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

WANKASAMBAR -1 (4D2D6M2b) 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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TO OBTAIN COPIES,

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

Amaravati Road, NAGPUR - 440 033, India

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

Telefax : 0712-2522534

E-Mail : director@nbsslup.ernet.in

Website URL : nbsslup.in

Or

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

Phone : (080) 23412242, 23510350 (O)

Telefax : 080-23510350

E-Mail : nbssrcb@gmail.com

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PREFACE

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

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

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

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

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

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

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

Nagpur
Date:25.05.2019

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

Contributors

Dr. Rajendra Hegde Principal Scientist, Head & Project Leader, Sujala-III Project ICAR-NBSS&LUP, Regional Centre Bangalore	**Dr. S.K. Singh** Director, ICAR-NBSS&LUP Coordinator, Sujala-III Project Nagpur
Soil Survey, Mapping & Report Preparation	
Dr. B.A. Dhanorkar	Sh.R.S.Reddy
Dr. K.V. Niranjana	Sh. Venkata Giriyappa
	Sh. Somashekar, T. N.
	Smt. Chaitra, S. P.
	Sh. Nagendra, B. R.
	Dr. H. R. Savitha
	Dr. B. Gayathri
	Dr. Gopali Bardhan
Field Work	
Sh. C. Bache Gowda	Sh. Mahesh, D.B.
Sh. Somashekar	Sh. Ashok, S. Sindagi
Sh. M. Jayaramaiah	Sh. Veerabhadrappa
Sh. Paramesha, K.	Sh. Kailash.
Sh. B. M. Narayana Reddy	Sh. Yogesh, H.N.
	Sh. Kamalesh, Avate.
	Sh. Sharan Kumar Uppar
	Sh. Kalaveerachari, Kammar
	Sh. Arun, N. Kambar
	Sh. Anand
	Sh. Manohar, Y. Hosamane
	Sh. Pramod, Navale
	Sh. Ramesh Hangargi
	Sh. Santhosha
	Sh. Prasanna kumar, N. S.
	Sh. Vijaya kumar, S. Lamani
	Sh. Rakesh, Achalkar
GIS Work	
Dr. S.Srinivas	Sh. A.G.Devendra Prasad
Dr. M.Ramesh	Sh. Abhijith Sastry, N.S.
Sh. D.H.Venkatesh	Sh. Nagendra Babu Kolukondu
Smt.K.Sujatha	Sh. Avinash, K.N.
Smt. K.V.Archana	Sh. Amar Suputhra, S.
Sh. N.Maddileti	Sh. Deepak, M.J.
	Smt. K.Karunya Lakshmi
	Ms. Seema, K.V.
	Ms. Ramireddy Lakshmi Silpa
	Ms. Bhanu Rekha, T.
	Ms. Rajata Bhat

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

PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

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

The present study covers an area of 408 ha in Wankasambar-1 microwatershed in Yadgir taluk and 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 about 87 per cent is covered by soils, 13 per cent by rock lands and others. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 11 soil series and 11 soil phases (management units) and 8 land management units.*
- *The length of crop growing period is 120-150 days starting from the 1st week of June to 4th week of October.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 26 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire land area of the microwatershed is suitable for agriculture.*
- *About 10 per cent soils are shallow (25-50 cm), 27 per cent soils are moderately shallow (50-75 cm), 18 per cent are moderately deep (75-100 cm) and about 31 per cent soils are deep (100-150 cm) to very deep (>150 cm) soils.*
- *About 12 per cent of the area has clayey soils, 52 per cent loamy soils and 23 per cent sandy soils at the surface.*
- *Entire area of about 87 per cent has non-gravelly.*
- *About 15 per cent of the area has soils that are very high (>200 mm/m) in available water capacity, 31 per cent medium (101-150 mm/m), 27 per cent low (51-100 mm/m) and about 14 per cent very low (<50 mm/m).*

- *Entire area of 87 per cent of the microwatershed has very gently sloping (1-3%) lands.*
- *About 79 per cent has soils that are moderately eroded (e2) and 8 per cent has slightly eroded (e1) soils.*
- *An area of about 12 per cent is neutral (pH 6.5-7.3), 38 per cent is slightly alkaline (pH 7.3-7.8), 25 per cent soils that are moderately alkaline (pH 7.8 to 8.4) and about 11 per cent soils that are strongly alkaline (pH 8.4 – 9.0) in soil reaction.*
- *The Electrical Conductivity (EC) of the soils are dominantly <2 dSm^{-1} indicating that the soils are non-saline.*
- *About 12 per cent is low (<0.5%), 12 per cent medium (0.5-0.75%) and 63 per cent high (>0.75%) in organic carbon.*
- *An area of 28 per cent has soils that are low (<23 kg/ha), 56 per cent medium (23-57 kg/ha) and about 3 per cent high (>57 kg/ha) in available phosphorus.*
- *About <1% per cent is low (<145 kg/ha), 73 per cent medium (145-337 kg/ha) and 14 per cent high (>337 kg/ha) in available potassium.*
- *Available sulphur is low (<10 ppm) in about 72 per cent area, medium (10-20 ppm) in 15 per cent and high (>20 ppm) in about <1 per cent area of the microwatershed.*
- *Available boron is low (<0.5 ppm) in 9 per cent, 76 per cent medium (0.5-1.0 ppm) and high (>1.0 ppm) in about 3 per cent area of the microwatershed.*
- *Entire area has soils that are sufficient (>4.5 ppm) in available iron.*
- *Available manganese and copper are sufficient in all the soils of the microwatershed.*
- *Entire area of the microwatershed is deficient (<0.6 ppm) in available zinc.*
- *The land suitability for 26 major agricultural and horticultural crops grown in the microwatershed was assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the Wankasambar-1 microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	-	*252 (62)*		*Sapota*	-	*40 (10)*
Maize	-	*118 (29)*		*Guava*	-	*40 (10)*
Red gram	-	*174 (43)*		*Pomegranate*	-	*174 (43)*
Bajra	-	*298 (73)*		*Jackfruit*	-	*23 (6)*
Ground nut	-	*135 (33)*		*Jamun*	-	*100 (24)*
Sunflower	-	*157 (39)*		*Musambi*	-	*174 (43)*
Cotton	*31 (8)*	*222 (54)*		*Lime*	-	*174 (43)*
Bengalgram	*31 (8)*	*221 (54)*		*Cashew*	-	-
Chilli	-	*269 (66)*		*Custard apple*	-	*252 (62)*
Tomato	-	*135 (33)*		*Amla*	-	*252 (62)*
Drumstick	-	*174 (43)*		*Tamarind*	-	*100 (24)*
Mulberry	-	*23 (60*		*Marigold*	-	*269 (66)*
Mango	-	*23 (6)*		*Chrysanthemum*	-	*269 (66)*

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 8 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 that helps in maintaining the ecological balance in the microwatershed

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

Chapter 1

INTRODUCTION

Soil being a vital natural resource on whose proper use depends the life supporting systems of a country and the socioeconomic development of its people. Soils provide food, fodder, fibre and fuel for meeting the basic human and animal needs. With the ever increasing growth in human and animal population, the demand on soil for more food and fodder production is on the increase. The area available for agriculture is about 51 per cent of the total geographical area and more than 60 per cent of the people are still dependant on agriculture for their livelihood. However, the capacity of a soil to produce is limited and the limits to the production are set by its intrinsic characteristics, agro-climatic setting, and, use and management. There is, therefore, tremendous pressure on land and water resources, which is causing decline in soil-health and stagnation in productivity. The soils have been degrading at an estimated rate of one million hectares per year and ground water levels have been receding at an alarming rate resulting in decline in the ground water resource. Further, land degradation has emerged as a serious problem which has already affected about 38 lakh ha of cultivated area in the State. Soil erosion alone has degraded about 35 lakh ha. Almost all the uncultivated areas are facing various degrees of degradation, particularly soil erosion; salinity and alkalinity has emerged as a major problem in more than 3.5 lakh ha in the irrigated areas of the State. Nutrient depletion and declining factor productivity is common in both rainfed and irrigated areas. The degradation is continuing at an alarming rate and there appears to be no systematic effort among the stakeholders to contain this process. In recent times, an aberration of weather due to climate change phenomenon has added another dimension leading to unpredictable situation to be tackled by the farmers.

In this critical juncture, the challenge before us is not only to increase the productivity per unit area which is steadily declining and showing a fatigue syndrome, but also to prevent or at least reduce the severity of degradation. If the situation is not reversed at the earliest, then the sustainability of the already fragile crop production system and the overall ecosystem will be badly affected in the state. Added to this, every year there is a significant diversion of farm lands and water resources for non-agricultural purposes. Thus, developing strategies to slow down the degradation process or reclaim the soils to normal condition and ensure sustainability of production system are the major issues today. These, demand a systematic appraisal of our soil and land resources with respect to their extent, geographic distribution, characteristics, behaviour and use potential, which is very important for developing an effective land use and cropping systems for augmenting agricultural production on a sustainable basis.

The soil and land resource inventories made so far in Karnataka had limited utility because the surveys were of different types, scales and intensities carried out at different times with specific objectives. Hence, there is an urgent need to generate detailed site-

specific farm level database on various land resources for all the villages/watersheds in a time bound manner that would help to protect the valuable soil and land resources and also to stabilize the farm production. Therefore, the land resource inventory required for farm level planning is the one which investigates all the parameters which are critical for productivity *viz.*, soils, site characteristics like slope, erosion, gravelliness and stoniness, climate, water, topography, geology, hydrology, vegetation, crops, land use pattern, animal population, socio-economic conditions, infrastructure, marketing facilities and various schemes and developmental works of the government etc. From the data collected at farm level, the specific problems and potentials of the area can be identified and highlighted, conservation measures required for the area can be planned on a scientific footing, suitability of the area for various uses can be worked out and finally viable and sustainable land use options suitable for each and every land holding can be prescribed.

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

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

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

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Wankasambara-1 micro-watershed is located in the northeastern part of Karnataka in Yadgir Taluk and District, Karnataka State (Fig. 2.1). It comprises parts of Sambara, Vadavata and Vankasambara villages. It lies between 16^0 36' and 16^0 38' north latitudes and 77^0 21' and 77^0 23' east longitudes and covers an area of 408 ha. It is about 36 km from Yadgir town and is surrounded by Sambara village on the southwest, Vadavata village on the northeast and Vankasambara village on the south, southeast and western side.

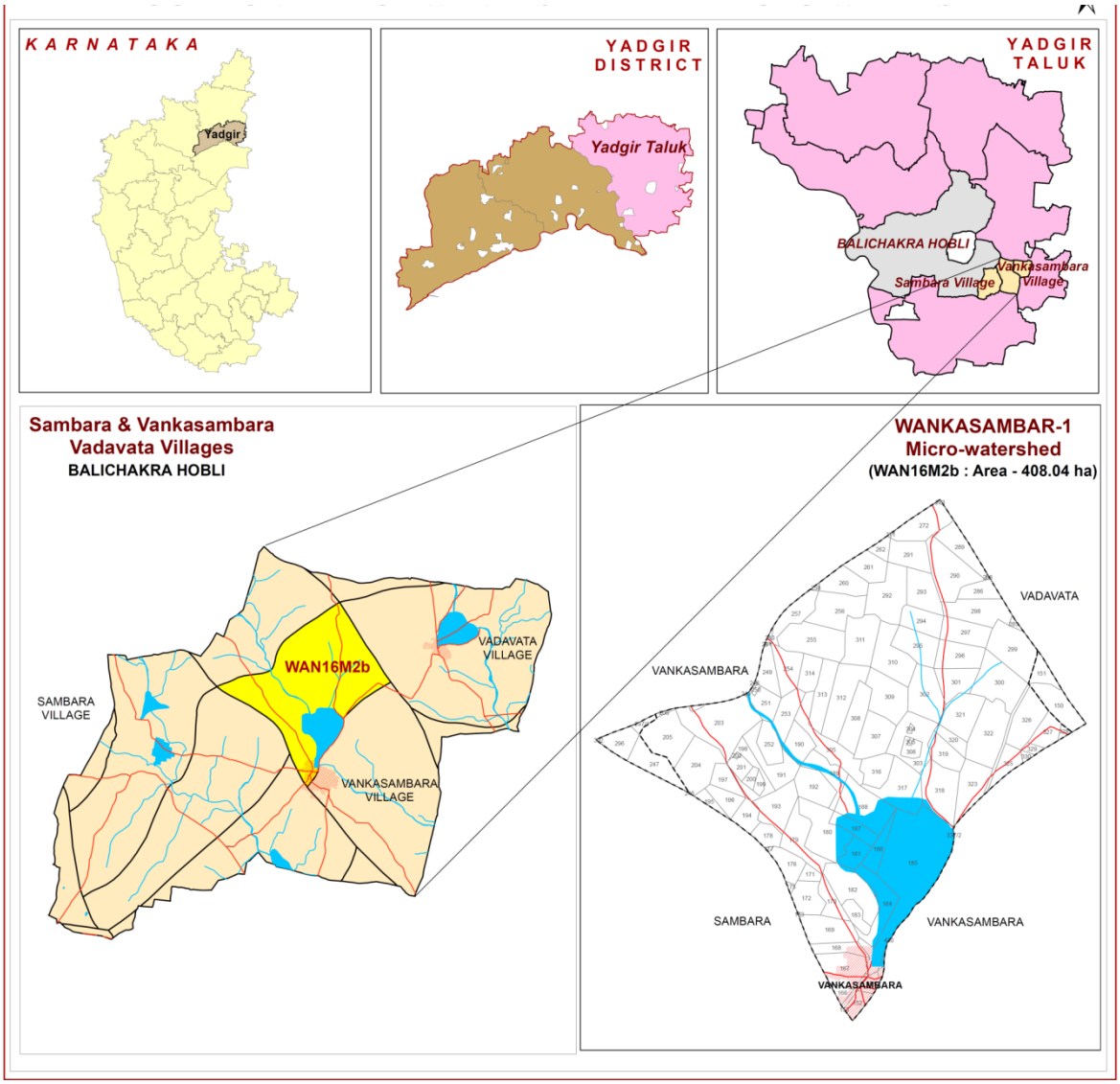


Fig. 2.1 Location map of Wankasambara-1 Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are granite gneiss (Fig. 2.2). Granite gneisses are essentially pink to gray and are coarse to medium grained. They consist primarily of quartz, feldspar, biotite and hornblende. The gray granite gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in the village.

Fig. 2.2 Granite and granite gneiss rocks

2.3 Physiography

Physiographically, the area has been identified as granite gneiss landscape based on geology. The microwatershed area has been further divided into mounds/ridges, summits, very gently sloping uplands, plains and valleys based on slope and its relief features. The elevation ranges from 362-378 m above MSL.

2.4 Drainage

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

2.5 Climate

The Yadgir district lies in the northern plains of Karnataka and falls under semiarid tract of the state and is categorized as drought-prone with total annual rainfall of 866 mm (Table 2.1). Of the total rainfall, maximum of 652 mm is received during the

south–west monsoon period from June to September, the north-east monsoon from October to early December contributes about 138 mm, and the remaining 76 mm during the rest of the year. The summer season starts during the middle of February and continues up to the first week of June. The period from December to the middle of February is the cold season. December is the coldest month with mean daily maximum and minimum temperatures being 29.5^{0}C and 10^{0}C respectively. During peak summer, temperature shoots up to 45^{0}C. 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 to end of September. Generally, the Length of crop Growing Period (LGP) is 120-150 days and starts from 1st week of June to 4th week of October.

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

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**	**141.4**	

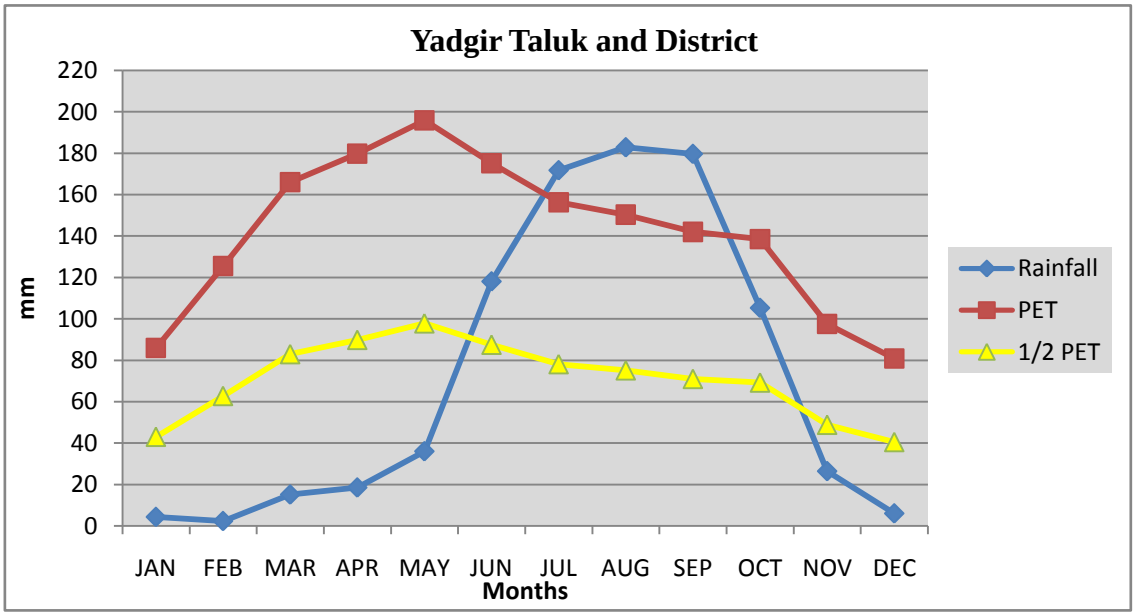


Fig 2.3 Rainfall distribution in Yadgir Taluk

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 taluk 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, mango, pomegranate and marigold. The different crops and cropping systems adopted in the microwatershed is presented in the Figures 2.4 a & b. While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Wankasambara-1 microwatershed is presented in Fig. 2.5. Simultaneously, enumeration of wells (bore wells and open wells) and other conservation structures in the microwatershed was made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells and other water bodies in the Wankasambara-1 microwatershed is given in Fig. 2.6.

Table 2.2 Land Utilization in Yadgir Taluk

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.	Trees and grooves	737	0.14
5.	Forest	33773	6.54
6.	Cultivable wasteland	2385	0.46
7.	Permanent Pasture land	11755	2.28
8.	Barren land	27954	5.41
9.	Non- Agriculture land	29623	5.73
10.	Current Fallows	105212	20.4

Fig. 2.4 a. Different Crops and Cropping Systems in Wankasambara-1 Microwatershed

Fig. 2.4 b. Different Crops and Cropping Systems in Wankasambara-1 Microwatershed

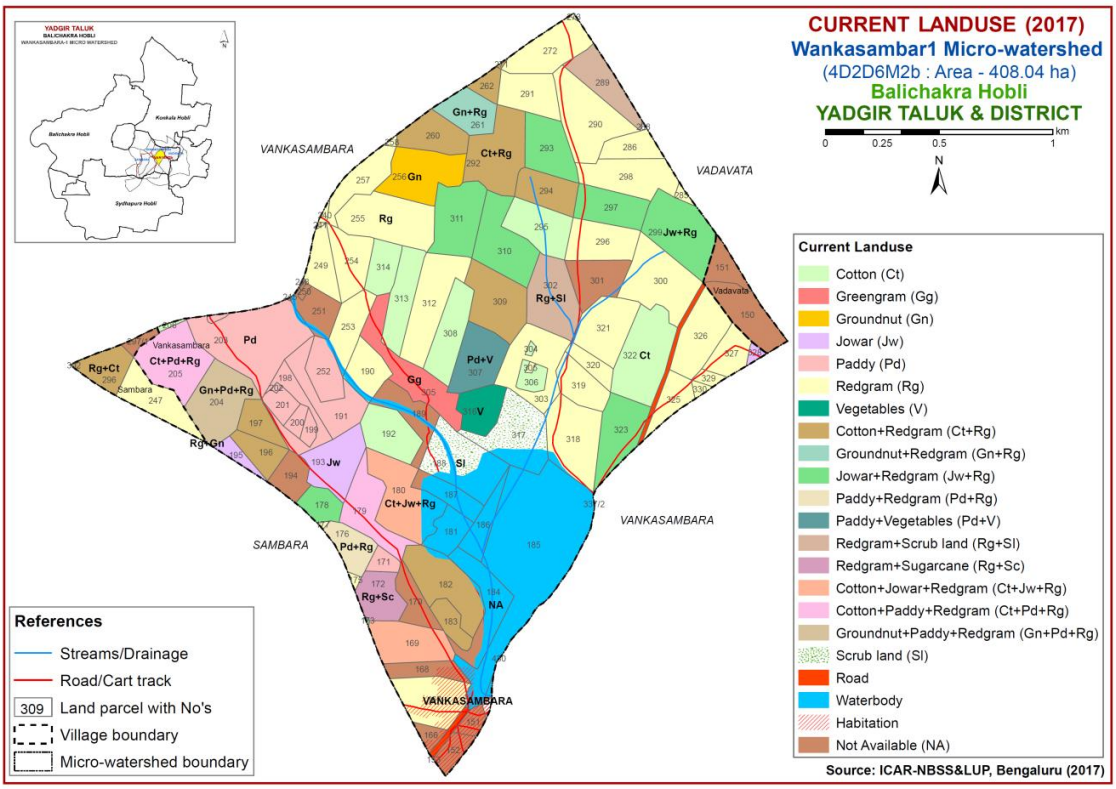


Fig. 2.5 Current Land Use map of Wankasambara-1 Microwatershed

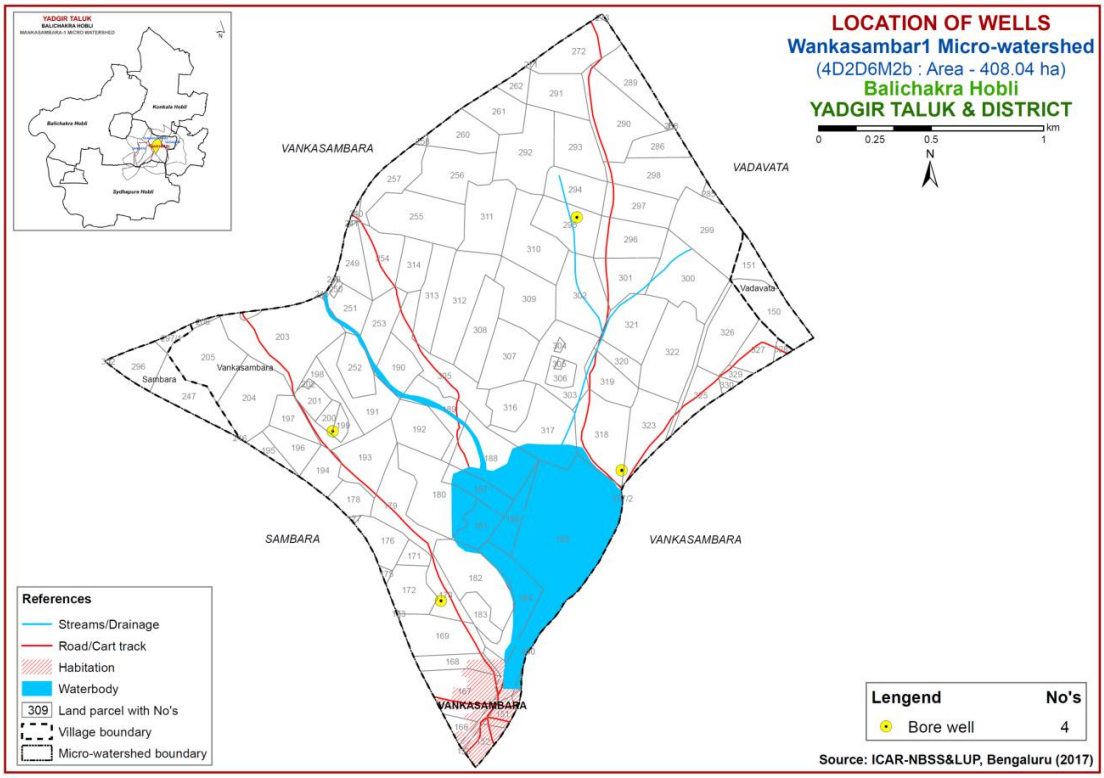


Fig. 2.6 Location of wells - Wankasambara-1 Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly for a given level of management. This was achieved in Wankasambara-1 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 408 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

The detailed survey of the land resources occurring in the microwatershed was carried out by using digitized cadastral map and satellite imagery as base supplied by the 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 rock types, the landscapes, landforms and other surface features. The imagery helped in the identification and delineation of boundaries between hills, uplands and lowlands, water bodies, forest and vegetated areas, roads, habitations and other cultural features of the area (Fig. 3.2). The cadastral map was overlaid on the satellite imagery (Fig. 3.3) that helps to identify the parcel boundaries and other permanent features. Apart from cadastral maps and images, toposheets of the area (1:50,000 scale) were used for initial traversing, identification of geology and landforms, drainage features, present land use and also for selection of transects in the microwatershed.

3.2 Image Interpretation for Physiography

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

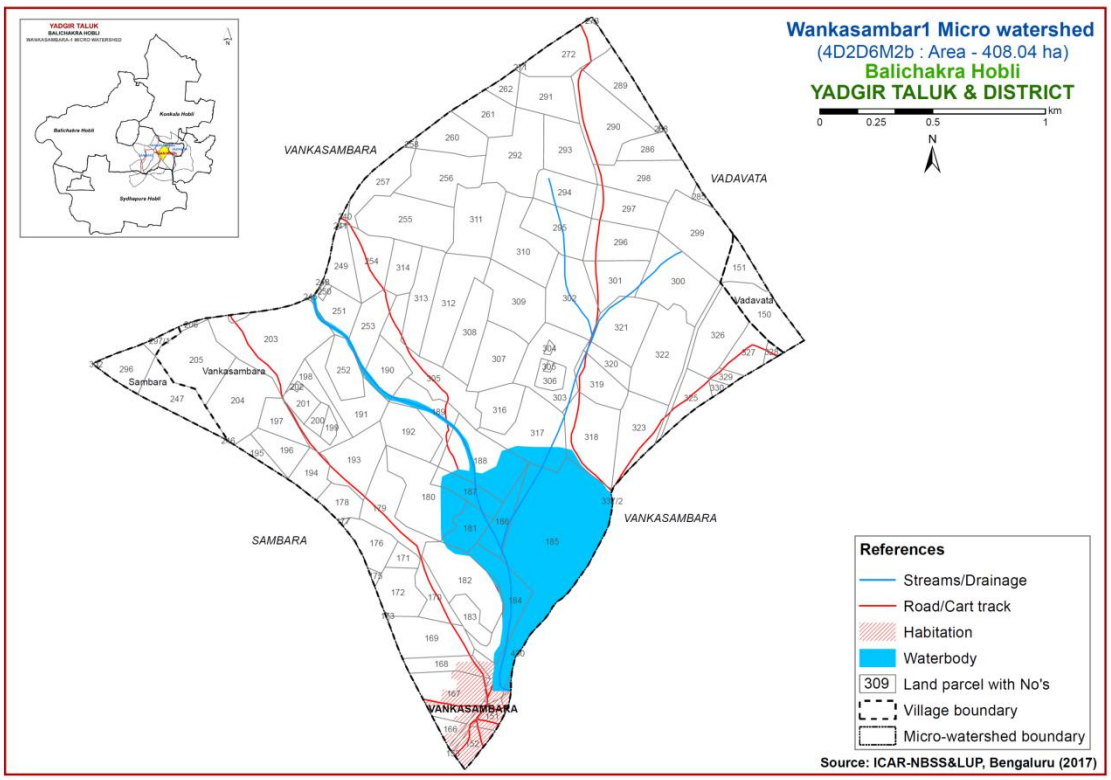


Fig 3.1 Scanned and Digitized Cadastral map of Wankasambara-1 Microwatershed

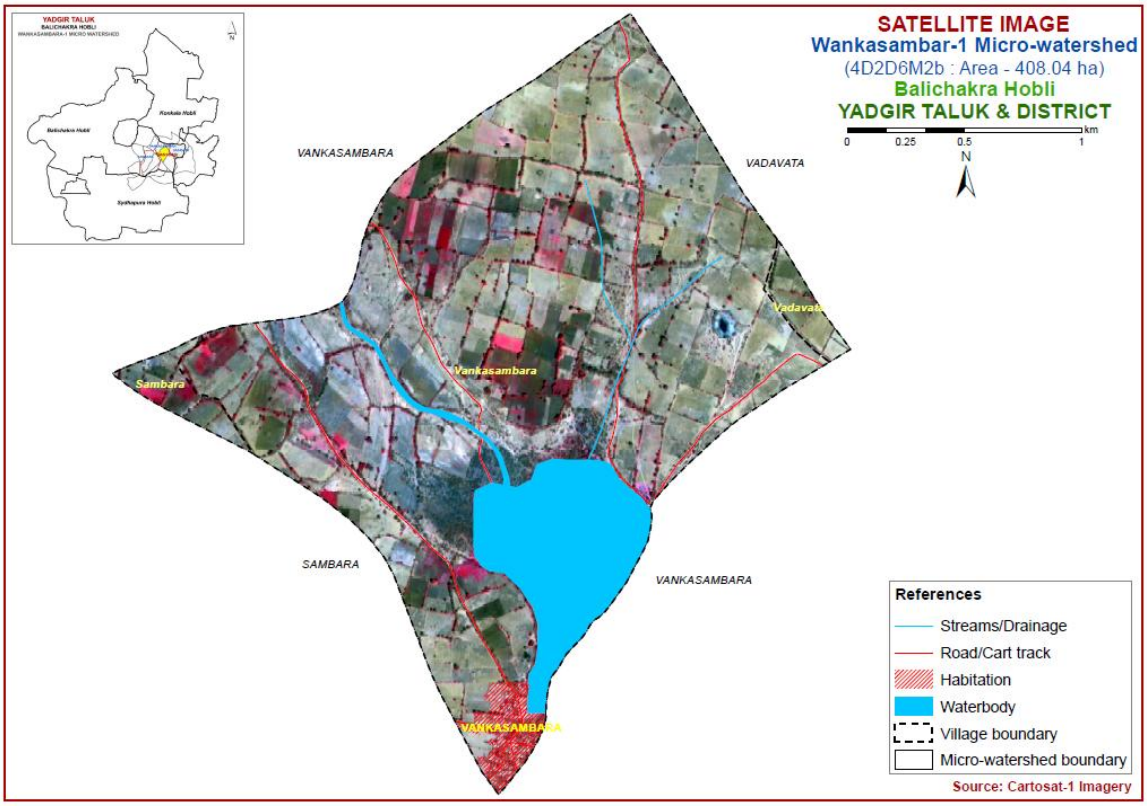


Fig.3.2 Satellite Image of Wankasambara-1 Microwatershed

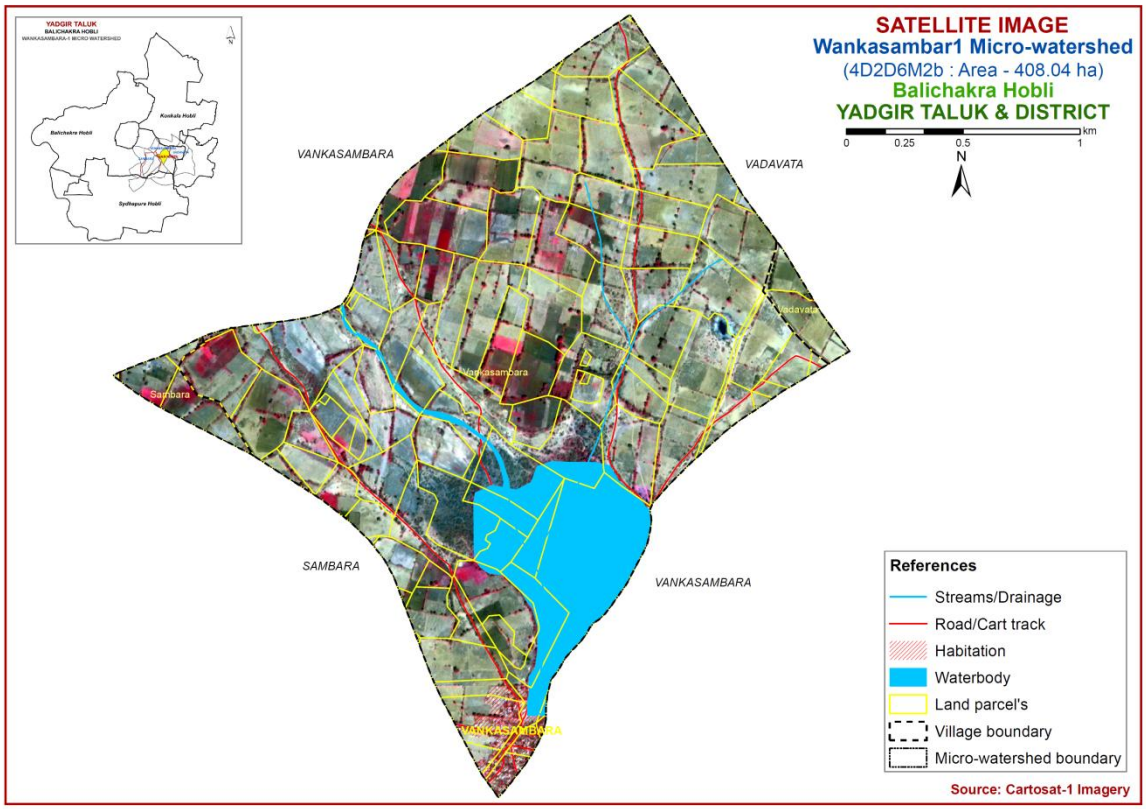


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Wankasambara-1 Microwatershed

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)

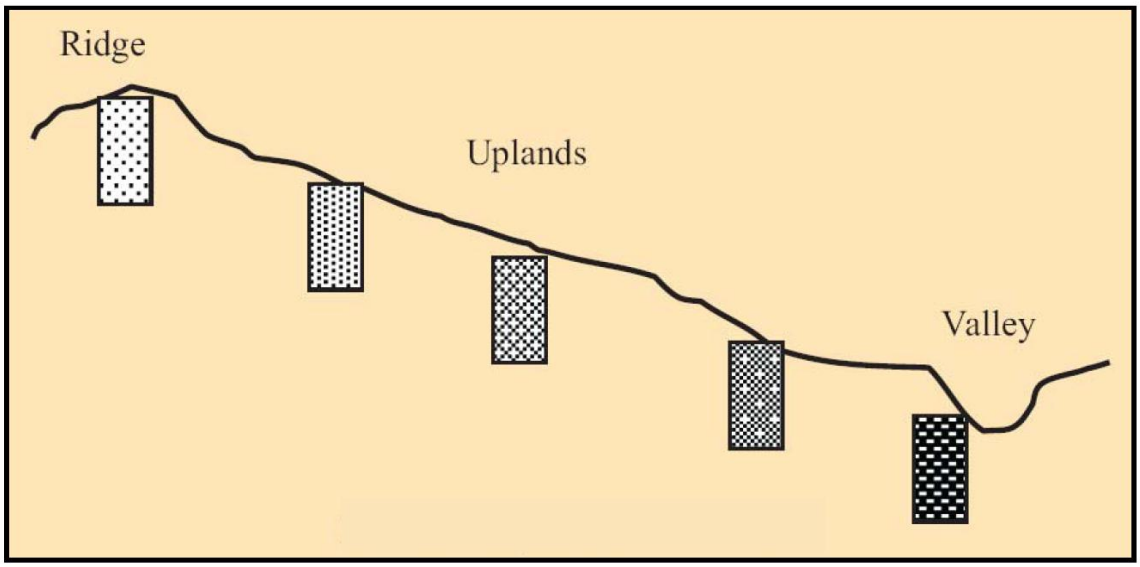


Fig: 3.4. Location of profiles in a transect

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

Based on the soil-site characteristics, the soils were grouped into different soil series (soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management). Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, 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 soil series are given in Table 3.1. Based on the above characteristics, 11 soil series were identified in the Wankasambara-1 microwatershed.

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

SOILS OF GRANITE AND GRANITE GNEISS LANDSCAPE							
Sl. No.	**Soil Series**	**Depth (cm)**	**Colour (moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcare ousness**
1	Badiyala (BDL)	25-50	7.5YR 2.5/3,2.5/2,3/3 **10YR 3/4,4/3**	sl	-	Ap-Bw	e
2	Sambara (SBR)	50-75	10YR 7/1 **7.5YR 7/4**	ls	-	Ap-AC	-
3	Halagera (HLG)	50-75	10YR 3/2,4/4 **7.5YR 4/3,4/2**	scl	-	Ap-Bw	es
4	Gowdagera (GWD)	75-100	10YR 3/1,3/2,4/2	scl	-	Ap-Bw	es
5	Yadgir (YDR)	100-150	10YR 4/3,4/4 **2.5Y 4/3,5/3**	sl	-	Ap-Ac	-
6	Gondedagi (GDG)	100-150	5YR 4/2 **7.5YR 4/2**	scl	100-150	Ap-Bt	e
7	Nagalapur (NGP)	100-150	10YR 3/2,3/1,2/1	c	-	Ap-Bss	es
8	Belagundi (BGD)	100-150	10 YR 5/4,4/4 **7.5YR 4/4**	c	-	Ap-Bw	-
9	Madhwara (MDR)	>150	10YR 3/1,3/2,2/1,2/2	scl	-	Ap-Bw	e
10	Neelahalli (NHL)	100-150	10YR 5/3,4/2	sl	-	Ap-Bw	-
11	Thumakur (TMK)	>150	10 YR 3/1,3/2,3/3,4/3	c	-	Ap-Bw	e

3.4 Soil Mapping

The area under each soil series was further separated into 11 soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management.

The soil mapping units are shown on the soil map (Fig. 3.5) in the form of symbols. During the survey many soil profile pits, few minipits and a few auger bores representing different landforms occurring in the microwatershed were studied. In addition to the profile study, spot observations in the form of minipits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map.

The soil map shows the geographic distribution of 11 mapping units representing 11 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 11 soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

3.5 Laboratory Characterization

Soil samples for each soil series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2017 from farmer's fields (39 samples) for fertility status (major and micronutrients) at 320 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps for the 11 elements including pH and EC were generated using Kriging method for the microwatershed.

Table 3.2 Soil Map Unit description of Wankasambara-1 microwatershed

Soil Map unit No.	Soil Series	Soil phase	Soil Map Unit	Mapping Unit Description	Area in ha (%)
	Soil of Granite and Granite Gneiss Landscape				
	BDL	Badiyala soils are shallow (25-50 cm), well drained, have dark brown to very dark brown and dark yellowish brown, slightly calcareous, sandy loam soils occurring on very gently to gently sloping uplands under cultivation			**42 (10.36)**
2		BDLbB2	Loamy sand surface, slope 1-3%, moderate erosion		42 (10.36)
	SBR	Sambara soils are moderately shallow (50-75 cm), well drained, have light gray to pink, loamy sand to sandy soils occurring on very gently to gently sloping uplands under cultivation			**14 (3.32)**
11		SBRcB2	Sandy loam surface, slope 1-3%, moderate erosion		14 (3.32)
	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			**95 (23.36)**
16		HLGcB2	Sandy loam surface, slope 1-3%, moderate erosion		95 (23.36)
	GWD	Gowdagera soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown, calcareous sandy clay to clay alluvial soils occurring on very gently sloping uplands under cultivation			**74 (18.19)**
34		GWDcB2	Sandy loam surface, slope 1-3%, moderate erosion		74 (18.19)
	YDR	Yadgir soils are deep (100-150 cm), well drained, have brown to dark yellowish brown and olive brown, sandy loam alluvial soils occurring on very gently sloping			**17 (4.08)**

		uplands under cultivation		
42		YDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	17 (4.08)
	GDG	Gondedagi soils are deep (100-150 cm), well drained, have brown to dark reddish gray, slightly calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation		**23 (5.67)**
44		GDGbB2	Loamy sand surface, slope 1-3%, moderate erosion	23 (5.67)
	NGP	Nagalapur soils are deep (100-150 cm), moderately well drained, have very dark gray to very dark grayish brown, black calcareous cracking clay soils occurring on very gently sloping uplands under cultivation		**0.0008 (0.00021)**
47		NGPbB2	Loamy sand surface, slope 1-3%, moderate erosion	0.0008 (0.00021)
	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		**29 (7.09)**
50		BGDbB2	Loamy sand surface, slope 1-3%, moderate erosion	29 (7.09)
	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		**12 (2.9)**
59		MDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	12 (2.9)
	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		**31 (7.64)**
101		NHLmB1	Clay surface, slope 1-3%, slight erosion	31 (7.64)
	TMK	Thumakur soils are very deep (>150 cm), moderately well drained, have brown to very dark grayish brown, slightly calcareous clay black soils occurring on nearly level to very gently sloping lowlands under cultivation		**17 (4.11)**
104		TMKiB2	Sandy clay surface, slope 1-3%, moderate erosion	17 (4.11)
999	Rock outcrops	Rock lands with little or no soil		2 (0.47)
1000	Others	Habitation and water bodies		52 (12.8)

3.6 Land Management Units (LMU's)

The 11 soil phases identified and mapped in the microwatershed were grouped into 8 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been chosen for identification and delineation of LMUs. For Wankasambara-1 microwatershed, five soil and site characteristics, namely soil depth,

soil texture, slope, erosion and gravel content have been considered for defining LMUs. The Land Management Units are expected to behave similarly for a given level of management.

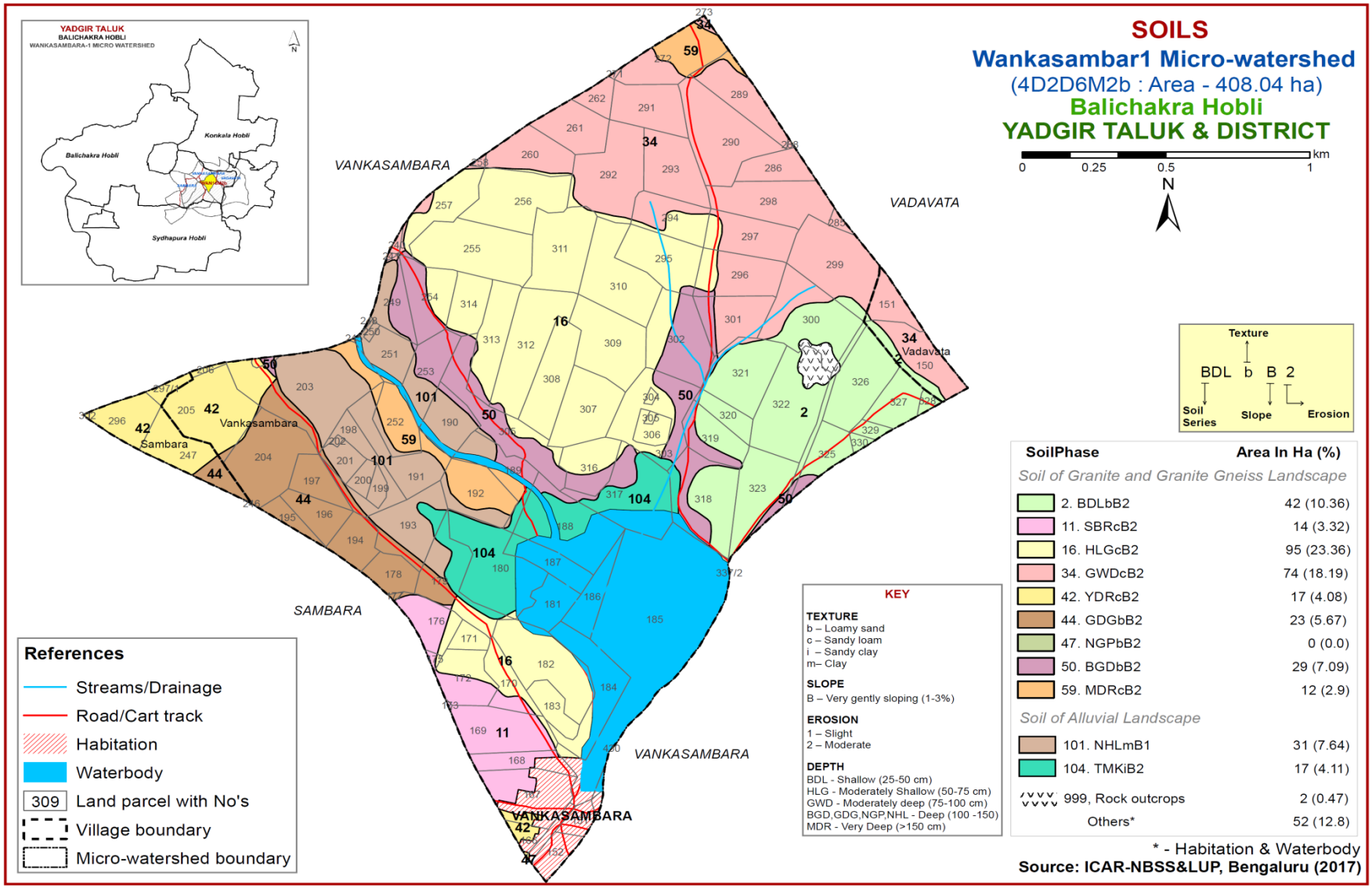


Fig 3.5 Soil phase or management units map of Wankasambara-1 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Wankasambara-1 microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss landscape based on geology. In all, 11 soil series were identified in this landscape. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. In the granite gneiss landscape, it is by parent material, relief, time and climate.

A brief description of each of the 11 soil series identified followed by 11 soil phases (management units) mapped (Fig. 3.4) are furnished below. The physical and chemical characteristics of soil series identified in Wankasambara-1 microwatershed are given in Table 4.1 along with soil classification. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristics 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, Halagera (HLG) series occur in an area of 95 ha (23%) followed by Gowdagera (GWD) 74 ha (18%), Badiyala (BDL) 42 ha (10%), Neelahalli (NHL) 31 ha (8%), Belagundi (BGD) 29 ha (7%), Gondedagi (GDG) 23 ha (6%), Thumakur (TMK) 17 ha (4%), Yadgir (YDR) 17 ha (4%), Sambara (SBR) 14 ha (3%), Madhwara (MDR) 12 ha (3%) and other series in a minor area in the microwatershed. The brief description of these series along with the soil phases identified and mapped is given below.

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

The thickness of the solum ranges from 28 to 50 cm. The thickness of A horizon ranges from 4 to 12 cm. Its colour is in 10YR hue with value 3 to 4 and chroma 3 to 4. The texture is loamy sand, sandy clay loam and sandy clay. The thickness of B horizon ranges from 27 to 45 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 4 and chroma 3 to 4. Its texture is sandy loam to sandy clay loam and sandy clay and is slightly

calcareous. The available water capacity is very low (<50 mm/m). Only one phase was identified and mapped.

Landscape and soil Profile characteristics of Badiyala (BDL) Series

4.1.2 Sambara (SBR) Series: Sambara soils are moderately shallow (50-75 cm), somewhat excessively drained, have light grey to reddish yellow, loamy sand soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The 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 1 to 4. The texture varies from loamy sand to sandy loam. The thickness of subsurface horizons ranges from 41 to 66 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 5 and chroma 1 to 4. The texture is loamy sand. The available water capacity is very low (<50 mm/m). Only one phase was identified and mapped.

Landscape and soil Profile characteristics of Sambara (SBR) Series

4.1.3 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). Only one phase was identified and mapped.

Landscape and soil Profile characteristics of Halagera (HLG) Series

4.1.4 Gowdagera (GWD) Series: Gowdagera soils are moderately deep (75-100 cm), moderately well drained, have very dark gray to dark grayish brown, 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. The available water capacity is medium (101-150 mm/m). Only one phase was identified and mapped.


Landscape and soil Profile characteristics of Gowdagera (GWD) Series

4.1.5 Yadgir (YDR) Series: Yadgir soils are deep (100-150 cm), well drained, have very dark yellowish brown to light olive brown, 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 A horizon ranges from 6 to 10 cm. Its colour is in 10 YR hue with value 4 and chroma 3. The texture is loamy sand. The thickness of subsurface horizons ranges 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. The available water capacity is low (51-100 mm/m). Only one phase was identified and mapped.


Landscape and soil Profile characteristics of Yadgir (YDR) Series

4.1.6 Gondedagi (GDG) Series: Gondedagi soils are deep (100-150 cm), well drained, have dark reddish gray to dark brown, slightly calcareous sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Gondedagi series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Typic Haplustalfs.

The thickness of the solum ranges from 105 to 148 cm. The thickness of A horizon ranges from 9 to 17 cm. Its colour is in 7.5 YR and 5 YR hue with value and chroma 3 to 4. The texture ranges from sandy loam to sandy clay. The thickness of B horizon ranges from 108 to 135 cm. Its colour is in 5 YR and 7.5 YR hue with value 2 to 4 and chroma 2 to 4. The texture is sandy clay loam and is slightly calcareous. The available water capacity is medium (101-150 mm/m). Only one phase was identified and mapped.

Landscape and soil Profile characteristics of Gondedagi (GDG) Series

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

The thickness of the solum ranges from 110 to 150 cm. The thickness of A horizon ranges from 6 to 25 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. The texture varies from sandy loam to sandy clay and clay. The thickness of B horizon ranges from 110 to 141 cm. Its colour is in 10 YR hue with value 2 to 3 and chroma 1 to 2. Texture is clay and is calcareous. The available water capacity is very high (>200 mm/m). Only one phase was identified and mapped.

Landscape and soil Profile characteristics of Naglapur (NGP) Series

4.1.8 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 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 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 phase was identified and mapped.

Landscape and soil Profile characteristics of Belagundi (BGD) 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 phase was identified and mapped.

Landscape and soil Profile characteristics of Madhwara (MDR) Series

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

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

Landscape and soil Profile characteristics of Neelahalli (NHL) Series

4.1.11 Thumakur (TMK) Series: Thumakur soils are very deep (>150 cm), moderately well drained, have very dark gray to dark brown, slightly calcareous clay soils. They are developed from weathered granite gneiss and occur on nearly level to very gently sloping low lands under cultivation. The Thumakur series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 150-200 cm. The thickness of A horizon ranges from 7 to 14 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. Texture varies from sandy loam to 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 to clay and is slightly calcareous. The available water capacity is very high (>200 mm/m). Only one phase was identified and mapped.

Landscape and soil Profile characteristics of Thumakur (TMK) Series

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

Soil Series: Badiyala **(**BDL) **Pedon:** R-5

Location: $16^0$37'10.0"N $77^0$20'21.5", Gudalagunta village, Balichakra hobli, Yadgir taluk and district

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

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

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-12	6.20	-	-	0.074	1.00	0.00	2.80	0.98	0.14	0.01	3.92	4.20	0.72	93	0.20
12-28	9.04	-	-	0.253	0.80	3.20	-	-	0.16	0.69	-	16.90	0.77	100	4.09
28-52	9.41	-	-	0.364	1.10	3.60	-	-	0.16	1.39	-	11.10	0.75	100	12.52

Contd...

Soil Series: 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: 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: 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: Gondedagi (GDG) **Pedon:** R-6

Location: $16^0$34' 42.6"N $77^0$20'00.1"E, Balached, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, 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
0-17	Ap	84.15	7.67	8.18	19.72	24.39	20.33	12.80	6.91	-	ls	5.83	3.37
17-55	Bt1	62.36	11.26	26.38	19.71	16.58	11.89	7.82	6.36	-	scl	14.94	9.18
55-115	Bt2	57.78	13.38	28.84	21.84	12.54	9.61	7.63	6.17	-	scl	17.93	9.86

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-17	5.57	-	-	0.25	0.60	0.00	3.45	0.92	0.14	0.01	4.52	5.83	0.71	78	0.22
17-55	6.20	-	-	0.04	0.57	0.00	9.79	1.58	0.07	0.05	11.49	14.96	0.57	77	0.31
55-115	8.32	-	-	0.14	0.45	6.24	-	-	0.08	0.05	-	15.84	0.55	100	0.34

Contd...

Soil Series: Naglapur (NGP) **Pedon:** R-8

Location: $16^0$52'84.1"N $77^0$22'99.4"E, Gurumitkal village, Gurumitkal hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Very fine, smectitic, (calcareous), isohyperthermic Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-10	Ap	7.53	19.88	72.59	1.00	0.78	0.89	2.10	2.77	-	c	44.31	32.79
10-35	Bss1	6.55	18.76	74.68	0.80	0.92	0.80	1.72	2.30	-	c	43.09	31.62
35-60	Bss2	6.58	21.05	72.37	0.69	0.46	1.04	1.50	2.89	-	c	46.52	32.52
60-102	Bss3	7.48	19.74	72.78	1.61	1.38	0.69	1.61	2.19	-	c	51.12	35.62

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}							%	%
0-10	7.42	-	-	0.24	0.84	1.30	-	-	0.84	0.15	-	67.10	0.92	100	0.22
10-35	8.52	-	-	0.291	0.64	2.86	-	-	0.17	0.29	-	65.20	0.87	100	0.45
35-60	7.89	-	-	0.134	0.62	4.55	-	-	0.15	0.20	-	65.00	0.90	100	0.30
60-102	8.68	-	-	0.213	0.54	8.32	-	-	0.17	0.15	-	64.10	0.88	100	0.24

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), 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
0-13	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: 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, isohyperthermic Fluventic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-11	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: 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: Thumakuru (TMK) **Pedon:** R-10

Location: $16^0$38'01.3"N $77^0$16'49.8"E, Kilankera village, Balichakra 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
0-12	Ap	62.92	15.76	21.32	5.56	9.37	21.83	18.33	7.83	-	scl	17.98	6.60
12-29	Bw1	45.91	18.53	35.56	6.08	8.18	15.41	11.43	4.82	-	sc	33.40	11.79
29-74	Bw2	48.47	16.24	35.29	5.93	9.84	16.40	11.75	4.55	-	sc	28.66	11.19
74-132	Bw3	38.25	20.59	41.16	3.21	8.23	14.64	8.97	3.21	-	c	38.85	14.72
132-158	Bw4	36.87	19.99	43.14	3.54	7.61	13.08	8.57	4.07	-	c	44.36	15.75

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-12	9.60	-	-	0.35	0.48	1.44	-	-	0.23	3.62	-	21.83	1.02	100	16.57
12-29	9.72	-	-	1.27	0.50	1.44	-	-	0.59	20.88	-	30.50	0.86	100	68.48
29-74	9.16	-	-	3.44	0.31	3.72	-	-	0.38	25.84	-	28.68	0.81	100	90.10
74-132	9.33	-	-	2.52	0.23	4.92	-	-	0.82	20.25	-	34.99	0.85	100	57.87
132-158	9.23	-	-	2.07	0.31	3.48	-	-	0.70	21.03	-	34.24	0.79	100	61.41

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

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

5.1 Land Capability Classification

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

Soil characteristics: Depth, texture, gravel content, 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 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 11 soil map units identified in the Wankasambara-1 microwatershed are grouped under two land capability classes and three land capability subclass. Entire area in the microwatershed is suitable for agriculture (Fig. 5.1).

An area of 314 ha (76%) are good cultivable lands (Class II) that have minor limitations and require moderate conservation practices and are distributed in the major part of the microwatershed. Moderately good cultivable lands (Class III) cover an area of 42 ha (10%) and are distributed in the eastern part of the microwatershed with moderate problems of erosion and soil that require special conservation practices. An area of about 54 ha (13%) is under miscellaneous lands comprising rock outcrops, habitation and water bodies.

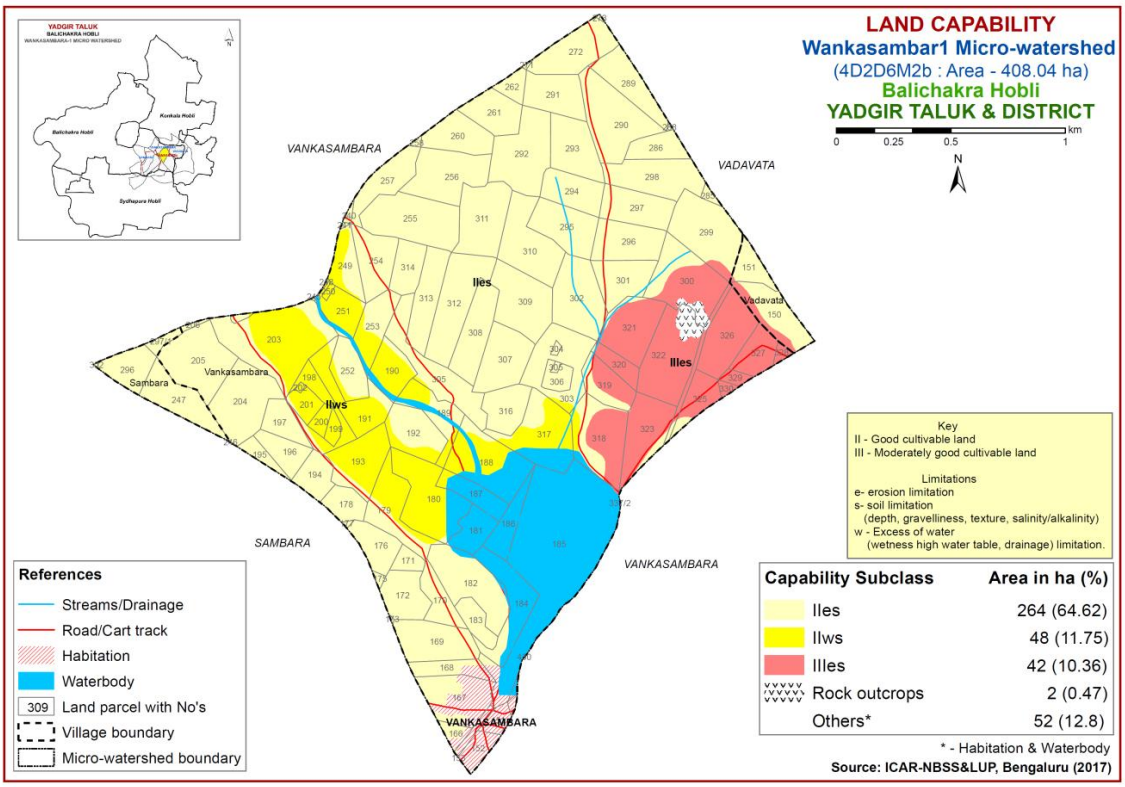


Fig. 5.1 Land Capability map of Wankasambara-1 Microwatershed

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 shown in Figure 5.2.

Shallow (25-50 cm) soils occupy an area of 42 ha (10%) and are distributed in the eastern part of the microwatershed. An area of 109 ha (27%) is moderately shallow (50-75 cm) and are distributed in the southern, central and northwestern part of the microwatershed. Moderately deep soils (75-100 cm) occur an area of 74 ha (18%) and are distributed in the northern and eastern part of the microwatershed. Deep (100-150 cm) to very deep (>150 cm) soils cover an area of 129 ha (31%) and are distributed in the northern, central, southern, eastern and western part of the microwatershed.

The most problem lands with an area of about 42 ha (10%) having shallow (25-50 cm) rooting depth. They are suitable for growing short duration agricultural crops but well suited for pasture, forestry or other recreational purposes. The most productive lands

covering about 129 ha (31%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep (100-150 cm) to very deep (>150 cm) occurring in the major part of the microwatershed.

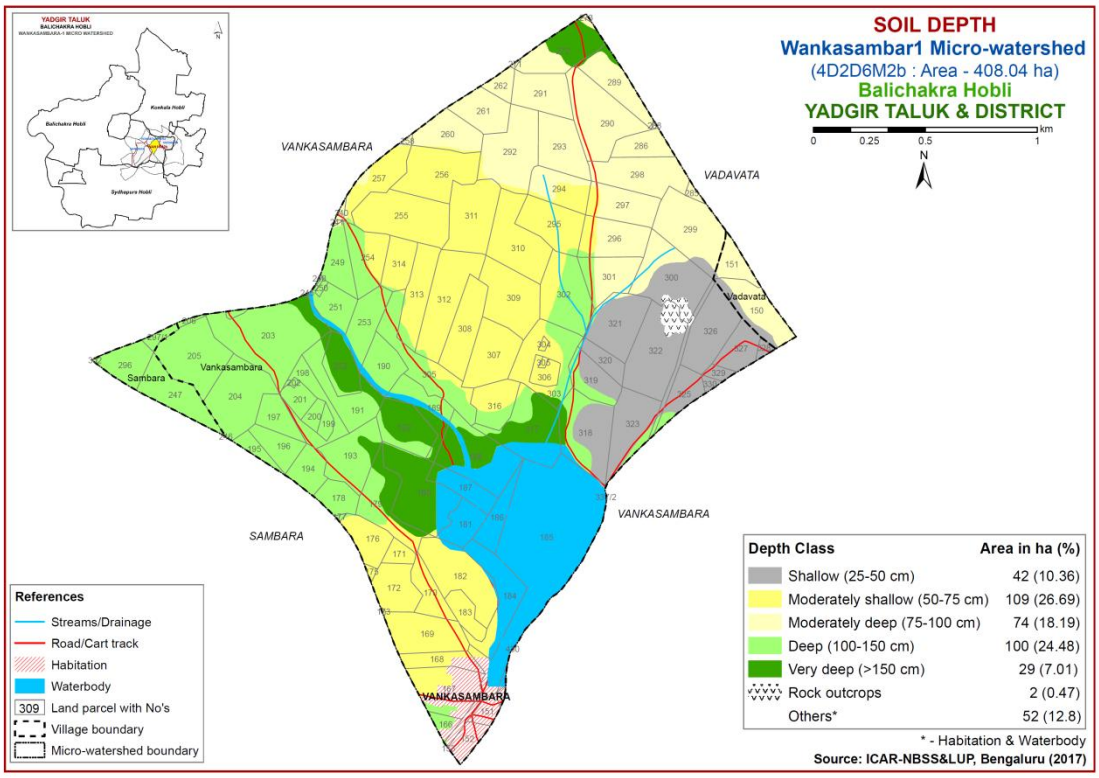


Fig. 5.2 Soil Depth map of Wankasambara-1 Microwatershed

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 48 ha (12%) has clayey soils at the surface and are distributed in the central and western part of the microwatershed. Loamy soils occur in a maximum area of about 212 ha (52%) and are distributed in the major part of the microwatershed. Sandy soils cover an area of about 94 ha (23%) and are distributed in the eastern, central and western part of the microwatershed.

The most productive lands 48 ha (12%) with respect to surface soil texture are the clayey that have high potential for soil-water retention and availability, and nutrient retention

and availability, but have problems of drainage, infiltration, workability and other physical problems as compared to loamy soils. The other productive lands (52%) are loamy soils which also have high potential for soil-water retention and nutrient availability but have no drainage or other physical problems. The problem soils cover about 94 ha (23%) that have sandy soils at the surface having problems of poor soil water retention, nutrient retention and availability, but have better rain water retention less run off and soil moisture conservation, less capillary rise and less evaporation losses.

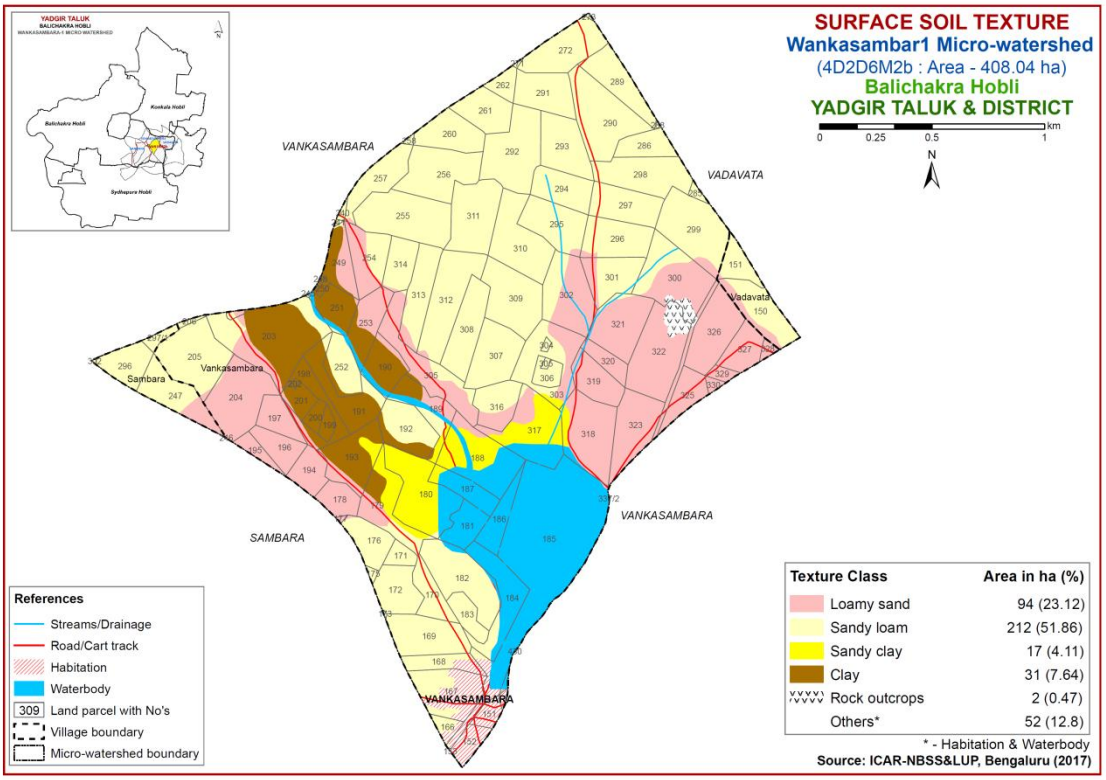


Fig. 5.3 Surface Soil Texture map of Wankasambara-1 Microwatershed

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 the 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 geographical distribution in the microwatershed is shown in Figure 5.4.

Entire area of about 354 ha (87%) has soils that are non gravelly (<15%) and are distributed in all parts of the microwatershed.

The most productive lands with respect to gravelliness are found to be 87 per cent. They are non gravelly (<15%) and have potential for growing all annual and perennial crops.

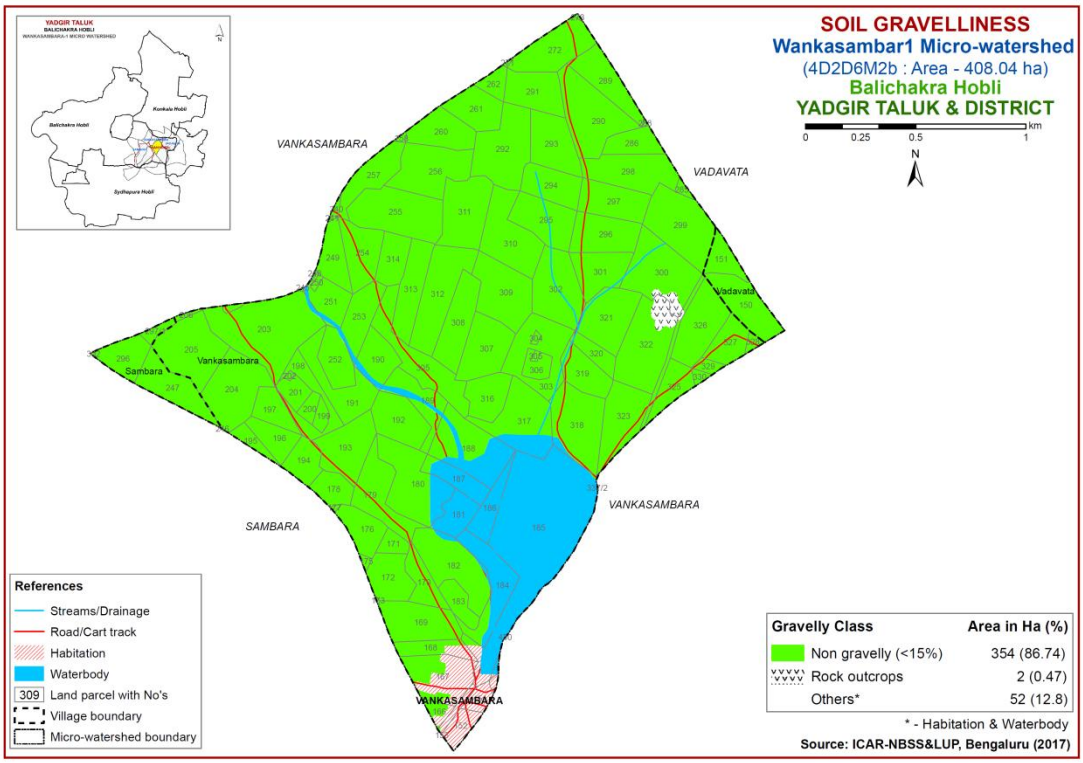


Fig. 5.4 Soil Gravelliness map of Wankasambara-1 Microwatershed

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 classes an AWC map was generated. The area extent and their geographical distribution in the microwatershed is shown in Figure 5.5), showing the area extent and their spatial distribution in the microwatershed.

An area of about 56 ha (14%) has soils that are very low (<50 mm/m) in available water capacity and are distributed in the southern and eastern part of the microwatershed. An area of about 112 ha (27%) has soils that are low (51-100 mm/m) in available water capacity and are distributed in the southern, western and central part of the microwatershed. Major area of 126 ha (31%) in the microwatershed has soils that are medium (101-150 mm/m) in available water capacity and are distributed in all parts of the microwatershed. The available water capacity is very high an area of 60 ha (15%) and are distributed in the central, western and northern part of the microwatershed.

Maximum area of 56 ha (14%) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only the short or medium duration crops can be grown and the probability of crop failure is very high. These areas

are best put to other alternative uses. The potential soils with respect to AWC cover about 60 ha that has very high AWC, where all climatically adapted long duration crops can be grown.

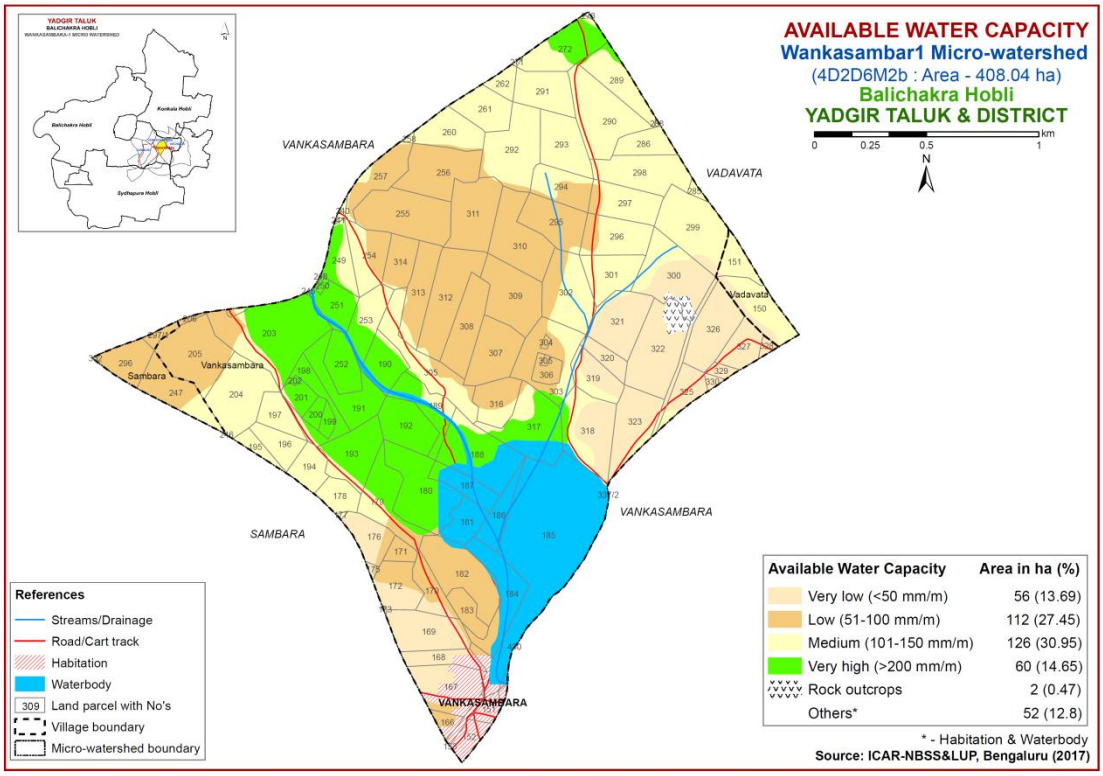


Fig. 5.5 Soil Available Water Capacity map of Wankasambara-1 Microwatershed

5.6 Soil Slope

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

Entire area in the microwatershed falls under very gently sloping (1-3%) lands. It covers an area of about 354 ha (87%) and is distributed in all parts of the microwatershed.

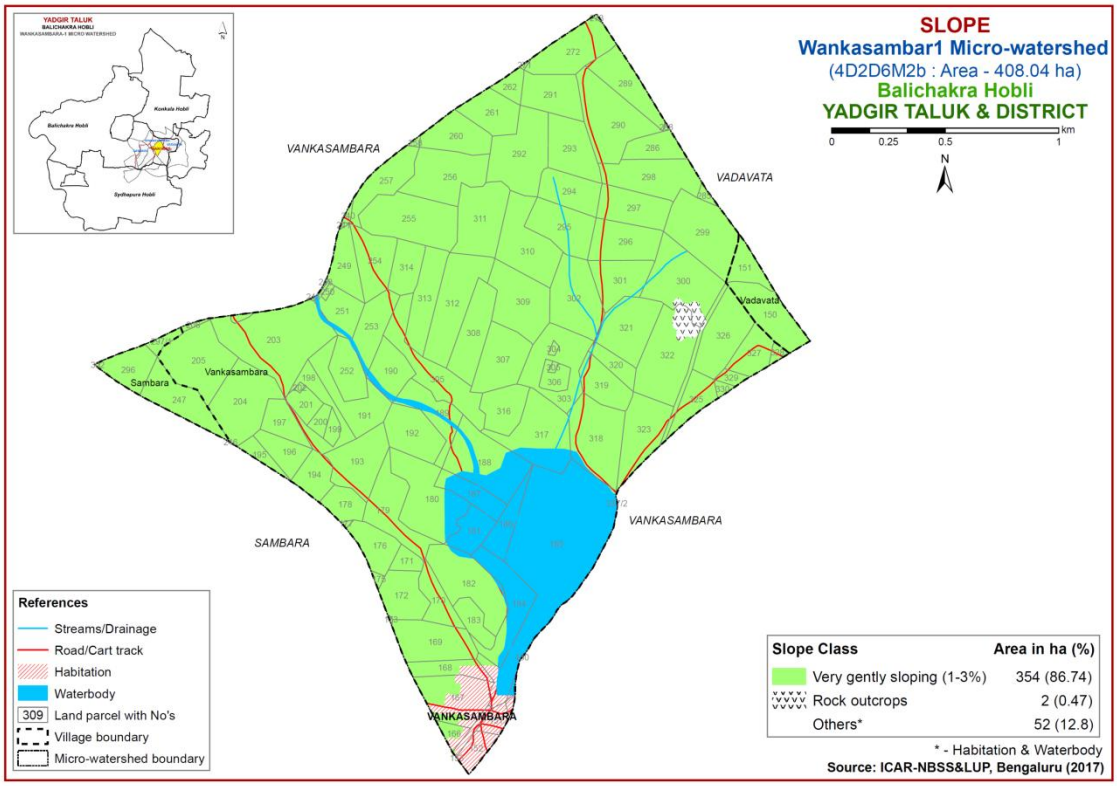


Fig. 5.6 Soil Slope map of Wankasambara-1 Microwatershed

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 was generated. The area extent and their spatial distribution in the microwatershed is given in Figure 5.7.

An area of 31 ha (8%) is slightly eroded (e1 class) and are distributed in the western part of the microwatershed. Soils that are moderately eroded (e2 class) cover major area of 323 ha (79%) of the microwatershed. The area that are moderately eroded (e2 class) need soil and water conservation and other land development measures for restoring the soil health.

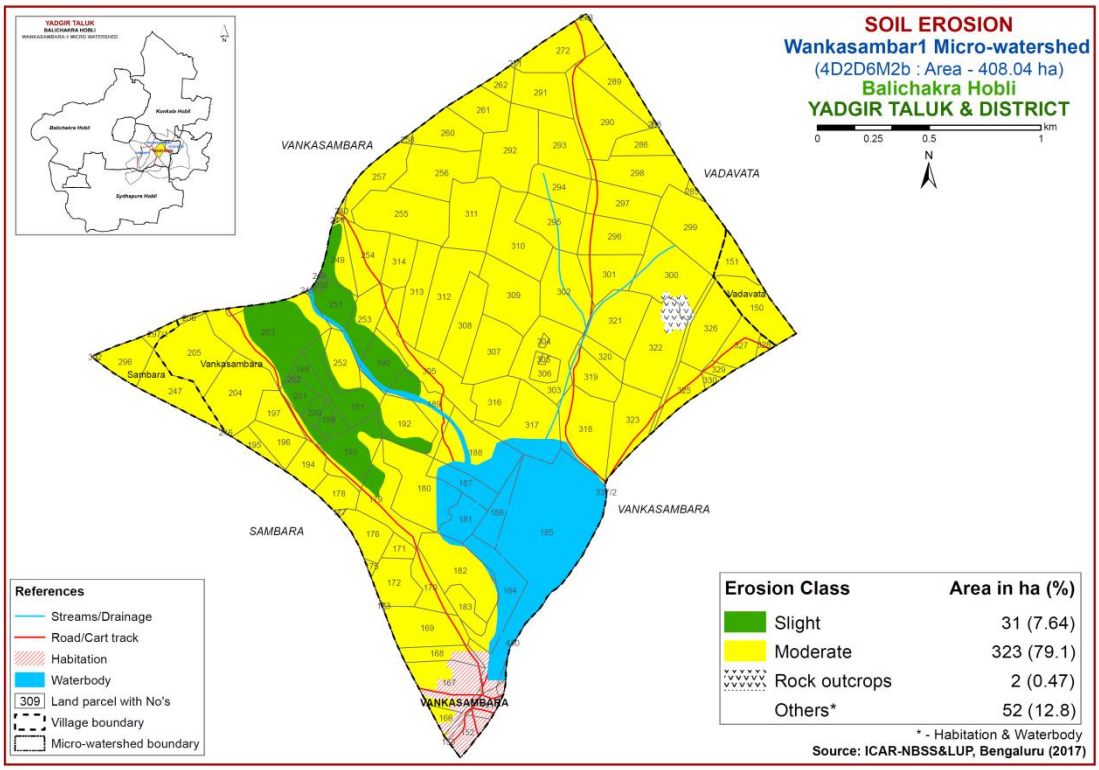


Fig. 5.7 Soil Erosion map of Wankasambara-1 Microwatershed

Chapter 6

FERTILITY STATUS

Soil fertility plays an important role in increasing crop yield. The adoption of high yielding varieties that require high amounts of nutrients has resulted in deficiency symptoms in crops and plants due to imbalanced fertilization and poor inherent fertility status, as these areas are characterised by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 320 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, 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 fertility analysis of the Wankasambara-1 microwatershed for soil reaction (pH) showed that an area of 44 ha (11%) is strongly alkaline (pH 8.4-9.0) and is distributed in the southern and central part of the microwatershed. An area of 104 ha (25%) is moderately alkaline (pH 7.8-8.4) in reaction and is distributed in the northern, western, central and southern part of the microwatershed (Fig. 6.1). Slightly alkaline (pH 7.3-7.8) is around 156 ha (38%) area and is distributed in the major part of the microwatershed. An area of 51 ha (12%) is neutral (pH 6.5-7.3) and are distributed in the northern, eastern, northwestern and western part of the microwatershed. Thus, major soils in the microwatershed are alkaline in reaction.

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon content (an index of available nitrogen) (Fig. 6.3) of the soils in the microwatershed is high (>0.75%) in an area of 256 ha (63%) and are distributed in the major part of the microwatershed. Medium (0.5-0.75%) in organic carbon content cover an area of 50 ha (12%) and is distributed in the southern, central, western and northwestern part of the microwatershed. An area of 49 ha (12%) is low (<0.5%) and are distributed in the southern and eastern part of the microwatershed.

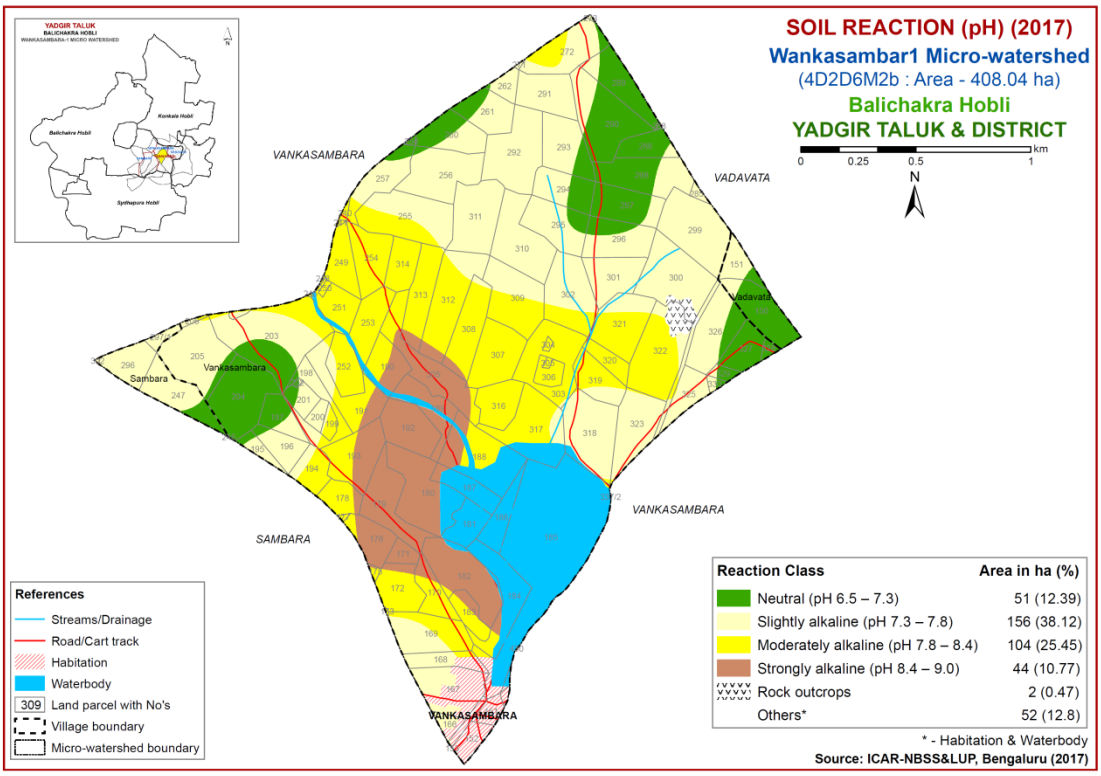


Fig.6.1 Soil Reaction (pH) map of Wankasambara-1 Microwatershed

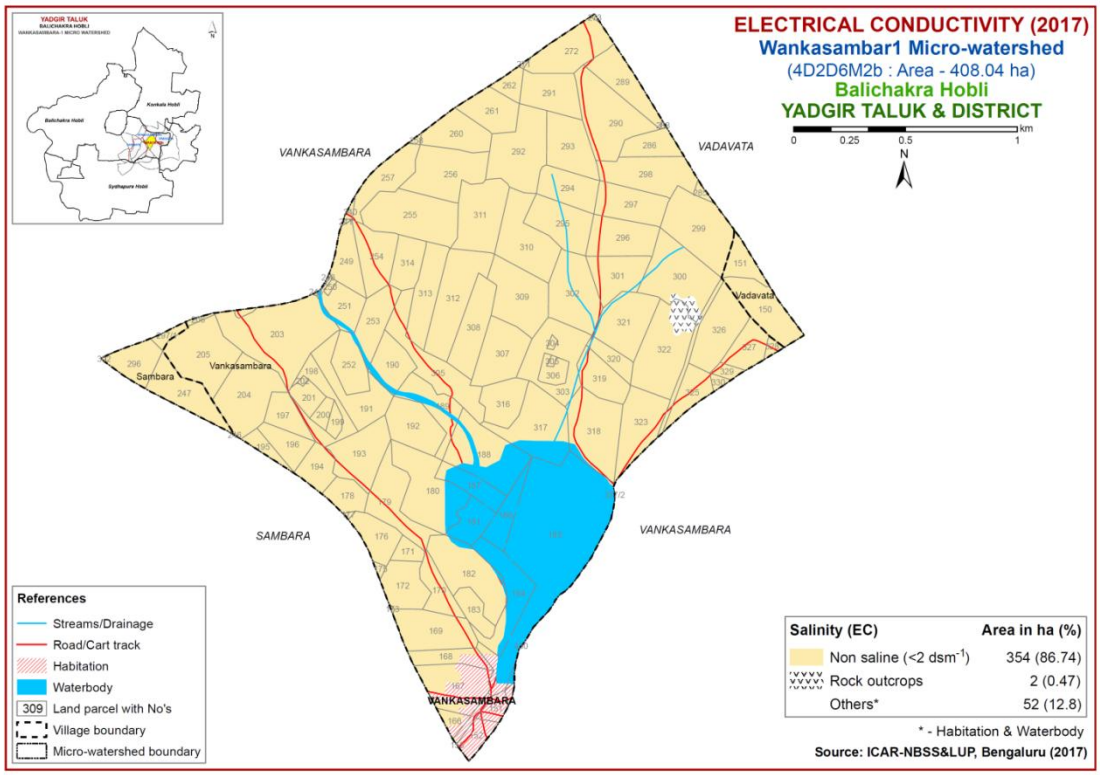


Fig.6.2 Electrical Conductivity (EC) map of Wankasambara-1 Microwatershed

6.4 Available Phosphorus

The soil fertility analysis revealed that available phosphorus (Fig. 6.4) is low (<23 kg/ha) in an area of 116 ha (28%) and are distributed in the northern, northwestern, eastern and southern part of the microwatershed. Medium (23-57 kg/ha) in available phosphorous cover a maximum area of 227 ha (56%) and is distributed in the major part of the microwatershed. A small area of about 11 ha (3%) is high (>57 kg/ha) in available phosphorus and is distributed in the western part of the microwatershed. There is an urgent need to increase the dose of phosphorous in soils that are low and medium for all the crops by 25 per cent over the recommended dose to realize better crop performance.

6.5 Available Potassium

Available potassium content (Fig. 6.5) is low (<145 kg/ha) in an area of 0.11 ha (<1%) and is distributed in the northwestern part of the microwatershed. Medium (145-337 kg/ha) in available potassium cover a maximum in area of 297 ha (73%) and are distributed in the major part of the microwatershed. An area of about 57 ha (14%) is high (>337 kg/ha) and is distributed in the southern and central part of the microwatershed.

6.6 Available Sulphur

Soils that are high in available sulphur content (>20 ppm) cover a very small area of 1 ha (<1%), 292 ha (72%) is low (<10 ppm) and is distributed in the northern part of the microwatershed. Medium (10-20 ppm) in an area of about 61 ha (15%) and is distributed in the northern, western and southern part of the microwatershed (Fig. 6.6). The areas that are low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or factomphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Available boron content (Fig. 6.7) is low (<0.5 ppm) in an area of 35 ha (9%) and is distributed in the southern, northern and eastern part of the microwatershed. An area of about 309 ha (76%) is medium (0.5-1.0 ppm) and is distributed in the northern, central, western and southern part of microwatershed. An area of about 10 ha (3%) is high (>1.0 ppm) in available boron and are distributed in the northern part of microwatershed.

6.8 Available Iron

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

6.9 Available Manganese

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

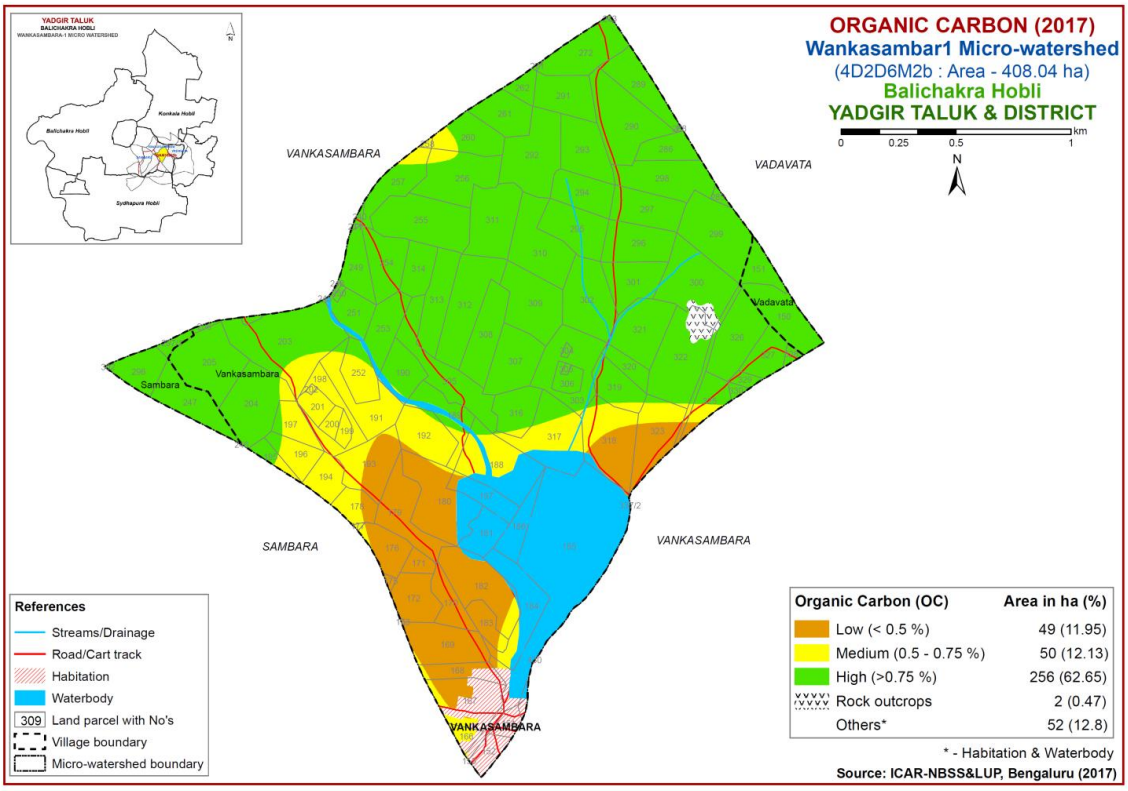


Fig.6.3 Soil Organic Carbon map of Wankasambara-1 Microwatershed

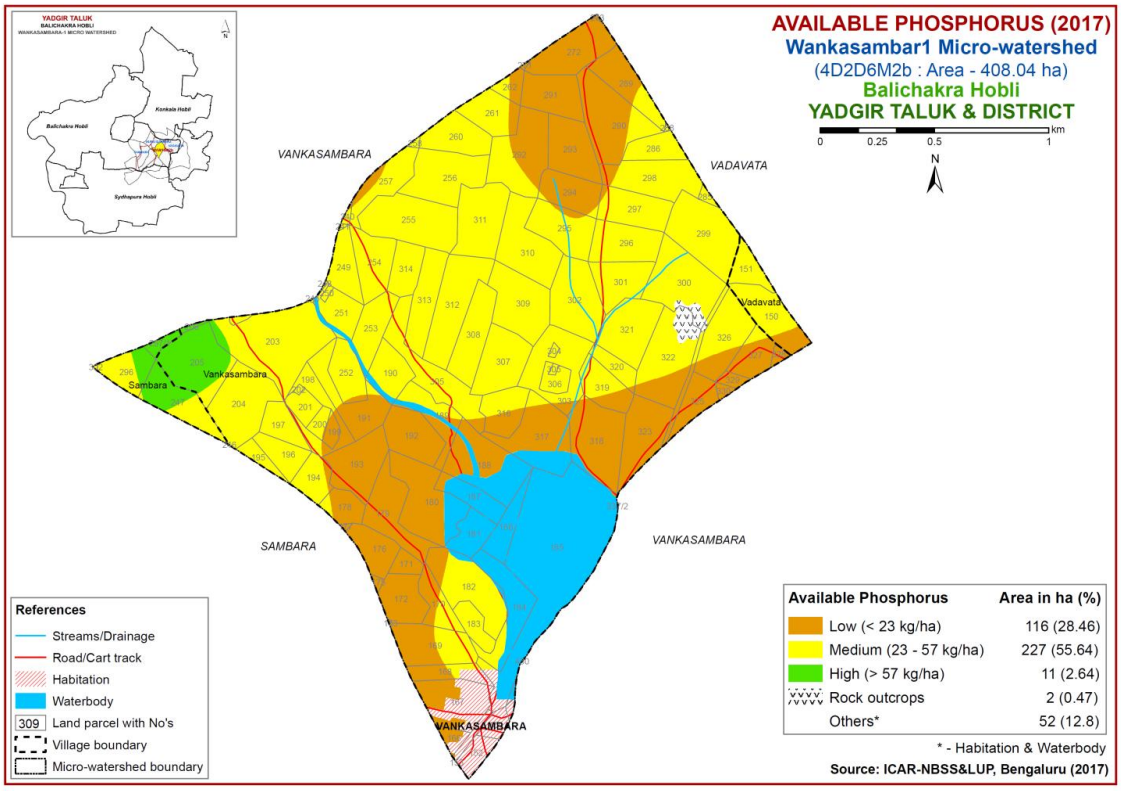


Fig.6.4 Soil available Phosphorus map of Wankasambara-1 Microwatershed

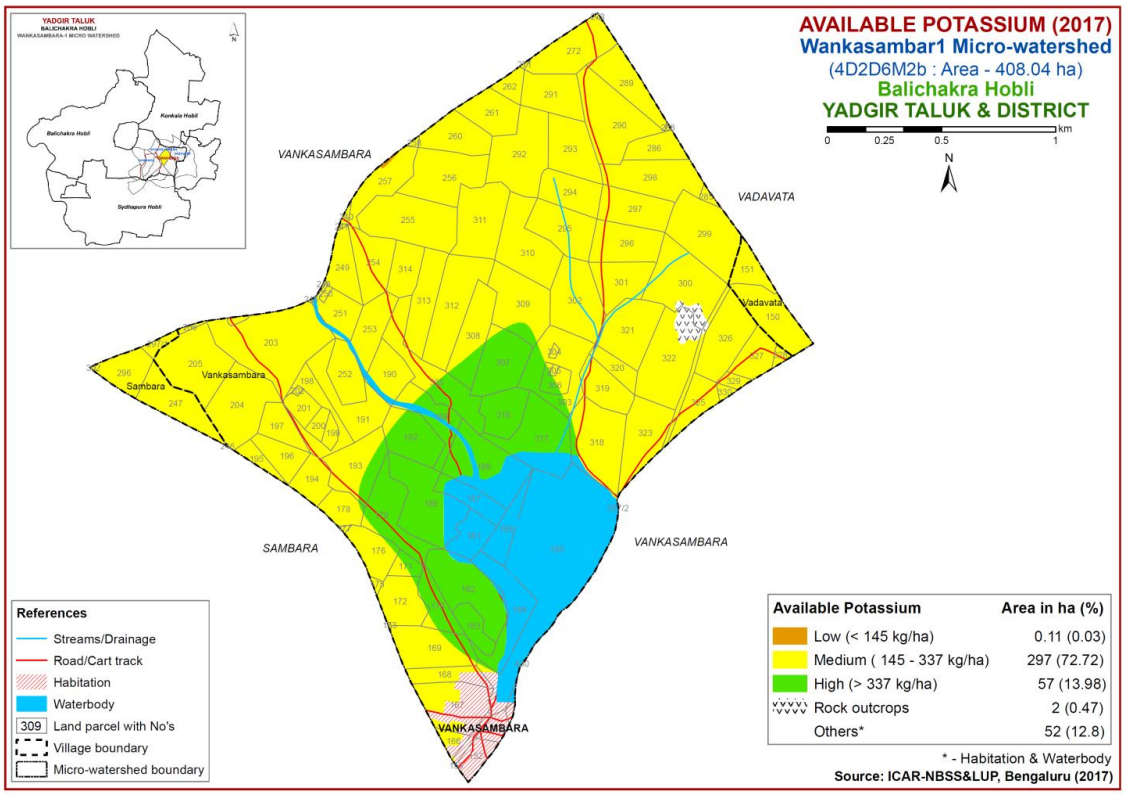


Fig. 6.5 Soil available Potassium map of Wankasambara-1 Microwatershed

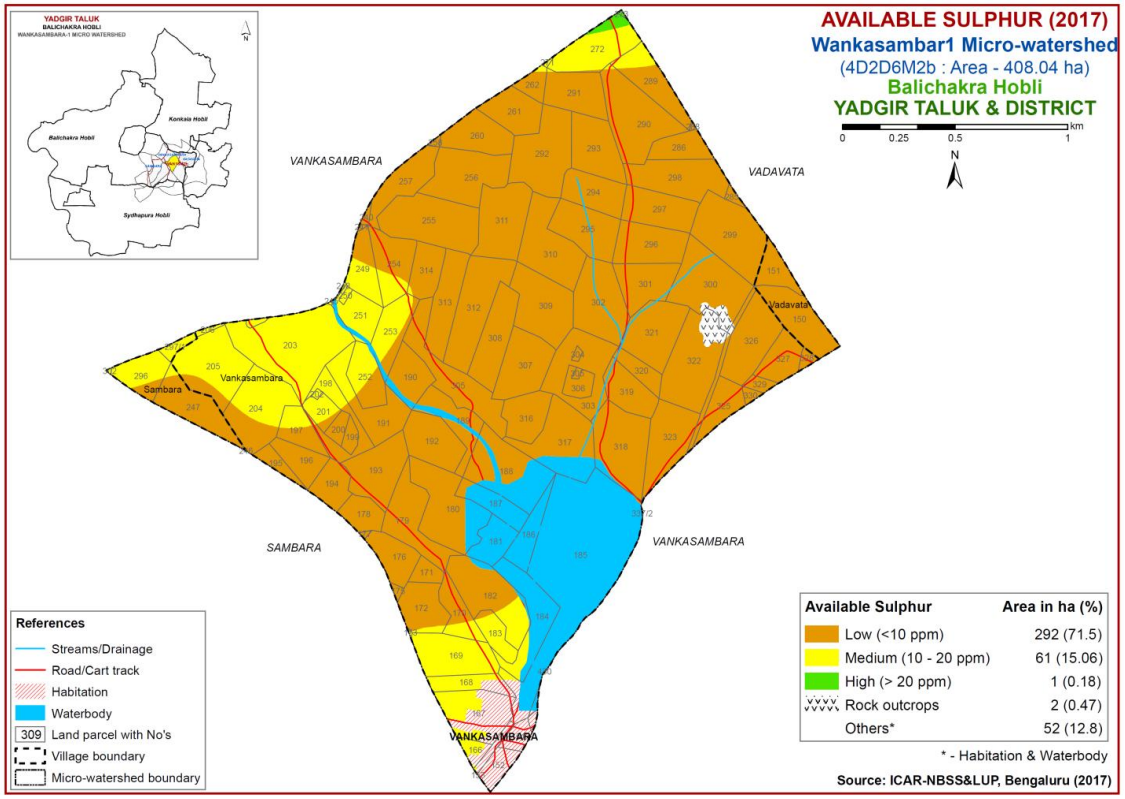


Fig. 6.6 Soil available Sulphur map of Wankasambara-1 Microwatershed

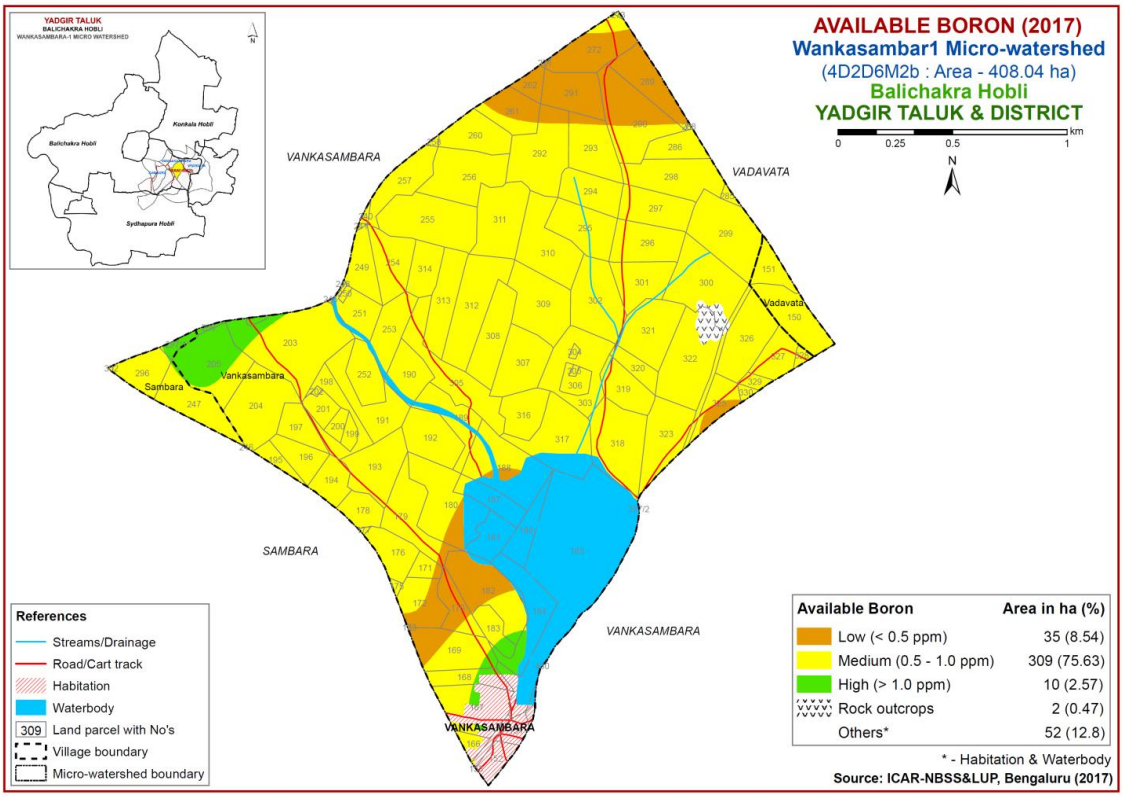


Fig. 6.7 Soil available Boron map of Wankasambara-1 Microwatershed

6.10 Available Copper

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

6.11 Available Zinc

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

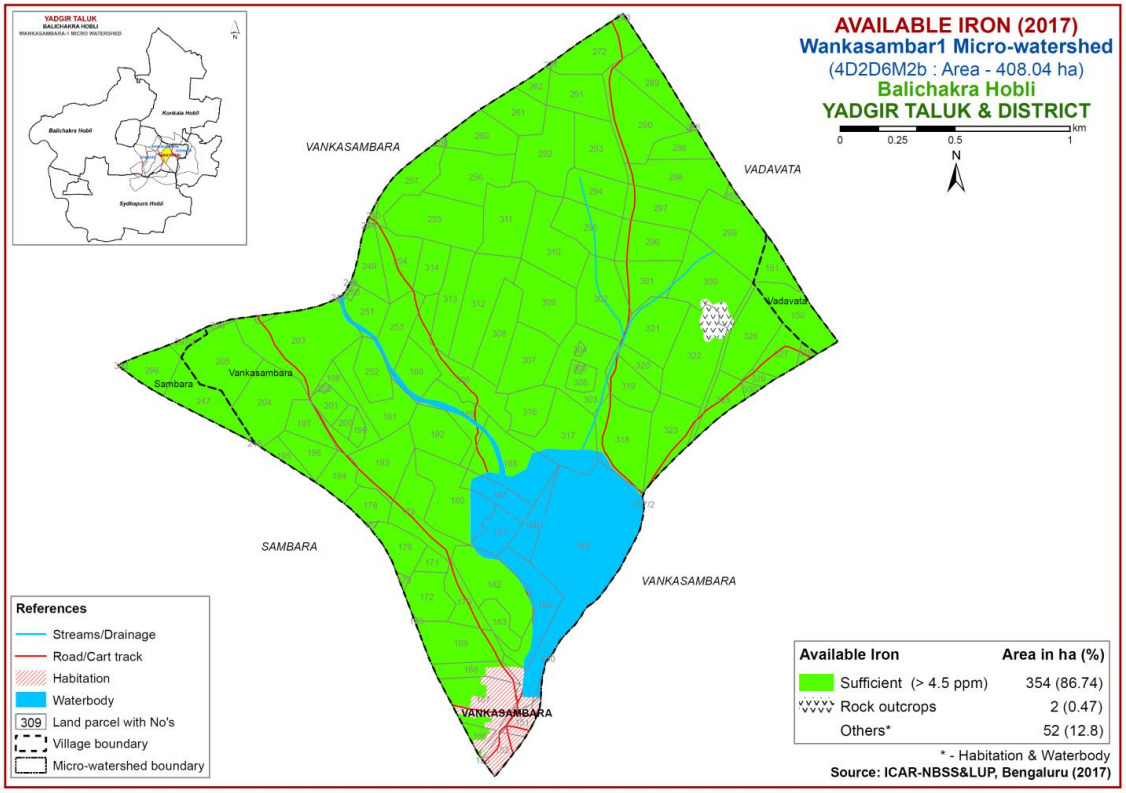


Fig. 6.8 Soil available Iron map of Wankasambara-1 Microwatershed

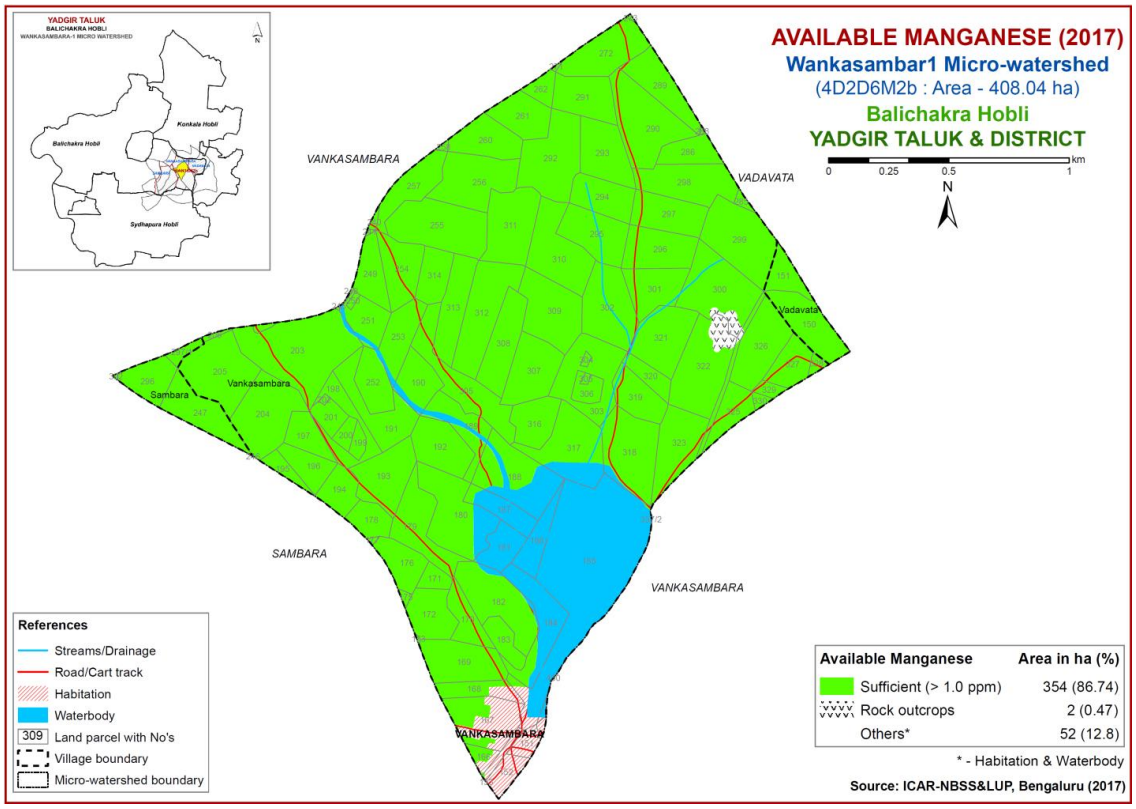


Fig. 6.9 Soil available Manganese map of Wankasambara-1 Microwatershed

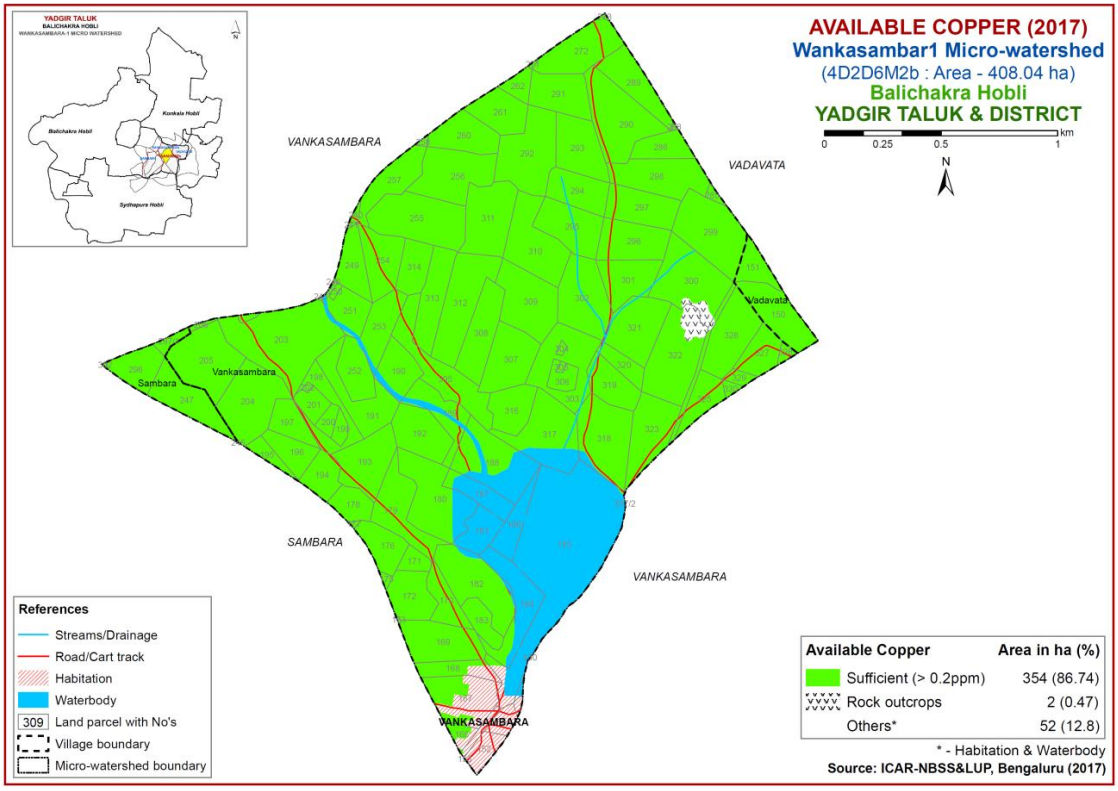


Fig. 6.10 Soil available Copper map of Wankasambara-1 Microwatershed

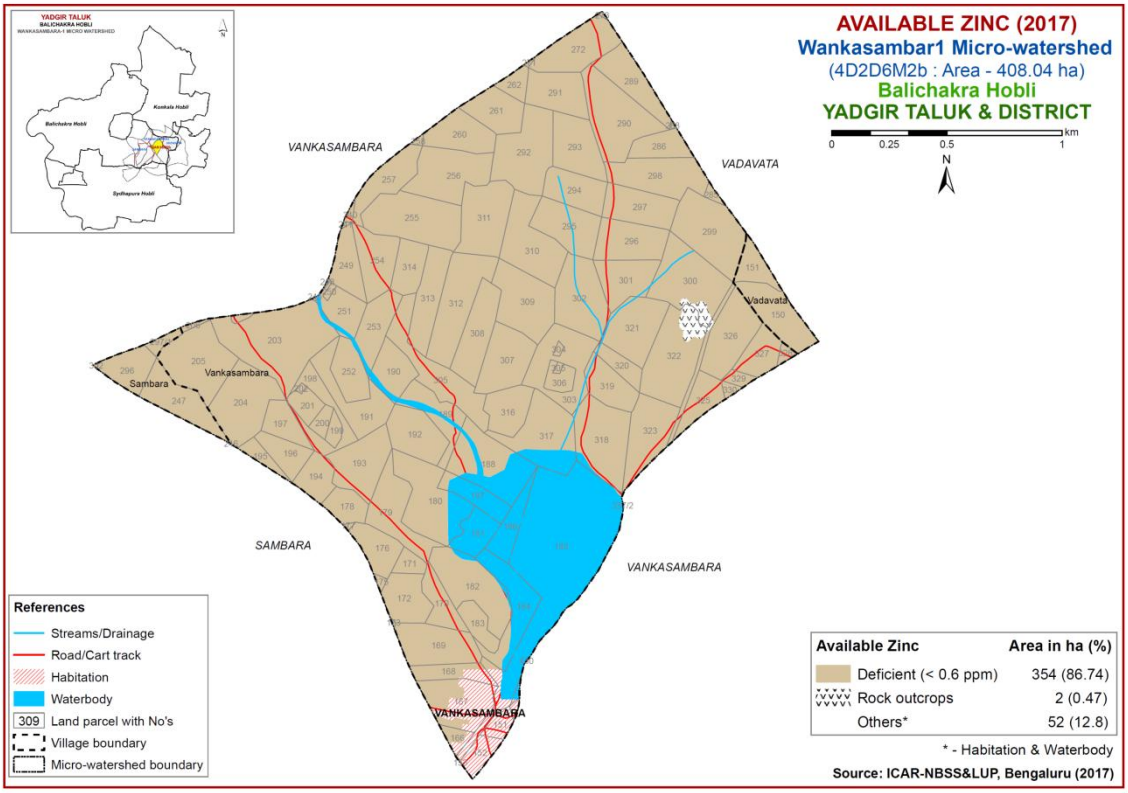


Fig. 6.11 Soil available Zinc map of Wankasambara-1 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Wankasambara-1 microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data, and also by referring to Naidu *et al.* (2006) and Natarajan *et al* (2015). The crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N-Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3-Marginally Suitable. Order N has two classes, N1-Currently not Suitable and N2-Permanently not Suitable. There are no subclasses within the class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'z' for calcareousness 's' for sodium and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable land with the limitations of soil depth and erosion is designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 26 major agricultural and horticultural crops grown in the state 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 an area of 10.47 lakh ha in the northern Karnataka in Bijapur, Kalaburgi, Raichur, Bidar, Belgaum, Dharwad and Bellary 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.

Table 7.1 Soil-Site Characteristics of Wankasambara-1 Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC	ESP	CEC [Cmol (p^+) kg^{-1}]	BS (%)
					Surf-ace	Sub-surface	Sur-face (%)	Sub-surface (%)								
BDLbB2	866	120-150	WD	25-50	ls	sl	-	-	<50	1-3	Moderate	6.20	0.07	0.20	4.20	93
SBRcB2	866	120-150	WD	50-75	sl	ls	-	-	<50	1-3	Moderate	8.24	0.14	1.15	7.50	100
HLGcB2	866	120-150	MWD	50-75	sl	scl	-	-	51-100	1-3	Moderate	8.49	0.18	0.69	8.80	100
GWDcB2	866	120-150	MWD	75-100	sl	scl	-	-	101-150	1-3	Moderate	9.89	0.74	43.51	8.35	100
YDRcB2	866	120-150	WD	100-150	sl	sl	-	-	51-100	1-3	Moderate	9.47	0.37	12.1	12.7	165
GDGbB2	866	120-150	WD	100-150	ls	scl	-	-	101-150	1-3	Moderate	5.57	0.25	0.22	5.83	78
NGPbB2	866	120-150	MWD	100-150	ls	c	-	-	>200	1-3	Moderate	7.42	0.24	0.22	67.10	100
BGDbB2	866	120-150	WD	100-150	ls	c	-	-	>200	1-3	Moderate	7.85	0.25	0.26	65.9	100
MDRcB2	866	120-150	MWD	>150	sl	scl	-	-	>200	1-3	Moderate	8.31	0.33	2.26	20.5	100
NHLmB1	866	120-150	MWD	100-150	c	sl	-	-	>200	1-3	Moderate	5.41	0.12	3.36	14.28	75
TMKiB2	866	120-150	MWD	>150	sc	c	-	-	>200	1-3	Moderate	9.60	0.35	16.5	21.83	100

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

There are no highly suitable (Class S1) lands for growing sorghum in the microwatershed. Maximum area of about 252 ha (62%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of drainage, calcareousness and rooting condition. Marginally suitable lands (Class S3) occur in an area of 101 ha (25%) and are distributed in the eastern, western, central and southern part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness.

Table 7.2 Crop suitability criteria for Sorghum

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

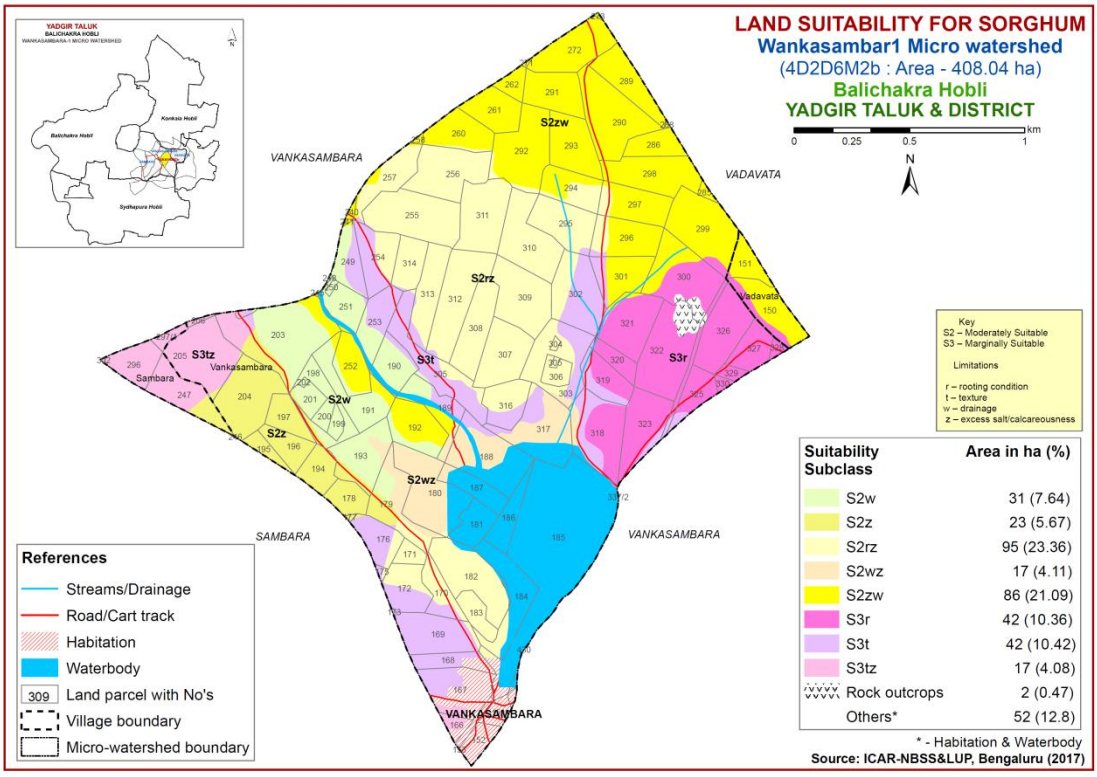


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

Maize is one of the most important food crop grown in an area of 13.37 lakh ha in 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 Crop suitability criteria for Maize

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

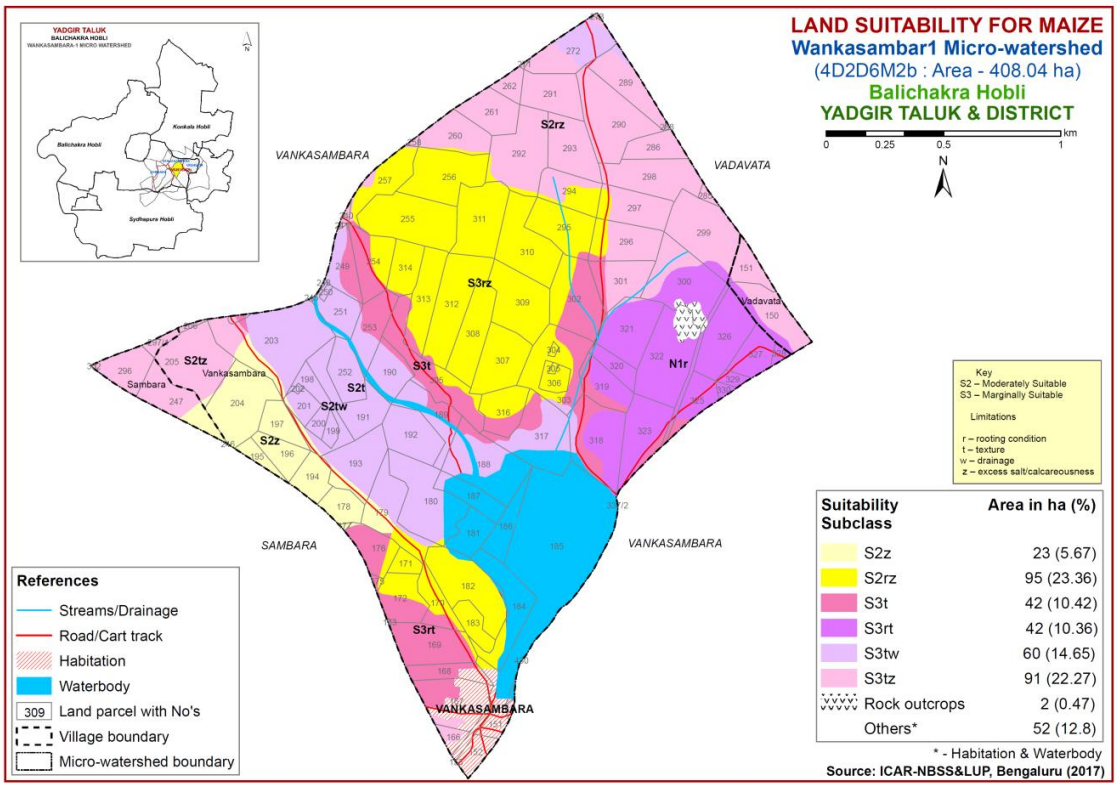


Fig. 7.2 Land Suitability map of Maize

In Wankasambara-1 microwatershed, there are no highly (Class S1) suitable lands for growing maize in the microwatershed. An area of about 118 ha (29%) is moderately

suitable (Class S2) and are distributed in the central, southern and southwestern part of the microwatershed. They have minor limitations of calcareousness and rooting condition. Marginally suitable lands (Class S3) occur in a maximum area of 235 ha (58%) and are distributed in all parts of the microwatershed. They have moderate limitations of texture, drainage, rooting condition and calcareousness.

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

Red gram is one of the major pulse crop grown in an area of 7.28 lakh ha mainly in northern Karnataka in Bijapur, Kalaburgi, Raichur, Bidar, Belgaum, Dharwad and Bellary districts. The crop requirements for growing red gram (Table 7.4) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing red gram was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.3.

There are no lands that are highly (Class S1) suitable for growing redgram in Wankasambara-1 microwatershed. An area of about 174 ha (43%) is moderately suitable (Class S2) and are distributed in the northern, northeastern, central, southern and western part of the microwatershed. They have minor limitations of texture, rooting condition, calcareousness and drainage. An area of 179 ha (44%) is marginally suitable (Class S3) and are distributed in the eastern, southern, central, western and northwestern part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness.

Table 7.4 Crop suitability criteria for Red gram

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>210	180-210	150-180	<150
Soil drainage	class	Well drained	Mod. to 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
Surface soil texture	Class	l, scl, sil, cl, sl	sicl, sic,c(m)	ls	s,fragmental
Soil depth	cm	>100	85-100	40-85	<40
Gravel content	% vol.	<20	20-35	35-60	>60
Salinity (EC)	dSm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

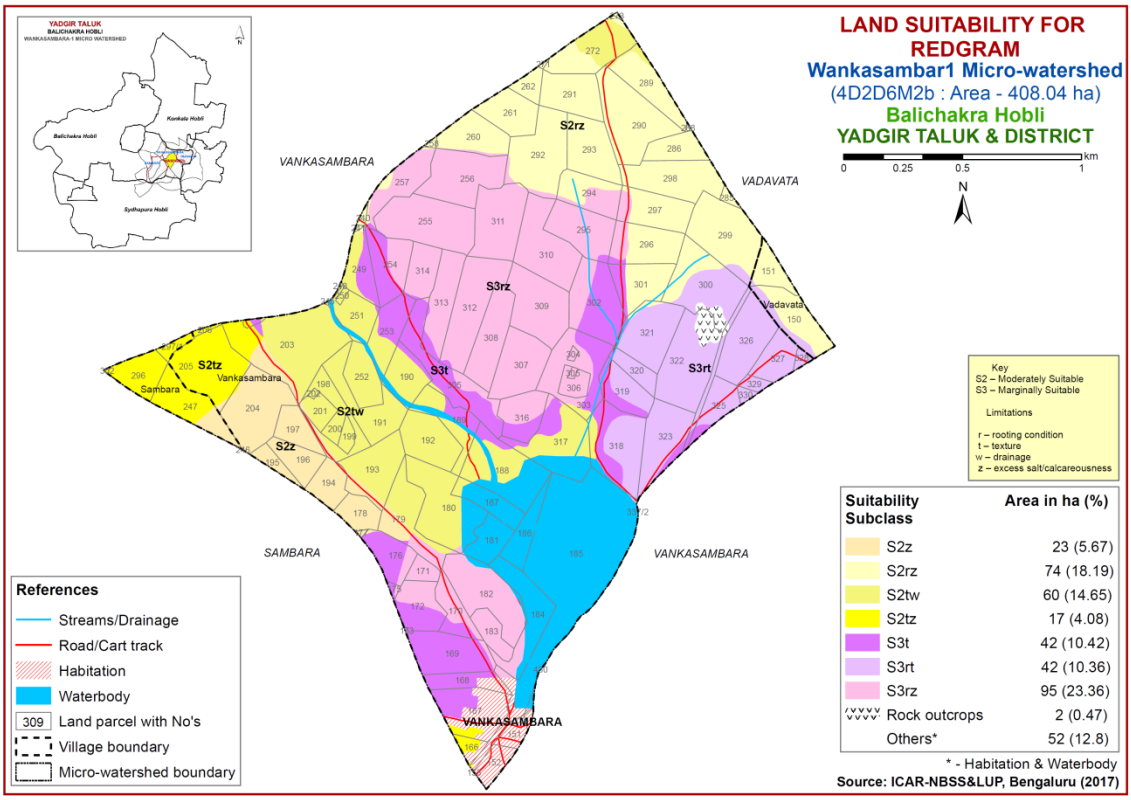


Fig. 7.3 Land Suitability map of Red gram

7.4 Land Suitability for Bajra (*Pennisetum glaucum)*

Bajra is one of the most important millet crop grown in an area of 2.34 lakh ha in the northern districts of Karnataka State. The crop requirements for growing bajra (Table 7.5) 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 7.4.

Table 7.5 Crop suitability criteria for Bajra

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Slope	%	2-3	3-8	8-15	>15
LGP	Days	120-150	120-90	<90	
Soil drainage	class	Well to mod. 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

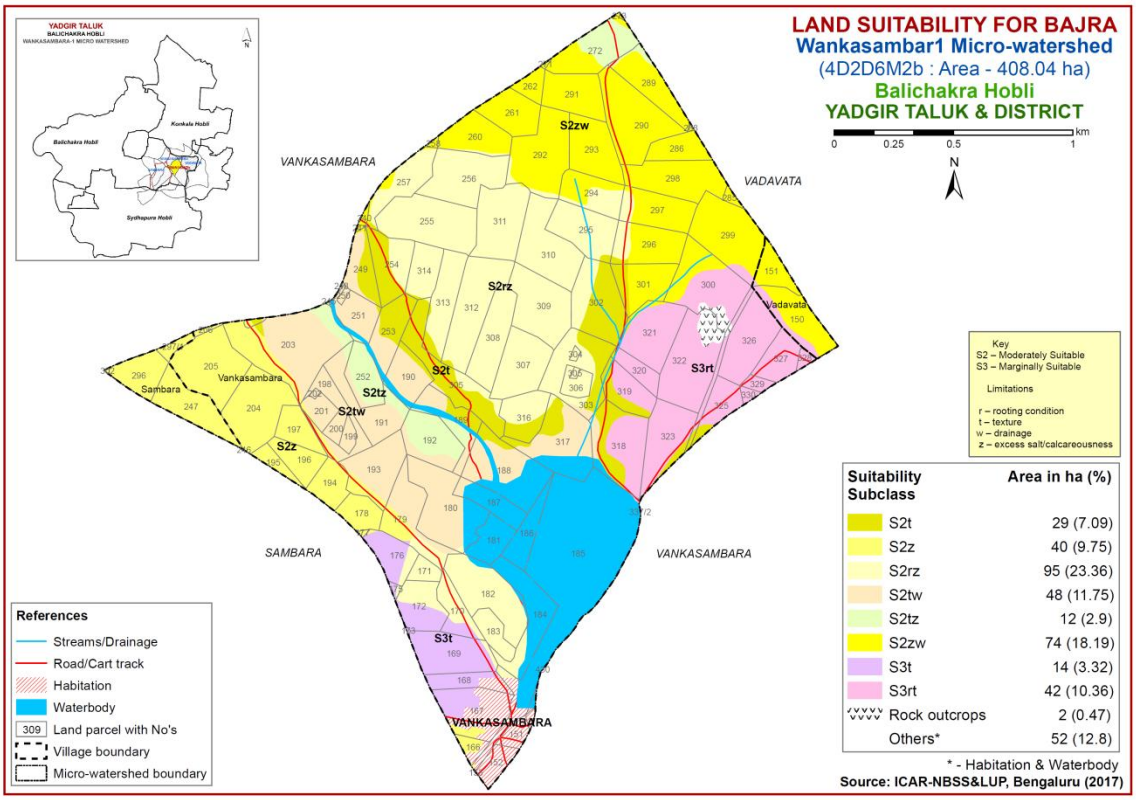


Fig. 7.4 Land Suitability map of Bajra

In Wankasambara-1 microwatershed, there are no highly (Class S1) suitable for growing bajra in the microwatershed. Maximum area of about 298 ha (73%) is moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of drainage, texture, calcareousness and rooting condition. Marginally suitable lands (Class S3) occupy an area of 56 ha (14%) and are distributed in the southern and eastern part of the microwatershed. They have moderate limitations of rooting condition and texture.

7.5 Land suitability for Groundnut (*Arachis hypogaea*)

Groundnut is one of the major oilseed crop grown in an area of 6.54 lakh ha in almost all the districts of the State. The crop requirements for growing groundnut (Table 7.6) were matched with the soil-site characteristics (Table 7.1) of soils of the microwatershed and a land suitability map for growing groundnut was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.5.

There are no highly suitable (Class S1) lands for growing groundnut in the microwatershed. An area of about 135 ha (33%) is moderately suitable (Class S2) and are distributed in the central, northwestern, southern and southwestern part of the microwatershed. They have minor limitations of rooting condition, calcareousness and texture. The marginally suitable (Class S3) lands cover in a maximum area of about 218

ha (54%) and occur in all parts of the microwatershed. They have moderate limitations of texture, rooting condition, calcareousness and drainage.

Table 7.6 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	
Sub Surface soil texture	Class	l, cl, sil, scl, sicl	sc, sic, c, sl	s, ls, c (>60%)	
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<35	35-50	>50	
$CaCO_3$ in root zone	%	low	Medium	high	
Salinity (EC)	dSm^{-1}	<2.0	2.0-4.0	4.0-8.0	
Sodicity (ESP)	%	<5	5-10	>10	

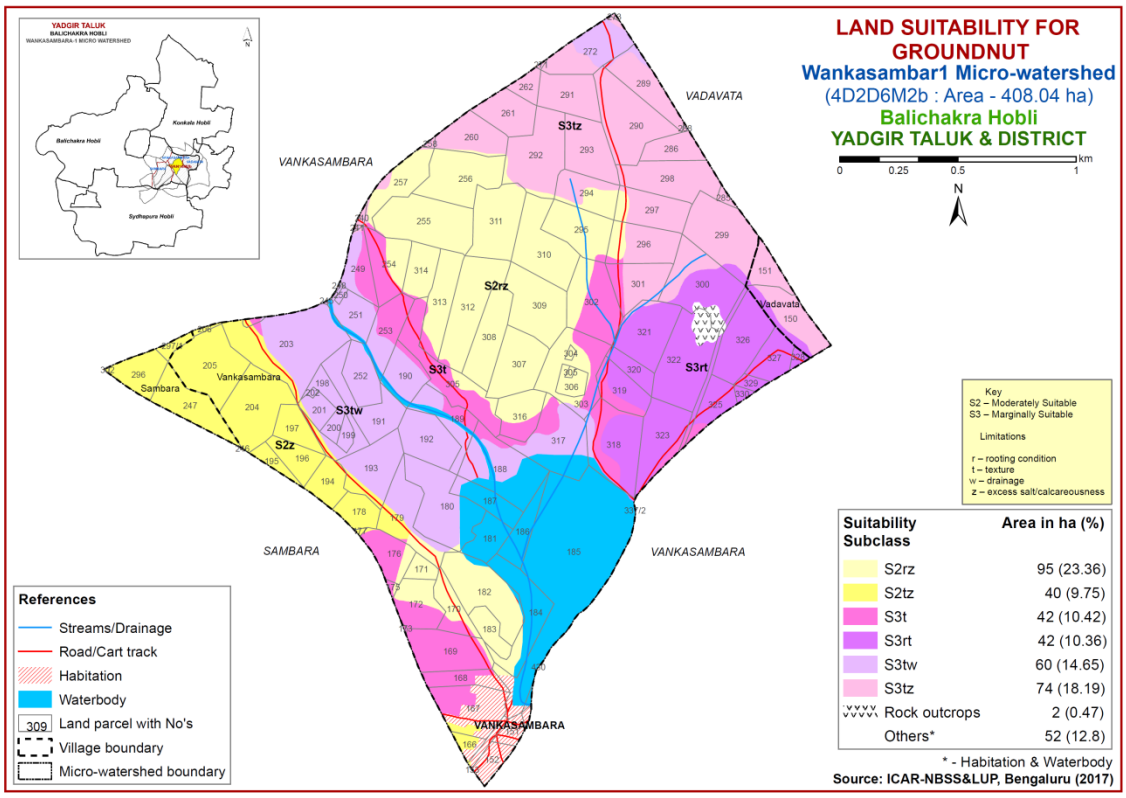


Fig. 7.5 Land Suitability map of Groundnut

7.6 Land Suitability for Sunflower (*Helianthus annus*)

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

7.7) 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 7.6.

Table 7.7 Crop suitability criteria for Sunflower

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

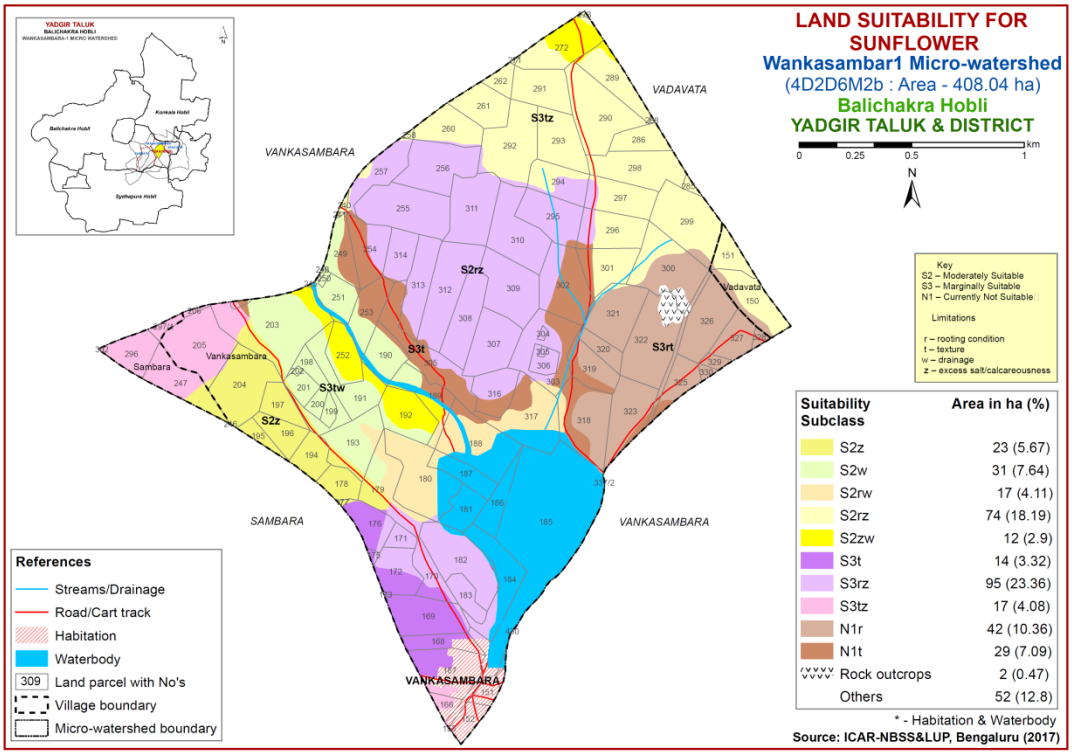


Fig. 7.6 Land Suitability map of Sunflower

There are no highly (Class S1) suitable lands for growing sunflower in the microwatershed. An area of 157 ha (39%) is moderately suitable (Class S2) and are distributed in the northern, northeastern, central and western part of the microwatershed. They have minor limitations of calcareousness, drainage, rooting condition and calcareousness. An area of 126 ha (31%) is marginally suitable (Class S3) and are distributed in the central, northwestern, western and southern part of the microwatershed.

They have moderate limitations of rooting condition, texture and calcareousness. An area of 71 ha (17%) is currently not suitable (Class N1) for growing sunflower and are distributed in the eastern, central and western part of the microwatershed with severe limitations of rooting condition and texture.

7.7 Land Suitability for Cotton (*Gossypium hirsutum*)

Cotton is one of the most important fibre crop grown in the state in about 8.75 lakh ha area in Raichur, Dharwad, Belgaum, Kalaburgi, Bijapur, Bidar, Bellary, Chitradurga and Chamarajnagar districts. The crop requirements for growing cotton (Table 7.8) 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 7.7.

The highly (Class S1) suitable for growing cotton in an area of 31 ha (8%) in the microwatershed. Maximum area of about 222 ha (54%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of drainage, calcareousness and rooting condition. Marginally suitable (Class S3) lands occur in an area of 42 ha (10%) and are distributed in the eastern part of the microwatershed with moderate limitation of rooting condition. Currently not suitable lands (Class N1) occur in an area of 59 ha (15%) and are distributed in the central, southern and western part of the microwatershed with severe limitations of texture and calcareousness.

Table 7.8 Crop suitability criteria for Cotton

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

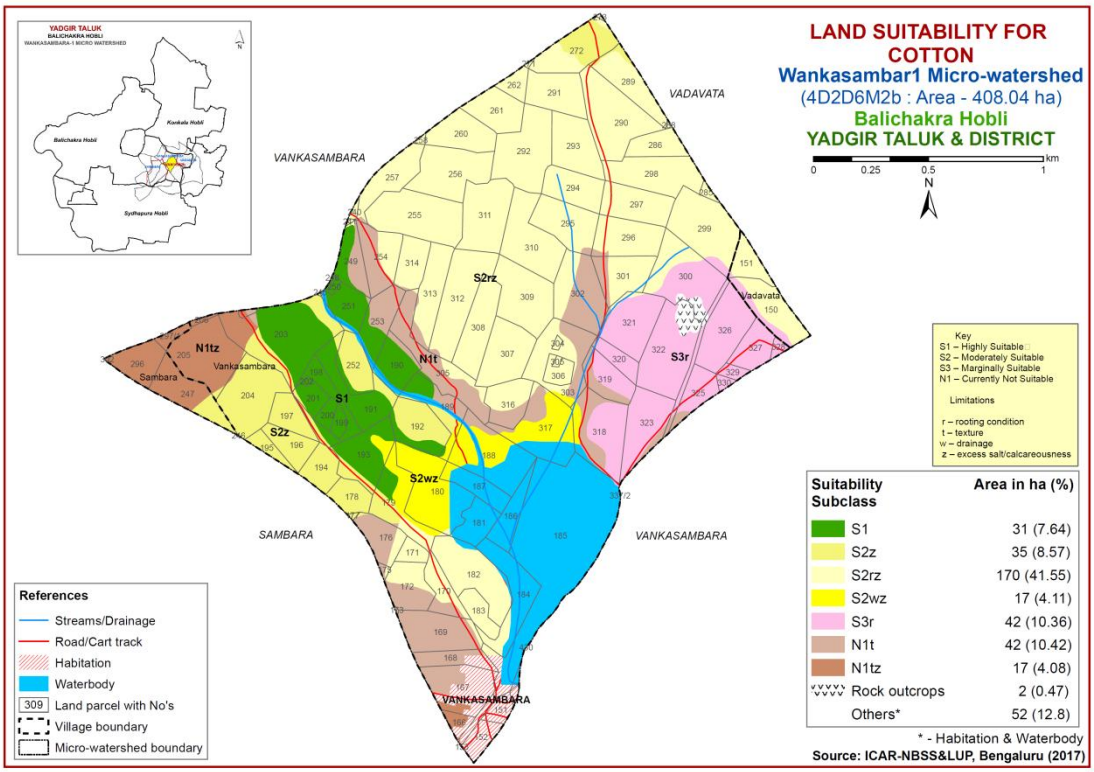


Fig. 7.7 Land Suitability map of Cotton

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

Bengal gram is one of the most important pulse crop grown in about 9.39 lakh ha area in Bijapur, Raichur, Kalaburgi, Dharwad, Belgaum and Bellary districts. The crop requirements for growing Bengal gram (Table 7.9) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Bengal gram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.8.

An area of 31 ha (8%) is highly (Class S1) suitable for growing bengal gram in the microwatershed. Maximum area of about 221 ha (54%) is moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of calcareousness, drainage, texture and rooting condition. Marginally suitable (Class S3) lands occur in an area of 42 ha (10%) and are distributed in the eastern part of the microwatershed with moderate limitation of rooting condition. An area of 59 ha (15%) is not currently suitable (Class N1) and are distributed in the central, eastern, southern and western part of the microwatershed with severe limitations of texture and calcareousness.

Table 7.9 Crop suitability criteria for Bengal gram

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>100	90-100	70-90	<70
Soil drainage	class	Well drained	Mod. to well drained; imp.drained	Poorly drained; excessively drained	Very Poorly drained
Soil reaction	pH	6.0-7.5	5.5-5.7, 7.6-8.0	8.1-9.0;4.5-5.4	>9.0
Surface soil texture	Class	l, scl, sil, cl,	sicl, sic, c	sl, c>60%	
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	

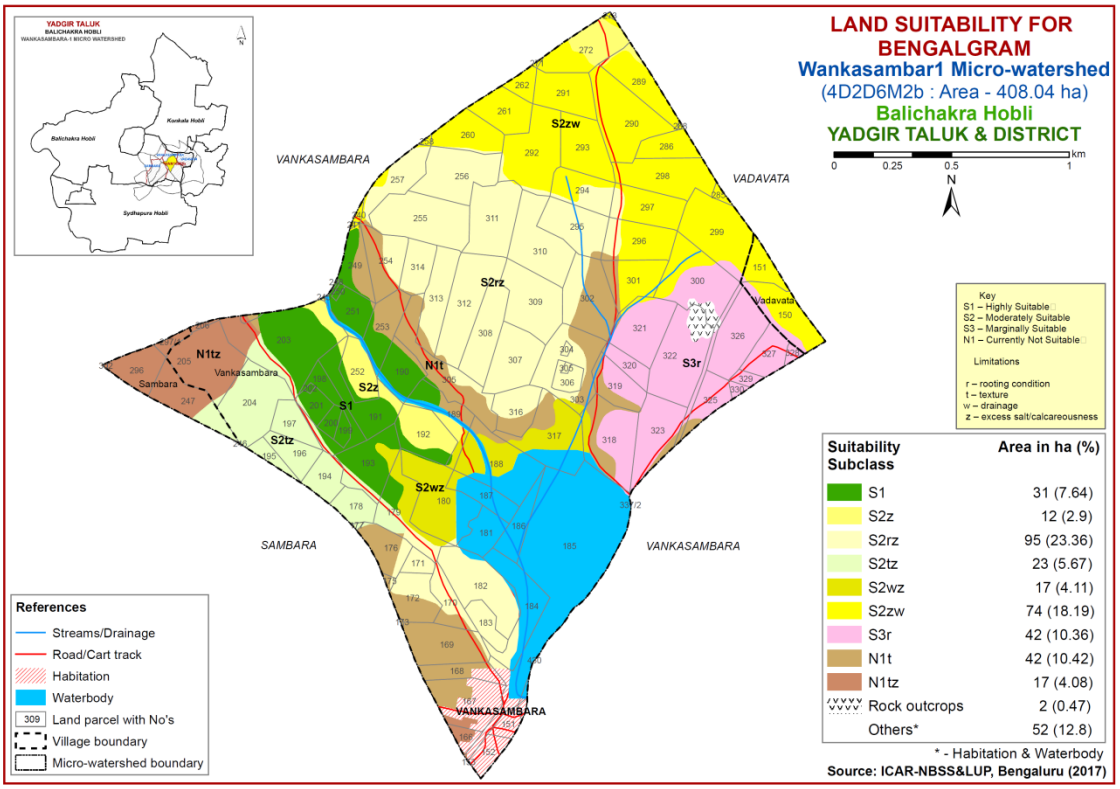


Fig. 7.8 Land Suitability map of Bengal gram

7.9 Land Suitability for Chilli (*Capsicum annuum)*

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

There are no highly suitable (Class S1) lands for growing chilli in the microwatershed. Maximum area of 269 ha (66%) is moderately (Class S2) suitable and are distributed in all parts of the microwatershed. They have minor limitations of drainage, texture, calcareousness and rooting condition. Marginally suitable lands (Class S3) occur in an area of 84 ha (21%) and are distributed in the eastern, southern, central and western part of the microwatershed. They have moderate limitations of rooting condition, texture and drainage.

Table 7.10 Crop suitability criteria for Chilli

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

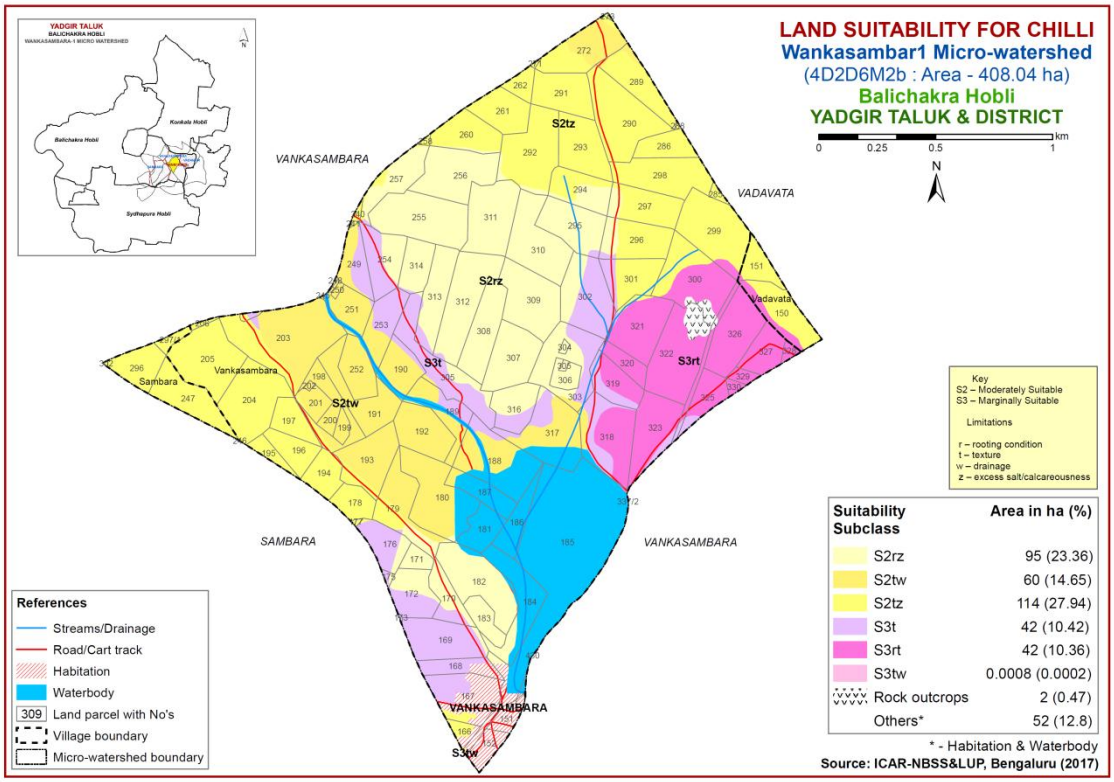


Fig 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato *(Lycopersicon esculentum*)

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

There are no highly (Class S1) suitable lands for growing tomato in the microwatershed. The moderately suitable (Class S2) lands cover an area of 135 ha (33%) and occur in the southern, southwestern, northwestern, western and central part of the microwatershed. They have minor limitations of rooting condition and calcareousness. The marginally suitable (Class S3) lands cover in a maximum area of 218 ha (54%) and occur in the major part of the microwatershed. They have moderate limitations of texture, rooting condition, calcareousness and drainage.

Table 7.11 Crop suitability criteria for Tomato

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	25-28	29-32 , 20-24	15-19 33-36	<15, >36
Soil moisture	Growing period	Days	>150	120-150	90-120	
Soil aeration	Soil drainage	class	Well drained	Moderately well drained	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	5.5-6.0 7.3-8.4	8.4-9.0	>9.0
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	%vol.	<15	15-35	>35	
Soil toxicity	Salinity	ds/m	Non saline	slight	strongly	
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	>10

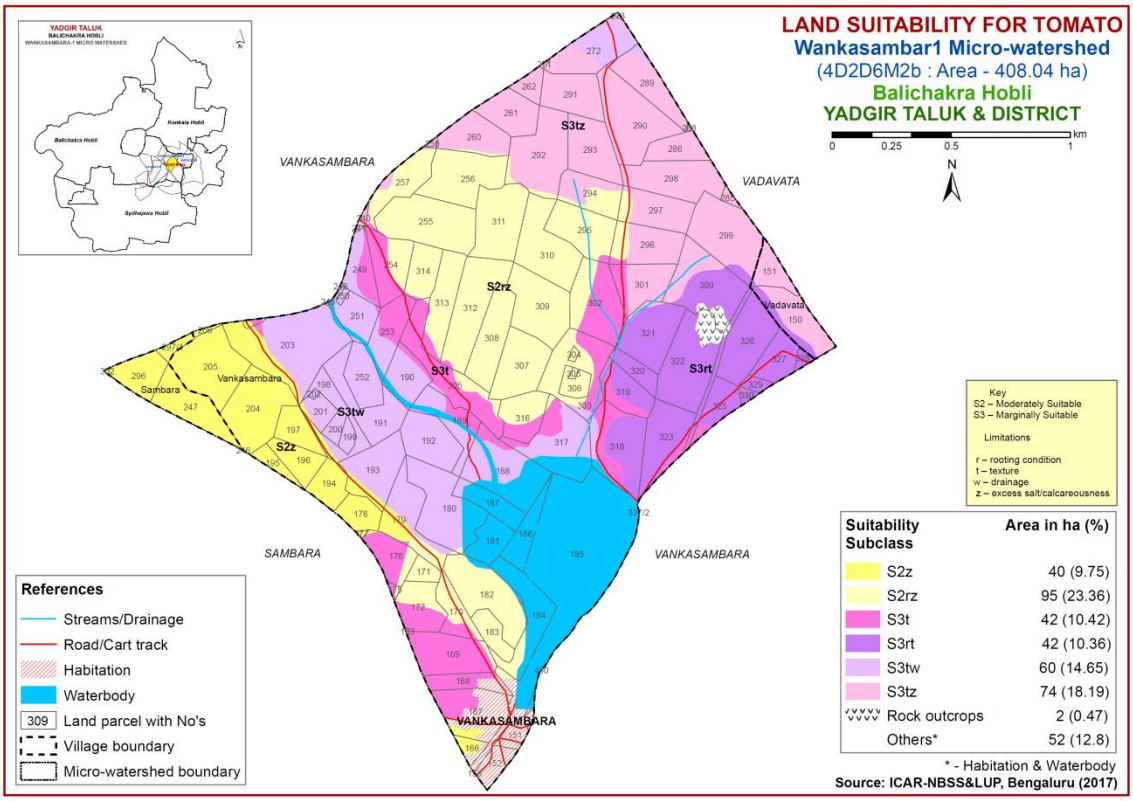


Fig 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Drumstick (*Moringa oleifera*)

Drumstick is one of the most important vegetable crop grown in 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.

There are no highly (Class S1) suitable lands for growing drumstick in the microwatershed. Maximum area of 174 ha (43%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of texture, rooting condition, calcareousness and drainage. An area of about 137 ha (34%) is marginally suitable (Class S3) and are distributed in the central, northwestern, southern and eastern part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness. Currently not suitable (Class N1) lands occupy an area of about 42 ha (10%) and are distributed in the eastern part of the microwatershed with severe limitations of rooting condition and texture.

Table 7.12 Crop 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

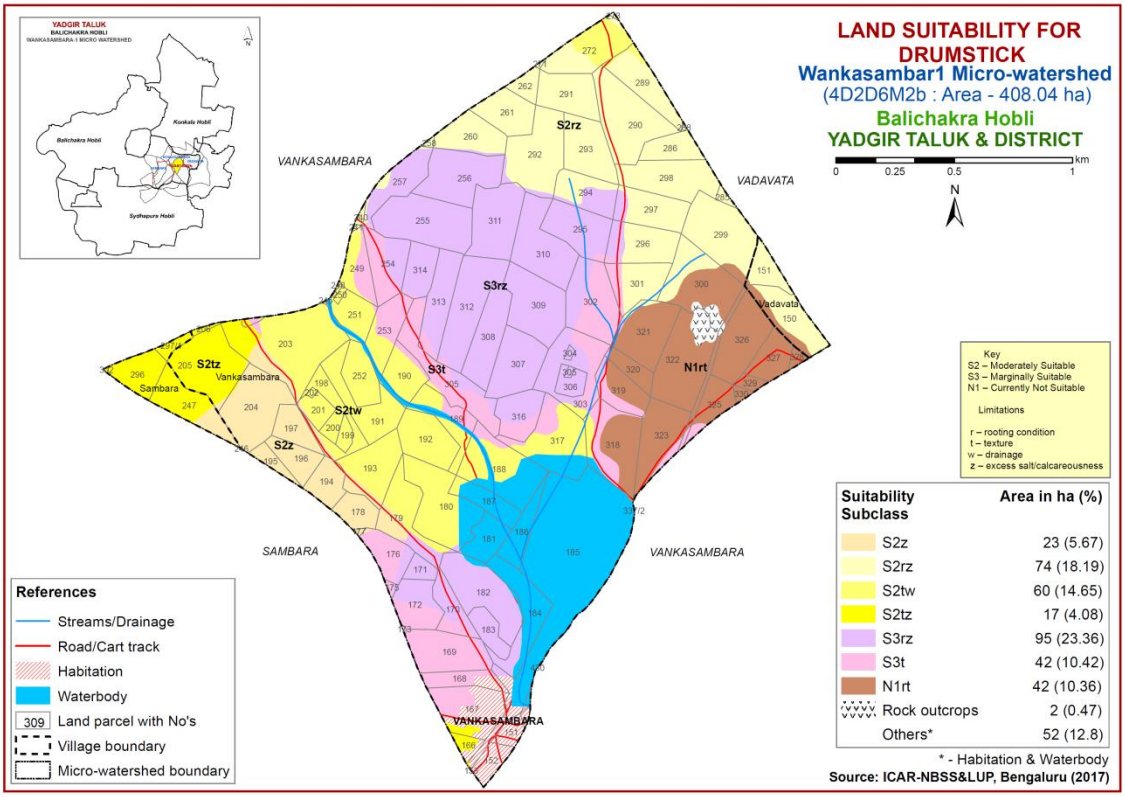


Fig 7.11 Land Suitability map of Drumstick

7.12 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is the important leaf crop grown for rearing silk worm in about 1,66,000 ha area in all the districts of the state. The crop requirements for growing mulberry (Table 7.13) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mulberry was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.12.

Moderately suitable (Class S2) lands cover an area of 23 ha (6%) for growing mulberry and are distributed in the western part of the microwatershed. Marginally suitable lands (Class S3) occur in a maximum area of 288 ha (71%) and are distributed in the major part of the microwatershed. They have moderate limitations of rooting

condition, texture, calcareousness and drainage. Currently not suitable (Class N1) lands occupy an area of 42 ha (10%) and are distributed in the eastern part of the microwatershed with severe limitations of rooting condition and texture.

Table 7.13 Crop 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

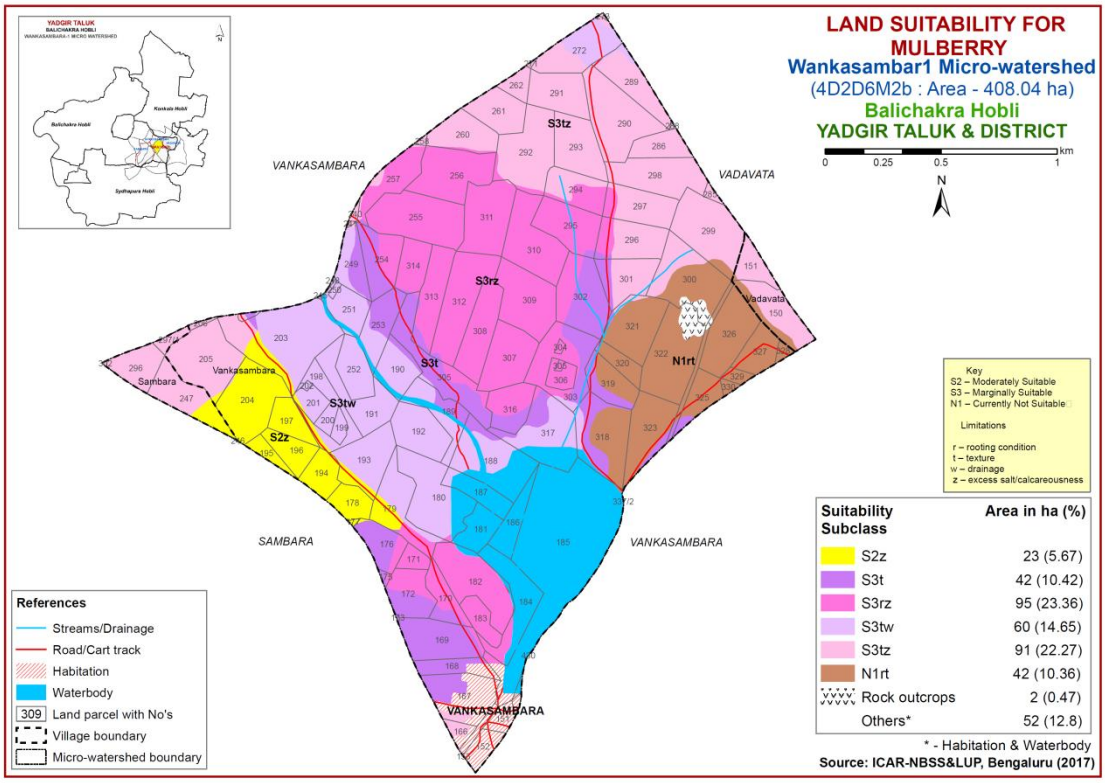


Fig 7.12 Land Suitability map of Mulberry

7.13 Land Suitability for Mango (*Mangifera indica*)

Mango is one of the most important fruit crop grown in about 173080 ha in all the districts of the State. The crop requirements for growing mango (Table 7.14) 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 geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.13.

Table 7.14 Crop suitability criteria for Mango

Crop requirement			Rating			
soil-site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	28-32	24-27 33-35	36-40	20-24
	Min. temp. before flowering	^{0}C	10-15	15-22	>22	
Soil moisture	Growing period	Days	>180	150-180	120-150	<120
Soil aeration	Soil drainage	class	Well drained	Mod. To imp. drained	Poor drained	V. poorly drained
	Water table	M	>3	2.50-3.0	2.5-1.5	<1.5
Nutrient availability	Texture	Class	sc, l, sil, cl	sl, sc, sic, l, c	c (<60%)	c (>60%),
	pH	1:2.5	5.5-7.5	7.6-8.55.0-5.4	8.6-9.0, 4.0-4	>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	

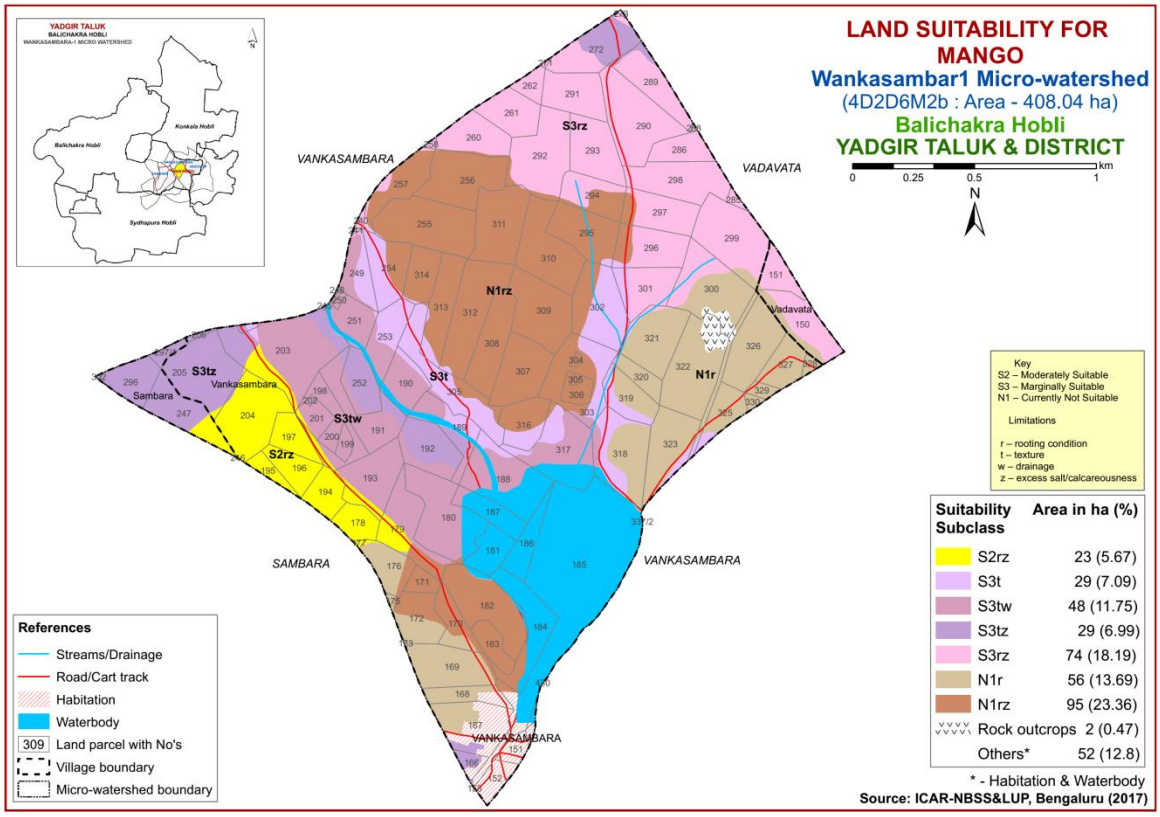


Fig. 7.13 Land Suitability map of Mango

There are no highly (Class S1) suitable lands for growing mango in the microwatershed. An area of about 23 ha (6%) is moderately suitable (Class S2) and are distributed in the southwestern part of the microwatershed. Maximum area of 180 ha (44%) is marginally suitable (Class S3) and are distributed in the major part of the microwatershed. They have moderate limitations of texture, drainage, calcareousness and rooting condition. Currently not suitable lands (Class N1) occupy an area of 151 ha (37%) and are distributed in the eastern, southern, central and northwestern part of the microwatershed. They have severe limitations of rooting condition and calcareousness.

7.14 Land Suitability for Sapota (*Manilkara zapota*)

Sapota is one of the most important fruit crop grown in about 29373 ha in almost all the districts of the state. The crop requirements for growing sapota (Table 7.15) 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 is given in Figure 7.14.

There are no highly (Class S1) suitable lands for growing sapota in the microwatershed. An area of 40 ha (10%) is moderately suitable (Class S2) and are distributed in the southern and western part of the microwatershed. They have minor limitations of calcareousness and texture. Maximum area of about 272 ha (67%) is marginally suitable (Class S3) and are distributed in all parts of the microwatershed. They have moderate limitations of texture, drainage, calcareousness and rooting condition. An area of about 42 ha (10%) is currently not suitable (Class N1) and are distributed in the eastern part of the microwatershed with severe limitation of rooting condition.

Table 7.15 Crop suitability criteria for Sapota

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0} C	28-32	33-36 24-27	37-42 20-23	>42 <18
Soil moisture	Growing period	Days	>150	120-150	90-120	<120
Soil aeration	Soil drainage	class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availabiliy	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

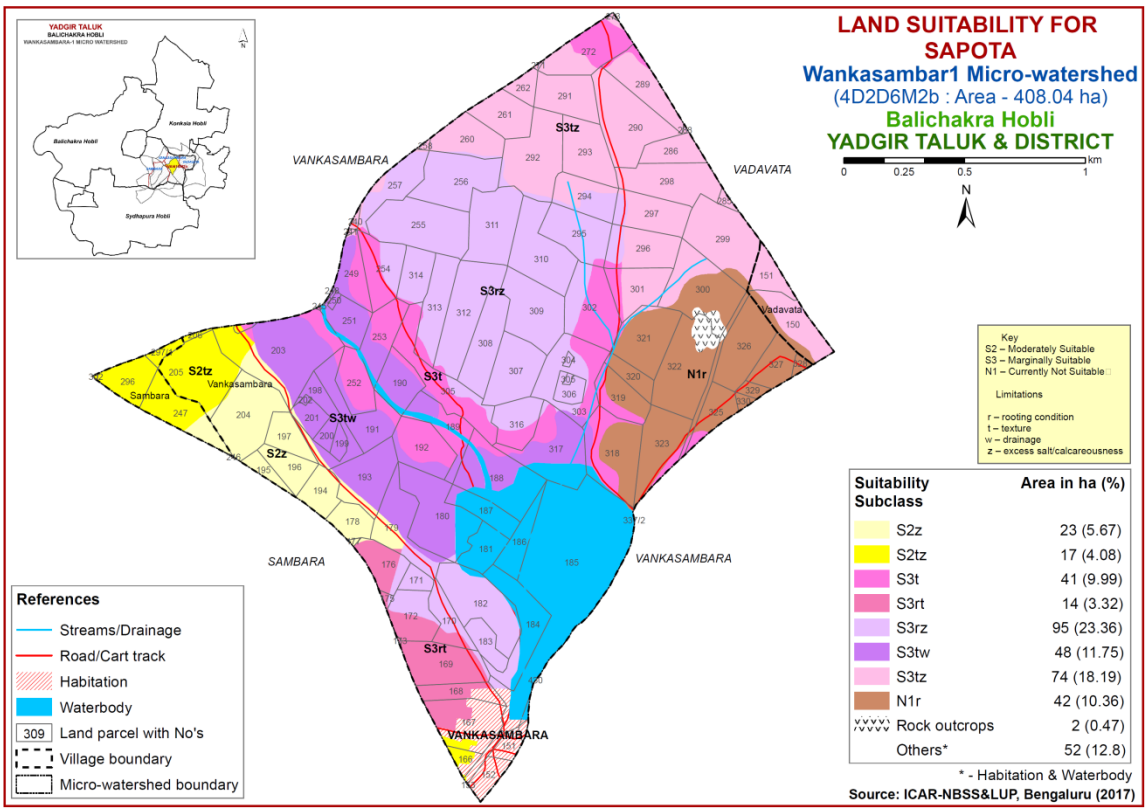


Fig. 7.14 Land Suitability map of Sapota

7.15 Land Suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in about 6558 ha in the State of Raichur, Dharwad, Belgaum, Kalaburgi, Bijapur, Bidar, Bellary, Chitradurga, Bangalore, Kolar, Chikkaballapur and Chamarajnagar districts. The crop requirements for growing guava (Table 7.16) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing guava was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.15.

There are no highly (Class S1) suitable lands for growing guava in the microwatershed. An area of about 40 ha (10%) is moderately suitable (Class S2) and are distributed in the western part of the microwatershed. They have minor limitations of texture and calcareousness. Maximum area of about 272 ha (67%) is marginally suitable (Class S3) and are distributed in all parts of the microwatershed. They have moderate limitations of texture, drainage, calcareousness and rooting condition. Currently not suitable (Class N1) lands occur in an area of 42 ha (10%) and are distributed in the eastern part of the microwaterhsed. They have severe limitations of rooting condition and texture.

Table 7.16 Crop suitability criteria for Guava

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

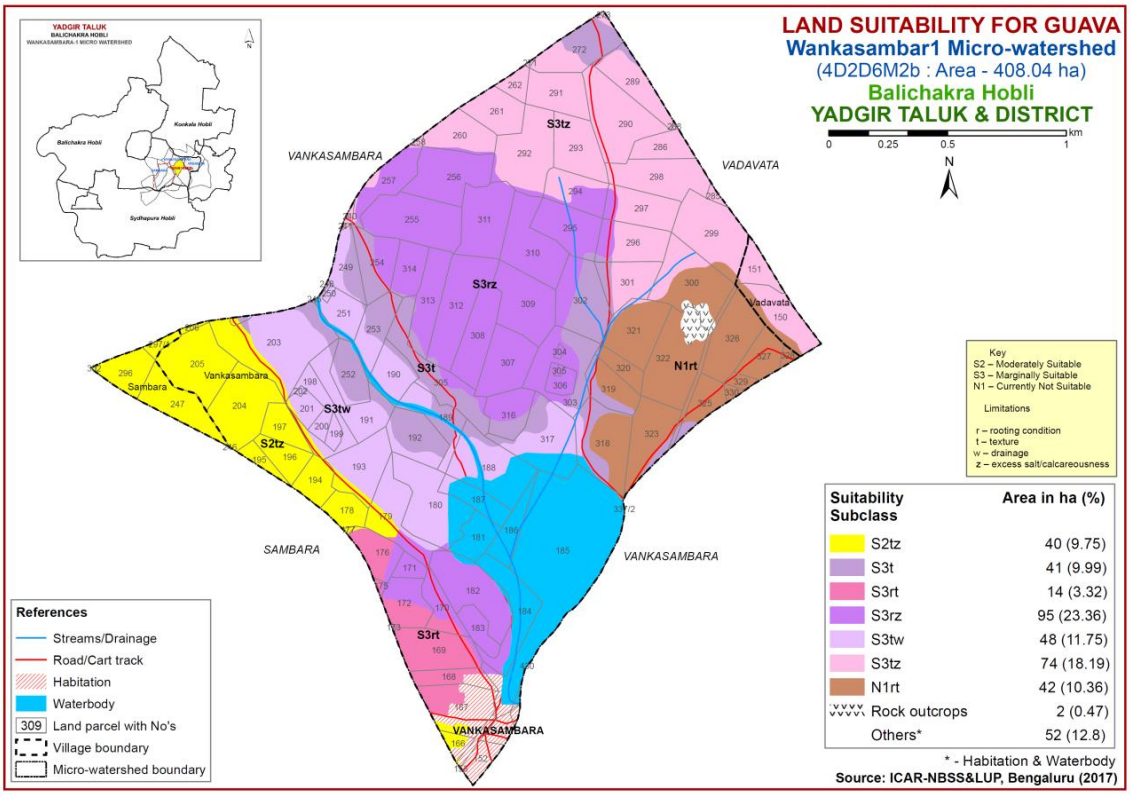


Fig 7.15 Land Suitability map of Guava

7.16 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the most important fruit crop commercially grown in about 18488 ha in karnataka in an area of about 0.16 lakh ha mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing

pomegranate (Table 7.17) 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 7.16.

Table 7.17 Crop suitability criteria for Pomegranate

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	30-34	35-38,25-29	39-40 15-24	
Soil moisture	Growing period	Days	>150	120-150	90-120	<90
Soil aeration	Soil drainage	class	Well drained	imperfectly drained		
Nutrient availability	Texture	Class	sl, scl, l, cl	c, sic, sicl	cl, s, ls	
	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	

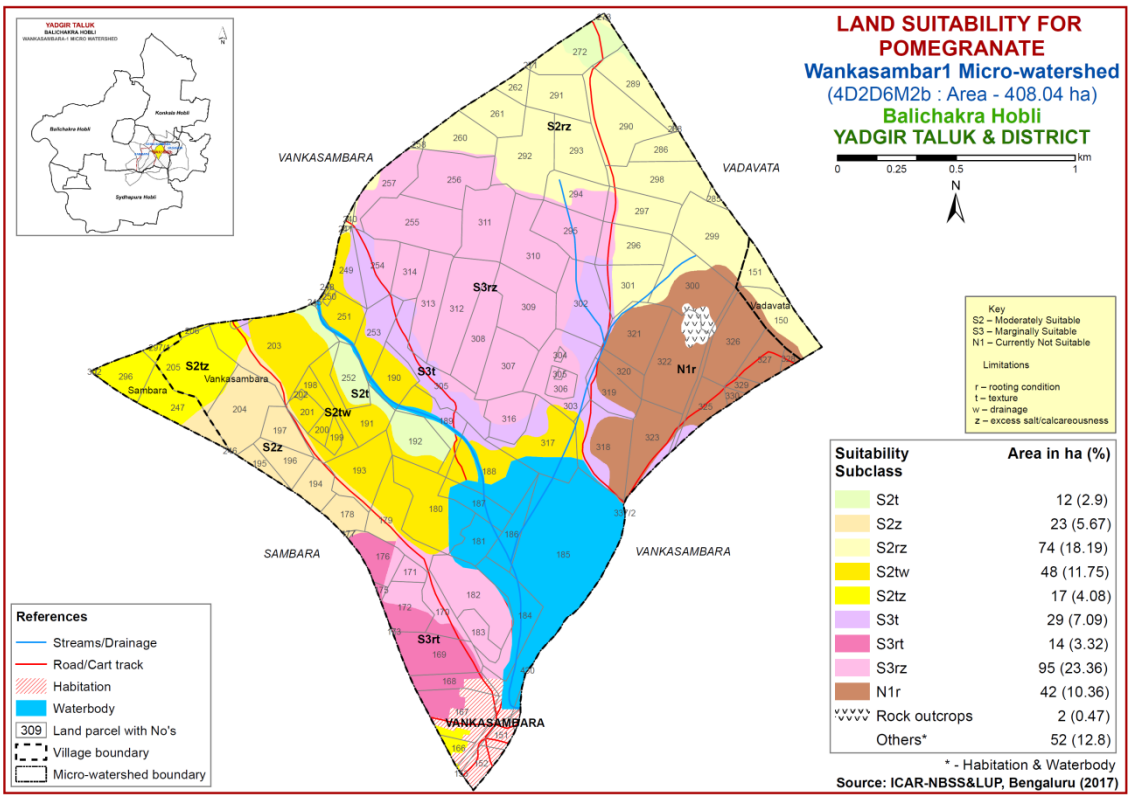


Fig 7.16 Land Suitability map of Pomegranate

There are no highly (Class S1) suitable lands for growing pomegranate in the microwatershed. An area of about 174 ha (43%) is moderately suitable (Class S2) and are distributed in the northern, northeastern, central, southern and western part of the microwatershed. They have minor limitations of texture, rooting condition, calcareousness and drainage. An area of 138 ha (34%) is marginally suitable (Class S3) and are distributed in the central, southern, eastern and northwestern part of the microwatershed. They have moderate limitations of texture, rooting condition and calcareousness. Currently not suitable lands (Class N1) occur in an area of 42 ha (10%) and are distributed in the eastern part of the microwatershed. They have severe limitation of rooting condition.

7.17 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

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

There are no highly (Class S1) suitable lands for growing jackfruit in the microwatershed. An area of 23 ha (6%) is moderately suitable (Class S2) and are distributed in the western part of the microwatershed. Maximum area of about 289 ha (71%) is marginally suitable (Class S3) and are distributed in the major part of the microwatershed. They have moderate limitations of texture, calcareousness, drainage and rooting condition. Not suitable lands (Class N1) occur in an area of about 42 ha (10%) and are distributed in the eastern part of the microwatershed with severe limitations of rooting condition and texture.

Table 7.18 Crop suitability criteria for Jackfruit

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

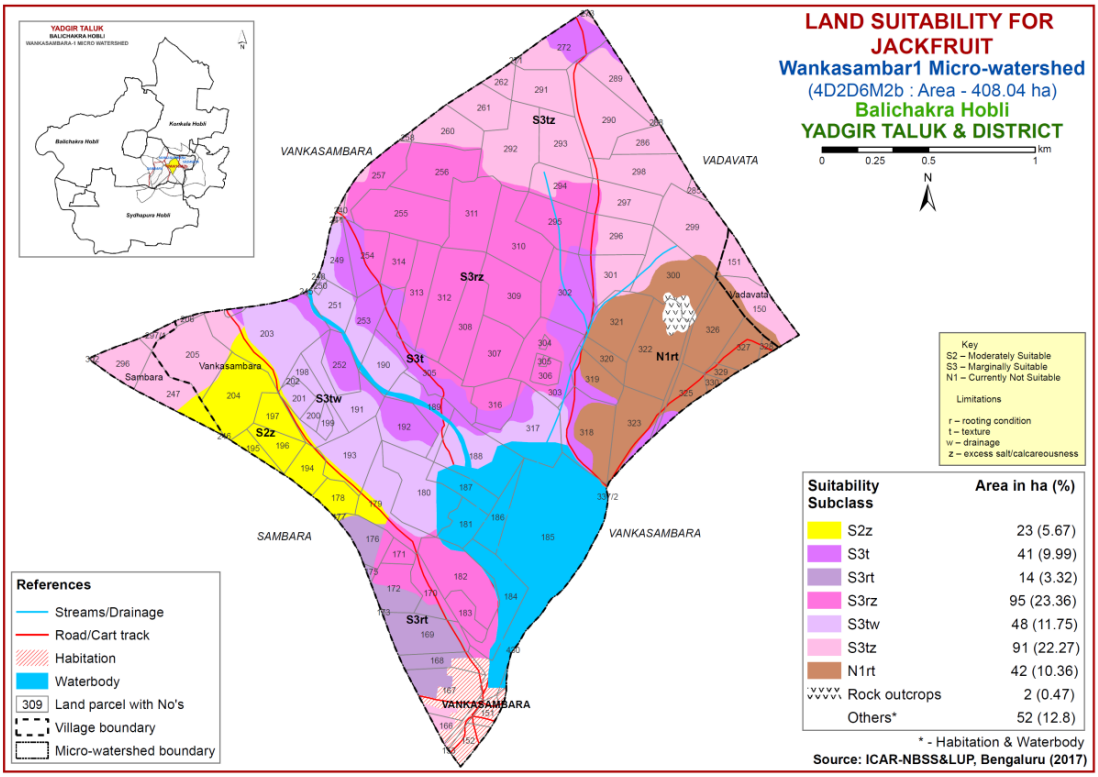


Fig 7.17 Land Suitability map of Jackfruit

7.18 Land Suitability for Jamun (*Syzygium cumini*)

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

Table 7.19 Crop suitability criteria for Jamun

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

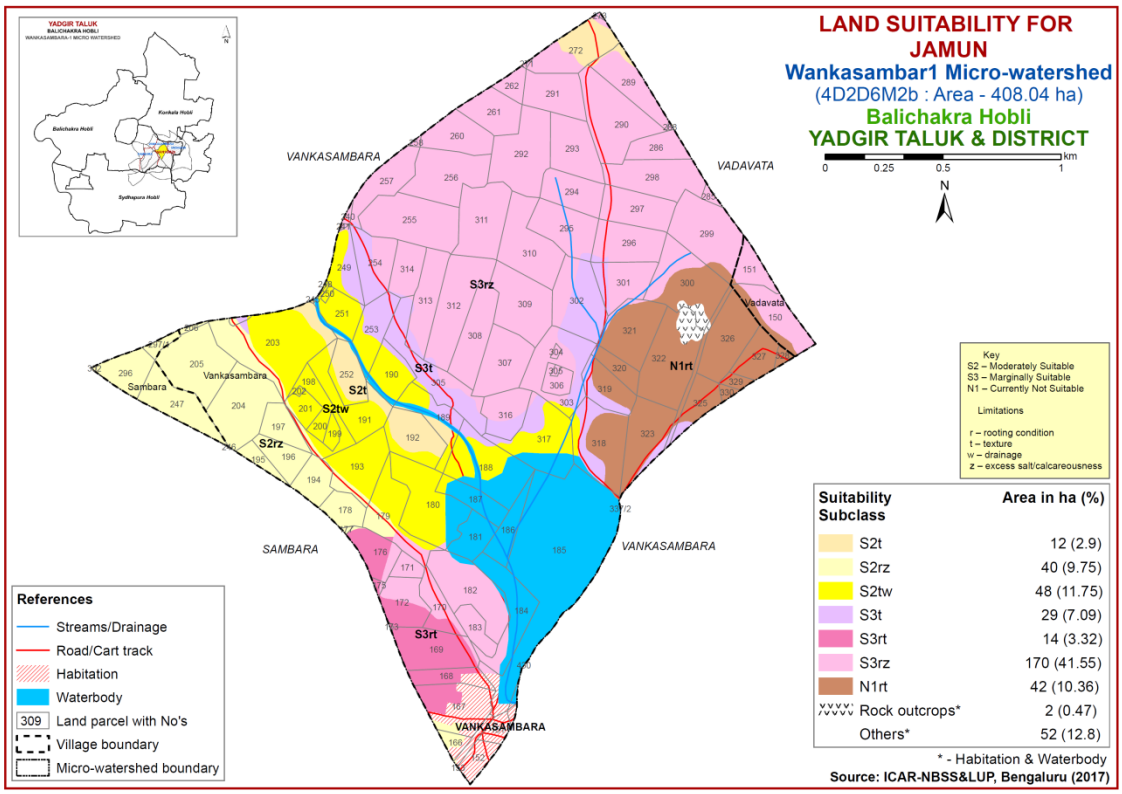


Fig 7.18 Land Suitability map of Jamun

There are no highly suitable (Class S1) lands for growing jamun in the microwatershed. An area of about 100 ha (24%) is moderately suitable (Class S2) and are distributed in the northern, central, southern and western part of the microwatershed. They have minor limitations of texture, rooting condition, calcareousness and drainage. An area of about 213 ha (52%) is marginally suitable (Class S3) and are distributed in the major part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness. Currently not suitable lands (Class N1) occur in an area of about 42 ha (10%) and are distributed in the eastern part of the microwatershed with severe limitations of rooting condition and texture.

7.19 Land Suitability for Musambi (*Citrus limetta*)

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

There are no highly (Class S1) suitable for growing musambi in Wankasambara-1 microwatershed. Maximum area of about 174 ha (43%) is moderately suitable (Class S2) and are distributed in the northern, northeastern, central, southern and western part of the microwatershed. They have minor limitations of calcareousness, rooting condition and drainage. An area of about 138 ha (34%) is marginally suitable (Class S3) and are

distributed in the southern, eastern, central and northwestern part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness. Currently not suitable (Class N1) lands occupy an area of about 42 ha (10%) and are distributed in the eastern part of the microwatershed with the severe limitation of rooting condition.

Table 7.20 Crop suitability criteria for Musambi

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

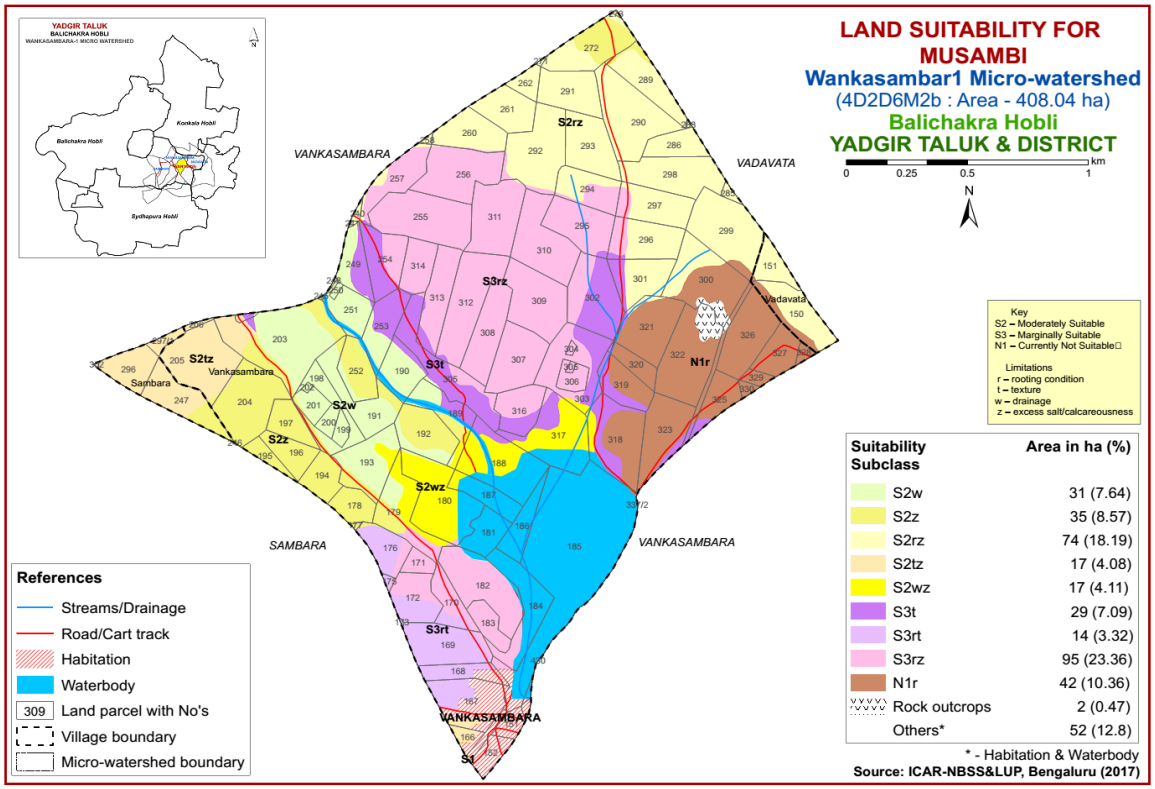


Fig 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in 11752 ha in almost all the districts of the State. The crop requirements for growing lime (Table 7.21) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.20.

Table 7.21 Crop suitability criteria for Lime

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

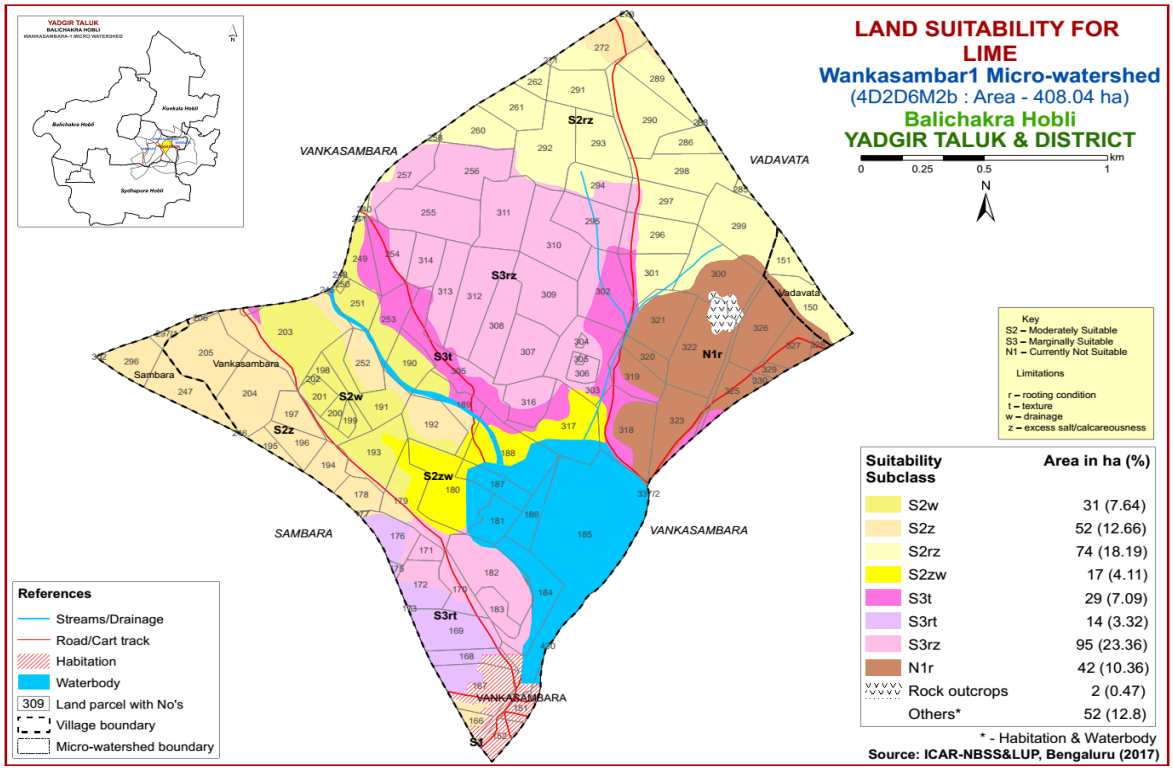


Fig 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important plantation nut crop grown in an area of about 70552 ha in almost all the districts. The crop requirements for growing Cashew (Table 7.22) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Cashew was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.21.

Table 7.22 Crop suitability criteria for Cashew

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

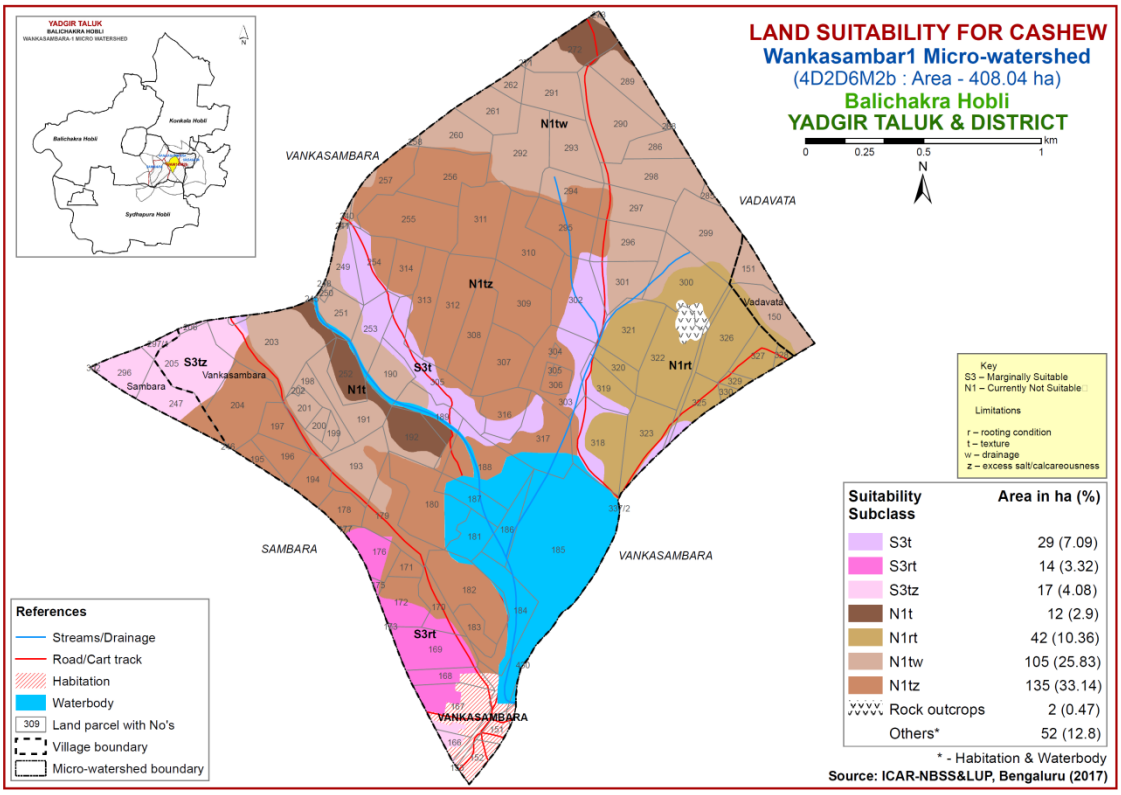


Fig 7.21 Land Suitability map of Cashew

There are no highly (Class S1) and moderately suitable (Class S2) for growing cashew in the microwatershed. Marginally suitable (Class S3) lands occur in an area of 60 ha (14%) and are distributed in the eastern, central, southern and western part of the

microwatershed. They have moderate limitations of rooting condition, texture and calcareousness. Currently not suitable (Class N1) lands for growing cashew occupy a maximum area of 294 ha (72%) and occur in all parts of the microwatershed. They have severe limitations of rooting condition, texture, drainage and calcareousness.

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

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

Table 7.23 Crop 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	

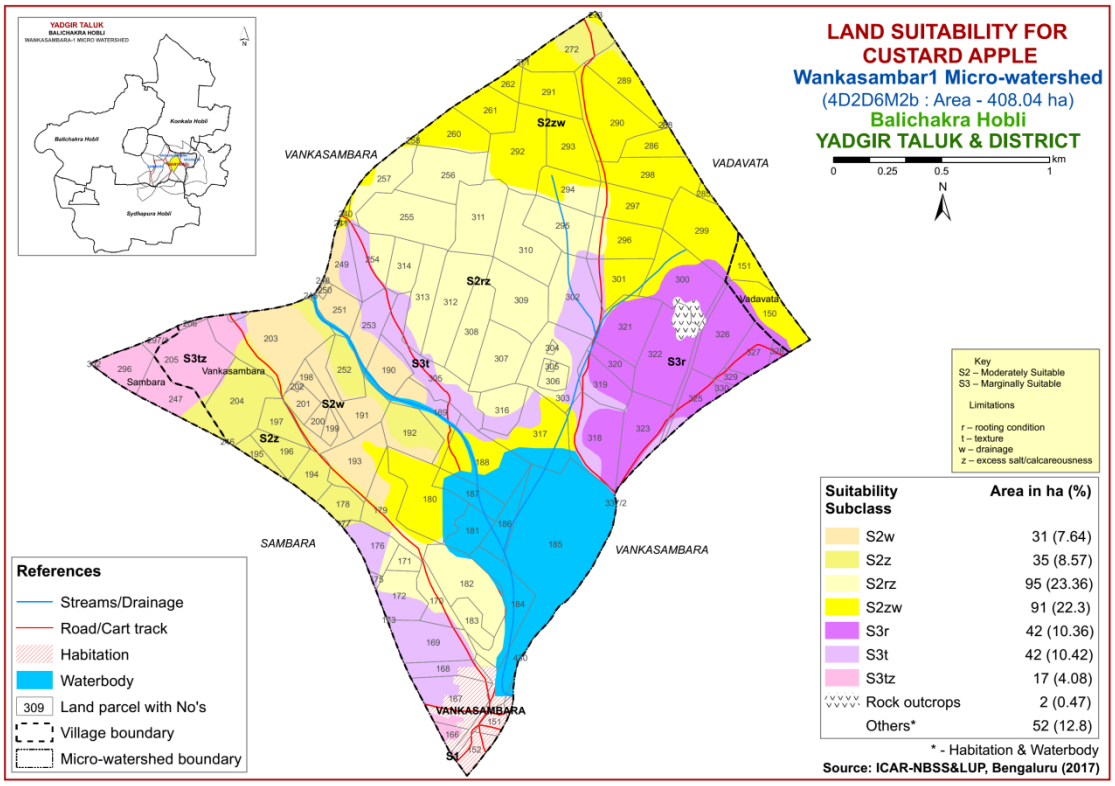


Fig 7.22 Land Suitability map of Custard Apple

There are no highly (Class S1) suitable lands for growing custard apple in the microwatershed. Maximum area of 252 ha (62%) is moderately suitable (Class S2) and are distributed in all parts of the microwatershed. They have minor limitations of drainage, calcareousness and rooting condition. Marginally suitable lands (Class S3) occupy an area of 101 ha (25%) and are distributed in the eastern, southern, central and western part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness.

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

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

In Wankasambara-1 microwatershed, there are no highly (Class S1) suitable for growing amla in the microwatershed. Moderately suitable (Class S2) lands occur in a maximum area of 252 ha (62%) and are distributed in the major part of the microwatershed. They have minor limitations of drainage, texture, calcareousness and rooting condition. An area of about 101 ha (25%) is marginally suitable (Class S3) for growing amla and are distributed in the eastern, southern, central and western part of the microwatershed. They have moderate limitations of rooting condition, texture and calcareousness.

Table 7.24 Crop suitability criteria for Amla

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

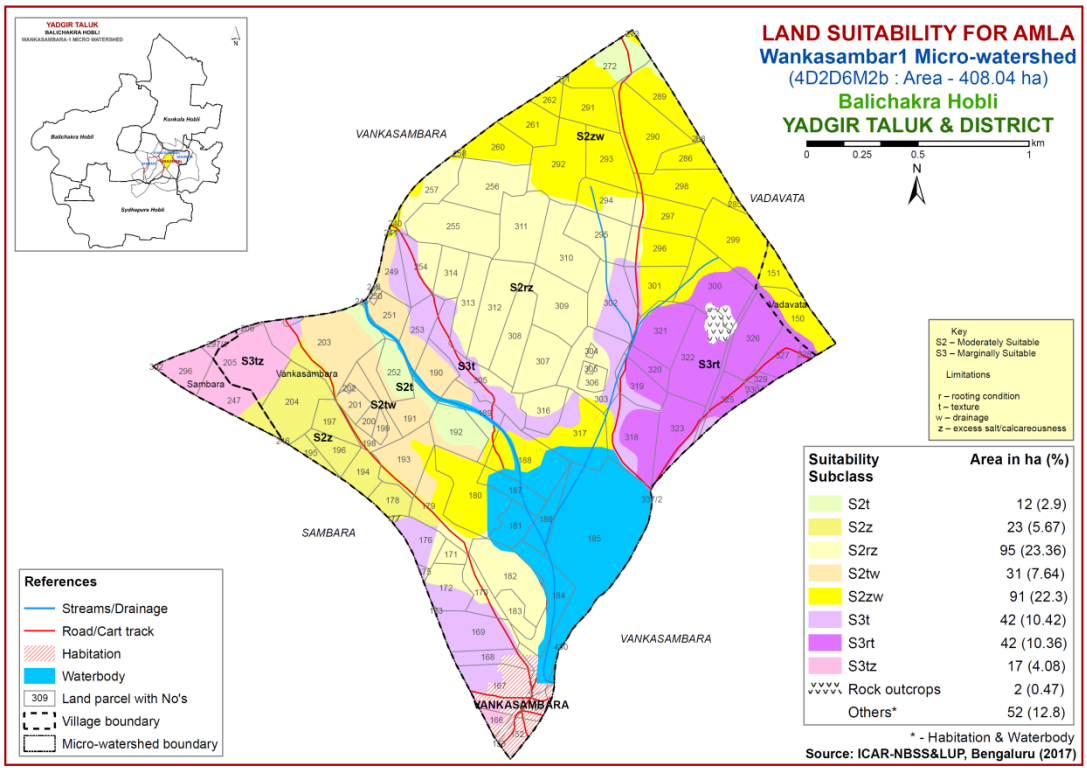


Fig 7.23 Land Suitability map of Amla

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

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

There are no highly suitable (Class S1) lands for growing tamarind in the microwatershed. Moderately suitable (Class S2) lands occur in a maximum area of 100 ha (24%) and are distributed in the northern, southern, central and western part of the microwatershed. They have minor limitations of texture, rooting condition, calcareousness and drainage. An area of 103 ha (25%) is marginally suitable (Class S3) and are distributed in the northern, eastern, central and western part of the microwatershed with moderate limitations of rooting condition, texture and calcareousness. Currently not suitable lands (Class N1) occupy an area of 151 ha (37%) and are distributed in the eastern, southern, central and northwestern part of the microwatershed. They have severe limitations of rooting condition, texture and calcareousness.

Table 7.25 Crop suitability criteria for Tamarind

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

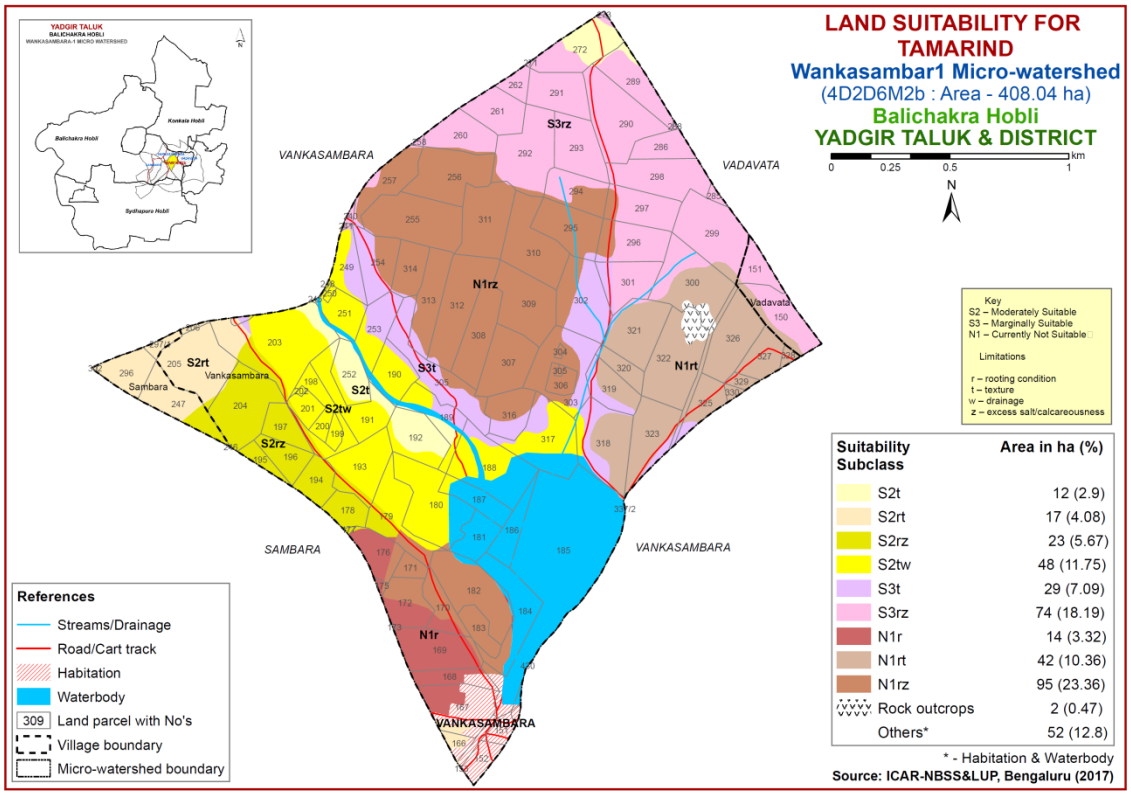


Fig 7.24 Land Suitability map of Tamarind

7.25 Land suitability for Marigold (*Tagetes 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 for growing marigold (Table 7.26) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

There are no highly (Class S1) suitable lands for growing marigold in the microwatershed. Maximum area of 269 ha (66%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of drainage, texture, calcareousness and rooting condition. Marginally suitable lands (Class

S3) occupy an area of 84 ha (21%) and are distributed in the eastern, central, southern and western part of the microwatershed. They have moderate limitations of rooting condition and 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	-

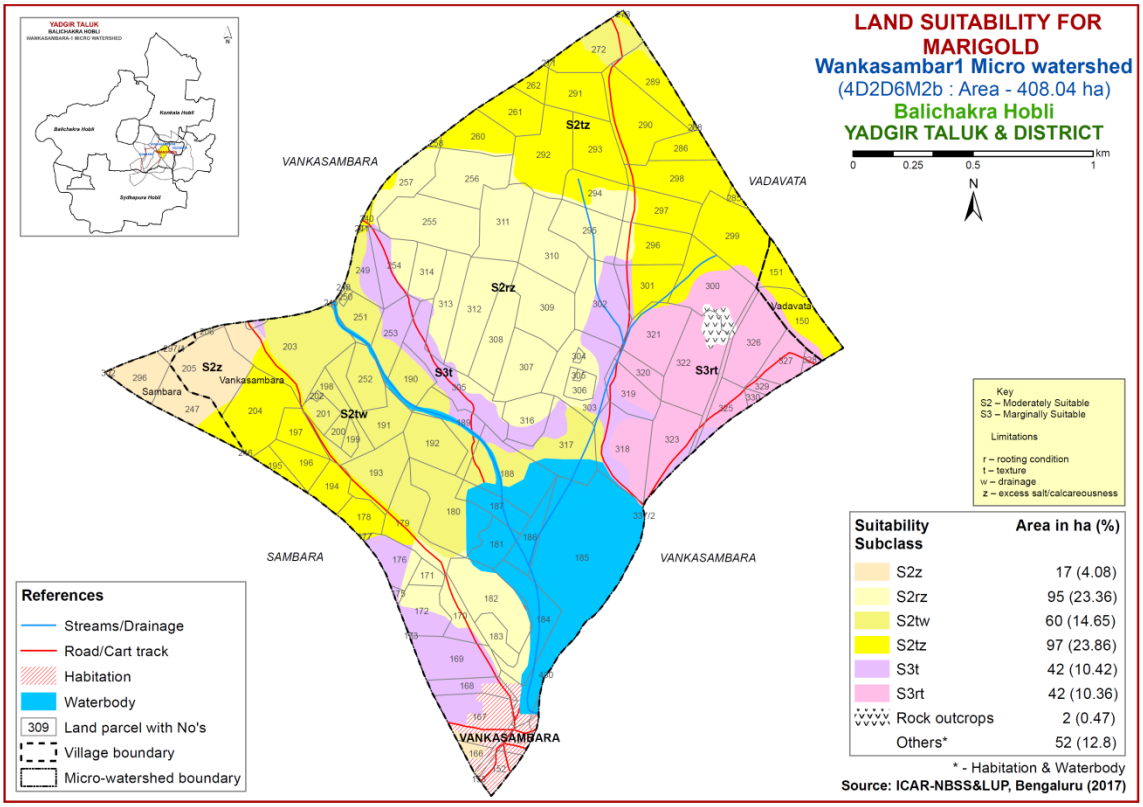


Fig. 7.25 Land Suitability map of Marigold

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 for growing chrysanthemum (Table 7.27) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing chrysanthemum was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is 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	^{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	

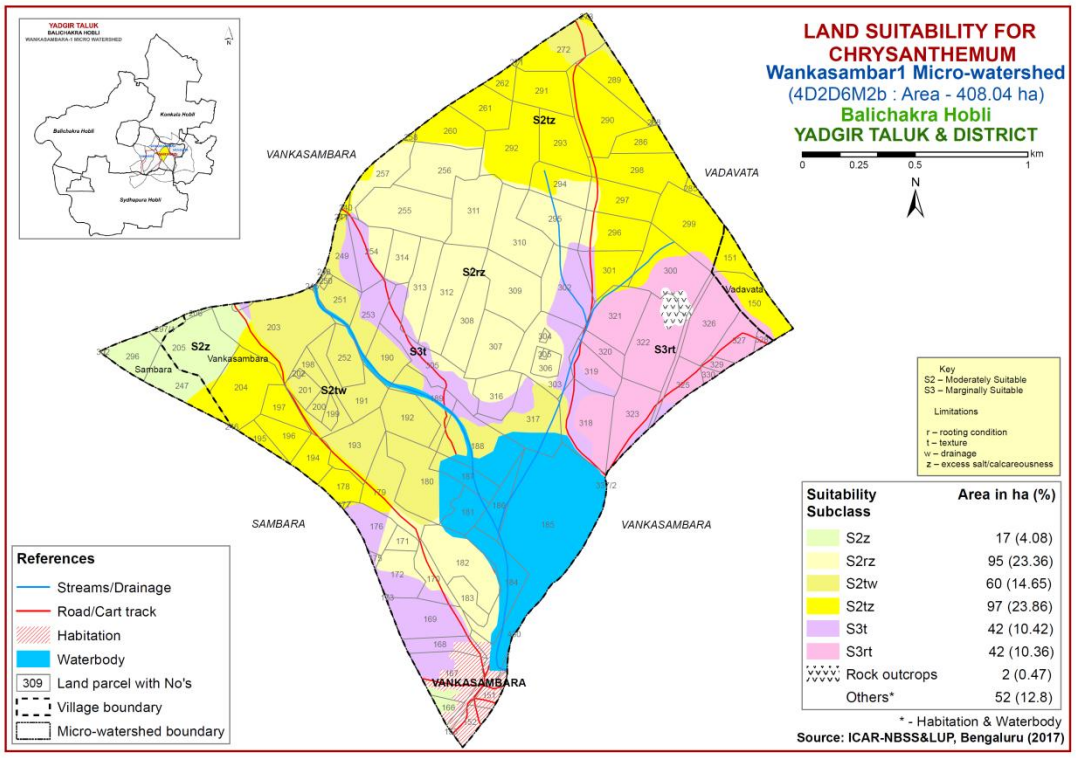


Fig. 7.26 Land Suitability map of Chrysanthemum

There are no highly (Class S1) suitable lands for growing chrysanthemum in the microwatershed. Maximum area of about 269 ha (66%) is moderately suitable (Class S2) and are distributed in the major part of the microwatershed. They have minor limitations of drainage, texture, calcareousness and rooting condition. Marginally suitable lands (Class S3) occur in an area of 84 ha (21%) and are distributed in the eastern, central, southern and western part of the microwatershed. They have moderate limitations of rooting condition and texture.

7.27 Land Management Units (LMUs)

The 11 soil map units identified in Wankasambara-1 microwatershed have been grouped into eight 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. 7.27) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

The 11 soil map units that have been grouped into eight Land Management Units along with brief description of soil and site characteristics are given below.

LUC NO.	Soil Map Unit number	Soil Map Units	Soil and site characteristics
1	101, 104	NHLmB1, TMKiB2	Deep to very deep, lowland black clay soils
2	50, 59, 34	BGDbB2, MDRcB2, GWDcB2	Moderately deep to very deep, black clay soils
3	47	NGPbB2	Deep black loamy sand to sandy loam soils
4	44	GDGbB2	Deep, red clay soils
5	42	YDRcB2	Deep black loamy sand to sandy loam soils
6	16	HLGcB2	Moderately shallow, black sandy clay loam to sandy clay soils
7	11	SBRcB2	Moderately shallow, black loamy sand to sandy soils
8	2	BDLbB2	Shallow, black clay soils

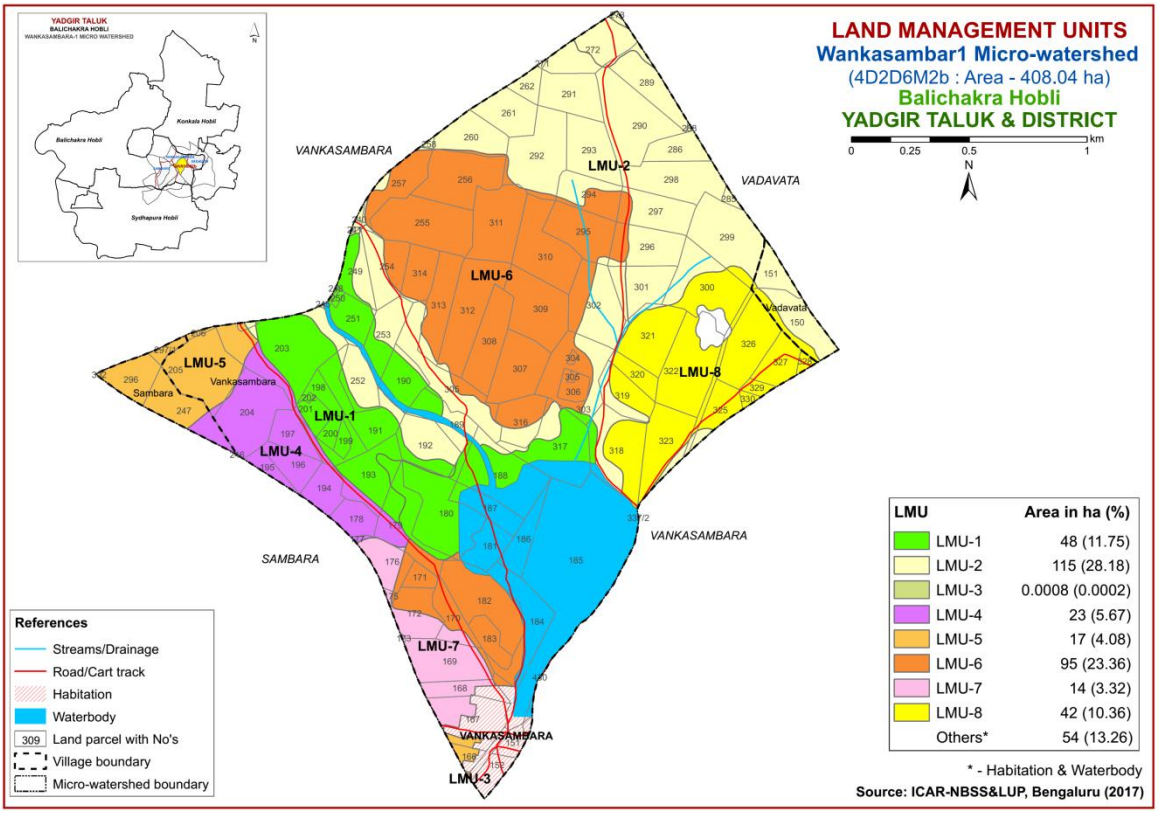


Fig. 7.27 Land Management Units (LMUs) map of Wankasambara-1 microwatershed

7.28 Proposed Crop Plan for Wankasambara-1 Microwatershed

After assessing the land suitability for the 26 crops, a proposed crop plan has been prepared for the 8 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 in Table 7.28.

Table 7.28 Proposed Crop Plan for Wankasambara-1 Micro watershed

Proposed LMU	Soil Map Units	Survey Number	Soil characters	Field Crops	Horticulture Crops	Suitable Interventions
1	101.NHLmB1 104.TMKiB2	**Vankasambara :** 179,180,189,190,191,193,198, 199, 200,201,202,203,248,250, 251,317	Deep to very deep, lowland black clay soils	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	50.BGDbB2 59.MDRcB2 34.GWDcB2	**Vadavata:** 150,151 **Vankasambara:** 192,240,241,245,249,252,253, 254,258 ,260,261,262,271,272, 273,285,286,287 ,288,289,290, 291,292,293,294,296, 297, 298, 299,301,302,305	Moderately deep to very deep, black clay soils	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	47.NGPbB2	**Vankasambara:** 152,166	Deep black loamy sand to sandy loam soils	Bajra	**Fruit crops:** Amla, Jamun, Custard apple, Tamarind **Vegetables:** Drumstick	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
4	44.GDGbB2	**Sambara:** 246 **Vankasambara:** 177,178,194,195,196,197,204	Deep, red clay soils	Maize, Sorghum, Groundnut, Redgram, Bajra	**Fruit crops:** Sapota, Guava, Jackfruit, Musambi, Pomegranate, Lime, Amla, Custard apple ,	Drip irrigation, mulching, suitable conservation practices (Crescent Bunding with Catch Pit etc)

					Tamarind, Jamun **Vegetables:** Tomato, Drumstick, Chilli, **Flowers:** Marigold, Chrysanthemum	
5	42.YDRcB2	**Sambara:** 247,296, 297/1,302 **Vankasambara:** 166,205,206	Deep black loamy sand to sandy loam soils	Bajra	**Fruit crops:** Amla, Jamun, Custard apple, Tamarind **Vegetables:** Drumstick	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
6	16.HLGcB2	**Vankasambara:** 170,171,182, 183,255,256, 257, 295,303, 304,306,307, 308,309, 310, 311,312,313, 314,316	Moderately shallow, black sandy clay loam to sandy clay soils	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
7	11.SBRcB2	**Vankasambara:** 168,169,172,173,175,176	Moderately shallow, black loamy sand to sandy soils	Groundnut	**Vegetables:** Onion **Agri-Silvi-Pasture:** Custard apple, Amla**,** Hybrid Napier, *Styloxanthes hamata,* Glyricidia, *Styloxanthes scabra*	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
8	2.BDLbB2	**Vankasambara:** 300,318,319,320,321,322,323, 325,326, 327,328,329,330	Shallow, black clay soils	Bengal gram, Horse gram, Linseed, Safflower, Coriander	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata,* Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope, drip irrigation and mulching is recommended.

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

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

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

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

The most important characteristics of a healthy soil are

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

Characteristics of Wankasambara-1 Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series Halagera (HLD) 95 ha (23%), Gowdagera (GWD) 74 ha (18%), Badiyala (BDL) 42 ha (10%), Neelahalli (NHL) 31 ha (8%), Belagundi (BGD) 29 ha (7%), Gondedagi (GDG) 23 ha (6%), Yadgir (YDR) 23 ha (4%), Thumakur (TMK) 17 ha (4%), Sambara (SBR) 14 ha (3%), Madhwara (MDR) 12 ha (3%) and other series covering minor area in the microwatershed.

- As per land capability classification, entire area comes under arable land category (Class II and III). The major limitations identified in the arable lands were soil, wetness and erosion.
- On the basis of soil reaction, about 51 ha (12%) is neutral (pH 6.5-7.3). Maximum area of 156 ha (38%) is slightly alkaline (pH 7.3-7.8). An area of about 104 ha (25%) is moderately alkaline (pH 7.8-8.4) in reaction. An area of about 44 ha (11%) is strongly alkaline (pH 8.4-9.0) in reaction in the microwatershed. Major area in the microwatershed is alkaline in reaction.

Soil Health Management

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

Alkaline soils

(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. Out of total 408 ha area in the microwatershed, an area of about 31 ha (8%) is suffering from slight and 323 ha (79%) is suffering from moderate erosion. The areas with moderate erosion need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

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

1. Soil and Water Conservation Treatment 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 may be adopted.
- **Gravelliness:** More gravel content is favourable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these

units. In general, erosion and soil are the major constraints in Wankasambara-1 microwatershed.

- **Organic Carbon:** The OC content (an index of available Nitrogen) is low (<0.5%) in an area of 49 ha (12%), 50 ha (12%) is medium (0.5-0.75%) and about 256 ha (63%) area high (>0.75%). In the areas of low and medium OC, it needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops cost 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 99 ha area where OC is less than 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**: In 116 ha (28%) area, the available phosphorus is low and about 227 ha (56%) is medium. Hence for all the crops, 25% additional P-needs to be applied, where it is low or medium in available phosphorus. Available phosphorus is high in 11 ha (3%) area in the microwatershed**.**
- **Available Potassium:** Available potassium is low in 0.11 ha (<1%), medium in 197 ha (73%) and high in 57 ha (14%) area of the microwatershed. In the medium plots, for all crops, additional 25 % potassium may be applied.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. It is low in 292 ha (72%) area of the microwatershed and medium in 61 ha (15%). These 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 sulphur is high in 1 ha (<1%) area in the microwatershed**.**
- **Available Boron:** It is low in 35 ha (9%) area of the microwatershed and medium in 309 ha (76%). The areas that are low and medium need to be applied with sodium borate @ 10 kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency. High in area of about 10 ha (3%) in the microwatershed.
- **Available Iron:** Entire area is sufficient in available iron.
- **Available Manganese and Copper:** Entire area is sufficient in available manganese and copper**.**
- **Available Zinc:** Entire area is deficient in available zinc. Application of zinc sulphate @25kg/ha is to be followed.

Soil Alkalinity: The entire microwatershed has soils that are alkaline in reaction. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and, provision of subsurface drainage

and growing of salt tolerant crops like Casuarina, Acacia, Neem, Ber etc., are recommended.

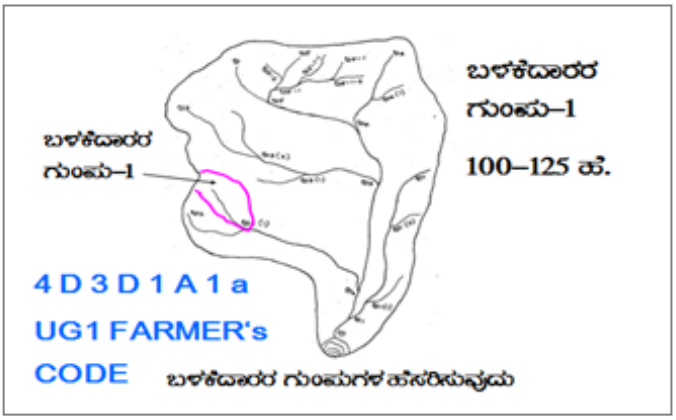
Land Suitability for various crops: Areas that are highly, moderately, marginally suitable and not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting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

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

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

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



Apart from these, Hand Level/ Hydro Marker/ Dumpy Level/ Total Station and *Kathedars'* List needs 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.

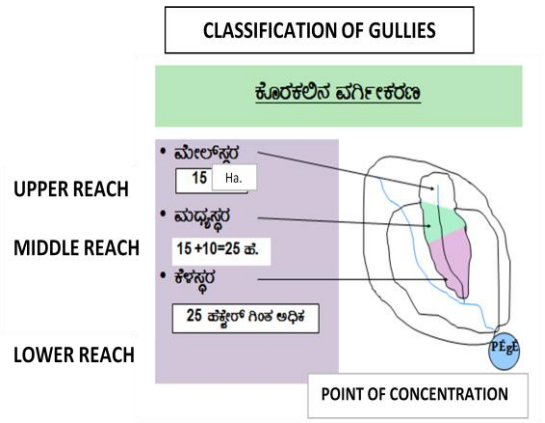
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below

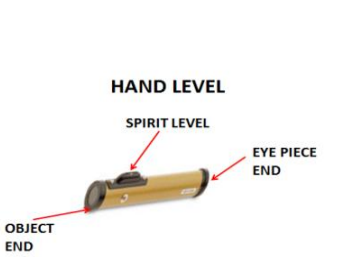
9.1.1 Arable Land Treatment

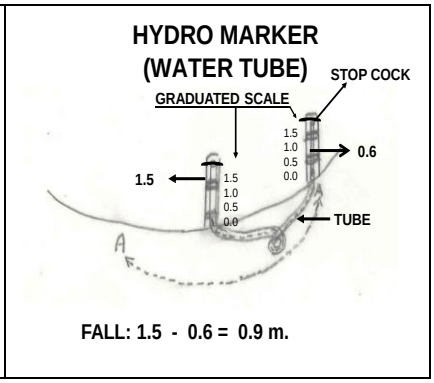
A. BUNDING

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.

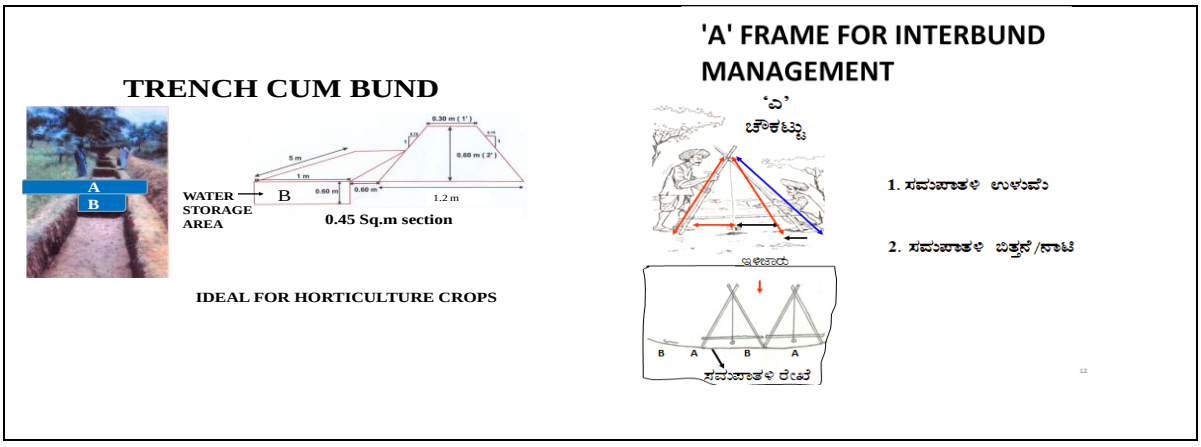
Recommended Bund Section

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 soil	
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

- Existing waterways are marked on the cadastral map (1:7920 scale) and their dimensions are recorded.
- Considering the contour plan of the MWS, additional waterways/ modernization of the existing ones can be thought of.
- 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 Bunds.

9.1.3 Treatment of Natural Water Course/ Drainage Lines

a) The cadastral map has to be updated as regards the network of drainage lines (gullies/ *nalas/hallas*) and existing structures are marked to the scale and storage capacity of the existing water bodies are documented.
b) The drainage line will be demarcated into Upper Reach, Middle Reach and Lower Reach.

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

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

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

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

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

h) Silt load to the Storage/Recharge Structures is reduced by providing vegetative, boulder and 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 the kind of conservation structures recommended has been prepared, which shows the spatial distribution and extent of area. An area of about 23 ha (6%) requires Trench cum Bunding and 331 ha (81%) requires Graded Bunding. The conservation plan prepared may be presented to all the stakeholders including farmers and after including their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

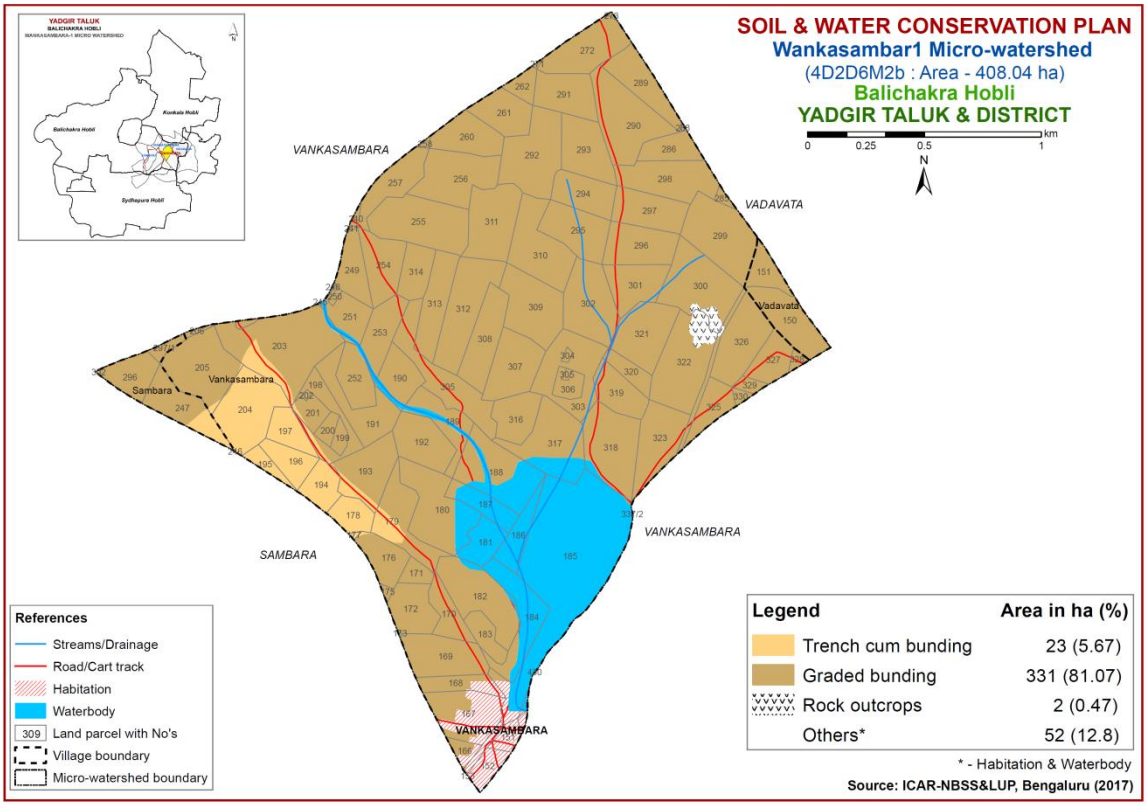


Fig. 9.1 Soil and Water Conservation Plan map of Wankasambara-1 Microwatershed

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

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

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Appendix I

Wankasambar-1 Microwatershed

Soil Phase Information

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Sambara	246	0	LMU-4	GDGbB2	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	Trench cum bunding
Sambara	247	4.47	LMU-5	YDRcB2	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	3.03	LMU-5	YDRcB2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Sambara	297/1	0.67	LMU-5	YDRcB2	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	302	0.03	LMU-5	YDRcB2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vadavata	150	4.67	LMU-2	GWDcB2	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
Vadavata	151	2.05	LMU-2	GWDcB2	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
Vankasambara	151	1.11	Others	Habitation	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Vankasambara	152	1.65	Others	Habitation	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Vankasambara	153	0	Others	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Vankasambara	166	0.91	LMU-5	YDRcB2	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
Vankasambara	167	5.39	Others	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Vankasambara	168	2.25	LMU-7	SBRcB2	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	169	5.22	LMU-7	SBRcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar+Redgram (Ct+Jw+Rg)	Not Available	IIes	Graded bunding
Vankasambara	170	2.57	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	1 Bore well	IIes	Graded bunding
Vankasambara	171	1.08	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy (Pd)	Not Available	IIes	Graded bunding
Vankasambara	172	3.58	LMU-7	SBRcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Sugarcane (Rg+Sc)	Not Available	IIes	Graded bunding
Vankasambara	173	0.04	LMU-7	SBRcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding
Vankasambara	175	0.22	LMU-7	SBRcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	176	2.95	LMU-7	SBRcB2	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	177	0.09	LMU-4	GDGbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Vankasambara	178	2.13	LMU-4	GDGbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Trench cum bunding

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Vankasambara	179	5.26	LMU-1	TMKiB2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Paddy+Redgram (Ct+Pd+Rg)	Not Available	IIws	Graded bunding
Vankasambara	180	7.42	LMU-1	TMKiB2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Jowar+Redgram (Ct+Jw+Rg)	Not Available	IIws	Graded bunding
Vankasambara	181	2.48	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Vankasambara	182	6.61	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	183	1.9	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	184	5.17	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Vankasambara	185	24.33	Others	Waterbody	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others
Vankasambara	186	2.45	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Vankasambara	187	2.54	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Vankasambara	188	7.22	Others	Waterbody	Others	Others	Others	Others	Others	Others	Scrub land (Sl)	Not Available	Others	Others
Vankasambara	189	3.61	LMU-1	NHLmB1	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	190	3.21	LMU-1	NHLmB1	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	191	4.64	LMU-1	NHLmB1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIws	Graded bunding
Vankasambara	192	4.41	LMU-2	MDRcB2	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	193	5.11	LMU-1	NHLmB1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIws	Graded bunding
Vankasambara	194	2.43	LMU-4	GDGbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Vankasambara	195	1.11	LMU-4	GDGbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Vankasambara	196	2.43	LMU-4	GDGbB2	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	Trench cum bunding
Vankasambara	197	2.38	LMU-4	GDGbB2	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	Trench cum bunding
Vankasambara	198	2.94	LMU-1	NHLmB1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIws	Graded bunding
Vankasambara	199	0.71	LMU-1	NHLmB1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIws	Graded bunding
Vankasambara	200	0.8	LMU-1	NHLmB1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	1 Bore well	IIws	Graded bunding
Vankasambara	201	1.46	LMU-1	NHLmB1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIws	Graded bunding
Vankasambara	202	0.11	LMU-1	NHLmB1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIws	Graded bunding

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Vankasambara	203	11.38	LMU-1	NHLmB1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Paddy (Pd)	Not Available	IIws	Graded bunding
Vankasambara	204	6.7	LMU-4	GDGbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Paddy+Redgram (Gn+Pd+Rg)	Not Available	IIes	Trench cum bunding
Vankasambara	205	6.78	LMU-5	YDRcB2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Paddy+Redgram (Ct+Pd+Rg)	Not Available	IIes	Graded bunding
Vankasambara	206	0.22	LMU-5	YDRcB2	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	240	0.21	LMU-2	GWDcB2	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	0.06	LMU-2	GWDcB2	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	245	0.05	LMU-2	MDRcB2	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	248	0.04	LMU-1	NHLmB1	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	2.91	LMU-2	BGDbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	250	0.18	LMU-1	NHLmB1	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	251	2.82	LMU-1	NHLmB1	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	252	3.13	LMU-2	MDRcB2	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	253	3.6	LMU-2	BGDbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	254	4.12	LMU-2	BGDbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Vankasambara	255	7.57	LMU-6	HLGcB2	Moderately shallow (50-75 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	256	6.24	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Vankasambara	257	3.75	LMU-6	HLGcB2	Moderately shallow (50-75 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	258	0.14	LMU-2	GWDcB2	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	260	3.88	LMU-2	GWDcB2	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	3.54	LMU-2	GWDcB2	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	1.24	LMU-2	GWDcB2	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	271	0.07	LMU-2	GWDcB2	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	272	5.19	LMU-2	MDRcB2	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	0.05	LMU-2	GWDcB2	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)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Vankasambara	285	0.33	LMU-2	GWDcB2	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	2.45	LMU-2	GWDcB2	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	287	0	LMU-2	GWDcB2	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	288	0.06	LMU-2	GWDcB2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIes	Graded bunding
Vankasambara	289	4.03	LMU-2	GWDcB2	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Scrub land (Rg+Sl)	Not Available	IIes	Graded bunding
Vankasambara	290	7.47	LMU-2	GWDcB2	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	291	4.18	LMU-2	GWDcB2	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	292	7.1	LMU-2	GWDcB2	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	293	4.77	LMU-2	GWDcB2	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	294	3.68	LMU-2	GWDcB2	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	295	4.77	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	1 Bore well	IIes	Graded bunding
Vankasambara	296	4.62	LMU-2	GWDcB2	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	297	4.31	LMU-2	GWDcB2	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	298	5.73	LMU-2	GWDcB2	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	299	7.15	LMU-2	GWDcB2	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	300	7.32	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	301	4	LMU-2	GWDcB2	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
Vankasambara	302	6.21	LMU-2	BGDbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Scrub land (Rg+Sl)	Not Available	IIes	Graded bunding
Vankasambara	303	5.77	LMU-6	HLGcB2	Moderately shallow (50-75 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	304	0.16	LMU-6	HLGcB2	Moderately shallow (50-75 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	305	6.34	LMU-2	BGDbB2	Deep (100-150 cm)	Loamy sand	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IIes	Graded bunding
Vankasambara	306	1.25	LMU-6	HLGcB2	Moderately shallow (50-75 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	307	5.05	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Paddy+Vegetables (Pd+V)	Not Available	IIes	Graded bunding
Vankasambara	308	4.82	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding

Village	Survey No	Area (ha)	LMU	Soil Phase	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Vankasambara	309	6.21	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Vankasambara	310	6.32	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding
Vankasambara	311	6	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Graded bunding
Vankasambara	312	6.98	LMU-6	HLGcB2	Moderately shallow (50-75 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	313	4.41	LMU-6	HLGcB2	Moderately shallow (50-75 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	314	2.73	LMU-6	HLGcB2	Moderately shallow (50-75 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	316	3.32	LMU-6	HLGcB2	Moderately shallow (50-75 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Vegetables (V)	Not Available	IIes	Graded bunding
Vankasambara	317	6.9	LMU-1	TMKiB2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IIws	Graded bunding
Vankasambara	318	6.96	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	1 Bore well	IIIes	Graded bunding
Vankasambara	319	3.27	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	320	1.62	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	321	5.44	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	322	7.81	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIIes	Graded bunding
Vankasambara	323	5.24	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIIes	Graded bunding
Vankasambara	325	2.58	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	326	5.43	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	327	2.72	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	328	0.41	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIIes	Graded bunding
Vankasambara	329	0.62	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	330	0.36	LMU-8	BDLbB2	Shallow (25-50 cm)	Loamy sand	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Graded bunding
Vankasambara	337/2	0	Others	Waterbody	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Vankasambara	430	0	Others	Waterbody	Others	Others	Others	Others	Others	Others	Waterbody	Not Available	Others	Others

Appendix II

Wankasambar-1Microwatershed

Soil Fertility Information

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Sambara	246	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	247	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	High (> 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	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	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)
Vadavata	150	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)
Vadavata	151	Slightly alkaline (pH 7.3 – 7.8)	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	151	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	152	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	153	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	166	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	Medium (145 - 337 kg/ha)	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	167	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	168	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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	169	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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	170	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 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)
Vankasambara	171	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	172	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	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)
Vankasambara	173	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	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	175	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	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	176	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	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	177	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)
Vankasambara	178	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)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Vankasambara	179	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	180	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	181	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	182	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 - 57 kg/ha)	High (> 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)
Vankasambara	183	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	184	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	185	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	186	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	187	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	188	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	189	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	190	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	191	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)
Vankasambara	192	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	193	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	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	194	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)
Vankasambara	195	Slightly alkaline (pH 7.3 – 7.8)	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	196	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	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	197	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)
Vankasambara	198	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)
Vankasambara	199	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)
Vankasambara	200	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)
Vankasambara	201	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)
Vankasambara	202	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Vankasambara	203	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	204	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Medium (10 - 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	205	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)
Vankasambara	206	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)
Vankasambara	240	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)	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 %)	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	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	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	250	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	251	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	252	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)
Vankasambara	253	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	254	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	255	Slightly alkaline (pH 7.3 – 7.8)	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	256	Slightly alkaline (pH 7.3 – 7.8)	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	257	Slightly alkaline (pH 7.3 – 7.8)	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	258	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)
Vankasambara	260	Slightly alkaline (pH 7.3 – 7.8)	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	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	Medium (145 - 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	262	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)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	271	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)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	272	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)	Low (< 0.5 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)	High (> 20 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Vankasambara	285	Slightly alkaline (pH 7.3 – 7.8)	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	286	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	287	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	288	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	289	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>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)
Vankasambara	290	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (>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)
Vankasambara	291	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)	Low (< 0.5 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	292	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	293	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	294	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	295	Slightly alkaline (pH 7.3 – 7.8)	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	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)	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	297	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	298	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	299	Slightly alkaline (pH 7.3 – 7.8)	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	300	Slightly alkaline (pH 7.3 – 7.8)	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	301	Slightly alkaline (pH 7.3 – 7.8)	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	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)	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	303	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	304	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	305	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	306	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	307	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	308	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Vankasambara	309	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	310	Slightly alkaline (pH 7.3 – 7.8)	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	311	Slightly alkaline (pH 7.3 – 7.8)	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	312	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	313	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	314	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	316	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (>0.75 %)	Medium (23 - 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	317	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 - 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	318	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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	319	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	320	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	321	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	322	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)	Medium (0.5 - 1.0 ppm)	Sufficient (> 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2ppm)	Deficient (< 0.6 ppm)
Vankasambara	323	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	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	325	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	326	Slightly alkaline (pH 7.3 – 7.8)	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	327	Neutral (pH 6.5 – 7.3)	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	328	Neutral (pH 6.5 – 7.3)	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	329	Neutral (pH 6.5 – 7.3)	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	330	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	337/2	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	430	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

Appendix III

Wankasambar-1Microwatershed

Soil Suitability Information

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Drumstick	Mulberry
Sambara	246	S2rz	S2z	S2z	S2z	S2tz	S2z	S2rz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	N1tz	S2rz	S2z	S2tz	S2tz	S2z	S2tz	S2tz	S2z	S2z	S2z	S2z
Sambara	247	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
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
Vadavata	150	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
Vadavata	151	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	151	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	152	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	153	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	166	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	167	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	168	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	169	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	170	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	171	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	172	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	173	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	175	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	176	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	177	S2rz	S2z	S2z	S2z	S2tz	S2z	S2rz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	N1tz	S2rz	S2z	S2tz	S2tz	S2z	S2tz	S2tz	S2z	S2z	S2z	S2z
Vankasambara	178	S2rz	S2z	S2z	S2z	S2tz	S2z	S2rz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	N1tz	S2rz	S2z	S2tz	S2tz	S2z	S2tz	S2tz	S2z	S2z	S2z	S2z
Vankasambara	179	S3tw	S3tw	S3tw	S2wz	S3tw	S2wz	S2tw	S2zw	S2wz	S2rw	S2tw	S2zw	S3tw	S2zw	N1tz	S2tw	S2wz	S3tw	S2tw	S3tw	S2tw	S2tw	S2tw	S2tw	S2tw	S3tw

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Drumstick	Mulberry
Vankasambara	180	S3tw	S3tw	S3tw	S2wz	S3tw	S2wz	S2tw	S2zw	S2wz	S2rw	S2tw	S2zw	S3tw	S2zw	N1tz	S2tw	S2wz	S3tw	S2tw	S3tw	S2tw	S2tw	S2tw	S2tw	S2tw	S3tw
Vankasambara	181	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	182	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	183	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	184	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	185	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	186	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	187	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	188	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	189	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	190	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	191	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	192	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	193	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	194	S2rz	S2z	S2z	S2z	S2tz	S2z	S2rz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	N1tz	S2rz	S2z	S2tz	S2tz	S2z	S2tz	S2tz	S2z	S2z	S2z	S2z
Vankasambara	195	S2rz	S2z	S2z	S2z	S2tz	S2z	S2rz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	N1tz	S2rz	S2z	S2tz	S2tz	S2z	S2tz	S2tz	S2z	S2z	S2z	S2z
Vankasambara	196	S2rz	S2z	S2z	S2z	S2tz	S2z	S2rz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	N1tz	S2rz	S2z	S2tz	S2tz	S2z	S2tz	S2tz	S2z	S2z	S2z	S2z
Vankasambara	197	S2rz	S2z	S2z	S2z	S2tz	S2z	S2rz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	N1tz	S2rz	S2z	S2tz	S2tz	S2z	S2tz	S2tz	S2z	S2z	S2z	S2z
Vankasambara	198	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	199	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	200	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	201	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

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Drumstick	Mulberry
Vankasambara	202	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	203	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	204	S2rz	S2z	S2z	S2z	S2tz	S2z	S2rz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	N1tz	S2rz	S2z	S2tz	S2tz	S2z	S2tz	S2tz	S2z	S2z	S2z	S2z
Vankasambara	205	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	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	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	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	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	248	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	249	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	250	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	251	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	252	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	253	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	254	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	255	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	256	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	257	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	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	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

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Drumstick	Mulberry
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
Vankasambara	285	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	286	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	287	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	288	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	289	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	290	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	291	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	292	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	293	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	294	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	295	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	296	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	297	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	298	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	299	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	300	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	301	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	302	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	303	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

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Drumstick	Mulberry
Vankasambara	304	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	305	S3t	S3t	S3t	S3t	S3t	N1t	S3t	S3t	N1t	N1t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S3t	S2t	S3t	S3t
Vankasambara	306	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	307	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	308	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	309	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	310	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	311	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	312	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	313	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	314	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	316	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	317	S3tw	S3tw	S3tw	S2wz	S3tw	S2wz	S2tw	S2zw	S2wz	S2rw	S2tw	S2zw	S3tw	S2zw	N1tz	S2tw	S2wz	S3tw	S2tw	S3tw	S2tw	S2tw	S2tw	S2tw	S2tw	S3tw
Vankasambara	318	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	319	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	320	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	321	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	322	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	323	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	325	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	326	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	327	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Drumstick	Mulberry
Vankasambara	328	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	329	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	330	N1r	S3rt	N1r	S3r	N1rt	S3r	N1rt	N1r	S3r	N1r	S3rt	S3rt	N1rt	S3r	N1rt	N1rt	N1r	S3rt	S3rt	S3rt	S3rt	S3rt	N1r	S3rt	N1rt	N1rt
Vankasambara	337/2	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Vankasambara	430	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

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-1 is located at North latitude 16^0 38' 15.368" and 16^0 36' 24.117" and East longitude 77^0 23' 18.585" and 77^0 21' 27.725" covering an area of about 407.81 ha coming under Vankasambara, Sambara and VadavataVillages of Yadagiri taluk.*
- *Socio-economic analysis of Wankasambar-1 micro watersheds of Turk Madhawar sub-watershed, Yadgiri taluk & District indicated that, out of the total sample of 34 farmers were sampled in Wankasambar-1 micro-watershed among households surveyed 5 (14.71%) were marginal, 19 (55.88%) were small, 3 (8.82 %) were semi medium and 1 (2.94 %) were medium farmers. 6 landless farmers were also interviewed for the survey.*
- *The population characteristics of households indicated that, there were 78 (54.55%) men and 65 (45.45 %) were women.*
- *Majority of the respondents (37.06%) were in the age group of 16-35 years.*
- *Education level of the sample households indicated that, there were 44.76 per cent illiterates, 53.86 per cent pre university education and 4.20 per cent attained graduation.*
- *About, 79.41 per cent of household heads practicing agriculture and 8.82 per cent of the household heads were engaged as agricultural labourers.*
- *Agriculture was the major occupation for 57.34 per cent of the household members.*
- *In the study area, 17.65 percent possess thatched house and 82.35 per cent of the households possess katcha house.*
- *The durable assets owned by the households showed that, 61.76 per cent possess TV, 38.24 per cent possess mixer grinder, 97.06 per cent possess mobile phones and 20.59 per cent possess motor cycles.*
- *Farm implements owned by the households indicated that, 17.65 per cent of the households possess Bullock Cart, 35.29 per cent possess plough, 2.94 per cent possess Sprayer, 76.47 per cent possess Weeder, 8.82 per cent possess Chaff Cutter and 2.94 per cent possess JCB/Hitachi.*
- *Regarding livestock possession by the households, 14.71 per cent possess local cow and 8.82 per cent possess buffalo.*
- *The average labour availability in the study area showed that, own labour men available in the micro watershed was 1.38, women available in the micro watershed was 1.22, hired labour (men) available was 7.41 and hired labour (women) available was 12.41.*
- *Further, 85.29 per cent of the household opined that hired labour was adequate.*

- *In the study area, about 2.80 per cent of the respondents migrated from the micro watershed in search of jobs with an average distance of 495.00 kms for about 3.75 months.*
- *Out of the total land holding of the sample respondents 92.88 per cent (39.84 ha) of the area is under dry condition and the remaining 7.12 per cent area is irrigated land.*
- *Bore well was the major source of irrigation for 2.94 per cent of the households.*
- *The major crops grown by sample farmers are Red gram, Cotton, Paddy, Maize and Groundnut and cropping intensity was recorded as 100.00 per cent.*
- *Out of the sample households 85.29 percent possessed bank account and 73.53 per cent of them have savings in the account.*
- *About 47.06 per cent of the respondents borrowed credit from various sources.*
- *Among the credit borrowed by households, 12.50 per cent have borrowed loan from commercial banks.*
- *Majority of the respondents (100.00%) have borrowed loan for agriculture purpose.*
- *Regarding the opinion on institutional sources of credit, 100.00 per cent of the households opined that credit helped to perform timely agricultural operations.*
- *The per hectare cost of cultivation for Red gram, Cotton, Paddy, Maize and Groundnut was Rs.22085.73, 32319.65, 27386.33, 12694.39 and 39182.72 with benefit cost ratio of 1:1.90, 1: 1.90, 1: 1.40, 1: 2.50 and 1:1.10 respectively.*
- *Further, 23.53 per cent of the households opined that dry fodder was adequate.*
- *The average annual gross income of the farmers was Rs. 101457.35 in micro-watershed, of which Rs. 57680.88 comes from agriculture.*
- *Sampled households have grown 60 forestry trees together in the fields and back yards.*
- *About 79.41 per cent of the households shown interest to cultivate horticultural crops.*
- *Households have an average investment capacity of Rs. 7941.18 for land development and Rs. 12029.41 for irrigation facility.*
- *Source of funds for additional investment is concerned, 34.29 per cent depends on own funds and 5.71 per cent depends on bank loan for land development activities.*
- *Regarding marketing channels, 41.18 per cent of the households have sold agricultural produce to the local/village merchants, while, 44.12 per cent have sold in regulated markets.*
- *Further, 50.00 per cent of the households have used tractor for the transport of agriculture commodity.*
- *Majority of the farmers (38.24%) have experienced soil and water erosion problems in the watershed and 82.35 per cent of the households were interested towards soil testing.*

- *Fire was the major source of fuel for domestic use for 85.29 per cent of the households and 11.76 per cent households has LPG connection.*
- *Piped supply was the major source for drinking water for 76.47 per cent of the households.*
- *Electricity was the major source of light for 100.00 per cent of the households.*
- *In the study area, 67.65 per cent of the households possess toilet facility.*
- *Regarding possession of PDS card, 100.00 per cent of the households possessed BPL card.*
- *Households opined that, the requirement of cereals (94.12%), pulses (94.12%) and oilseeds (47.06%) are adequate for consumption.*
- *Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (82.35%) wild animal menace on farm field (85.29%), frequent incidence of pest and diseases (79.41%), inadequacy of irrigation water (79.41%), high cost of fertilizers and plant protection chemicals (82.35%), high rate of interest on credit (79.41%), low price for the agricultural commodities (85.29%), lack of marketing facilities in the area (64.71%), inadequate extension services (58.82%), lack of transport for safe transport of the agricultural produce to the market (64.71 %) and less rainfall (2.94 %).*

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-1 micro-watershed (Turk Madhawar sub-watershed, Yadgiri taluk & District) is located at North latitude 16^0 38’ 15.368” and 16^0 36’ 24.117” and East longitude 77^0 23’ 18.585" and 77^0 21’ 27.725”covering an area of about 407.81 ha bounded by under Vankasambara, Sambara and VadavataVillages.

3. Selection of the respondents for the study

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

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

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

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

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

5. Development of interview schedule and data collection

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

6. Tools used to analyze the data

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

Abbreviations used in the report

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

Chapter 4

FINDINGS OF THE SURVEY

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

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Wankasambar-1 Micro watershed is presented in Table 1 and it indicated that 34 farmers were sampled in Wankasambar-1 micro-watershed among households surveyed 5 (14.71%) were marginal, 19 (55.88%) were small, 3 (8.82 %) were semi medium and 1 (2.94 %) were medium farmers. 6 landless farmers were also interviewed for the survey.

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

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	6	17.7	5	14.7	19	55.9	3	8.82	1	2.94	34	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Wankasambar-1 Micro watershed is presented in Table 2. The data indicated that, there were 78 (54.55%) men and 65 (45.45%) were women. The average population of landless was 4.7, marginal farmers were 4.2, small farmers were 4.1, semi medium farmers were 4.3 and medium farmers were 4.

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

Sl.No.	Particulars	LL (28)		MF (21)		SF (77)		SMF (13)		MDF (4)		All (143)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	13	46.4	13	62	43	56	6	46.2	3	75	78	54.6
2	Women	15	53.6	8	38	34	44	7	53.9	1	25	65	45.5
Total		28	100	21	100	77	100	13	100	4	100	143	100
Average		4.7		4.2		4.1		4.3		4.0		4.2	

Age wise classification of population: The age wise classification of household members in Wankasambar-1 Micro watershed is presented in Table 3. The indicated that, 39 (27.27%) of population were 0-15 years of age, 53 (37.06%) were 16-35 years of age, 43(30.07%) were 36-60 years of age and 8 (5.59 %) were above 61 years of age.

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

Sl.No.	Particulars	LL (28)		MF (21)		SF (77)		SMF (13)		MDF (4)		All (143)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	14	50	6	28.6	15	19.5	4	30.77	0	0	39	27.27
2	16-35 years of age	7	25	10	47.6	30	39	4	30.77	2	50	53	37.06
3	36-60 years of age	7	25	5	23.8	25	32.5	4	30.77	2	50	43	30.07
4	> 61 years	0	0	0	0	7	9.09	1	7.69	0	0	8	5.59
Total		28	100	21	100	77	100	13	100	4	100	143	100

Education level of household members: Education level of household members in Wankasambar-1 Micro watershed is presented in Table 4. The results indicated that, there were 44.76 per cent of illiterates, 31.47 per cent of them had primary school education, 4.90 per cent middle school education, 10.49 per cent high school education, 3.50 per cent of them had PUC education and 4.20 per cent attained graduation.

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

Sl. No.	Particulars	LL (28)		MF (21)		SF (77)		SMF (13)		MDF (4)		All (143)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	12	42.9	6	28.6	41	53.3	5	38.5	0	0	64	44.8
2	Primary School	9	32.1	10	47.6	19	24.7	6	46.2	1	25	45	31.5
3	Middle School	4	14.3	3	14.3	0	0	0	0	0	0	7	4.9
4	High School	3	10.7	0	0	10	13	1	7.69	1	25	15	10.5
5	PUC	0	0	1	4.76	3	3.9	1	7.69	0	0	5	3.5
6	Degree	0	0	1	4.76	3	3.9	0	0	2	50	6	4.2
7	Masters	0	0	0	0	1	1.3	0	0	0	0	1	0.7
Total		28	100	21	100	77	100	13	100	4	100	143	100

Occupation of head of households: The data regarding the occupation of the household heads in Wankasambar-1 Micro watershed is presented in Table 5. The results indicate that, 79.41 per cent of households heads were practicing agriculture, 8.82 per cent of the household heads were agricultural Labour and General Labour (5.88 %).

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

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	1	17	5	100	17	89.47	3	100	1	100	27	79.41
2	Agricultural Labour	3	50	0	0	0	0	0	0	0	0	3	8.82
3	General Labour	2	33	0	0	0	0	0	0	0	0	2	5.88
Total		6	100	5	100	17	100	3	100	1	100	32	100

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

Sl.No.	Particulars	LL (28)		MF (21)		SF (77)		SMF (13)		MDF (4)		All (143)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	3	10.7	13	61.9	55	71.43	8	61.54	3	75	82	57.3
2	Agricultural Labour	6	21.4	0	0	0	0	0	0	0	0	6	4.2
3	General Labour	5	17.9	0	0	0	0	0	0	0	0	5	3.5
4	Private Service	0	0	1	4.76	2	2.6	0	0	0	0	3	2.1
5	Student	14	50	7	33.3	19	24.68	4	30.77	1	25	45	31.5
6	Housewife	0	0	0	0	1	1.3	0	0	0	0	1	0.7
7	Children	0	0	0	0	0	0	1	7.69	0	0	1	0.7
Total		28	100	21	100	77	100	13	100	4	100	143	100

Occupation of the members of the household: The data regarding the occupation of the household members in Wankasambar-1 Micro watershed is presented in Table 6. The results indicate that, agriculture was the major occupation for 57.34 per cent of the

household members, 4.20 per cent were agricultural labour, 3.50 per cent were general labour, 31.47 per cent were working in pursuing education, 0.70 per cent were involved as housewife and 0.70 per cent were children.

Institutional Participation of household members: The data regarding the institutional participation of the household members in Wankasambar-1 Micro watershed is presented in Table 7. The results show that, out of the total family members in the households 2.8 per cent of them are participating in Self Help Group**.**

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

Sl.No.	Particulars	LL (28)		MF (21)		SF (77)		SMF (13)		MDF (4)		All (143)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Self Help Group	1	3.6	0	0	3	3.9	0	0	0	0	4	2.8
2	No Participation	27	96	21	100	74	96.1	13	100	4	100	139	97.2
Total		28	100	21	100	77	100	13	100	4	100	143	100

Type of house owned: The data regarding the type of house owned by the households in Wankasambar-1 Micro watershed is presented in Table 8. The results indicate that, 17.65 percent possess thatched house and 82.35 per cent of the households possess katcha house.

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

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	0	0	2	40	4	21.05	0	0	0	0	6	17.65
2	Katcha	6	100	3	60	15	78.95	3	100	1	100	28	82.35
Total		6	100	5	100	19	100	3	100	1	100	34	100

Durable assets owned by the households: The data regarding the Durable Assets owned by the households in Wankasambar-1 Micro watershed is presented in Table 9. The results shows that, 61.76 per cent possess TV, 38.24 per cent possess mixer grinder, 23.53 per cent possess Bicycle, 20.59 per cent possess motor cycle and 97.06 per cent possess mobile phones.

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

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	2	33	2	40	13	68.4	3	100	1	100	21	61.76
2	Mixer/Grinder	2	33	2	40	7	36.8	1	33	1	100	13	38.24
3	Bicycle	1	17	1	20	5	26.3	1	33	0	0	8	23.53
4	Motor Cycle	1	17	1	20	4	21.1	1	33	0	0	7	20.59
5	Mobile Phone	6	100	5	100	19	100	2	67	1	100	33	97.06

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Wankasambar-1 Micro watershed is presented in Table 10. The result shows that, the average value of television was Rs.2761.00, mixer grinder was Rs.1076.00, bicycle was Rs.1000.00, motor cycle was Rs. 42857.00 and mobile phone was Rs.1315.00.

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

Average Value (Rs.)

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
1	Television	2000	2000	2769	3333	4000	2761
2	Mixer/Grinder	1000	1000	1000	1000	2000	1076
3	Bicycle	1000	1000	1000	1000	0	1000
4	Motor Cycle	30000	30000	45000	60000	0	42857
5	Mobile Phone	1333	762	1434	1750	2000	1315

Farm implements owned: The data regarding the farm implements owned by the households in Wankasambar-1 Micro watershed is presented in Table 11. About 17.65 per cent of the households possess Bullock Cart, 35.29 per cent possess plough, 2.94 per cent possess Sprayer, 76.47 per cent possess Weeder, 8.82 per cent possess Chaff Cutter and 2.94 per cent possess JCB/Hitachi.

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

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	0	0	4	21.05	2	66.7	0	0	6	17.65
2	Plough	0	0	0	0	9	47.37	2	66.7	1	100	12	35.29
3	Sprayer	0	0	0	0	1	5.26	0	0	0	0	1	2.94
4	Weeder	6	100	3	60	14	73.68	2	66.7	1	100	26	76.47
5	Chaff Cutter	0	0	0	0	3	15.79	0	0	0	0	3	8.82
6	JCB/Hitachi	0	0	0	0	0	0	1	33.3	0	0	1	2.94

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Wankasambar-1 Micro watershed is presented in Table 12. The results show that the average value of plough was Rs.1075.00, bullock Cart was Rs.20000.00, Sprayer was Rs.3000.00 and weeder was Rs.55.00, Chaff Cutter was Rs. 2666 and JCB/Hitachi was Rs. 4000.

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

Average Value (Rs.)

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
1	Bullock Cart	0	0	20000	20000	0	20000
2	Plough	0	0	1100	800	2000	1075
3	Sprayer	0	0	3000	0	0	3000
4	Weeder	40	25	67	62	100	55
5	Chaff Cutter	0	0	2666	0	0	2666
6	JCB/Hitachi	0	0	0	4000	0	4000

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

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	0	0	9	47.37	2	67	1	100	12	35.29
2	Local cow	1	17	0	0	3	15.79	1	33	0	0	5	14.71
3	Buffalo	0	0	0	0	2	10.53	0	0	1	100	3	8.82
4	Goat	0	0	0	0	1	5.26	0	0	0	0	1	2.94

Livestock possession by the households: The data regarding the Livestock possession by the households in Wankasambar-1 Micro watershed is presented in Table 13. The results indicate that, 35.29 per cent of the households possess bullocks, 14.71 per cent possess local cow, 8.82 per cent possess buffalo and 2.94 per cent possess goat.

Average Labour availability: The data regarding the average labour availability in Wankasambar-1 Micro watershed is presented in Table 14. The indicated that, own labour men available in the micro watershed was 1.38, women available in the micro watershed was 1.22, hired labour (men) available was 7.41 and hired labour (women) available was 12.41.

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

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
		N	N	N	N	N	N
1	Hired labour Female	5	10.4	13.68	11	10	12.41
2	Own Labour Female	1	1.2	1.26	1.33	1	1.22
3	Own labour Male	1	1.4	1.42	1.33	2	1.38
4	Hired labour Male	5	5.6	8.16	5.67	10	7.41

Adequacy of hired labour: The data regarding the adequacy of hired labour in Wankasambar-1 Micro watershed is presented in Table 15. The results indicate that, 85.29 per cent of the household opined that hired labour was adequate.

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

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	1	17	5	100	19	100	3	100	1	100	29	85.3

Migration among the households: The data regarding the migration (Table 16) indicate that, 2.80 percent of the population was being migrated from the micro watershed.

Table 16. Migration among the households in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (28)		MF (21)		SF (77)		SMF (13)		MDF (4)		All (143)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Migration	1	3.57	2	9.52	1	1.30	0	0.00	0	0.00	4	2.80

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 495 kms on an average for 3.75 months.

Table 17. Average distance and duration of migration in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (1)	MF (2)	SF (1)	SMF (0)	MDF (0)	All (4)
		N	N	N	N	N	N
1	Avg. Distance (kms)	600	390	600	0	0	495
2	Avg. Duration (months)	3	4.5	3	0	0	3.75

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.

Table 18. Purpose of migration by members of households in Wankasambar-1 micro-watershed

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

Positive consequence of migration: The data regarding the positive consequence of migration (Table 19) indicate that, 100 per cent of the migrants opined that due to their migration from the village it was helped for them to Improve quality of life.

Table 19. Positive consequence of migration in Wankasambar-1 micro-watershed

Sl. No.	Particulars	LL (1)		MF (2)		SF (1)		SMF (0)		MDF (0)		All (4)
		N	%	N	%	N	%	N	%	N	%	%
1	Improved quality of life	1	100	2	100	1	100	0	0	0	0	100

Distribution of land (ha): The data regarding the distribution of land (ha) in Wankasambar-1 Micro watershed is presented in Table 20. The results indicate that, 37.01 ha (92.88%) of dry land and 2.84 ha (7.12 %) of irrigated land.

Table 20. Distribution of land (ha) in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Dry	0	0	3.68	100	26.71	100	6.62	100	0	0	37.01	92.88
2	Irrigated	0	0	0	0	0	0	0	0	2.84	100	2.84	7.12
Total		0	100	3.68	100	26.71	100	6.62	100	2.84	100	39.84	100

Average value of land (ha): The data regarding the average land value (Rs./ha) in Wankasambar-1 Micro watershed is presented in Table 21. The results show that the average value of dry land was Rs.337653.11 and the average value of irrigated land was Rs.281883.02.

Table 21. Average value of land (ha) in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
		N	N	N	N	N	N
1	Dry	0	570627.1	329333.3	241712.5	0	337653.1
2	Irrigated	0	0	0	0	281883	281883

Status of open wells: The data regarding the status of open wells in Wankasambar-1 Micro watershed is presented in Table 22. The results indicate that, there were 1 De-functioning open wells and 1 functioning open wells among the sampled households in micro watershed.

Table 22. Status of open wells in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
		N	N	N	N	N	N
1	De-functioning	0	0	0	0	1	1
2	Functioning	0	0	0	0	1	1

Source of irrigation: The data regarding the source of irrigation in Wankasambar-1 Micro watershed is presented in Table 23. The results that open well were major source of irrigation for 2.94 per cent of the households.

Table 23. Source of irrigation in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Open Well	0	0	0	0	0	0	0	0	1	100	1	2.94

Depth of water (Avg. In meters): The data regarding the depth of water in Wankasambar-1 Micro watershed is presented in Table 24. The results revealed that, the depth of open well was 1.08 meter.

Table 24. Depth of water (Avg. In meters) in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
		N	N	N	N	N	N
1	Open Well	0	0	0	0	36.58	1.08

Cropping pattern: The data regarding the cropping pattern in Wankasambar-1 Micro watershed is presented in Table 25. The results indicate that, farmers have grown Cotton (16.97 ha), Red gram (5.88 ha), Cotton (3.74 ha), Red gram (3.64 ha), Groundnut (2.60 ha), Maize (1.62 ha) and Pearl millet (1.36 ha).

Table 25. Cropping pattern in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
1	Kharif - Cotton	0	0.95	12.64	3.38	0	16.97
2	Rabi - Red gram	0	1.83	2.83	1.21	0	5.88
3	Rabi - Cotton	0	0.9	2.83	0	0	3.74
4	Kharif - Red gram	0	0	1.21	0.81	1.62	3.64
5	Rabi - Groundnut	0	0	2.6	0	0	2.6
6	Rabi - Maize	0	0	1.62	0	0	1.62
7	Kharif - Pearl millet	0	0	1.36	0	0	1.36

Cropping intensity: The data regarding the cropping intensity in Wankasambar-1 Micro watershed is presented in Table 26. The results indicate that, the cropping intensity was 100.00 per cent.

Table 26. Cropping intensity (%) in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
1	Cropping Intensity	0	100	100	100	100	100

Table 27. Possession of Bank account and savings in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	6	100	5	100	15	78.95	2	66.67	1	100	29	85.29
2	Savings	6	100	4	80	13	68.42	2	66.67	0	0	25	73.53

Possession of bank account and savings: The data regarding the possession of bank account and saving in Wankasambar-1 micro-watershed is presented in Table 27. The results indicate that, 85.29 cent of the households posses bank account and 73.53 per cent of them have savings.

Borrowing status: The data regarding the borrowing status in Wankasambar-1 micro-watershed is presented in Table 28. The results indicate that, 47.06 percent of the sample farmers have borrowed credit from different sources.

Table 28. Borrowing status in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	6	100	1	20	7	36.8	1	33.3	1	100	16	47.06

Source of credit: The data regarding the source of credit availed by households in Wankasambar-1 micro-watershed is presented in Table 29. The results show that, 12.50 per cent have borrowed loan from commercial banks, 45.83 per cent have borrowed loan from Cooperative bank, 41.67 per cent have borrowed loan from money lender and 25.00 per cent have borrowed loan from SHGs/CBOs.

Table 29. Source of credit borrowed by households in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (4)		SF (12)		SMF (2)		MDF (0)		All (24)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Commercial Bank	0	0	2	50	1	8.33	0	0	0	0	3	12.5
2	Cooperative Bank	0	0	2	50	8	66.7	0	0	1	∞	11	45.83
3	Money Lender	2	33	2	50	4	33.3	2	100	0	0	10	41.67
4	SHGs/CBOs	3	50	0	0	3	25	0	0	0	0	6	25

Avg. Credit amount: The data regarding the avg. Credit amount in Wankasambar-1 micro-watershed is presented in Table 30. The results show that, farmers have borrowed Avg. Credit of Rs.101666.67 from different sources.

Table 30. Avg. Credit amount in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)	MF (4)	SF (12)	SMF (2)	MDF (0)	All (24)
		N	N	N	N	N	N
1	Average Credit	12000	103750	92500	112500	0	101667

Purpose of credit borrowed (institutional Source): The data regarding the purpose of credit borrowed - Institutional Credit in Wankasambar-1 micro-watershed is presented in Table 31. The results indicate that, 100.00 per cent of the households have borrowed loan for agriculture.

Table 31. Purpose of credit borrowed (institutional Source) by households in Wankasambar-1 micro-watershed

SN	Particulars	LL (0)		MF (4)		SF (9)		SMF (0)		MDF (1)		All (14)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0	4	100	9	100	0	0	1	100	14	100

Purpose of credit borrowed (Private Source): The data regarding the purpose of credit borrowed – Private Source in Wankasambar-1 micro-watershed is presented in Table 32. The results indicate that, 73.33 per cent of the households have borrowed loan for agriculture, construction-house (6.67 %) and household consumption (6.67 %).

Repayment status of household (institutional Source): The data regarding the repayment status of credit borrowed from institutional Source by households in Wankasambar-1 micro watershed is presented in Table 33. The results indicate that, 100.00 per cent have unpaid.

Table 32. Purpose of credit borrowed (Private Source) by households in Wankasambar-1 micro-watershed

Sl. No.	Particulars	LL (5)		MF (1)		SF (7)		SMF (2)		MDF (0)		All (15)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	1	20	1	100	7	100	2	100	0	0	11	73.33
2	Household consumption	1	20	0	0	0	0	0	0	0	0	1	6.67
3	Healthcare	1	20	0	0	0	0	0	0	0	0	1	6.67
4	Other	1	20	0	0	0	0	0	0	0	0	1	6.67
5	Construction-house, Construction-cattle shed	1	20	0	0	0	0	0	0	0	0	1	6.67

Table 33. Repayment status of household (institutional Source) in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (0)		MF (4)		SF (9)		SMF (0)		MDF (1)		All (14)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Un paid	0	0	4	100	9	100	0	0	1	100	14	100

Repayment status of household (Private Source): The data regarding the repayment status of credit borrowed from private sources by households in Wankasambar-1 micro watershed is presented in Table 34. The results indicate that, 18.75 per cent of the households have partially paid and 81.3 per cent has unpaid.

Table 34. Repayment status of household (Private Source) in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (2)		SF (7)		SMF (2)		MDF (0)		All (16)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Partially paid	3	60	0	0	0	0	0	0	0	0	3	18.8
2	Un paid	2	40	2	100	7	100	2	100	0	0	13	81.3

Opinion regarding institutional sources of credit: The data regarding the opinion on institutional sources of credit in Wankasambar-1 micro watershed is presented in Table 35. The results indicate that, 100.00 per cent of the households opined that credit helped to perform timely agricultural operations.

Table 35. Opinion regarding institutional sources of credit in Wankasambar-1 micro-watershed

Sl. No.	Particulars	MF (4)		SF (9)		SMF (0)		MDF (1)		All (14)	
		N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	4	100	9	100	0	0	1	100	14	100

Opinion regarding Non- institutional sources of credit: The data regarding the opinion on non-institutional sources of credit in Wankasambar-1 micro watershed is presented in Table 36. The results indicate that, 100.00 per cent of the households opined that credit helped to perform timely agricultural operations.

Table 36. Opinion regarding Non- institutional sources of credit in Wankasambar-1 micro-watershed

Sl. No.	Particulars	LL (5)		MF (2)		SF (7)		SMF (2)		MDF (0)		All (16)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	5	100	2	100	7	100	2	100	0	0	16	100

Cost of Cultivation of Red gram: The data regarding the cost of cultivation (Rs/ha) of Red gram in Wankasambar-1 micro watershed is presented in Table 37.a. The results indicate that, the total cost of cultivation (Rs/ha) for Red gram was Rs. 22085.73. The gross income realized by the farmers was Rs. 42389.44. The net income from Red gram cultivation was Rs.20303.71, thus the benefit cost ratio was found to be 1:1.90.

Table 37(a). Cost of Cultivation of Red gram in Wankasambar-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	29.31	5915.23	26.78
2	Bullock		Pairs/day	2.13	1521.71	6.89
3	Tractor		Hours	2.97	2391.45	10.83
4	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	11.31	1401.29	6.34
5	Fertilizer + micronutrients		Quintal	4.29	3117.83	14.12
6	Pesticides (PPC)		Kgs / liters	1.82	1266.74	5.74
7	Msc. Charges (Marketing costs etc)			0	388.89	1.76
8	Depreciation charges			0	65.95	0.3
9	Land revenue and Taxes			0	0.91	0
II	**Cost B1**					
10	Interest on working capital				694.3	3.14
11	**Cost B1 = (Cost A1 + sum of 15 and 16)**				16764.3	75.91
III	**Cost B2**					
12	Rental Value of Land				551.85	2.5
13	**Cost B2 = (Cost B1 + Rental value)**				17316.15	78.4
IV	**Cost C1**					
14	Family Human Labour			10.84	2761.79	12.5
15	**Cost C1 = (Cost B2 + Family Labour)**				20077.94	90.91
V	**Cost C2**					
16	Risk Premium				0	0
17	**Cost C2 = (Cost C1 + Risk Premium)**				20077.94	90.91
VI	**Cost C3**					
18	Managerial Cost				2007.79	9.09
19	**Cost C3 = (Cost C2 + Managerial Cost)**				22085.73	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		7.98	42297.96	
		b) Main Crop Sales Price (Rs.)			5300	
	By Product	e) Main Product (q)		0.21	91.48	
		f) Main Crop Sales Price (Rs.)			444.44	
b.	Gross Income (Rs.)				42389.44	
c.	Net Income (Rs.)				20303.71	
d.	Cost per Quintal (Rs./q.)				2767.38	
e.	Benefit Cost Ratio (BC Ratio)				1:1.9	

Cost of Cultivation of Cotton: The data regarding the cost of cultivation (Rs/ha) of Cotton in Wankasambar-1 micro watershed is presented in Table 37.b. The results indicate that, the total cost of cultivation (Rs/ha) for Cotton was Rs. 32319.65. The gross income realized by the farmers was Rs. 60219.95. The net income from Cotton cultivation was Rs.27900.31, thus the benefit cost ratio was found to be 1:1.90.

Table 37(b). Cost of Cultivation of Cotton in Wankasambar-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	36.22	7259.87	22.46
2	Bullock		Pairs/day	4.23	3844.8	11.9
3	Tractor		Hours	2.18	1937.43	5.99
4	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	4.29	4510.94	13.96
5	Fertilizer + micronutrients		Quintal	5.3	4141.52	12.81
6	Pesticides (PPC)		Kgs / liters	2.27	1792.67	5.55
7	Msc. Charges (Marketing costs etc)			0	126.25	0.39
8	Depreciation charges			0	113.2	0.35
II	**Cost B1**					
16	Interest on working capital				1253.42	3.88
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				24980.09	77.29
III	**Cost B2**					
18	Rental Value of Land				390.62	1.21
19	**Cost B2 = (Cost B1 + Rental value)**				25370.71	78.5
IV	**Cost C1**					
20	Family Human Labour			16.04	4010.78	12.41
21	**Cost C1 = (Cost B2 + Family Labour)**				29381.5	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				29381.5	90.91
VI	**Cost C3**					
24	Managerial Cost				2938.15	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				32319.65	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		11.97	60219.95	
		b) Main Crop Sales Price (Rs.)			5031.25	
b.	Gross Income (Rs.)				60219.95	
c.	Net Income (Rs.)				27900.31	
d.	Cost per Quintal (Rs./q.)				2700.24	
e.	Benefit Cost Ratio (BC Ratio)				1:1.9	

Cost of Cultivation of Paddy: The data regarding the cost of cultivation (Rs/ha) of Paddy in Wankasambar-1 micro watershed is presented in Table 37.c. The results indicate, the total cost of cultivation (Rs/ha) for Paddy was Rs.27386.33. The gross income realized by the farmers was Rs. 39520.00. The net income from Paddy cultivation was Rs. 12133.67, thus the benefit cost ratio was found to be 1:1.40.

Table 37(c). Cost of Cultivation of Paddy in Wankasambar-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	27.17	5187	18.94
2	Bullock		Pairs/day	0	0	0
3	Tractor		Hours	2.47	3705	13.53
4	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	98.8	6916	25.25
5	Fertilizer + micronutrients		Quintal	3.29	2140.67	7.82
6	Pesticides (PPC)		Kgs / liters	2.47	2470	9.02
7	Depreciation charges			0	36.23	0.13
8	Land revenue and Taxes			0	8.23	0.03
II	**Cost B1**					
9	Interest on working capital				1383.2	5.05
10	**Cost B1 = (Cost A1 + sum of 15 and 16)**				21846.33	79.77
III	**Cost B2**					
11	Rental Value of Land				333.33	1.22
12	**Cost B2 = (Cost B1 + Rental value)**				22179.66	80.99
IV	**Cost C1**					
13	Family Human Labour			10.7	2717	9.92
14	**Cost C1 = (Cost B2 + Family Labour)**				24896.66	90.91
V	**Cost C2**					
15	Risk Premium				0	0
16	**Cost C2 = (Cost C1 + Risk Premium)**				24896.66	90.91
VI	**Cost C3**					
17	Managerial Cost				2489.67	9.09
18	**Cost C3 = (Cost C2 + Managerial Cost)**				27386.33	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		24.7	37050	
		b) Main Crop Sales Price (Rs.)			1500	
	By Product	e) Main Product (q)		2.47	2470	
		f) Main Crop Sales Price (Rs.)			1000	
b.	Gross Income (Rs.)				39520	
c.	Net Income (Rs.)				12133.67	
d.	Cost per Quintal (Rs./q.)				1108.76	
e.	Benefit Cost Ratio (BC Ratio)				1:1.4	

Cost of Cultivation of Maize: The data regarding the cost of cultivation (Rs/ha) of Maize in Wankasambar-1 micro watershed is presented in Table 37.d. The results indicate that, the total cost of cultivation (Rs/ha) for Maize was Rs. 12694.39. The gross income realized by the farmers was Rs.31616.00. The net income from Maize cultivation was Rs. 18921.61, thus the benefit cost ratio was found to be 1:2.50.

Table 37(d). Cost of Cultivation of Maize in Wankasambar-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	18.53	3952	31.13
2	Bullock		Pairs/day	0	0	0
3	Tractor		Hours	2.47	1852.5	14.59
4	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	9.26	648.38	5.11
5	Fertilizer + micronutrients		Quintal	3.71	2840.5	22.38
6	Depreciation charges			0	1.24	0.01
II	**Cost B1**					
7	Interest on working capital				418.66	3.3
8	**Cost B1 = (Cost A1 + sum of 15 and 16)**				9713.28	76.52
III	**Cost B2**					
9	Rental Value of Land				283.33	2.23
10	**Cost B2 = (Cost B1 + Rental value)**				9996.61	78.75
IV	**Cost C1**					
11	Family Human Labour			6.18	1543.75	12.16
12	**Cost C1 = (Cost B2 + Family Labour)**				11540.36	90.91
V	**Cost C2**					
13	Risk Premium				0	0
14	**Cost C2 = (Cost C1 + Risk Premium)**				11540.36	90.91
VI	**Cost C3**					
15	Managerial Cost				1154.04	9.09
16	**Cost C3 = (Cost C2 + Managerial Cost)**				12694.39	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		13.59	31245.5	
		b) Main Crop Sales Price (Rs.)			2300	
	By Product	e) Main Product (q)		0.62	370.5	
		f) Main Crop Sales Price (Rs.)			600	
b.	Gross Income (Rs.)				31616	
c.	Net Income (Rs.)				18921.61	
d.	Cost per Quintal (Rs./q.)				934.44	
e.	Benefit Cost Ratio (BC Ratio)				1:2.5	

Cost of Cultivation of Groundnut: The data regarding the cost of cultivation (Rs/ha) of Groundnut in Wankasambar-1 micro watershed is presented in Table 37.e. The results indicate that, the total cost of cultivation (Rs/ha) for Groundnut was Rs.39182.72. The gross income realized by the farmers was Rs. 44060.49. The net income from Groundnut cultivation was Rs. 4877.77, thus the benefit cost ratio was found to be 1:1.10.

Table 37(e). Cost of Cultivation of Groundnut in Wankasambar-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	28.87	6158.29	15.72
2	Bullock		Pairs/day	1.15	711.89	1.82
3	Tractor		Hours	2.31	1734.05	4.43
4	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	127.11	17324.24	44.21
5	Fertilizer + micronutrients		Quintal	3.85	3313.96	8.46
6	Pesticides (PPC)		Kgs / liters	1.54	885.75	2.26
7	Msc. Charges (Marketing costs etc)			0	250	0.64
8	Depreciation charges			0	218.34	0.56
II	**Cost B1**					
9	Interest on working capital				2582.87	6.59
10	**Cost B1 = (Cost A1 + sum of 15 and 16)**				33179.4	84.68
III	**Cost B2**					
11	Rental Value of Land				283.33	0.72
12	**Cost B2 = (Cost B1 + Rental value)**				33462.73	85.4
IV	**Cost C1**					
13	Family Human Labour			8.48	2157.93	5.51
14	**Cost C1 = (Cost B2 + Family Labour)**				35620.65	90.91
V	**Cost C2**					
15	Risk Premium				0	0
16	**Cost C2 = (Cost C1 + Risk Premium)**				35620.65	90.91
VI	**Cost C3**					
17	Managerial Cost				3562.07	9.09
18	**Cost C3 = (Cost C2 + Managerial Cost)**				39182.72	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		10.02	43598.08	
		b) Main Crop Sales Price (Rs.)			4350	
	By Product	e) Main Product (q)		0.77	462.41	
		f) Main Crop Sales Price (Rs.)			600	
b.	Gross Income (Rs.)				44060.49	
c.	Net Income (Rs.)				4877.77	
d.	Cost per Quintal (Rs./q.)				3909.46	
e.	Benefit Cost Ratio (BC Ratio)				1:1.1	

Adequacy of fodder: The data regarding the adequacy of fodder in Wankasambar-1 Micro watershed is presented in Table 38. The results indicate that, 23.53 per cent of the households opined that dry fodder was adequate and 5.88 per cent of them opined dry fodder was inadequate.

Table 38. Adequacy of fodder in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	0	0	6	31.58	1	33.3	1	100	8	23.53
2	Inadequate-Dry Fodder	1	16.7	0	0	1	5.26	0	0	0	0	2	5.88

Average annual gross income: The data regarding the annual gross income in Wankasambar-1 Micro watershed is presented in Table 39. The results indicate that, the farmers have annual gross income of Rs. 101457.35 in micro-watershed, of which Rs. 57680.88 is from agriculture itself.

Table 39. Average annual gross income in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	12000	5263.16	0	0	4705.88
2	Wage	114167	15200	22484.2	38333.3	0	38329.4
3	Agriculture	0	36040	71086.8	107433	108000	57680.9
4	Dairy Farm	0	0	1326.32	0	0	741.18
	Income(Rs.)	114167	63240	100161	145767	108000	101457

Average annual Expenditure: The data regarding the average annual expenditure in Wankasambar-1 Micro watershed is presented in Table 40. The results indicate that, the farmers have annual gross expenditure of Rs. 151633.33 in micro-watershed, of which Rs. 16558.82 is from agriculture itself.

Table 40. Average annual Expenditure in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Wage	20000	0	8333.33	25000	0	7941.18
2	Agriculture	0	16800	28000	43500	0	16558.8
3	Dairy Farm	0	0	10000	0	0	294.12
Total		20000	16800	46333.3	68500	0	151633

Interest towards cultivation of horticulture crops: The data regarding Table (41) indicates that, 79.41 per cent of the households shown interest to cultivate horticultural crops.

Table 41. Interest towards cultivation of horticulture crops in Wankasambar-1 micro-watershed

Sl. No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interested towards cultivation of horticulture crops	0	0	5	100	18	95	3	100	1	100	27	79.4

Forest species grown: The data regarding forest species grown in Wankasambar-1 Micro watershed is presented in Table 42. The results indicate that, households have planted 56 neem trees, 1 tamarind trees and 3 banyan trees together in both field and backyard.

Table 42. Forest species grown in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Neem	0	0	8	0	35	5	6	2	0	0	49	7
2	Tamarind	0	0	0	0	1	0	0	0	0	0	1	0
3	Banyan	0	0	0	0	3	0	0	0	0	0	3	0

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

Average additional investment capacity: The data regarding average additional investment capacity in Wankasambar-1 Micro watershed is presented in Table 43. The results indicate that, households have an average investment capacity of Rs. 7941.18 for land development, Rs. 12029.41 for creation of irrigation facility, Rs.3029.41 for adoption of improved livestock breeds and Rs.235.29 for adoption of improved crop production activities.

Table 43. Average additional investment capacity of households in Wankasambar-1 micro-watershed

Sl. No.	Particulars	LL (6)	MF (5)	SF (19)	SMF (3)	MDF (1)	All (34)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Land development	0	2000	8947.37	26666.7	10000	7941.18
2	Irrigation facility	0	0	16263.2	33333.3	0	12029.4
3	Improved crop production	0	1600	3578.95	4000	15000	3029.41
4	Improved livestock management	0	0	315.79	0	2000	235.29

Source of funds for additional investment: The data regarding source of funds for additional investment in Wankasambar-1 Micro watershed is presented in Table 44. The results indicate that, the sources of finance raised from bank as a loan and from own sources for land development was 5.71 and 34.29 per cent, for irrigation facility was 11.43 and 12029.41 per cent, for improved crop production was and per cent, for improved livestock adoption was and per cent, for orchard development/ maintenance was and per cent and for subsidiary enterprises was and per cent.

Table 44. Source of funds for additional investment in Wankasambar-1 micro-watershed

Sl. No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Government Subsidy	2	5.71	4	11.4	0	0	0	0
2	Own funds	12	34.29	1	2.86	11	31.43	4	11.4

Marketing of agricultural produce: The data regarding marketing of the agricultural produce in Wankasambar-1 Micro watershed is presented in Table 45. The results indicated that, 100.00 percent of output of Bajra was sold in the market with average price

of Rs. 1100.00; 100.00 percent of output of Cotton was sold in the market with average price of Rs. 5031.25; 46.15 percent of output of Groundnut was sold in the market with average price of Rs. 8700.00; 100.00 per cent of output of Maize was sold in the market with average price of Rs. 2300.00 and 83.33 percent of output of Paddy was sold in the market with average price of Rs. 1500.00.

Table 45. Marketing of agricultural produce in Wankasambar-1 micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	11	0	11	100	1100
2	Cotton	255	0	255	100	5031
3	Groundnut	26	14	12	46	8700
4	Maize	22	0	22	100	2300
5	Paddy	30	5	25	83	1500
6	Red gram	91	2	89	98	5300

Marketing channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Wankasambar-1 Micro watershed is presented in Table 46. The results indicated that, 41.18 cent of the households have sold agricultural produce to the local/village merchants and 44.12 per cent of regulated market.

Table 46. Marketing channels used for sale of agricultural produce in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0	4	80	8	42.1	2	66.7	0	0	14	41.18
2	Regulated Market	0	0	1	20	10	52.6	2	66.7	2	200	15	44.12

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Wankasambar-1 Micro watershed is presented in Table 47. The results indicated that, 50.00 cent of the households have used tractor and 35.29 per cent have used Cart for the transport of agriculture commodity.

Table 47. Mode of transport of agricultural produce in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cart	0	0	5	100	5	26.3	2	66.7	0	0	12	35.29
2	Tractor	0	0	0	0	13	68.4	2	66.7	2	200	17	50

Incidence of soil and water erosion problems: The data regarding incidence of incidence of soil and water erosion problems in Wankasambar-1 Micro watershed is presented in Table 48. The results indicate that, 38.24 per cent of the households have experienced soil and water erosion problems.

Table 48. Incidence of soil and water erosion problems in Wankasambar-1 micro-watershed

Sl. No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	2	40	8	42.1	2	67	1	100	13	38.24

Interest towards soil testing: The data regarding Interest shown towards soil testing in Wankasambar-1 Micro watershed is presented in Table 49. The results indicated that, 82.35 per cent of the households were interested towards soil testing.

Table 49. Interest regarding soil testing in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	5	100	19	100	3	100	1	100	28	82.35

Soil and water conservation practices and structures adopted: The data regarding soil and water conservation practices and structures adopted in Wankasambar-1 Micro watershed is presented in Table 50. The results indicated that 100 per cent of farmers practicing summer ploughing as soil and water conservation practice.

Table 50. Soil and water conservation practices and structures adopted in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farm Pond	0	0	0	0	1	5.3	0	0	0	0	1	2.94

Status of soil and water conservation structures: The data regarding status soil and water conservation structures adopted in Wankasambar-1 Micro watershed is presented in Table 51. The results indicated that, the households have adopted farm pond as a soil and water conservation structures out of which 100.00 per cent was in good condition.

Table 51. Status of soil and water conservation structures in Wankasambar-1 micro-watershed

Sl.No	Item	Good		Slightly Damaged	
		N	%	N	%
1	Farm Pond	1	100	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-1 Micro watershed is presented in Table 52. The results indicated that, 2.94 per cent were done by Govt.

Table 52. Agencies involved in the soil and water conservation structures in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Govt.	0	0	0	0	1	5.26	0	0	0	0	1	2.94

Usage pattern of fuel for domestic use: The data on usage pattern of fuel for domestic use in Wankasambar-1 Micro watershed is presented in Table 53. The results indicated that, firewood was the major source of fuel for domestic use for 85.29 per cent of the households followed by LPG (11.76%) and Dung cake (2.94 %).

Table 53. Usage pattern of fuel for domestic use in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Dung Cake	0	0	1	20	0	0	0	0	0	0	1	2.94
2	Fire Wood	4	66.7	4	80	18	94.7	3	100	0	0	29	85.29
3	LPG	2	33.3	0	0	1	5.26	0	0	1	100	4	11.76

Source of drinking water: The data on source of drinking water in Wankasambar-1 Micro watershed is presented in Table 54. The results indicated that, piped waters supply was the major source for drinking water for 76.47 per cent of the households followed by bore well water (23.53%).

Table 54. Source of drinking water in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	5	83.33	4	80	14	73.68	2	66.7	1	100	26	76.47
2	Bore Well	1	16.67	1	20	5	26.32	1	33.3	0	0	8	23.53

Source of light: The data on source of light in Wankasambar-1 Micro watershed is presented in Table 55. The results indicated that, electricity was the major source of light for 100.00 per cent of the households.

Table 55. Source of light in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	6	100	5	100	19	100	3	100	1	100	34	100

Existence of sanitary toilet facility: The data on availability of toilet facility in Wankasambar-1 Micro watershed is presented in Table 56. The results indicated that, 67.65 per cent of the households possess toilets.

Table 56. Existence of sanitary toilet facility in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	4	66.7	4	80	12	63.16	2	67	1	100	23	67.7

Possession of PDS card: The data regarding possession of PDS card in Wankasambar-1 Micro watershed is presented in Table 57. The results indicated that, 100.00per cent of the households possessed BPL card.

Table 57. Possession of PDS card in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	6	100	5	100	19	100	3	100	1	100	34	100

Participation in NREGA programme: The data regarding Participation in NREGA programme in Wankasambar-1 Micro watershed is presented in Table 58. The results indicated that, only 50.00 percent of the households have participated in NREGA programme.

Table 58. Participation in NREGA programme in Wankasambar-1 micro-watershed

Sl. No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	4	66.7	3	60	9	47.4	1	33.3	0	0	17	50

Adequacy of food items: The data regarding adequacy of food items in Wankasambar-1 Micro watershed is presented in Table 59. The results indicated that, the extent of adequacy of food items for cereals, pulses, Oilseeds and vegetables were 94.12, 94.12, 47.06, 38.24 per cent respectively, similarly for Fruits (70.59%) and milk (55.88%).

Table 59. Adequacy of food items in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	4	66.7	5	100	19	100	3	100	1	100	32	94.12
2	Pulses	4	66.7	5	100	19	100	3	100	1	100	32	94.12
3	Oilseed	0	0	2	40	11	57.89	2	66.7	1	100	16	47.06
4	Vegetables	0	0	3	60	8	42.11	1	33.3	1	100	13	38.24
5	Fruits	4	66.7	4	80	14	73.68	1	33.3	1	100	24	70.59
6	Milk	4	66.7	3	60	10	52.63	2	66.7	0	0	19	55.88

Inadequacy of food items: The data regarding in adequacy of food items in Wankasambar-1 Micro watershed is presented in Table 60. The results indicated that, the extent of in adequacy of food items for cereals, pulses, Oilseeds and vegetables were 5.88, 5.88, 52.94, 61.76 and 94.12 per cent respectively, similarly for fruits (23.53%), milk (44.12%), egg (94.12%) and meat (94.12%).

Table 60. Inadequacy of food items in Wankasambar-1 micro-watershed

Sl.No.	Particulars	LL (6)		MF (5)		SF (19)		SMF (3)		MDF (1)		All (34)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	2	33.3	0	0	0	0	0	0	0	0	2	5.88
2	Pulses	2	33.3	0	0	0	0	0	0	0	0	2	5.88
3	Oilseed	6	100	3	60	8	42.11	1	33.3	0	0	18	52.94
4	Vegetables	6	100	2	40	11	57.89	2	66.7	0	0	21	61.76
5	Fruits	2	33.3	1	20	4	21.05	1	33.3	0	0	8	23.53
6	Milk	2	33.3	2	40	9	47.37	1	33.3	1	100	15	44.12
7	Egg	6	100	5	100	18	94.74	2	66.7	1	100	32	94.12
8	Meat	6	100	5	100	18	94.74	2	66.7	1	100	32	94.12

Farming constraints: The data regarding farming constraints experienced by households in Wankasambar-1 Micro watershed is presented in Table 61. The results indicated that, lower fertility status of the soil was the constraint experienced by (82.35 %) per cent of the households, wild animal menace on farm field (85.29%), frequent incidence of pest and

diseases (79.41%), inadequacy of irrigation water (79.41%), high cost of fertilizers and plant protection chemicals (82.35%), high rate of interest on credit (79.41%), low price for the agricultural commodities (85.29 %), lack of marketing facilities in the area (64.71%), inadequate extension services (58.82 %), lack of transport for safe transport of the agricultural produce to the market (64.71%) and less rainfall (2.94%).

Table 61. Farming constraints experienced in Wankasambar-1 micro-watershed

SN	Particulars	**LL** (6)		**MF** (5)		**SF** (19)		**SMF** (3)		**MDF** (1)		**All (34)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Lower fertility status of the soil	0	0	5	100	19	100	3	100	1	100	28	82.35
2	Wild animal menace on farm field	0	0	5	100	20	105.26	3	100	1	100	29	85.29
3	Frequent incidence of pest and diseases	0	0	5	100	18	94.74	3	100	1	100	27	79.41
4	Inadequacy of irrigation water	0	0	5	100	18	94.74	3	100	1	100	27	79.41
5	High cost of Fertilizers and plant protection chemicals	0	0	5	100	19	100	3	100	1	100	28	82.35
6	High rate of interest on credit	0	0	5	100	19	100	2	66.67	1	100	27	79.41
7	Low price for the agricultural commodities	0	0	5	100	20	105.26	3	100	1	100	29	85.29
8	Lack of marketing facilities in the area	0	0	4	80	15	78.95	2	66.67	1	100	22	64.71
9	Inadequate extension services	0	0	4	80	14	73.68	1	33.33	1	100	20	58.82
10	Lack of transport for safe transport of the Agril produce to the market.	0	0	4	80	15	78.95	2	66.67	1	100	22	64.71
11	Less rainfall	0	0	0	0	1	5.26	0	0	0	0	1	2.94

Chapter 5

SUMMARY AND IMPLICATIONS

In order to assess the socio-economic condition of the farmers in the watershed 34 households located in the micro watershed were interviewed for the survey. The study was conducted in Wankasambar-1 micro-watershed (Turk Madhawar sub-watershed, Yadgiri taluk & District) is located at North latitude 16^0 38' 15.368" and 16^0 36' 24.117" and East longitude 77^0 23' 18.585" and 77^0 21' 27.725"covering an area of about 407.81 ha bounded by under Vankasambara, Sambara and VadavataVillages.

Socio-economic analysis of Wankasambar-1 micro watersheds of Turk Madhawar sub-watershed, Yadgiri taluk & District indicated that, out of the total sample of 34 farmers were sampled in Wankasambar-1 micro-watershed among households surveyed 5 (14.71%) were marginal, 19 (55.88%) were small, 3 (8.82 %) were semi medium and 1 (2.94 %) were medium farmers. 6 landless farmers were also interviewed for the survey.

The population characteristics of households indicated that, there were 78 (54.55%) men and 65 (45.45 %) were women. Majority of the respondents (37.06%) were in the age group of 16-35 years.

Education level of the sample households indicated that, there were 44.76 per cent illiterates, 53.86 per cent pre university education and 4.20 per cent attained graduation. About, 79.41 per cent of household heads practicing agriculture and 8.82 per cent of the household heads were engaged as agricultural labourers. Agriculture was the major occupation for 57.34 per cent of the household members. In the study area, 17.65 percent possess thatched house and 82.35 per cent of the households possess katcha house.

The durable assets owned by the households showed that, 61.76 per cent possess TV, 38.24 per cent possess mixer grinder, 97.06 per cent possess mobile phones and 20.59 per cent possess motor cycles. Farm implements owned by the households indicated that, 17.65 per cent of the households possess Bullock Cart, 35.29 per cent possess plough, 2.94 per cent possess Sprayer, 76.47 per cent possess Weeder, 8.82 per cent possess Chaff Cutter and 2.94 per cent possess JCB/Hitachi.

Regarding livestock possession by the households, 14.71 per cent possess local cow and 8.82 per cent possess buffalo. The average labour availability in the study area showed that**,** own labour men available in the micro watershed was 1.38, women available in the micro watershed was 1.22, hired labour (men) available was 7.41 and hired labour (women) available was 12.41. Further, 85.29 per cent of the household opined that hired labour was adequate.

In the study area, about 2.80 per cent of the respondents migrated from the micro watershed in search of jobs with an average distance of 495.00 kms for about 3.75 months.

Out of the total land holding of the sample respondents 92.88 per cent (39.84 ha) of the area is under dry condition and the remaining 7.12 per cent area is irrigated land. Bore well was the major source of irrigation for 2.94 per cent of the households.

The major crops grown by sample farmers are Red gram, Cotton, Paddy, Maize and Groundnut and cropping intensity was recorded as 100.00 per cent. Out of the sample households 85.29 percent possessed bank account and 73.53 per cent of them have savings in the account. About 47.06 per cent of the respondents borrowed credit from various sources. Among the credit borrowed by households, 12.50 per cent have borrowed loan from commercial banks.

Majority of the respondents (100.00%) have borrowed loan for agriculture purpose. Regarding the opinion on institutional sources of credit, 100.00 per cent of the households opined that credit helped to perform timely agricultural operations. Per hectare cost of cultivation for Red gram, Cotton, Paddy, Maize and Groundnut was Rs.22085.73, 32319.65, 27386.33, 12694.39 and 39182.72 with benefit cost ratio of 1:1.90, 1: 1.90, 1: 1.40, 1: 2.50 and 1:1.10 respectively.

Further, 23.53 per cent of the households opined that dry fodder was adequate. The average annual gross income of the farmers was Rs. 101457.35 in micro-watershed, of which Rs. 57680.88 comes from agriculture. Sampled households have grown 60 forestry trees together in the fields and back yards. About 79.41 per cent of the households shown interest to cultivate horticultural crops.

Households have an average investment capacity of Rs. 7941.18 for land development and Rs. 12029.41 for irrigation facility. Source of funds for additional investment is concerned, 34.29 per cent depends on own funds and 5.71 per cent depends on bank loan for land development activities. Regarding marketing channels, 41.18 per cent of the households have sold agricultural produce to the local/village merchants, while, 44.12 per cent have sold in regulated markets.

Further, 50.00 per cent of the households have used tractor for the transport of agriculture commodity. Majority of the farmers (38.24%) have experienced soil and water erosion problems in the watershed and 82.35 per cent of the households were interested towards soil testing. Fire wood was the major source of fuel for domestic use for 85.29 per cent of the households and 11.76 per cent households has LPG connection.

Piped supply was the major source for drinking water for 76.47 per cent of the households. Electricity was the major source of light for 100.00 per cent of the households. In the study area, 67.65 per cent of the households possess toilet facility. Regarding possession of PDS card, 100.00 per cent of the households possessed BPL card. Households opined that, the requirement of cereals (94.12%), pulses (94.12%) and oilseeds (47.06%) are adequate for consumption.

Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (82.35%) wild animal menace on farm field (85.29%), frequent incidence of pest and diseases (79.41%), inadequacy of irrigation water (79.41%), high cost of fertilizers and plant protection chemicals (82.35%), high rate of interest on credit (79.41%), low price for the agricultural commodities (85.29%), lack of marketing facilities in the area (64.71%), inadequate extension services (58.82%), lack of transport for safe transport of the agricultural produce to the market (64.71 %) and less rainfall (2.94 %).

Implications of the survey

- ✓ Result indicated that, there were 44.76 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, 82.35 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 37.01ha (92.88 %) of dry land and 2.84ha (7.12 %) of irrigated land hence, the availability of the dryland agricultural technologies such as short

duration crops, high yielding drought resistance crop varieties, drip irrigation technology and subsidy information will be helpful for the farmers to enhance the productivity of land and as well as farmers income.

- ✓ Few of the bore well in micro watershed found non functional hence, farmers may be trained on possibility of bore well rejuvenation.
- ✓ Bore well was major source of irrigation for 0.00 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.
- ✓ Farmers have grown 10 coconut, 52 Custard apple, 4 Guava, 10 Jamun, 11 Lemon trees in the fields, Further, 78 mango trees were also planted in the farm fields. Hence, production technologies related to these crops can be made available to the farmers for better adoption.
- ✓ The cropping intensity in the micro watershed was found to be (100.00 %) hence, care must be taken by the implementing agency to bring uncultivated land into cultivation through suitable measures.
- ✓ Many of the household members have borrowed loan from cooperative banks which has higher rate of interest hence, farmers may be sensitized on the different sources of credit with lesser interest rate such SHGs etc.
- ✓ The results indicated the non availability of both green and dry fodder throughout the year hence, fodder development activities can be taken up in the micro watershed.
- ✓ The average annual gross income of the households Rs.57680.88 from agriculture, Rs.0.00 from business and Rs. 38329.41 from wages and. Agriculture was found to be the major source of income for households hence; the development activities should focus on productivity enhancement, marketing arrangements and agricultural technology dissemination to have a direct impact on the farmers.
- ✓ The cultivation of forest species is found minimal hence, information and production technology related to agro-forestry and integrated farming system.
- ✓ The data indicated that, 38.24 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, 82.35 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 (82.35%), wild animal menace on farm field (85.29%), frequent incidence of pest and diseases (79.41%), high cost of fertilizers and plant protection chemicals (82.35%), high rate of interest on credit (79.41%), low price for the agricultural commodities (85.29%), lack of marketing facilities in the area (64.71%), inadequate extension services (58.82%), lack of transport for safe transport of the agricultural produce to the market (64.71%) 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.