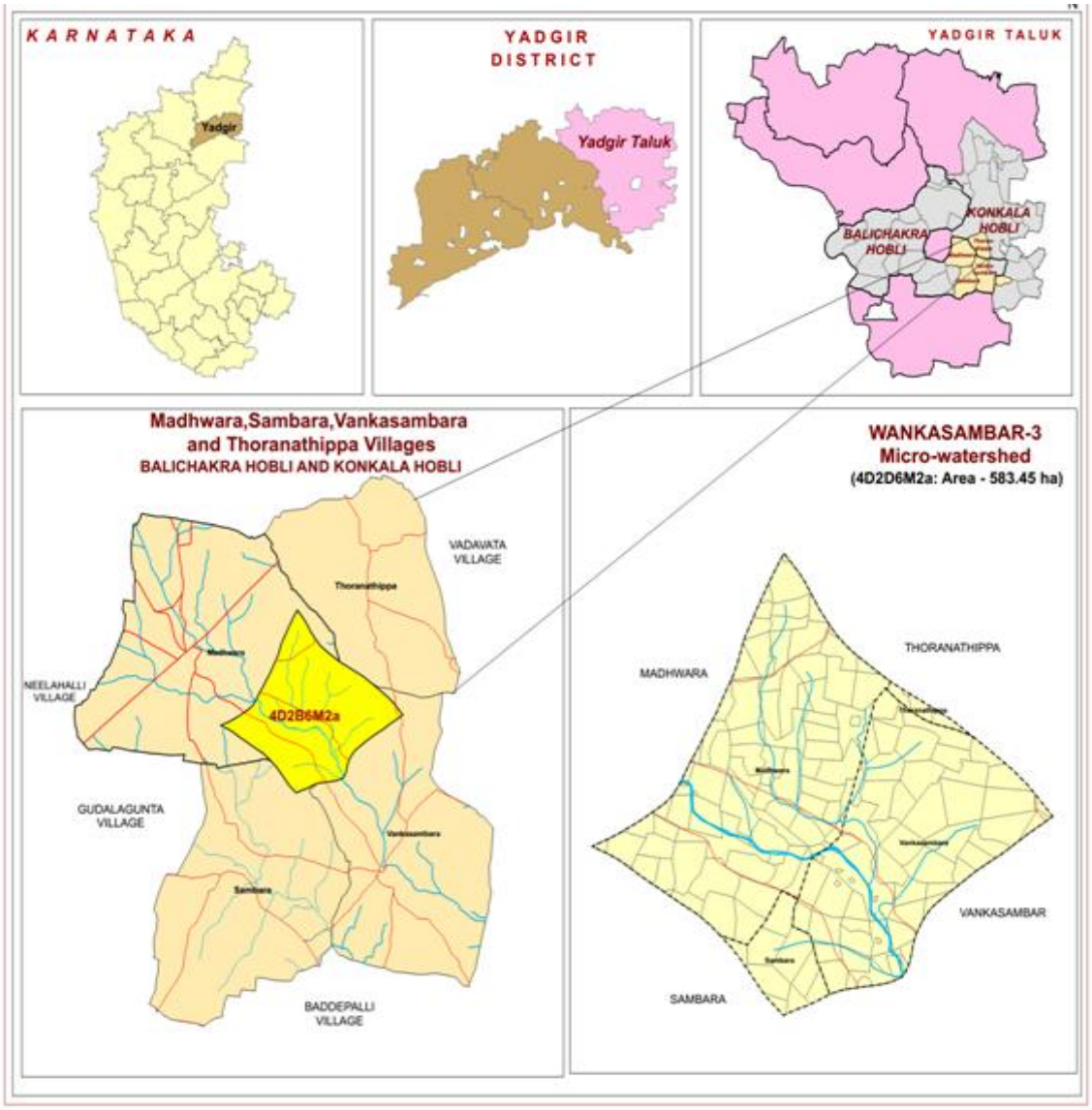


Fig.2.1 Location map of Wankasambar-3 Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are granite gneiss and alluvium(Figs.2.2aandb). Granite gneisses are essentially pink to gray and are coarse to medium grained. They consist primarily of quartz, feldspar, biotite and hornblende. The gray granite gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in Wankasambar-3microwatershed. The most widespread and characteristic development of alluvium in the watershed region lying between the rivers Krishna and Bhima is a wide belt, the underlying formation is gneiss and alluvial soils occur over gneiss, limestone and shale. The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2a Granite and granite gneiss rocks

Fig. 2.2b Alluvium

2.3 Physiography

Physiographically, the area has been identified as granite gneiss and alluvial landscapes 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 394-402 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 866mm (Table 2.1). Of the total rainfall, maximum of 652 mm is received during the south–west monsoon period from June to September, the north-east monsoon from October to early December contributes about 138 mm and the remaining 76 mm during the rest of the year. The summer season starts during the middle of February and continues up to the first week of June. The period from December to the middle of February is the coldest season. December is the coldest month with mean daily maximum and minimum temperatures being 29.5^0C and 10^0C respectively. During peak summer, temperature shoots up to 45^0C. Relative humidity varies from 26% in summer to 62% in winter. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo-Transpiration (PET) is 141 mm and varies from a low of 81 mm in December to 199 mm in the month of May. The PET is always higher than precipitation in all the months except July, August and September. Generally, the Length of crop Growing Period (LGP) is 120-150 days and starts from 1^{st} week of June to 4^{th}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**		

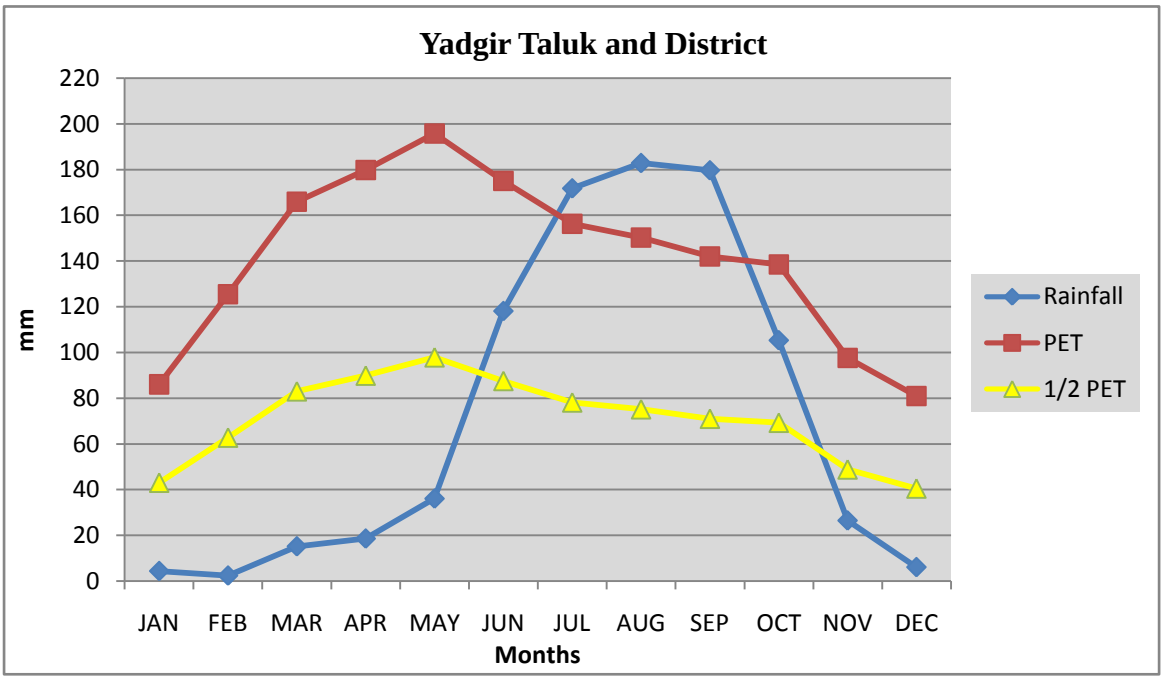


Fig 2.3 Rainfall distribution in Yadgir Taluk, Yadgir District

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.

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.

2.7 Land Utilization

About 72 per cent area (Table 2.2) in Yadgir district is cultivated at present. An area of about 2 per cent is permanently under pasture, 20 per cent under current fallows and 6 per cent under non-agricultural land, and 5 per cent under currently barren. Forests occupy an area of about 7 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, cotton, sunflower, groundnut, red gram, mango, pomegranate, marigold and sapota. The cropping intensity is 120 per cent in the taluk. 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 Wankasambar-3microwatershed is presented in Fig.2.4. The different crops and cropping systems adopted in the microwatershed is presented in Figures 2.5a & b. Simultaneously, enumeration of existing wells (bore wells and open wells) and conservation structures is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells in Wankasambar-3 microwatershed is presented in Fig.2.6.

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

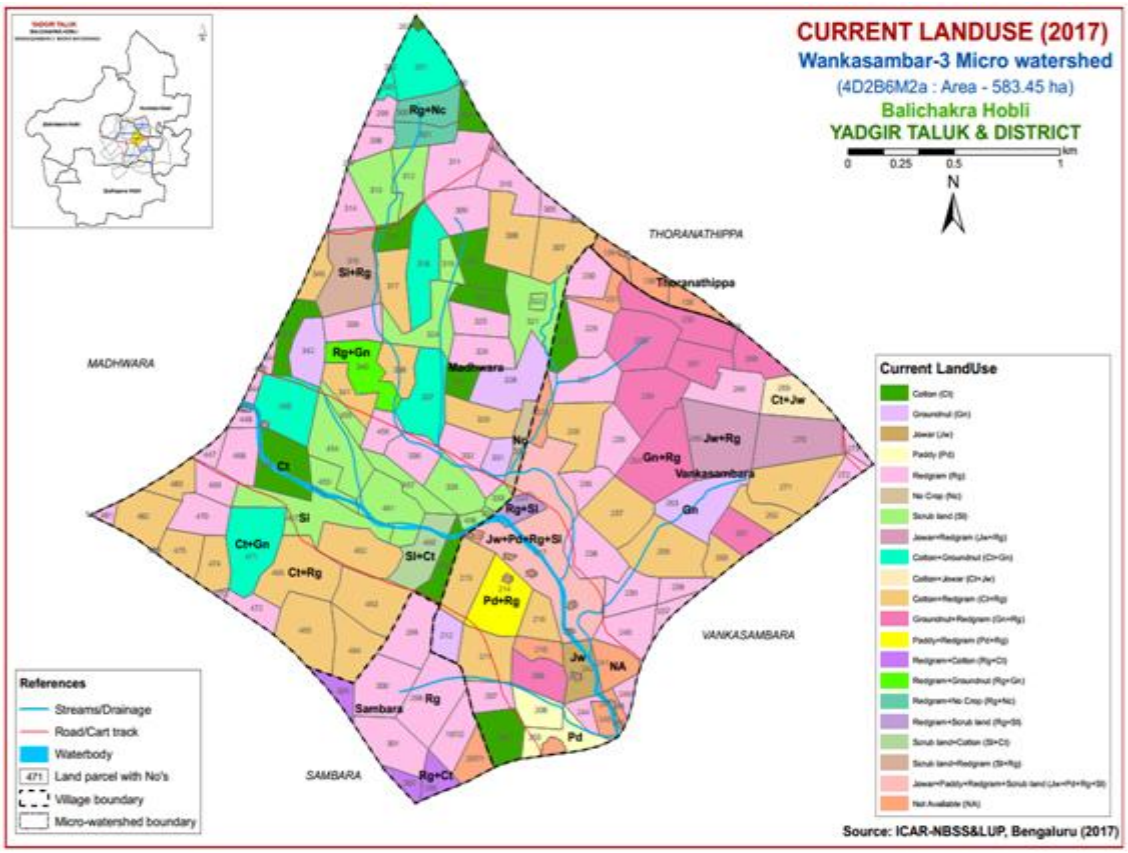


Fig.2.4 Current Land Use map of Wankasambar-3 Microwatershed

Fig 2.5 a. Different Crops and Cropping Systems in Wankasambar-3 Microwatershed

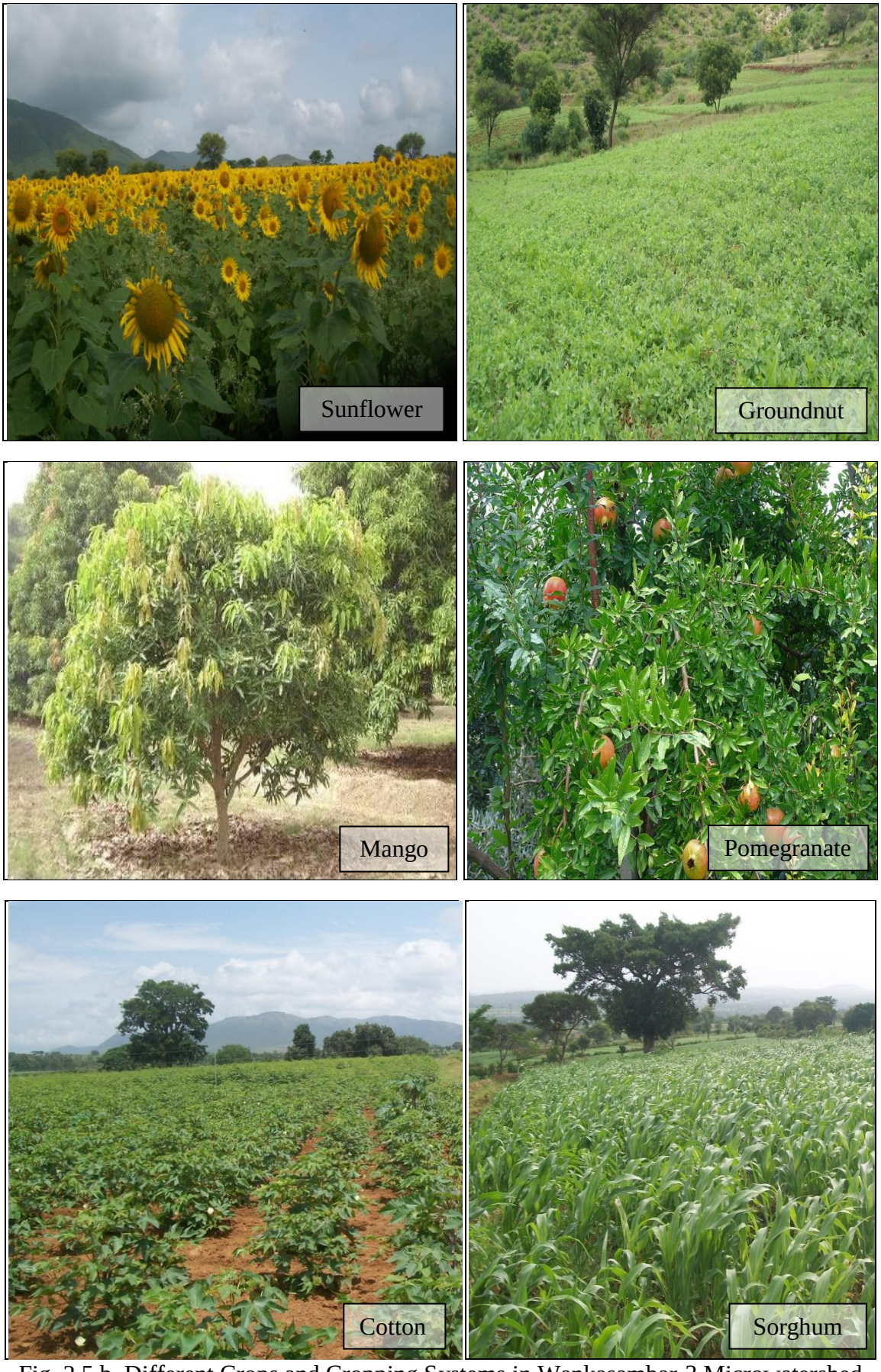


Fig. 2.5 b. Different Crops and Cropping Systems in Wankasambar-3 Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly for a given level of management. This was achieved in Wankasambar-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 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 583 ha. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

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

3.2 Image Interpretation for Physiography

False Colour Composites (FCCs) of Cartosat-I and LISS-IV merged satellite data covering microwatershed area was visually interpreted using image interpretation elements and all the available collateral data with local knowledge. The delineated physiographic boundaries were transferred on to a cadastral map overlaid on satellite imagery. Physiographically, the area has been identified as granite gneiss and alluvial landscapes. They were 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)
G3			**Valleys/ lowlands**
	G31		Valleys, pink tones
	G32		Valleys gray mixed with pink tones

DSe – Alluvial Landscape

DSe1 – Summit

DSe11 –

DSe12 –

DSe2 – Very genetly sloping

DSe21 – Very gently sloping, dark gray tone

DSe22 – Very gently sloping, medium gray tone

DSe23 – Very gently sloping, yellowish grey tone

DSe24 – Very gently sloping, whitish grey tone

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

DSe 26- Very gently sloping, medium pink

DSe3 – Valley/ Lowland

DSe31 – Whitish gray/Calcareous

DSe32 – Gray with pink patches

DSe 33 – Medium gray tone

DSe 34 – Lightish gray tone

DSe 35 – Dark gray tone

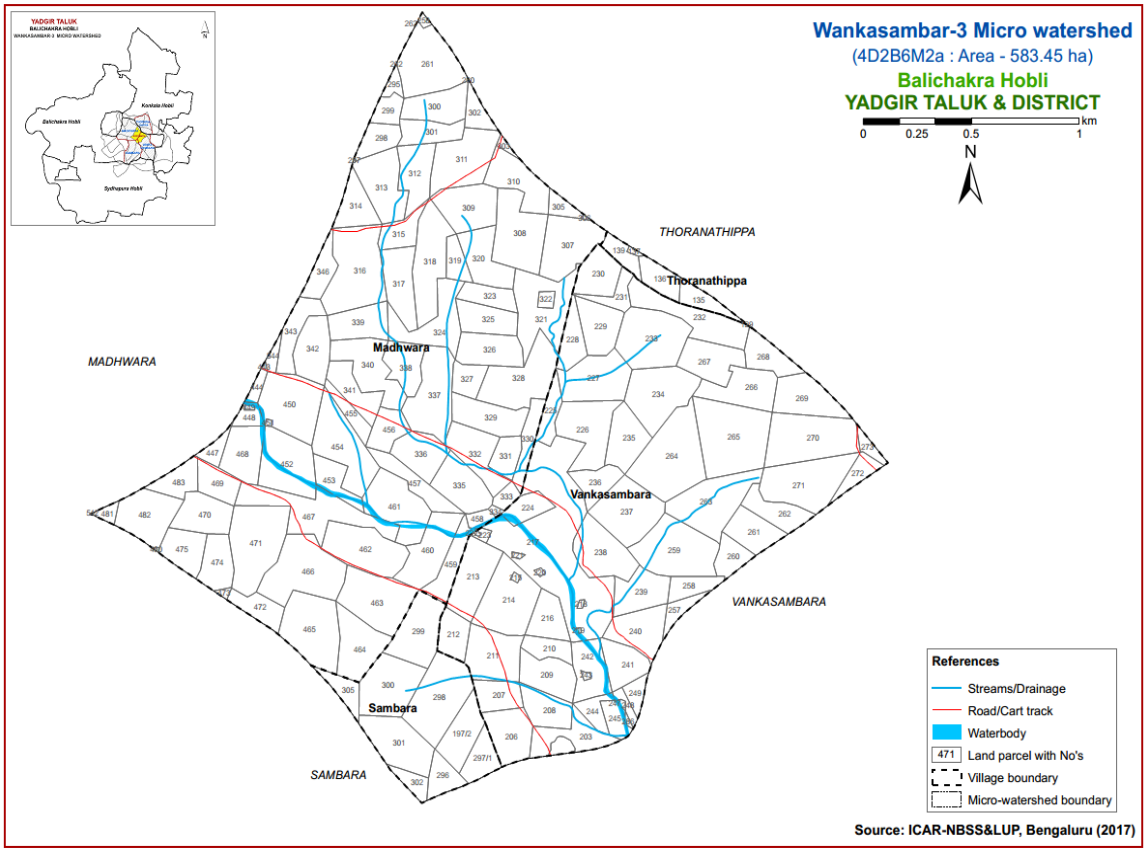


Fig 3.1 Scanned and Digitized Cadastral map of Wankasambar-3 Microwatershed

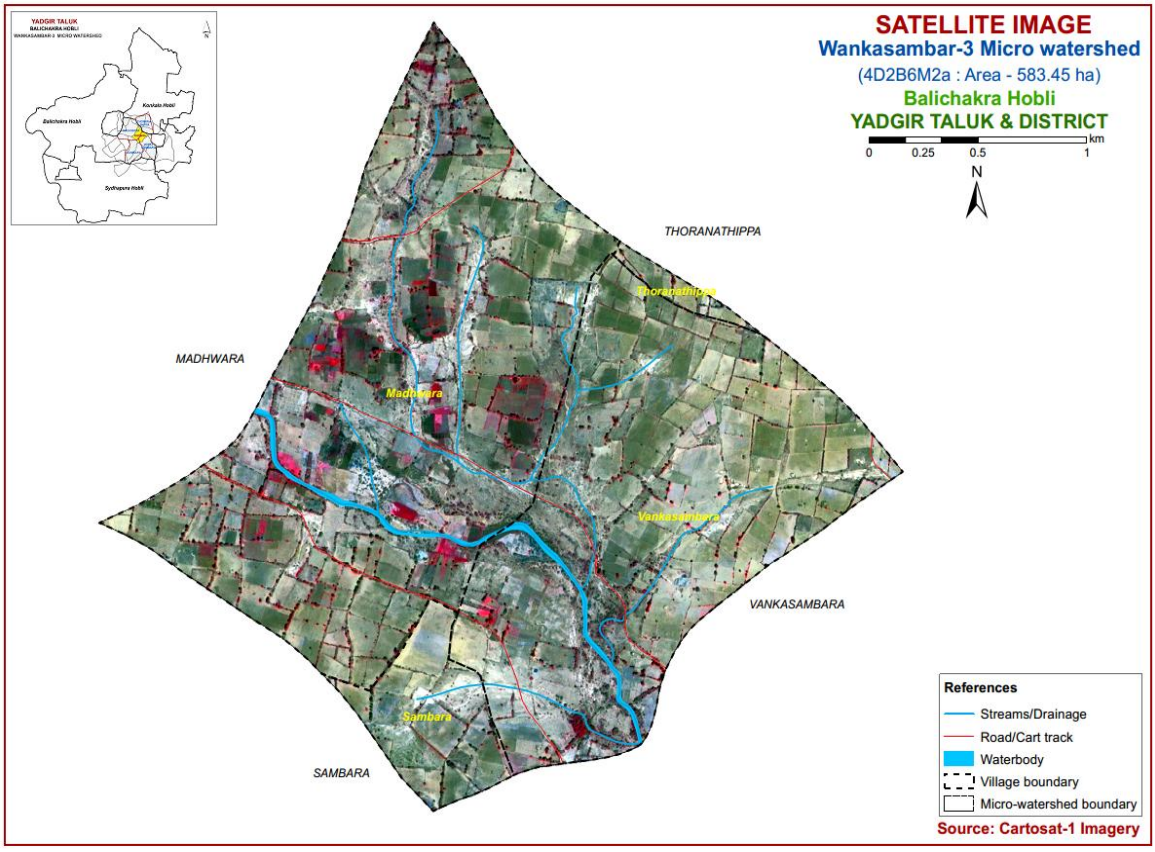


Fig.3.2 Satellite Image of Wankasambar-3 Microwatershed

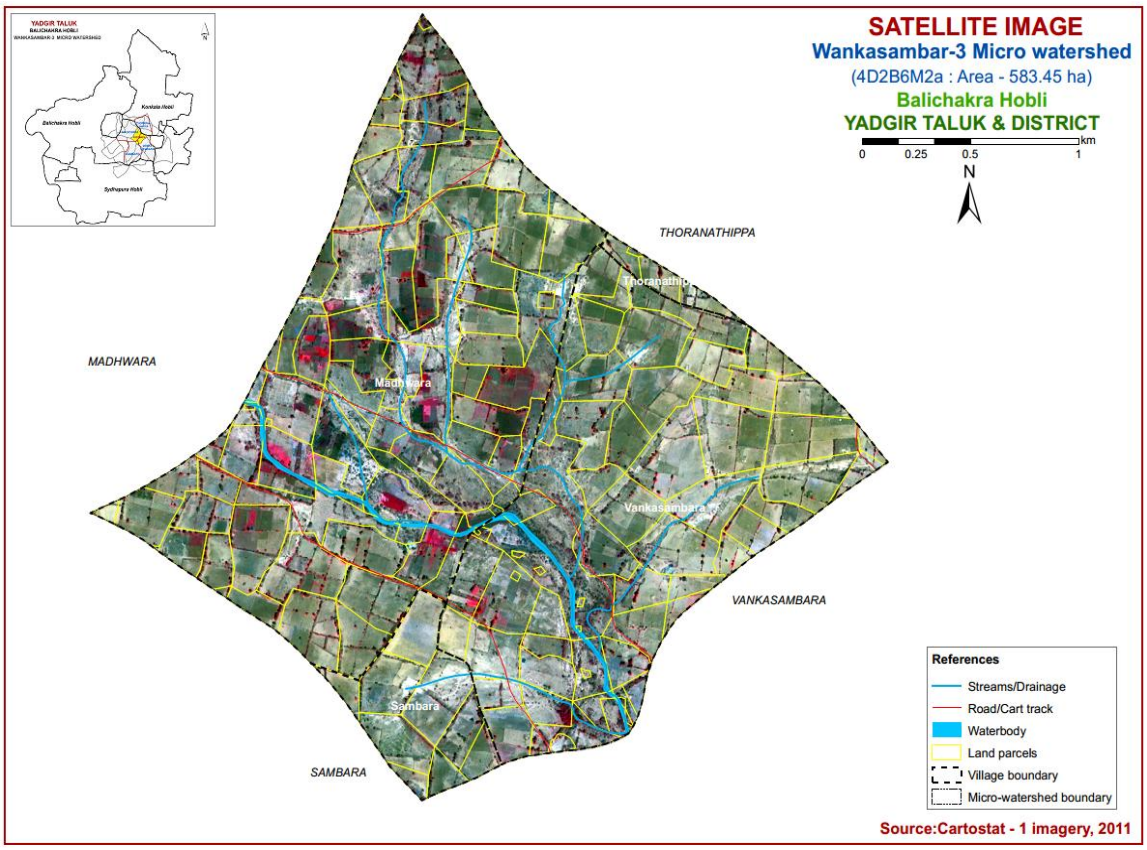


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Wankasambar-3 Microwatershed

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).

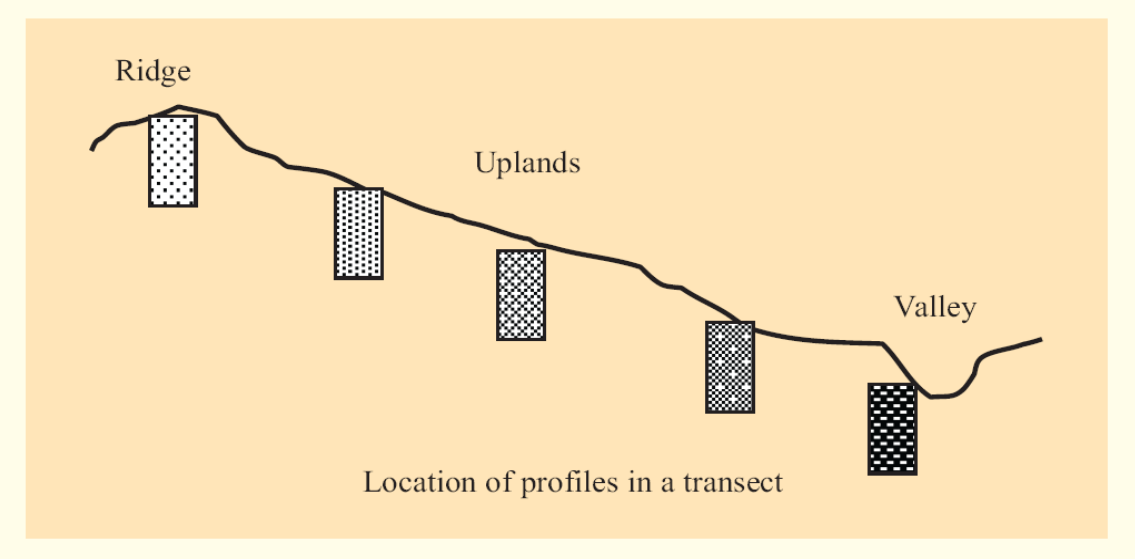


Fig: 3.4. Location of profiles in a transect

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

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, calcareousness, amount and nature of gravel present, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 12soil series were identified in the Wankasambar-3microwatershed.

Table 3.1 Differentiating Characteristics used for identifying Soil Series

(Characteristics are of Series Control Section)

Sl. no.	Soil Series	Depth (cm)	Colour (moist)	Texture	Gravel (%)	Horizon sequence	Calcareous-ness
Soils of Granite Gneiss Landscape							
1	SBR (Sambara)	50-75	10 YR 7/1 7.5 YR 7/4	ls	-	Ap-Ac	-
2	HLG (Halagera)	50-75	10 YR 3/2, 4/4 7.5 YR 4/3, 4/2	scl	-	Ap-Bw	es
3	YLR (Yalleri)	50-75	2.5 YR 3/4, 4/4 5 YR 3/4 7.5 YR 4/4	c	15-35	Ap-Bt	-
4	GWD (Gowdagera)	75-100	10 YR 3/1, 3/2, 4/2	scl	-	Ap-Bw	es
5	PGP (Poglapur)	100-150	5 YR 4/6, 3/3 7.5 YR 4/4	sc	-	Ap-Bt	-
6	YDR (Yadgir)	100-150	10 YR 4/3, 4/4 2.5 YR 4/3,5/3	sl	-	Ap-Ac	-
7	BGD (Belagundi)	100-150	10 YR 5/4, 4/4 7.5 YR 4/4	c	-	Ap-Bw	-
8	ANR (Anur)	100-150	10 YR 4/3,4/1	c	-	Ap-Bw	es
9	MDR (Madhwara)	>150	10 YR 3/1,3/2,2/1,2/2	scl	-	Ap-Bw	e
10	SHT (Shettalli)	75-100	10YR3/1	scl	15-35	Ap-Bw	e
11	NHL (Neelahalli)	100-150	10 YR 5/3, 4/2,	sl	-	Ap-Bw	-
Soils of Alluvial Landscape							
12	KDR (Kudlura)	100-150	10 YR 3/1,3/2,4/1,5/2	c	-	Ap-Bw	es

3.4 Soil Mapping

The area under each soil series was further separated into soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management. The soil mapping units are shown on the map (Fig.3.5) in the form of symbols. During the 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 17soil mapping units representing 12 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 soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar

soil and site characteristics. In other words, all the farms or survey numbers included in one soil phase will have similar management needs and have to be treated accordingly.

3.5 Land Management Units (LMU's)

The 17 soil phases identified and mapped in the microwatershed were grouped into 7 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been choosen for identification and delineation of LMUs. For Wankasambar-3microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope, erosion and gravel content have been considered for defining LMUs. The Land Management Units are expected to behave similarly for a given level of management.

3.6 Laboratory Characterization

Soil samples for each soil series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected from farmer's fields (54 samples) for fertility status (major and micronutrients) at 250 m grid interval in the year 2017 were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Wankasambar-3 Microwatershed

Soil No*	Soil Series	Soil Phase	Mapping Unit Description	Area in Ha (%)
Soils of Granite and Granite Gneiss Landscape				
	SBR	Sambara soils are moderately shallow (50-75 cm), well drained, have light gray to pink, loamy sand soils occurring on very gently to gently sloping uplands under cultivation		**20 (3.36)**
11		SBRcB2	Sandy loam surface, slope 1-3%, moderate erosion	20(3.36)
	HLG	Halagera soils are moderately shallow (50-75 cm), moderately well drained, have dark brown to dark yellowish brown and dark grayish brown, calcareous sandy clay loam black soils occurring on very gently sloping uplands under cultivation		**23.3 (4.05)**
16		HLGcB2	Sandy loam surface, slope 1-3%, moderate erosion	0.3(0.06)
17		HLGiB2	Sandy clay surface, slope 1-3%, moderate erosion	23(3.99)
	YLR	Yalleri soils are moderately shallow (50-75 cm), well drained, have brown to reddish brown and dark reddish brown, gravelly red soils occurring on very gently to gently sloping uplands under cultivation		**31 (5.39)**
27		YLRbB2	Loamy sand surface, slope 1-3%, moderate erosion	23(4.02)

28		YLRbB3	Loamy sand surface, slope 1-3%, severe erosion	7(1.18)
31		YLRiB2	Sandy clay surface, slope 1-3%, moderate erosion	1(0.19)
	GWD	Gowdagera soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown, calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation		**207 (35.49)**
34		GWDcB2	Sandy loam surface, slope 1-3%, moderate erosion	82(14.04)
35		GWDiB2	Sandy clay surface, slope 1-3%, moderate erosion	125(21.45)
	PGP	Poglapur soils are moderately deep (75-100 cm), well drained, have brown to dark reddish brown and yellowish red, sandy clay red soils occurring on very gently sloping uplands under cultivation		**64 (11.08)**
40		PGPcB2	Sandy loam surface, slope 1-3%, moderate erosion	22(3.8)
41		PGPiB2	Sandy clay surface, slope 1-3%, moderate erosion	42(7.28)
	YDR	Yadgir soils are deep (100-150 cm), well drained, have brown to dark yellowish brown and olive brown, sandy loam soils occurring on very gently sloping uplands under cultivation		**17 (2.97)**
42		YDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	17(2.97)
	BGD	Belagundi soils are deep (100-150 cm), well drained, have brown to dark yellowish brown, clayey soils occurring on very gently sloping uplands under cultivation		**12 (1.99)**
50		BGDbB2	Loamy sand surface, slope 1-3%, moderate erosion	12(1.99)
	ANR	Anur soils are deep (100-150 cm), moderately well drained, have dark gray to brown, calcareous clay soils occurring on very gently sloping uplands under cultivation		**31 (5.35)**
52		ANRbB3	Loamy sand surface, slope 1-3%, severe erosion	31(5.35)
	MDR	Madhwara soils are very deep (>150 cm), moderately well drained, have very dark gray to very dark brown, slightly calcareous sandy clay loam soils occurring on nearly level to very gently sloping uplands under cultivation		**64 (11.04)**
59		MDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	64(11.04)
	SHT	Shettalli soils are moderately deep (75-100 cm), moderately well drained, have very dark gray, slightly calcareous gravelly sandy clay loam soils occurring on very gently sloping uplands under cultivation		**32 (5.5)**
112		SHTmB2	Clay surface, slope 1-3%, moderate erosion	32(5.5)
	NHL	Neelahalli soils are deep (100-150 cm), moderately well drained, have brown to dark grayish brown, sandy loam black soils occurring on very gently sloping lowlands under cultivation		**6 (1.08)**
101		NHLmB1	Clay surface, slope 1-3%, slight erosion	6(1.08)
Soil of Alluvial Landscape				
	KDR	Kudlura soils are deep (100-150 cm), moderately well drained, have dark gray to very dark grayish brown, calcareous clay alluvial soils occurring on nearly level to very gently sloping uplands under cultivation		**68 (11.66)**
84		KDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	68 (11.66)

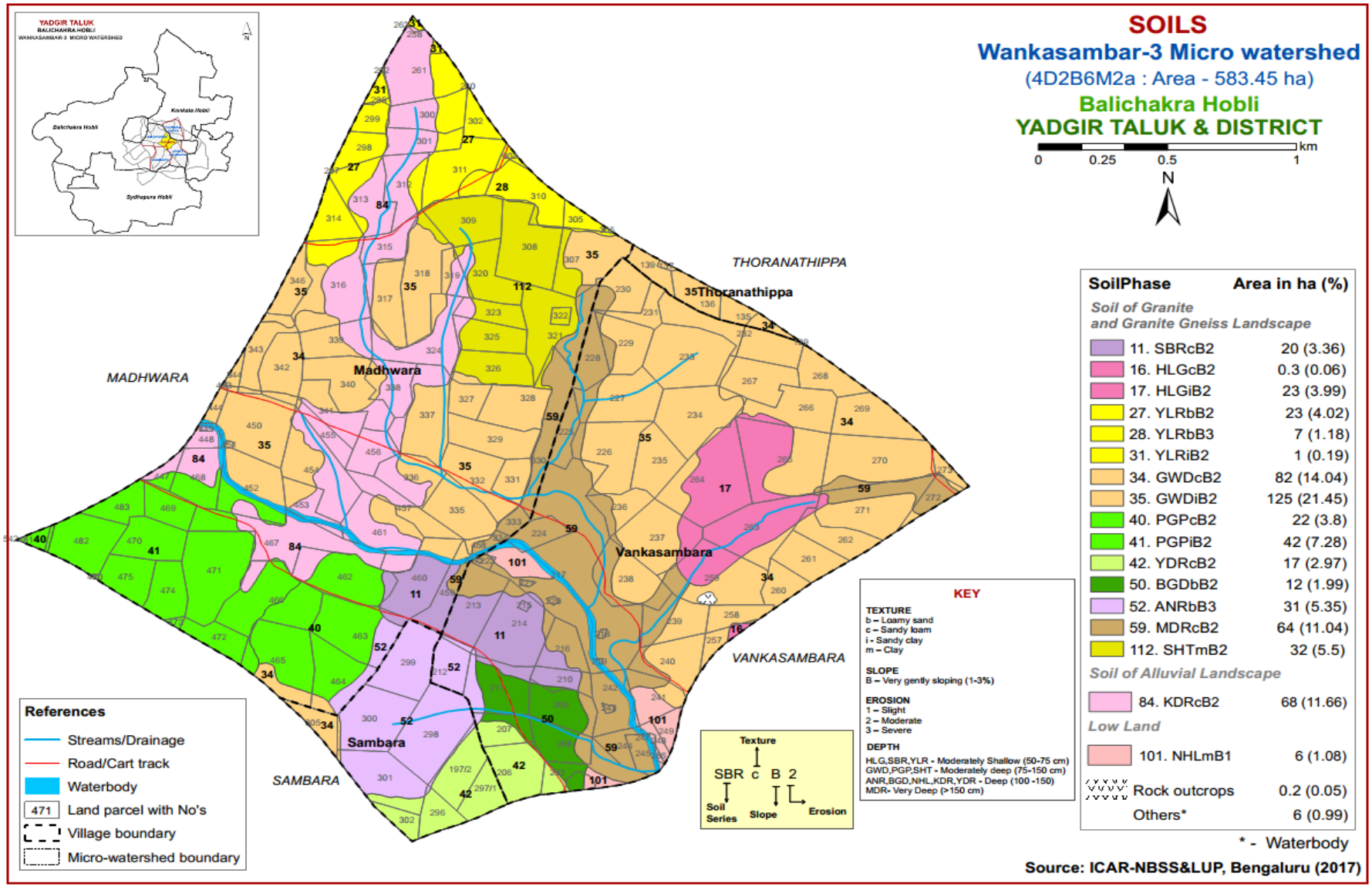


Fig 3.5 Soil Phase or Management Units- Wankasambar-3 Microwatershed.

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Wankasambar-3microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluvial landscapes based on geology. In all, 12 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 these landscapes, it is by parent material, relief, time and climate.

A brief description of each of the 12 soil series identified followed by 17 soil phases (management units) mapped are furnished below. The physical and chemical characteristics of soil series identified in Wankasambar-3microwatershed are given in Table 4.1. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of granite gneiss landscape

In this landscape, 11 soil series are identified and mapped. Of these, GWD series occupies maximum area of 207ha (35%) followed by PGP64 ha (11%), MDR64 ha (11%), SHT32 ha (6%), ANR 31 ha (5%), YLR 31 ha (5%), HLG23 ha (4%), SBR20 ha (3%), YDR 17 ha (3%) and BGD12 ha (2%). In the low land, NHL series occupies an area of 6ha (1%). Brief description of each series identified and number of soil phases mapped is given below.

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

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 1to 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 soil phase was identified and mapped.

Landscape and Soil Profile characteristics of Sambara (SBR) Series

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

The thickness of the solum ranges from 51 to 75 cm. The thickness of A horizon ranges from 9 to 15 cm. Its colour is in 7.5 YR and 10 YR hue with value 3 to 4and chroma 2 to 4. The texture is loamy sand to sandy clay loam. The thickness of B horizon ranges from 44 to 66 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 4 and chroma 2 to 3. Its texture varies from sandy clay loam to sandy clay and is calcareous. The available water capacity is low (51-100 mm/m).Two soil phases were identified and mapped.

Landscape and Soil Profile characteristics of Halagera (HLG) Series

4.1.3 Yalleri (YLR) Series: Yalleri soils are moderately shallow (50-75 cm), well drained, have very dark reddish brown to dark brown, gravelly clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Yalleri series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Haplustalfs.

The thickness of the solum ranges from 50 to 74 cm. The thickness of A horizon ranges from 10 to 13 cm. Its colour is in 7.5 YR and 5 YR hue with value and chroma 2 to 4. The texture is sandy loam, loamy sand, and sandy clay loam. The thickness of B horizon ranges from 45 to 64 cm. Its colour is in 10 YR, 7.5 YR and 5 YR hue with value 2 to 4 and chroma 2 to 4. Its texture is clay with gravel content of 15-35 per cent. The available water capacity is low (51-100 mm/m).Three soil phases were identified and mapped.

Landscape and Soil Profile characteristics of Yalleri (YLR) Series

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

The thickness of the solum ranges from 76 to 100 cm. The thickness of A horizon ranges from 8 to 16 cm. Its colour is in hue 10 YR with value 3 to 4 and chroma 2 to 4. Its texture varies from sandy loam to sandy clay loam. The thickness of B horizon ranges from 61 to 91 cm. Its colour is in hue 10 YR with value 2 to 4 and chroma 1 to 4. Its texture is sandy clay loam to sandy clay and is calcareous. These are sodic with ESP more than 15 per cent ranging from 44 to 121 per cent. The available water capacity is medium (101-150 mm/m).Two soil phases were identified and mapped.

Landscape and Soil Profile characteristics of Gowdagera (GWD) Series

4.1.5 Poglapur (PGP) Series: Poglapur soils are moderately deep (75-100 cm), well drained, dark brown to dark reddish brown and yellowish red 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 Typic Haplustalfs.

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 in7.5 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). Two soil phases were identified and mapped.

Landscape and Soil Profile characteristics of Poglapur (PGP) Series

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

The thickness of the soil ranges from 105 to 145 cm. The thickness of surface horizon ranges from 6 to 10 cm. Its colour is in 10 YR hue with value 4 and chroma 3. The texture is loamy sand. The thickness of subsurface horizons range from 95 to 130 cm. Its colour is in 10 YR and 2.5 Y hue with value 4 to 5 and chroma 3 to 4. Texture is loamy sand to sandy loam and sandy clay loam. These are sodic with ESP ranging from 1 to 89 per cent. The available water capacity is low (51-100 mm/m). Only one soil phase was identified and mapped.

Landscape and Soil Profile characteristics of Yadgir (YDR) Series

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

The thickness of the solum ranges from 100 to 145 cm. The thickness of A horizon ranges from 5 to 12 cm. Its colour is in 10 YR and 5 YR hue with value 5 and chroma 2 to 4. The texture varies from sandy loam to loamy sand. The thickness of B horizon ranges from 95 to 135 cm. Its colour is in 10 YR and 7.5 YR hue with value 4 to 5 and chroma 4. Texture is sandy clay to clay. The available water capacity is very high (>200 mm/m). Only one soil phase was identified and mapped.

Landscape and Soil Profile characteristics of Belagundi (BGD) Series

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

The thickness of the solum ranges from 102 to 148 cm. The thickness of A-horizon ranges from 9 to 17 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture ranges from loamy sand to sandy clay loam and sandy clay and are calcareous. The thickness of B horizon ranges from 102 to 135 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 6. Texture is sandy clay loam to sandy clay and clay and is calcareous. These are sodic with ESP ranging from 17 to 72 per cent. The available water capacity is very high (>200 mm/m).Only one soil phase was identified and mapped.

Landscape and Soil Profile characteristics of Anur (ANR) Series

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

The thickness of the solum is more than150 cm. The thickness of A horizon ranges from 10 to 16 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 2 to 3. Texture varies from sandy clay and clay. The thickness of B horizon is >150 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. Texture varies from sandy clay loam to sandy clay and is slightly calcareous. The available water capacity is very high (>200 mm/m).Only one soil phase was identified and mapped.

Landscape and Soil Profile characteristics of Madhwara (MDR) Series

4.1.10 Shettalli (SHT) Series: Shettalli soils are moderately deep (75-100 cm), well drained, very dark gray, slightly calcareous gravelly sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Shettalli series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 78 to 100 cm. The thickness of A horizon ranges from 7 to 12 cm. Its colour is in hue 7.5 YR with value and chroma of 3 to 4. Its texture varies from sandy loam to sandy clay with 20 per cent gravel. The thickness of B horizon ranges from 68 to 92 cm. Its colour is in hue 7.5 YR with value 2 to 4 and chroma 1 to 3. Its texture is sandy clay loam to sandy clay with 15-35 per cent gravel and is slightly calcareous. The available water capacity is low (51-100 mm/m).Only one soil phase was identified and mapped.

Landscape and Soil Profile characteristics of Shettalli (SHT) Series

4.1.11 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).

Landscape and Soil Profile characteristics of Neelahalli (NHL) Series

4.2 Soils of Alluvial landscape

In this landscape, only one soil series (KDR) is identified and mapped.KDR series occupies an area of 68 ha (12%). Brief description of the series identified and number of soil phases mapped is given below.

4.2.1 Kudlura (KDR) Series: Kudlura soils are deep (100-150 cm), moderately well drained, very dark gray to grayish brown, calcareous cracking clay soils. They have developed from alluvium and occur on nearly level to very gently sloping plains under cultivation. The Kudlura series has been classified as a member of the fine, mixed (calcareous) isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum ranges from 110 to 149 cm. The thickness of A horizon ranges from 6 to 22 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 2. The texture ranges from sandy loam, sandy clay loam, sandy clay and clay. The thickness of B horizon ranges from 115 to 143 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 3. Texture is sandy clay loam, sandy clay to clay and is calcareous in nature. The available water capacity is very high (>200 mm/m).Only one soil phases was identified and mapped.

Landscape and Soil Profile characteristics of Kudlura (KDR) Series

Table: 4.1 Physical and Chemical characteristics of soil series identified in Wankasambar-3microwatershed

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-9	8.24	-	-	0.145	0.61	0.91	-	-	0.12	0.09	-	7.50	0.76	100	1.15
9-17	8.21	-	-	0.068	0.57	0.39	-	-	0.06	0.12	-	6.70	0.72	100	1.82
17-60	8.47	-	-	0.080	0.38	0.48	-	-	0.03	0.17	-	2.70	0.39	100	6.34
60-78	8.50	-	-	0.081	0.30	0.52	-	-	0.03	0.17	-	2.70	0.46	100	6.43

Contd…

Soil Series: Halagera **(**HLG) **Pedon:** R-4

Location: $16^0$44'29.3"N $77^0$13'56.3"E, Halagera village, Yadgir hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-8	Ap	81.02	8.42	10.56	10.41	24.08	18.98	19.08	8.47	<15	ls	9.10	4.79
8-22	Bw1	61.00	11.50	27.50	8.29	9.35	21.89	14.35	7.12	<15	scl	16.91	12.28
22-53	Bw2	61.41	13.80	24.79	15.98	15.67	12.62	11.78	5.36	15-35	scl	17.08	11.26

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-8	8.49	-	-	0.185	0.30	2.99	-	-	0.24	0.06	-	8.80	0.83	100	0.69
8-22	8.57	-	-	0.116	0.45	4.03	-	-	0.11	0.02	-	19.50	0.71	100	0.12
22-53	8.70	-	-	0.113	0.27	7.67	-	-	0.11	0.05	-	15.50	0.63	100	0.33

Contd…

Soil Series: Yalleri (YLR) **Pedon:** R-16

Location: $16^0$32'54.3"N $77^0$22'71.2"E, Duppalli village, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:**Fine, 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
0-5	Ap	81.69	5.44	12.87	6.10	8.65	33.88	21.57	11.50	-	sl	8.60	3.37
5-34	Bt1	38.78	6.73	54.49	3.38	9.91	12.42	8.93	4.14	-	c	25.33	15.82
34-75	Bt2	40.35	2.90	56.75	12.91	6.83	10.30	7.48	2.82	35-60	c	24.49	16.20

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-5	6.91	-	-	0.069	0.70	0.00	5.29	1.37	0.28	0.03	6.96	6.90	0.54	100	0.45
5-34	7.05	-	-	0.053	0.62	0.00	16.43	3.89	0.26	0.09	20.67	21.60	0.40	96	0.42
34-75	7.25	-	-	0.058	0.59	0.00	15.22	3.46	0.25	0.14	19.06	19.90	0.35	96	0.69

Contd…

Soil Series: Gowdagera (GWD) **Pedon:** R-13

Location: $16^0$38'24.4"N $77^0$21'24.0"E, Madhawara village, Balichakara hobli, Yadgir taluk and district

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

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	79.61	13.94	6.45	14.17	17.53	23.65	17.02	7.24	-	ls	11.36	3.86
18-42	BW1	69.09	10.58	21.06	10.54	16.58	22.01	14.43	5.53	-	scl	31.62	12.30
42-81	Bw2	51.37	13.51	35.60	7.59	10.55	16.24	11.60	5.38	-	sc	67.57	26.89

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	9.89	-	-	0.74	0.66	1.20	-	-	0.18	3.63	-	8.35	1.29	100	43.51
18-42	10.82	-	-	1.60	0.27	5.76	-	-	0.19	19.23	-	15.84	0.75	100	121.42
42-81	10.83	-	-	2.30	0.27	7.80	-	-	0.40	26.71	-	26.54	0.75	100	100.67

Contd…

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

Location: $16^0$34'45.2"N $77^0$10'96.4"E, Anura B village, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, 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
0-15	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.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-15	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: Yadgir **(**YDR) **Pedon:** R-5

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

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Coarse-loamy, mixed, isohyperthermic Typic 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
0-14	Ap	73.39	11.31	15.30	6.76	20.27	24.87	15.66	5.83	-	sl	12.14	7.22
14-43	C1	86.59	8.77	4.64	23.19	26.92	14.11	15.22	7.16	-	ls	6.97	2.68
43-89	C2	80.41	3.75	15.84	8.06	13.47	36.73	15.71	6.43	-	sl	22.84	10.18
89-110	C3	63.55	5.40	31.05	8.10	23.05	19.00	9.87	3.53	15-35	scl	38.46	17.70

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-14	9.47	-	-	0.371	0.32	1.30	14.71	4.28	0.38	1.54	20.91	12.70	0.83	165	12.14
14-43	7.25	-	-	0.114	0.56	0.00	2.29	0.86	0.07	0.03	3.25	3.40	0.73	96	0.78
43-89	10.30	-	-	0.820	0.16	0.52	1.70	0.98	0.15	6.62	9.45	8.61	0.54	110	76.93
89-110	10.80	-	-	1.440	0.12	0.91	1.02	2.00	0.29	14.43	17.74	16.17	0.52	110	89.22

Contd…

Soil Series: Belagundi **(**BGD) **Pedon:** T_1/P_2

Location: $16^0$31'65.3"N $77^0$20'84.9"E, Kadechoora village, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:**Very fine, mixed, (calcareous), isohyperthermicTypic 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
0-13	Ap	14.90	17.83	67.27	0.77	2.10	2.65	5.96	3.42	-	c	43.97	29.27
13-40	Bw1	13.07	18.32	68.61	0.80	2.05	2.61	4.20	3.41	-	c	41.23	30.48
40-80	Bw2	11.68	17.18	71.13	0.80	2.06	2.29	3.32	3.21	-	c	46.72	32.41
80-113	Bw3	12.17	16.53	71.30	1.95	1.61	3.21	2.41	2.99	-	c	46.87	35.13

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-13	7.85	-	-	0.253	0.87	5.20	-	-	0.67	0.17	-	65.90	0.98	100	0.26
13-40	8.11	-	-	0.172	0.74	4.29	-	-	0.31	0.16	-	66.70	0.97	100	0.23
40-80	8.44	-	-	0.205	0.58	5.59	-	-	0.20	0.27	-	66.30	0.93	100	0.40
80-113	8.82	-	-	0.201	0.39	10.14	-	-	0.19	0.17	-	63.80	0.89	100	0.27

Contd…

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

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

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

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	10.17	-	-	0.365	0.48	6.11	-	-	0.25	3.52	-	19.90	0.91	100	17.70
18-49	10.32	-	-	1.38	0.30	6.76	-	-	0.21	16.03	-	24.60	0.79	100	65.17
49-95	10.08	-	-	2.55	0.17	6.11	-	-	0.33	21.49	-	32.60	0.77	100	65.91
95-123	9.92	-	-	2.56	0.12	7.93	-	-	0.51	26.03	-	36.00	0.70	100	72.30

Contd…

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

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

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

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-11	8.31	-	-	0.33	0.46	2.76	-	-	0.45	0.47	-	20.57	1.01	100	2.26
11-30	9.25	-	-	0.20	0.31	4.20	-	-	0.19	1.40	-	23.98	0.95	100	5.84
30-53	9.78	-	-	0.40	0.19	5.76	-	-	0.16	1.53	-	24.53	0.91	100	6.22
53-117	9.94	-	-	0.88	0.23	4.80	-	-	0.18	9.09	-	24.31	0.87	100	37.40
117-160	9.98	-	-	0.93	0.15	3.00	-	-	0.24	11.09	-	28.27	0.86	100	39.23

Contd…

Soil Series: Shettalli (SHT) **Pedon:** R-14

Location: $16^0$47'21.1"N $77^0$04'91.1"E, Thumakura 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
0-14	Ap	74.39	10.89	14.73	5.64	8.30	21.00	28.89	10.55	50	sl	12.58	4.51
14-35	Bw1	54.37	14.73	30.90	3.58	5.90	15.38	21.71	7.80	25	scl	20.37	10.92
35-63	Bw2	41.16	20.63	38.21	1.71	1.71	10.61	13.61	13.50	30	cl	24.34	15.03
63-83	Bw3	36.96	21.52	41.51	4.31	5.28	8.94	12.39	6.03	35	c	24.76	16.17

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-14	7.26	-	-	0.199	0.91	0.13	-	-	0.28	0.09	-	10.60	0.72	100	0.86
14-35	7.05	-	-	0.051	0.80	1.17	-	-	0.12	0.09	-	18.20	0.59	100	0.48
35-63	7.67	-	-	0.238	0.70	2.86	-	-	0.14	0.16	-	24.40	0.64	100	0.64
63-83	8.67	-	-	0.142	0.20	12.48	-	-	0.13	0.23	-	27.40	0.66	100	0.84

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.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-15	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

Contd…

Soil Series: Kudlura (KDR) **Pedon:** T_1/P_2

Location: $16^0$34'03.1"N $77^0$14'71.7"E, Kyathanala village, Sydhapura Hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, mixed,(calcareous), isohyperthermicFluventic 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
0-6	Ap	49.52	14.58	35.90	5.71	7.41	14.81	15.66	5.93	-	sc	26.86	12.10
6-26	BA	50.79	13.31	35.90	7.41	9.10	15.56	13.12	5.61	-	sc	25.65	12.24
26-67	Bw1	43.49	15.97	40.54	5.86	7.38	13.56	10.85	5.86	-	c	31.22	16.48
67-115	Bw2	37.42	18.93	43.66	6.51	6.83	10.95	8.68	4.45	-	c	36.13	22.34
115-144	Bw3	39.74	18.88	41.38	8.16	7.84	10.63	8.70	4.40	-	c	35.83	20.57

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-6	8.34	-	-	0.15	0.72	3.55	-	-	0.42	0.07	-	33.20	0.92	100	0.22
6-26	8.55	-	-	0.11	0.85	4.90	-	-	0.33	0.25	-	32.70	0.91	100	0.76
26-67	9.08	-	-	0.17	0.60	5.02	-	-	0.18	1.34	-	36.20	0.89	100	3.69
67-115	9.44	-	-	0.37	0.52	6.61	-	-	0.25	6.72	-	39.30	0.90	100	17.09
115-144	9.53	-	-	0.43	0.56	6.10	-	-	0.26	7.85	-	33.70	0.81	100	23.29

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

Soil Characteristics: Depth, texture, gravelliness, calcareousness.

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

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

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

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

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

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

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

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

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

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

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

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

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

The 17 soil map units identified in the Wankasambar-3microwatershed are grouped under 2land capability classes and3land capability subclasses. Entire area in the microwatershed is suitable for agriculture and about 6 ha (1%) is covered by others (habitation and water bodies) (Fig. 5.1).

Good cultivable lands (Class II) cover a maximum area of about 92per cent and are distributed in the major part of the microwatershed with minor problems of soil, erosion and drainage. Moderately good cultivable lands (Class III) cover an area of about 7per cent and are distributed in the northern and southern part of the microwatershed with moderate limitations of erosion and soil.

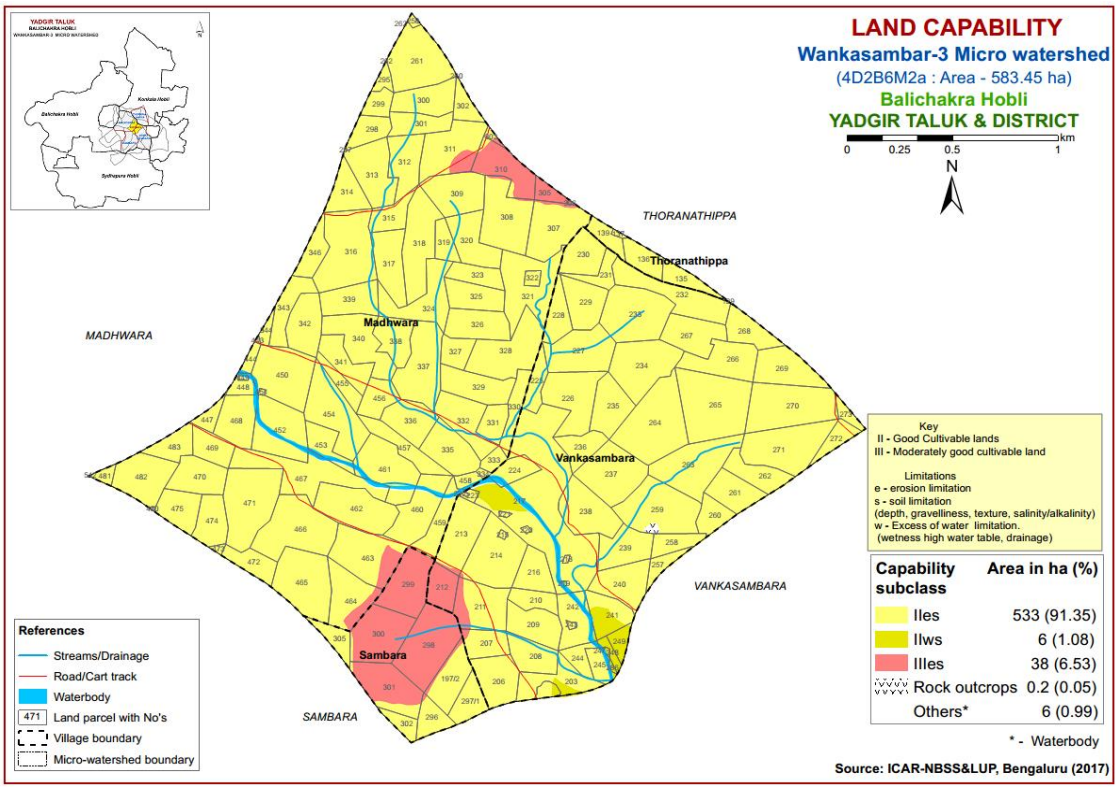


Fig. 5.1 Land Capability map of Wankasambar-3 Microwatershed

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.

Moderately shallow (50-75 cm) soils occupy an area of about75 ha (13%) and are distributed in the northern, eastern and southern part of the microwatershed. Moderately deep (75-100 cm) soils occupy a maximum area of about 304 ha (52%) and are distributed in the major part of the microwatershed. Deep (100-150 cm) soils occupy an area of 135ha (23%) and are distributed in the northern, central, western and southern part of the microwatershed. Very deep (>150 cm) soils occur in an area of64 ha (11%) and are distributed in the central, eastern and southern part of the microwatershed.

The most productive lands 199 ha (34%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep to very deep (100 to >150 cm depth) soils occurring in the microwatershed.

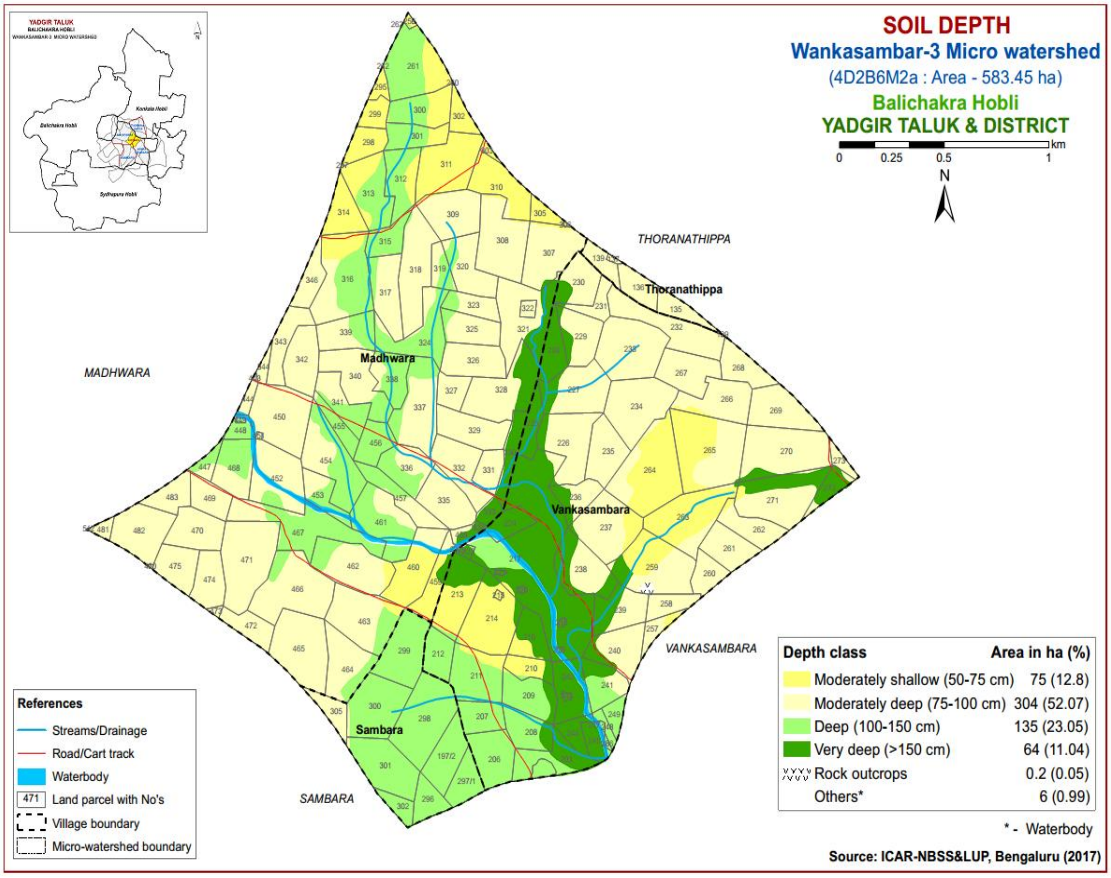


Fig. 5.2Soil Depth map of Wankasambar-3 Microwatershed

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 73 ha (13%) has soils that are sandy at the surface and are distributed in the northern and southern part of the microwatershed. Maximum area of about 274ha (47%) has soils that are loamy at the surface and are distributed in the northern, eastern, western, central and southern parts of the microwatershed. An area of about 230 ha (40%) has soils that are clayey at the surface and are distributed in all part of the microwatershed.

The most productive lands with respect to surface soil texture are clayey and loamy soils (87%)that have high potential for soil-water retention and availability, and nutrient retention and availability, but clayey soils have more problems of drainage, infiltration, workability and other physical problems then the loamy soils. The problem soils are sandy covering 13per cent areas that have moisture and nutrient constraints.

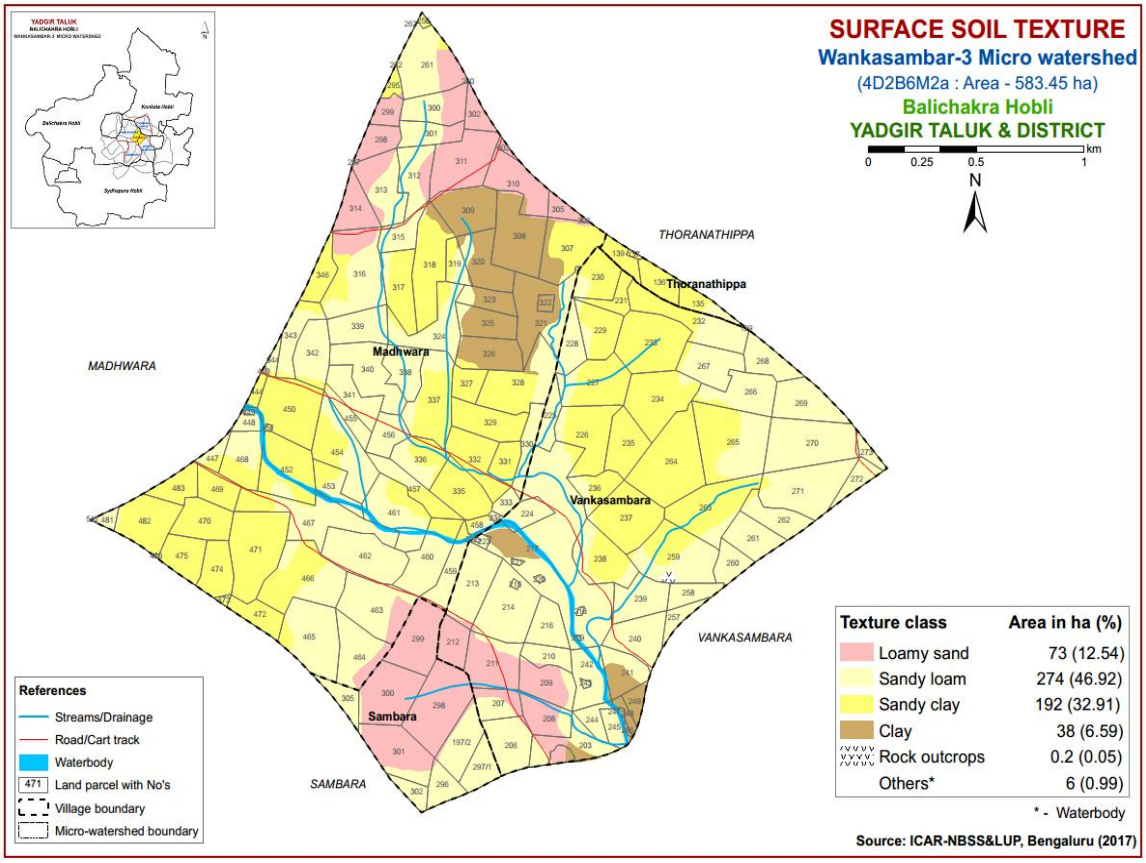


Fig. 5.3 Surface Soil Texture map of Wankasambar-3 Microwatershed

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 are shown in Figure 5.4.

Non gravelly (<15%) soils cover an entire area of the microwatershed. These are the most productive soils, where all climatically adapted short and long duration crops can be grown.

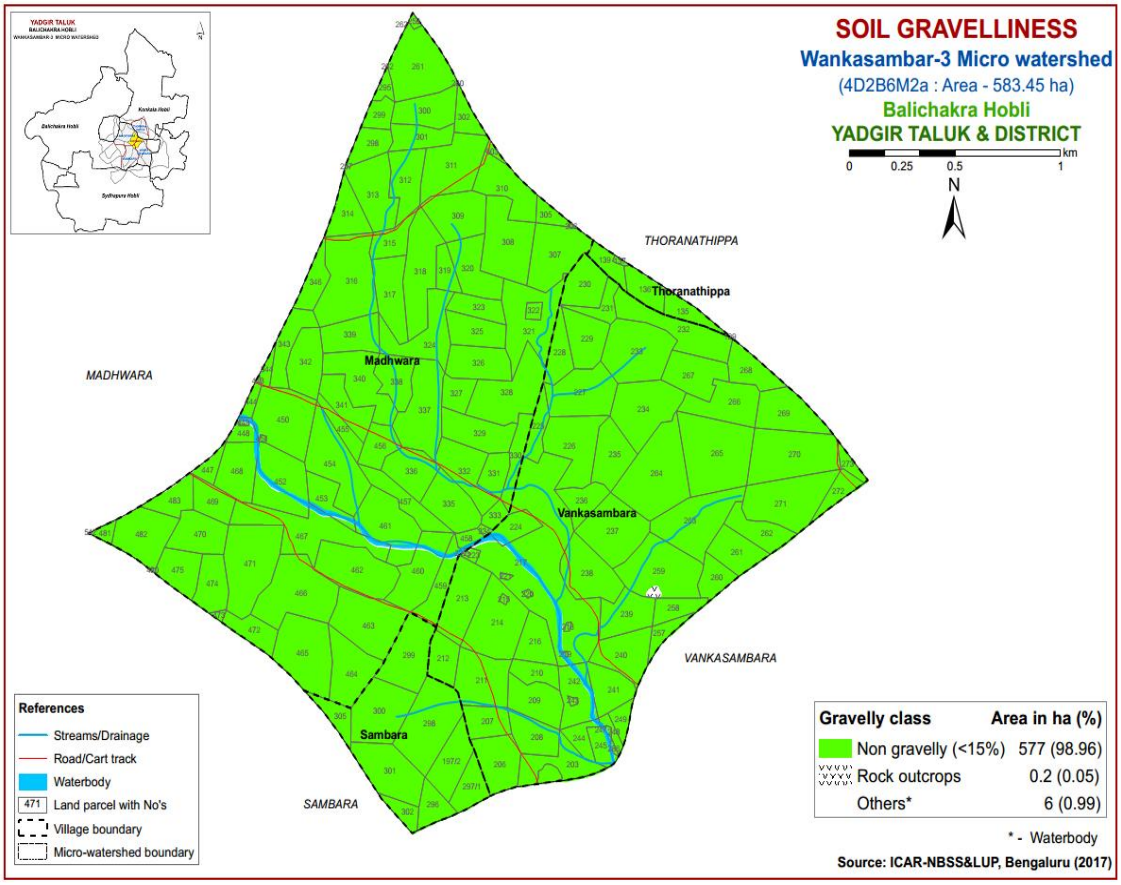


Fig. 5.4 Soil Gravelliness map of Wankasambar-3 Microwatershed

5.5 Available Water Capacity

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

An area of about 20 ha (3%) in the microwatershed has soils that are very low (<50 mm/m) in available water capacity and are distributed in the southern part of the microwatershed and 137ha (23%) area are low (51-100 mm/m) and are distributed in the western, northern, eastern and southern part of the microwatershed. Maximum area of about 251 ha (43%) are medium (101-150mm/m) in available water capacity and are distributed in all parts of the microwatershed. An area of about 170 ha (29%) are very high (>200 mm/m) in available water capacity and are distributed in the northern, western, eastern, central and southern part of the microwatershed.

About 157 ha (26%) 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. The most productive soils cover about170 ha (29%) where all climatically adapted long duration crops can be grown.

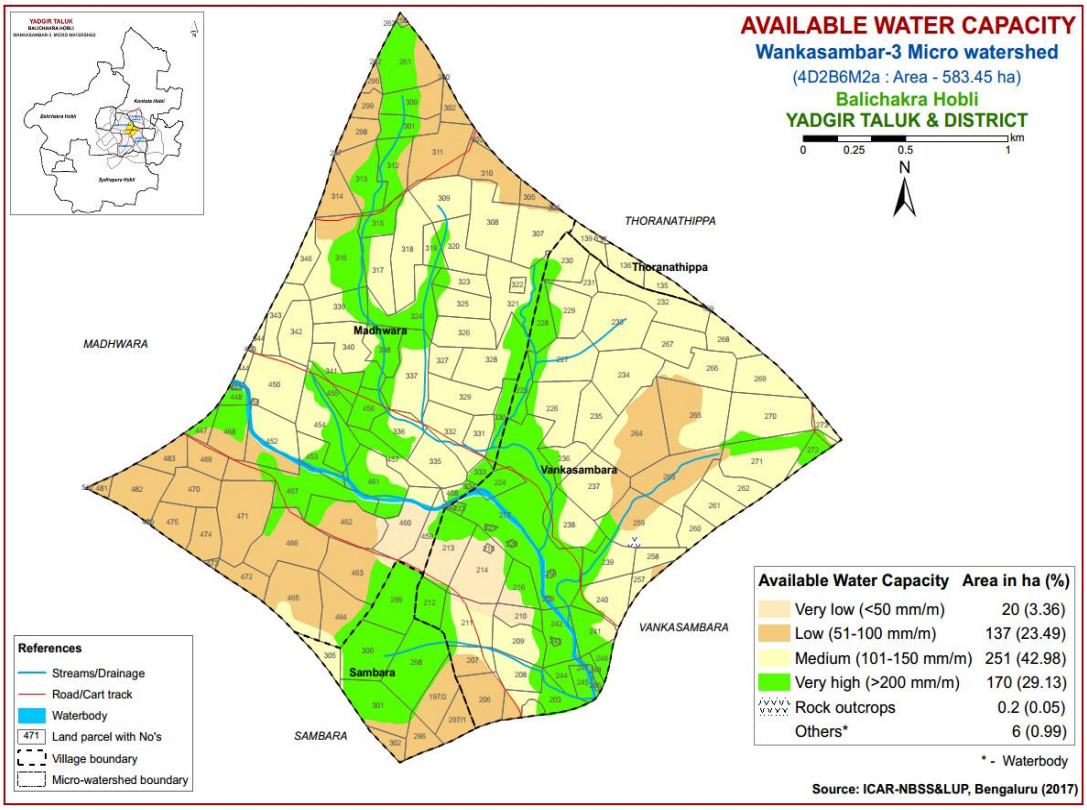


Fig. 5.5 Soil Available Water Capacity map of Wankasambar-3 Microwatershed

5.6 Soil Slope

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

Entire areas in the microwatershed are falls under very gently sloping (1-3% slope) lands and 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.

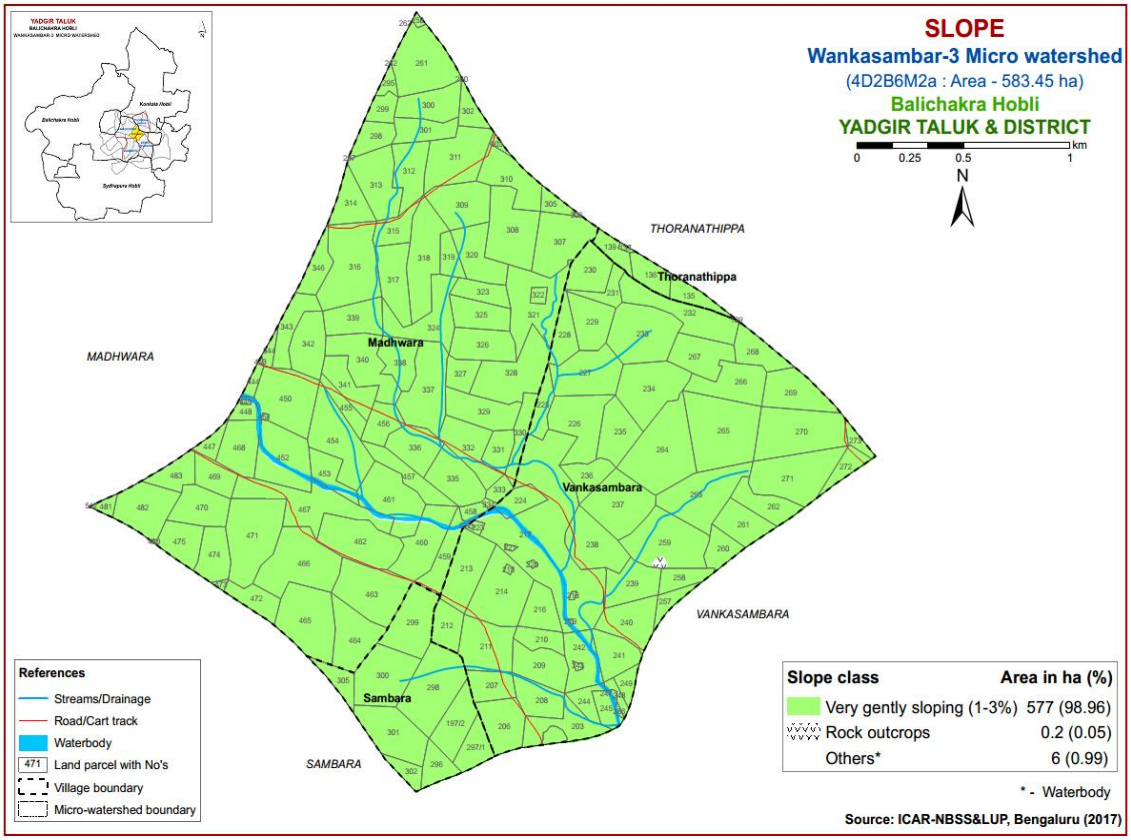


Fig. 5.6 Soil Slope map of Wankasambar-3 Microwatershed

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.

An area of about 6 ha (1%) has soils that are slightly eroded (e1) and are distributed in the southern part of the microwatershed. Soils that are moderately eroded (e2) covering a maximum area of about 533 ha (91%) are distributed in all parts of the microwatershed. Severely eroded (e3) soils cover an area of about 38 ha (7%) and are distributed in the northern and western part of the microwatershed.

Entire area in the microwatershed except a very small area of 6 ha is problematic because of moderate and severe erosion. For these areas, taking up soil and water conservation and other land development measures are needed.

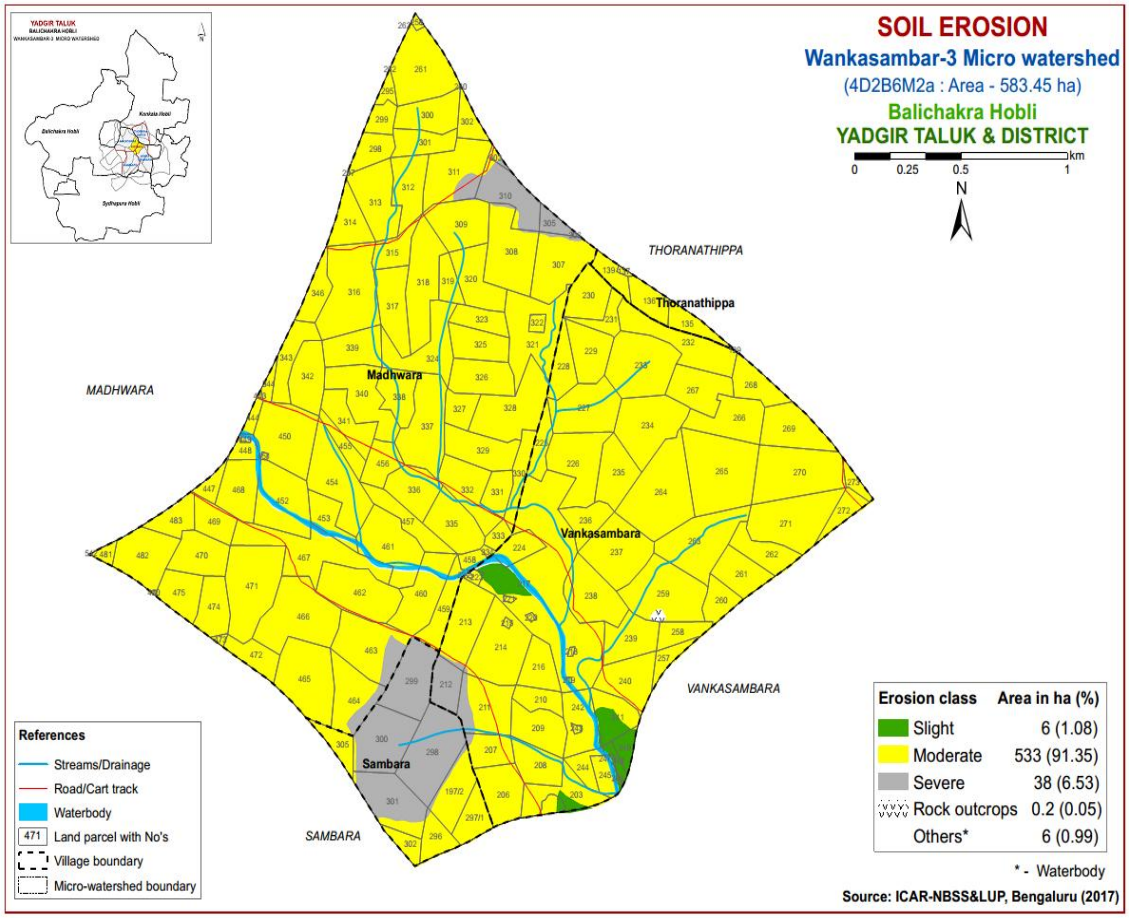


Fig. 5.7 Soil Erosion map of Wankasambar-3 Microwatershed

Chapter 6

FERTILITY STATUS

Soil fertility plays an important role in increasing crop yield. The adoption of high yielding varieties that require high amounts of nutrients has resulted in deficiency symptoms in crops and plants due to imbalanced fertilization and poor inherent fertility statusas these areas are characterised by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 250 m interval) all over the microwatershed through land resource inventory in the year 2017 were analysed for pH, EC, organic carbon, available phosphorus and potassium, and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

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

6.1 Soil Reaction (pH)

The soil analysis of the Wankasambar-3microwatershed for soil reaction (pH) showed that an area of about 7 ha (1%) is moderately acid (pH 5.5-6.0) and are distributed in the eastern part of the microwatershed. An area of about 57 ha (10%) is slightly acid (pH 6.0-6.5) and are distributed in the eastern part of the microwatershed. Maximum area of about 149 ha (26%) is neutral (6.5-7.3) and are distributed in all parts of the microwatershed. An area of about 119 ha (20%) is slightly alkaline (pH 7.3-7.8) and are distributed in the northern, eastern, western and southern part of the microwatershed. An area of about 135 ha (23%) is moderately alkaline (pH 7.8-8.4) and are distributed in the northern, eastern, central and southern part of the microwatershed. Strongly alkaline (pH 8.4-9.0) soils occupy an area about 99 ha (17%) and are distributed in the eastern and central part of the microwatershed (Fig.6.1). An area of about 11 ha (2%) is very strongly alkaline (pH >9.0) and are distributed in the central part of the microwatershed. Thus, all the soils in the microwatershed are alkaline in reaction, except an area of 149 ha (26%) are neutral in reaction and 64 ha (11%) area are acidic in reaction.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in the soils of the microwatershed is low (<0.5%) in an area of about 33ha (6%) and are distributed in the western part of the microwatershed. Maximum area of about 313 ha (54%) are medium (0.5-0.75%) in organic carbon and are distributed in all parts of the microwatershed. High (>0.75) covering an area of about231ha (40%) and are distributed in the eastern, central and southern part of the microwatershed (Fig.6.3).

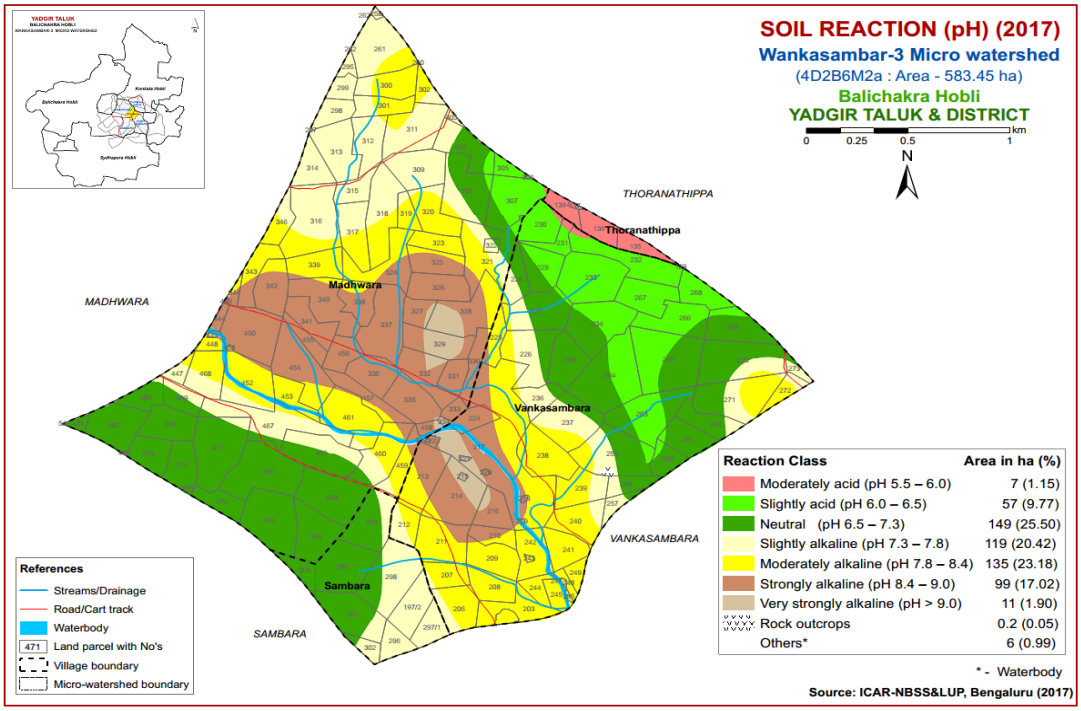


Fig.6.1 Soil Reaction (pH) map ofWankasambar-3 Microwatershed

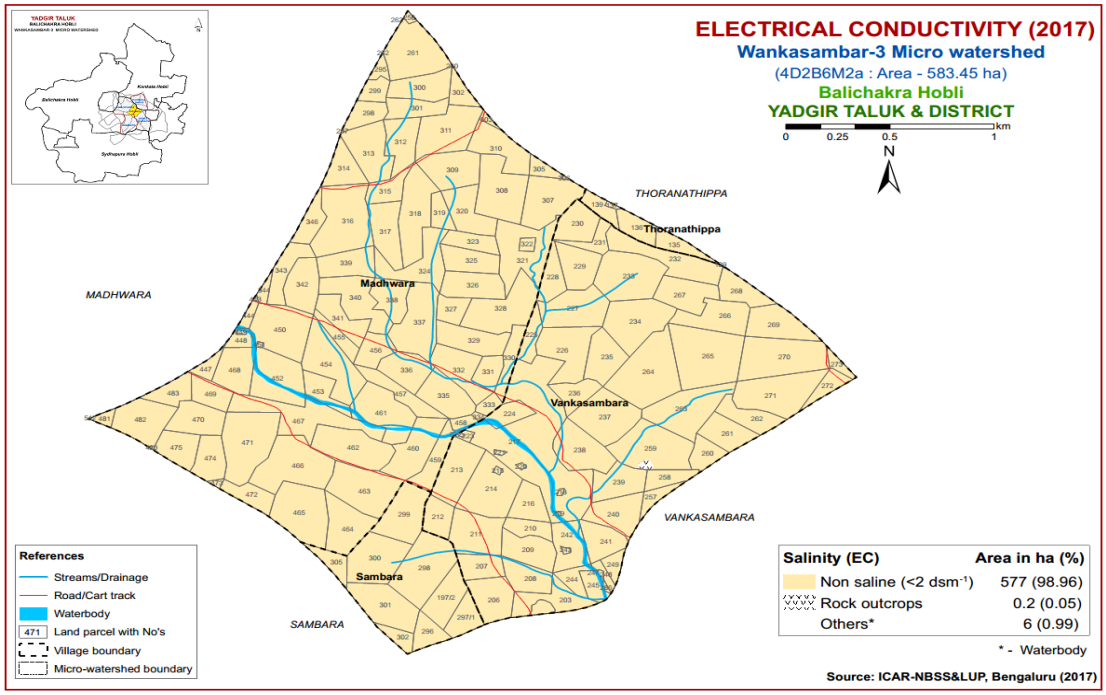


Fig.6.2Electrical Conductivity (EC) map of Wankasambar-3 Microwatershed

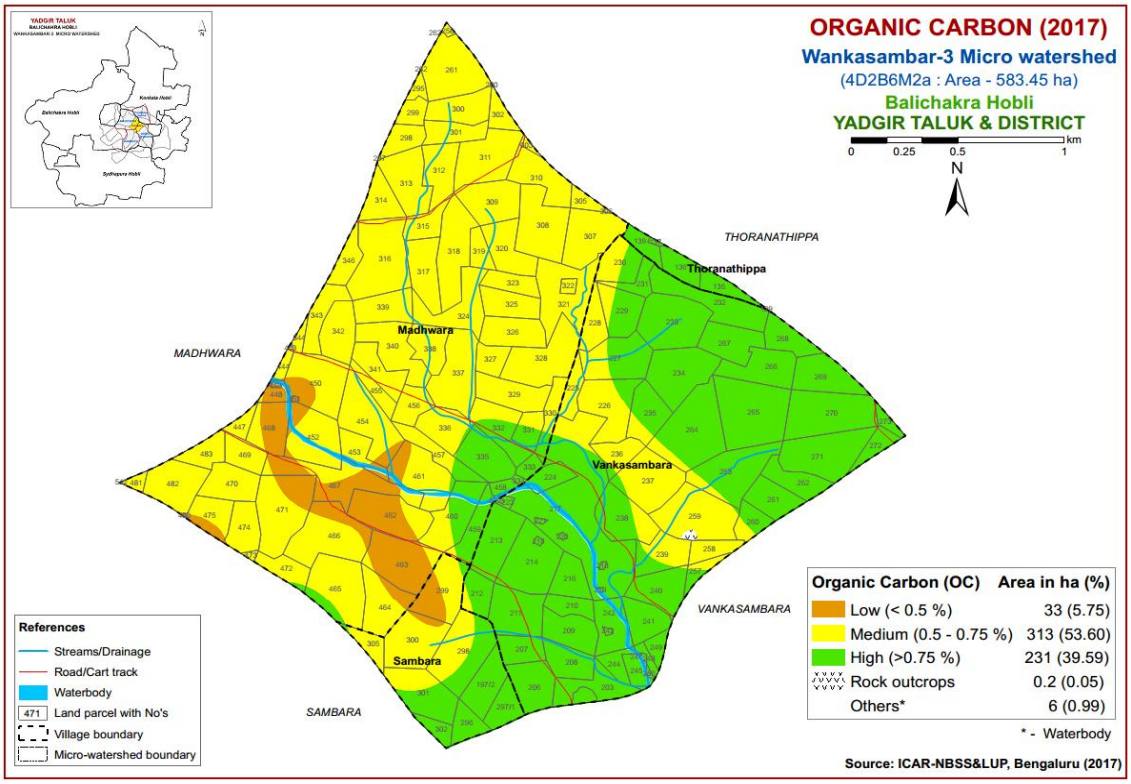


Fig.6.3 Soil Organic Carbon map of Wankasambar-3 Microwatershed

6.4 Available Phosphorus

Available phosphorus content is low (<23 kg/ha) in an area of199 ha (34%) and are distributed in the eastern, northwestern, central and southern part of the microwatershed. Medium (23-57 kg/ha) in maximum area of about 269 ha (46%) and are distributed in all parts of the microwatershed (Fig. 6.4). An area of about 109 ha (19%) is high (>57 kg/ha) in available phosphorous and are distributed in the western and southern part of the microwatershed.

6.5 Available Potassium

An area of about 138 ha (24%) is low (<145 kg/ha) in available potassium and are distributed in the eastern part of the microwatershed. Medium (145-337 kg/ha) in maximum area of about 438ha (75%) and are distributed in all parts of the microwatershed (Fig.6.5).

6.6 Available Sulphur

An area of about 263ha (45%) is low (<10ppm) in available sulphur content and are distributed in the northern, western, central, southeastern and southern part of the microwatershed. Medium (10-20 ppm) in maximum area of about 273 ha (47%) and are distributed in all parts of the microwatershed (Fig.6.6). An area of about 41 ha (7%) is high (>20 ppm) in available sulphur content and are distributed in the western, eastern and southern part of the microwatershed.

6.7 Available Boron

An area of about 128 ha (22%) is low (<0.5 ppm) in available boron content and are distributed in the northern, eastern and western part of the microwatershed. Medium (0.5-1.0 ppm) in a maximum area of313 ha (54%) and are distributed in all parts of the microwatershed. An area of about 135ha (23%) is high (>1.0ppm) in available boron and are distributed in the eastern, central and southern part of the microwatershed (Fig.6.7).

6.8 Available Iron

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

6.9 Available Manganese

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

6.10 Available Copper

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

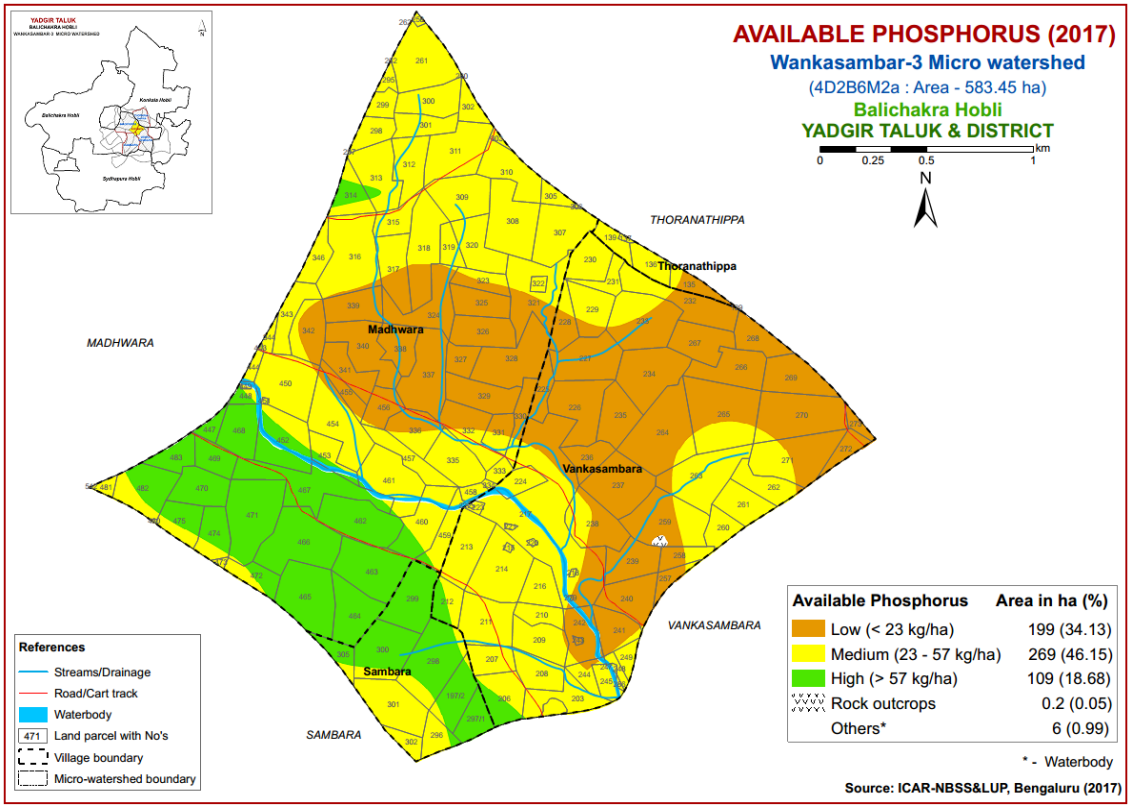


Fig.6.4 Soil Available Phosphorus map of Wankasambar-3 Microwatershed

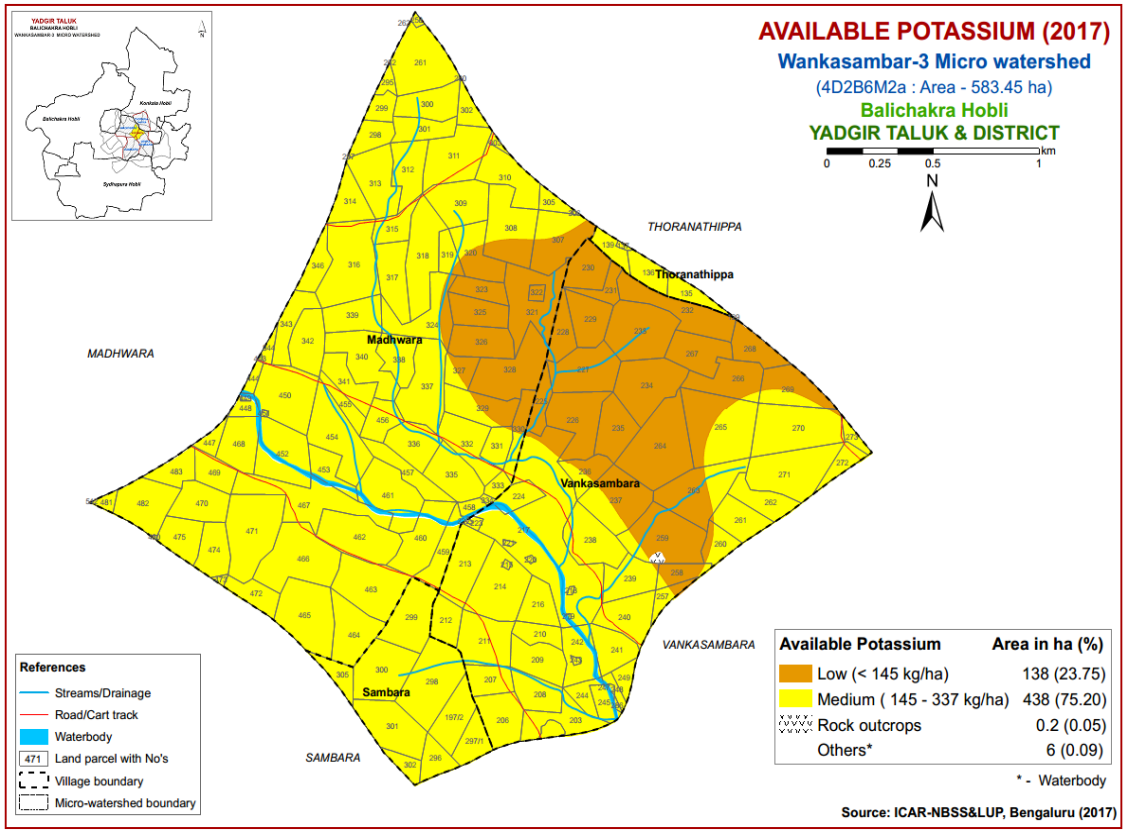


Fig.6.5 Soil Available Potassium map of Wankasambar-3 Microwatershed

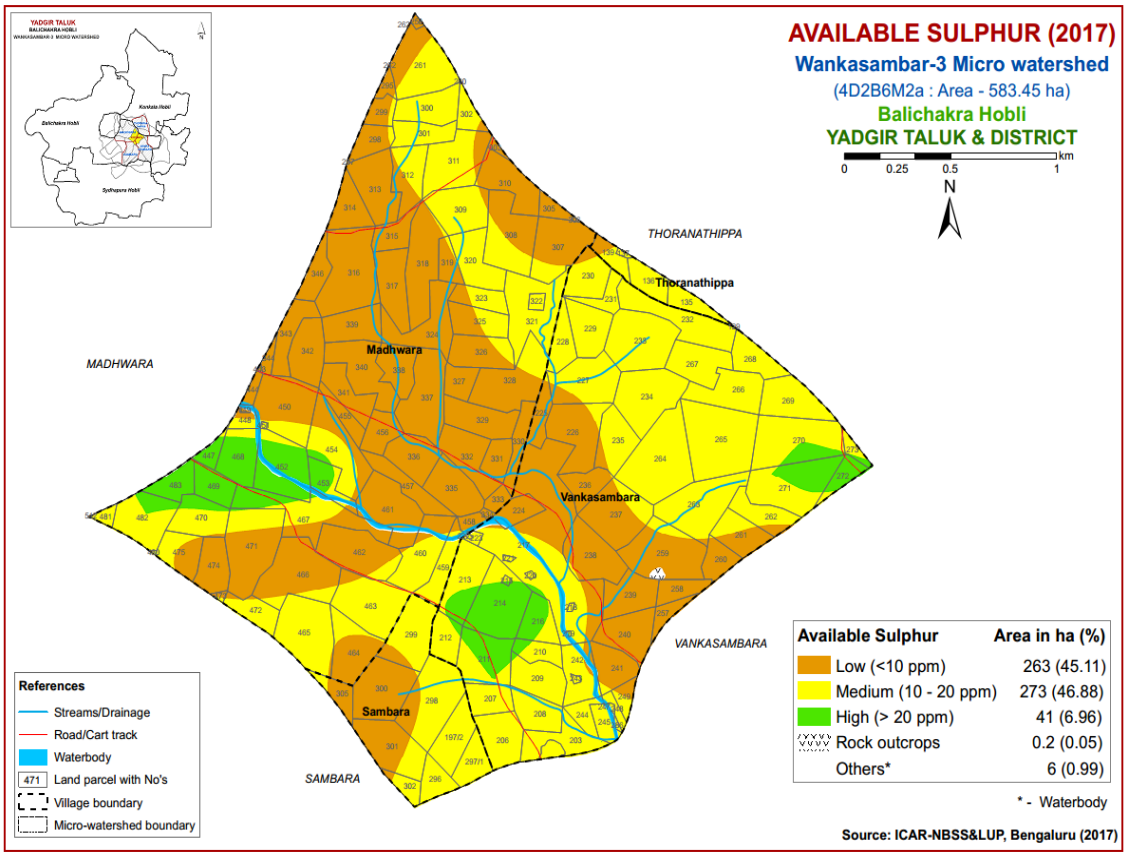


Fig.6.6 Soil Available Sulphur map of Wankasambar-3 Microwatershed

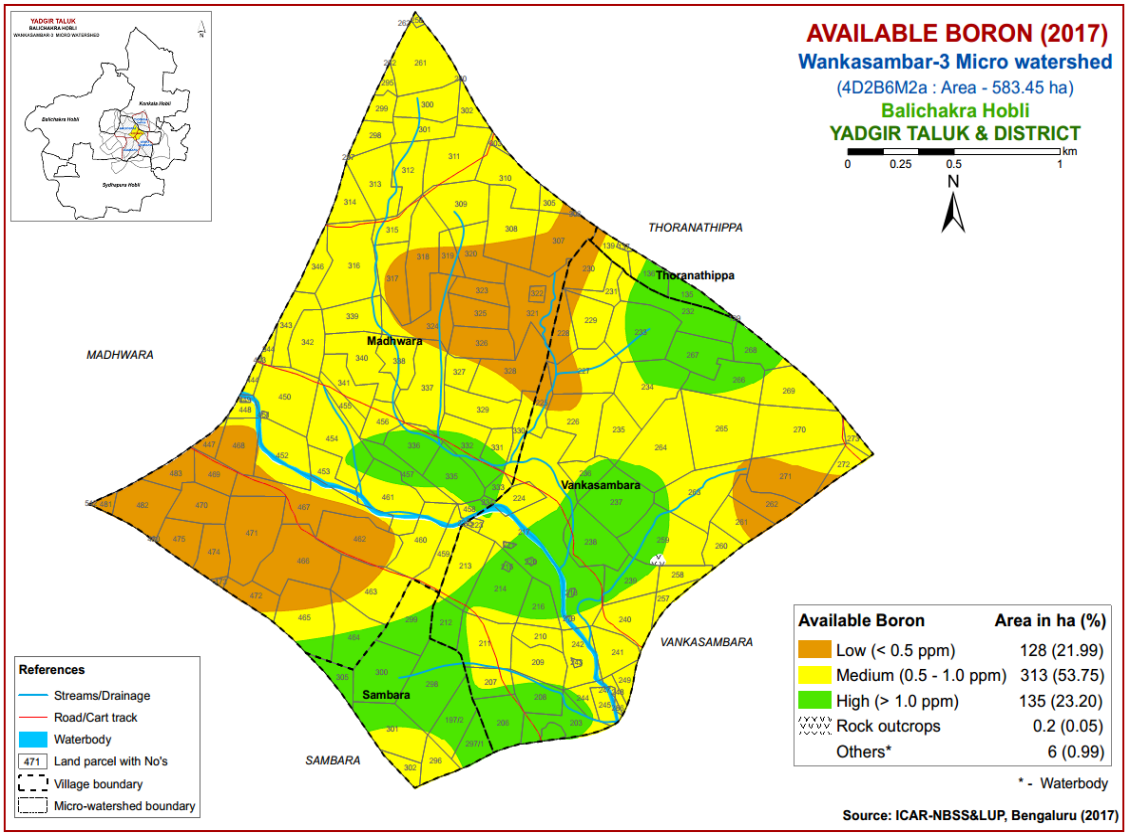


Fig.6.7 Soil Available Boron map of Wankasambar-3 Microwatershed

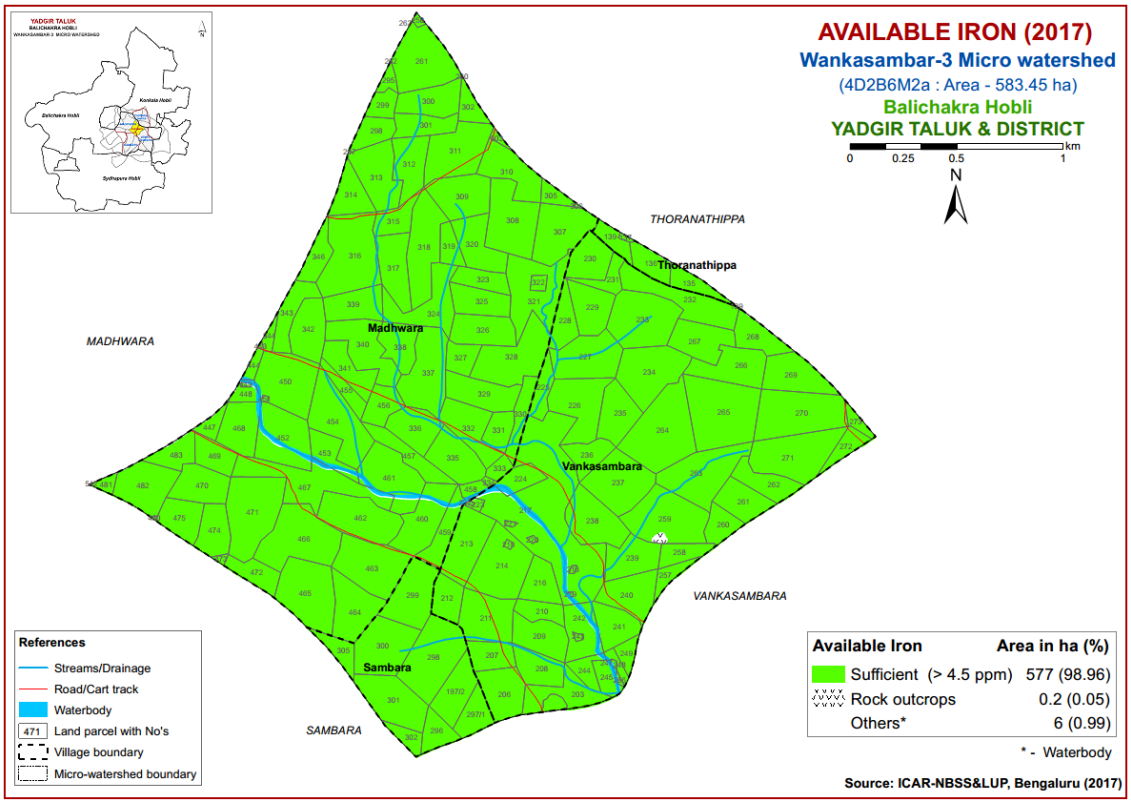


Fig.6.8 Soil Available Iron map of Wankasambar-3 Microwatershed

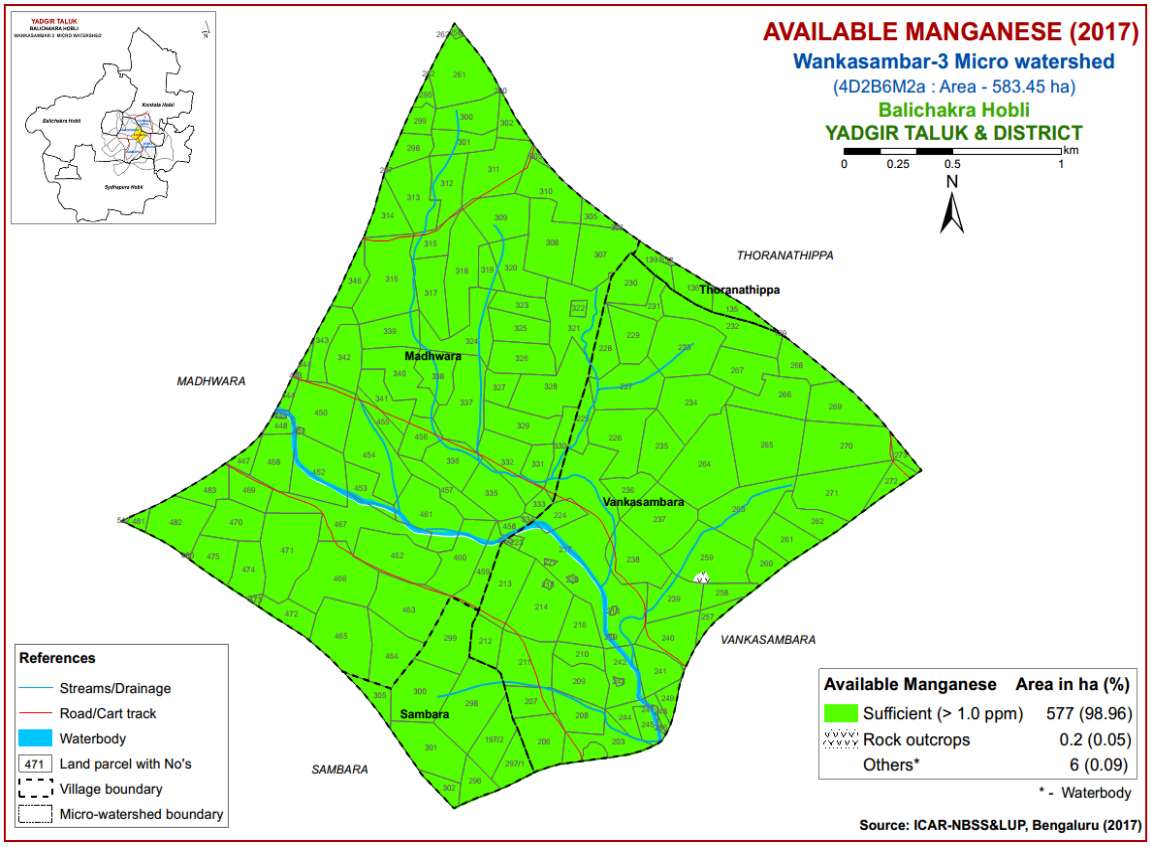


Fig.6.9 Soil Available Manganese map of Wankasambar-3 Microwatershed

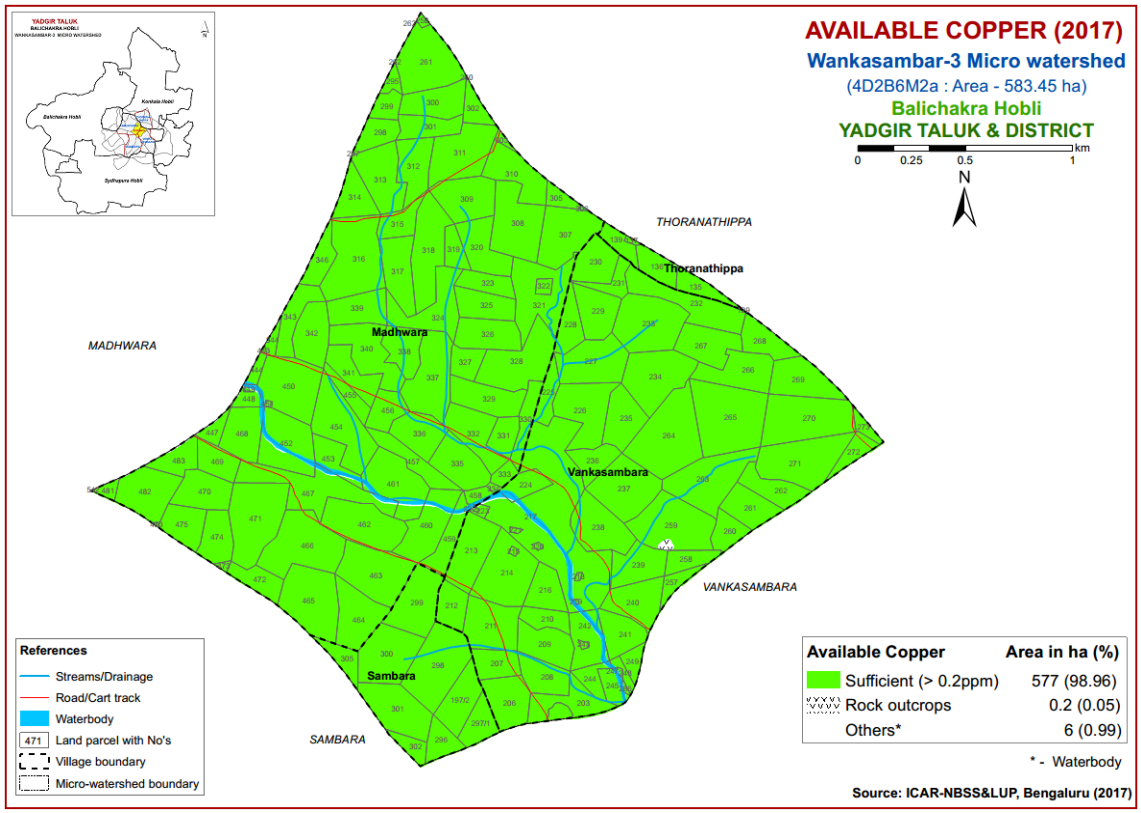


Fig.6.10 Soil Available Copper map of Wankasambar-3 Microwatershed

6.11 Available Zinc

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

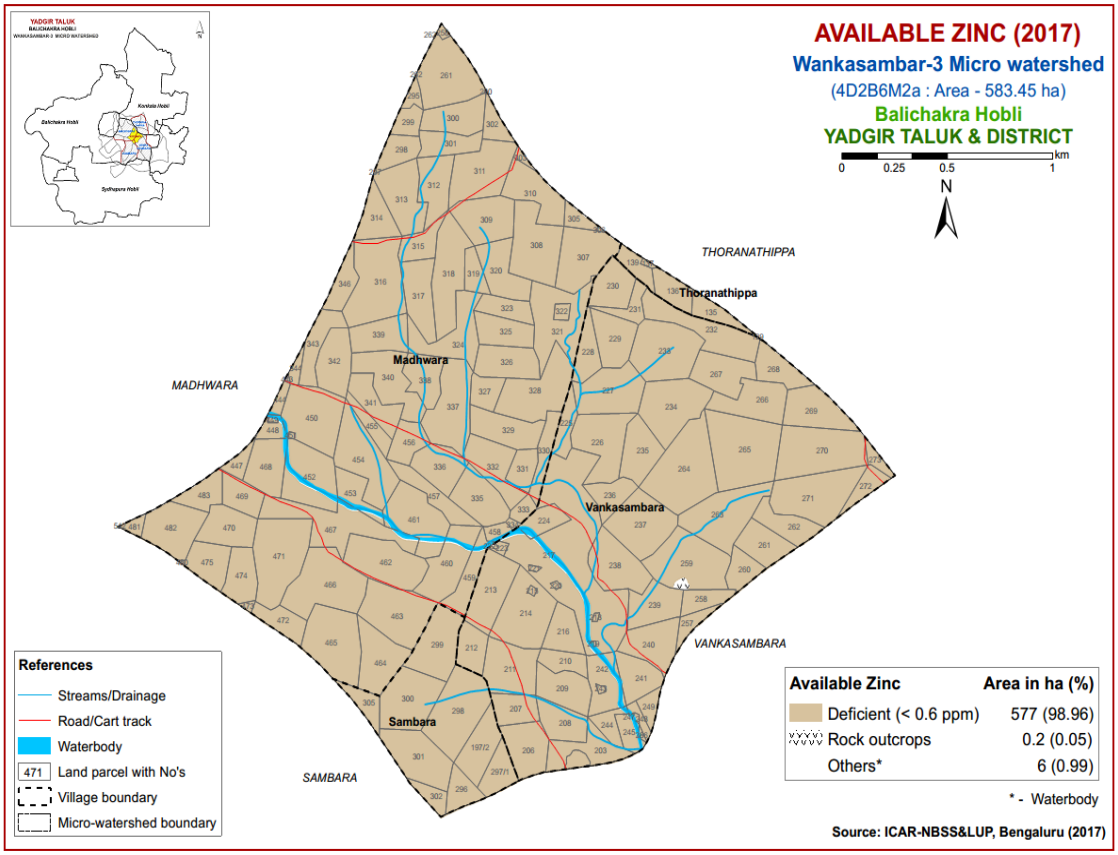


Fig.6.11 Soil Available Zinc map of Wankasambar-3 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Wankasambar-3microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3- Marginally Suitable. Order N has two classes, N1-Currently not Suitable and N2- Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability,'l' for topography, 'm' for moisture availability, 'w' for drainage, 's' for sodicity 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 for26major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

An area of about 97ha (17%) is highly suitable (Class S1) for growing Sorghum in the microwatershed and distributed in the northern and western part of the microwatershed. Maximum area of about432 ha (75%) is moderately suitable (ClassS2)

for growing sorghum and are distributed in the major part of the microwatershed. They have minor limitations of calcareousness, drainage and rooting depth. An area of about 48ha (8%) is marginally suitable (Class S3) for growing sorghum and are distributed in the southern part of the microwatershed with major limitations of calcareousness and texture.

Table 7.2 Land suitability criteria for Sorghum.

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

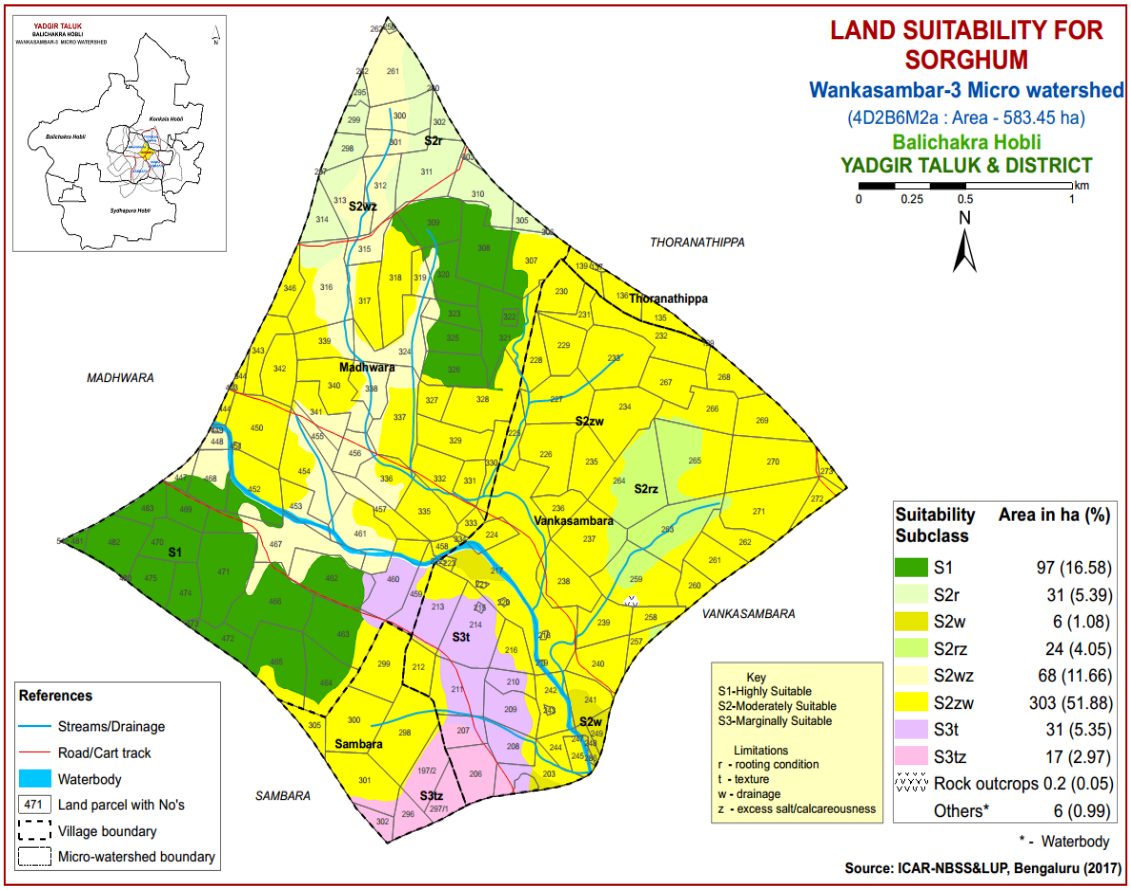


Fig. 7.1 Land Suitability map of Sorghum

Table 7.1 Soil-Site Characteristics of Wankasambar-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 (%)								
SBRcB2	866	150	SED	50-75	sl	ls	-	-	<50	1-3	moderate	8.24	0.15	1.15	7.50	100
HLGcB2	866	150	WD	50-75	sl	scl	-	-	51-100	1-3	moderate	8.49	0.19	0.69	8.80	100
HLGiB2	866	150	WD	50-75	sc	scl	-	-	51-100	1-3	moderate	8.49	0.19	0.69	8.80	100
YLRbB2	866	150	WD	50-75	ls	c	-	15-35	51-100	1-3	moderate	6.91	0.07	0.45	6.90	100
YLRbB3	866	150	WD	50-75	ls	c	-	15-35	51-100	1-3	severe	6.91	0.07	0.45	6.90	100
YLRiB2	866	150	WD	50-75	sc	c	-	15-35	51-100	1-3	moderate	6.91	0.07	0.45	6.90	100
GWDcB2	866	150	MWD	75-100	sl	scl	-	-	101-150	1-3	moderate	9.89	0.74	43.51	8.35	100
GWDiB2	866	150	MWD	75-100	sc	scl	-	-	101-150	1-3	moderate	9.89	0.74	43.51	8.35	100
PGPcB2	866	150	WD	100-150	sl	sc	-	-	101-150	1-3	moderate	6.83	0.21	2.83	3.20	100
PGPiB2	866	150	WD	100-150	sc	sc	-	-	101-150	1-3	moderate	6.83	0.21	2.83	3.20	100
YDRcB2	866	150	WD	100-150	sl	sl	-	-	51-100	1-3	moderate	9.47	0.37	12.14	12.70	165
BGDbB2	866	150	MWD	100-150	ls	c	-	-	>200	1-3	moderate	7.85	0.25	0.26	66.00	100
ANRbB3	866	150	MWD	100-150	ls	c	-	-	>200	1-3	severe	10.17	0.36	17.70	20.00	100
MDRcB2	866	150	WD	>150	sl	scl	-	-	>200	1-3	moderate	8.31	0.33	2.26	21.00	100
SHTmB2	866	150	WD	75-100	c	scl	-	15-35	51-100	1-3	moderate	7.26	0.20	0.86	10.60	100
NHLmB1	866	150	WD	100-150	c	sl	-	-	>200	1-3	slight	5.41	0.12	3.36	14.28	75
KDRcB2	866	150	MWD	100-150	sl	c	-	-	>200	1-3	moderate	8.34	0.15	0.22	33.20	100

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

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.

Table 7.3 Land suitability criteria for Maize

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

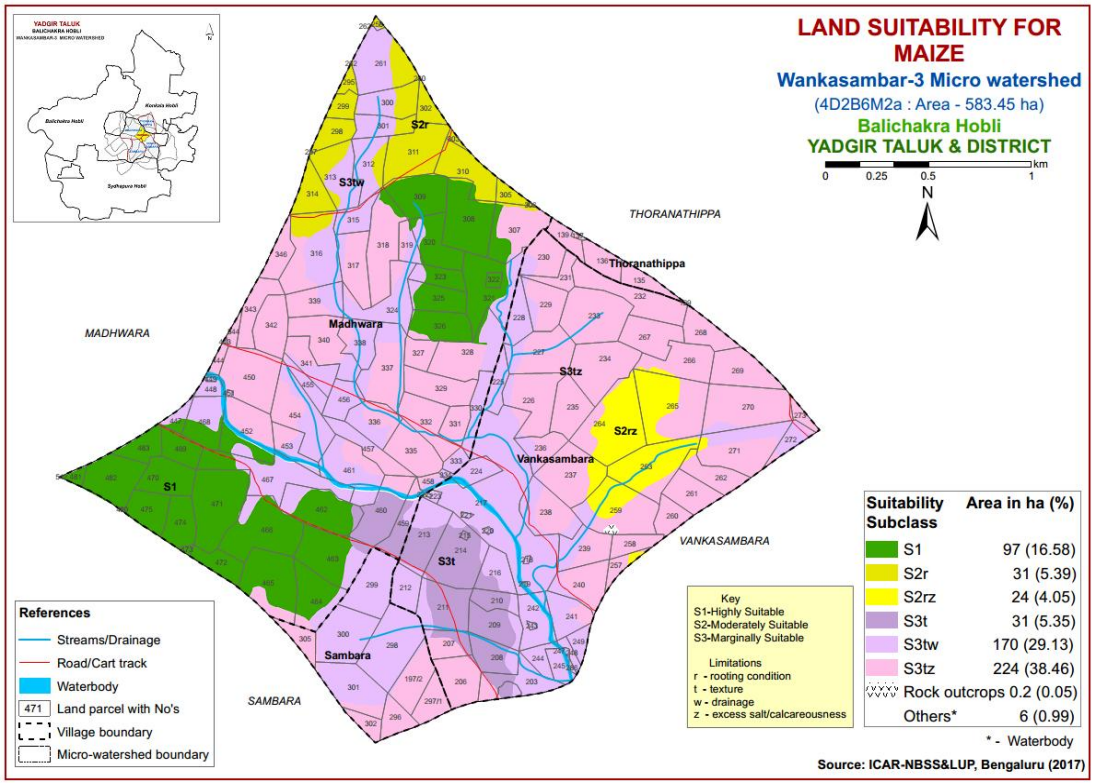


Fig. 7.2 Land Suitability map of Maize

Highly suitable (Class S1) lands for growing maize cover an area of about 97 ha (17%) and distributed in the northern and western part of the microwatershed. An area of about 55 ha (9%) is moderately suitable (Class S2) for growing maize and are distributed in the northern and western part of the microwatershed with minor limitations of

calcareousness and rooting depth. Marginally suitable lands (Class S3) for growing maize occupy an entire area of 425 ha (73%) and occur in all parts of the microwatershed. They have major limitations of texture, drainage and calcareousness.

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 districtsof 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 97 ha (17%) is highly suitable (Class S1) for growing bajra in the microwatershed and are distributed in the northern and western part of the microwatershed. Maximum area of about 461 ha (79%) is moderately suitable (Class S2) for growing bajra and are distributed in the major part of the microwatershed. They have minor limitations of texture, drainage, calcareousness and rooting depth. An area of about 20 ha (3%) is marginally suitable (Class S3) for growing Bajra and is distributed in the southern part of the microwatershed with major limitation of texture.

Table 7.4 Land suitability criteria for Bajra

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

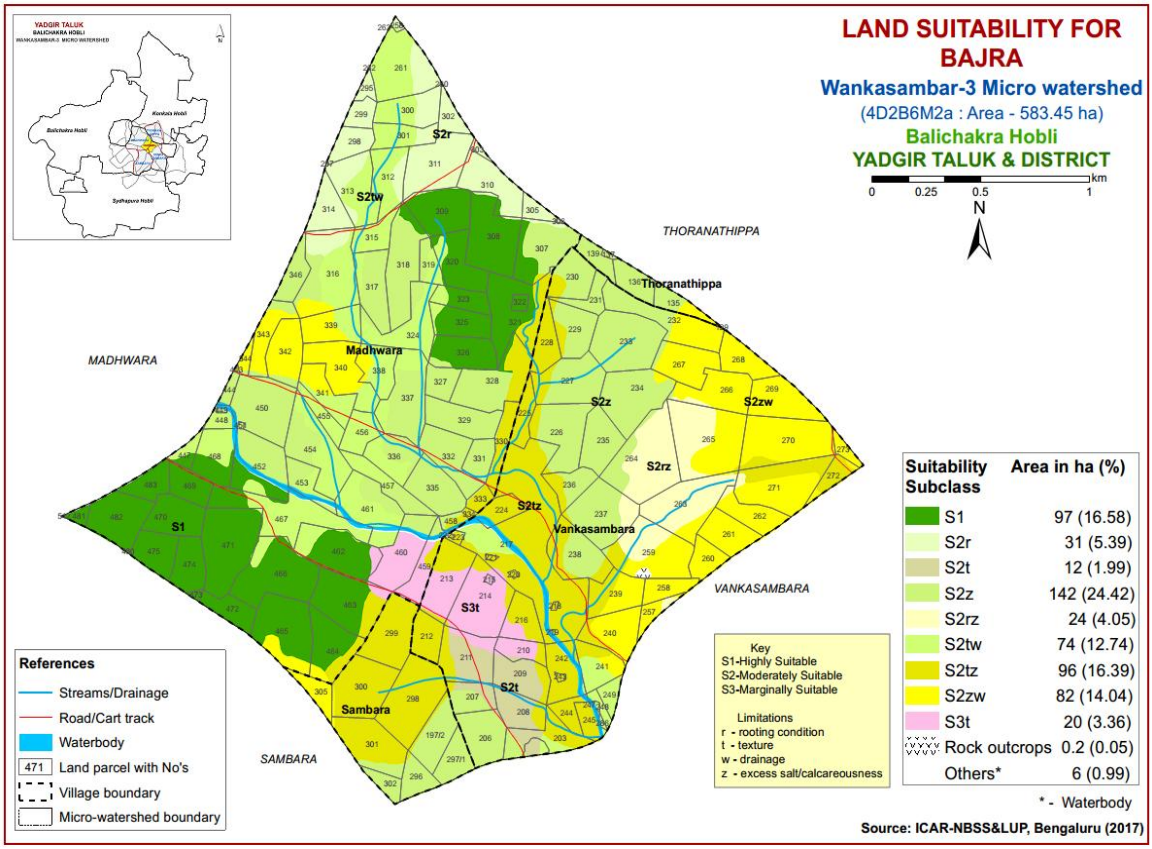


Fig. 7.3 Land Suitability map of Bajra

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.

Table 7.5 Land suitability criteria for Groundnut

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

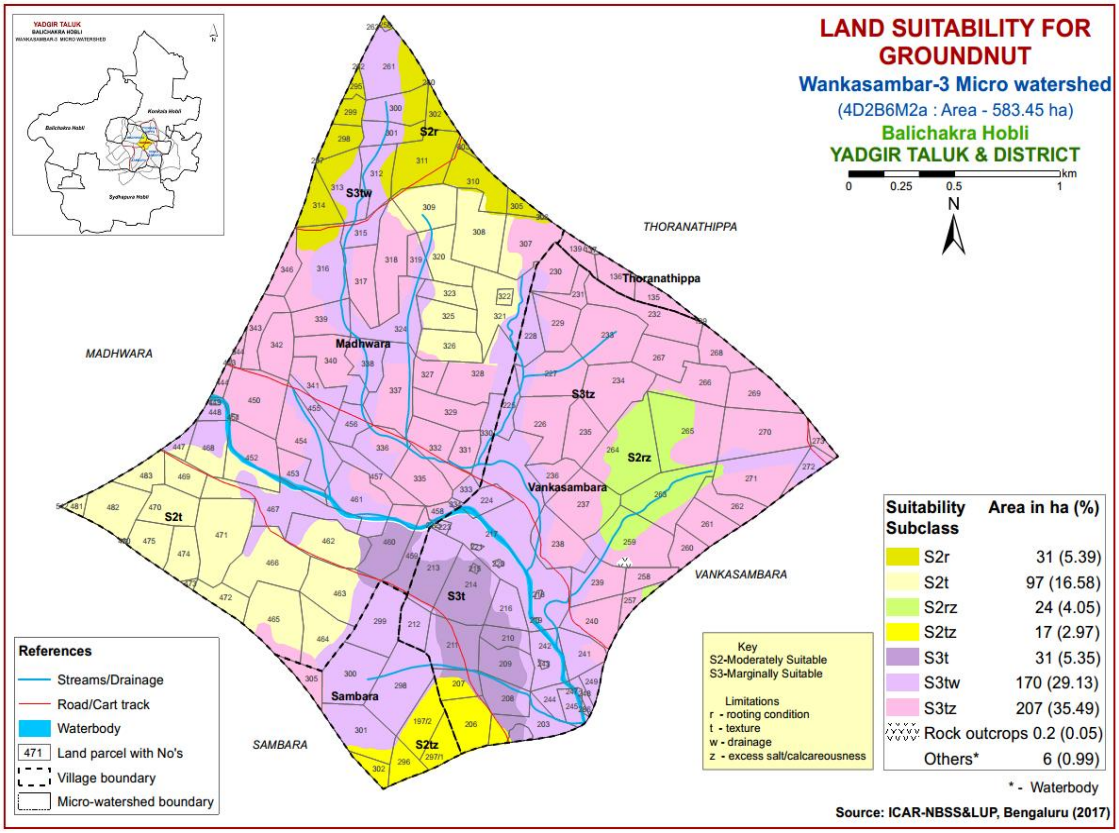


Fig. 7.4 Land Suitability map of Groundnut

No highly suitable (Class S1) lands are available for growing Groundnut in the microwatershed. An area of about 169 ha (29%) is moderately suitable (Class S2) for groundnut and are distributed in the northern, western and southern part of the microwatershed with minor limitations of rooting depth, texture and calcareousness. Marginally suitable lands (Class S3) for growing groundnut occupy maximum area of about 408 ha (70%) and are distributed in the major part of the microwatershed. They have major limitations of texture, drainage and calcareousness.

7.5 Land Suitability for Sunflower (*Helianthus annus*)

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

No highly suitable (Class S1) lands available for growing sunflower in the microwatershed. Maximum area of about 474 ha (82%) is moderately suitable (Class S2) for sunflower and are distributed in the major part of the microwatershed with minor limitations of drainage, calcareousness and rooting depth. An area of about 92 ha (16%) is marginally suitable (Class S3) for sunflower and are distributed in the northern, southern and eastern part of the microwatershed. They have major limitations of rooting depth, texture and calcareousness. An area of about 12ha (2%) is not suitable (Class N1) for

sunflower and are distributed in the southern part of the microwatershed with severe limitation of texture.

Table 7.6 Land suitability criteria for Sunflower

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

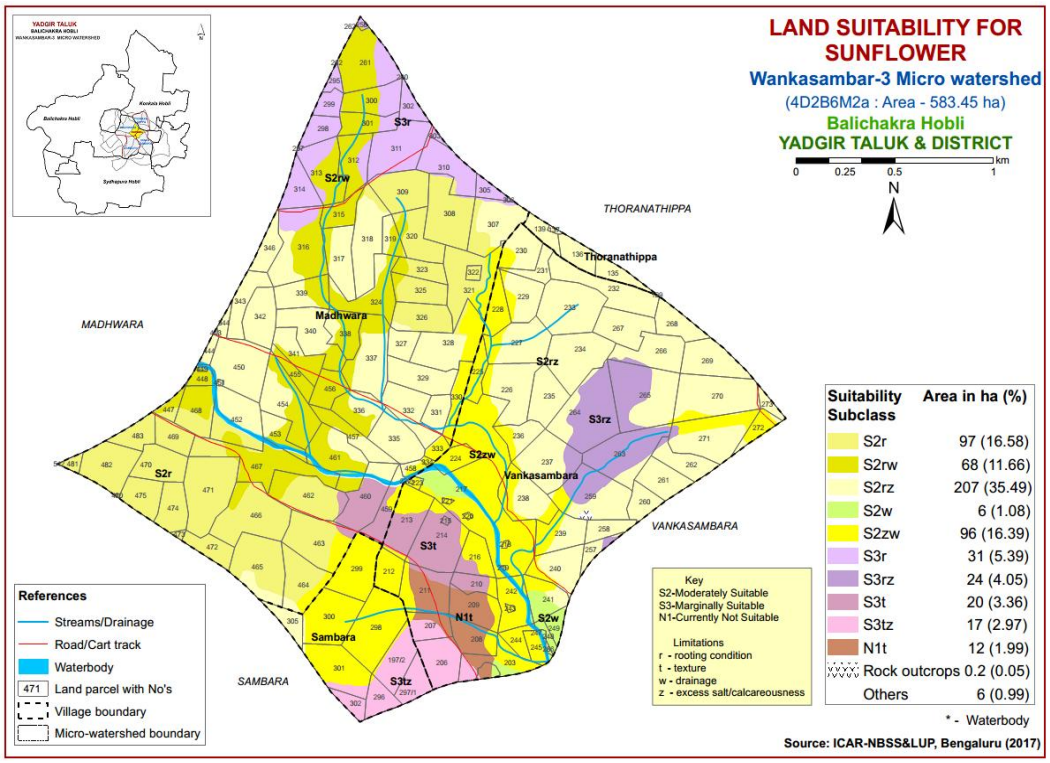


Fig. 7.5 Land Suitability map of Sunflower

7.6 Land suitability criteria for Redgram (*Cajanus Cajan)*

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

Table 7.7 Land suitability criteria for Redgram

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

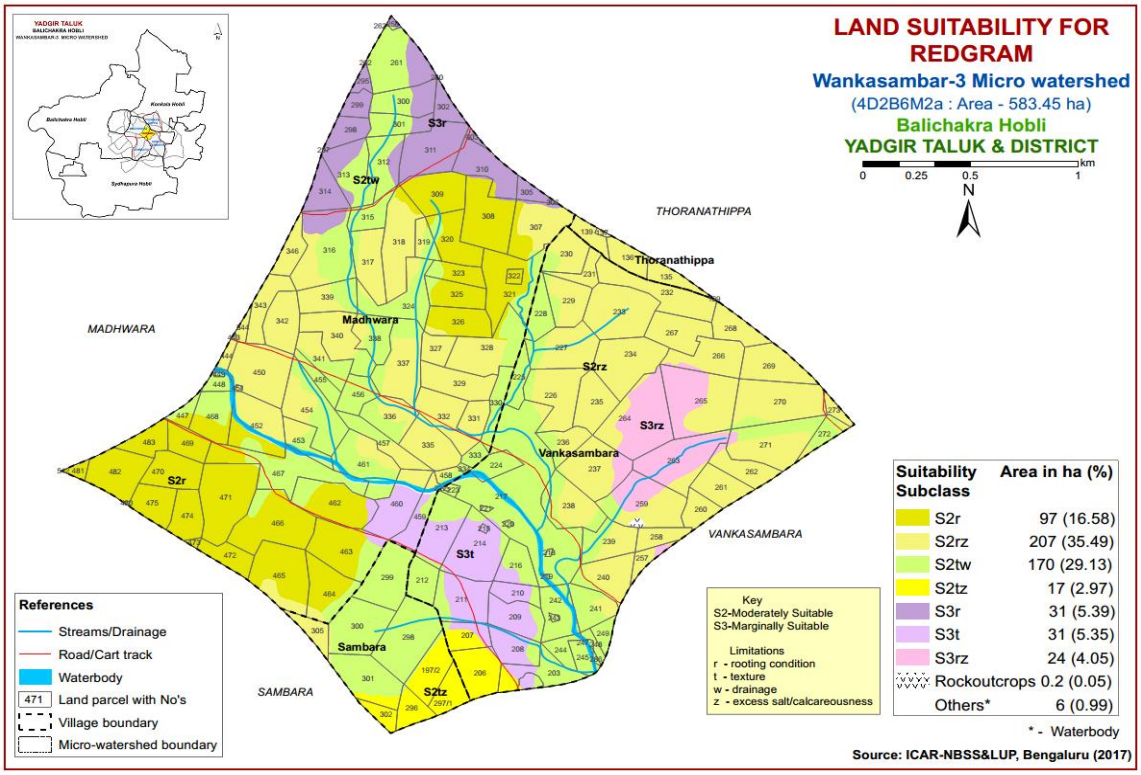


Fig. 7.6 Land Suitability map of Redgram

No highly suitable (Class S1) lands available for growing redgram in the microwatershed. Maximum area of about 491 ha (84%) is moderately suitable (Class S2) for growing redgram and are distributed in the major part of the microwatershed with minor limitations of texture, rooting depth, calcareousness and drainage. An area of about 86 ha (15%) is marginally suitable (Class S3) for redgram and are distributed in the northern, eastern and southern part of the microwatershed. They have major limitations of rooting depth, texture and calcareousness.

7.7 Land Suitability for Bengalgram (*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 are given in Figure 7.7.

Table 7.8 Land suitability criteria for Bengalgram

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

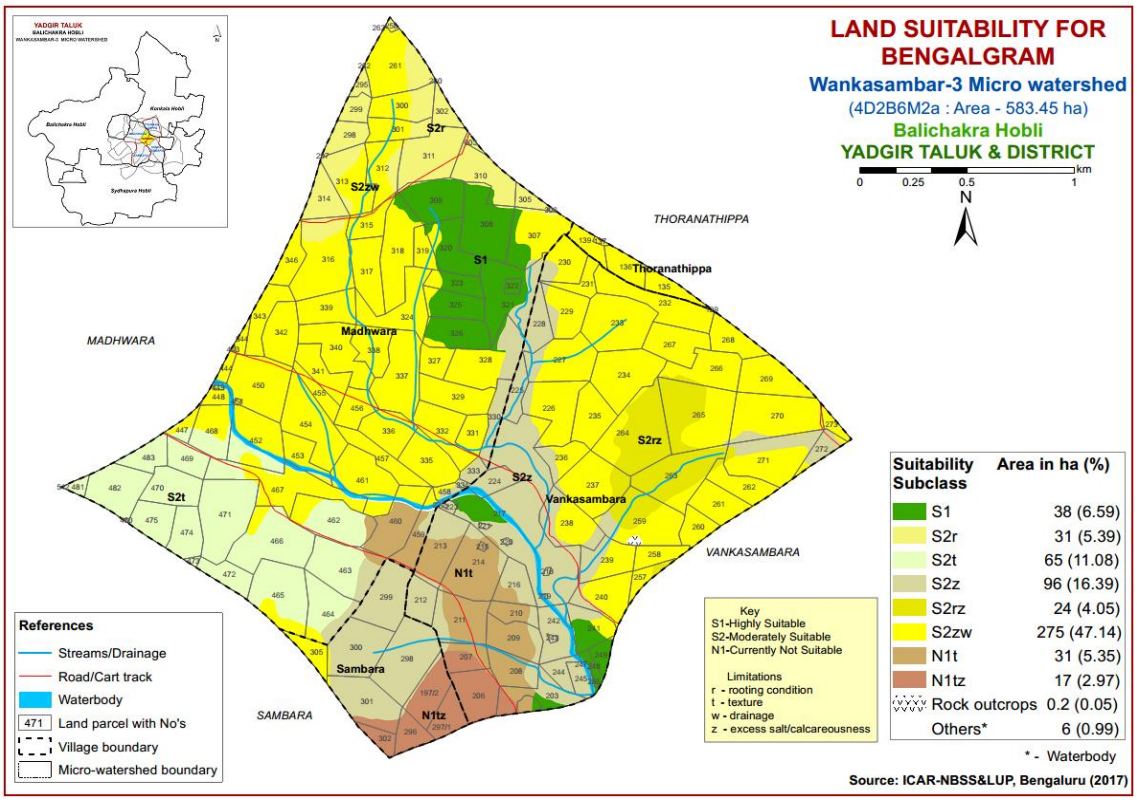


Fig. 7.7 Land Suitability map of Bengalgram

Highly suitable (Class S1) lands for growing Bengal gram cover an area of about 38 ha (7%) and are distributed in the northern and southern part of the microwatershed. Maximum area of about 491 ha (84%) is moderately suitable (Class S2) for growing Bengal gram and are distributed in all parts of the microwatershed with minor limitations of drainage, calcareousness, texture and rooting depth. No Marginally suitable lands (Class S3) are available for growing Bengal gram. An area of about 48 ha (8%) is not suitable (Class N1) for Bengal gram and are distributed in the southern part of the microwatershed with severe limitations of texture and calcareousness.

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

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

Highly suitable (Class S1) lands for growing cotton cover an area of about 6 ha (1%) and are distributed in the southern part of the microwatershed. Maximum area of about 523 ha (90%) is moderately suitable (Class S2) for growing cotton and are distributed in all parts of the microwatershed with minor limitations of drainage, calcareousness and rooting depth. No Marginally suitable lands (Class S3) are available for growing cotton. An area of about 48ha (8%) is not suitable (Class N1) for cotton and are distributed in the southern part of the microwatershed with severe limitations of texture and calcareousness.

Table 7.9 Land suitability criteria for Cotton

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

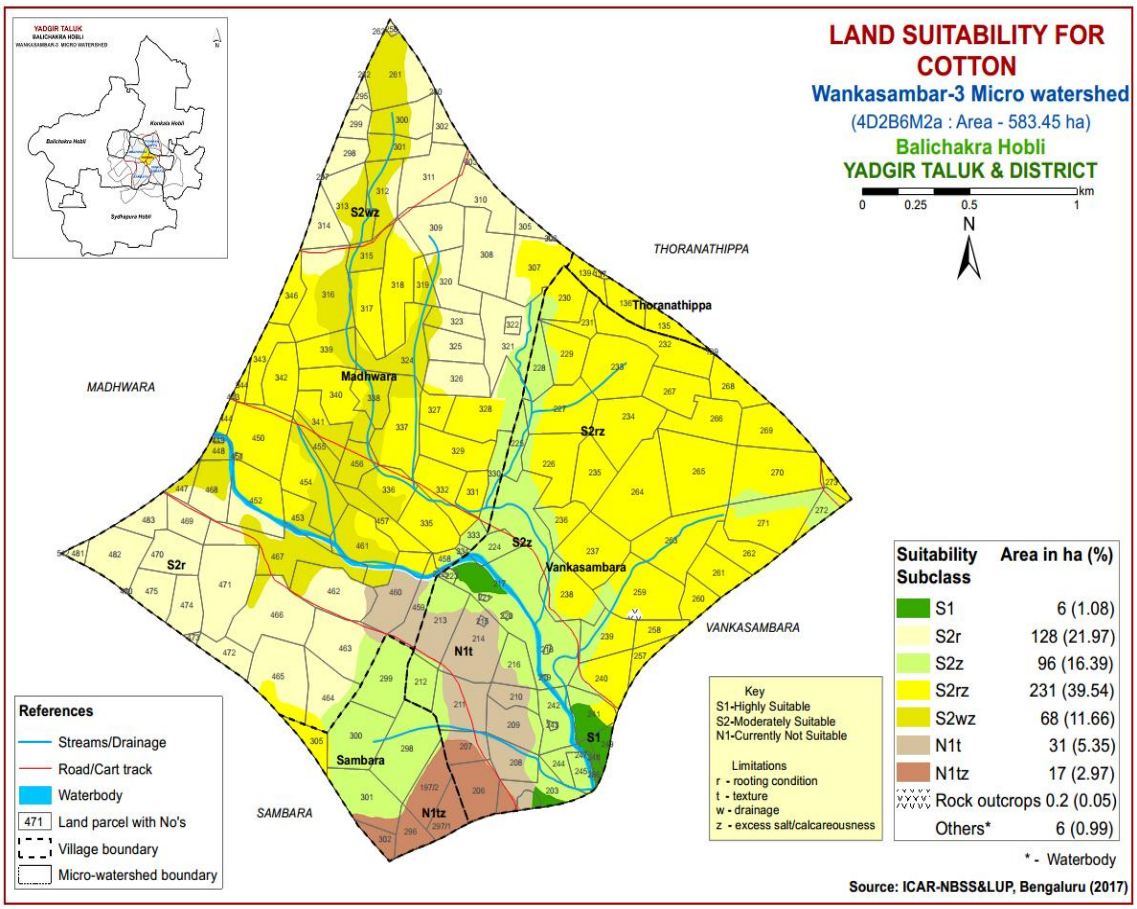


Fig. 7.8 Land Suitability map of Cotton

7.9 Land Suitability for Chilli (*Capsicum annuum)*

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

No highly (Class S1) suitable lands for growing chilli in the microwatershed. Maximum area of about 546 ha (94%) is moderately suitable (Class S2) for growing chilli and are distributed in all parts of the microwatershed with minor limitations of drainage, texture, calcareousness and rooting depth. Marginally suitable lands (Class S3) occupy an area of about 31ha (5%) and are distributed in the southeastren part of the microwatershed. They have major limitation of texture.

Table 7.10 Land suitability criteria for Chilli

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

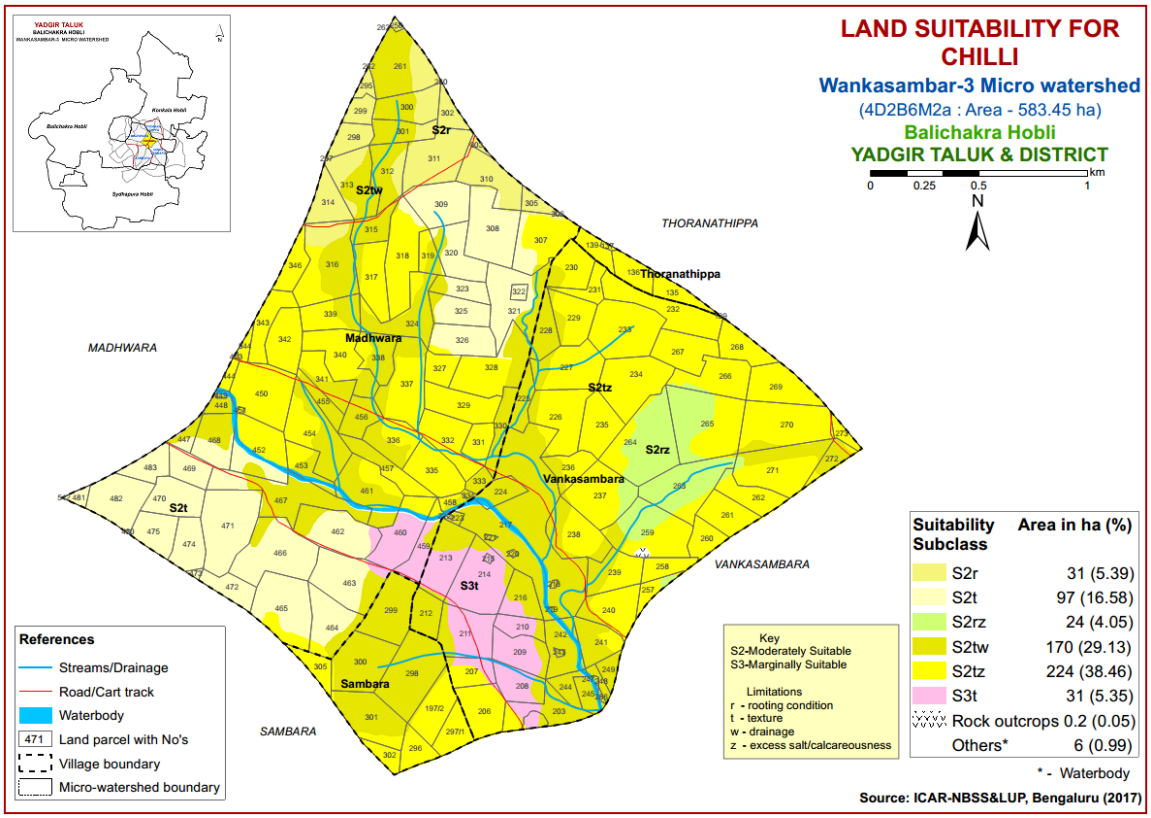


Fig 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato *(Lycopersicon esculentum)*

Tomato is one of the most important vegetablecrop 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.

Table 7.11 Land suitability criteria for Tomato

Crop requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
climate	Temp in growingseason	^{0}c	25-28	29-32, 20-24	15-1933-36	<15, >36
Soil moisture	Growing period	Days	>150	120-150	90-120	
Soil aeration	Soil drainage	class	Well drained	Moderately well drained	Poorly drained	V. poorly drained
Nutrient availability	Texture	Class	l, sl, cl, scl	sic, sicl, sc, c(m/k)	c (ss), ls	s
	pH	1:2.5	6.0-7.3	5.5-6.07.3-8.4	8.4-9.0	>9.0
	$CaCO_3$ in root zone		Non calcareous	Slightly calcareous	Stronglycalcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	%vol.	<15	15-35	>35	
Soil toxicity	Salinity	ds/m	Non saline	slight	strongly	
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	>10

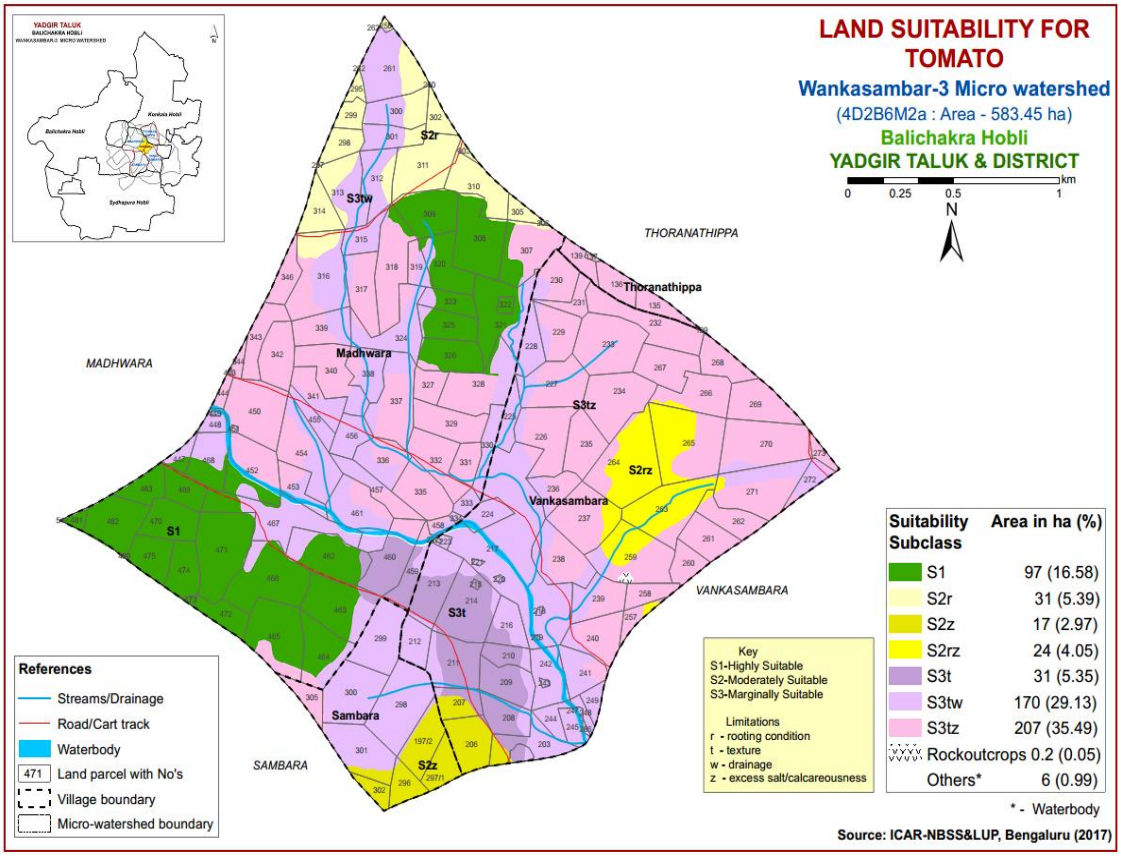


Fig 7.10 Land Suitability map of Tomato

Highly suitable (Class S1) lands for growing tomato cover an area of 97 ha (17%) and are distributed in the northern and western part of the microwatershed. An area of about 72 ha (12%) is moderately suitable (Class S2) for growing tomato and are distributed in the northern, eastern and southern part of the microwatershed. They have minor limitations of rooting depth and calcareousness. Marginally suitable lands (Class S3) occupy major area of about 408 ha (70%) and are distributed in all parts of the microwatershed. They have moderate limitations of texture, calcareousness and drainage.

7.11 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 7.12)were matched with the soil-site characteristics (Table 7.1)and a land suitability map for growing drumstick was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.11.

No highly (Class S1) suitable lands for growing drumstick in the microwatershed. Major area of about 491ha (85%) is moderately suitable (Class S2) for drumstick and are distributed in the major part of the microwatershed. They have minor limitations of texture, rooting depth, calcareousness and drainage. An area of about 86 ha (15%) is marginally suitable (Class S3) for growing drumstick and are distributed in the northern, southern and eastern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and texture.

Table 7.12 Land suitability criteria for Drumstick

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

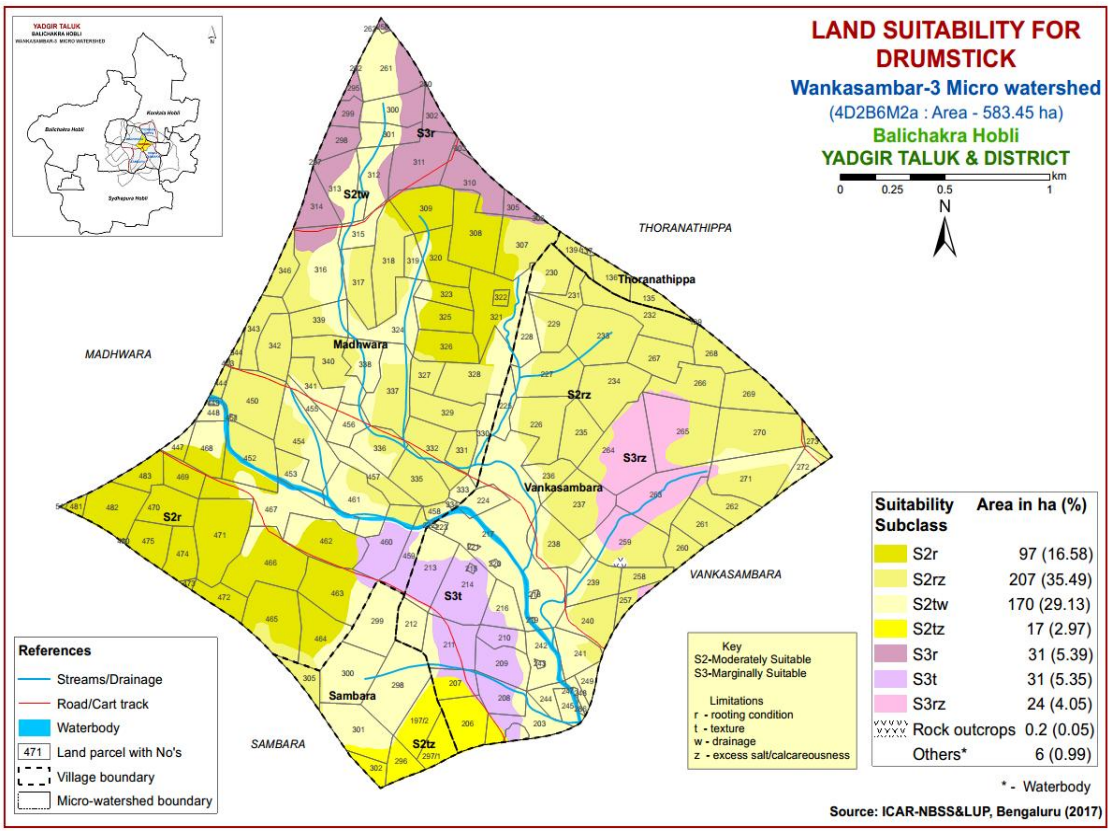


Fig 7.11 Land Suitability map of Drumstick

7.12 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 7.13) 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 7.12.

No highly suitable (Class S1)and moderately suitable (Class S2) lands are available for growing mango in the microwatershed. Maximum area of 503 ha (87%) is marginally suitable (Class S3) for growing mango with moderate limitations of drainage, texture, rooting depth and calcareousness and are distributed in the major part of the microwatershed. An area of about 75 ha (13%) is not suitable (Class N1) for growing mango and occur in the northern, southern and eastern part of the microwatershed with severe limitations of rooting depth and calcareousness.

Table 7.13 Land suitability criteria for Mango

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

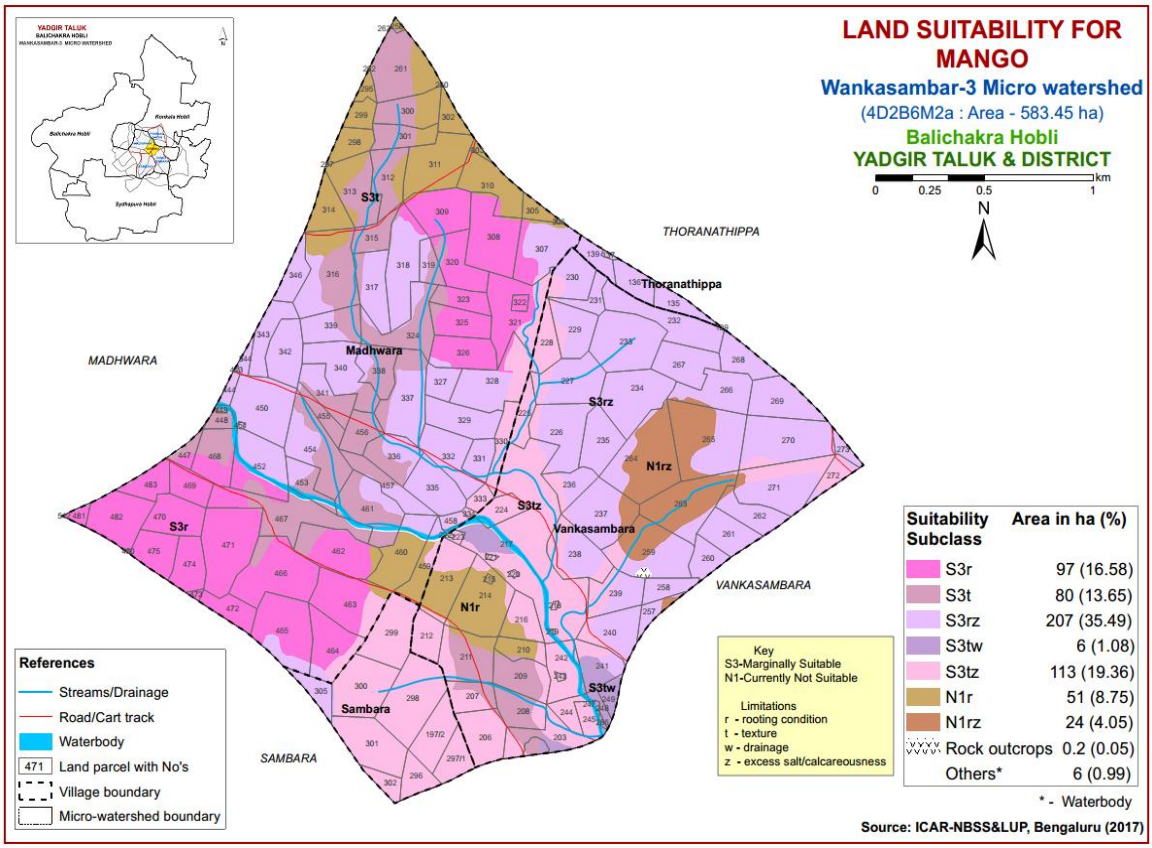


Fig. 7.12 Land Suitability map of Mango

7.13 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 7.14) 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 7.13.

Table 7.14 Land suitability criteria for Guava

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

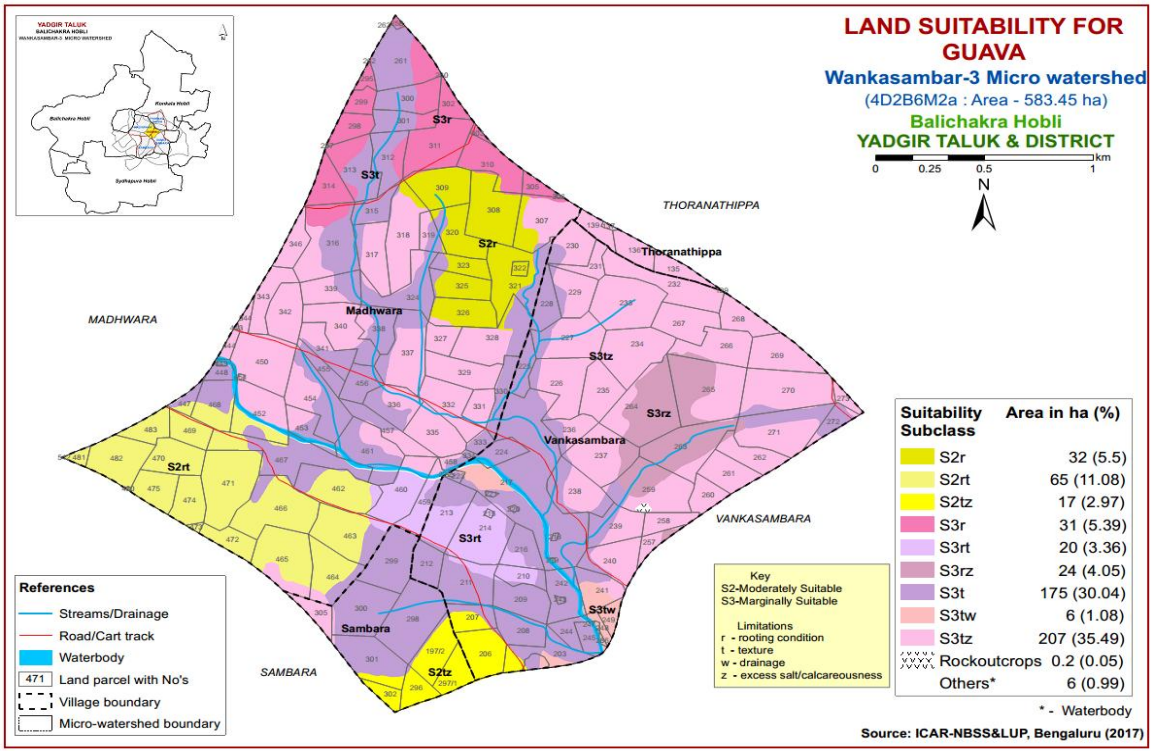


Fig. 7.13 Land Suitability map of Guava

No highly suitable (Class S1) lands are available for growing guava in the microwatershed. An area of about 114 ha (20%) is moderately suitable (Class S2) with minor limitations of texture, calcareousness and rooting depth and are distributed in the northern, western and southern part of the microwatershed. Maximum area of 463 ha (79%) is marginally suitable (Class S3) for growing guava with moderate limitations of drainage, texture, calcareousness and rooting depth and are distributed in the major part of the microwatershed.

7.14 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 7.15) for growing sapota were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sapota was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.14.

No highly suitable (Class S1) lands are available for growing Sapota in the microwatershed. An area of about 114 ha (20%) is moderately suitable (Class S2) with minor limitations of calcareousness, texture and rooting depth and are distributed in the northern, southern and western part of the microwatershed. Maximum area of about 463 ha (79%) is marginally suitable (Class S3) for growing sapota and are distributed in the major part of the microwatershed. They have moderate limitations of rooting depth, texture, calcareousness and drainage.

Table 7.15 Land suitability criteria for Sapota

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

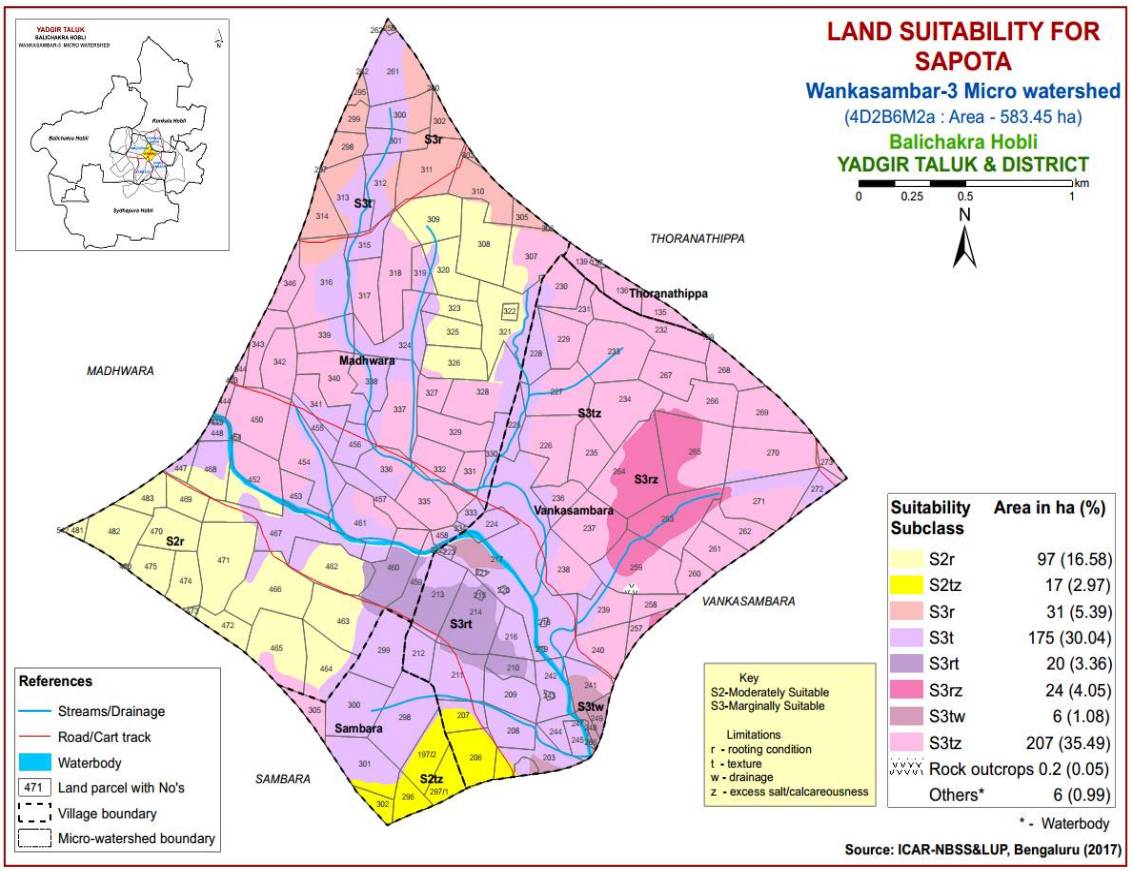


Fig. 7.14 Land Suitability map of Sapota

7.15 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 7.16) 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 7.15.

No highly (Class S1) suitable lands available for growing pomegranate in the microwatershed. Major area of about 491ha (85%) is moderately suitable (Class S2) for growing pomegranate and is distributed in all parts of the microwatershed. They have minor limitations of texture, rooting depth, calcareousness and drainage. An area of about 87 ha (15%) is marginally suitable (Class S3) for growing pomegranate and are distributed in the northern, southern and eastern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and texture.

Table 7.16 Land suitability criteria for Pomegranate

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

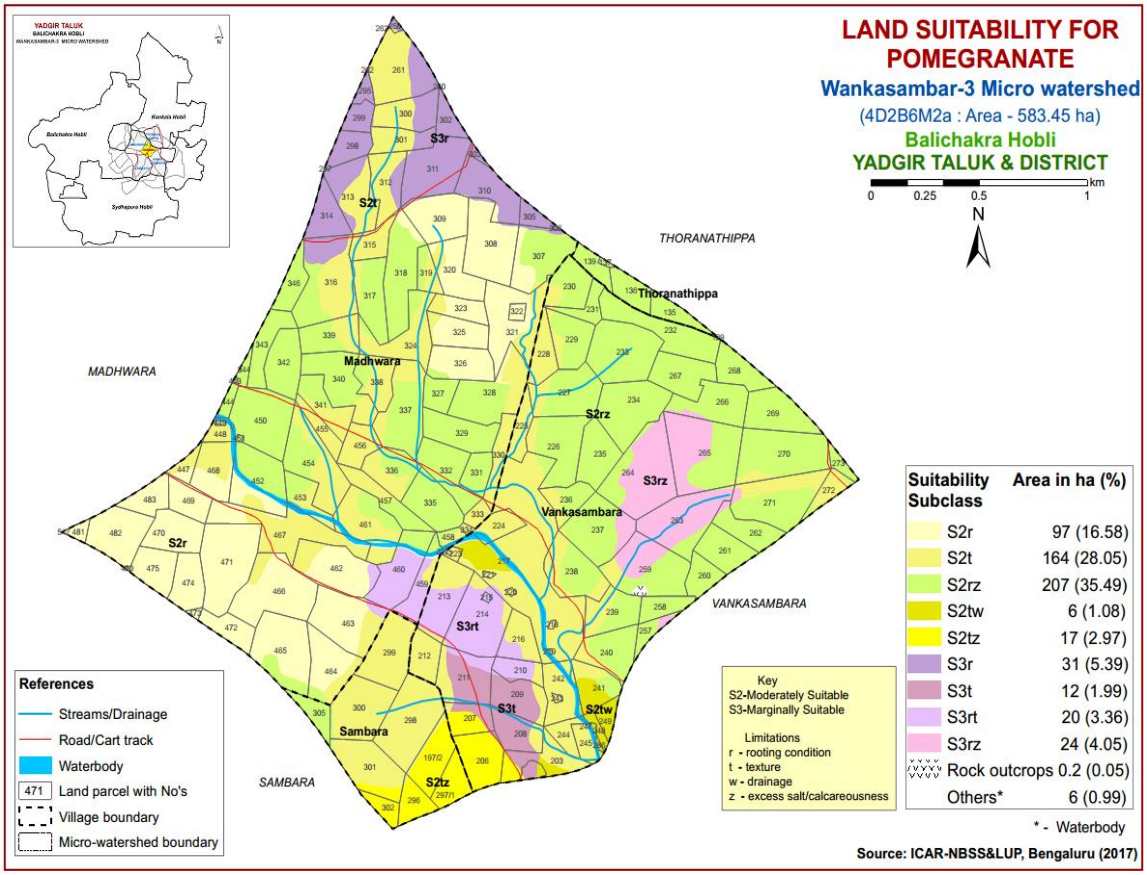


Fig 7.15 Land Suitability map of Pomegranate

7.16 Land Suitability for 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 7.17) 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 7.16.

Table 7.17 Land suitability criteria for Musambi

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable (S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod. to imperfectly drained	poorly	Very poorly
Nutrient availability	Texture	Class	scl, l, sicl, cl, s	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.4,7.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
Rooting conditions	Soil depth	Cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Erosion	Slope	%	<3	3-5	5-10	

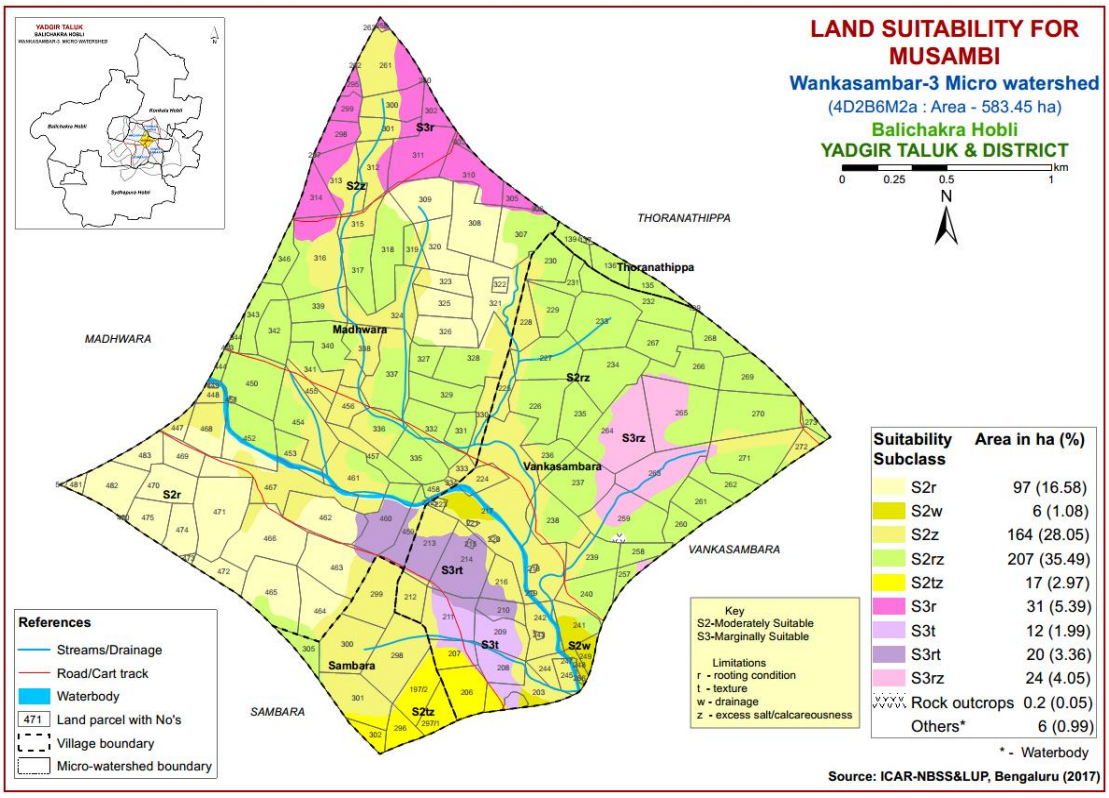


Fig. 7.16 Land Suitability map of Musambi

No highly (Class S1) suitable lands are available for growing Musambi in the microwatershed. Maximum area of about 491 ha (85%) is moderately suitable (Class S2) for growing Musambi and are distributed in all parts of the microwatershed. They have minor limitations of drainage, texture, rooting depth and calcareousness. Marginally suitable (Class S3) lands occupy an area of about 87 ha (15%) and are distributed in the northern, southern and eastern part of the microwatershed. They have moderate limitations of rooting depth, texture and calcareousness.

7.17 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 7.18) 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. 17.

Table 7.18 Land suitability criteria for Lime

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	28-30	31-35 24-27	36-40 20-23	>40 <20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imper. drained	poorly	Very poorly
Nutrient availability	Texture	Class	scl, l, sicl, cl, s	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.47.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
	$CaCO_3$ in root zone	%	Non 34calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	Cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

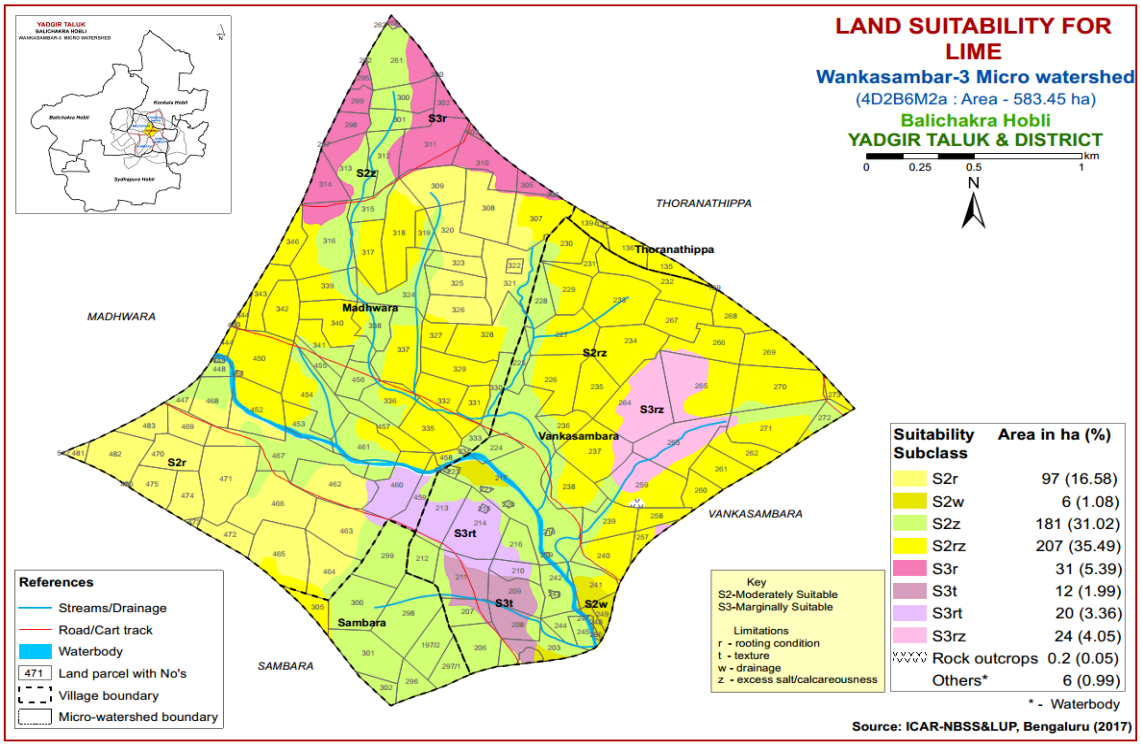


Fig. 7.17 Land Suitability map of Lime

No highly (Class S1) suitable lands available for growing Lime in the microwatershed. Maximum area of about 491 ha (85%) is moderately suitable (Class S2) for growing Lime and are distributed in all parts of the microwatershed. They have minor limitations of drainage, rooting depth and calcareousness. Marginally suitable (Class S3) lands occupy an area of about 87 ha (15%) and are distributed in the northern, southern and eastern part of the microwatershed. They have moderate limitations of rooting depth, texture and calcareousness.

7.18 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 7.19) 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 7.18.

Highly suitable (Class S1) lands are available for growing Amla in an area of 97 ha (17%) and are distributed in the northern and western part of the microwatershed. Maximum area of about 432 ha (74%) is moderately suitable (Class S2) for growing amla 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 an area of about 48 ha (8%) and are distributed in the southern part of the microwatershed with major limitations of calcareousness and texture.

Table 7.19 Land suitability criteria for Amla

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

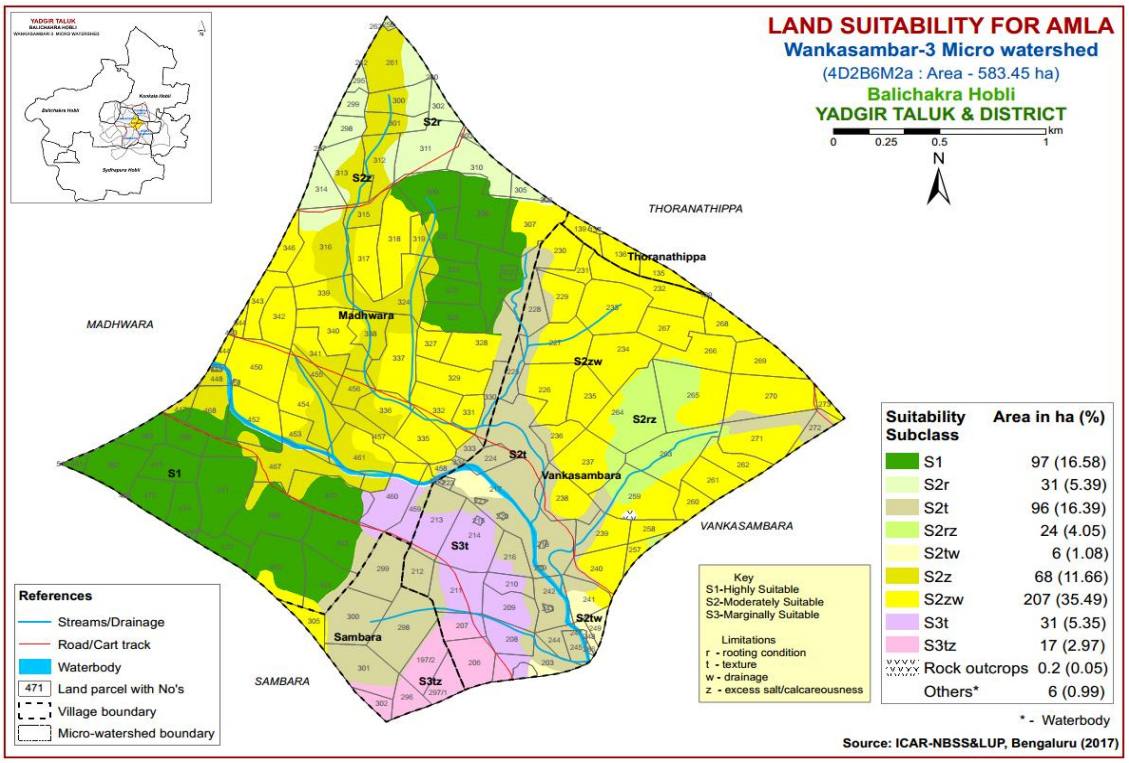


Fig. 7.18 Land Suitability map of Amla

7.19 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 7.20) 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 7.19.

No highly suitable (Class S1) lands are available for growing Cashew in the microwatershed. An area of about 65 ha (11%) is moderately suitable (Class S2) for growing cashew and are distributed in the western part of the microwatershed. They have minor limitations of rooting depth and texture. An area of about 80 ha (14%) is marginally suitable (Class S3) for growing cashew and are distributed in the northern and southern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and texture. Maximum area of about 433ha (75%) is not suitable (Class N1) for growing cashew and occur in all parts of the microwatershed with severe limitations of texture, drainage and calcareousness.

Table 7.20 Land suitability criteria for Cashew

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

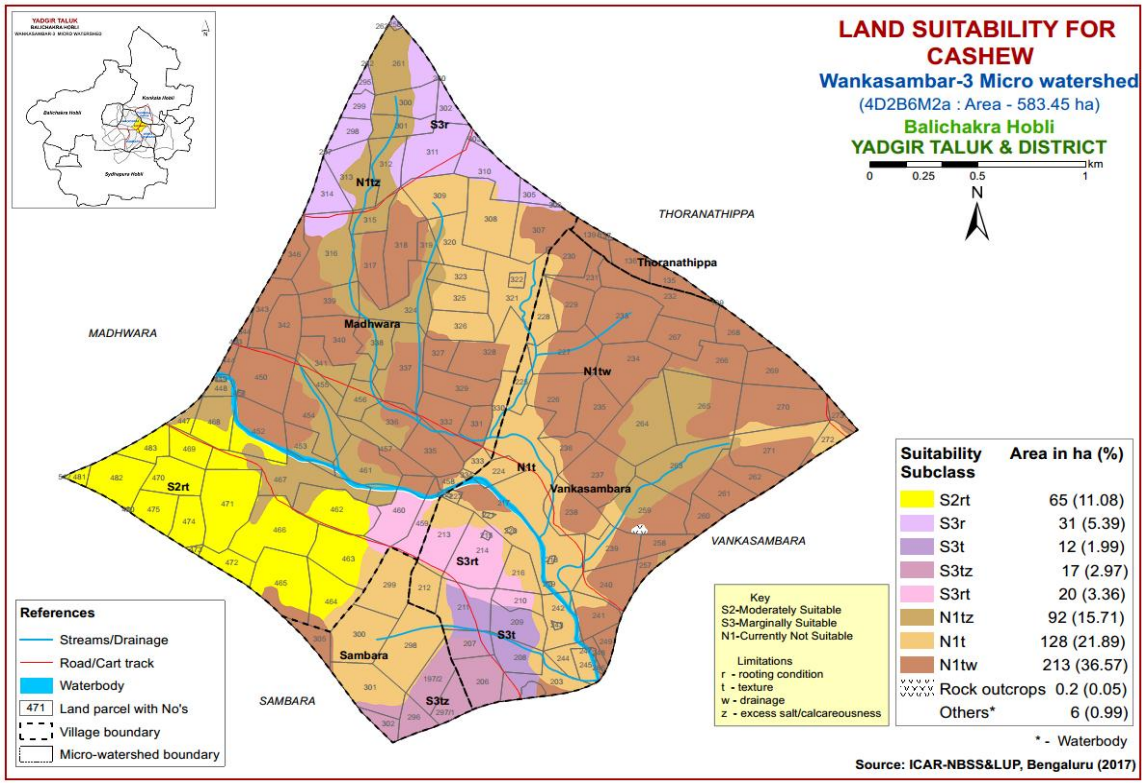


Fig. 7.19 Land Suitability map of Cashew

7. 20Land 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 7.21) 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 7.20.

No highly suitable (Class S1) lands available for growing Jackfruit in the microwatershed. An area of about 97 ha (17%) is moderately suitable (Class S2) for growing Jackfruit with minor limitation of rooting depth. Major area of about 480ha (82%) is marginally suitable (Class S3) for growing Jackfruit and are distributed in all parts of the microwatershed. They have major limitations of rooting depth, texture, calcareousness and drainage.

Table 7.21 Land suitability criteria for Jackfruit

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

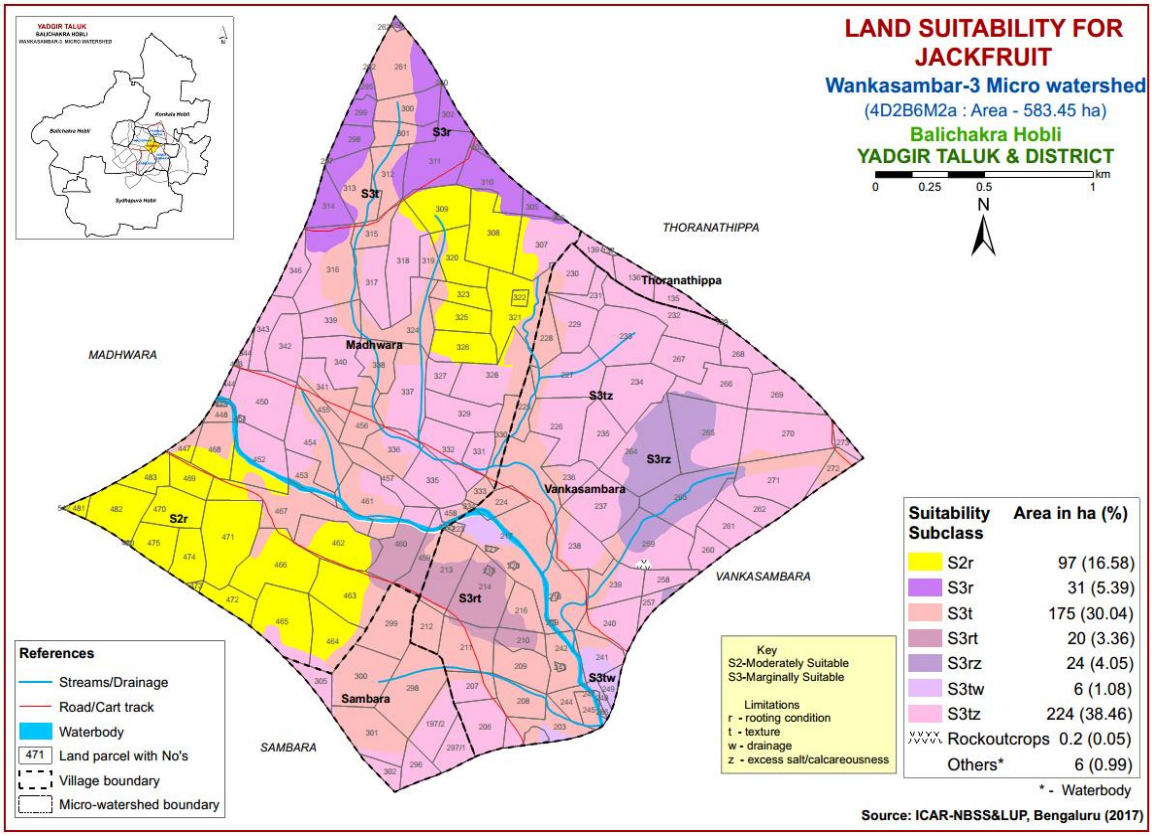


Fig. 7.20 Land Suitability map of Jackfruit

7.21 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 22) 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 are given in Figure 7.21.

No highly suitable (Class S1) lands available for growing Jamun in the microwatershed. An area of about 187 ha (32%) is moderately suitable (Class S2) for growing Jamun and are distributed in the northern, eastern, western, central and southern part of the microwatershed. They have minor limitations of texture, calcareousness,

rooting depth and drainage. Maximum area of about 391 ha (67%) is marginally suitable (Class S3) for growing Jamun and are distributed in all parts of the microwatershed. They have major limitations of rooting depth, texture and calcareousness.

Table 7.22 Land suitability criteria for Jamun

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

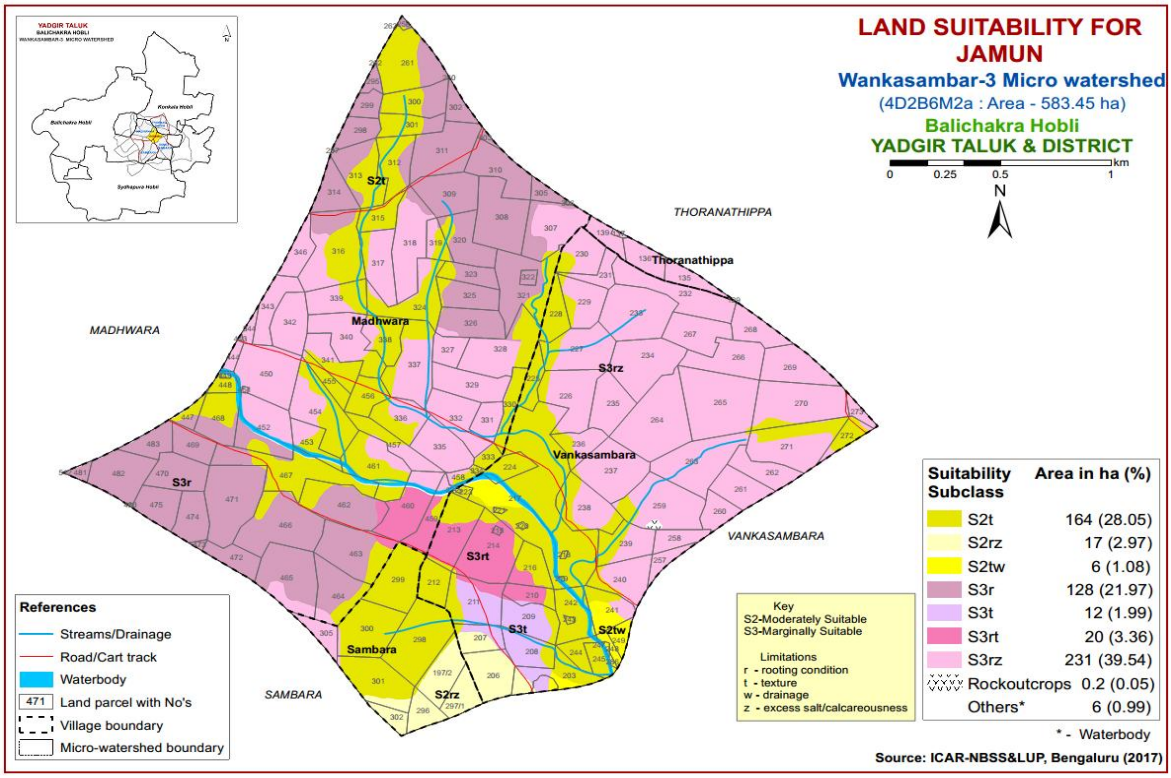


Fig. 7.21 Land Suitability map of Jamun

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

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing custard apple (Table7.23) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.22.

Highly suitable (Class S1) lands of about 97 ha (17%) is available for growing Custard apple and are distributed in the northern and western part of the microwatershed. Maximum area of about 432 ha (74%) is moderately suitable (Class S2) for growing Custard apple and are distributed in all parts of the microwatershed. They have minor limitations of drainage, calcareousness and rooting depth. Marginally suitable lands (Class S3) occupy an area of about 48 ha (8%) and are distributed in the southern part of the microwatershed with major limitations of calcareousness and texture.

Table 7.23 Land suitability criteria for Custard apple

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

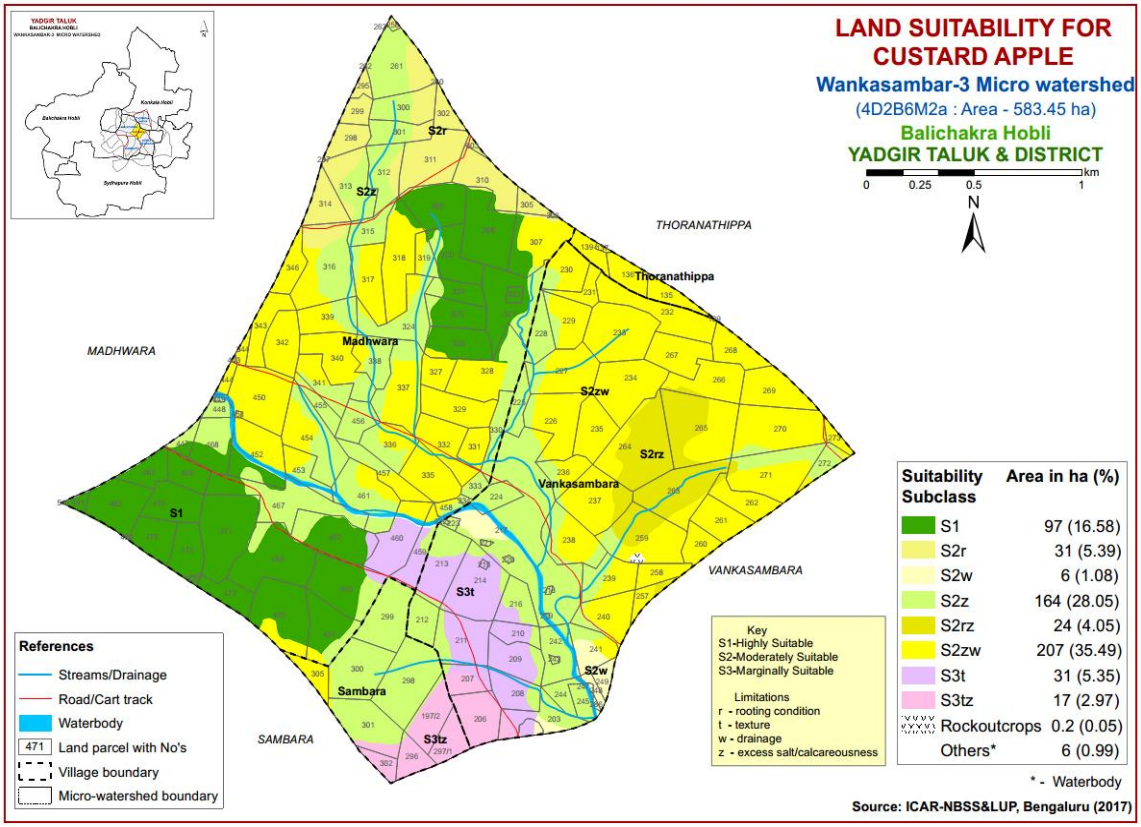


Fig. 7.22 Land Suitability map of Custard Apple

7.23 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is the most important spice crop grown in almost all the districts of the state. The crop requirements for growing tamarind (Table 7.24) 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. 7.23.

Table 7.24 Land suitability criteria for Tamarind

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

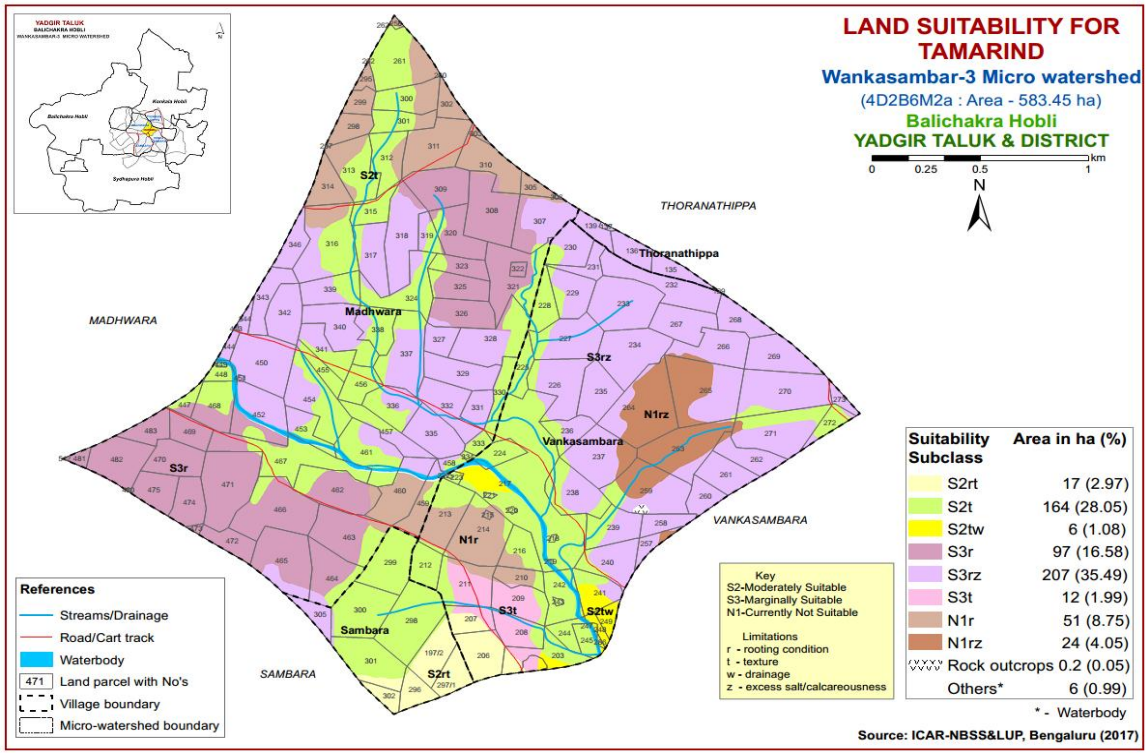


Fig. 7.23 Land Suitability map of Tamarind

No highly suitable (Class S1) lands are available for growing Tamarind in the microwatershed. An area of about 187 ha (32%) is moderately suitable (Class S2) for growing Tamarind and are distributed in the northern, eastern, southern, central and western part of the microwatershed with minor limitations of texture, rooting depth and drainage. Maximum area of about 316 ha (54%) is marginally suitable (Class S3) for growing Tamarind and are distributed in all parts of the microwatershed. They have

minor limitations of texture, calcareousness and rooting depth. An area of about 75 ha (13%) is not suitable (Class N1) for growing Tamarind and are distributed in the northern, eastern and southern part of the microwatershed with severe limitations of rooting depth and calcareousness.

7.24 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 7.25)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 7.24.

Table 7.25 Land suitability criteria for Mulberry

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

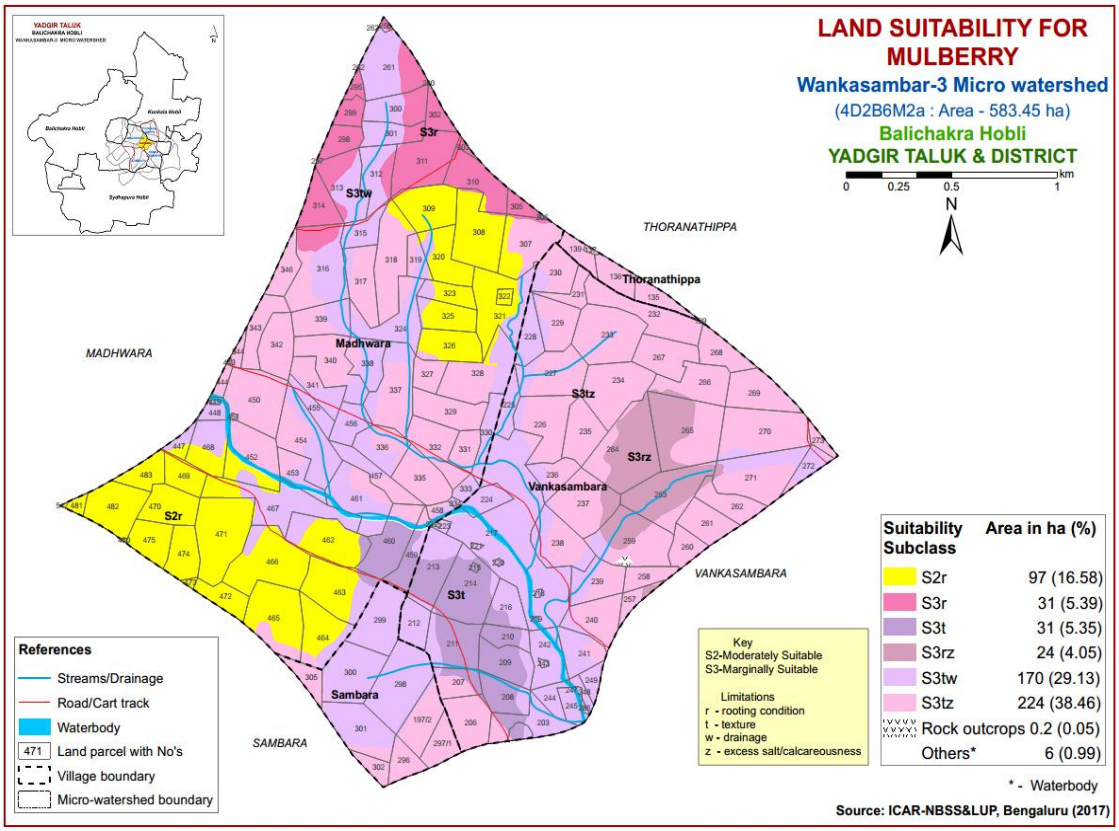


Fig 7.24 Land Suitability map of Mulberry

No highly suitable (Class S1) lands are available for growing mulberry in the microwatershed. An area of about 97 ha (17%) is moderately suitable (Class S2) for growing Mulberry with minor limitation of rooting depth and are distributed in the northern and western part of the microwatershed. Major area of about 480 ha (82%) is marginally suitable (Class S3) for growing mulberry and are distributed in all parts of the microwatershed. They have major limitations of texture, drainage, calcareousness and rooting depth.

7.25 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 7.26) 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 7.25.

No highly suitable (Class S1) lands are available for growing Marigold in the microwatershed. Maximum area of about 546 ha (94%) is moderately suitable (Class S2) for growing Marigold and are distributed in the major part of the microwatershed. They have minor limitations of texture, drainage, calcareousness and rooting depth. Marginally suitable (Class S3) lands for growing Marigold occupy an area of about 31 ha (5%) and are distributed in the southern part of the microwatershed with severe limitation of texture.

Table 7.26 Land suitability criteria for Marigold

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	18-23	17-15 24-35	35-40 10-14	>40 <10
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l ,sl,scl,cl, sil	sicl, sc, sic,c	c	ls, s
	pH	1:2.5	7.0-7.5	5.5-5.9,7.6-8.5	<5,>8.5	-
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	-
Rooting conditions	Soil depth	Cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	-
Soil toxicity	Salinity	ds/m	Non saline	Slightly	Strongly	-
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	-

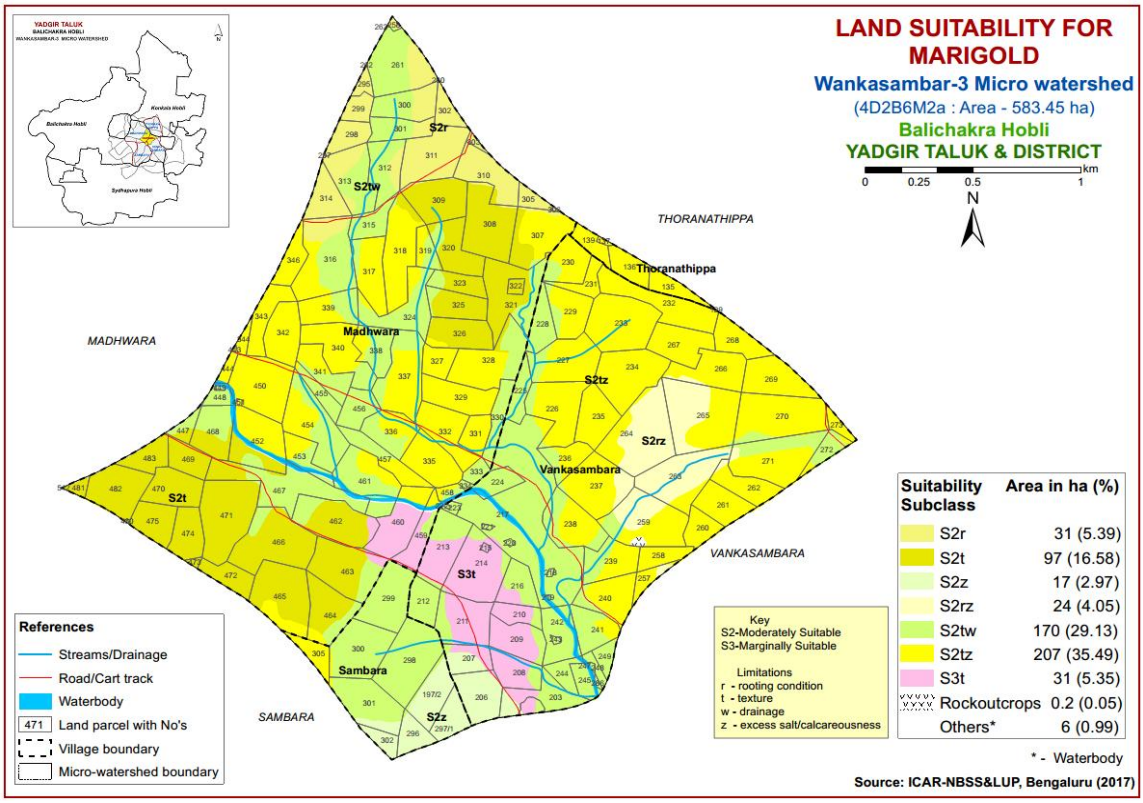


Fig. 7.25 Land Suitability map of Marigold

7.26 Land Suitability for Chrysanthemum (*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 7.27) for growing chrysanthemum were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing chrysanthemum was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.26.

Table 7.27 Land suitability criteria for Chrysanthemum

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

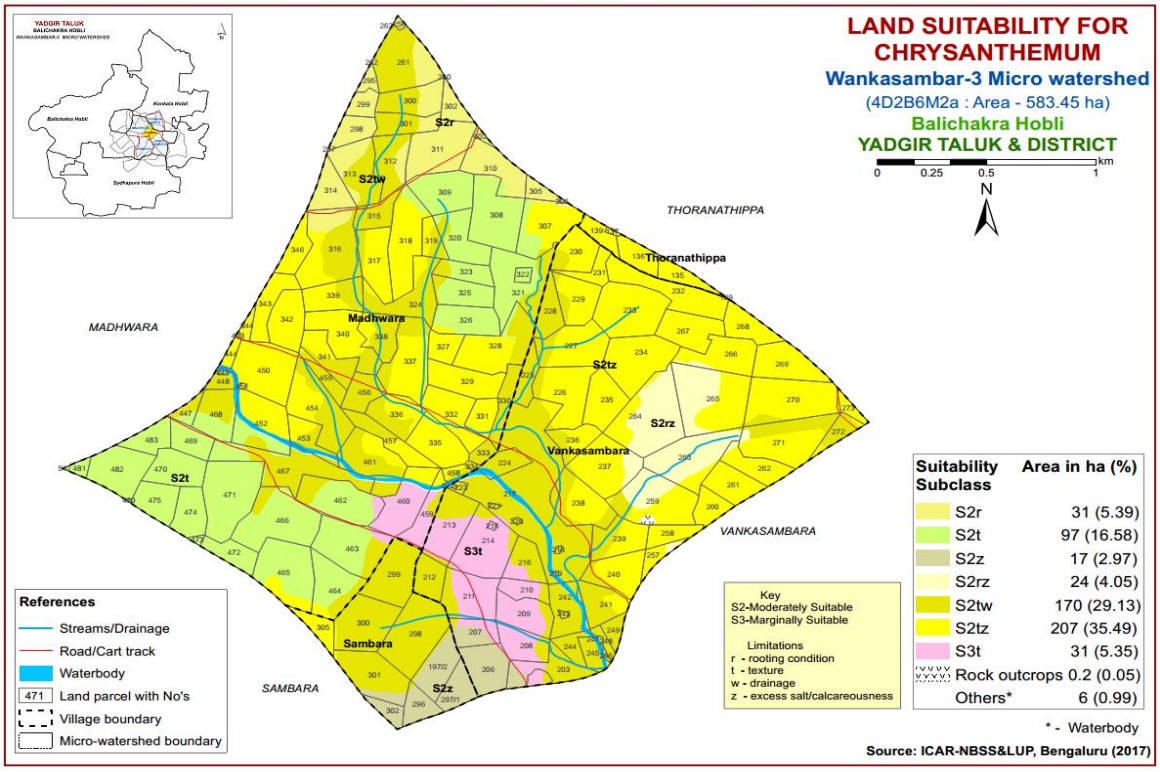


Fig. 7.26 Land Suitability map of Chrysanthemum

No highly suitable (Class S1) lands are available for growing Chrysanthemum in the microwatershed. Maximum area of about 546 ha (94%) is moderately suitable (Class S2) for growing Chrysanthemum and are distributed in the major part of the microwatershed. They have minor limitations of texture, drainage, calcareousness and rooting depth. Marginally suitable (Class S3) lands for growing Chrysanthemum occupy an area of about 31 ha (5%) and are distributed in the southern part of the microwatershed with severe limitation of texture.

7.27 Land Management Units (LMUs)

The 17 soil map units identified in Wankasambar-3microwatershed have been grouped into 7 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. 7.28) 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 7 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	101.NHLmB1	Very deep (>150 cm), lowland black clay soils, 1-3% slope, slight erosion.
2	112.SHTmB2 50.BGDbB2 52.ANRbB3 59.MDRcB2 84.KDRcB2 34.GWDcB2 35.GWDiB2	Moderately deep to very deep (75 to >150 cm), black sandy loam to clay soils, 1-3% slope, moderate to severe erosion.
3	42.YDRcB2	Deep(100-150 cm), black sandy loam soils, 1-3% slope, moderate erosion.
4	11.SBRcB2	Moderately shallow (50-75 cm), black sandy loam soils, 1-3% slope, moderate erosion.
5	16.HLGcB2 17.HLGiB2	Moderately shallow (50-75 cm), black sandy loam to sandy clay soils, 1-3% slope, moderate erosion.
6	40.PGPcB2 41.PGPiB2	Moderately deep (75-100 cm), red clay soils, 1-3% slope, moderate erosion.
7	27.YLRbB2 28.YLRbB3 31.YLRiB2	Moderately shallow (50-75 cm), red loamy sand to sandy clay soils, 1-3% slope, moderate to severe erosion

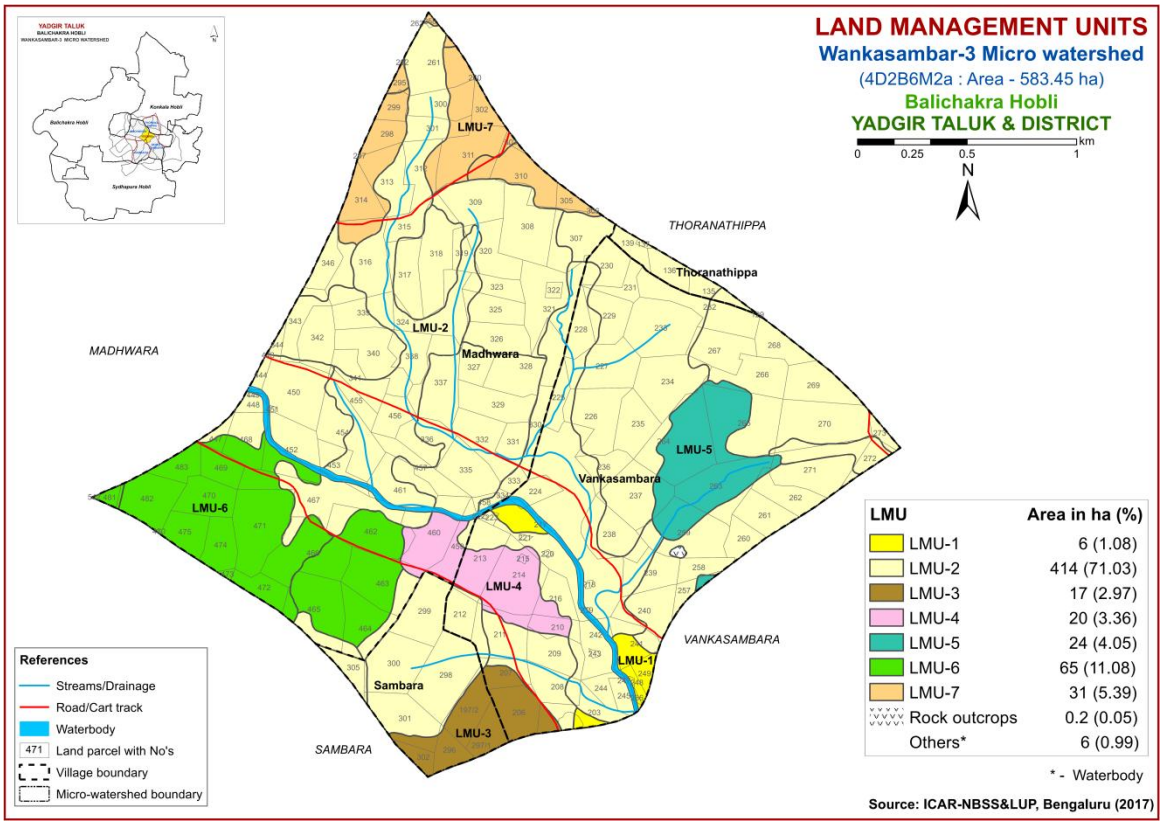


Fig. 7.27 Land Management Units Map of Wankasambar-3 Microwatershed

7.28 Proposed Crop Plan for Wankasambar-3 Microwatershed

After assessing the land suitability for the 26 crops, the proposed crop plan has been prepared for the 7 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 26 crops. The resultant proposed crop plan is presented below in Table 7.28.

Table 7.28 Proposed Crop Plan for Wankasambar-3Microwatershed

Proposed Land use Class	Soil Map Units	Survey Number	Soil and site characteristics	Field Crops	Horticulture Crops	Suitable Interventions
1	101.NHLmB1	**Vankasambara:** 241,247,248,249,286	Very deep (>150 cm), lowland black clay soils, 1-3% slope, slight erosion.	Sunflower, Cotton, Bengal gram, Bajra	**Fruit crops:**Lime, Musambi, Amla, Jamun **Vegetables:** Drumstick,Chilli, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, suitable soil and water conservation practices
2	112.SHTmB2 50.BGDbB2 52.ANRbB3 59.MDRcB2 84.KDRcB2 34.GWDcB2 35.GWDiB2	**Madhwara:**261,300,301,307,308, 309,312,313,315,316,317,318,319, 320,321,322,323,324,325,326,327, 328,329,330,331,332,333,334,335, 336,337,338,339,340,341,342,343, 344,346,443,444,447,448,449,450, 451,452,453,454,455,456,457,458, 461,467,468 **Sambara:** 298,299,300,301,305 **Thoranathippa:**129,135,136,137, 139 **Vankasambara:**203,208,209,211, 212,216,217,218,220,221,222,223, 224,225,226,227,228,229,230,231, 232,233,234,235,236,237,238,239, 240,242,243,244,245,257,258,259, 260,261,262,266,267,268,269, 272,273,270,271	Moderately deep to very deep (75 to >150 cm), black sandy loam to clay soils, 1-3% slope, moderate to severe erosion.	Sunflower, Sorghum, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Pomegranate, Lime, Musambi, Amla, Custard apple, Tamarind, Jamun, **Vegetables:** Drumstick, Chilli, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
3	42.YDRcB2	**Sambara:** 197/2,296,297/1,302 **Vankasambara:** 206,207	Deep (100-150 cm), black sandy loam soils, 1-3% slope, moderate	Bajra	**Fruit crops:** Custard apple, Amla, Jamun, Tamarind **Vegetables:** Drumstick	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching,

			erosion.			suitable soil and water conservation practices
4	11.SBRcB2	**Madhwara:** 459,460 **Vankasambara:** 210,213,214,215	Moderately shallow (50-75 cm), black sandy loam soils, 1-3% slope, moderate erosion.	Groundnut	**Fruit crops:**Custard apple, Amla **Vegetables:** Onion **Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
5	16.HLGcB2 17.HLGiB2	**Vankasambara:** 263,264,265	Moderately shallow (50-75 cm), black sandy loam to sandy clay soils, 1-3% slope, moderate erosion	Maize, Sorghum, Groundnut, Bengal gram, Bajra	**Fruit crops:** Amla, Custard apple, **Vegetables:** Tomato, Chilli, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
6	40.PGPcB2 41.PGPiB2	**Madhwara:**462,463,464,465,466, 469,470,471,472,473,474,475,480, 481,482,483,542	Moderately deep (75-100 cm), red clay soils, 1-3% slope, moderate erosion	Maize, Sorghum, Groundnut, Redgram, Bajra	**Fruit crops:** Sapota, Guava, Musambi, Pomegranate, Lime, Amla, Custard apple **Vegetables:** Tomato, Drumstick, Chilli, **Flowers:** Marigold, Chrysanthemum	Drip irrigation, mulching, suitable conservation practices (Crescent Bunding with Catch Pit etc)
7	27.YLRbB2 28.YLRbB3 31.YLRiB2	**Madhwara:**258,260,262,263,295, 297,298,299,302,303,305,306,310, 311,314	Moderately shallow (50-75 cm), red loamy sandto sandy clay soils, 1-3% slope, moderate to severe erosion	Maize, Sorghum, Groundnut, Bajra, Redgram	**Fruit crops:** Custard apple Amla, **Vegetables:** Tomato, Chilli **Flowers:** Marigold Chrysanthemum	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Wankasambar-3Microwatershed

- The soil phases identified in the microwatershed belonged to the soil series of GWD 207 ha (35%),KDR 68 ha (12%),PGP 64 ha (11%), MDR 64 ha (11%), SHT 32 ha (6%), ANR 31 ha (5%), YLR 31 ha (5%), HLG 23 ha (4%), SBR 20 ha (3%), YDR 17 ha (3%), BGD 12 ha (2%) and NHL 6 ha (1%).
- As per land capability classification,entire area of the microwatershed falls under arable land category (Class II &III). The major limitations identified in the arable lands were soil, erosion and drainage.
- On the basis of soil reaction, about 7 ha (1%) is moderately acid (pH 5.5-6.0), 57 ha (10%) is slightly acid (pH 6.0-6.5), 149 ha (26%) is neutral (pH 6.5-7.3), 119 ha (20%) is

slightly alkaline (pH 7.3-7.8),135 ha (23%) is moderately alkaline (pH 7.8-8.4),99 ha (17%) is strongly alkaline (pH 8.4-9.0) and 11 ha (2%) is very strongly alkaline (pH >9.0).

Soil Health Management

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

Acid soils

1. Growing of crops suitable for particular soil pH.
2. Amelioration of 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)

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

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. An area of about 6 ha has slightly eroded land. Maximum area of about 533 ha is suffering from moderate erosion and 38 ha from severe erosion. The moderately and severely eroded 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 soil, erosion and drainage are the major constraints in Wankasambar-3microwatershed.

- **Organic Carbon:** The OC content (an index of available Nitrogen) is high (>0.75%)in 231 ha (40%), medium (0.5-0.75%) in about 313 ha (54%) and low in an area of 33 ha (6%). The areas that are medium and low in OC needs to be further improved by applying farm yard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuri**n**g crop**s** 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 346 ha area where OC is low to medium (<0.5-0.75%). For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus**: Available Phosphorus is low (<23 kg/ha) in an area of 199 ha (34%),medium (23-57 kg/ha) in an area of 269 ha (46%) and high (>57kg/ha) in an area of 109 ha (19%)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 138 ha (24%) and medium (145-337 kg/ha) in maximum area of 438 ha (75%) 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 low in 263 ha (45%), medium in 273 ha (47%) and high in 41 ha (7%). Low and medium areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** An area of 128ha (22%) is low, 313ha (54%) is medium and 135ha (23%) is high. For areas that are low and medium, application of sodium borate @ 10 kg/ha as soil application or 0.2 % borax as foliar spray is recommended.
- **Available Iron:** Entire area of about 577 ha (99%) of the microwatershed is sufficient in available iron.
- **Available Manganese:** An entire area of about 577 ha (99%) in the microwatershed is sufficient in available manganese.
- **Available Copper:** An entire area of about 577 ha (99%) in the microwatershed is sufficient in available copper.
- **Available Zinc:** Almost entire area of about 577 ha (99%) of the microwatershed is deficient in available zinc content. Application of zinc sulphate @25 kg/ha is to be recommended for these areas**.**

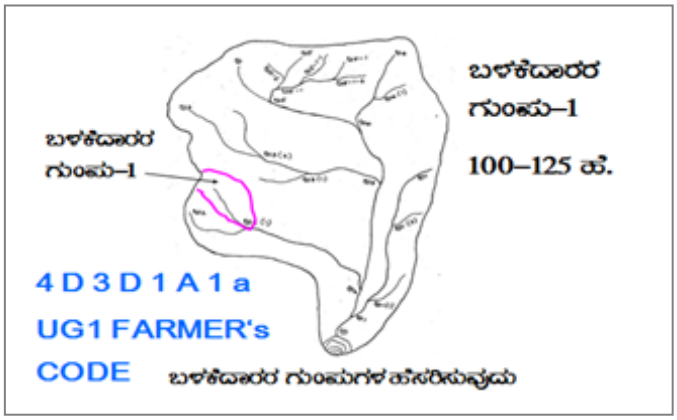
- **Soil Alkalinity:** The microwatershed has 364ha (63%) area with soils that are slightly to very strongly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.
- **Land Suitability for various crops:** Areas that are highly, moderately and marginally suitable and also not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase the water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

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

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



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

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

Steps for Survey and Preparation of Treatment Plan

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

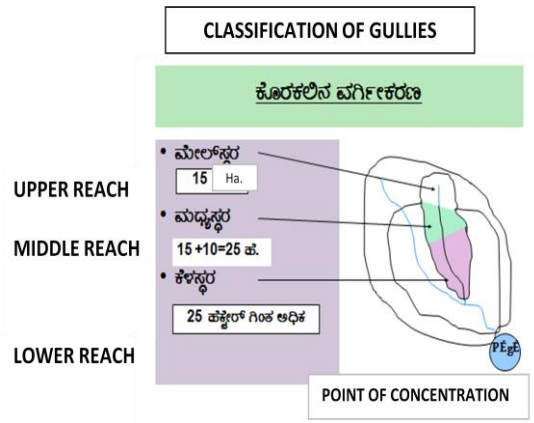
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below

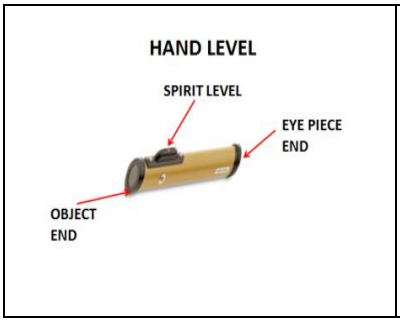
9.1.1 Arable Land Treatment

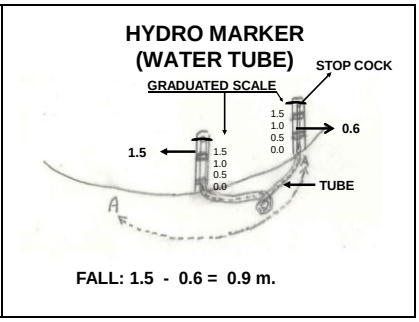
A. BUNDING

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

Measurement of Land Slope

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





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

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

Note:(i) The above intervals are maximum.

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

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

Section of the Bund

Bund section is decided considering the soil texture class and gravelliness class ($bg_{0...}$ b=loamy sand, g_0 = <15% gravel). The recommended Sections for different soils are given below.

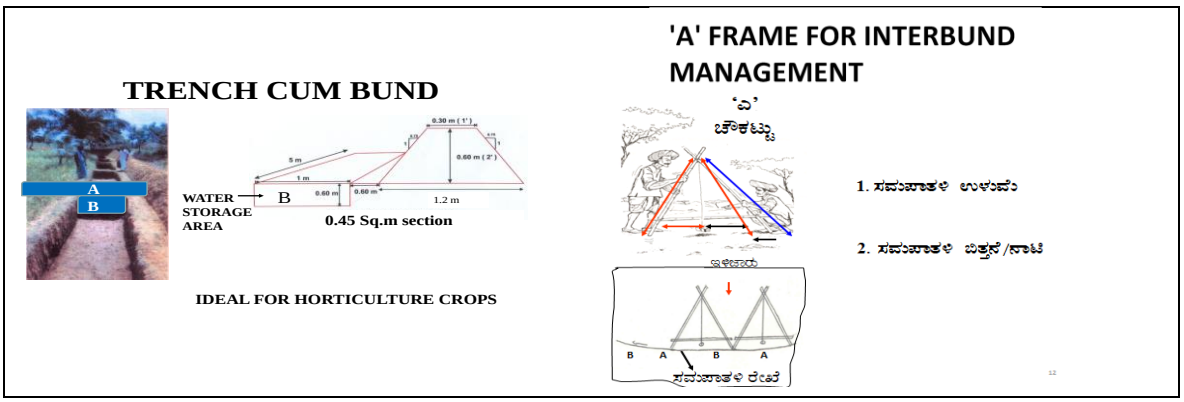
Recommended Bund Section

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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below:



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

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

B. Water Ways

1. Existing waterways are marked on the cadastral map (1:7920 scale) andtheir 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 Levelling Survey using Dumpy Level / Total Station has to be carried out to arrive at the site-specific designs as shown in the Manual.
f) The location of ground water recharge structures are decided by examining the lineaments and fracture zones from geological maps.
g) Rainfall intensity data of the nearest Rain Gauge Station is considered for Hydrologic Designs.
h) Silt load to the Storage/Recharge Structures is reduced by providing vegetative, boulder and 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 about481 ha (82%) needs Graded Bunding and96 ha (16%) requires Trench cum 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.

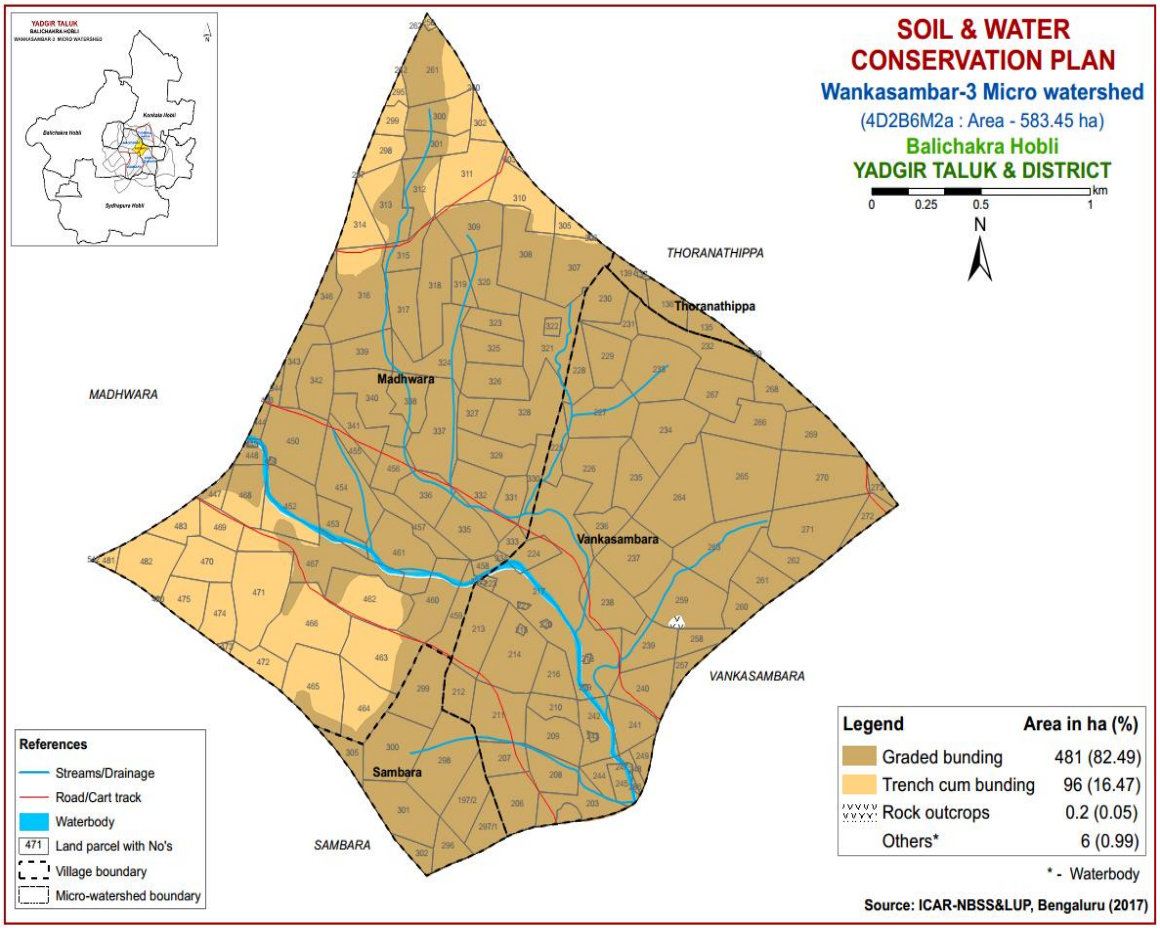


Fig. 9.1 Soil and Water Conservation Plan map of Wankasambar-3 Microwatershed

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 (*Sizyziumcumini*) and Bamboo. Dry areas are to be planted with species like Honge, Bevu, Seetaphal *etc*.

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

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Appendix I

Wankasambara-3 Microwatershed

Soil Phase Information

Village	Survey No	Area (ha)	Soil Phase	Land Use Class	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Madhwara	258	0.23	YLRiB2	LUC-7	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	TCB
Madhwara	260	0	YLRbB2	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	261	6.96	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Madhwara	262	0	YLRiB2	LUC-7	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	TCB
Madhwara	263	0	YLRiB2	LUC-7	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	295	0.78	YLRiB2	LUC-7	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	TCB
Madhwara	297	0.02	YLRbB2	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	298	2.25	YLRbB2	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	299	1.54	YLRbB2	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	300	3.89	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+No Crop (Rg+Nc)	Not Available	IIes	Graded bunding
Madhwara	301	2.84	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+No Crop (Rg+Nc)	Not Available	IIes	Graded bunding
Madhwara	302	1.61	YLRbB2	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	TCB
Madhwara	303	0.33	YLRbB2	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	305	1.12	YLRbB3	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	TCB
Madhwara	306	0.05	YLRbB3	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	TCB
Madhwara	307	5.91	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Madhwara	308	6.88	SHTmB2	LUC-2	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Madhwara	309	5.02	SHTmB2	LUC-2	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	310	4.55	YLRbB3	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	TCB
Madhwara	311	6.34	YLRbB2	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	312	3.97	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	313	5.3	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	Land Use Class	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Madhwara	314	3.06	YLRbB2	LUC-7	Moderately shallow (50-75 cm)	Loamy sand	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	315	2.37	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Madhwara	316	8.73	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land+Redgram (Sl+Rg)	Not Available	IIes	Graded bunding
Madhwara	317	4.41	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Madhwara	318	6.57	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Madhwara	319	1.69	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	320	4.28	SHTmB2	LUC-2	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Madhwara	321	7.01	SHTmB2	LUC-2	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	322	0.52	SHTmB2	LUC-2	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	323	2.3	SHTmB2	LUC-2	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Madhwara	324	5.36	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	325	3.35	SHTmB2	LUC-2	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	326	4.1	SHTmB2	LUC-2	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	327	1.99	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Madhwara	328	6.95	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Madhwara	329	4.34	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Madhwara	330	2.4	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	No Crop (Nc)	Not Available	IIes	Graded bunding
Madhwara	331	2.01	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Madhwara	332	4.52	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	333	0.93	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	334	0.21	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	335	4.48	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	336	3.86	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	Land Use Class	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Madhwara	337	6.77	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Madhwara	338	3.31	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Madhwara	339	3.78	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	340	5.64	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IIes	Graded bunding
Madhwara	341	3.27	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Madhwara	342	4.12	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Madhwara	343	3.09	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Madhwara	344	0.63	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	346	2.35	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Madhwara	443	0.06	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Madhwara	444	0.7	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	447	1.13	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	448	1.05	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	449	0.1	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	450	6.8	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	Graded bunding
Madhwara	451	0.08	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	452	6.33	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Madhwara	453	2.52	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	454	6.9	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	455	1.67	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	456	2.55	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	457	3.08	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	458	0.78	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	459	2.95	SBRcB2	LUC-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	Land Use Class	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Madhwara	460	5.37	SBRcB2	LUC-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land+Cotton (Sl+Ct)	Not Available	IIes	Graded bunding
Madhwara	461	6.21	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	462	6.37	PGPcB2	LUC-6	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	463	6.9	PGPcB2	LUC-6	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	464	5.07	PGPcB2	LUC-6	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	465	7.35	PGPcB2	LUC-6	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	466	8.24	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	467	7.95	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Madhwara	468	4.06	KDRcB2	LUC-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Madhwara	469	2.6	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	470	4.02	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	471	8.19	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IIes	TCB
Madhwara	472	2.45	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	473	0.22	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	474	3.27	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	475	3.24	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	480	0.04	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	481	0.64	PGPcB2	LUC-6	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	TCB
Madhwara	482	5.24	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	483	2.45	PGPiB2	LUC-6	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Madhwara	542	0.01	PGPcB2	LUC-6	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	TCB
Sambara	197/2	3.94	YDRcB2	LUC-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Sambara	296	2.16	YDRcB2	LUC-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	Land Use Class	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Sambara	297/1	2.58	YDRcB2	LUC-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Sambara	298	7.82	ANRbB3	LUC-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Graded bunding
Sambara	299	5.56	ANRbB3	LUC-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Graded bunding
Sambara	300	6.25	ANRbB3	LUC-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Graded bunding
Sambara	301	5.75	ANRbB3	LUC-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Redgram (Rg)	Not Available	IIIes	Graded bunding
Sambara	302	1.33	YDRcB2	LUC-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding
Sambara	305	1.8	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Cotton (Rg+Ct)	Not Available	IIes	Graded bunding
Thoranathippa	129	0.01	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Thoranathippa	135	1.93	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Thoranathippa	136	2.29	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Thoranathippa	137	0.16	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Thoranathippa	139	1.62	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	203	3.86	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Vankasambara	206	4.3	YDRcB2	LUC-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Vankasambara	207	2.71	YDRcB2	LUC-3	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	208	3.25	BGDbB2	LUC-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Vankasambara	209	3.98	BGDbB2	LUC-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Vankasambara	210	2	SBRcB2	LUC-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	211	5.39	BGDbB2	LUC-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	212	2.61	ANRbB3	LUC-2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Severe	Groundnut (Gn)	Not Available	IIIes	Graded bunding
Vankasambara	213	5.25	SBRcB2	LUC-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	214	6.92	SBRcB2	LUC-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Redgram (Pd+Rg)	Not Available	IIes	Graded bunding
Vankasambara	215	0.13	SBRcB2	LUC-4	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	216	2.96	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	Land Use Class	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Vankasambara	217	22.89	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Paddy+Redgram+Scrubland(Jw+Pd+Rg+Sl)	Not Available	IIes	Graded bunding
Vankasambara	218	0.09	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	219	0.05	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Vankasambara	220	0.11	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	221	0.12	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	222	0.05	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	223	0.32	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	224	2.04	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Scrub land (Rg+Sl)	Not Available	IIes	Graded bunding
Vankasambara	225	2	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	226	6.09	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	227	5.93	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	228	2.6	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Vankasambara	229	3.91	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	230	3.52	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	231	1.68	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	232	5.93	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Vankasambara	233	7.32	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Vankasambara	234	6.76	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Vankasambara	235	4.02	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	236	2.55	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	237	6.49	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	238	5.38	GWDiB2	LUC-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	239	3.99	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	Land Use Class	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Vankasambara	240	4.4	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	241	3.28	NHLmB1	LUC-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIws	Graded bunding
Vankasambara	242	3.76	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Vankasambara	243	0.12	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	244	1.54	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	245	1.54	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Vankasambara	247	0.12	NHLmB1	LUC-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIws	Graded bunding
Vankasambara	248	0.62	NHLmB1	LUC-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIws	Graded bunding
Vankasambara	249	1.14	NHLmB1	LUC-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIws	Graded bunding
Vankasambara	257	1.3	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	258	1.98	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	259	7.83	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	260	2.14	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	261	3.39	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Vankasambara	262	3.13	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	263	7.25	HLGiB2	LUC-5	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Vankasambara	264	9.46	HLGiB2	LUC-5	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Vankasambara	265	9.72	HLGiB2	LUC-5	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding
Vankasambara	266	4.84	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	267	4.28	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Vankasambara	268	3.01	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram (Gn+Rg)	Not Available	IIes	Graded bunding
Vankasambara	269	4.62	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar (Ct+Jw)	Not Available	IIes	Graded bunding
Vankasambara	270	8.12	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding
Vankasambara	271	7.49	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	Land Use Class	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Vankasambara	272	1.71	MDRcB2	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	273	0.84	GWDcB2	LUC-2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	286	0.13	NHLmB1	LUC-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIws	Graded bunding

Appendix II

Wankasambara-3 Microwatershed

Soil Fertility Information

Village	SY No	Soil Reaction	Salinity (EC)	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Madhwara	258	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	260	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	261	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	262	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	263	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	295	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	297	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	298	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	299	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	300	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	301	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	302	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	303	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	305	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	306	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	307	Slightly acid (pH 6.0 – 6.5)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	308	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	309	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	310	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	311	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	312	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	313	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	SY No	Soil Reaction	Salinity (EC)	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Madhwara	314	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	315	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	316	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	317	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	318	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	319	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	320	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	321	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	322	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	323	Moderately alkaline (pH 7.8 – 8.4)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	324	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	325	Strongly alkaline (pH 8.4 – 9.0)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	326	Strongly alkaline (pH 8.4 – 9.0)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	327	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	328	Strongly alkaline (pH 8.4 – 9.0)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	329	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	330	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	331	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	332	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	333	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	334	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	335	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	336	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	337	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	SY No	Soil Reaction	Salinity (EC)	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Madhwara	338	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	339	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	340	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	341	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	342	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	343	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	344	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	346	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	443	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	444	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	447	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	448	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	449	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	450	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	451	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	452	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	453	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	454	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	455	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	456	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	457	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	458	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	459	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	460	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	SY No	Soil Reaction	Salinity (EC)	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Madhwara	461	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	462	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	463	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	464	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	465	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	466	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	467	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	468	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	469	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	470	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	471	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	472	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	473	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	474	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	475	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	480	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	481	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	482	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	483	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Madhwara	542	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Sambara	197 /2	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Sambara	296	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Sambara	297 /1	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Sambara	298	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	SY No	Soil Reaction	Salinity (EC)	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Sambara	299	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Sambara	300	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Sambara	301	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Sambara	302	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Sambara	305	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	High (> 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Thoranat hippa	129	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Thoranat hippa	135	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Thoranat hippa	136	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Thoranat hippa	137	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Thoranat hippa	139	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	203	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	206	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	207	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	208	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	209	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	210	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	211	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	212	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	213	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	214	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	215	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	216	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	217	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasa mbara	218	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	SY No	Soil Reaction	Salinity (EC)	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Vankasambara	219	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	220	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	221	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	222	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	223	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	224	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	225	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	226	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	227	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	228	Neutral (pH 6.5 – 7.3)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	229	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	230	Slightly acid (pH 6.0 – 6.5)	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 (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	231	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	232	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	233	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	234	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	235	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	236	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)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	237	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)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	238	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	239	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)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	240	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	241	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	242	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	SY No	Soil Reaction	Salinity (EC)	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Vankasambara	243	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	244	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	245	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	247	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	248	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	249	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	257	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	258	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	259	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)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	260	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	261	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	262	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	263	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	264	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	265	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	266	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	267	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	268	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	High (> 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	269	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Low (< 145 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	270	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	271	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	272	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	High (> 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	273	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	286	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Appendix III

Wankasambara-3 Microwatershed

Soil Suitability Information

Village	SY No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custardapple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Dstick	Mulberry
Madhwara	258	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	260	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	261	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	262	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	263	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	295	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	297	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	298	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	299	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	300	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	301	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	302	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	303	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	305	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	306	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	307	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	308	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S1	S2r	S2r	S1	S2r	S1	N1t	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	309	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S1	S2r	S2r	S1	S2r	S1	N1t	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	310	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	311	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	312	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw

Village	SY No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custardapple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Dstick	Mulberry
Madhwara	313	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	314	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2r	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S3r	S3r
Madhwara	315	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	316	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	317	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	318	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	319	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	320	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S1	S2r	S2r	S1	S2r	S1	N1t	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	321	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S1	S2r	S2r	S1	S2r	S1	N1t	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	322	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S1	S2r	S2r	S1	S2r	S1	N1t	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	323	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S1	S2r	S2r	S1	S2r	S1	N1t	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	324	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	325	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S1	S2r	S2r	S1	S2r	S1	N1t	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	326	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S1	S2r	S2r	S1	S2r	S1	N1t	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	327	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	328	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	329	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	330	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Madhwara	331	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	332	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	333	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Madhwara	334	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Madhwara	335	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	336	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw

Village	SY No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custardapple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Dstick	Mulberry
Madhwara	337	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	338	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	339	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Madhwara	340	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Madhwara	341	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	342	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Madhwara	343	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Madhwara	344	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Madhwara	346	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	443	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	444	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	447	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	448	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	449	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	450	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	451	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	452	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	453	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	454	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	455	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	456	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	457	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Madhwara	458	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Madhwara	459	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t

Village	SY No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custardapple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Dstick	Mulberry
Madhwara	460	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t
Madhwara	461	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	462	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	463	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	464	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	465	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	466	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	467	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	468	S3t	S3tw	S3t	S2wz	S3t	S2wz	S2t	S2z	S2zw	S2rw	S2tw	S2z	S3t	S2z	N1tz	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tw	S2tw	S3tw
Madhwara	469	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	470	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	471	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	472	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	473	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	474	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	475	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	480	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	481	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	482	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	483	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Madhwara	542	S3r	S1	S2r	S1	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S3r	S2r	S2t	S2t	S1	S2t	S2t	S2r	S1	S2r	S2r
Sambara	197/2	S3tz	S3tz	S2tz	S3tz	S2tz	N1tz	S2rt	S2z	N1tz	S3tz	S2tz	S3tz	S3tz	S3tz	S3tz	S2rz	S2tz	S2tz	S2tz	S2z	S2z	S2z	S2tz	S2z	S2tz	S3tz
Sambara	296	S3tz	S3tz	S2tz	S3tz	S2tz	N1tz	S2rt	S2z	N1tz	S3tz	S2tz	S3tz	S3tz	S3tz	S3tz	S2rz	S2tz	S2tz	S2tz	S2z	S2z	S2z	S2tz	S2z	S2tz	S3tz
Sambara	297/1	S3tz	S3tz	S2tz	S3tz	S2tz	N1tz	S2rt	S2z	N1tz	S3tz	S2tz	S3tz	S3tz	S3tz	S3tz	S2rz	S2tz	S2tz	S2tz	S2z	S2z	S2z	S2tz	S2z	S2tz	S3tz

Village	SY No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custardapple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Dstick	Mulberry
Sambara	298	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Sambara	299	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Sambara	300	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Sambara	301	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Sambara	302	S3tz	S3tz	S2tz	S3tz	S2tz	N1tz	S2rt	S2z	N1tz	S3tz	S2tz	S3tz	S3tz	S3tz	S3tz	S2rz	S2tz	S2tz	S2tz	S2z	S2z	S2z	S2tz	S2z	S2tz	S3tz
Sambara	305	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Thoranathippa	129	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Thoranathippa	135	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Thoranathippa	136	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Thoranathippa	137	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Thoranathippa	139	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	203	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	206	S3tz	S3tz	S2tz	S3tz	S2tz	N1tz	S2rt	S2z	N1tz	S3tz	S2tz	S3tz	S3tz	S3tz	S3tz	S2rz	S2tz	S2tz	S2tz	S2z	S2z	S2z	S2tz	S2z	S2tz	S3tz
Vankasambara	207	S3tz	S3tz	S2tz	S3tz	S2tz	N1tz	S2rt	S2z	N1tz	S3tz	S2tz	S3tz	S3tz	S3tz	S3tz	S2rz	S2tz	S2tz	S2tz	S2z	S2z	S2z	S2tz	S2z	S2tz	S3tz
Vankasambara	208	S3t	S3t	S3t	S3t	S3t	N1t	S3t	S3t	N1t	N1t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S2t	S3t	S3t
Vankasambara	209	S3t	S3t	S3t	S3t	S3t	N1t	S3t	S3t	N1t	N1t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S2t	S3t	S3t
Vankasambara	210	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t
Vankasambara	211	S3t	S3t	S3t	S3t	S3t	N1t	S3t	S3t	N1t	N1t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S2t	S3t	S3t
Vankasambara	212	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	213	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t
Vankasambara	214	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t
Vankasambara	215	N1r	S3t	S3rt	S3t	S3rt	N1t	N1r	S3rt	N1t	S3t	S3t	S3t	S3rt	S3t	S3rt	S3rt	S3rt	S3t	S3t	S3t	S3t	S3t	S3rt	S3t	S3t	S3t
Vankasambara	216	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	217	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw

Village	SY No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custardapple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Dstick	Mulberry
Vankasambara	218	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	219	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
Vankasambara	220	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	221	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	222	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	223	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	224	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	225	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	226	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	227	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	228	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	229	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	230	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	231	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	232	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	233	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	234	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	235	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	236	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	237	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	238	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2z	S2rz	S3tz
Vankasambara	239	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	240	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	241	S3tw	S3tw	S3tw	S2w	S3tw	S1	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S2tw	S3tw	S2tw	S2tw	S2tw	S2tw	S2tw	S3tw	S3tw

Village	SY No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custardapple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Dstick	Mulberry
Vankasambara	242	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	243	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	244	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	245	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	247	S3tw	S3tw	S3tw	S2w	S3tw	S1	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S2tw	S3tw	S2tw	S2tw	S2tw	S2tw	S2tw	S3tw
Vankasambara	248	S3tw	S3tw	S3tw	S2w	S3tw	S1	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S2tw	S3tw	S2tw	S2tw	S2tw	2tw	2tw	S3tw
Vankasambara	249	S3tw	S3tw	S3tw	S2w	S3tw	S1	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S2tw	S3tw	S2tw	S2tw	S2tw	S2tw	S2tw	S3tw
Vankasambara	257	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	258	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	259	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	260	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	261	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	262	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	263	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1tz	S3rz	S3rz	S2rz	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S3rz	S3rz
Vankasambara	264	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1tz	S3rz	S3rz	S2rz	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S3rz	S3rz
Vankasambara	265	N1rz	S2rz	S3rz	S2rz	S3rz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3rz	S2rz	N1tz	S3rz	S3rz	S2rz	S2rz	S2rz	S2rz	S2rz	S3rz	S2rz	S3rz	S3rz
Vankasambara	266	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	267	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	268	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	269	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	270	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	271	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz
Vankasambara	272	S3tz	S3tw	S3t	S2zw	S3t	S2z	S2t	S2z	S2z	S2zw	S2tw	S2t	S3t	S2z	N1t	S2t	S2z	S3tw	S2tw	S3tw	S2tw	S2tw	S2t	S2tz	S2tw	S3tw
Vankasambara	273	S3rz	S3tz	S3tz	S2zw	S3tz	S2rz	S3rz	S2rz	S2zw	S2rz	S2rz	S2zw	S3tz	S2zw	N1tw	S3rz	S2rz	S3tz	S2tz	S3tz	S2tz	S2tz	S2rz	S2zw	S2rz	S3tz

Village	SY No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custardapple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Dstick	Mulberry
Vankasambara	286	S3tw	S3tw	S3tw	S2w	S3tw	S1	S2tw	S2w	S1	S2w	S2tw	S2tw	S3tw	S2w	N1tw	S2tw	S2w	S3tw	S2tw	S3tw	S2tw	S2tw	S2tw	S2tw	S2tw	S3tw

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

FINDINGS OF THE SOCIO-ECONOMIC SURVEY

- *The survey was conducted in Wankasambar-3 is located at North latitude 16^0 39' 16.015" and 16^0 37' 27.275" and East longitude 77^0 22' 37.304" and 77^0 20' 41.304" covering an area of about 583.14 ha coming under Vankasambara, Sambara and Madhwara villages of Yadagiri taluk.*
- *Socio-economic analysis of Wankasambar-3 micro watersheds of Turk Madhawar sub-watershed, Yadgir taluk & District indicated that, out of the total sample of 40 farmers were sampled in Wankasambar-3 micro-watershed among households surveyed 7 (17.50%) were marginal, 15 (37.50%) were small, 8 (20.00 %) were semi medium, 5 (12.50 %) were medium farmers. 5 landless farmers were also interviewed for the survey.*
- *The population characteristics of households indicated that, there were 119 (54.09%) men and 101 (45.91 %) were women.*
- *Majority of the respondents (53.64%) were in the age group of 16-35 years.*
- *Education level of the sample households indicated that, there were 25.00 per cent illiterates, 71.37 per cent pre university education and 7.27 per cent attained graduation.*
- *About, 52.50 per cent of household heads practicing agriculture and 47.50 per cent of the household heads were engaged as agricultural labourers.*
- *Agriculture was the major occupation for 34.09 per cent of the household members.*
- *In the study area, 70.00 per cent of the households possess katcha house and 2.50 per cent possess pucca house.*
- *The durable assets owned by the households showed that, 82.50 per cent possess TV, 75.00 per cent possess mixer grinder, 90.00 per cent possess mobile phones and 15.00 per cent possess motor cycles.*
- *Farm implements owned by the households indicated that, 32.50 per cent of the households possess plough, 5.00 per cent possess tractor, 15.00 per cent possess bullock cart.*
- *Regarding livestock possession by the households, 15.00 per cent possess local cow and 2.50 per cent possess buffalo.*
- *The average labour availability in the study area showed that, own labour men available in the micro watershed was 1.92, women available in the micro watershed was 1.78, hired labour (men) available was 4.97 and hired labour (women) available was 11.33.*
- *Further, 2.50 per cent of the households opined that hired labour was inadequate during the agricultural season.*

- *In the study area, about 10.45 per cent of the respondents migrated from the micro watershed in search of jobs with an average distance of 1705.00 kms for about 4.30 months.*
- *Out of the total land holding of the sample respondents 91.32 per cent (69.64 ha) of the area is under dry condition and the remaining 8.68 per cent area is irrigated land.*
- *There were 4.00 live bore wells and 3.00 dry bore wells among the sampled households.*
- *Bore/open well was the major source of irrigation for 10.00 per cent of the households.*
- *The major crops grown by sample farmers are Cotton, Red gram, Sugarcane, Groundnut and Paddy and cropping intensity was recorded as 100.00 per cent.*
- *Out of the sample households 85.00 percent possessed bank account and 17.50 per cent of them have savings in the account.*
- *About 67.50 per cent of the respondents borrowed credit from various sources.*
- *Among the credit borrowed by households, 157.14 per cent have borrowed loan from commercial banks and 128.57 per cent from co-operative/Grameena bank.*
- *Majority of the respondents (100.00%) have borrowed loan for agriculture purpose.*
- *Regarding the opinion on institutional sources of credit, 50.00 per cent of the households opined that credit helped to perform timely agricultural operations.*
- *The per hectare cost of cultivation for Cotton, Red gram, Sugarcane, Groundnut and Paddy was Rs.64881.38, 20711.75, 0.00, 71012.87 and 125743.60 with benefit cost ratio of 1:0.60, 1: 1.70, 1: 0.00, 1: 0.80 and 1:0.50 respectively.*
- *Further, 30.00 per cent of the households opined that dry fodder was adequate and 10.00 per cent of the households have opined that the green fodder was adequate.*
- *The average annual gross income of the farmers was Rs. 81625.03 in micro-watershed, of which Rs. 53400.03 comes from agriculture.*
- *Sampled households have grown 1050 horticulture trees and 1022 forestry trees together in the fields and back yards.*
- *About 42.50 per cent of the households shown interest to cultivate horticultural crops.*
- *Households have an average investment capacity of Rs. 10225.00 for land development and Rs. 150.00 for irrigation facility.*
- *Source of funds for additional investment is concerned, 52.50 per cent depends on own funds and 35.00 per cent depends on bank loan for land development activities.*
- *Regarding marketing channels, 60.00 per cent of the households have sold agricultural produce to the local/village merchants, while, 50.00 per cent have sold in regulated markets.*

- *Further, 40.00 per cent of the households have used tractor for the transport of agriculture commodity.*
- *Majority of the farmers (85.00%) have experienced soil and water erosion problems in the watershed and 35.00 per cent of the households were interested towards soil testing.*
- *Fire was the major source of fuel for domestic use for 100.00 per cent of the households.*
- *Piped supply was the major source for drinking water for 100.00 per cent of the households.*
- *Electricity was the major source of light for 97.50 per cent of the households.*
- *In the study area, 40.00 per cent of the households possess toilet facility.*
- *Regarding possession of PDS card, 97.50 per cent of the households possessed BPL card.*
- *Households opined that, the requirement of cereals (102.50%), pulses (75.00%) and oilseeds (50.00%) are adequate for consumption.*
- *Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (90.00%) wild animal menace on farm field (82.50%), frequent incidence of pest and diseases (57.50%), inadequacy of irrigation water (52.50%), high cost of fertilizers and plant protection chemicals (55.00%), high rate of interest on credit (45.00%), low price for the agricultural commodities (67.50%), lack of marketing facilities in the area (62.50%), inadequate extension services (52.50%), lack of transport for safe transport of the agricultural produce to the market (42.50%), Less rainfall (2.50%) and Source of Agri-technology information (Newspaper/ TV/Mobile) (2.50%).*

Chapter 2

INTRODUCTION

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

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

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

Scope and importance of survey

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

Chapter 3

METHODOLOGY

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

1. Description of the study area

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

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

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

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

The study was conducted in Wankasambar-3 micro-watershed (Turk Madhawar sub-watershed, Yadgir taluk & District) is located at North latitude 16^0 39’ 16.015” and 16^0 37’ 27.275” and East longitude 77^0 22’ 37.304” and 77^0 20’ 41.304”covering an area of about 583.14 ha bounded by under Vankasambara, Sambara and Madhwara Villages.

3. Selection of the respondents for the study

The micro-watershed is marked with 320 square meters grids. One farmer from every alternate grid in the micro-watershed was selected for the study and interviewed for socio-economic data. Totally 40 households were interviewed for the survey.

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

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

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

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

5. Development of interview schedule and data collection

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

6. Tools used to analyze the data

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

Abbreviations used in the report

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

Chapter 4

FINDINGS OF THE SURVEY

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

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Wankasambar-3 Micro watershed is presented in Table 1 and it indicated that 40 farmers were sampled in Wankasambar-3 micro-watershed among households surveyed 7 (17.50%) were marginal, 15 (37.50%) were small, 8 (20.00 %) were semi medium, 5 (12.50 %) were medium farmers. 5 landless farmers were also interviewed for the survey.

Table 1. Households sampled for socio economic survey in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	12.5	7	17.5	15	37.5	8	20	5	12.5	40	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Wankasambar-3 Micro watershed is presented in Table 2. The data indicated that, there were 119 (54.09%) men and 101 (45.91%) were women.

Table 2. Population characteristics in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (13)		MF (44)		SF (84)		SMF (57)		MDF (22)		All (220)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	8	61.5	19	43	49	58	33	57.9	10	45.5	119	54.1
2	Women	5	38.5	25	57	35	42	24	42.1	12	54.6	101	45.9
Total		13	100	44	100	84	100	57	100	22	100	220	100

Age wise classification of population: The age wise classification of household members in Wankasambar-3 Micro watershed is presented in Table 3. The indicated that, 35 (15.91%) of population were 0-15 years of age, 118 (53.64%) were 16-35 years of age, 52(23.64%) were 36-60 years of age and 15 (6.82 %) were above 61 years of age.

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

Sl.No.	Particulars	LL (13)		MF (44)		SF (84)		SMF (57)		MDF (22)		All (220)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	1	7.69	9	20.5	14	16.7	9	15.79	2	9.1	35	15.91
2	16-35 years of age	5	38.5	23	52.3	46	54.8	32	56.14	12	55	118	53.64
3	36-60 years of age	7	53.9	8	18.2	18	21.4	13	22.81	6	27	52	23.64
4	> 61 years	0	0	4	9.09	6	7.14	3	5.26	2	9.1	15	6.82
Total		13	100	44	100	84	100	57	100	22	100	220	100

Education level of household members: Education level of household members in Wankasambar-3 Micro watershed is presented in Table 4. The results indicated that, there

were 25.00 per cent of illiterates, 44.09 per cent of them had primary school education, 3.18 per cent middle school education, 16.82 per cent high school education, 3.64 per cent of them had PUC education, 7.27 per cent attained graduation.

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

Sl.No.	Particulars	LL (13)		MF (44)		SF (84)		SMF (57)		MDF (22)		All (220)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	5	38.5	11	25	19	22.6	14	24.6	6	27.27	55	25
2	Primary School	5	38.5	21	47.7	35	41.7	28	49.1	8	36.36	97	44.1
3	Middle School	0	0	2	4.55	1	1.19	4	7.02	0	0	7	3.18
4	High School	1	7.69	7	15.9	18	21.4	8	14	3	13.64	37	16.8
5	PUC	0	0	1	2.27	5	5.95	1	1.75	1	4.55	8	3.64
6	Degree	2	15.4	2	4.55	6	7.14	2	3.51	4	18.18	16	7.27
Total		13	100	44	100	84	100	57	100	22	100	220	100

Occupation of head of households: The data regarding the occupation of the household heads in Wankasambar-3 Micro watershed is presented in Table 5. The results indicate that, 52.50 per cent of households heads were practicing agriculture, 47.50 per cent of the household heads were agricultural Labour.

Table 5: Occupation of heads of households in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	5	100	3	43	5	33.33	5	63	3	60	21	52.5
2	Agricultural Labour	0	0	5	71	10	66.67	3	38	1	20	19	47.5
3	Government Service	0	0	0	0	0	0	0	0	1	20	1	2.5
Total		5	100	8	100	15	100	8	100	5	100	41	100

Occupation of the members of the household: The data regarding the occupation of the household members in Wankasambar-3 Micro watershed is presented in Table 6. The results indicate that, agriculture was the major occupation for 34.09 per cent of the household members, 41.82 per cent were agricultural labour, 0.45 per cent were working in government sector, 20.91 per cent were working in pursuing education and 1.36 per cent were involved as housewife.

Table 6: Occupation of members of the household in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (13)		MF (44)		SF (84)		SMF (57)		MDF (22)		All (220)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	5	38.5	16	36.4	24	28.57	23	40.35	7	32	75	34.1
2	Agricultural Labour	8	61.5	17	38.6	36	42.86	23	40.35	8	36	92	41.8
3	Government Service	0	0	0	0	0	0	0	0	1	4.6	1	0.45
4	Private Service	0	0	0	0	2	2.38	0	0	1	4.6	3	1.36
5	Student	0	0	11	25	20	23.81	11	19.3	4	18	46	20.9
6	Housewife	0	0	0	0	2	2.38	0	0	1	4.6	3	1.36
Total		13	100	44	100	84	100	57	100	22	100	220	100

Institutional Participation of household members: The data regarding the institutional participation of the household members in Wankasambar-3 Micro watershed is presented in Table 7. The results show that, out of the total family members in the households 0.45 per cent of them are participating in NGOs.

Table 7: Institutional Participation of household member in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (13)		MF (44)		SF (84)		SMF (57)		MDF (22)		All (220)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	NGOs	0	0	0	0	1	1.19	0	0	0	0	1	0.45
2	No Participation	13	100	44	100	83	98.8	57	100	22	100	219	99.6
Total		13	100	44	100	84	100	57	100	22	100	220	100

Type of house owned: The data regarding the type of house owned by the households in Wankasambar-3 Micro watershed is presented in Table 8. The results indicate that, 27.50 percent possess thatched house, 70.00 per cent of the households possess katcha house, 2.50 per cent possess pacca house.

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

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	1	20	3	43	5	33.33	2	25	0	0	11	27.5
2	Katcha	4	80	3	43	10	66.67	6	75	5	100	28	70
3	Pucca/RCC	0	0	1	14	0	0	0	0	0	0	1	2.5
Total		5	100	7	100	15	100	8	100	5	100	40	100

Durable assets owned by the households: The data regarding the Durable Assets owned by the households in Wankasambar-3 Micro watershed is presented in Table 9. The result shows that, 82.50 per cent possess TV, 75.00 per cent possess mixer grinder, 2.50 per cent possess Bicycle, 15.00 per cent possess motor cycle, 90.00 per cent possess mobile phones.

Table 9. Durable assets owned by households in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	2	40	5	71	13	86.7	8	100	5	100	33	82.5
2	Mixer/Grinder	1	20	5	71	12	80	7	88	5	100	30	75
3	Bicycle	0	0	1	14	0	0	0	0	0	0	1	2.5
4	Motor Cycle	0	0	1	14	4	26.7	1	13	0	0	6	15
5	Mobile Phone	2	40	6	86	15	100	8	100	5	100	36	90
6	Blank	3	60	0	0	0	0	0	0	0	0	3	7.5

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Wankasambar-3 Micro watershed is presented in Table 10. The result shows that, the average value of television was Rs.5606.00, mixer grinder was Rs.1793.00, bicycle was Rs.3000.00, motor cycle was Rs. 37500.00, mobile phone was Rs.2183.00.

Table 10. Average value of durable assets owned in Wankasambar-3 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
1	Television	5000	6200	5461	6000	5000	5606
2	Mixer/Grinder	2500	1820	1725	1728	1880	1793
3	Bicycle	0	3000	0	0	0	3000
4	Motor Cycle	0	35000	38750	35000	0	37500
5	Mobile Phone	2250	2071	2120	2100	2857	2183

Farm implements owned: The data regarding the farm implements owned by the households in Wankasambar-3 Micro watershed is presented in Table 11. About 15.00 per cent of the households possess Bullock Cart, 32.50 per cent possess plough, 75.00 per cent possess Weeder, 5.00 per cent possess tractor.

Table 11. Farm implements owned in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	2	28.6	2	13.33	2	25	0	0	6	15
2	Plough	0	0	2	28.6	8	53.33	2	25	1	20	13	32.5
3	Power Tiller	0	0	1	14.3	0	0	0	0	0	0	1	2.5
4	Tractor	0	0	1	14.3	0	0	1	12.5	0	0	2	5
5	Weeder	0	0	6	85.7	14	93.33	7	87.5	3	60	30	75
6	Thresher	0	0	1	14.3	2	13.33	2	25	2	40	7	17.5
7	Blank	5	100	0	0	0	0	0	0	0	0	5	12.5

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Wankasambar-3 Micro watershed is presented in Table 12. The results show that the average value of plough was Rs.7369.00, bullock Cart was Rs.9766.00, weeder was Rs.121.00 and tractor was Rs. 250090.

Table 12. Average value of farm implements in Wankasambar-3 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
1	Bullock Cart	0	8400	5900	15000	0	9766
2	Plough	0	2000	8912	9000	2500	7369
3	Power Tiller	0	200000	0	0	0	200000
4	Tractor	0	500000	0	180	0	250090
5	Weeder	0	122	115	122	160	121
6	Thresher	0	180	180	180	180	180

Livestock possession by the households: The data regarding the Livestock possession by the households in Wankasambar-3 Micro watershed is presented in Table 13. The results indicate that, 25.00 per cent of the households possess bullocks, 15.00 per cent possess local cow, 2.50 per cent possess buffalo, 10.00 per cent possess crossbred cow, 5.00 per cent possess sheep.

Average Labour availability: The data regarding the average labour availability in Wankasambar-3 Micro watershed is presented in Table 14. The indicated that, own labour men available in the micro watershed was 1.92, women available in the micro watershed

was 1.78, hired labour (men) available was 4.97 and hired labour (women) available was 11.33.

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

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	3	43	4	26.67	3	38	0	0	10	25
2	Local cow	0	0	0	0	2	13.33	3	38	1	20	6	15
3	Crossbred cow	0	0	1	14	1	6.67	1	13	1	20	4	10
4	Buffalo	0	0	0	0	1	6.67	0	0	0	0	1	2.5
5	Sheep	0	0	0	0	1	6.67	0	0	1	20	2	5
6	blank	5	100	0	0	0	0	0	0	0	0	5	12.5

Table 14. Average labour availability in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
		N	N	N	N	N	N
1	Hired labour Female	5	10.7	12.67	13.75	5.6	11.33
2	Own Labour Female	1	2	1.67	2.25	1.2	1.78
3	Own labour Male	1	2	2	2.25	1.2	1.92
4	Hired labour Male	5	4.57	5.67	5.25	3	4.97

Adequacy of hired labour: The data regarding the adequacy of hired labour in Wankasambar-3 Micro watershed is presented in Table 15. The results indicate that, 87.50 per cent of the household opined that hired labour was adequate, 2.50 per cent of the household opined that hired labour was Inadequate.

Table 15. Adequacy of hired labour in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0	7	100	15	100	8	100	5	100	35	87.5
2	Inadequate	1	20	0	0	0	0	0	0	0	0	1	2.5

Migration among the households: The data regarding the migration (Table 16) indicate that, 10.45 percent of the population was being migrated from the micro watershed.

Table 16. Migration among the households in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (13)		MF (44)		SF (84)		SMF (57)		MDF (22)		All (220)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Migration	0	0.00	4	9.09	4	4.76	13	22.81	2	9.09	23	10.45

Average distance and duration of migration: The data regarding the average distance and duration of migration (Table 17) indicate that, people migrated to a distance of 1705 kms on an average for 4.29 months.

Table 17. Average distance and duration of migration in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)	MF (4)	SF (4)	SMF (13)	MDF (2)	All (23)
		N	N	N	N	N	N
1	Avg. Distance (kms)	0	1425	1550	1940	1400	1705
2	Avg. Duration (months)	0	4	4	4.6	4	4.3

Purpose of migration: The data regarding the purpose of migration **(**Table 18) indicate that, 100.00 percent of them went for the purpose of job/wage/work, 0.00 percent for business.

Table 18. Purpose of migration by members of households in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)		MF (4)		SF (4)		SMF (13)		MDF (2)		All (23)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Job/wage/work	0	0	4	100	4	100	13	100	2	100	23	100
Total		0	100	4	100	4	100	13	100	2	100	23	100

Positive consequence of migration: The data regarding the positive consequence of migration (Table 19) indicate that, percent of the migrants opined that due to their migration from the village it was helped for them to Improved quality of life (17.39 %).

Table 19. Positive consequence of migration in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)		MF (4)		SF (4)		SMF (13)		MDF (2)		All (23)
		N	%	N	%	N	%	N	%	N	%	%
1	Improved quality of life	0	0	1	25	0	0	3	23	0	0	17.4
2	None	0	0	1	25	2	50	2	15	2	100	30.4

Distribution of land (ha): The data regarding the distribution of land (ha) in Wankasambar-3 Micro watershed is presented in Table 20. The results indicate that, 63.60 ha (91.32%) of dry land and 6.04 ha (8.68 %) of irrigated land.

Table 20. Distribution of land (ha) in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Dry	0	0	5.43	100	21.4	97.44	19.72	93.58	17.05	80.5	63.6	91.32
2	Irrigated	0	0	0	0	0.56	2.56	1.35	6.42	4.13	19.5	6.04	8.68
Total		0	100	5.43	100	21.96	100	21.07	100	21.18	100	69.64	100

Average value of land (ha): The data regarding the average land value (Rs./ha) in Wankasambar-3 Micro watershed is presented in Table 21. The results show that the average value of dry land was Rs.216887.25 and the average value of irrigated land was Rs.347421.31.

Table 21. Average value of land (ha) in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
		N	N	N	N	N	N
1	Dry	0	588971.7	284928.1	147023.8	93782.63	216887.3
2	Irrigated	0	0	1599281	295808.4	193725.5	347421.3

Status of bore wells: The data regarding the status of bore wells in Wankasambar-3 Micro watershed is presented in Table 22. The results indicate that, there were 3 De-functioning bore wells and 4 functioning bore wells among the sampled households in micro watershed.

Source of irrigation: The data regarding the source of irrigation in Wankasambar-3 Micro watershed is presented in Table 23. The results that bore well were major source of irrigation for 10.00 per cent of the households.

Table 22. Status of bore wells in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
		N	N	N	N	N	N
1	De-functioning	0	0	0	2	1	3
2	Functioning	0	0	0	2	2	4

Table 23. Source of irrigation in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	0	0	0	0	2	25	2	40	4	10

Depth of water (Avg. In meters): The data regarding the depth of water in Wankasambar-3 Micro watershed is presented in Table 24. The results revealed that, the depth of bore well was 2.30 meter.

Table 24. Depth of water (Avg. In meters) in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
		N	N	N	N	N	N
1	Bore Well	0	0	0	0.08	18.29	2.3

Irrigated Area (ha): The data regarding the irrigated area (ha) in Wankasambar-3 Micro watershed is presented in Table 25. The results indicate that, the availability of irrigation water was used for kharif crops was 5.36 ha.

Table 25. Irrigated Area (ha) in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
1	Kharif	0	0	0	1.31	4.05	5.36
Total		0	0	0	1.31	4.05	5.36

Cropping pattern: The data regarding the cropping pattern in Wankasambar-3 Micro watershed is presented in Table 26. The results indicate that, farmers have grown Cotton (31.68 ha), Red gram (18.02 ha), Lemon (3.24 ha), Mango (3.24 ha), Groundnut (2.75 ha), Mandarin (0.81 ha) and Sapota (0.81 ha).

Table 26. Cropping pattern in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
1	Kharif - Cotton	0	4.51	9.64	11.45	6.07	31.68
2	Kharif - Red gram (togari)	0	0	8.31	5.26	4.45	18.02
3	Kharif - Lemon	0	0	0	0	3.24	3.24
4	Kharif - Mango	0	0	0	0	3.24	3.24
5	Kharif - Groundnut	0	0	2.75	0	0	2.75
6	Kharif - Mandarin	0	0	0	0	0.81	0.81
7	Kharif - Sapota	0	0	0	0	0.81	0.81

Cropping intensity: The data regarding the cropping intensity in Wankasambar-3 Micro watershed is presented in Table 27. The results indicate that, the cropping intensity was 100.00 per cent.

Table 27. Cropping intensity (%) in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
1	Cropping Intensity	0	100	100	100	100	100

Possession of bank account and savings: The data regarding the possession of bank account and saving in Wankasambar-3 micro-watershed is presented in Table 28. The results indicate that, 85.00 cent of the households posses bank account and 17.50 per cent of them have savings.

Table 28. Possession of Bank account and savings in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	0	0	7	100	15	100	7	87.5	5	100	34	85
2	Savings	0	0	0	0	4	26.67	3	37.5	0	0	7	17.5

Borrowing status: The data regarding the borrowing status in Wankasambar-3 micro-watershed is presented in Table 29. The results indicate that, 67.50 percent of the sample farmers have borrowed credit from different sources.

Table 29. Borrowing status in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	0	0	7	100	11	73.3	4	50	5	100	27	67.5

Source of credit: The data regarding the source of credit availed by households in Wankasambar-3 micro-watershed is presented in Table 30. The results show that, 157.14 per cent have borrowed loan from commercial banks, 128.57 per cent have borrowed loan from Grameena Bank, 28.57 per cent have borrowed loan from money lender.

Table 30. Source of credit borrowed by households in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)		MF (0)		SF (4)		SMF (3)		MDF (0)		All (7)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Commercial Bank	0	0	3	∞	5	125	2	67	1	0	11	157.1
2	Grameena Bank	0	0	3	∞	3	75	3	100	0	0	9	128.6
3	Money Lender	0	0	0	0	1	25	1	33	0	0	2	28.57

Avg. Credit amount: The data regarding the avg. Credit amount in Wankasambar-3 micro-watershed is presented in Table 31. The results show that, farmers have borrowed Avg. Credit of Rs.399285.71 from different sources.

Table 31. Avg. Credit amount in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)	MF (0)	SF (4)	SMF (3)	MDF (0)	All (7)
		N	N	N	N	N	N
1	Average Credit	0	0	143750	563333	0	399286

Purpose of credit borrowed (institutional Source): The data regarding the purpose of credit borrowed - Institutional Credit in Wankasambar-3 micro-watershed is presented in Table 32. The results indicate that, 100.00 per cent of the households have borrowed loan for agriculture.

Table 32. Purpose of credit borrowed (institutional Source) by households in Wankasambar-3 micro-watershed

SN	Particulars	LL (0)		MF (0)		SF (4)		SMF (3)		MDF (0)		All (7)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0	6	100	8	100	5	100	1	100	20	100

Purpose of credit borrowed (Private Source): The data regarding the purpose of credit borrowed – Private Source in Wankasambar-3 micro-watershed is presented in Table 33. The results indicate that, 100.00 per cent of the households have borrowed loan for agriculture.

Table 33. Purpose of credit borrowed (Private Source) by households in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)		MF (0)		SF (1)		SMF (1)		MDF (0)		All (2)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0	0	0	1	100	1	100	0	0	2	100

Repayment status of household (institutional Source): The data regarding the repayment status of credit borrowed from institutional Source by households in Wankasambar-3 micro watershed is presented in Table 34. The results indicate that, 100.00 per cent have unpaid.

Table 34. Repayment status of household (institutional Source) in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)		MF (6)		SF (8)		SMF (5)		MDF (1)		All (20)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Un paid	0	0	6	100	8	100	5	100	1	100	20	100

Repayment status of household (Private Source): The data regarding the repayment status of credit borrowed from private sources by households in Wankasambar-3 micro watershed is presented in Table 35. The results indicate that, 50.00 per cent of the households have partially paid and 50.00 percent have fully paid.

Table 35. Repayment status of household (Private Source) in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)		MF (0)		SF (1)		SMF (1)		MDF (0)		All (2)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Partially paid	0	0	0	0	0	0	1	100	0	0	1	50
2	Un paid	0	0	0	0	1	100	0	0	0	0	1	50

Opinion regarding institutional sources of credit: The data regarding the opinion on institutional sources of credit in Wankasambar-3 micro watershed is presented in Table 36. The results indicate that, 50.00 per cent of the households opined that credit helped to perform timely agricultural operations, 50.00 per cent higher rate of interest.

Table 36. Opinion regarding institutional sources of credit in Wankasambar-3 micro-watershed

Sl. No.	Particulars	LL (0)		MF (6)		SF (8)		SMF (5)		MDF (1)		All (20)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	0	0	3	50	4	50	2	40	1	100	10	50
2	Higher rate of interest	0	0	3	50	4	50	3	60	0	0	10	50

Opinion regarding Non- institutional sources of credit: The data regarding the opinion on non-institutional sources of credit in Wankasambar-3 micro watershed is presented in Table 37. The results indicate that, 50.00 per cent of the households opined that credit helped to perform timely agricultural operations, 100.00 per cent higher rate of interest.

Table 37. Opinion regarding Non- institutional sources of credit in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (0)		MF (0)		SF (1)		SMF (1)		MDF (0)		All (2)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Higher rate of interest	0	0	0	0	1	100	1	100	0	0	2	100

Cost of Cultivation of Cotton: The data regarding the cost of cultivation (Rs/ha) of Cotton in Wankasambar-3 micro watershed is presented in Table 38.a. The results indicate that, the total cost of cultivation (Rs/ha) for Cotton was Rs. 64881.38. The gross income realized by the farmers was Rs. 40294.85. The net income from Cotton cultivation was Rs.-24586.53, thus the benefit cost ratio was found to be 1:0.60.

Table 38(a). Cost of Cultivation of Cotton in Wankasambar-3 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	34.23	6298.95	9.71
2	Bullock	Pairs/day	1.94	1537.79	2.37
3	Tractor	Hours	2.7	2286.86	3.52
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	6.08	3874.68	5.97
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	0	0	0
8	Fertilizer + micronutrients	Quintal	6.51	5446.37	8.39
9	Pesticides (PPC)	Kgs / liters	35.29	28611.83	44.1
10	Irrigation	Number	0	0	0
11	Repairs		0	33.33	0.05
12	Msc. Charges (Marketing costs etc)		0	8.33	0.01
13	Depreciation charges		0	963.66	1.49
14	Land revenue and Taxes		0	0.34	0
II	**Cost B1**				
16	Interest on working capital			4552.45	7.02
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			53614.6	82.63
III	**Cost B2**				
18	Rental Value of Land			356.25	0.55
19	**Cost B2 = (Cost B1 + Rental value)**			53970.85	83.18
IV	**Cost C1**				
20	Family Human Labour		22.39	5008.05	7.72
21	**Cost C1 = (Cost B2 + Family Labour)**			58978.9	90.9
V	**Cost C2**				
22	Risk Premium			4.17	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**			58983.07	90.91
VI	**Cost C3**				
24	Managerial Cost			5898.31	9.09

25	**Cost C3 = (Cost C2 + Managerial Cost)**			64881.38	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	8.95	40294.85	
		b) Main Crop Sales Price (Rs.)		4500	
b.	Gross Income (Rs.)			40294.85	
c.	Net Income (Rs.)			-24586.53	
d.	Cost per Quintal (Rs./q.)			7245.74	
e.	Benefit Cost Ratio (BC Ratio)			1:0.6	

Cost of Cultivation of Red gram: The data regarding the cost of cultivation (Rs/ha) of Red gram in Wankasambar-3 micro watershed is presented in Table 38.b. The results indicate that, the total cost of cultivation (Rs/ha) for Red gram was Rs. 20711.75. The gross income realized by the farmers was Rs. 35722.79. The net income from Red gram cultivation was Rs.15011.05, thus the benefit cost ratio was found to be 1:1.70.

Table 38(b). Cost of Cultivation of Red gram in Wankasambar-3 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	26.53	5147.71	24.85
2	Bullock	Pairs/day	1.91	1485.51	7.17
3	Tractor	Hours	2.2	1816.6	8.77
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	12.2	1036.64	5.01
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	0	0	0
8	Fertilizer + micronutrients	Quintal	4.8	3943.39	19.04
9	Pesticides (PPC)	Kgs /liters	0.71	815.86	3.94
10	Irrigation	Number	0	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	45.58	0.22
14	Land revenue and Taxes		0	0	0
II	**Cost B1**				
16	Interest on working capital			695.51	3.36
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			14986.8	72.36
III	**Cost B2**				
18	Rental Value of Land			283.33	1.37
19	**Cost B2 = (Cost B1 + Rental value)**			15270.14	73.73
IV	**Cost C1**				
20	Family Human Labour		15.84	3558.72	17.18
21	**Cost C1 = (Cost B2 + Family Labour)**			18828.86	90.91
V	**Cost C2**				
22	Risk Premium			0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**			18828.86	90.91
VI	**Cost C3**				
24	Managerial Cost			1882.89	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			20711.75	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	7.56	35722.79	
		b) Main Crop Sales Price (Rs.)		4727.27	
b.	Gross Income (Rs.)			35722.79	

c.	Net Income (Rs.)		15011.05	
d.	Cost per Quintal (Rs./q.)		2740.83	
e.	Benefit Cost Ratio (BC Ratio)		1:1.7	

Cost of Cultivation of Groundnut: The data regarding the cost of cultivation (Rs/ha) of Groundnut in Wankasambar-3 micro watershed is presented in Table 38.c. The results indicate that, the total cost of cultivation (Rs/ha) for Groundnut was Rs. 71012.87. The gross income realized by the farmers was Rs.56117.20. The net income from Groundnut cultivation was Rs. -14895.67, thus the benefit cost ratio was found to be 1:0.80.

Table 38(c). Cost of Cultivation of Groundnut in Wankasambar-3 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	30.46	5586.12	7.87
2	Bullock	Pairs/day	3.19	1912.74	2.69
3	Tractor	Hours	2.33	1630.6	2.3
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	137.05	40438.72	56.95
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	0	0	0
8	Fertilizer + micronutrients	Quintal	5.04	4011.99	5.65
9	Pesticides (PPC)	Kgs /liters	0.79	863.5	1.22
10	Irrigation	Number	0	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	289.83	0.41
14	Land revenue and Taxes		0	0	0
II	**Cost B1**				
16	Interest on working capital			5437.71	7.66
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			60171.21	84.73
III	**Cost B2**				
18	Rental Value of Land			283.33	0.4
19	**Cost B2 = (Cost B1 + Rental value)**			60454.54	85.13
IV	**Cost C1**				
20	Family Human Labour		19.02	4102.61	5.78
21	**Cost C1 = (Cost B2 + Family Labour)**			64557.15	90.91
V	**Cost C2**				
22	Risk Premium			0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**			64557.15	90.91
VI	**Cost C3**				
24	Managerial Cost			6455.72	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			71012.87	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	9.35	56117.2	
		b) Main Crop Sales Price (Rs.)		6000	
b.	Gross Income (Rs.)			56117.2	
c.	Net Income (Rs.)			-14895.67	
d.	Cost per Quintal (Rs./q.)			7592.63	
e.	Benefit Cost Ratio (BC Ratio)			1:0.8	

Cost of Cultivation of Paddy: The data regarding the cost of cultivation (Rs/ha) of Paddy in Wankasambar-3 micro watershed is presented in Table 38.d. The results indicate that, the total cost of cultivation (Rs/ha) for Paddy was Rs.125743.60. The gross income realized by the farmers was Rs. 61750.00. The net income from Paddy cultivation was Rs. -63993.60, thus the benefit cost ratio was found to be 1:0.50.

Table 38(d). Cost of Cultivation of Paddy in Wankasambar-3 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	121.03	20748	16.5
2	Bullock		Pairs/day	4.94	3458	2.75
3	Tractor		Hours	7.41	5928	4.71
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	86.45	38902.5	30.94
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	0	0	0
8	Fertilizer + micronutrients		Quintal	19.76	16005.6	12.73
9	Pesticides (PPC)		Kgs / liters	2.47	2964	2.36
10	Irrigation		Number	12.35	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	182.78	0.15
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				6944.65	5.52
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				95133.53	75.66
III	**Cost B2**					
18	Rental Value of Land				283.33	0.23
19	**Cost B2 = (Cost B1 + Rental value)**				95416.87	75.88
IV	**Cost C1**					
20	Family Human Labour			83.98	18895.5	15.03
21	**Cost C1 = (Cost B2 + Family Labour)**				114312.37	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				114312.37	90.91
VI	**Cost C3**					
24	Managerial Cost				11431.24	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				125743.6	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		24.7	61750	
		b) Main Crop Sales Price (Rs.)			2500	
b.	Gross Income (Rs.)				61750	
c.	Net Income (Rs.)				-63993.6	
d.	Cost per Quintal (Rs./q.)				5090.83	
e.	Benefit Cost Ratio (BC Ratio)				1:0.5	

Adequacy of fodder: The data regarding the adequacy of fodder in Wankasambar-3 Micro watershed is presented in Table 39. The results indicate that, 30.00 per cent of the households opined that dry fodder was adequate. With respect to green fodder availability, 10.00 percent of them opined it was sufficient.

Table 39. Adequacy of fodder in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	2	28.57	5	33.33	4	50	1	20	12	30
2	Adequate-Green Fodder	0	0	1	14.29	1	6.67	2	25	0	0	4	10

Average annual gross income: The data regarding the annual gross income in Wankasambar-3 Micro watershed is presented in Table 40. The results indicate that, the farmers have annual gross income of Rs. 81625.03 in micro-watershed, of which Rs. 53400.03 is from agriculture itself.

Table 40. Average annual gross income in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	1428.57	3000	0	0	1375
2	Wage	20000	20142.9	21333.3	21625	42000	23600
3	Agriculture	0.2	32000	50200	63000	131000	53400
4	Dairy Farm	0	0	666.67	0	0	250
5	Goat Farming	0	0	6666.67	0	4000	3000
Income(Rs.)		20000.2	53571.4	81866.7	84625	177000	81625

Table 41. Average annual Expenditure in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	All (40)
		Rs.	Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	2000	12000	0	350
2	Wage	6875	2771.43	2446.67	3500	3877.5
3	Agriculture	25000	13857.1	24000	25375	23000
4	Dairy Farm	0	0	500	0	12.5
5	Goat Farming	0	0	20000	0	550
Total		31875	18628.6	58946.7	28875	202992

Average annual Expenditure: The data regarding the average annual expenditure in Wankasambar-3 Micro watershed is presented in Table 41. The results indicate that, the farmers have annual gross expenditure of Rs. 202991.90 in micro-watershed, of which Rs. 23000.00 is from agriculture itself.

Table 42. Horticulture species grown in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	0	0	0	0	0	0	400	0	400	0
2	Mango	0	0	0	0	0	0	0	0	400	0	400	0
3	Sapota	0	0	0	0	0	0	0	0	50	0	50	0
4	lime	0	0	0	0	0	0	0	0	200	0	200	0

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

Horticulture species grown: The data regarding horticulture species grown in Wankasambar-3 Micro watershed is presented in Table 42. The results indicate that, the total number of horticultural trees grown (both field and backyard) by the sampled households were coconut (400), Mango (400) and Sapota (50).

Interest towards cultivation of horticulture crops: The data regarding Table (43) indicates that, 42.50 per cent of the households shown interest to cultivate horticultural crops.

Table 43. Interest towards cultivation of horticulture crops in Wankasambar-3 micro-watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)	All (40)	
		N	%	N	%	N	%	N	%	N	N	%
1	Interested towards cultivation of horticulture crops	0	0	5	71	6	40	4	50	2	17	42.5

Forest species grown: The data regarding forest species grown in Wankasambar-3 Micro watershed is presented in Table 44. The results indicate that, households have planted 1000 teak trees, 17 neem trees, 1 tamarind trees and 4 acacia trees together in both field and backyard.

Table 44. Forest species grown in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Teak	0	0	0	0	0	0	0	0	1000	0	1000	0
2	Neem	0	0	2	0	7	0	8	0	0	0	17	0
3	Tamarind	0	0	0	0	1	0	0	0	0	0	1	0
4	Acacia	0	0	0	0	2	0	2	0	0	0	4	0

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

Average additional investment capacity: The data regarding average additional investment capacity in Wankasambar-3 Micro watershed is presented in Table 45. The results indicate that, households have an average investment capacity of Rs. 10225.00 for land development, Rs. 150.00 for creation of irrigation facility, Rs.7950.00 for adoption of improved livestock breeds, Rs.100.00 for adoption of improved crop production activities.

Table 45. Average additional investment capacity of households in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)	MF (7)	SF (15)	SMF (8)	MDF (5)	All (40)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Land development	0	8714.29	11333.3	13000	14800	10225
2	Irrigation facility	0	857.14	0	0	0	150
3	Improved crop production	0	6571.43	8000	7125	19000	7950
4	Improved livestock management	0	0	133.33	250	0	100

Source of funds for additional investment: The data regarding source of funds for additional investment in Wankasambar-3 Micro watershed is presented in Table 46. The results indicate that, the sources of finance raised from bank as a loan and from own sources for land development were 35.00 and 52.50 per cent.

Table 46. Source of funds for additional investment in Wankasambar-3 micro-watershed

Sl.No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Loan from bank	14	35	0	0	20	50	1	2.5
2	Own funds	21	52.5	1	2.5	15	37.5	1	2.5

Marketing of agricultural produce: The data regarding marketing of the agricultural produce in Wankasambar-3 Micro watershed is presented in Table 47. The results indicated that, 100.39 percent of output of Cotton was sold in the market with average price of Rs. 4500.00; 83.33 percent of output of Groundnut was sold in the market with average price of Rs. 6000.00; 100.00 percent of output of Lemon was sold in the market with average price of Rs. 11000.00; 100.00 percent of output of Mango was sold in the market with average price of Rs. 15500.00 and 93.33 percent of output of Onion was sold in the market with average price of Rs. 800.00.

Table 47. Marketing of agricultural produce in Wankasambar-3 micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Cotton	257	0	258	100	4500
2	Groundnut	24	4	20	83	6000
3	Lemon	200	0	200	100	11000
4	Mango	200	0	200	100	15500
5	Onion	30	2	28	93	800
6	Paddy	10	2	8	80	2500
7	Red gram	135	22	113	84	4727
8	Sapota	30	0	30	100	20000

Marketing channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Wankasambar-3 Micro watershed is presented in Table 48. The results indicated that, 60.00 cent of the households have sold agricultural produce to the local/village merchants and 50.00 per cent of regulated market.

Table 48. Marketing channels used for sale of agricultural produce in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0	5	71	12	80	6	75	1	20	24	60
2	Regulated Market	0	0	2	29	5	33.3	5	62.5	8	160	20	50

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Wankasambar-3 Micro watershed is presented in Table 49. The results indicated that, 40.00 cent of the households have used tractor, 72.50 per cent have used Cart.

Table 49. Mode of transport of agricultural produce in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cart	0	0	6	86	13	86.7	6	75	4	80	29	72.5
2	Tractor	0	0	1	14	4	26.7	6	75	5	100	16	40

Incidence of soil and water erosion problems: The data regarding incidence of incidence of soil and water erosion problems in Wankasambar-3 Micro watershed is presented in Table 50. The results indicate that, 85.00 per cent of the households have experienced soil and water erosion problems.

Table 50. Incidence of soil and water erosion problems in Wankasambar-3 micro-watershed

Sl. No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	7	100	14	93.3	8	100	5	100	34	85

Interest towards soil testing: The data regarding Interest shown towards soil testing in Wankasambar-3 Micro watershed is presented in Table 51. The results indicated that, 35.00 per cent of the households were interested towards soil testing.

Table 51. Interest regarding soil testing in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	4	57	5	33.3	4	50	1	20	14	35

Soil and water conservation practices and structures adopted: The data regarding soil and water conservation practices and structures adopted in Wankasambar-3 Micro watershed is presented in Table 52. The results indicated that 100 per cent of farmers practicing summer ploughing as soil and water conservation practice.

Table 52. Soil and water conservation practices and structures adopted in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farm Pond	0	0	2	29	1	6.7	1	12.5	1	20	5	12.5

Status of soil and water conservation structures: The data regarding status soil and water conservation structures adopted in Wankasambar-3 Micro watershed is presented in Table 53. The results indicated that, the households have adopted field bunding as a soil and water conservation structures out of which 40.00 per cent was in good condition, 20.00 per cent was slightly damaged, 40.00 percent were severely damaged.

Table 53. Status of soil and water conservation structures in Wankasambar-3 micro-watershed

Sl.No	Item	Good		Slightly Damaged		Severely Damaged		Full Replacement Required	
		N	%	N	%	N	%	N	%
1	Farm Pond	2	40	1	20	2	40	0	0

Agencies involved in the soil and water conservation structures: The data regarding Agencies involved in the soil and water conservation structures adopted in Wankasambar-3 Micro watershed is presented in Table 54. The results indicated that, 12.50 per cent were done by Govt.

Table 54. Agencies involved in the soil and water conservation structures in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Govt.	0	0	2	29	1	6.67	1	13	1	20	5	12.5

Usage pattern of fuel for domestic use: The data on usage pattern of fuel for domestic use in Wankasambar-3 Micro watershed is presented in Table 55. The results indicated that, firewood was the major source of fuel for domestic use for 100.00 per cent of the households.

Table 55. Usage pattern of fuel for domestic use in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	5	100	7	100	15	100	8	100	5	100	40	100

Source of drinking water: The data on source of drinking water in Wankasambar-3 Micro watershed is presented in Table 56. The results indicated that, piped waters supply was the major source for drinking water for 100 per cent of the households.

Table 56. Source of drinking water in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	5	100	7	100	15	100	8	100	5	100	40	100

Source of light: The data on source of light in Wankasambar-3 Micro watershed is presented in Table 57. The results indicated that, electricity was the major source of light for 97.50 per cent of the households.

Existence of sanitary toilet facility: The data on availability of toilet facility in Wankasambar-3 Micro watershed is presented in Table 58. The results indicated that, 40.00 per cent of the households possess toilets.

Table 57. Source of light in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100	7	100	14	93.3	8	100	5	100	39	97.5

Table 58. Existence of sanitary toilet facility in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	5	100	4	57	3	20	2	25	2	40	16	40

Possession of PDS card: The data regarding possession of PDS card in Wankasambar-3 Micro watershed is presented in Table 59. The results indicated that, 97.50per cent of the households possessed BPL card.

Table 59. Possession of PDS card in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100	7	100	14	93.33	8	100	5	100	39	97.5

Participation in NREGA programme: The data regarding Participation in NREGA programme in Wankasambar-3 Micro watershed is presented in Table 60. The results indicated that, only 47.50 percent of the households have participated in NREGA programme.

Table 60. Participation in NREGA programme in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	1	20	4	57.1	7	46.7	4	50	3	60	19	47.5

Adequacy of food items: The data regarding adequacy of food items in Wankasambar-3 Micro watershed is presented in Table 61. The results indicated that, the extent of adequacy of food items for cereals, pulses, Oilseeds and vegetables were 102.50, 75.00, 50.00, 70.00 per cent respectively, similarly for Fruits (27.50%), milk (37.50%), Egg (25.00%) and Meat (17.50%).

Table 61. Adequacy of food items in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	5	100	8	114	15	100	8	100	5	100	41	102.5
2	Pulses	3	60	6	85.7	12	80	6	75	3	60	30	75
3	Oilseed	1	20	6	85.7	7	46.67	2	25	4	80	20	50
4	Vegetables	0	0	4	57.1	13	86.67	7	87.5	4	80	28	70
5	Fruits	1	20	4	57.1	3	20	0	0	3	60	11	27.5
6	Milk	1	20	2	28.6	7	46.67	3	37.5	2	40	15	37.5
7	Egg	1	20	1	14.3	5	33.33	0	0	3	60	10	25
8	Meat	0	0	1	14.3	4	26.67	1	12.5	1	20	7	17.5

Table 62. Inadequacy of food items in Wankasambar-3 micro-watershed

Sl.No.	Particulars	LL (5)		MF (7)		SF (15)		SMF (8)		MDF (5)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	0	0	0	0	0	0	0	0	0	0	0	0
2	Pulses	2	40	1	14.3	3	20	2	25	2	40	10	25
3	Oilseed	4	80	1	14.3	8	53.33	6	75	1	20	20	50
4	Vegetables	2	40	3	42.9	2	13.33	1	12.5	1	20	9	22.5
5	Fruits	4	80	3	42.9	12	80	8	100	2	40	29	72.5
6	Milk	2	40	5	71.4	8	53.33	5	62.5	3	60	23	57.5
7	Egg	4	80	6	85.7	10	66.67	8	100	2	40	30	75
8	Meat	5	100	6	85.7	11	73.33	7	87.5	4	80	33	82.5

Inadequacy of food items: The data regarding in adequacy of food items in Wankasambar-3 Micro watershed is presented in Table 62. The results indicated that, the extent of in adequacy of food items for cereals, pulses, Oilseeds and vegetables were 0.00,

25.00, 50.00, 22.50 and 82.50 per cent respectively, similarly for fruits (72.50%), milk (57.50%), egg (75.00%) and meat (82.50%).

Farming constraints: The data regarding farming constraints experienced by households in Wankasambar-3 Micro watershed is presented in Table 63. The results indicated that, lower fertility status of the soil was the constraint experienced by (90.00 %) per cent of the households, wild animal menace on farm field (82.50%), frequent incidence of pest and diseases (57.50%), inadequacy of irrigation water (52.50%), high cost of fertilizers and plant protection chemicals (55.00%), high rate of interest on credit (45.00%), low price for the agricultural commodities (67.50 %), lack of marketing facilities in the area (62.50%), inadequate extension services (52.50 %), lack of transport for safe transport of the agricultural produce to the market (42.50%), less rainfall (2.50%), source of agri-technology information (Newspaper/Tv/Mobile) (2.50%).

Table 63. Farming constraints experienced in Wankasambar-3 micro-watershed

SN	Particulars	**LL** (5)		**MF** (7)		**SF** (15)		**SMF** (8)		**MDF** (5)		**All (40)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Lower fertility status of the soil	1	20	7	100	15	100	8	100	5	100	36	90
2	Wild animal menace on farm field	1	20	7	100	14	93.33	6	75	5	100	33	82.5
3	Frequent incidence of pest and diseases	2	40	4	57.14	8	53.33	6	75	3	60	23	57.5
4	Inadequacy of irrigation water	1	20	3	42.86	5	33.33	7	87.5	5	100	21	52.5
5	High cost of Fertilizers and plant protection chemicals	0	0	6	85.71	9	60	4	50	3	60	22	55
6	High rate of interest on credit	0	0	3	42.86	7	46.67	5	62.5	3	60	18	45
7	Low price for the agricultural commodities	1	20	5	71.43	12	80	6	75	3	60	27	67.5
8	Lack of marketing facilities in the area	1	20	6	85.71	12	80	3	37.5	3	60	25	62.5
9	Inadequate extension services	0	0	6	85.71	9	60	3	37.5	3	60	21	52.5
10	Lack of transport for safe transport of the Agril produce to the market.	1	20	2	28.57	7	46.67	3	37.5	4	80	17	42.5
11	Less rainfall	1	20	0	0	0	0	0	0	0	0	1	2.5
12	Source of Agri-technology information	1	20	0	0	0	0	0	0	0	0	1	2.5

Chapter 5

SUMMARY AND IMPLICATIONS

In order to assess the socio-economic condition of the farmers in the watershed 40 households located in the micro watershed were interviewed for the survey. The study was conducted in Wankasambar-3 micro-watershed (Turk Madhawar sub-watershed, Yadgir taluk & District) is located at North latitude 16^0 39' 16.015" and 16^0 37' 27.275" and East longitude 77^0 22' 37.304" and 77^0 20' 41.304"covering an area of about 583.14 ha bounded by under Vankasambara, Sambara and Madhwara villages.

Socio-economic analysis of Wankasambar-3 micro watersheds of Turk Madhawar sub-watershed, Yadgir taluk & District indicated that, out of the total sample of 40 farmers were sampled in Wankasambar-3 micro-watershed among households surveyed 7 (17.50%) were marginal, 15 (37.50%) were small, 8 (20.00 %) were semi medium, 5 (12.50 %) were medium farmers. 5 landless farmers were also interviewed for the survey. The population characteristics of households indicated that, there were 119 (54.09%) men and 101 (45.91 %) were women.

Majority of the respondents (53.64%) were in the age group of 16-35 years. Education level of the sample households indicated that, there were 25.00 per cent illiterates, 71.37 per cent pre university education and 7.27 per cent attained graduation. About, 52.50 per cent of household heads practicing agriculture and 47.50 per cent of the household heads were engaged as agricultural labourers.

Agriculture was the major occupation for 34.09 per cent of the household members. In the study area, 70.00 per cent of the households possess katcha house and 2.50 per cent possess pucca house. The durable assets owned by the households showed that, 82.50 per cent possess TV, 75.00 per cent possess mixer grinder, 90.00 per cent possess mobile phones and 15.00 per cent possess motor cycles.

Farm implements owned by the households indicated that, 32.50 per cent of the households possess plough, 5.00 per cent possess tractor, 15.00 per cent possess bullock cart. Regarding livestock possession by the households, 15.00 per cent possess local cow and 2.50 per cent possess buffalo.

The average labour availability in the study area showed that**,** own labour men available in the micro watershed was 1.92, women available in the micro watershed was 1.78, hired labour (men) available was 4.97 and hired labour (women) available was 11.33. Further, 2.50 per cent of the households opined that hired labour was inadequate during the agricultural season.

In the study area, about 10.45 per cent of the respondents migrated from the micro watershed in search of jobs with an average distance of 1705.00 kms for about 4.30 months. Out of the total land holding of the sample respondents 91.32 per cent (69.64 ha) of the area is under dry condition and the remaining 8.68 per cent area is irrigated land.

There were 4.00 live bore wells and 3.00 dry bore wells among the sampled households. Bore/open well was the major source of irrigation for 10.00 per cent of the households.

The major crops grown by sample farmers are Cotton, Red gram, Sugarcane, Groundnut and Paddy and cropping intensity was recorded as 100.00 per cent. Out of the sample households 85.00 percent possessed bank account and 17.50 per cent of them have savings in the account. About 67.50 per cent of the respondents borrowed credit from various sources.

Among the credit borrowed by households, 157.14 per cent have borrowed loan from commercial banks and 128.57 per cent from co-operative/Grameena bank. Majority of the respondents (100.00%) have borrowed loan for agriculture purpose. Regarding the opinion on institutional sources of credit, 50.00 per cent of the households opined that credit helped to perform timely agricultural operations.

The per hectare cost of cultivation for Cotton, Red gram, Sugarcane, Groundnut and Paddy was Rs.64881.38, 20711.75, 0.00, 71012.87 and 125743.60 with benefit cost ratio of 1:0.60, 1: 1.70, 1: 0.00, 1: 0.80 and 1:0.50 respectively. Further, 30.00 per cent of the households opined that dry fodder was adequate and 10.00 per cent of the households have opined that the green fodder was adequate.

The average annual gross income of the farmers was Rs. 81625.03 in micro-watershed, of which Rs. 53400.03 comes from agriculture. Sampled households have grown 1050 horticulture trees and 1022 forestry trees together in the fields and back yards. About 42.50 per cent of the households shown interest to cultivate horticultural crops.

Households have an average investment capacity of Rs. 10225.00 for land development and Rs. 150.00 for irrigation facility. Source of funds for additional investment is concerned, 52.50 per cent depends on own funds and 35.00 per cent depends on bank loan for land development activities.

Regarding marketing channels, 60.00 per cent of the households have sold agricultural produce to the local/village merchants, while, 50.00 per cent have sold in regulated markets. Further, 40.00 per cent of the households have used tractor for the transport of agriculture commodity. Majority of the farmers (85.00%) have experienced soil and water erosion problems in the watershed and 35.00 per cent of the households were interested towards soil testing.

Fire was the major source of fuel for domestic use for 100.00 per cent of the households. Piped supply was the major source for drinking water for 100.00 per cent of the households. Electricity was the major source of light for 97.50 per cent of the households.

In the study area, 40.00 per cent of the households possess toilet facility. Regarding possession of PDS card, 97.50 per cent of the households possessed BPL card. Households

opined that, the requirement of cereals (102.50%), pulses (75.00%) and oilseeds (50.00%) are adequate for consumption.

Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (90.00%) wild animal menace on farm field (82.50%), frequent incidence of pest and diseases (57.50%), inadequacy of irrigation water (52.50%), high cost of fertilizers and plant protection chemicals (55.00%), high rate of interest on credit (45.00%), low price for the agricultural commodities (67.50%), lack of marketing facilities in the area (62.50%), inadequate extension services (52.50%), lack of transport for safe transport of the agricultural produce to the market (42.50%), Less rainfall (2.50%) and Source of Agri-technology information (Newspaper/ TV/Mobile) (2.50%).

Implications of the survey

- ✓ Result indicated that, there were 25.00 per cent were illiterate hence; extension methodologies such as demonstration, street play, drama, video shows will be effective in dissemination of the technologies in the micro watershed.
- ✓ The data indicate that, 70.00 per cent of the households possess katcha house. Hence, the development department while implementing the watershed plan should focus on agriculture to enhance the productivity of major crops in the area to increase the income of the farmers.
- ✓ Results indicated that the local institutional participation of the household members in the micro watershed is minimal hence, activities like membership campaign, awareness creation about the benefits of membership in local institutions and strengths of organized groups must be conveyed.
- ✓ Majority of the households in the watershed have experience in use of mobile phones, and television hence, these mass media can be effectively utilized for transfer of technology as well as for information dissemination.
- ✓ The farm machinery/implement possession in the micro watershed was found to be minimum the reasons may lack of knowledge or lack of financial ability which can be addressed through training on use of different farm implements, providing information on different sources of finance for purchase of farm implements.
- ✓ The possession of livestock such as crossbred cow found is less hence, farmers must be made aware of the benefits of crossbred cow in increased milk production.
- ✓ The possession of livestock such as sheep, goat and poultry was found to be low hence, farmers may be informed the role of subsidiary enterprises in enhancing the income and information on financial support for subsidiary activities.
- ✓ The data indicate that, job/work was the reason for all the migrants hence, farmers may be trained on profitable agriculture or self employment such has animal husbandry, plate making, sheep rearing, goat rearing, rabbit rearing with suitable information on sources of financial support.

- ✓ The results indicate that there was a change in quality of life due to migration hence, the developmental departments should take actions to arrest migration and to improve the quality of the life in rural areas.
- ✓ Households possess 63.60ha (91.32 %) of dry land and 6.04ha (8.68 %) of irrigated land hence, the availability of the dry land agricultural technologies such as short duration crops, high yielding drought resistance crop varieties, drip irrigation technology and subsidy information will be helpful for the farmers to enhance the productivity of land and as well as farmers income.
- ✓ Few of the bore well in micro watershed found non functional hence, farmers may be trained on possibility of bore well rejuvenation.
- ✓ Bore well was major source of irrigation for 10.00 per cent of the households. Hence, in order to increase the area under irrigation as well as to increase the water use efficiency farmers may trained on drip irrigation and provide the information on subsidy for drip irrigation equipment's along with the information on different agencies which provides the financial assistance for drip irrigation.
- ✓ The cropping intensity in the micro watershed was found to be (100.00 %) hence, care must be taken by the implementing agency to bring uncultivated land into cultivation through suitable measures.
- ✓ Many of the household members have borrowed loan from cooperative banks which has higher rate of interest hence, farmers may be sensitized on the different sources of credit with lesser interest rate such SHGs etc.
- ✓ The results indicated the non availability of both green and dry fodder throughout the year hence, fodder development activities can be taken up in the micro watershed.
- ✓ The average annual gross income of the households Rs.53400.03 from agriculture, and Rs. 23600.00 from wages. Agriculture was found to be the major source of income for households hence; the development activities should focus on productivity enhancement, marketing arrangements and agricultural technology dissemination to have a direct impact on the farmers.
- ✓ The cultivation of forest species is found minimal hence, information and production technology related to agro-forestry and integrated farming system.
- ✓ The data indicated that, 85.00 per cent of the households have experienced soil and water erosion problems. Hence, those farmers who reported the soil and water erosion problems may be given attention while implementation of the watershed development plan.
- ✓ The data indicated that, 35.00 per cent of the households have interest in soil testing hence, farmers must be provided with the information on various institutions which are involved in soil testing for the benefit of the farmers.
- ✓ Except summer ploughing the adoption of other soil and water conservation structures is minimum hence, the farmers in the micro watershed should be sensitized on the use of different conservation structures for soil water conservation.

- ✓ Cereals and pulses found be adequate for per cent of the households respectively hence, farm households and the farm women must be trained on importance of balanced nutrition and role of vegetable, milk, egg, meat in balanced diet.
- ✓ Lower fertility status of the soil (90.00%), wild animal menace on farm field (82.50%), frequent incidence of pest and diseases (57.50%), high cost of fertilizers and plant protection chemicals (55.00%), high rate of interest on credit (45.00%), low price for the agricultural commodities (67.50%), lack of marketing facilities in the area (62.50%), inadequate extension services (52.50%), lack of transport for safe transport of the agricultural produce to the market (42.50%) were the major farming constraints experienced hence, these constraints must be addressed immediately for the welfare of the farmers. Awareness to be created among the farmers to approach nearest KVKs/RSKs and other developmental departments for technical and for subsidized inputs and utilize the well established regulated markets, approaching the contract firms, direct markets to avoid the involvement of middlemen.