ICAR-NBSS&LUP Sujala MWS Publ.84

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

NALLUR (4B3D3N2c) MICROWATERSHED

Gubbi Taluk, Tumkur District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

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

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PREFACE

In Karnataka, as in other Indian States, the livelihoods of rural people are intertwined with farming pursuits. 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 NallurMicrowatershed, Gubbi Taluk and Tumakuru 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 micowatershed. The project report with the accompanying maps for the Microwatershed will provide required detailed database for evolving effective land use plan, alternative land use options and conservation plans for the planners, administrators, agricutural extention personnel, KVK officials, developmental departments and other land users to manage the land resources in a sustainable manner.

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

Nagpur **S.K. SINGH**
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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

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

The present study covers an area of 604 ha in Gubbi taluk of Tumakuru district, Karnataka. The climate is semiarid and categorized as drought-prone with an average annual rainfall of 813 mm, of which about 466 mm is received during south-west monsoon, 196 mm during north-east and the remaining 151 mm during the rest of the year. An area of about 95 per cent is covered by soils and two per cent by others. The salient findings from the land resource inventory are summarized briefly below.

- ❖ *The soils belong to 7 soil series and 13 soil phases (management units) and 4 land use classes.*
- ❖ *The length of crop growing period is about 150 days starting from 3rd week of June to third week of November.*
- ❖ *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- ❖ *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 250 m grid interval.*
- ❖ *Land suitability for growing 34 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- ❖ *Entire area is suitable for agriculture.*
- ❖ *About 98 per cent of the soils are deep (100-150 cm) to very deep (>150 cm).*
- ❖ *About 2 per cent of the area has clayey soils at the surface and 96 per cent loamy soils.*
- ❖ *Entire area in the microwatershed has non-gravelly soils (<15%).*
- ❖ *An area of about 35 per cent are low (51-100 mm/m, 11 per cent medium (101-150 mm/m) and a maximum area of 52 per cent very high (>200 mm/m) in available water capacity.*
- ❖ *About 98 per cent of the area has nearly level (0-1%) to very gently sloping (1-3% slope) lands.*
- ❖ *An area of about 83 per cent has soils that are slightly eroded (e1) and 15 per cent moderately eroded (e2).*
- ❖ *Maximum area of about 68 per cent has soils that are slightly acidic to moderately and strongly acid (pH 5.0-6.5), 27 per cent area neutral (pH 6.5-7.3) and about 2 per cent has soils that are slightly alkaline (pH 7.3 to 7.8).*

- *The Electrical Conductivity (EC) of the soils are dominantly <2 dsm^{-1}indicating that the soils are non-saline.*
- *About 87 per cent of the soils are low (<0.5%) and 11 per cent soils are medium (0.5-0.75%) in organic carbon.*
- *Entire area in the microwatershed is high (>57 kg/ha) in available phosphorus.*
- *About 13 per cent of the soils are low (<145 kg/ha), medium (145-337 kg/ha) in 80 per cent area and 5 per cent of the soils are high (>337 kg/ha) in available potassium.*
- *Available sulphur is medium (10 -20 ppm) in an area of about 97 per cent and low (10 ppm) in an area of 1 per cent.*
- *Available boron is low (<0.5 ppm) in maximum area about 55 per cent and medium (0.5-1.0 ppm) in 43 per cent area.*
- *Available iron is sufficient (>4.5 ppm) in the entire area.*
- *Available manganese and copper are sufficient in all the soils of the microwatershed.*
- *Available zinc is deficient (<0.6 ppm) in 31 per cent and sufficient (>0.6 ppm) in 67 per cent of soils of the microwatershed.*
- *The land suitability for 34 major crops grown in the microwatershed were assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the Microwatershed

Crop	*Suitability Area in ha (%)*			*Crop*	*Suitability Area in ha (%)*	
	Highly suitable (S1)	*Moderately suitable (S2)*			*Highly suitable (S1)*	*Moderately suitable (S2)*
Sorghum	*381 (63)*	*196 (32)*		*Guava*	*155(27)*	*173 (30)*
Fodder Sorghum	*381 (63)*	*196 (32)*		*Pomegranate*	*381 (63)*	*196 (32)*
Maize	*69 (11)*	*508(84)*		*Banana*	*381 (63)*	*196 (32)*
Upland paddy	*381 (63)*	*196 (32)*		*Jackfruit*	*381 (63)*	*196 (32)*
Finger millet	*381 (63)*	*196 (32)*		*Jamun*	*357 (59)*	*220 (36)*
Redgram	*381 (63)*	*196 (32)*		*Musambi*	*381 (63)*	*196 (32)*
Horse gram	*381 (63)*	*212 (35)*		*Lime*	*381 (63)*	*196 (32)*
Field bean	*381 (63)*	*196 (32)*		*Cashew*	*381 (63)*	*196 (32)*
Cowpea	*381 (63)*	*196 (32)*		*Custard apple*	*439 (73)*	*154(26)*
Groundnut	*24 (4)*	*512 (85)*		*Amla*	*438 (73)*	*154(26)*
Sunflower	*381 (63)*	*196 (32)*		*Tamarind*	*357 (59)*	*220 (36)*
Onion	*69(11)*	*508(84)*		*Marigold*	*381 (63)*	*209 (34)*
Chilli	*381 (63)*	*196 (32)*		*Chrysanthemum*	*381 (63)*	*209 (34)*
Brinjal	*381 (63)*	*196 (32)*		*Jasmine*	*381 (63)*	*209 (34)*
Tomato	*381 (63)*	*196 (32)*		*Coconut*	*381 (63)*	*196 (32)*
Mango	*357 (59)*	*220(36)*		*Arecanut*	*381 (63)*	*196 (32)*
Sapota	*381 (63)*	*196 (32)*				

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 4 identified LUCs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and horticulture crops.

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

Chapter 1

INTRODUCTION

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

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

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

Therefore, the land resource inventory required for farm level planning is the one which investigates not only the surface but also consider the other parameters which are critical for productivity *viz.*, soils, climate, water, minerals and rocks, topography, geology, hydrology, vegetation, crops, land use pattern, animal population, socio-economic conditions, infrastructure, marketing facilities and various schemes and developmental works of the government etc. From the data collected at farm level, the specific problems and potentials of the area can be identified and highlighted, conservation measures required for the area can be planned on a scientific footing, suitability of the area for various uses can be worked out and finally viable and sustainable land use options suitable for each and every land holding can be prescribed.

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

The land resource inventory aims to provide site specific database for Nallur microwatershed in Gubbi Taluk, Tumakuru 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.

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

GEOGRAPHICAL SETTING

2.1 Location and Extent

Tumakuru District popularly known as *Kalpataru Nadu* (famous for production of Coconuts) is located in the southeastern part of Karnataka State. The Nallur microwatershed (Bangihalli subwatershed) is located in the southeastern part of Karnataka in Gubbi Taluk, Tumakuru District, Karnataka State (Fig.2.1). It comprises parts of Malamachanakunte, Maranahalli, Ankasandra and Nalluru villages. It lies between 13^0 27' and 13^0 28' North latitudes and 76^0 53' and 76^0 55' East longitudes and covers an area of 604 ha. It is about 71 km south of Tumakuru and is surrounded by Malamachanakunte on the north, Maranahalli on the west, Nallur on the east and Ankasandra on southern side.

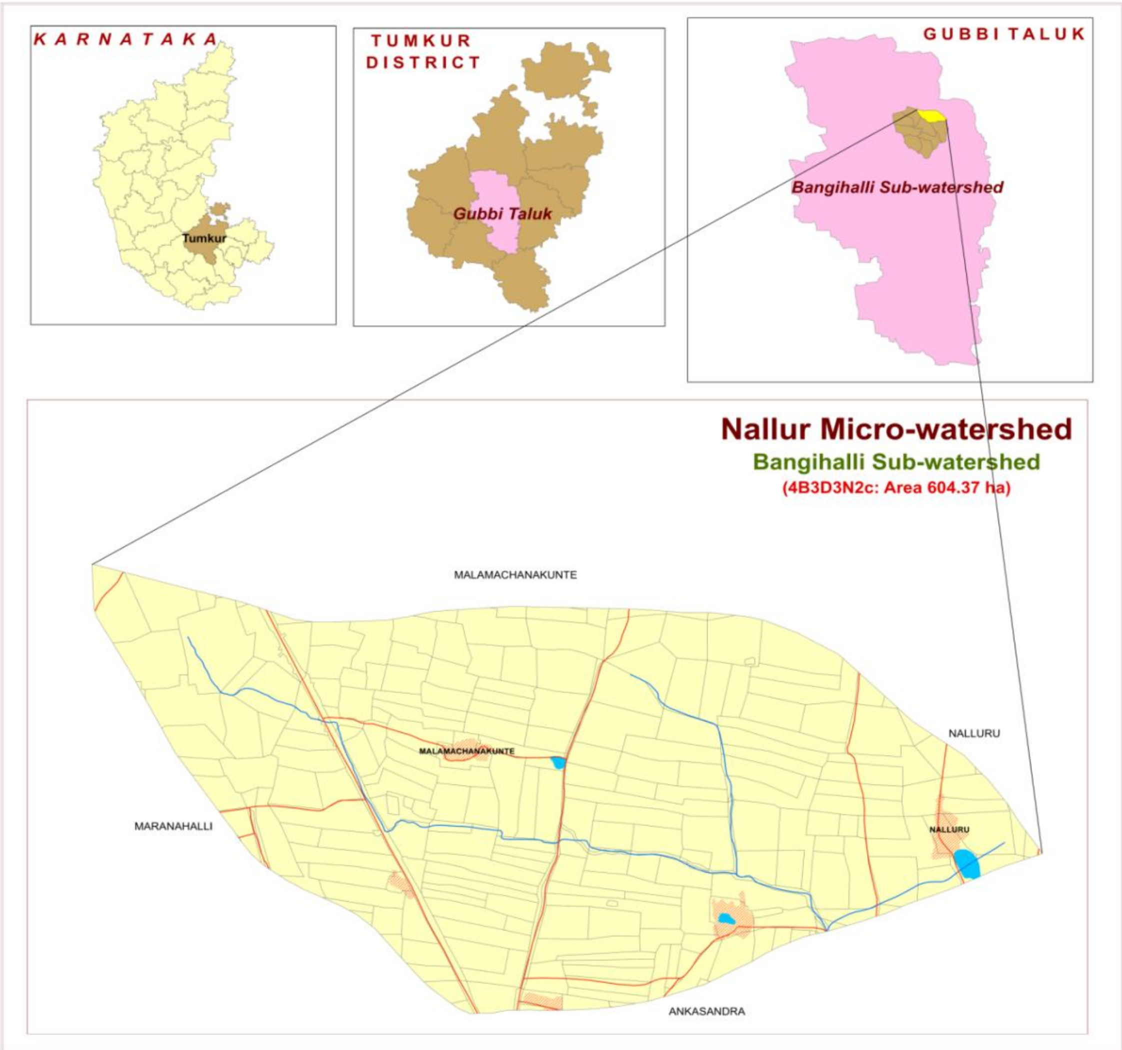


Fig.2.1 Location map of Nallur Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are granite gneiss and alluvium (Fig.2.2 and 2.3). Granite and gneiss 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. The most widespread and characteristic development of alluvium in the watershed region lying in the Suvarnamukhi is a wide belt, the underlying formation is gneiss and alluvial soils occur over gneiss, limestone and shale are far more extensive and homogeneous than those found on the Deccan Trap country lying to the river Suvarnamukhi. The soil thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soil originally formed at higher elevation, but now occupying river valleys.

Fig.2.2 Granite and granite gneiss rocks

Fig. 2.3 Alluvium

2.3 Physiography

Physiographically, the area has been identified as granite gneiss landscape based on geology. It has been further divided into three landforms *viz*; mounds/ ridges, uplands and lowlands based on slope and other relief features. They have been further subdivided into four physiographic units, *viz;* summits, side slopes, very gently sloping uplands and lowlands/valleys. The elevation ranges from 817-846 m. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

There are no perennial rivers flowing in Gubbi taluk. However, the area is drained by several small seasonal streams like *Hosa kaluve* which joins river Shimsha along its course. Though, they are not perennial, during rainy season, it carries large quantities of rain water. The microwatershed area has only few small tanks which are not capable of storing water that flows during the rainy season. Due to this, the ground water recharge is very much affected in the villages. This is reflected in the failure of many bore wells in the villages. If the available rain water is properly harnessed by constructing 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 dendritic to sub parallel.

2.5 Climate

The district falls under semiarid tract and is categorized as drought - prone with average annual rainfall of 813 mm (Table 2.1). Of the total rainfall, a maximum of 466 mm is received during south–west monsoon period from June to September, north-east monsoon from October to early December contributes maximum of about 196 mm and the remaining 151 mm is received during the rest of the year. The winter season is from December to February. During April and May, the temperatures reach up to 35°C and in December and January, the temperatures will go down to 20°C. Rainfall distribution is shown in Figure 2.4. The average Potential Evapo-Transpiration (PET) is 110 mm and varies from a low of 73 mm in December to 152 mm in the month of April. The PET is always higher than precipitation in all the months except in the months of August, September, October and December. Generally, the Length of crop Growing Period (LGP) is 150 days and starts from 3rd week of June to third week of November.

Table 2.1 Mean Monthly Rainfall, PET, 1/2 PET in Gubbi Taluk, Tumakuru District

Sl. no.	Months	Rainfall	PET	1/2 PET
1	JAN	6.50	78.30	39.15
2	FEB	7.00	102.70	51.35
3	MAR	24.40	142.60	71.30
4	APR	40.50	151.60	75.80
5	MAY	72.50	149.70	74.85
6	JUN	78.50	121.10	60.55
7	JUL	99.20	107.60	53.80
8	AUG	119.70	105.80	52.90
9	SEP	168.30	101.20	50.60
10	OCT	141.90	100.20	50.10
11	NOV	47.00	85.00	42.50
12	DEC	7.30	73.00	36.50
Total		**812.80**	**109.90**	

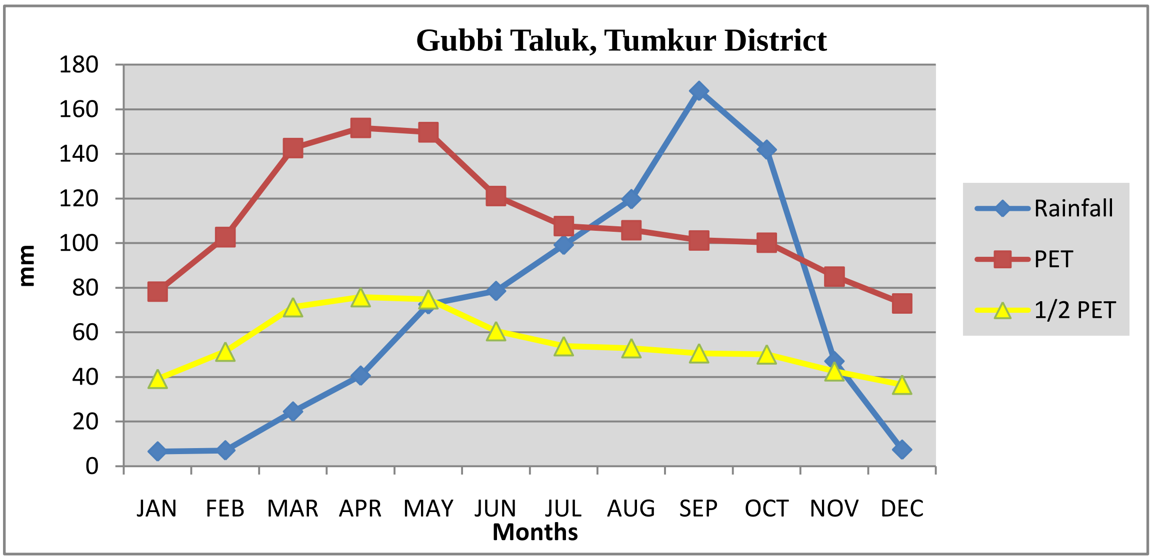


Fig 2.4 Rainfall distribution in Gubbi Taluk, Chamarajanagara District

2.6 Natural Vegetation

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

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

Fig. 2.5 Natural vegetation of Nallur Microwatershed

2.7 Land Utilization

About 64 per cent area (Table 2.2) in Gubbi taluk is cultivated at present. An area of about 4 per cent is currently barren. Forests occupy an area of about 8 per cent. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are Ragi, Groundnut, Maize, Sorghum, Redgram, Horse gram, Sunflower, Field bean, Cowpea, Mango, Banana, Mulberry and Plantation crops like Coconut, Banana and Arecanut. The cropping intensity is 116 per cent in the taluk. While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the Nallur microwatershed is prepared. The current land use map generated shows the arable and non-arable lands, other land uses and different types of crops grown in the area (Fig 2.6). The different crops and cropping systems adopted in the microwatershed is presented in Figures 2.8.a &b. Simultaneously, enumeration of wells (bore wells and open wells) and existing conservation structures in the microwatershed are made and their location in different survey numbers is located on the cadastral map. Map showing the location of wells and other water bodies in Nallur microwatershed is given in Fig.2.7.

Table 2.2 Land Utilization in Gubbi Taluk

Sl. No.	Agricultural land use	Area (ha)	Per cent
1	Total geographical area	122057	-
2	Total cultivated area	78418	64.24
3	Area sown more than once	12934	-
4	Cropping intensity	-	116.49
5	Trees and grooves	2811	2.30
6	Forest	10090	8.26
7	Cultivable wasteland	2731	2.23
8	Permanent Pasture land	3850	3.15
9	Barren land	4971	4.07
10	Non- Agriculture land	17390	14.24

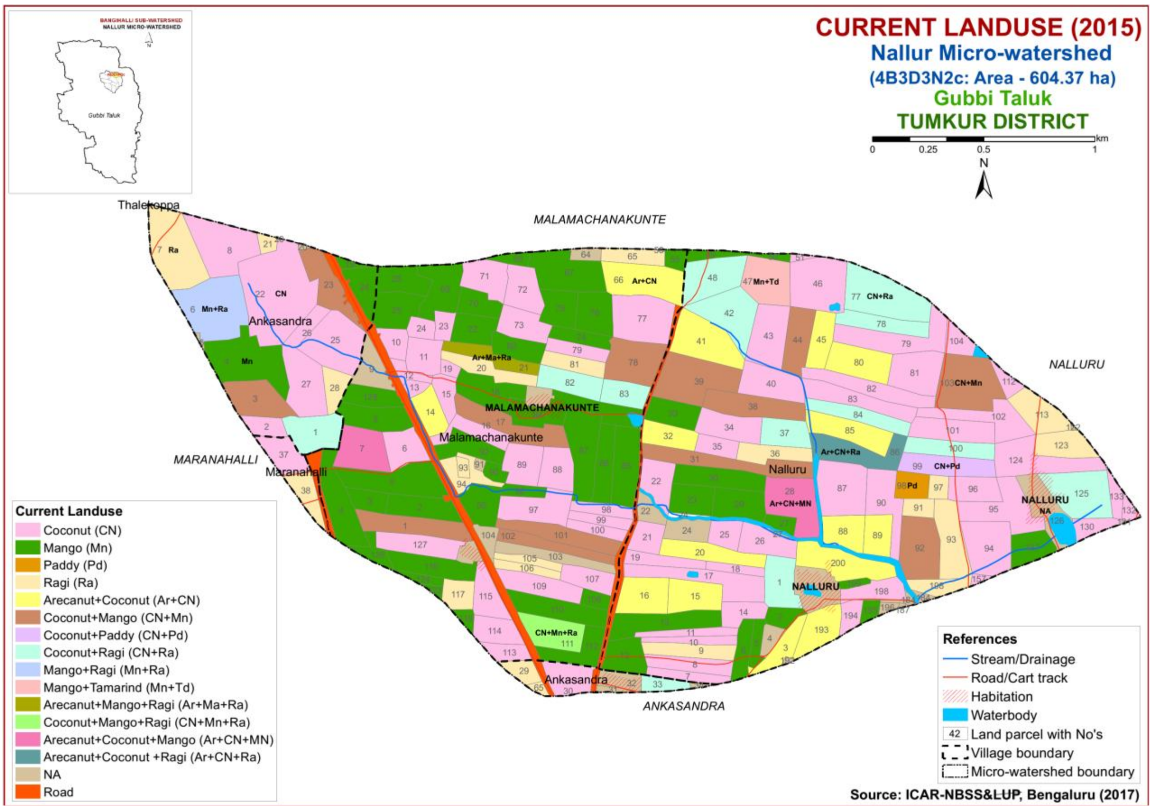


Fig.2.6 Current Land Use – Nallur Microwatershed

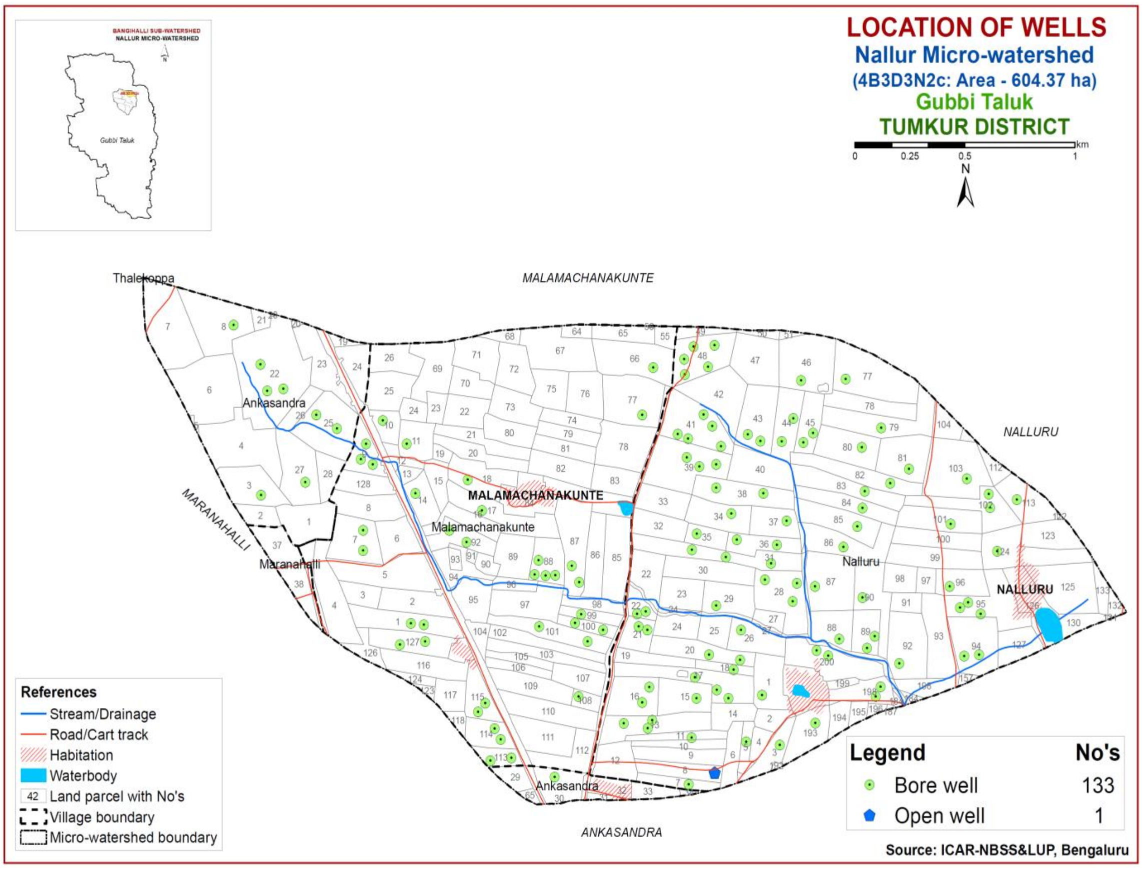


Fig.2.7 Location of Wells and Conservation Structure- Nallur Microwatershed

Fig.2.8.a Different crops and cropping systems in Nallur Microwatershed

Fig.2.8.b Different crops and cropping systems in Nallur Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly to a given level of management. This was achieved in Nallur 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.) and followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units, and showing their extent and geographic distribution on the microwatershed cadastral map. The detailed survey at 1:7920 scale was carried out in an area of 604 ha. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

The detailed survey of the land resources occurring in the microwatershed was carried out by using digitized cadastral map as a base. The cadastral map shows field boundaries with their survey numbers, location of tanks, streams and other permanent features of the area (Fig. 3.1). Apart from the cadastral map, remote sensing data products from Cartosat-1 and LISS IV merged at the scale of 1:7920 were used in conjunction with the cadastral map to identify the landscapes, landforms and other surface features. The imagery helped in the identification and delineation of boundaries between hills, uplands and lowlands, water bodies, forest and vegetated areas, roads, habitations and other cultural features of the area (Fig.3.2).The cadastral map was overlaid on the satellite imagery (Fig.3.3) that helps to identify the parcel boundaries and other permanent features. Apart from cadastral maps and images, toposheets of the area (1:50,000 scale) were also used for initial traversing, identification of geology, landscapes, 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 the microwatershed area was visually interpreted using image interpretation elements along with the geology map and all the available collateral data with local knowledge. The delineated physiographic boundaries were transferred on to a cadastral map overlaid on satellite imagery. Physiographically, the area has been identified as granite gneiss and alluvial landscape and is divided into landforms such as ridges, mounds, uplands and valleys based on slope and other relief features. 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 landform

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

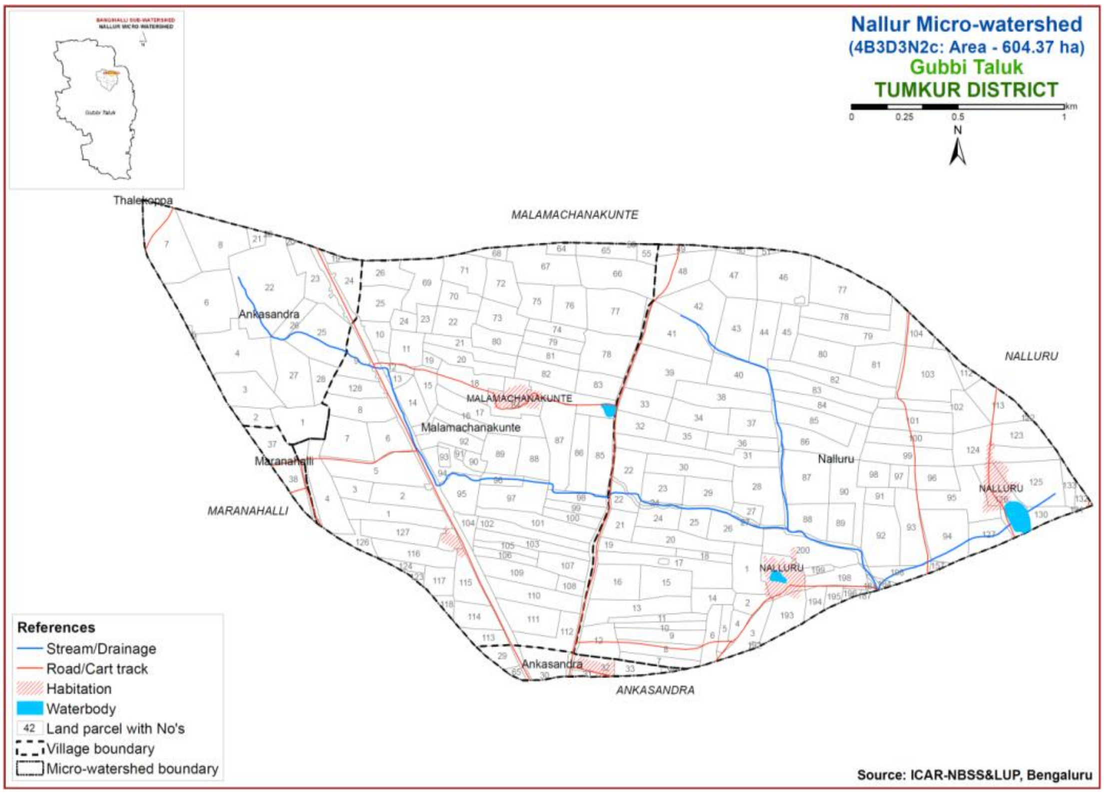


Fig 3.1 Scanned and Digitized Cadastral map of Nallur Microwatershed

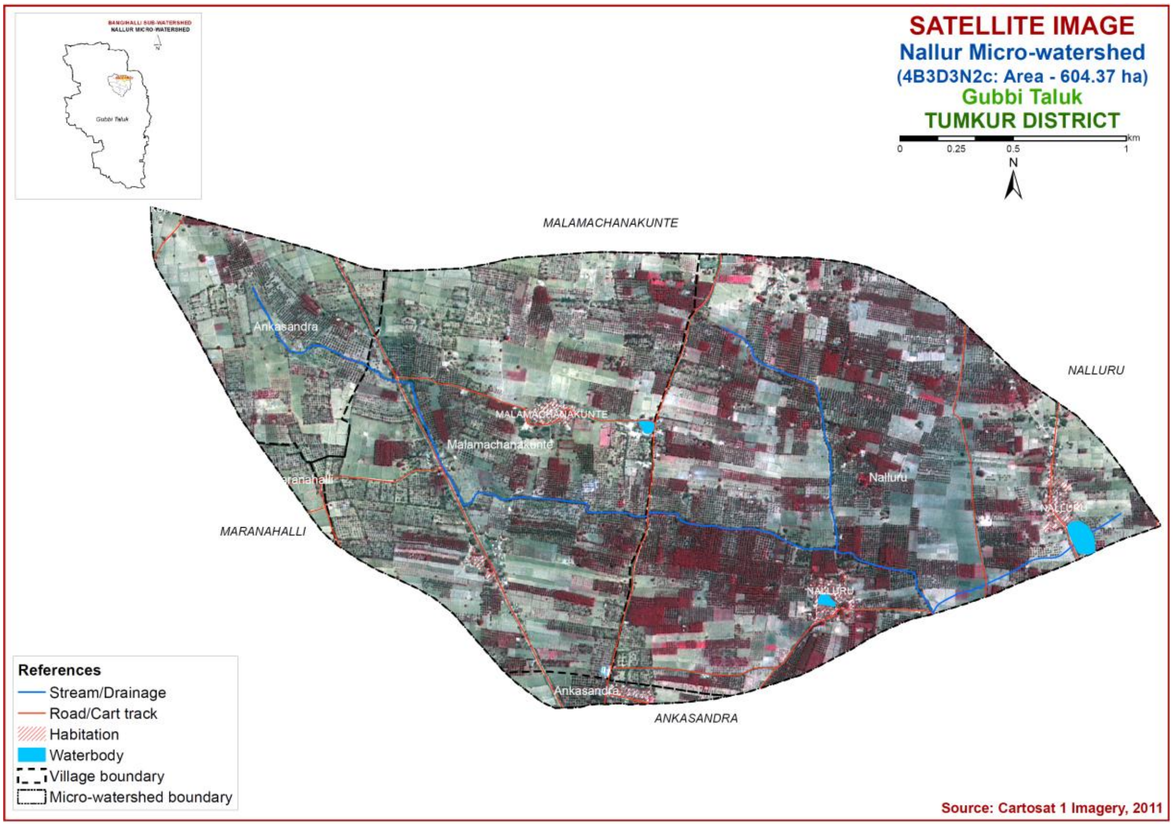


Fig.3.2 Satellite Image of Nallur Microwatershed

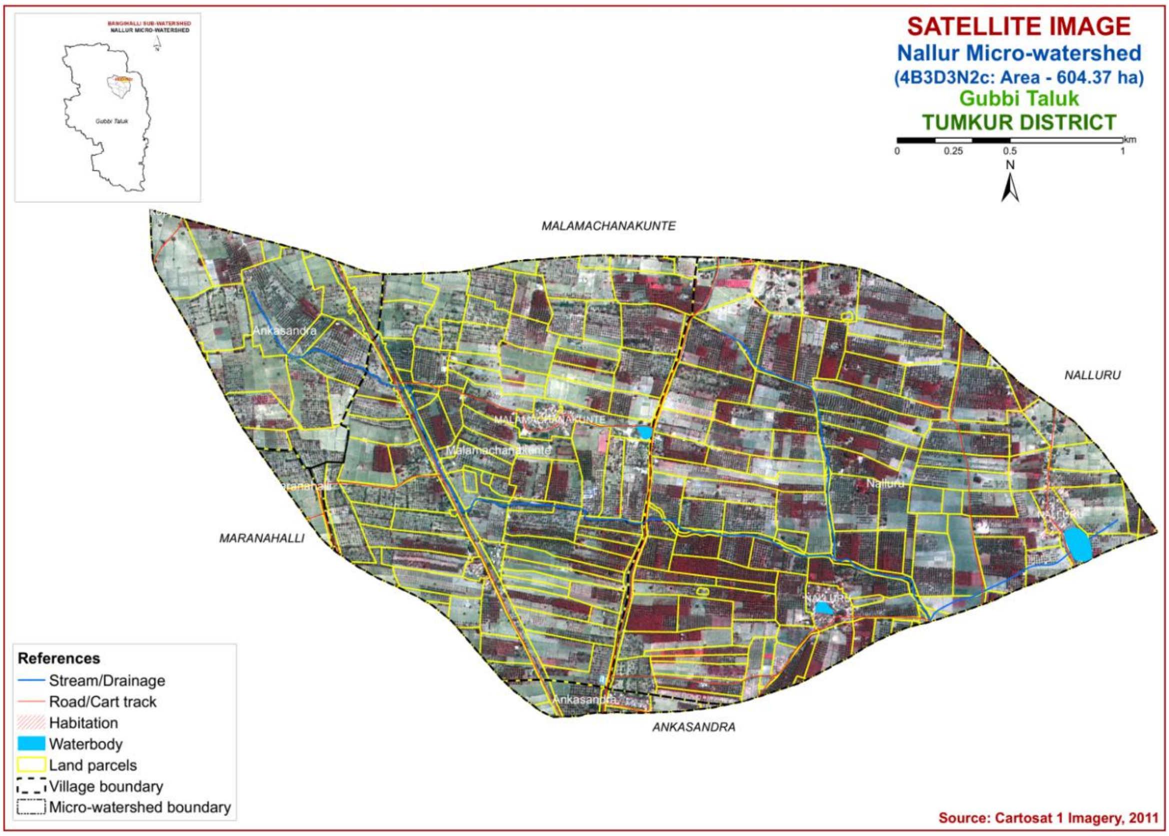


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Nallur Microwatershed

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).

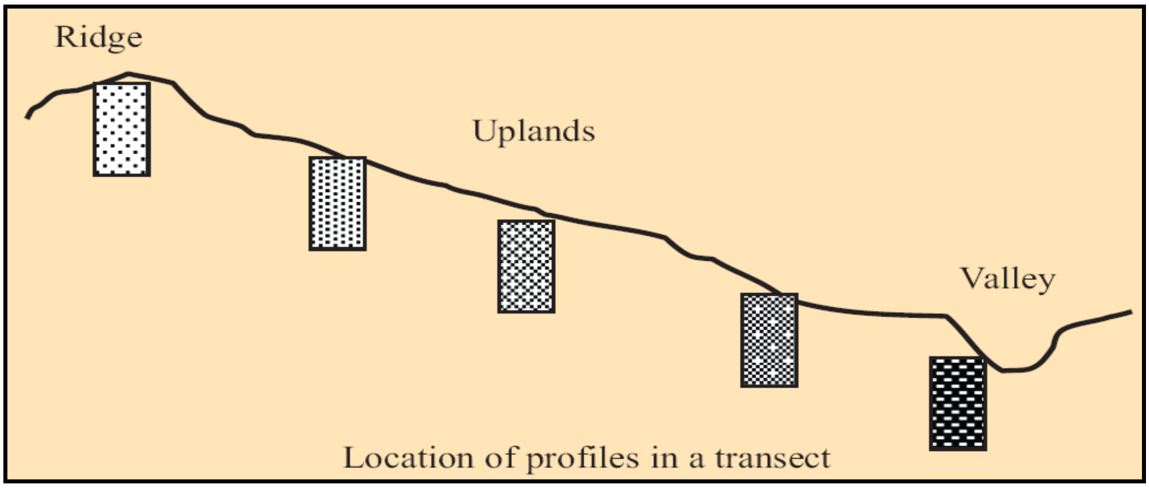


Fig: 3.4. Location of profiles in a transect

In the selected transect, soil profiles (Fig. 3.4) were located at closely spaced intervals to take care of any change in the land features like break in slope, erosion, gravel, stones etc. In the selected sites, profiles (vertical cut showing the soil layers from surface to the rock) were opened up to 200 cm or to the depth limited by rock or hard substratum and studied in detail for all their morphological and physical characteristics. The soil and site characteristics were recorded for all profile sites on a standard proforma as per the guidelines given in USDA Soil Survey Manual (Soil Survey Staff, 2012). Apart from the transect study, profiles were also studied at random, almost like in a grid pattern, outside the transect areas.

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

The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 7 soil series were identified in the Nallur microwatershed.

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

Sl. No	Soil Series	Depth (cm)	Colour (moist)	Texture (control section)	Gravel (%) (control section)	Horizon sequence	Calcareo-usness
Soils of Granite gneiss Landscape							
1	Mornal (MNL)	>150	5YR3/3,3/4 7.5YR3/3,3/4	c	<15	Ap-Bt	-
2	Balapur (BPR)	100-150	2.5YR2.5/4,3/4	sc-c	>35	Ap-Bt-Cr	-
3	Nagalapur (NGP)	100-150	5YR2.5/2,3/2 2.5YR3/6,4/6	sc-c	>35	Ap-Bt-Cr	-
4	Hallikere (HLK)	>150	5YR3/3,3/4 7.5YR3/3,3/4	c	<15	Ap-Bt	-
5	NDL (Niduvalalu)	>150	2.5YR2.5/3, 2.5/4, 3/3,4/6	sc	>35	Ap-Bt	-
Soils of Alluvial Landscape							
6	Budagumpa (BGP)	>150	7.5YR3/2,5/1 10 YR 4/1, 4/4	c		Ap-Bw	-
7	Kadagathur (KDT)	>150	10 YR 3/1, 3/2, 3/3, 7.5YR 3/3, ¾	sc-c	-	Ap-Bw	-

3.4 Soil Mapping

The area under each soil series was further separated into 13 soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management.

The soil mapping units are shown on the map (Fig.3.5) in the form of symbols. During the survey about 8 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 13 mapping units representing 7 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 13 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.

The 13 soil phases identified and mapped in the microwatershed were grouped into 4 Land Use Classes (LUC's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Use Classes (LUCs) based on the management needs. One or more than one soil site characteristic having influence on the management have been choosen for identification and delineation of LUCs. For Nallur microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope, erosion and gravel content have been considered for defining LUCs. The Land Use Classes are expected to behave similarly for a given level of management.

3.5 Laboratory Characterization

Soil samples were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected from farmer's fields (88 samples) for fertility status (major and micronutrients) at 250 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated for the microwatershed.

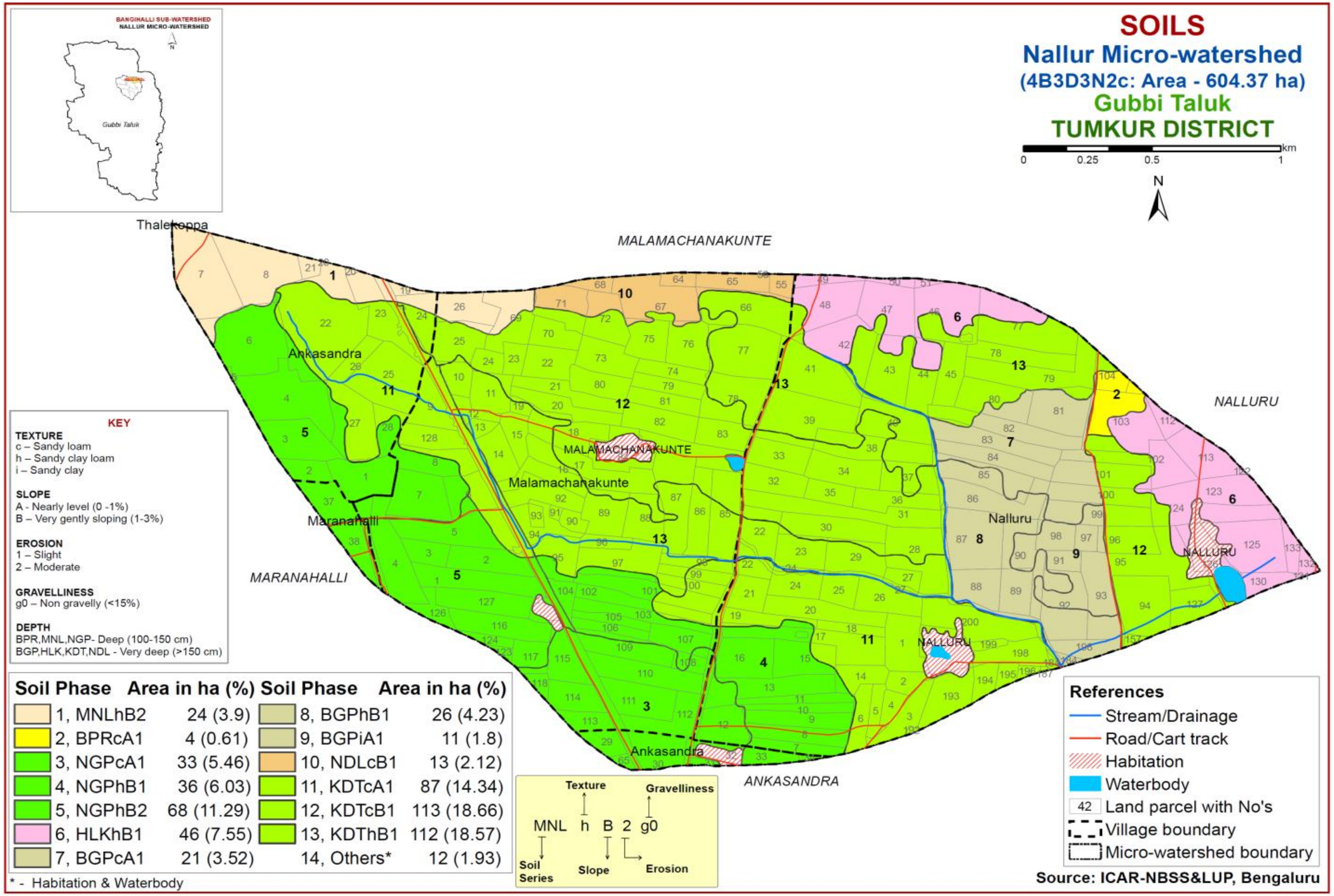


Fig 3.5 Soil Phase or Management Units Map - Nallur Microwatershed

Table 3.2 Soil map unit description of Nallur Microwatershed
(Soil Legend)

Soil No	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
SOILS OF GRANITE GNEISS LANDSCAPE				
	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands under cultivation		**24 (3.90)**
1		MNLhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	24 (3.90)
	BPR	Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on very gently sloping uplands under cultivation		**4 (0.61)**
2		BPRcA1	Sandy loam surface, slope 0-1%, slight erosion	4 (0.61)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on very gently sloping uplands under cultivation		**137 (22.78)**
3		NGPcA1	Sandy loam surface, slope 0-1%, slight erosion	33 (5.46)
4		NGPhB1	Sandy clay loam surface, slope 1-3%, slight erosion	36 (6.03)
5		NGPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	68 (11.29)
	HLK	Hallikere soils are very deep (>150 cm), well drained, have dark brown to dark reddish brown clayey soils occurring on very gently sloping uplands under cultivation		**46 (7.55)**
6		HLKhB1	Sandy clay loam surface, slope 1-3%, slight erosion	46 (7.55)
	NDL	Niduvalalu soils are very deep (>150 cm), well drained, have red to dark reddish brown gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**13 (2.12)**
7		NDLcB1	Sandy loam surface, slope 1-3%, slight erosion	13 (2.12)
SOILS OF ALLUVIAL LANDSCAPE				
	BGP	Budagumpa soils are very deep (>150 cm), moderately well drained, black calcareous cracking gravelly clay soils occurring on nearly level to very gently sloping uplands under cultivation		**58 (9.55)**
8		BGPcA1	Sandy loam surface, slope 0-1%, slight erosion	21 (3.52)
9		BGPhB1	Sandy clay loam surface, slope 1-3%, slight erosion	26 (4.23)
10		BGPiA1	Sandy clay surface, slope 0-1%, slight erosion	11 (1.80)
	KDT	Kadagathur soils are very deep (>150 cm), moderately well drained, have dark brown to very dark grayish brown sandy clay to clay soils occurring on very gently sloping uplands under cultivation		**312 (51.57)**
11		KDTcA1	Sandy loam surface, slope 0-1%, slight erosion	87 (14.34)
12		KDTcB1	Sandy loam surface, slope 1-3%, slight erosion	113 (18.66)
13		KDThB1	Sandy clay loam surface, slope 1-3%, slight erosion	112 (18.57)
	Others	Habitation & Waterbody		12 (1.93)

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and their distribution of different kinds of soils occurring in Nallur microwatershed is provided in this chapter. The microwatershed area has been identifies as granite gneiss and alluvial landscape based on geology. In all, 7 soil series are identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by parent material, relief and climate.

A brief description of each of the 7 soil series identified followed by the soil phases (management units) mapped under each series (Fig. 3.5) are furnished below. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Granite Gneiss Landscape

In this landscape, 5 soil series are identified and mapped. Brief description of each series identified is given below. Of these, Nagalapur (NGP) soil series occupies maximum area of about 137 ha (23%) and Hallikere (HLK) 46 ha (8%) area. The brief description of each soil series and their phases identified in the microwatershed are given below. The mapping unit description (Soil Legend) of the soil phases identified and mapped under each series is given in Table 3.2.

4.1.1 Mornal (MNL) Series: Mornal soils are deep (100-150 cm), well drained have dark reddish brown to dark red sandy clay soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 128 to 146 cm. The thickness of A-horizon ranges from 15 to 25 cm. Its colour is in 5 YR, 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture is sandy clay loam, sandy clay and clay with 15 to 30 per cent gravel. The thickness of B-horizon ranges from 103 to 131 cm. Its colour is in 2.5 YR and 5 YR hue with value 2.5 to 4 and chroma 3 to 6. Texture is sandy clay to clay with less than 15 per cent gravel. The available water capacity is medium (101-150 mm/m). Only one phase was identified and mapped.

Landscape and soil profile characteristics of Mornal (MNL) Series.

4.1.2 Balapur (BPR) Series: Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils. These soils are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Balapur series has been tentatively classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 102 to 147 cm. The thickness of A horizon ranges from 12 to 17 cm. Its colour is in 5 YR and 2.5 YR hue with value and chroma 3 to 4. The texture ranges from loamy sand to sandy clay with 15 to 50 per cent gravel. The thickness of B horizon ranges from 90 to 132 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4 to 6. Texture is sandy clay to clay with 35 to 50 per cent gravel. The available water capacity is medium (100-150 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile Characteristics of Balapur (BPR) Series

4.1.3 Nagalapur (NGP) Series: Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands.

The thickness of the solum ranges from 110 to 142 cm. The thickness of A-horizon ranges from 14 to 20 cm. Its colour is in 7.5 YR hue with value and chroma 3 to 4. The texture ranges from sandy loam to sandy clay with 10 to 50 per cent gravel. The thickness of B horizon ranges from 90 to 128 cm. Its colour is in 2.5 YR, 5 YR and 7.5 YR hue with value 3 to 5 and chroma 3 to 6. Texture is sandy clay to clay with 35 to 80 per cent gravel. The available water capacity is low (51-100 mm/m). Three phases were identified and mapped.

Landscape and Soil Profile Characteristics of Nagalapur (NGP) Series

4.1.4 Hallikere (HLK) Series: Hallikere soils are very deep (>150 cm), well drained, have dark brown and dark reddish brown clayey soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands. The Hallikere series has been tentatively classified as a member of the fine, mixed, isohyperthermic family of Typic Paleaustalfs.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 11 to 14 cm. Its colour is in 7.5 YR and 5 YR hue with value 3 to 4 and chroma 3 to 4. The texture varies from sandy loam to sandy clay loam. The thickness of B horizon is more than 150 cm. Its colour is in 7.5 YR and 5 YR hue with value and chroma 3 to 4. Its texture is clay. The available water capacity is high (150-200 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile Characteristics of Hallikere (HLK) Series

4.1.5 Niduvalalu (NDL): Niduvalalu soils are very deep (>150 cm), well drained, have dark red and dark reddish brown sandy clay soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands under cultivation.

The thickness of the solum is more than 150 cm. The thickness of A-horizon ranges from 11 to 15 cm. Its colour is in 5 YR hue with value 3 to 4 and chroma 4 to 6. The texture varies from sandy loam to sandy clay loam with 10 to 30 per cent gravel. The thickness of B-horizon ranges from 150 to 160 cm. Its colour is in 2.5 YR and 5 YR hue with value 2.5 to 4 and chroma 4 to 6. Its texture is sandy clay and ranges from sandy loam to sandy clay loam with 20 to 75 per cent gravel. The available water capacity is low (50-100 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile Characteristics of Niduvalalu (NDL) Series

4.2 Soils of Alluvial Landscape

In this landscape, 2 soil series are identified and mapped. Brief description of each series identified is given below. Of these, Kadagathur (KDT) soil series occupies maximum area of about 312 ha (52%) and Budagumpa (BGP) 58 ha (10%) area. The brief description of each soil series and their phases identified in the microwatershed are given below.

4.2.1 Budagumpa (BGP) Series: Budagumpa soils are very deep (>150 cm), well drained, black calcareous sandy clay to clay soils. They have developed from granite gneiss and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 120 to 180 cm. The thickness of A horizon ranges from 16 to 26 cm. Its colour is in 7.5 YR and 10 YR hue with value 2 to 3 and chroma 2 to 4. The texture varies from sandy clay to clay with 5 to 10 per cent gravel. The thickness of B horizon ranges from 112 to 160 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 to 5 and chroma 1 to 4. Its texture is clay with gravel content of 10 to 20 per cent. These soils are calcareous that increase with depth. The available water capacity is very high (>200 mm/m). Three phases were identified and mapped.

Landscape and Soil Profile Characteristics of Budagumpa (BGP) Series

4.2.2 Kadagathur (KDT) Series: Kadagathur soils are very deep (>150 cm), moderately well drained, have dark brown to very dark grayish brown sandy clay to clay soils. They have developed from weathered alluvium and occur on nearly level to very gently sloping uplands under cultivation.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 8 to 14 cm. Its colour is in 10 YR hue with value 3 and chroma 4. The texture varies is sandy loam. The thickness of B horizon is more than 150 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 and chroma 1 to 4. Its texture is sandy clay to clay. The available water capacity is very high (>200 mm/m). Three phases were identified and mapped.

Landscape and soil profile characteristics of Kadagathur (KDT) Series

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

5.1 Land Capability Classification

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

Soil characteristics **:** Depth, texture, 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 severe limitations that reduce the choice of crops or that require special conservation practices.

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

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

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

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

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

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

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

The 13 soil map units identified in the Nallur microwatershed are grouped under 2 land capability classes and 4 land capability subclasses. About 98 percent in the microwatershed is suitable for agriculture and 2 percent is not suitable for agriculture (Fig. 5.1).

Good cultivable lands (Class II) cover maximum an area of about 415 ha (69%) and are distributed in the northern, central, northeastern, eastern and southeastern part of the micowatershed with minor problems of soil. Moderately good cultivable lands (Class III) cover an area of about 178 ha (29%) and are distributed in the northern, northwestern and southwestern part of the microwatershed with moderate problems of erosion and soil.

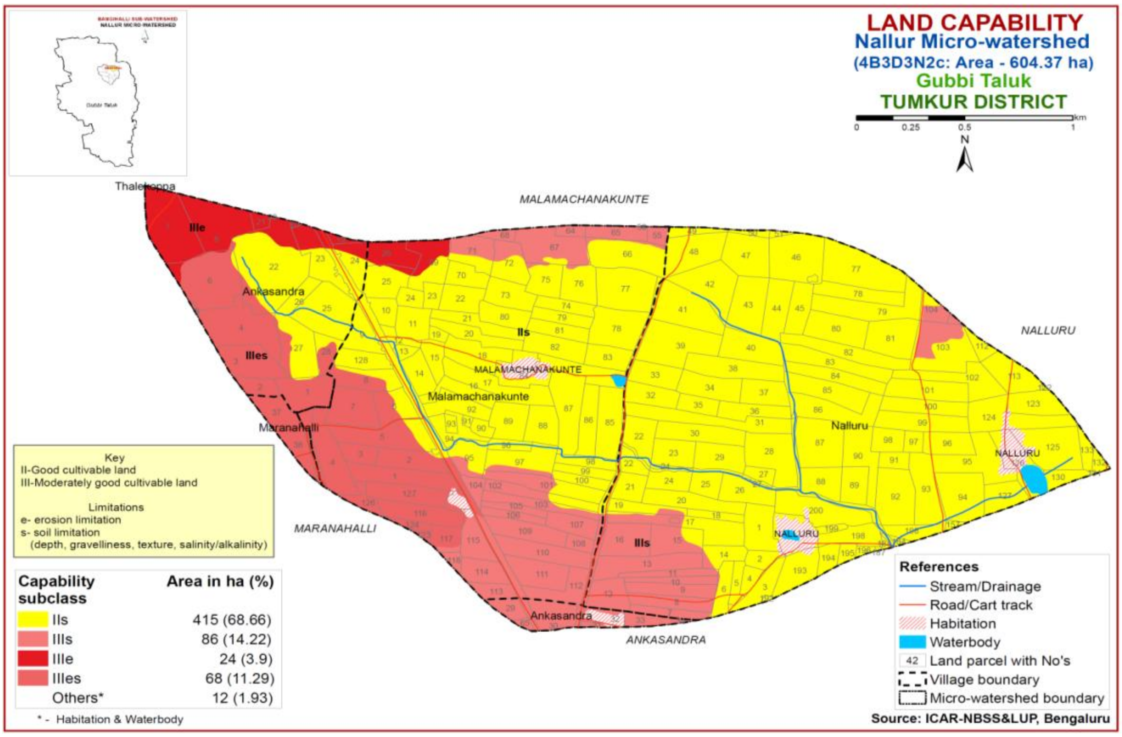


Fig. 5.1 Land Capability map of Nallur Microwatershed

5.2 Soil Depth

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

Deep (100-150 cm) soils occupy an area of 165 ha (27%) and are distributed in the northern, northwestern and southwestern part of the microwatershed. Very deep (>150 cm) soils cover maximum area of 428 ha (71%) and distributed in the northern, northeastern, central, eastern and southeastern part of the microwatershed.

Entire area in the microwatershed is most productive with respect to soil rooting depth where all climatically adapted annual and perennial crops can be.

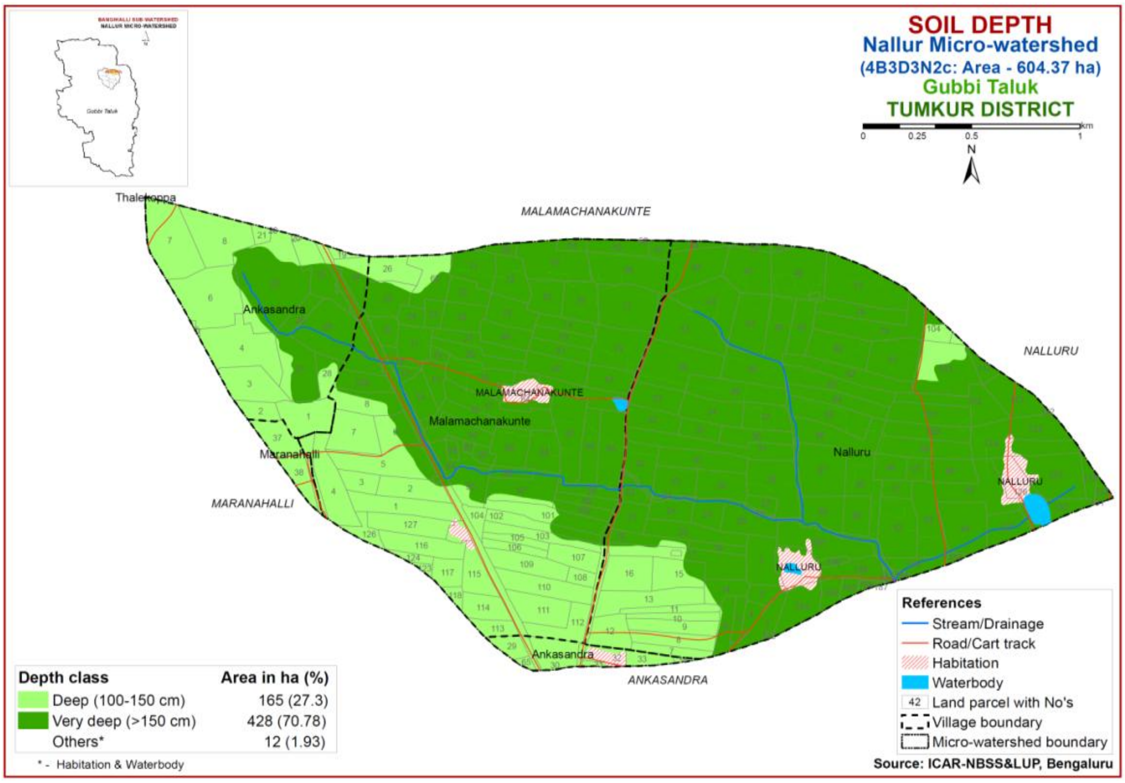


Fig. 5.2 Soil Depth map of Nallur Microwatershed

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.

Maximum area of about 582 ha (96%) has soils that are loamy soils at the surface. They are distributed in major parts of the microwatershed and an area of 11 ha (2%) has soils that are clayey at the surface and are distributed in the central part of the microwatershed (Fig. 5.3).

The most productive lands (2%) with respect to surface soil texture are the clayey soils that have high potential for soil-water retention and availability, and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other most productive lands (96%) are loamy soils which also have high potential for AWC, nutrient availability but have no drainage or other physical problems.

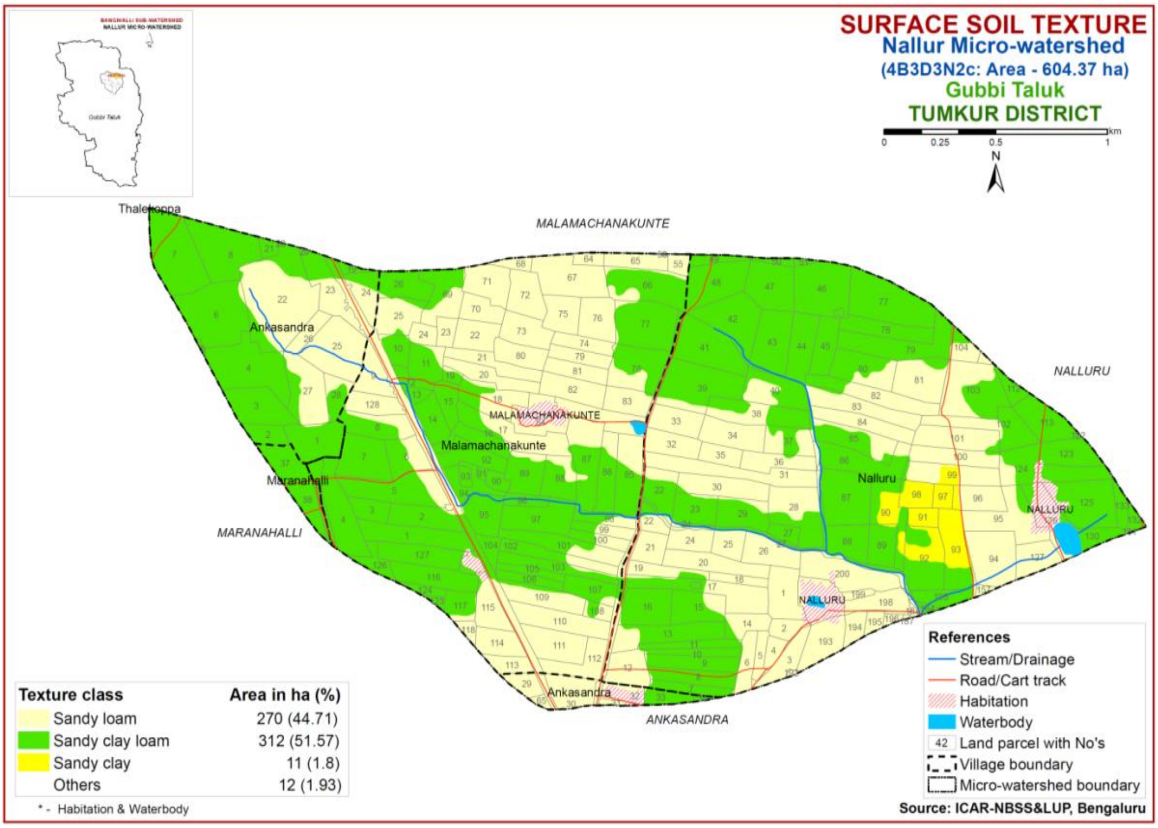


Fig. 5.3 Surface Soil Texture map of Nallur Microwatershed

5.4 Soil Gravelliness

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

Entire area in the microwatershed has non gravelly (<15%) soils (Fig 5.4). All the soils have high potential with respect to gravelliness and all long duration annual and perennial crops can be grown.

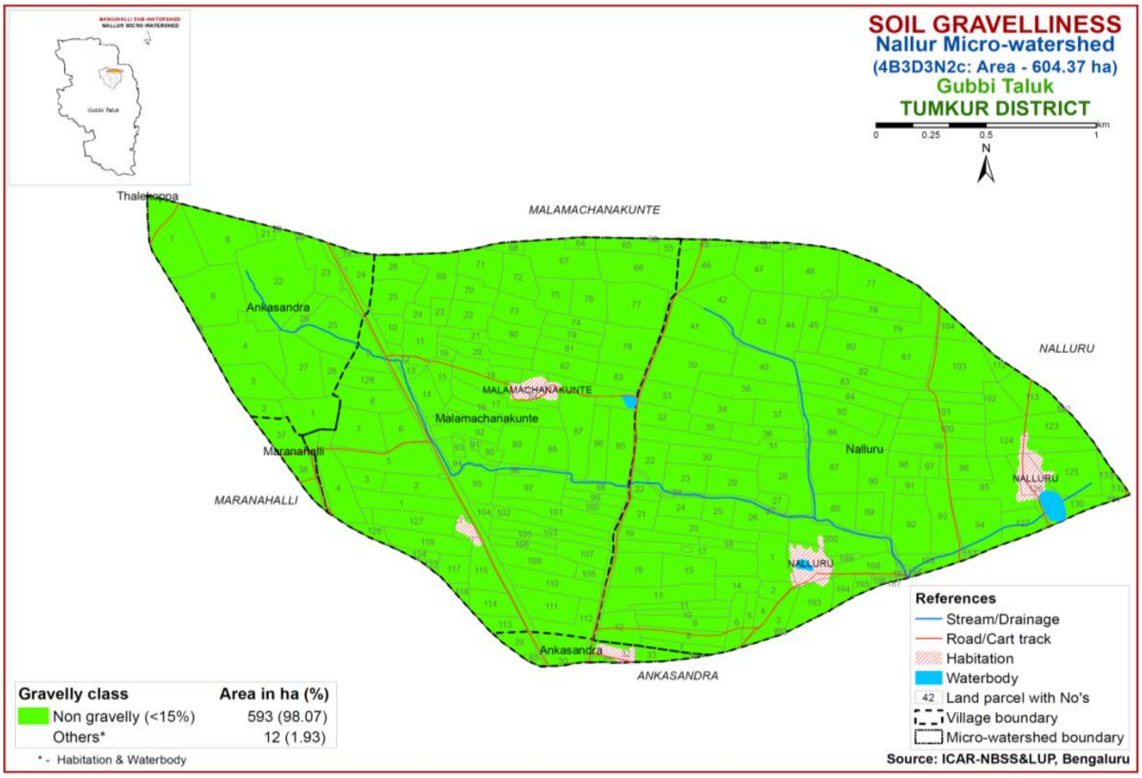


Fig. 5.4 Soil Gravelliness map of Nallur Microwatershed

5.5 Available Water Capacity

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

An area of about 212 ha (35%) are low (51-100 mm/m) in available water capacity and are distributed in the northern, southern, southwestern and southeastern part of the microwatershed. An area of about 69 ha (11%) is medium (101-150 mm/m) in available water capacity and are distributed in the northwestern and northeastern part of the microwatershed. Maximum area of 312 ha (52%) is very high (>200 mm/m) in AWC and are distributed in the central, southeastern and northeastern part of the microwatershed.

About 212 ha (35%) area in the microwatershed has soils that are problematic with regard to available water capacity. Here, only 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. An area of 312 ha (52%) has high potential with respect to AWC, where all climatically adapted annual and perennial crops can be grown.

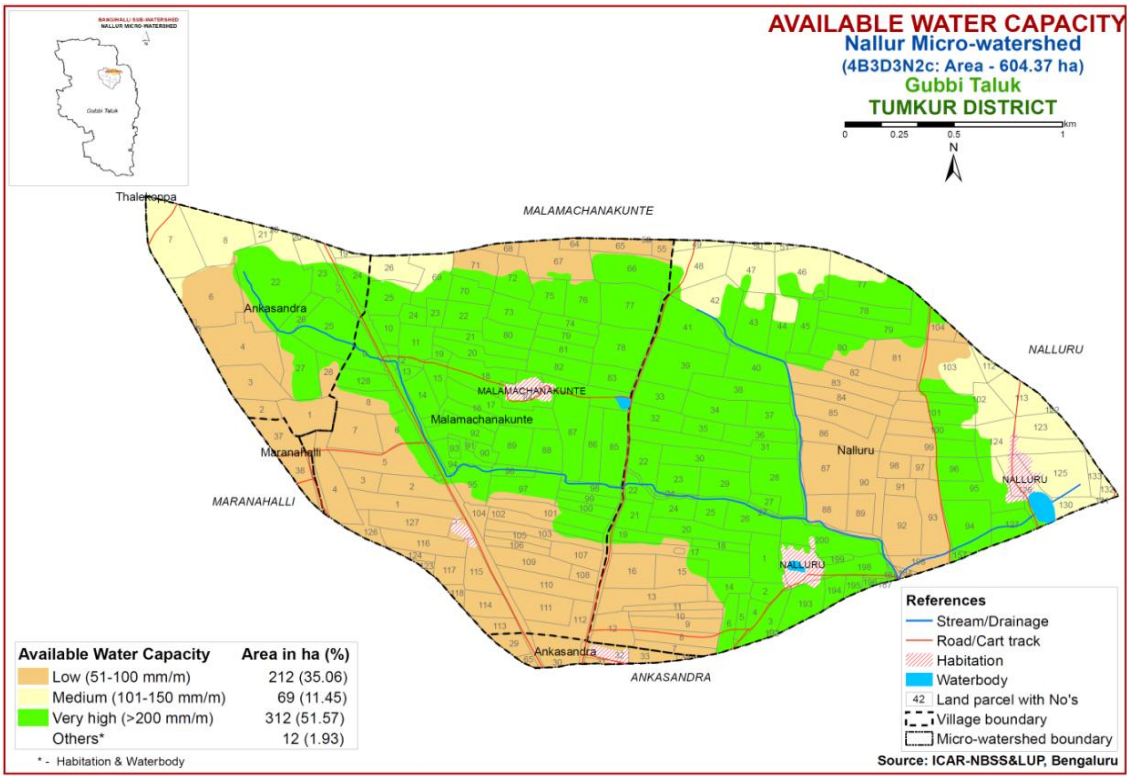


Fig. 5.5 Soil Available Water Capacity map of Nallur Microwatershed

5.6 Soil Slope

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

Major area of about 437 ha (72%) falls under very gently sloping (1-3% slope) lands and is distributed in major part of the microwatershed and an area of about 115 ha (26%) is under nearly level (0-1%) and distributed in the southern, central and northeastern part of the microwatershed.

Entire area in the microwatershed has soils that have high potential in respect of soil slopes. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

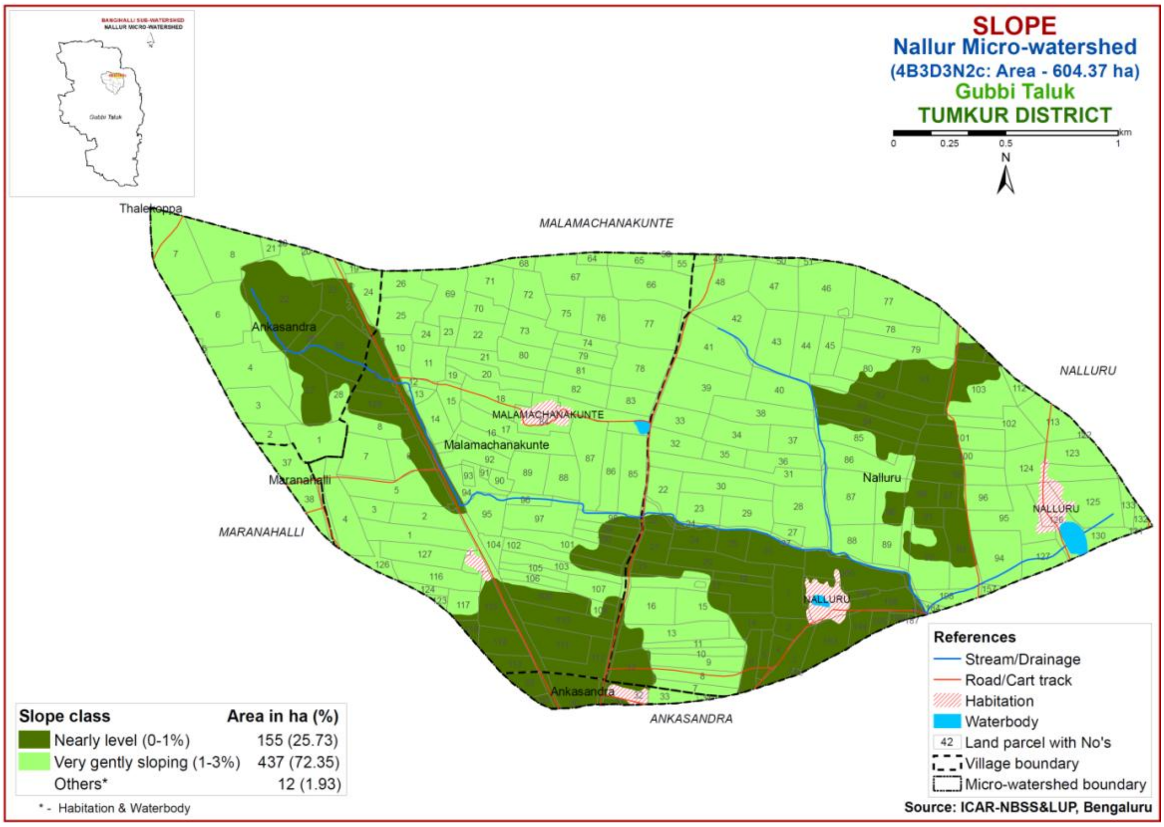


Fig. 5.6 Soil Slope map of Nallur Microwatershed

5.7 Soil Erosion

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

Soils that are moderately eroded (e2 class) cover an area of about 92 ha (15%) in the microwatershed. They are distributed in the western part of the microwatershed. Slightly eroded (e1 class) soils cover a maximum area of about 501 ha (83%) and are distributed in major part of the microwatershed.

An area of about 92 ha (15%) in the microwatershed is problematic because of moderate erosion. For these areas, taking up soil and water conservation and other land development measures is needed.

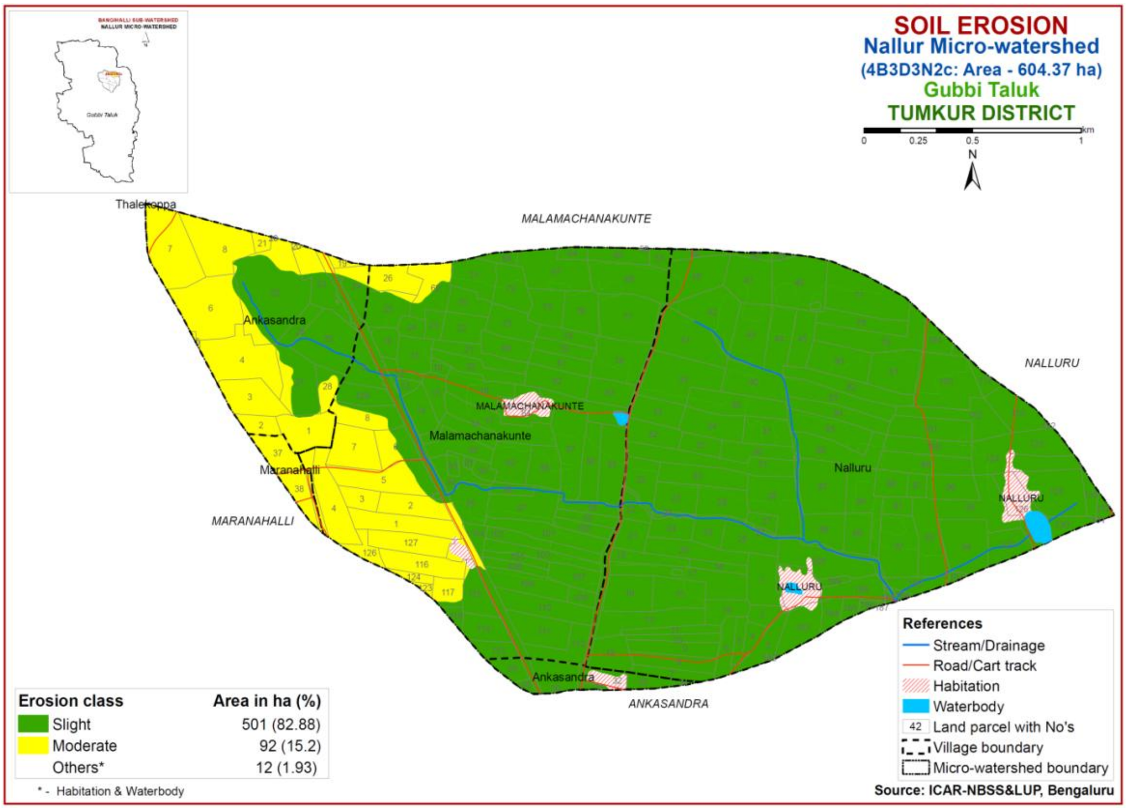


Fig. 5.7 Soil Erosion map of Nallur Microwatershed

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 the area is characterised by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 250 m interval) all over the microwatershed through land resource inventory in the year 2015 were analysed for pH, EC, organic carbon, available phosphorus and potassium, and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

Soil fertility data generated has been assessed and individual maps for all the nutrients for the microwatershed have been generated using kriging method under GIS.

6.1 Soil Reaction (pH)

The soil analysis of the Nallur microwatershed for soil reaction (pH) showed that an area of about 165 ha (27%) is neutral (pH 6.5-7.3) and are distributed in the southeastern, central and northeastern part of the microwatershed. An area of 66 ha (11%) is strongly acid (pH 5.0-5.5) and are distributed in the western, central and northern part of microwatershed. An area of 154 ha (25%) is moderately acid (pH 5.5-6.0) and are distributed in the northwestern, eastern and southern part of the microwatershed and slightly acid (pH 6.0-6.5) occupy maximum area of about 193 ha (32%) and are distributed in the northwestern, southeastern, central and northern part of the microwatershed. A very small area of about 15 ha (2%) is slightly alkaline (pH 7.3-7.8) and occur in the northeastern part of the microwatershed (Fig.6.1).

6.2 Electrical Conductivity (EC)

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

6.3 Organic Carbon

The soil organic carbon (An index of available Nitrogen) content of the soils in the microwatershed is medium (0.5-0.75%) covering an area of about 65 ha (11%) and is distributed in the northwestern, central, southern and northeastern part of the microwatershed. It is low (<0.5%) in a maximum area of about 528 ha (87%) and distributed in all parts of the microwatershed (Fig.6.3).

6.4 Available Phosphorus

Available phosphorus content is high (>57 kg/ha) in the entire microwatershed (Fig 6.4).

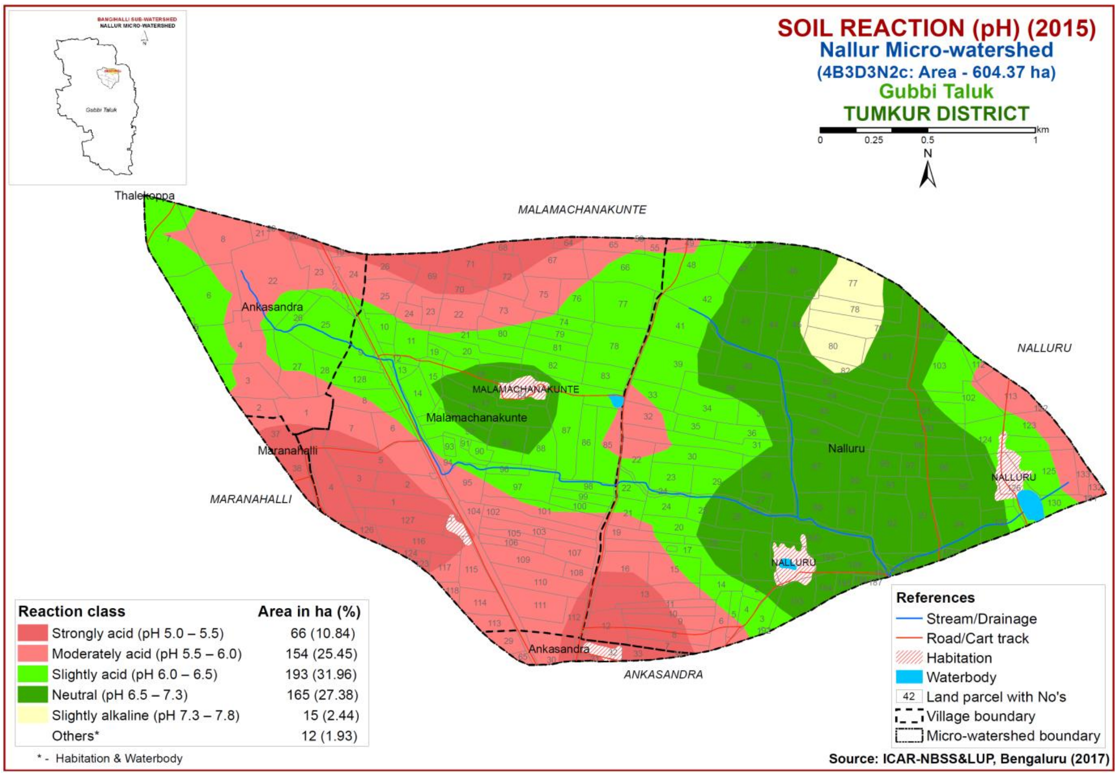


Fig.6.1 Soil Reaction (pH) map of Nallur Microwatershed

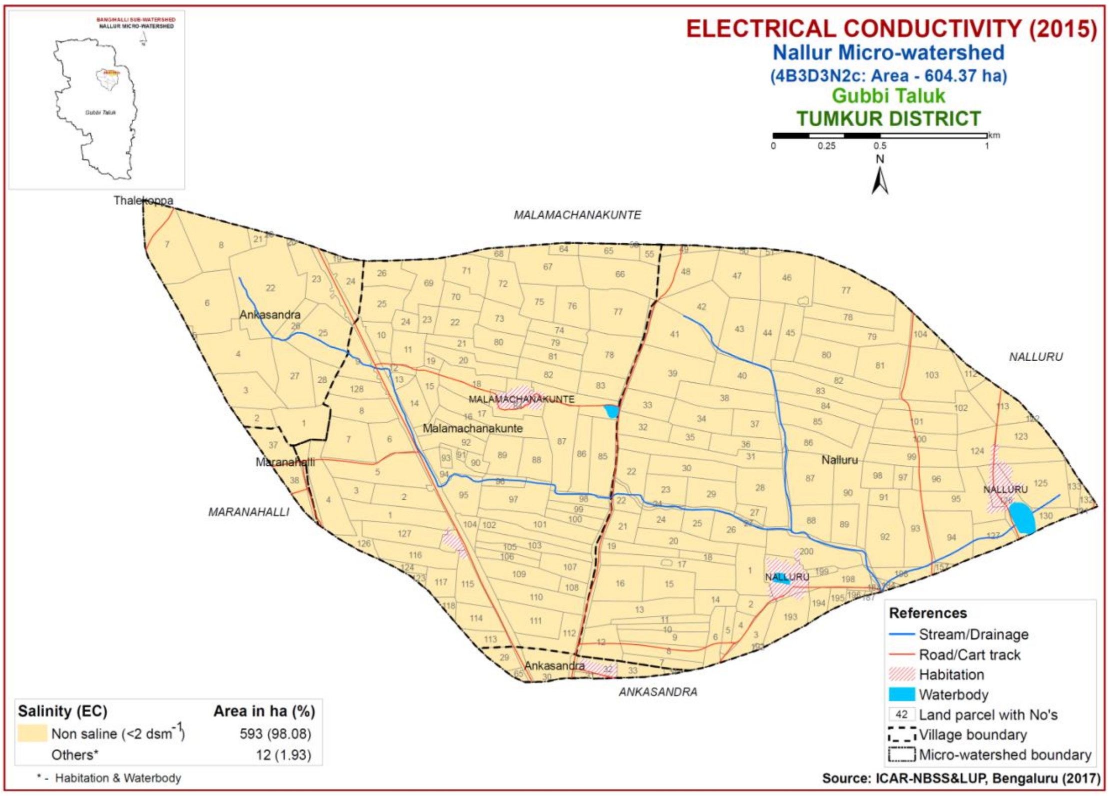


Fig.6.2 Electrical Conductivity (EC) map of Nallur Microwatershed

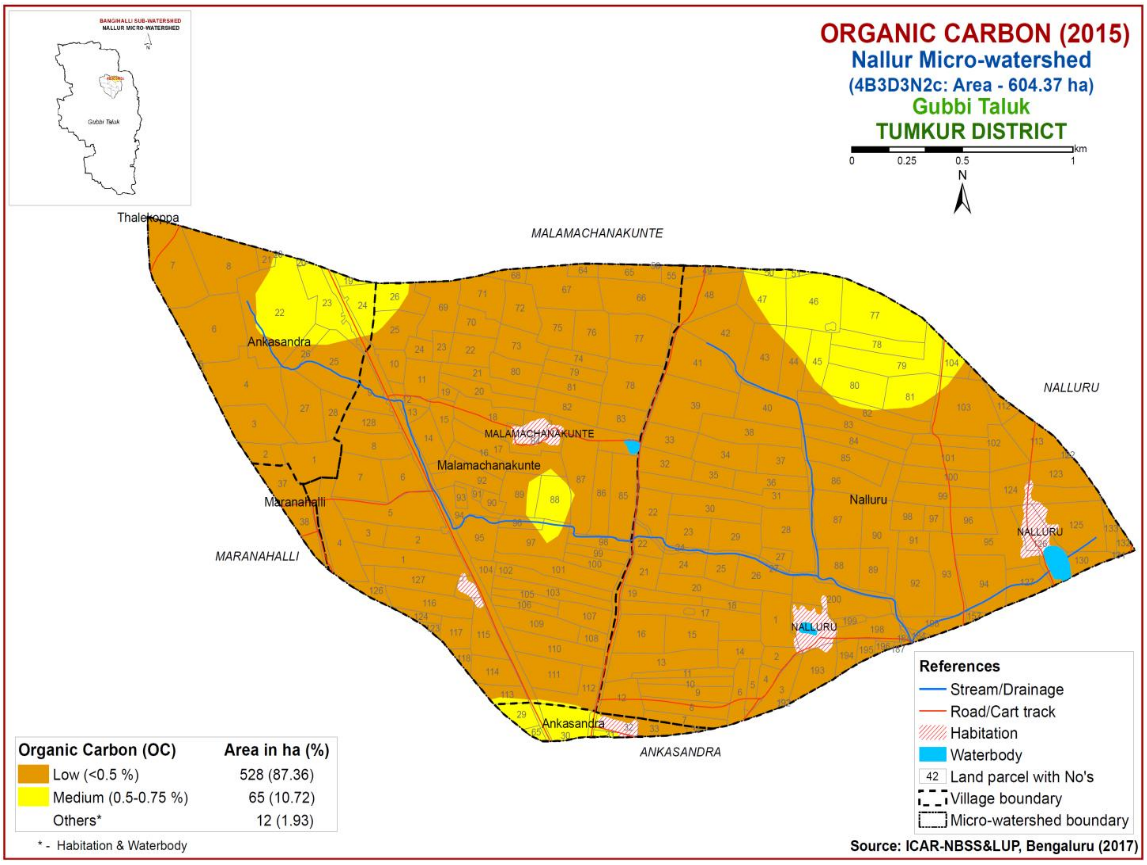


Fig.6.3 Soil Organic Carbon map of Nallur Microwatershed

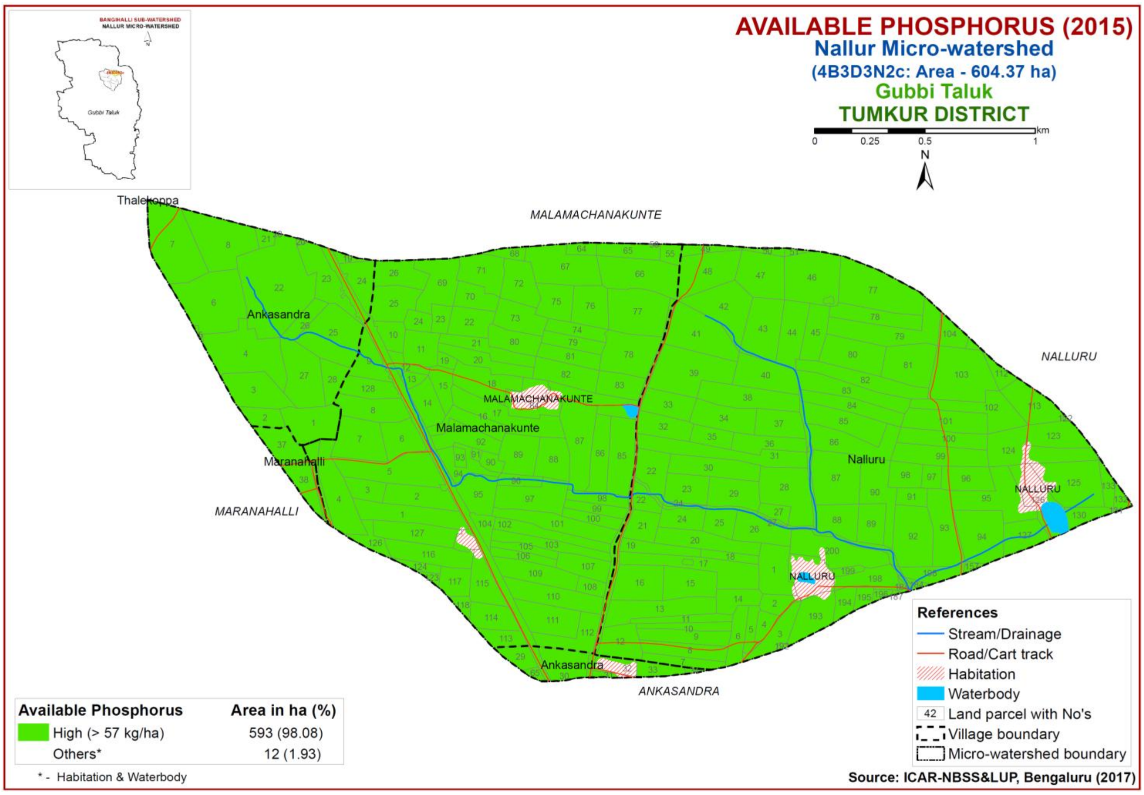


Fig.6.4 Soil Available Phosphorus map of Nallur Microwatershed

6.5 Available Potassium

Available potassium content is medium (145-337 kg/ha) in maximum area of about 482 ha (80%) and is distributed in all parts of the microwatershed and low (<145kg/ha) in an area of 80 ha (13%) and is distributed in northern, southeastern and southwestern part of the microwatershed (Fig.6.5). High available potassium (>337 kg/ha) is in an area of 30 ha (5%) and is distributed in the central and northeastern part of the microwatershed.

6.6 Available Sulphur

Available sulphur content is medium (10-20 ppm) in an area of about 586 ha (97%) and occur in all parts of the microwatershed. A very small area of about 7 ha (1%) is low in available sulphur (<10 ppm) and occur in the western part of the microwatershed (Fig.6.6).

6.7 Available Boron

Available boron content is medium (0.5-1.0 ppm) in an area of 262 ha (43%) and are distributed in the northwestern, central, southeastern and northeastern part of the microwatershed. Maximum area of about 330 ha (55%) is low (<0.5 ppm) in available boron and is distributed in all parts of the microwatershed (Fig.6.7).

6.8 Available Iron

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

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in an area of 187 ha (31%) and are distributed in the eastern, southern and northwestern part of the microwatershed and major area of 406 ha (67%) is sufficient (>0.6 ppm) and are distributed in major part of the microwatershed (Fig 6.11).

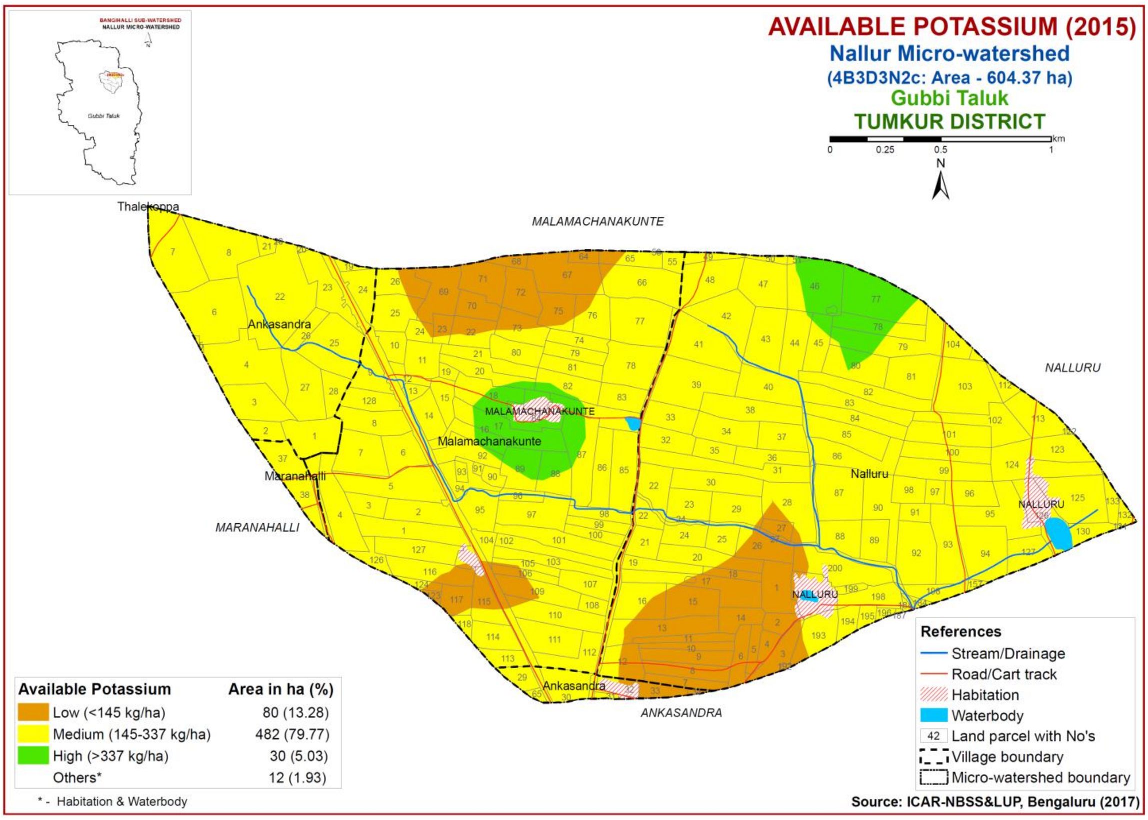


Fig.6.5 Soil Available Potassium map of Nallur Microwatershed

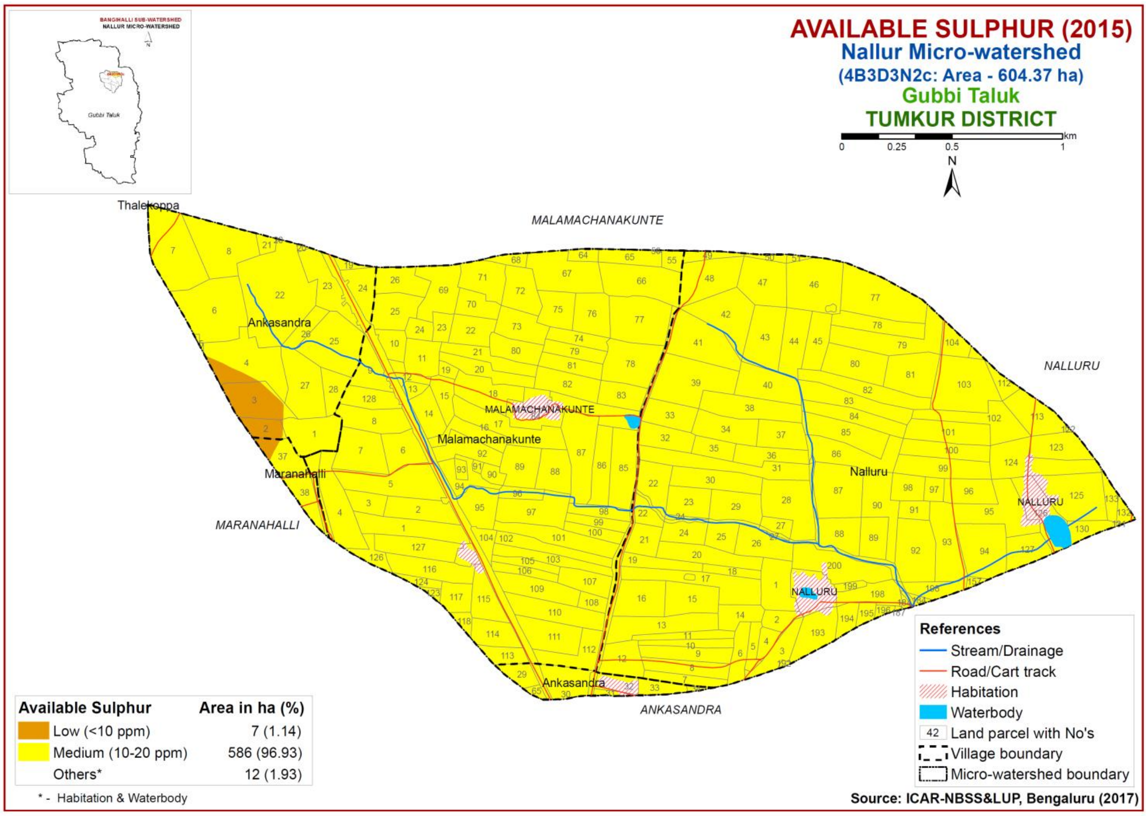


Fig.6.6 Soil Available Sulphur map of Nallur Microwatershed

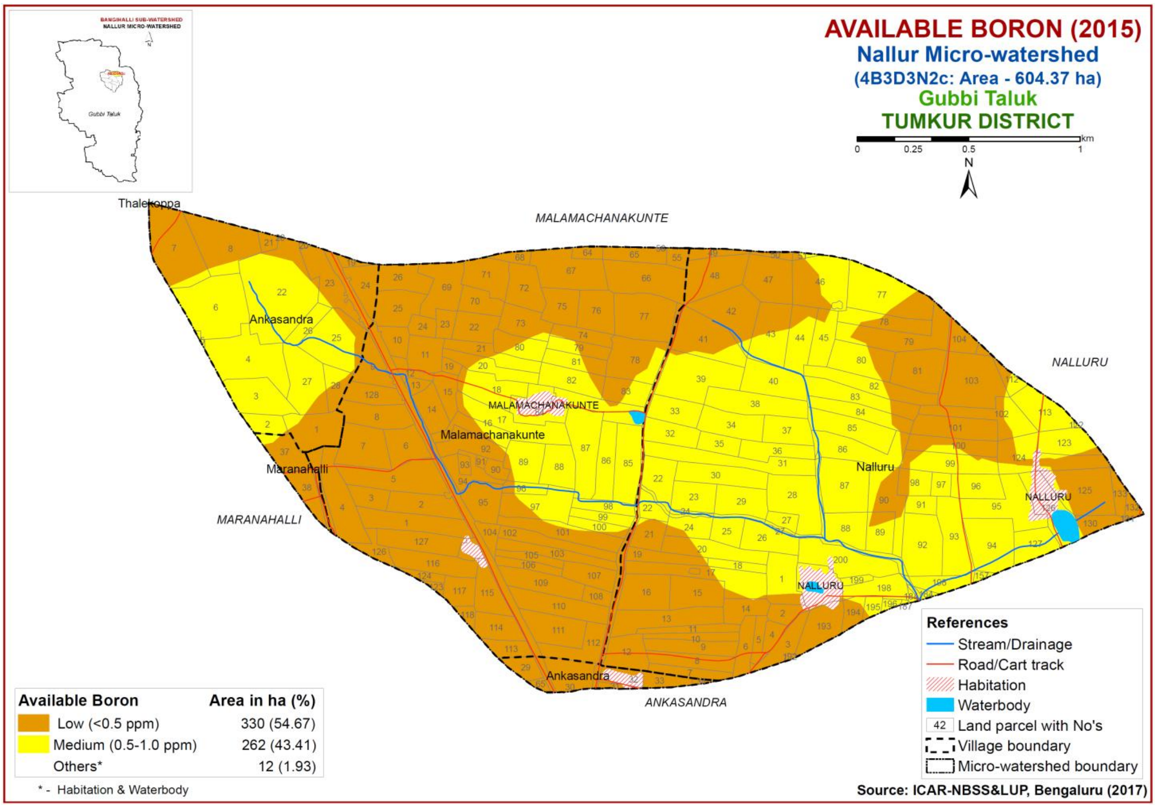


Fig.6.7 Soil Available Boron map of Nallur Microwatershed

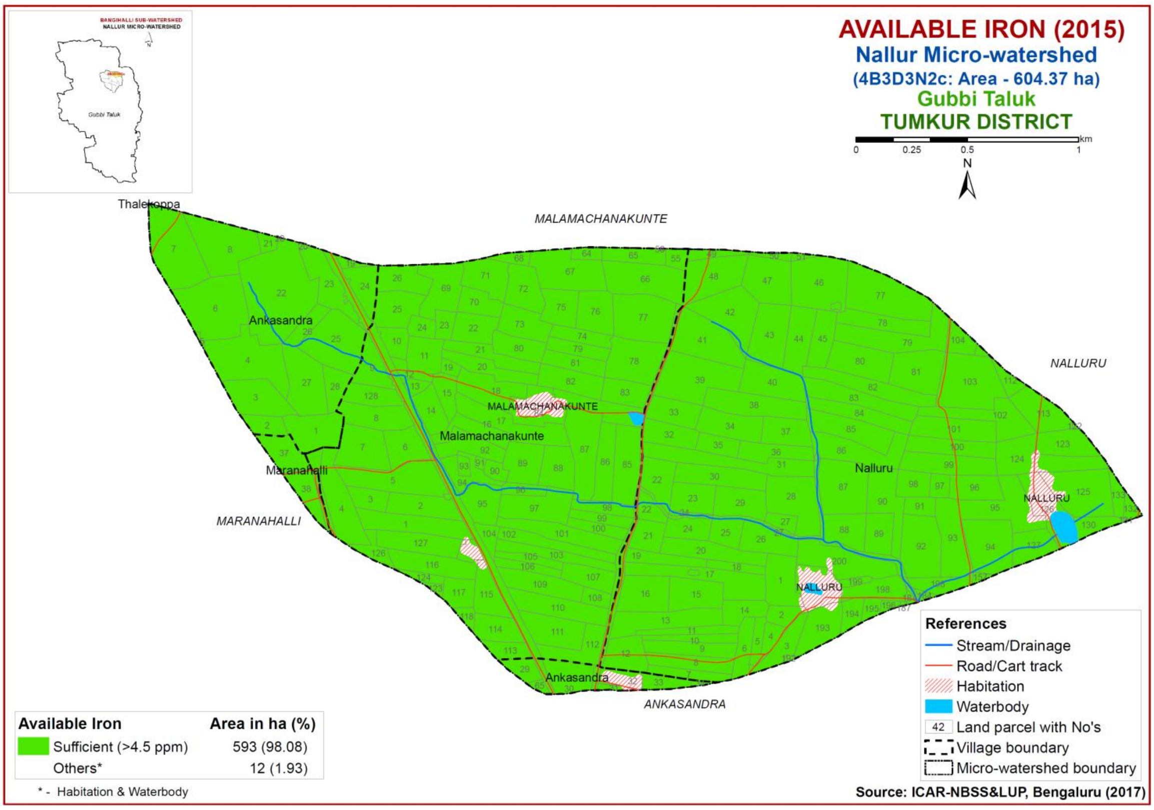


Fig.6.8 Soil Available Iron map of Nallur Microwatershed

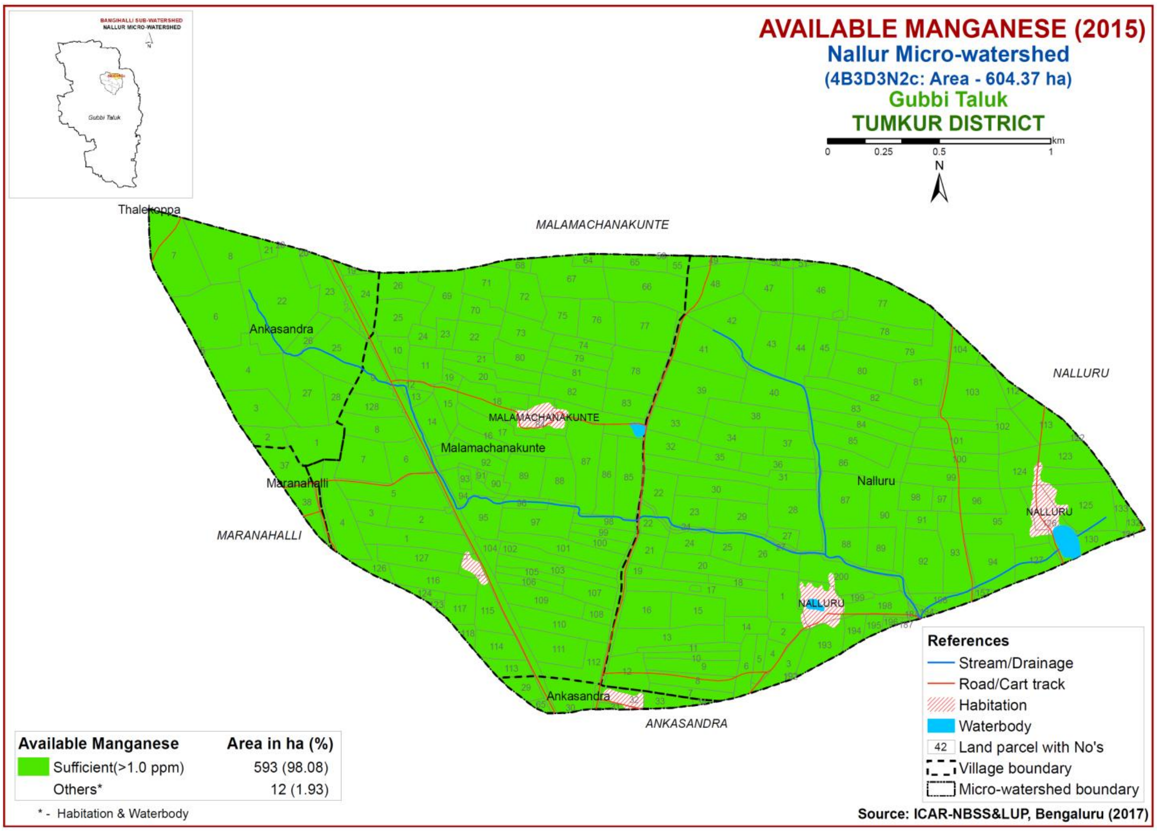


Fig.6.9 Soil Available Manganese map of Nallur Microwatershed

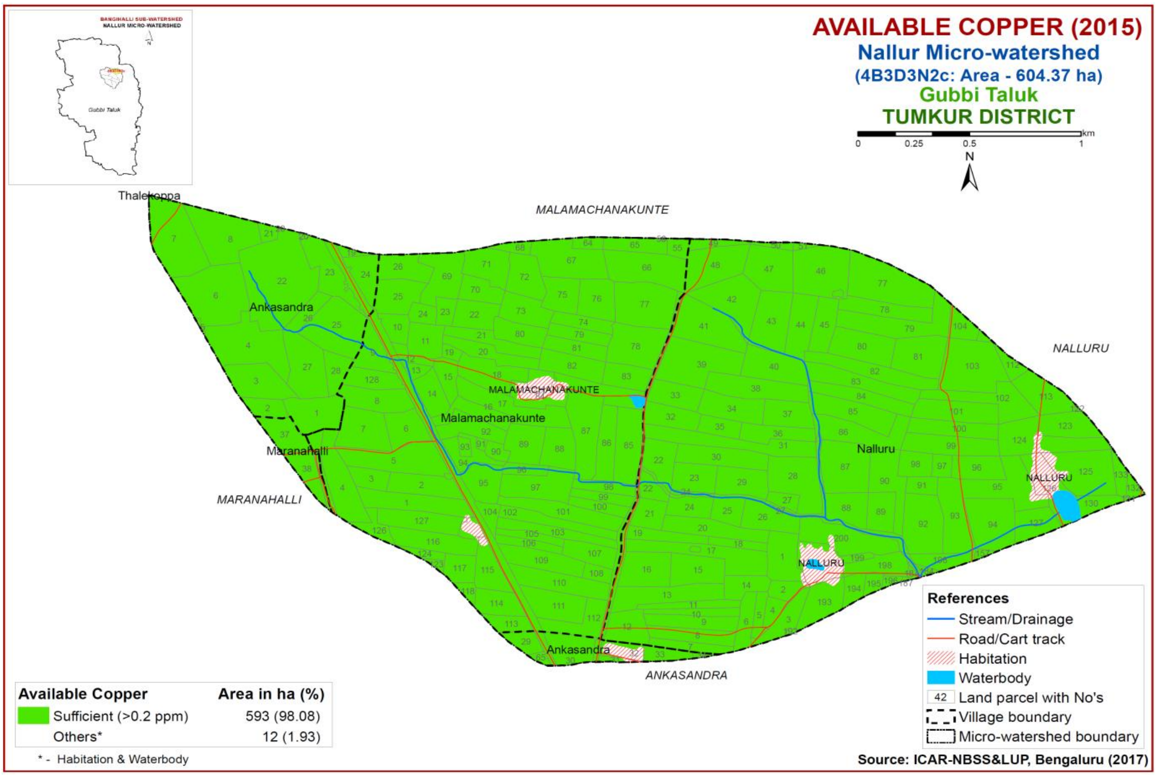


Fig.6.10 Soil Available Copper map of Nallur Microwatershed

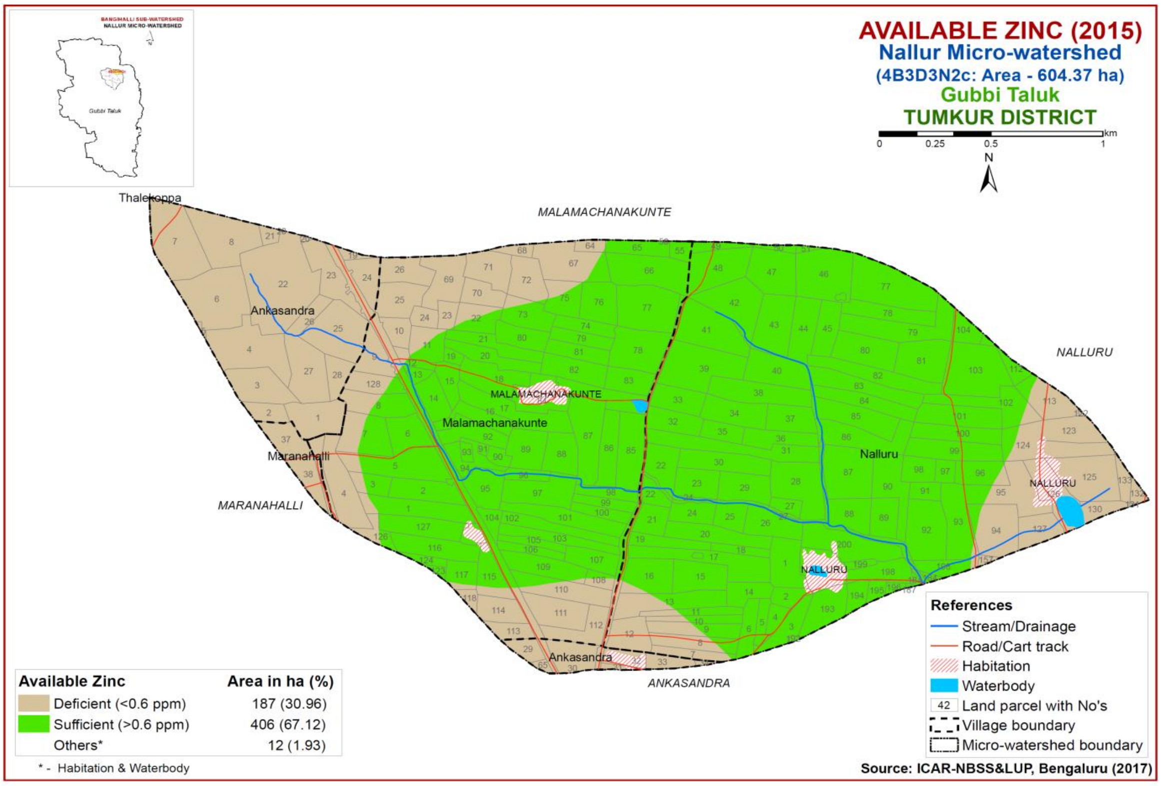


Fig.6.11 Soil Available Zinc map of Nallur Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Nallur 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 and S3 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 and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 34 major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

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

An area of about 381 ha (63%) is highly suitable (Class S1) for growing sorghum and are distributed in the major part the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 196 ha (32%) for growing sorghum and are distributed in the southern, western and southeastern part of the microwatershed.

Table 7.1 Soil-Site Characteristics of Nallur Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drai-nage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC	ESP	CEC [Cmol (p+)kg-1]	BS (%)
					Sur-face	Sub-surface	Surface (%)	Sub Surface (%)								
MNLhB2	813	150	WD	75-100	sl	sc-scl	-	15-35	100-150	1-3	moderate					
BPRcA1	813	150	WD	75-100	scl	sc-c	-	>35	100-150	0-1	slight					
NGPcA1	813	150	WD	75-100	scl	sc-c	-	>35	51-100	0-1	slight					
NGPhB1	813	150	WD	75-100	sc	sc-c	-	>35	51-100	1-3	slight					
NGPhB2	813	150	WD	100-150	scl	sc-c	-	>35	51-100	1-3	moderate					
HLKhB1	813	150	WD	100-150	scl	c	-	<15	150-200	1-3	slight					
BGPcA1	813	150	WD	100-150	sl	c	-	10-20	>200	0-1	slight					
BGPhB1	813	150	WD	100-150	sc	c	-	10-20	>200	1-3	slight					
BGPiA1	813	150	WD	>150	sl	c	-	10-20	>200	0-1	slight					
NDLcB1	813	150	WD	>150	sl	sc	-	>35	50-100	1-3	slight					
KDTcA1	813	150	WD	>150	scl	sc-c	-	-	>200	0-1	slight					
KDTcB1	813	150	WD	>150	scl	sc-c	-	-	>200	1-3	slight					
KDThB1	813	150	WD	50-75	scl	sc-c	-	-	>200	1-3	slight					

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

They have minor limitations of gravelliness and calcareousness. Marginally suitable lands (Class S3) for growing sorghum occupy a very small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.2 Crop suitability criteria for Sorghum

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

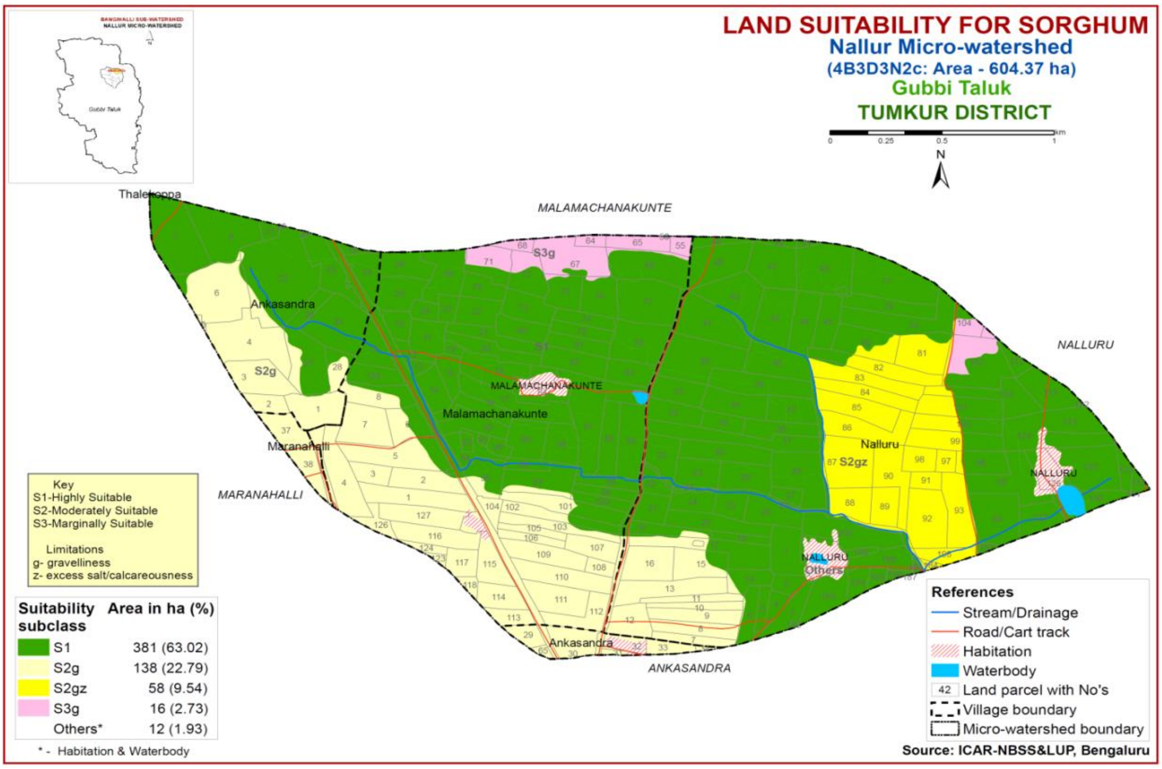


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Fodder Sorghum (*Sorghum bicolor*)

Fodder Sorghum is one of the major fodder crops grown in South Karnataka in Tumakuru, Chikkaballapur, Mysore, Mandya, Bengaluru Rural and Kolar districts. The crop requirements for growing Fodder sorghum (Table 7.3) 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 7.2.

Major area of about 381 ha (63%) is highly suitable (Class S1) for growing Fodder sorghum and are distributed in the major part the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 196 ha (32%) for growing Fodder sorghum and are distributed in the southern, western and southeastern part the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable lands (Class S3) occupy a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.3 Crop suitability criteria for Fodder Sorghum

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

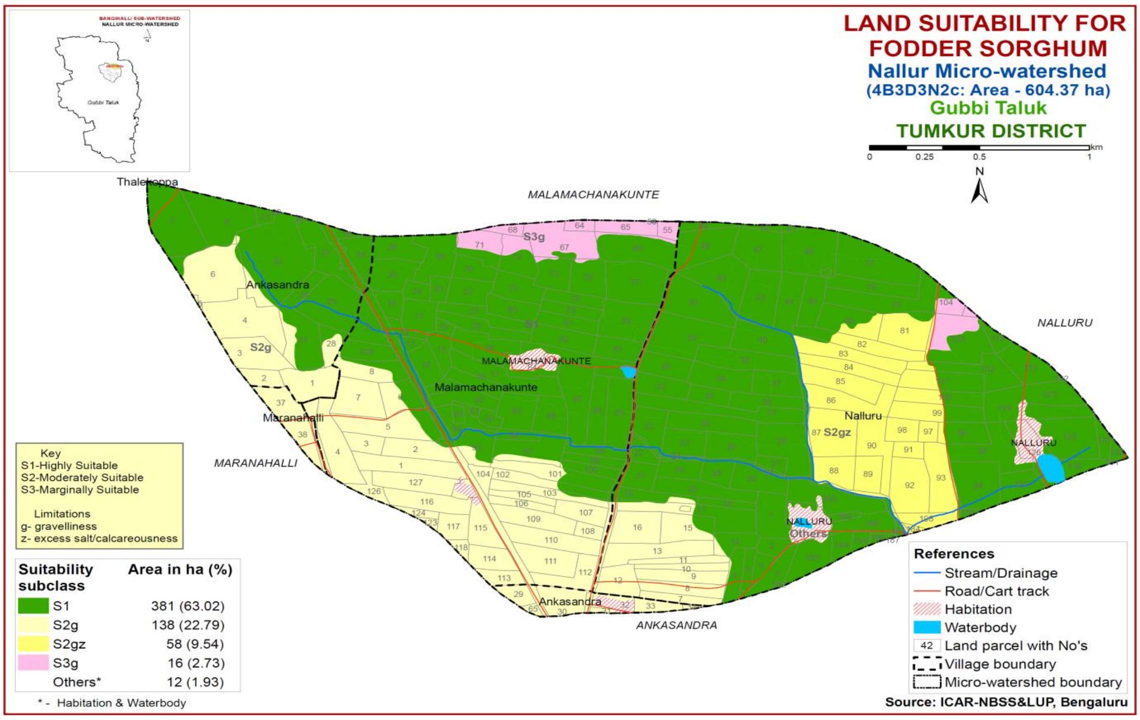


Fig. 7.2 Land Suitability map of Fodder Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

Maize is the most important food crop grown in an area of 13.37 lakh ha in almost all the districts of the State. The crop requirements for growing maize (Table 7.4) 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 7.3.

Highly suitable lands occupy an area of about 69 ha (11%) and are distributed in the northwestern, northern and eastern part of the microwatershed. Major area of about 508 ha (84%) is moderately suitable (Class S2) and are distributed in the major part the microwatershed. They have minor limitations gravelliness, texture and calcareousness. Marginally suitable lands (Class S3) for growing maize occupy an area of about 16 ha (3%) and occur in the northern, central and northeastern part of the microwatershed with moderate limitation of gravelliness.

Table 7.4 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	

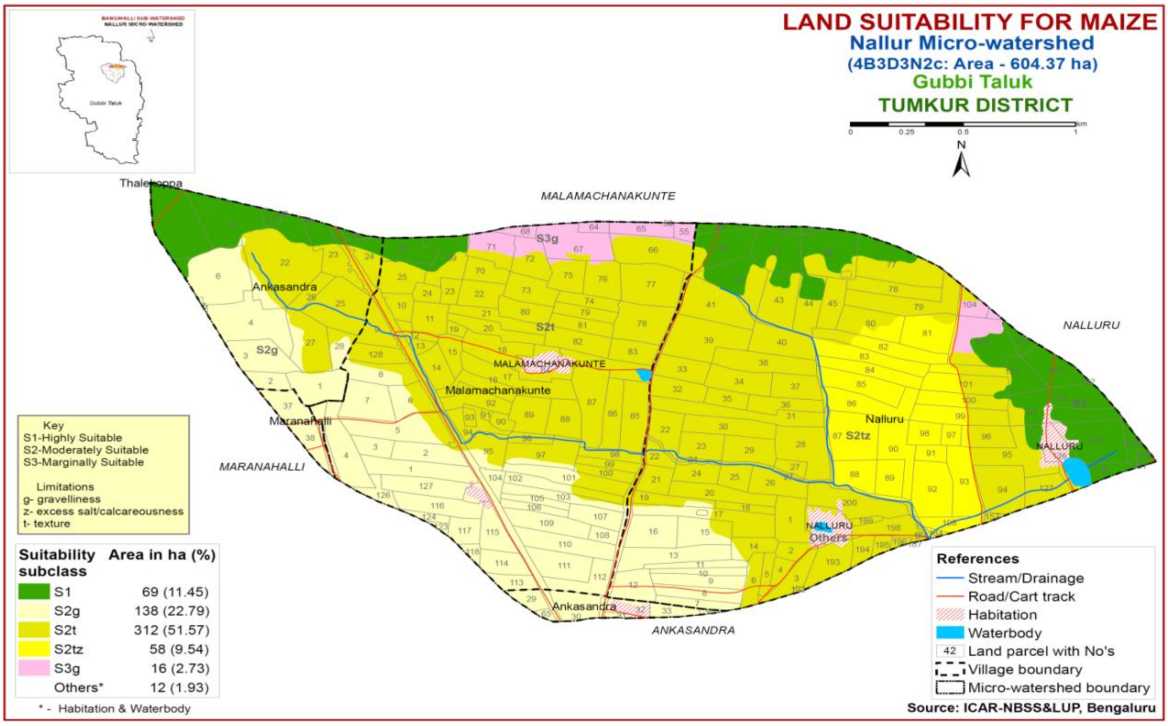


Fig. 7.3 Land Suitability map of Maize

7.4 Land Suitability for Upland Paddy (*Oryaza sativa*)

Upland paddy is the most important food crop grown in all of the district of the State under rainfed condition. The crop requirements for growing Upland paddy (Table 7.5) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Upland paddy was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.4.

Maximum area of about 381 ha (63%) is highly suitable (Class S1) for growing Upland paddy and are distributed in the major part the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) for growing Upland paddy and are distributed in the southern, western and southeastern part the microwatershed. They have minor limitations gravelliness and calcareousness. Marginally suitable lands (Class S3) occupy a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.5 Land suitability criteria for Upland paddy

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	1-3	1-3	3-5	>5
Soil drainage	class	Well to mod.	poorly	Very poorly	
Soil reaction	pH	5.5-6.5	6.5-7.3,4.5-5.4	7.3-8.4	>8.4
Surface soil texture	Class	C,sic,cl,sicl,sc	Scl, sil, l	Sl, ls	S
Soil depth	Cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	60-80

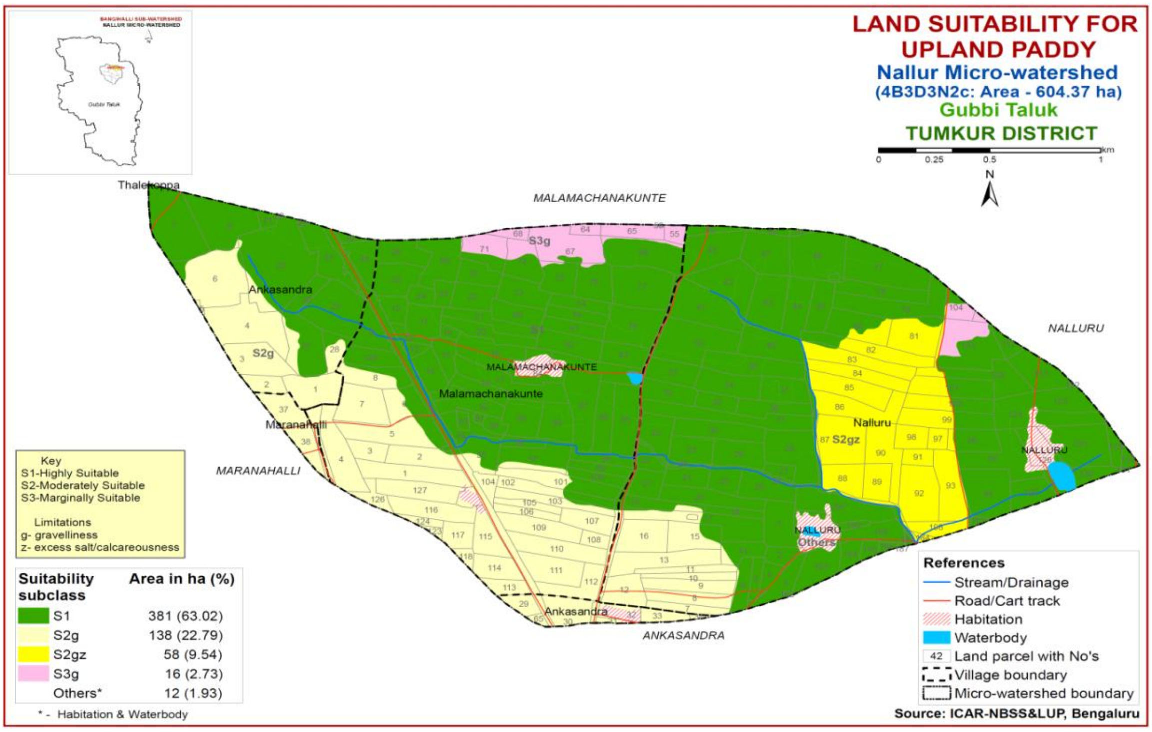


Fig. 7.4 Land Suitability map of Upland paddy

7.5 Land Suitability for Finger millet (*Eleusine coracana*)

Finger millet is the most important food crop grown in an area of 7.08 lakh ha in almost all the districts of south Karnataka. The crop requirements for growing Finger millet (Table 7.6) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Finger millet was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.5.

An area of about 381ha (63%) is highly suitable (Class S1) for growing finger millet and are distributed in the major part the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 196 ha (32%) and are distributed in the western, southwestern and northeastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable (Class S3) lands occupy a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.6 Land suitability criteria for Finger millet

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	>110	90-110	60-90	<60
Soil drainage	class	Well to mod. drained	Imperfectly drained	Poorly/excessively	V.poorly
Soil reaction	pH	5.5-7.3	7.3-8.4	8.4-9.0	>9.0
Surface soil texture	Class	l, sil, sl, cl, sicl, scl	sic, c, sc	ls, s,c >60%	
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	
Sodicity (ESP)	%	<10	10-15	15-25	>25

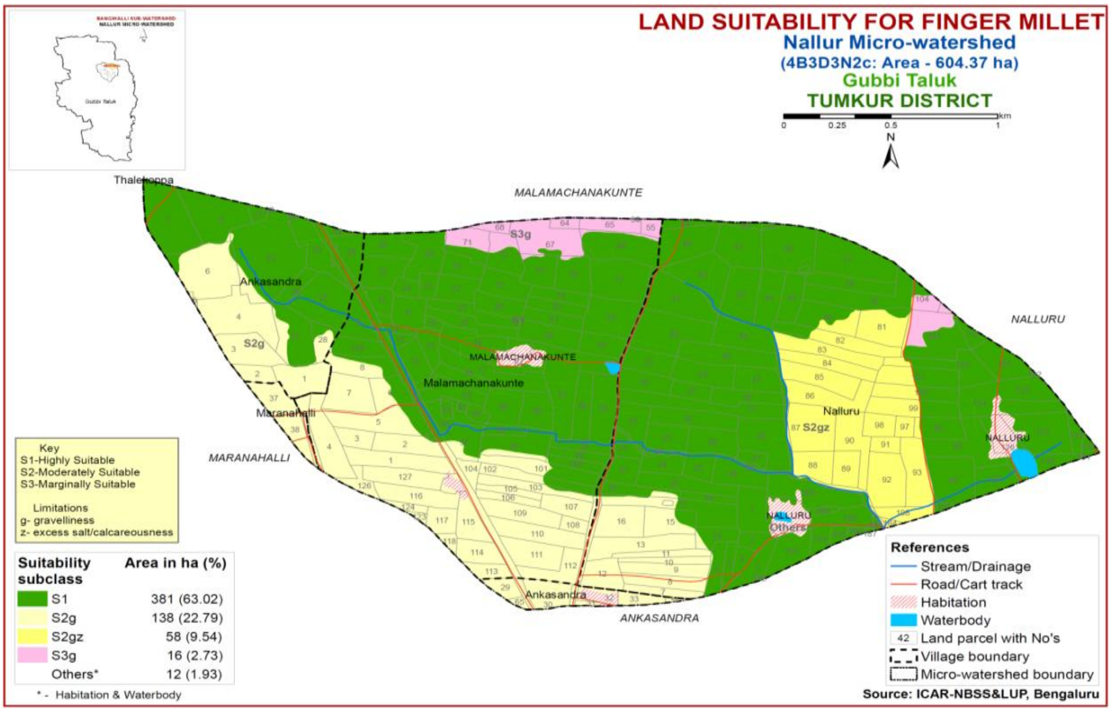


Fig. 7.5 Land Suitability map of Finger millet

7.6 Land suitability criteria for Red gram (*Cajanus cajan)*

Red gram is the most important food crop grown in an area of 7.28 lakh ha in almost all the districts of the State. The crop requirements for growing red gram (Table 7.7) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing red gram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.6.

Highly suitable (Class S1) lands occupy an area of about 381 ha (63%) for growing red gram and are distributed in major part the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 196 ha (32%) and are distributed in the southern, western and southeastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable lands (Class S3) occupy a very small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.7 Land suitability criteria for Red gram

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

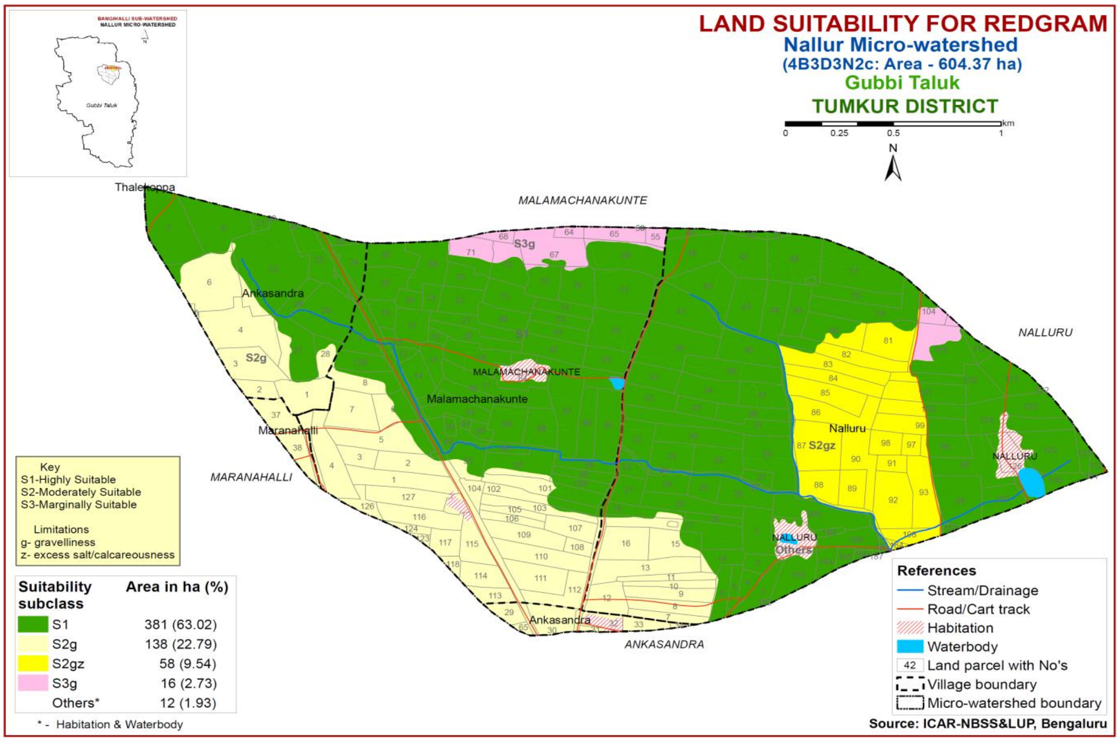


Fig. 7.6 Land Suitability map of Redgram

7.7 Land suitability for Horse gram (*Macrotyloma uniflorum*)

Horse gram is the most important pulse crop grown in an area of 1.8 lakh ha in almost all the districts of the State. The crop requirements for growing horse gram were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing horse gram (Table 7.8) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Fig. 7.7.

Major area of about 381 ha (63%) is highly suitable (Class S1) for growing horse gram and are distributed in major part the microwatershed. An area of about 212 ha (35%) is moderately suitable (Class S2) and are distributed in the southern, western and southeastern part the microwatershed with minor limitations of gravelliness and calcareousness.

Table 7.8 Land suitability criteria for Horse 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				
Soil drainage	Class	Welldrained/mod. well drained	imperfectly drained	Poorly drained	VeryPoorly drained
Soil reaction	pH	6.0-8.5	8.5-9.0,5.5-5.9	9.1-9.5,5.0-5.4	>9.5
Surface soil texture	Class	l, sl, scl, cl, sc	Ls, sic, sicl, c, ls	Heavy clays (>60%)	-
Soil depth	Cm	50-75	25-50	<25	-
$CaCO_3$ in root zone	%vol.	<15	15-25	25-30	>30
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	-

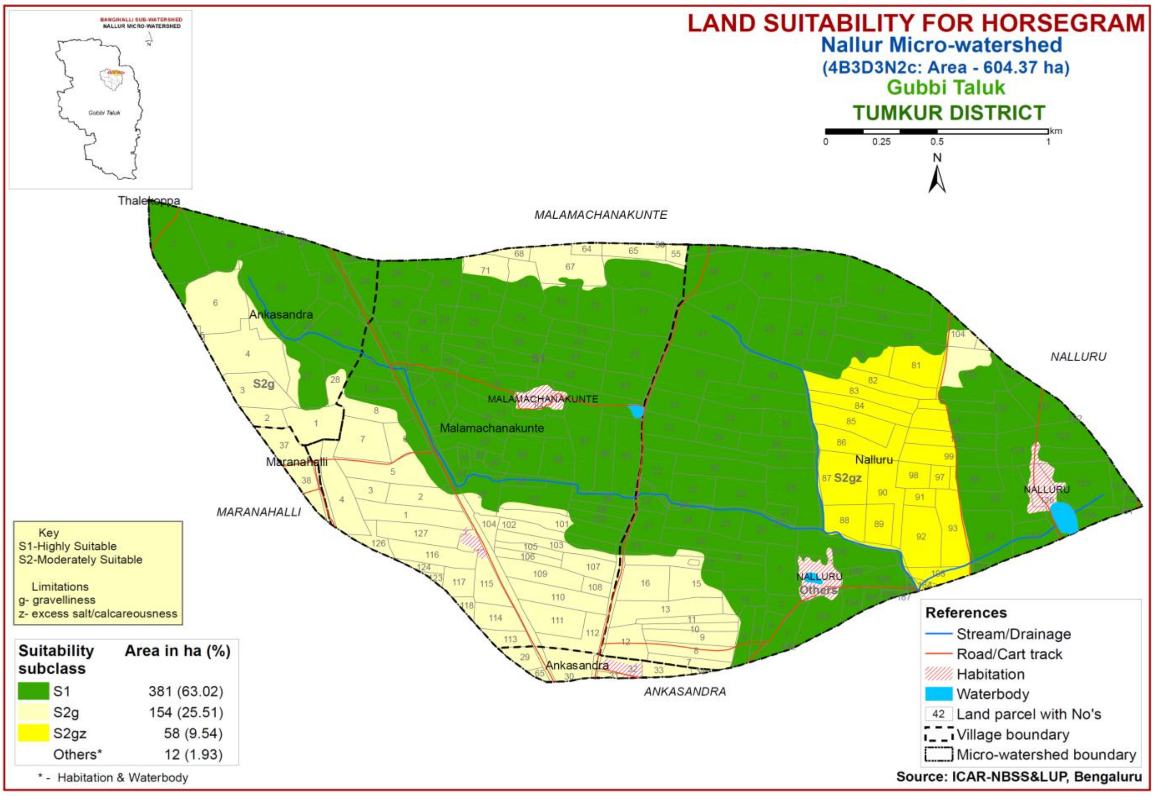


Fig. 7.7 Land Suitability map of Horse gram

7.8 Land suitability for Field Bean (*Dolichos lablab*)

Field Bean is the most important pulse crop grown in an area of 0.59 lakh ha in almost all the districts of the State. The crop requirements (Table 7.9) for growing field bean were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing field bean was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Fig. 7.8.

An area of about 381 ha (63%) is highly suitable (Class S1) for growing field bean and are distributed in the major part the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) and are distributed in the southern, western and southeastern part of the microwatershed with minor limitations of gravelliness and calcareousness. Marginally suitable lands (Class S3) for growing field bean occupy a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.9 Land suitability criteria for Field Bean

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	>120	90-120	70-90	<70
Soil drainage	Class	Welldrained/mod. welldrained	imperfectly drained	Poorly drained	Very Poorly drained
Soil reaction	pH	6.0-8.5	8.5-9.0,5.5-5.9	9.1-9.5,5.0-5.4	>9.5
Sub Surface soil texture	Class	l, sl, scl, cl, sc	sic, sicl, c	Heavy clays (>60%), ls	s
Soil depth	Cm	>75	50-75	25-50	<25
$CaCO_3$ in root zone	% vol.	<15	15-35	35-50	>50
Salinity (EC)	dsm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	15-20	>20

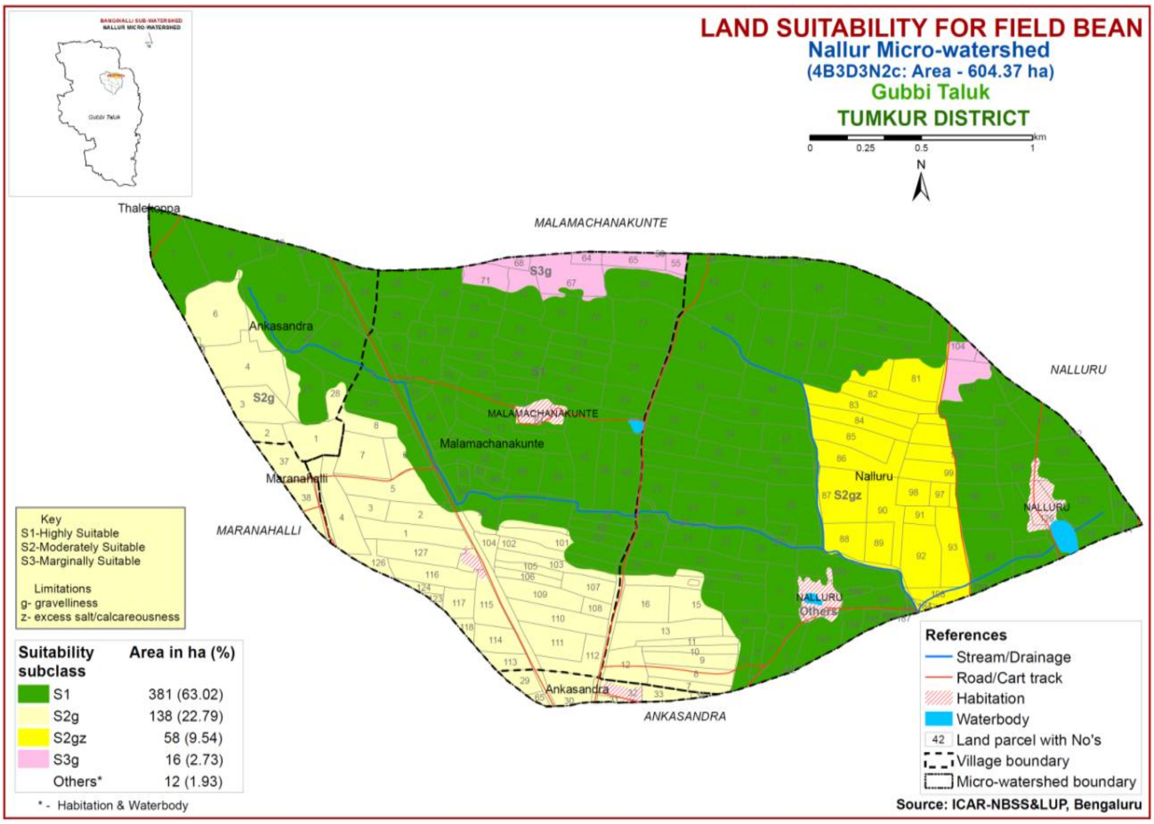


Fig. 7.8 Land Suitability map of Field bean

7. 9 Land Suitability for Cowpea (*Vigna radiata*)

Cowpea is the most important pulse crop grown in an area of 0.80 lakh ha in almost all the districts of the State. The crop requirements for growing cowpea were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cowpea was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.9.

Highly suitable (Class S1) lands occupy major area of about 381 ha (63%) is for growing Cowpea and are distributed in the major part of the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) and are distributed in the southern, central and eastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable lands (Class S3) occupy an area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

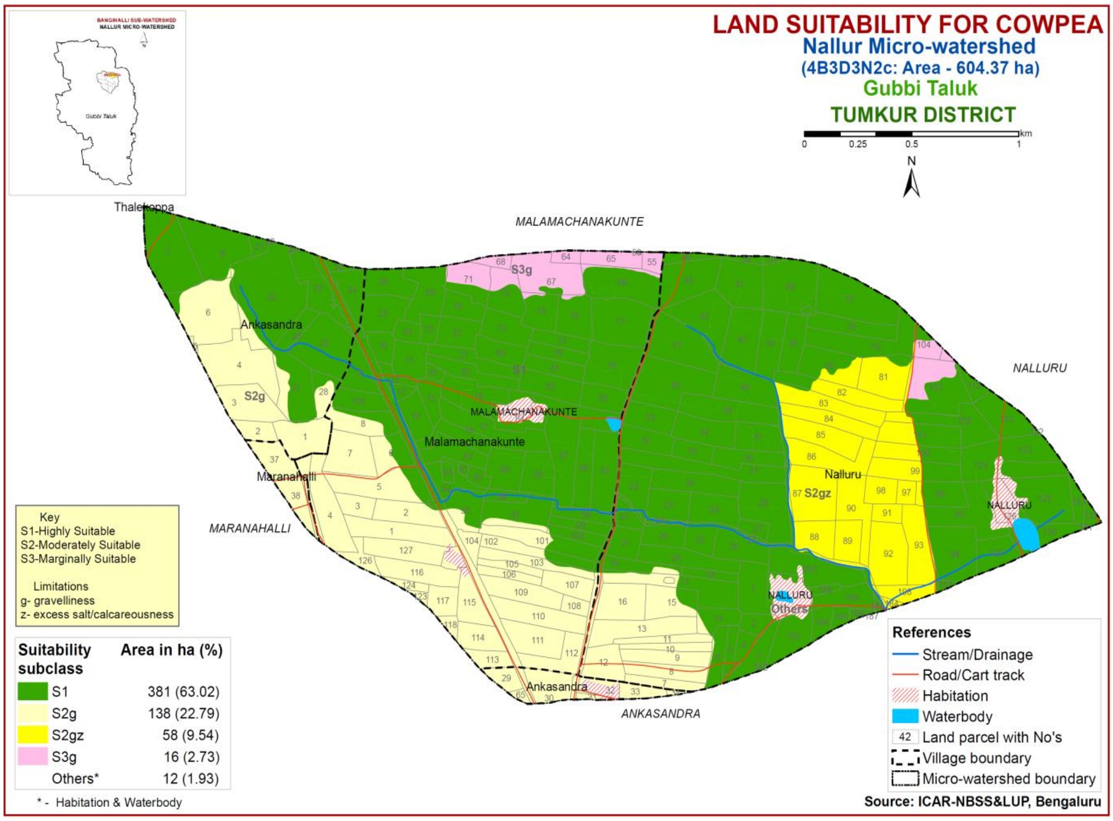


Fig. 7.9 Land Suitability map of Cowpea

7.10 Land Suitability for Groundnut (*Arachis hypogaea*)

Groundnut is one of the major oilseed crop grown in an area of 6.54 lakh ha in Karnataka in most of the districts either as rainfed or irrigated crop. The crop requirements for growing groundnut (Table 7.10) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing groundnut was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.10.

An area of about 24 ha (4%) is highly suitable (Class S1) for growing groundnut and are distributed in the northwestern part the microwatershed. Maximum area of about 512 ha (85%) is moderately suitable (Class S2) for growing groundnut and are distributed in all parts of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable (Class S3) lands occupy an area of about 58 ha (9%) and are distributed in the southeastern part of the microwatershed with moderate limitations of texture and calcareousness.

Table 7.10 Crop suitability criteria for Groundnut

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

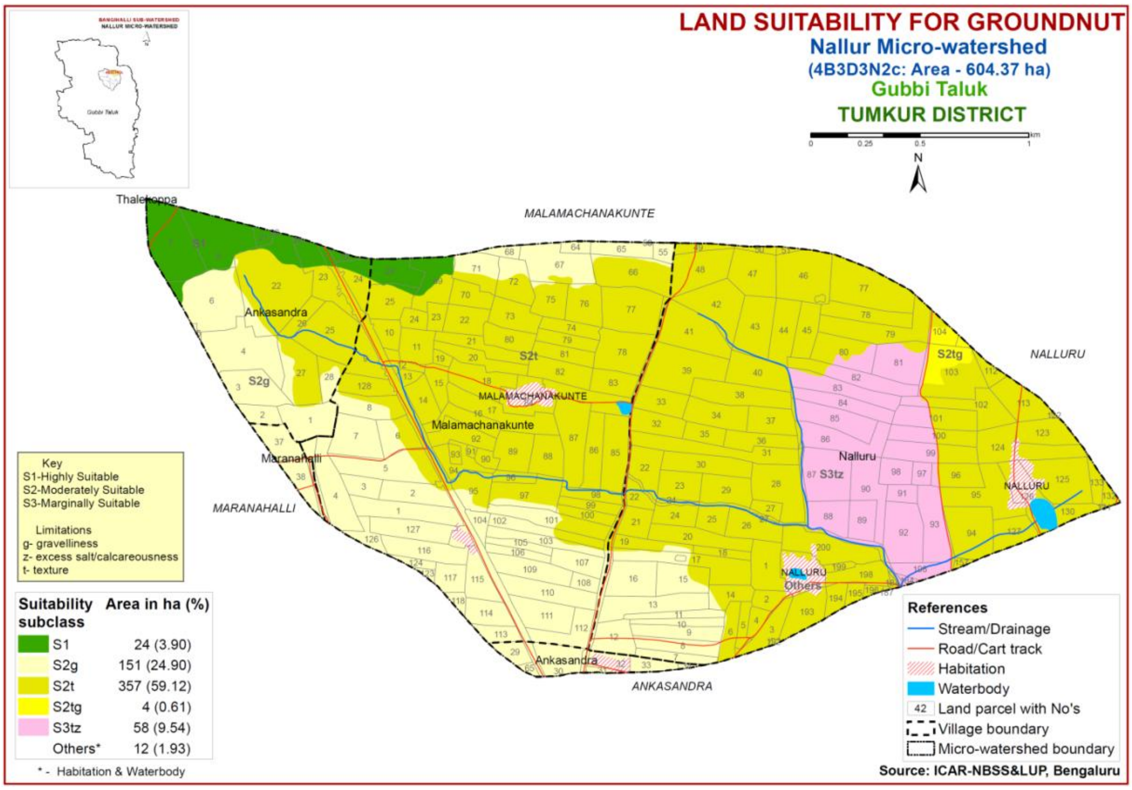


Fig. 7.10 Land Suitability map of Groundnut

7.11 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is 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 7.11) 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 7.11.

Major area of about 381 ha (63%) is highly suitable (Class S1) for growing sunflower and are distributed in the major part of the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) lands and are distributed in the southern, western and southeastern part of the microwatershed with minor limitations of gravelliness and calcareousness. Marginally suitable lands (Class S3) for growing sunflower occupy a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.11 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 rained	Imperfectly drained	Poorly drained
Soil reaction	pH	6.5-8.0	8.1-8.5, 5.5-6.4	8.6-9.0, 4.5-5.4	>9.0, <4.5
Surface soil texture	Class	l, cl, sil, sc	Scl, sic, c,	c (>60%), sl	ls, s
Soil depth	Cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (EC)	dSm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

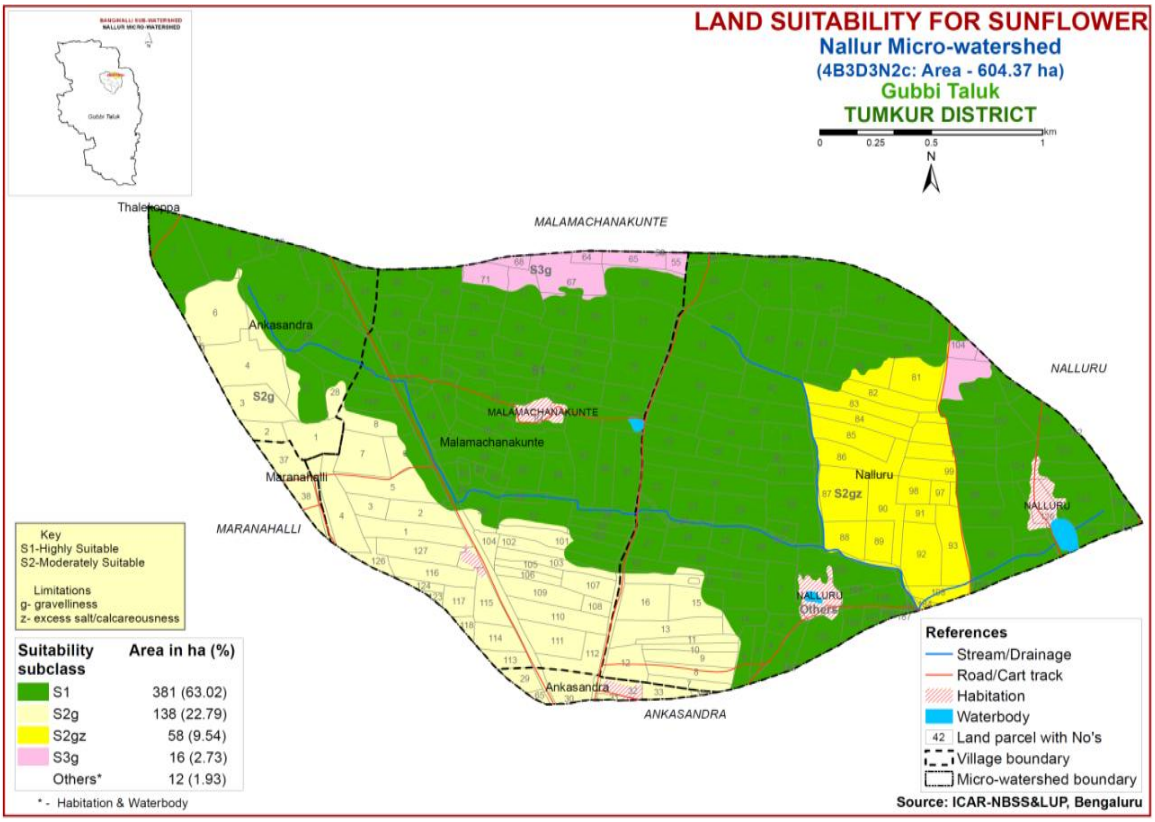


Fig. 7.11 Land Suitability map of Sunflower

7.12 Land Suitability for Onion (*Allium cepa*)

Onion is the most important vegetable crop grown in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and Tumakuru districts. The crop requirements for growing onion (Table 7.12) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Onion was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.12.

Highly suitable (Class S1) lands occupy an area of about 69 ha (11%) and are distributed in the northwestern, northern and eastern part of the microwatershed. Maximum area of about 508 ha (84%) has soils that are moderately suitable (Class S2) with minor limitations of gravelliness, texture and calcareousness. They are distributed in all parts of the microwatershed. The marginally suitable (Class S3) lands cover a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.12 Land suitability criteria for Onion

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	35-40	>40
Slope	%	<3	3-5	5-10	>10
Soil drainage	Class	Well drained	Moderately /imperfectly	Poor drained	Very poorly drained
Soil reaction	pH	6.5-7.3	7.3-7.8,5.0-5.4	7.8-8.4,<5.0	>8.4
Surface soil texture	Class	Scl, sil, sl	sc, sicl, c (red soil)	sc, c (black soil)	ls
Soil depth	Cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	60-80
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	<4
Sodicity (ESP)	%	<5	5-10	10-15	>15

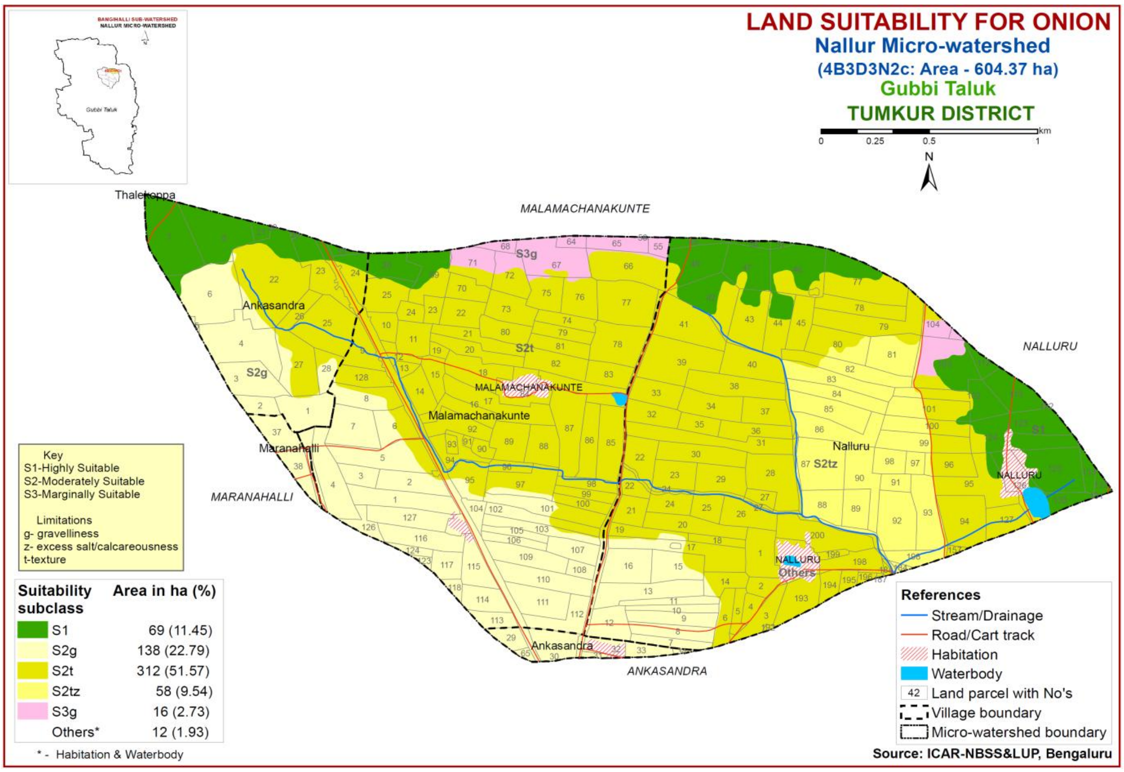


Fig. 7.12 Land Suitability map of Onion

7.13 Land Suitability for Chilli (*Capscicum annuum L.*)

Chilli is the most important commercial crop grown in an area of 0.42 lakh ha in the State in all the districts. The crop requirements for growing Chilli (Table 7.13) 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 7.13.

Major area of about 381 ha (63%) has soils that are highly suitable (Class S1) and are distributed in major part of the microwatershed. An area of about 196 ha (32%) has soils that are moderately suitable (Class S2) with minor limitations of gravelliness and calcareousness. They are distributed in the southern, western and southeastern part of the microwatershed. The marginally suitable (Class S3) lands cover a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.13 Land suitability criteria for chillies

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	
LGP	Days	>150	120-150	90-120	<90
Soil drainage	class	Well drained	Mod.to mperfectly drained	Poor drained/excessively	Very poorly drained
Soil reaction	pH	6.0-7.0	7.1-8.0	8.1-9.0,5.0-5.9	>9.0
Surface soil texture	Class	L, 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	
Salinity (ECe)	dsm^{-1}	<1.0	1.0-2.0	2.0-4.0	<4
Sodicity (ESP)	%	<5	5-10	10-15	

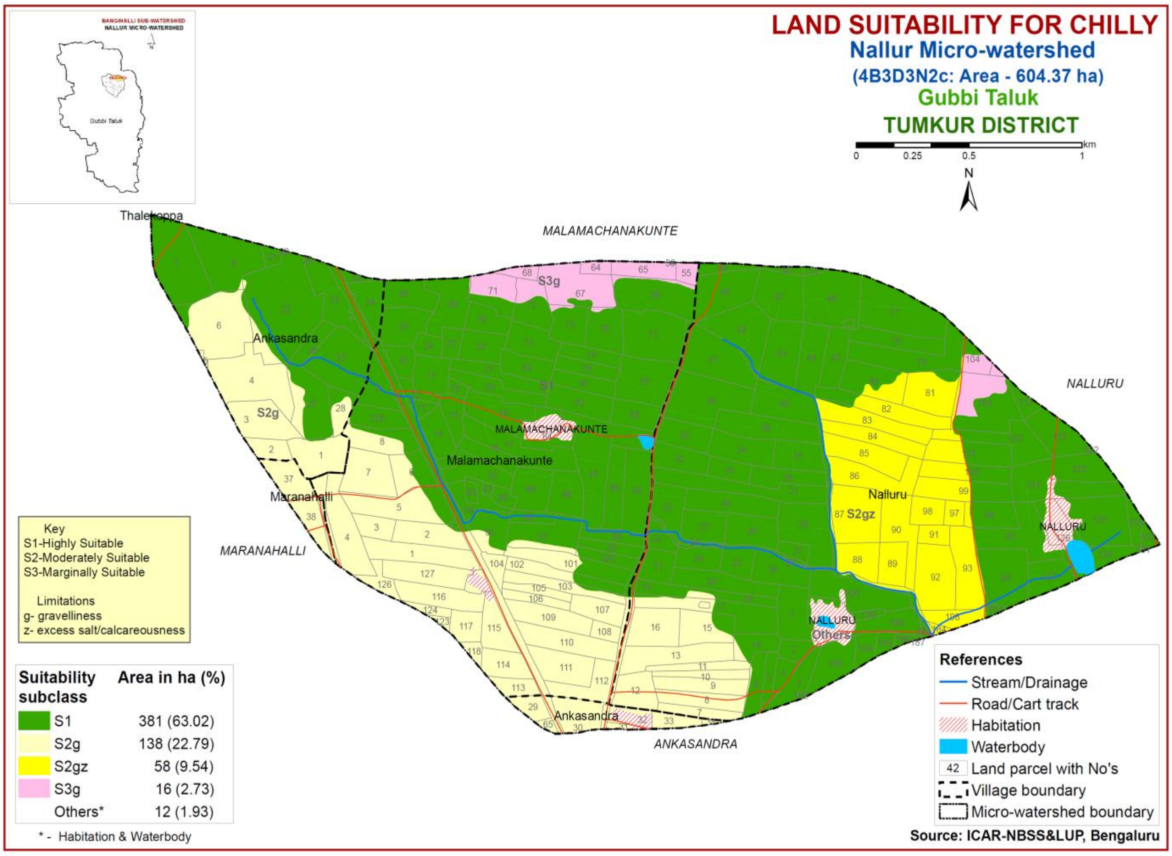


Fig. 7.13 Land Suitability map of Chilli

7.14 Land suitability for Brinjal (*Solanum melongena*)

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

Highly suitable (Class S1) lands occupy major area of about 381 ha (63%) and are distributed in the western, southern and northeastern part of the microwatershed. An area of about 196 ha (32%) has soils that are moderately suitable (Class S2) with minor limitations of texture, wetness and rooting depth. They are distributed in the eastern and central part of the microwatershed. The marginally suitable (Class S3) lands cover an area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.14 Land suitability criteria for Brinjal

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	Sl, scl, cl, sc	C (red)	Ls, c (black)	-
	pH	1:2.5	6.0-7.3	7.3-8.4, 5.5-6.0	8.4-9.0	>9.0
Rooting conditions	Soil depth	Cm	>75	50-75	25-50	<25
	Gravel content	%vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-5	5-10	>10

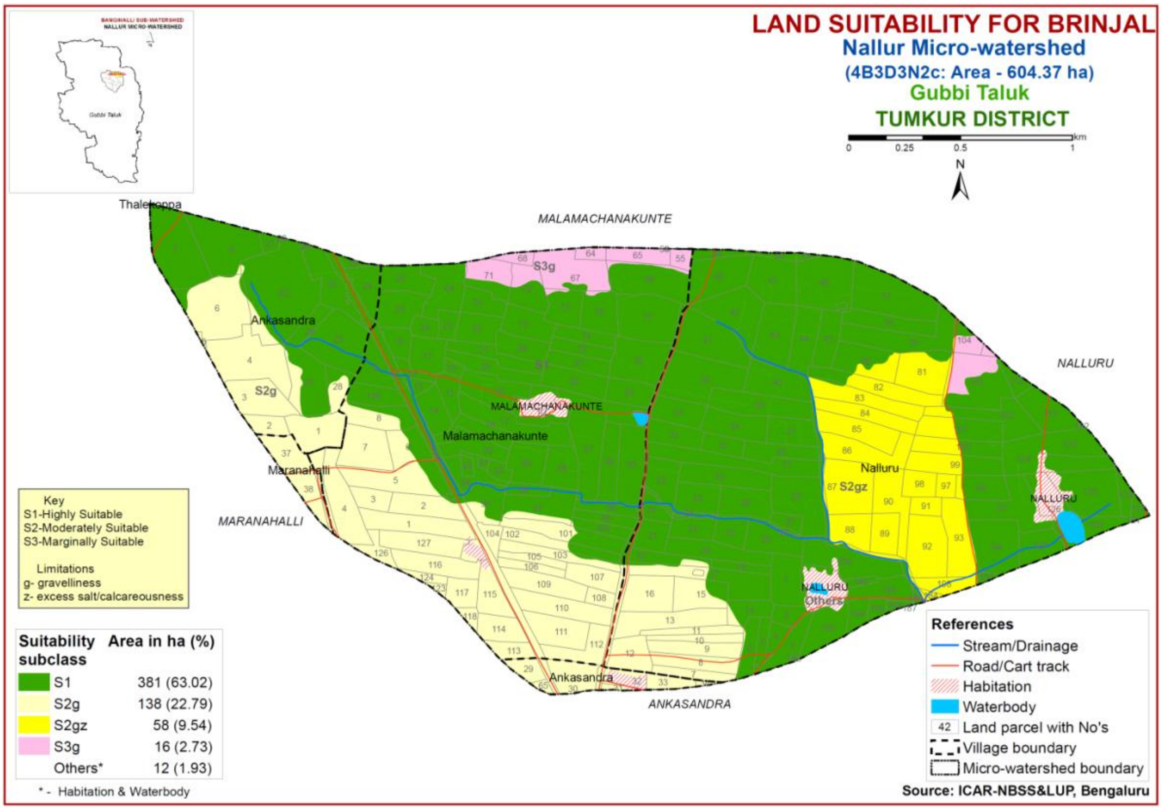


Fig. 7.15 Land Suitability map of Brinjal

7.15 Land suitability for Tomato (*Lycopersicon esculentum*)

Tomato is the most important fruit crop grown in an area of 0.65 lakh ha in almost all the districts of the State. The crop requirements for growing Tomato (Table 7.15) 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 7.15.

Maximum area of about 381 ha (63%) has soils that are highly suitable (Class S1) and are distributed in major part of the microwatershed. An area of about 196 ha (32%) has soils that are moderately suitable (Class S2) with minor limitations of gravelliness and calcareousness. They are distributed in the southern, western and southeastern part of the microwatershed. The marginally suitable (Class S3) lands cover an area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.15 Land suitability criteria for Tomato

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
climate	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

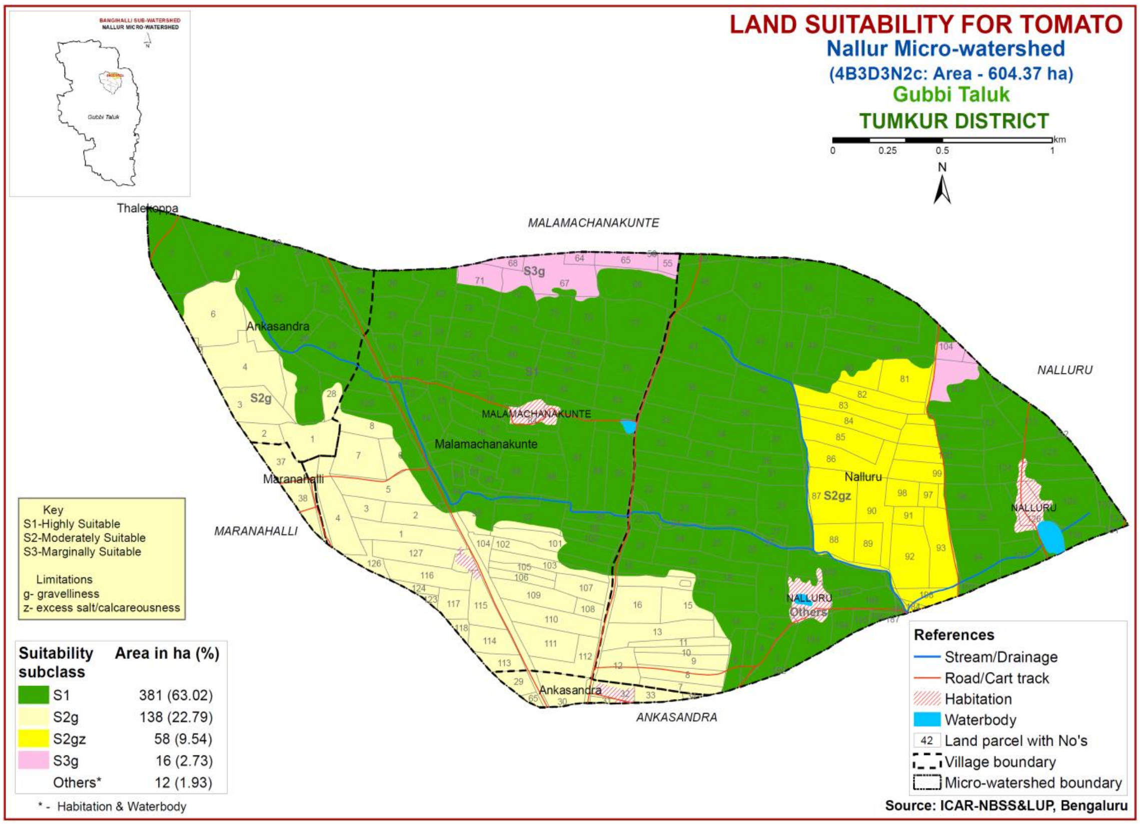


Fig. 7.15 Land Suitability map of Tomato

7.16 Land suitability for Mango (*Mangifera indica*)

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

Major area of about 357 ha (59%) in the microwatershed is highly suitable (Class S1) for growing mango and are distributed in major part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 220 ha (36%) and are distributed in the northwestern, western and southern part the microwatershed. They have minor limitations of gravelliness, rooting depth and calcareousness. The marginally suitable (Class S3) lands occur in an area of about 16 ha (3%) and are distributed in the southern, northeastern and northern part of the microwatershed and have moderate limitation of gravelliness.

Table 7.16 Crop suitability criteria for Mango

Crop requirement			Rating			
Soil-site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temp. in growin gseason	^{0}C	28-32	24-27 33-35	36-40	20-24
Soil moisture	Growing period	Days	>180	150-180	120-150	<120
Soil aeration	Soil drainage	Class	Well drained	Mod. To imperfectly drained	Poor drained	Very poorly drained
	Water table	M	>3	2.50-3.0	2.5-1.5	<1.5
Nutrient availability	Texture	Class	Sc, l, sil, cl	Sl, sc, sic, l, c	C (<60%)	C (>60%),
	pH	1:2.5	5.5-7.5	7.6-8.55.0-5.4	8.6-9.0,4.0-4.9	<4.0, >9.0
	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	

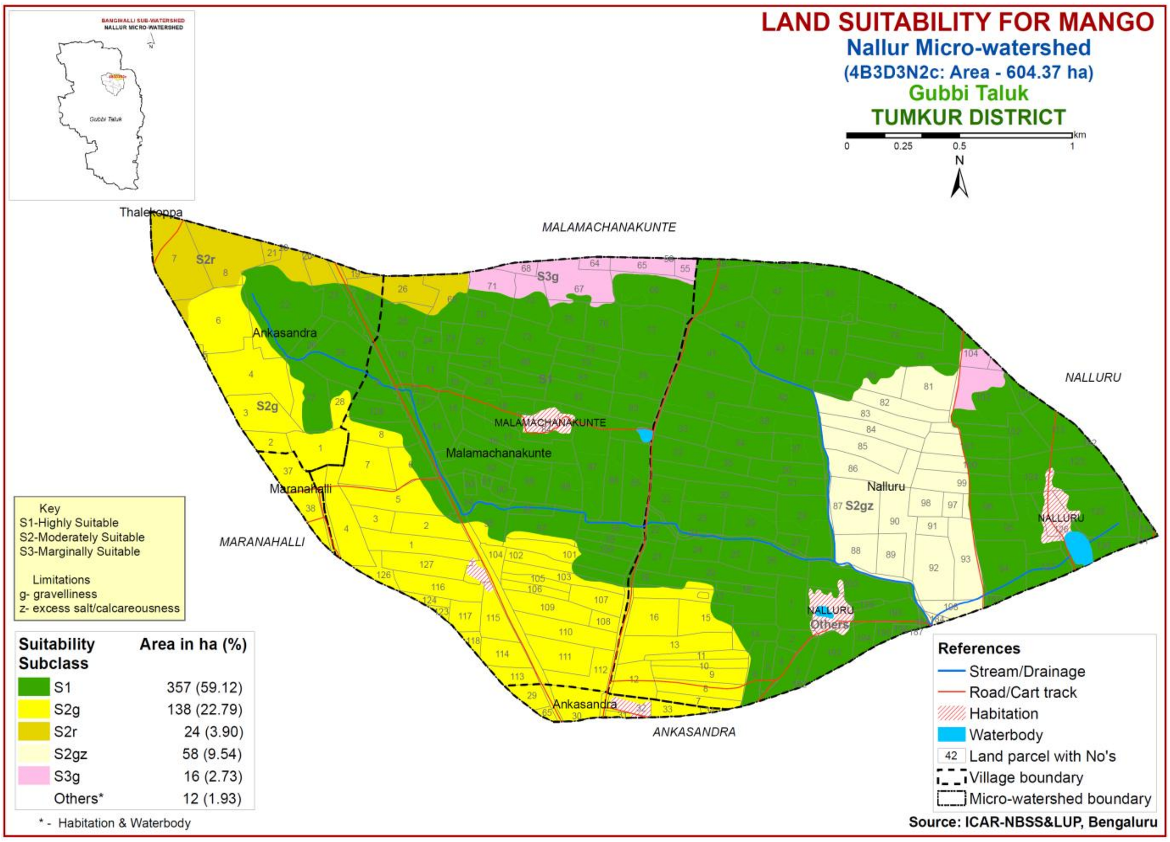


Fig. 7.16 Land Suitability map of Mango

7.17 Land suitability for Sapota (*Manilkara zapota*)

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

Highly suitable (Class S1) lands occupy an area of about 381 ha (63%) in for growing Sapota and are distributed in the major part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 196 ha (32%) and are distributed in the southern, western and southeastern part the microwatershed. They have minor limitations of gravelliness and calcareousness. The marginally suitable (Class S3) lands cover small area of about 16 ha (3%) and are distributed in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.17 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 availability	Texture	Class	Scl, l, cl,sil	Sl, sicl, sc	C (<60%)	ls, s, C (>60%)
	pH	1:2.5	6.0-7.5	7.6-8.0,5.0-5.9	8.1-9.0,4.5-4.9	<4.5, >9.0
	$CaCO_3$ 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

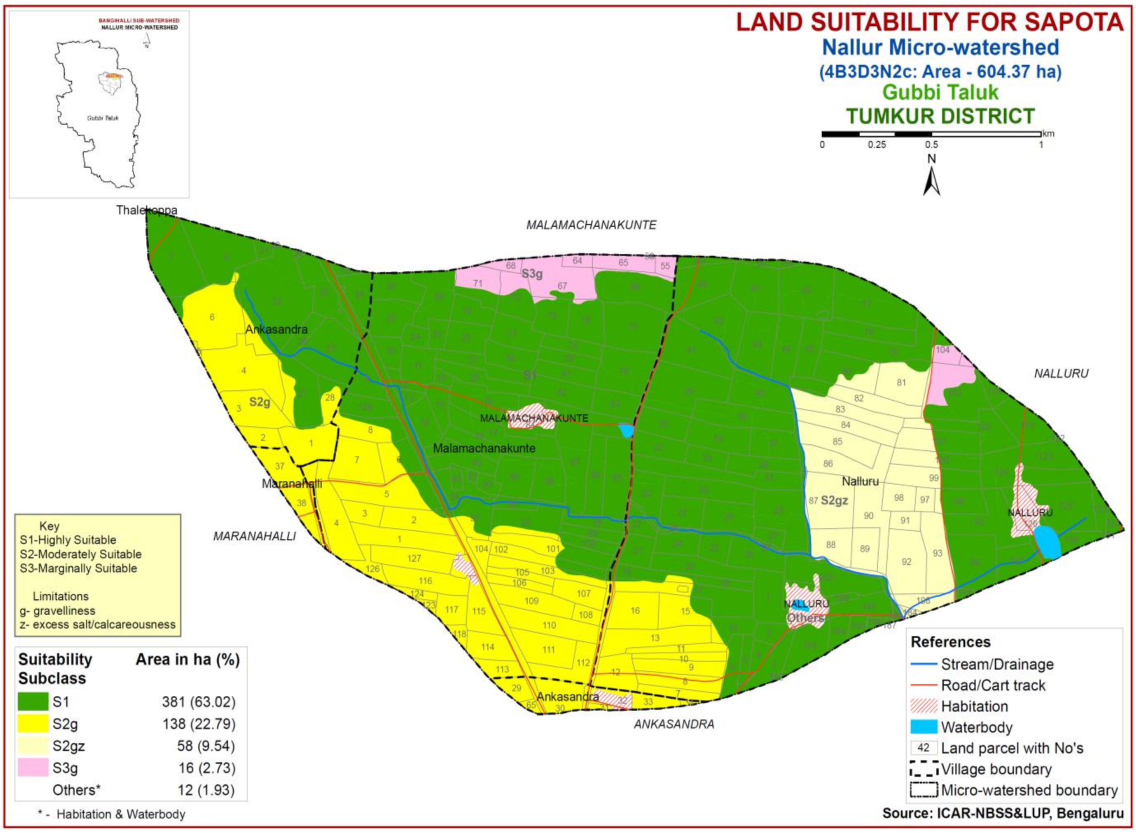


Fig. 7.18 Land Suitability map of Sapota

7.18 Land suitability for Guava (*Psidium guajava*)

Guava is the most important fruit crop grown in an area of 6558 ha in almost all the districts of the State. The crop requirements (Table 7.18) for growing guava were matched with the soil-site characteristics (7.1) and a land suitability map for growing guava was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.18.

An area of about 155 ha (27%) in the microwatershed is highly suitable (Class S1) for growing guava and are distributed in major part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 173 ha (30%) for growing guava and are distributed in the southern, western and southeastern part and have minor limitations of gravelliness, texture and calcareousness. The marginally suitable (Class S3) lands cover an area of about 223 ha (39%) and are distributed in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.18 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

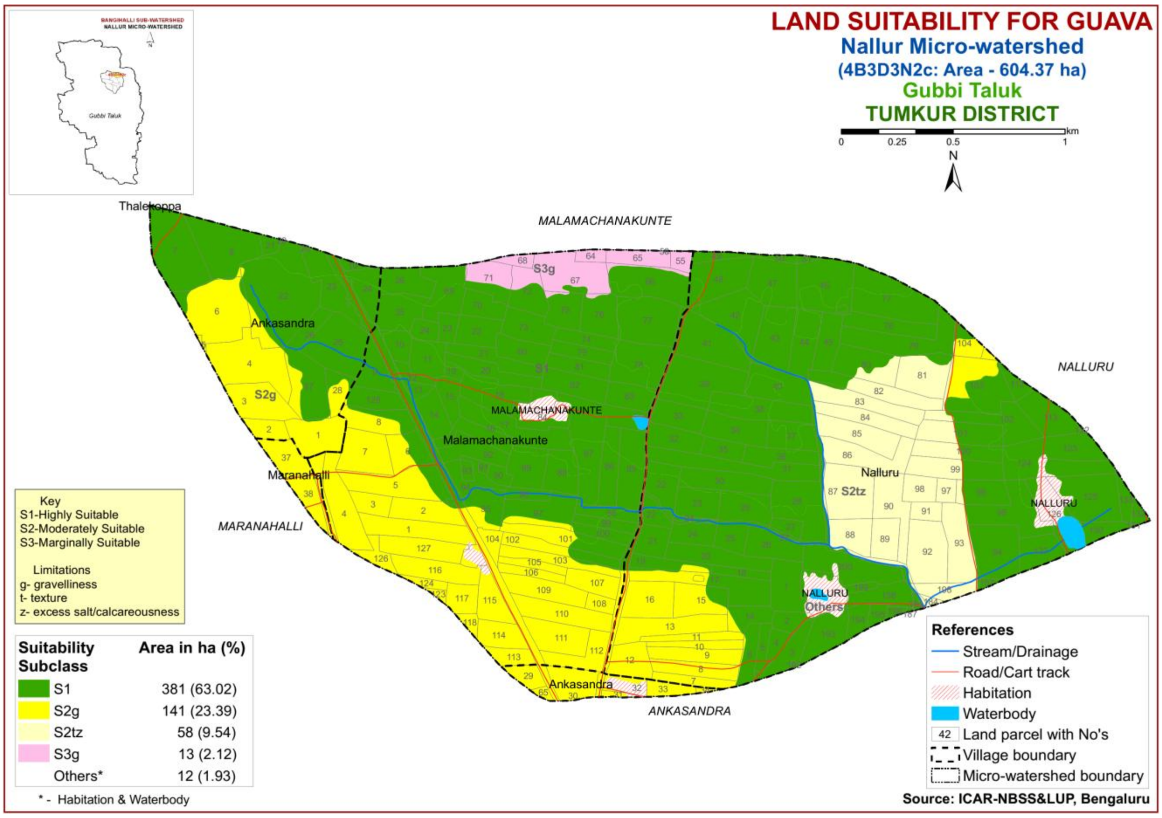


Fig. 7.18 Land Suitability map of Guava

7.19 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the commercially grown fruit crop in Karnataka in an area of 0.18 lakh ha mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing pomegranate (Table 7.19) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing pomegranate was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.19.

Highly suitable (Class S1) lands occupy an area of about 381 ha (63%) for growing pomegranate and are distributed in major part of the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) and are distributed in the southern, western and southeastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable (Class S3) lands for growing pomegranate occupy a small area of about 16 ha (3%) and are distributed in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.19 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	^0C	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	S, fragmental
Rooting conditions	pH	1:2.5	5.5-7.5	7.6-8.5	8.6-9.0	
	Soil depth	Cm	>100	75-100	50-75	<50
	Gravel content	% vol.	nil	15-35	35-60	>60
Soil toxicity	Salinity	dS/m	Nil	<9	>9	<50
	Sodicity	%	nil			
Erosion	Slope	%	<3	3-5	5-10	

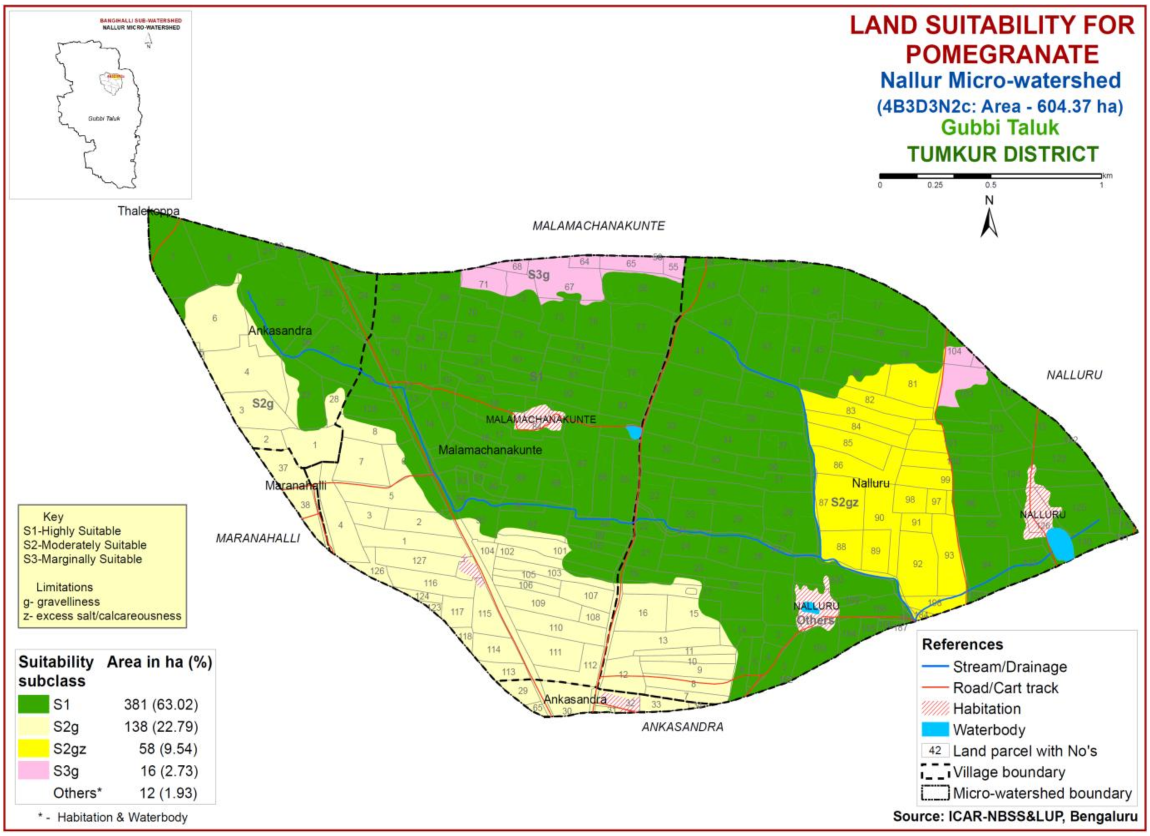


Fig. 7.19 Land Suitability map of Pomegranate

7.20 Land Suitability for Banana (*Musa paradisiaca*)

Banana is one of the major fruit crop grown in an area of 1.02 lakh ha in Karnataka State. The crop requirements for growing banana (Table 7.20) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing banana was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.20.

Maximum area of about 381 ha (63%) has soils that are highly suitable (Class S1) for growing banana and are distributed in major part of the microwatershed. An area of about 196 ha (32%) has soils that are moderately suitable (Class S2) with minor limitations of gravelliness and calcareousness. They are distributed in the southern, western and southeastern part of the microwatershed. The marginally suitable (Class S3) lands cover an area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.20 Crop suitability criteria for Banana

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	26-33	34-36 24-25	37-38	>38
Soil aeration	Soil drainage	Class	Well drained	Moderately to imperfectly drained	Poorly drained	Very poorly drained
Nutrient availability	Texture	Class	l,cl, scl,sil	Sicl, sc, c(<45%)	C (>45%), sic, sl	ls, s
	pH	1:2.5	6.5-7.0	7.1-8.5,5.5-6.4	>8.5, <5.5	
Rooting conditions	Soil depth	Cm	>125	76-125	50-75	<50
	Stoniness	%	<10	10-15	15-35	>35
Soil toxicity	Salinity	dS/m	<1.0	1-2	>2	
	Sodicity	%	<5	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-15	>15

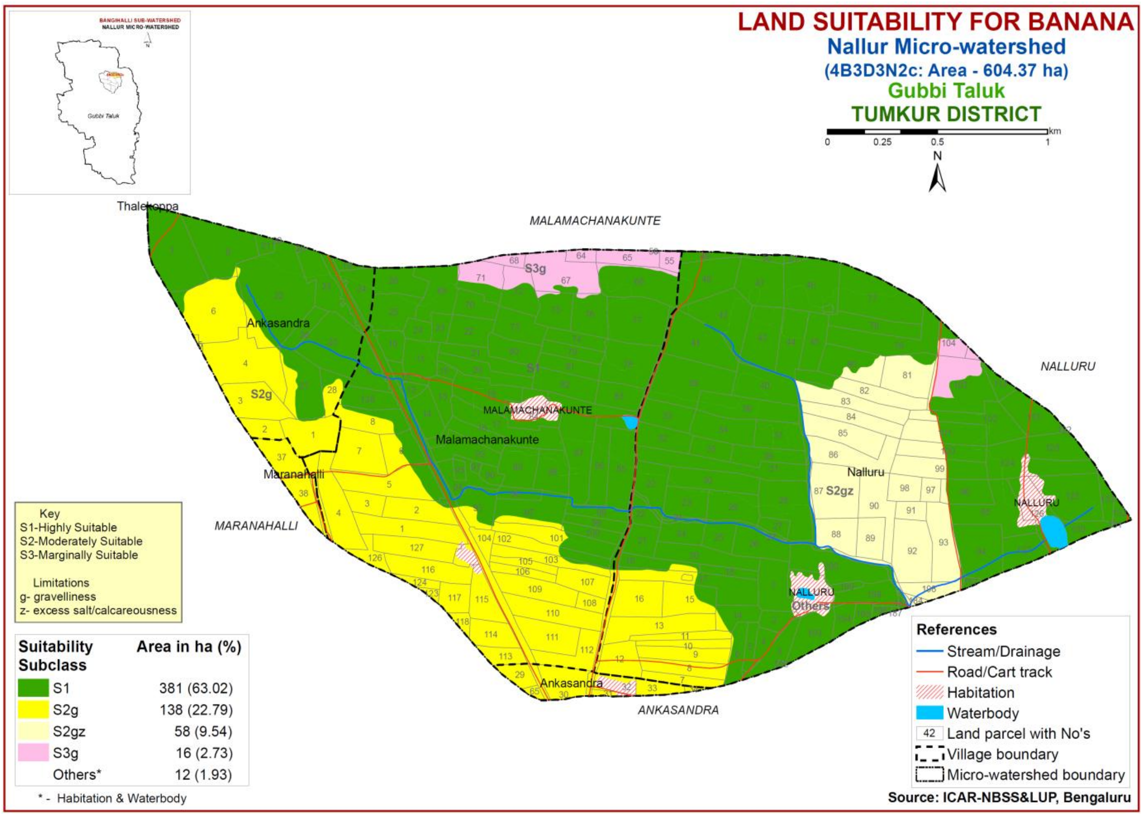


Fig. 7.20 Land Suitability map of Banana

7.21 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is the most important fruit crop grown in 5368 ha in all the districts of the state. The crop requirements for growing jackfruit were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jackfruit (Table 7.21) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.21.

Highly suitable (Class S1) lands occupy an area of about 381 ha (63%) is for growing Jackfruit and are distributed in the major part of the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) for growing Jackfruit and are distributed in the southern, western and southeastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable (Class S3) lands for growing Jackfruit occupy a small area of about 16 ha (3%) and are distributed in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.21 Land suitability criteria for Jackfruit

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

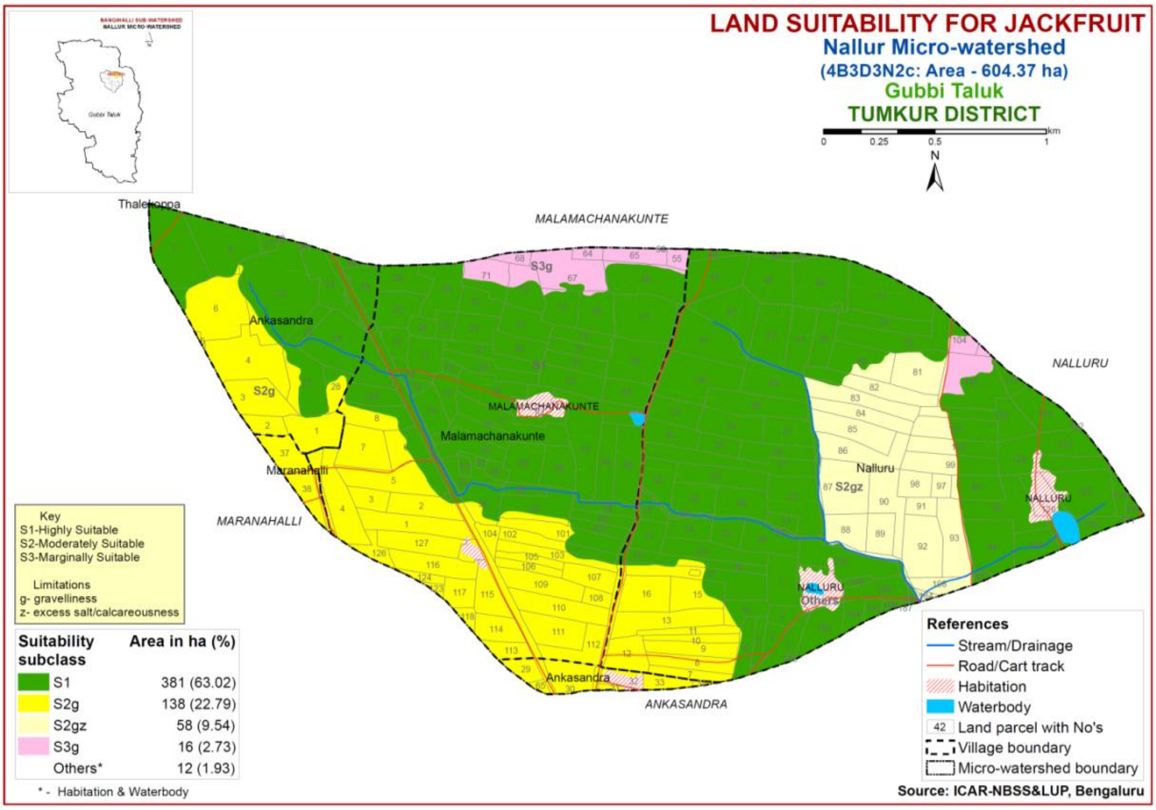


Fig. 7.21 Land Suitability map of Jackfruit

7.22 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jamun (Table .22) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.22.

Major area of about 357 ha (59%) is highly suitable (Class S1) for growing Jamun and are distributed in the major part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 220 ha (36%) and are distributed in the southern, western and southeastern part of the microwatershed and have minor limitations of gravelliness and calcareousness. Marginally suitable (Class S3) lands for growing Jamun occupy a small area of about 16 ha (3%) and are distributed in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table .22 Land suitability criteria for jamun

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

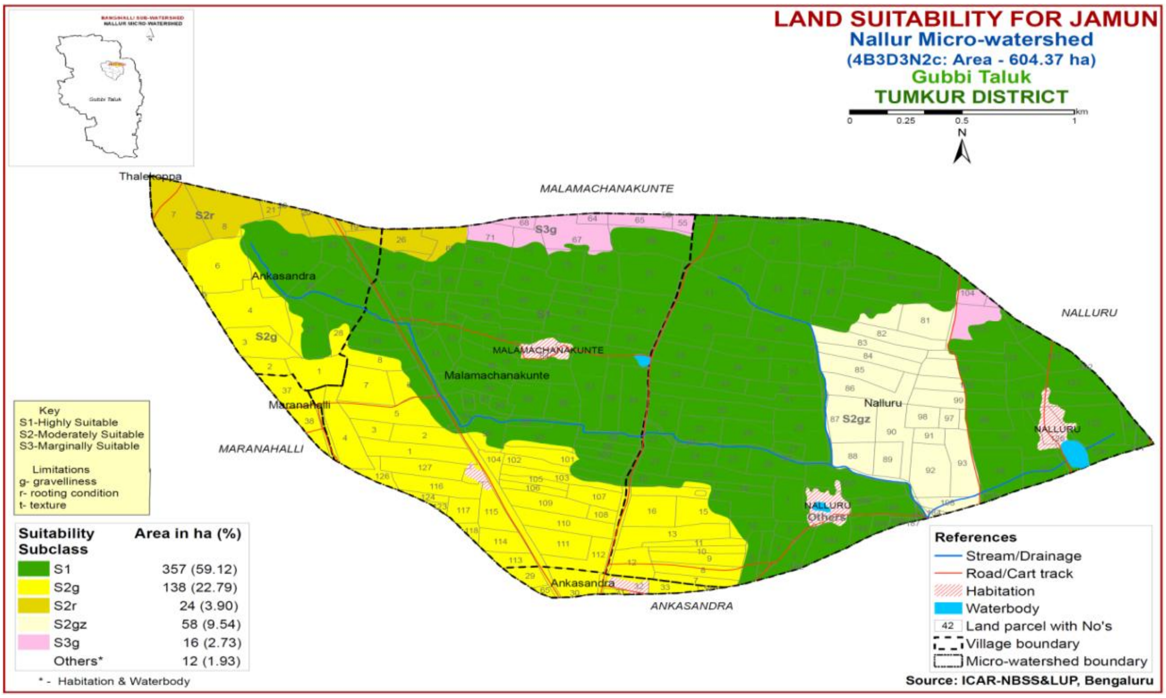


Fig. 7.22 Land Suitability map of Jamun

7.23 Land Suitability for Musambi (*Citrus limetta*)

Musambi is 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 were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing musambi (Table 7.23) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.23.

Maximum area of about 381 ha (63%) has soils that are highly suitable (Class S1) for growing musambi and are distributed in major part of the microwatershed. An area of about 196 ha (32%) has soils that are moderately suitable (Class S2) with minor limitations of gravelliness and calcareousness. They are distributed in the southern, western and southeastern part of the microwatershed. The marginally suitable (Class S3) lands cover a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.23 Crop suitability criteria for Musambi

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N)
Soil aeration	Soil drainage	Class	Well drained	Mod. To imperfectly drained	poorly	Very poorly
Nutrient availability	Texture	Class	Scl, l, sicl, cl, s	Sc, sc, c	C(>70%)	S, ls
	pH	1:2.5	6.0-7.5	5.5-6.47.6-8.0	4.0-5.4 8.1-8.5	<4.0 >8.5
Rooting conditions	Soil depth	Cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Erosion	Slope	%	<3	3-5	5-10	

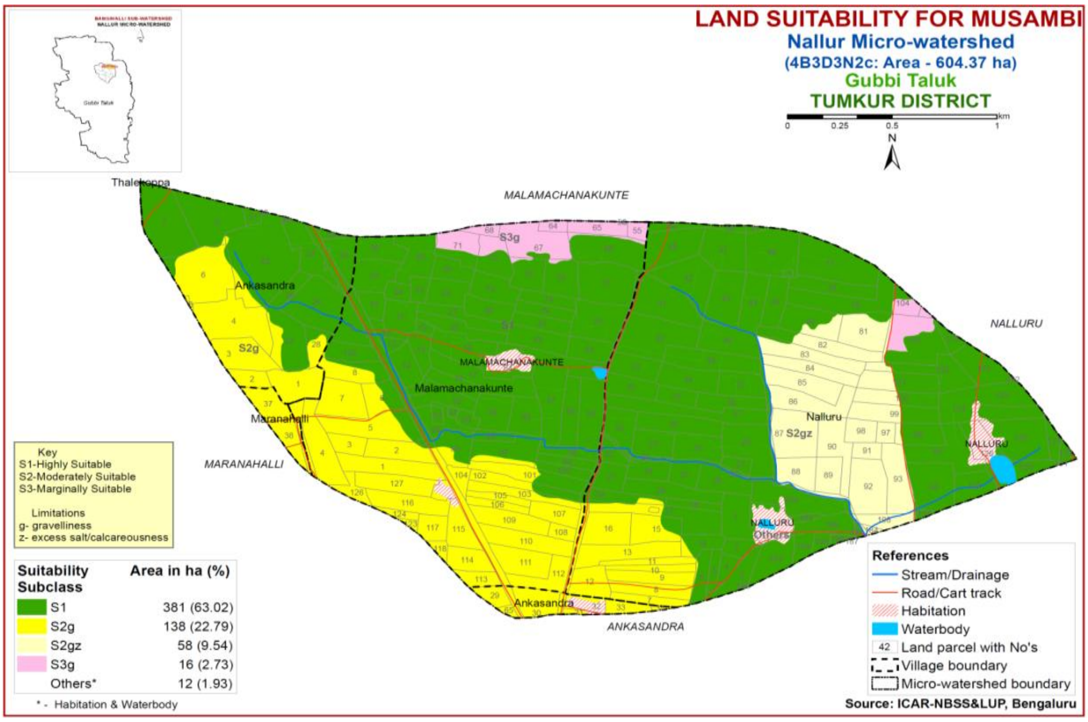


Fig. 7.23 Land Suitability map of Musambi

7.24 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 11752 ha in almost all the districts of the State. The crop requirements for growing lime (Table 7.24) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7. 24.

Highly suitable (Class S1) lands occupy an area of about 381 ha (63%) for growing lime and are distributed in the major part of the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) and are distributed in the southern, western and southeastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable (Class S3) lands occupy a small area of about 16 ha (3%) and are distributed in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.24 Crop suitability criteria for Lime

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

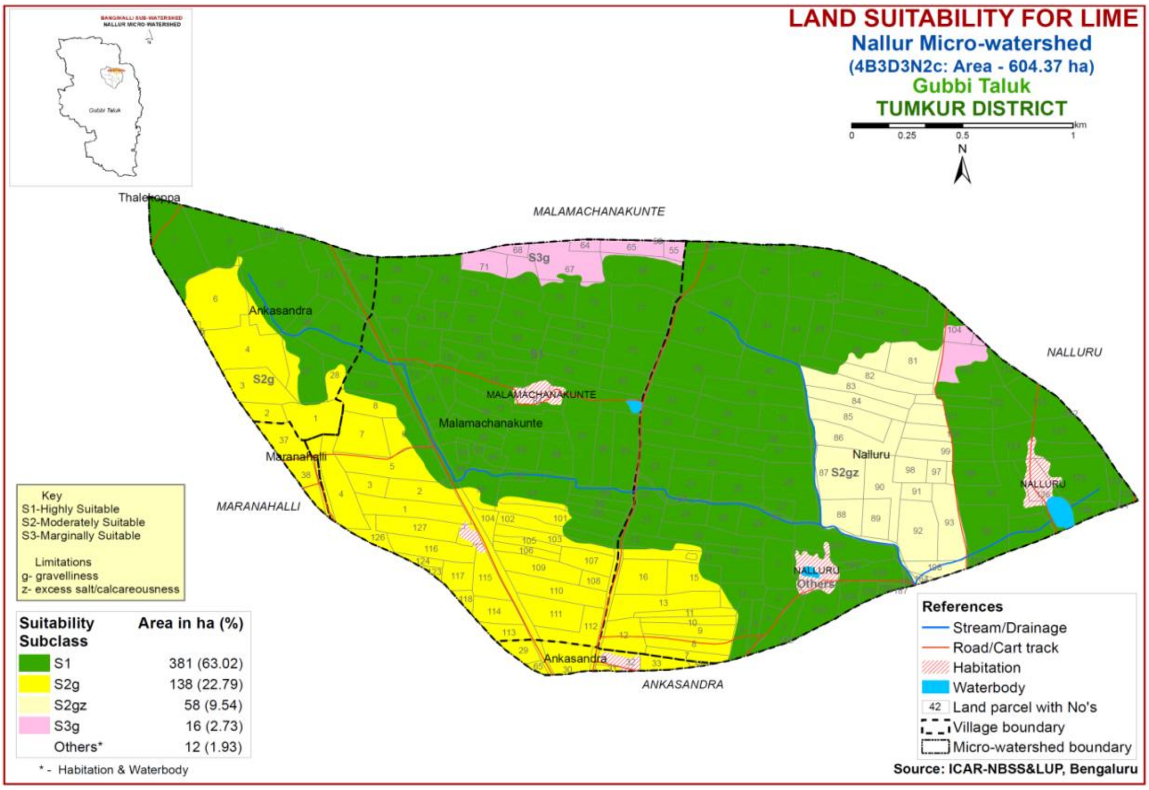


Fig. 7.24 Land Suitability map of Lime

7.25 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important fruit crop grown in an area of 7052 ha in almost all the districts of the State. The crop requirements for growing cashew were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew (Table 7.25) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

Maximum area of about 381 ha (63%) has soils that are highly suitable (Class S1) for growing cashew and are distributed in major part of the microwatershed. An area of about 196 ha (32%) has soils that are moderately suitable (Class S2) with minor limitations of gravelliness and calcareousness. They are distributed in the southern, western and southeastern part of the microwatershed. The marginally suitable (Class S3) lands cover a small area of about 16 ha (3%) and occur in small patches in the northeastern, central and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.25 Land suitability criteria for Cashew

Crop requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Soil aeration	Soil drainage	Class	Well drained	Mod. well drained	Poorly drained	V.Poorly drainage
Nutrient availability	Texture	Class				
	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	

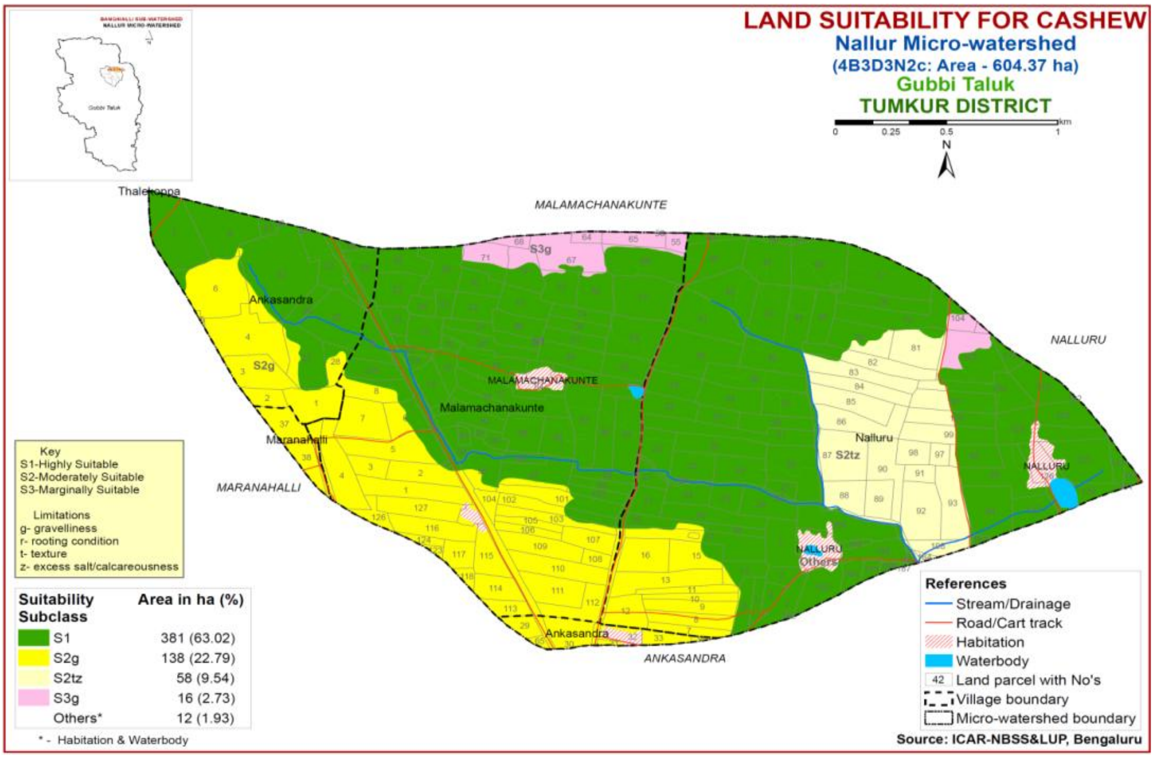


Fig. 7.25 Land Suitability map of Cashew

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

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing custard apple were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple (Table 26) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.26.

Maximum area of 439 ha (73%) is highly suitable (Class S1) for growing custard apple and are distributed in major part of the microwatershed. An area of about 154 ha (26%) has soils that are moderately suitable (Class S2) for growing custard apple with minor limitation of gravelliness and are distributed in the northern, northeastern, western and southern part of the microwatershed.

Table 7.26 Land suitability criteria for Custard apple

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

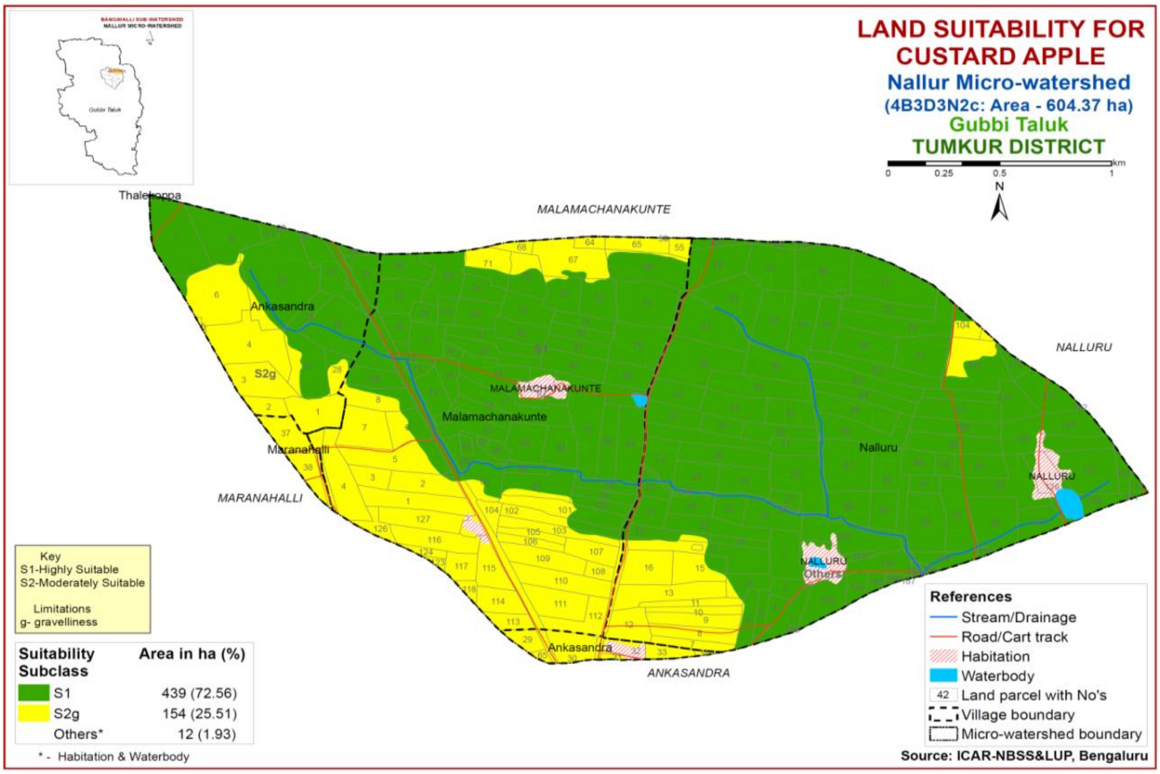


Fig. 7.26 Land Suitability map of Custard Apple

7.27 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the medicinal and fruit crop grown in almost all the districts of the State. The crop requirements for growing amla were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing amla (Table 7.27) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.27.

Major area of 438 ha (73%) is highly suitable (Class S1) for growing amla and are distributed in the major part of the microwatershed. An area of about 154 ha (26%) has soils that are moderately suitable (Class S2) with minor limitation of gravelliness and are distributed in the northern, northeastern, western and southern part of the microwatershed.

Table 7. 27 Land suitability criteria for Amla

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

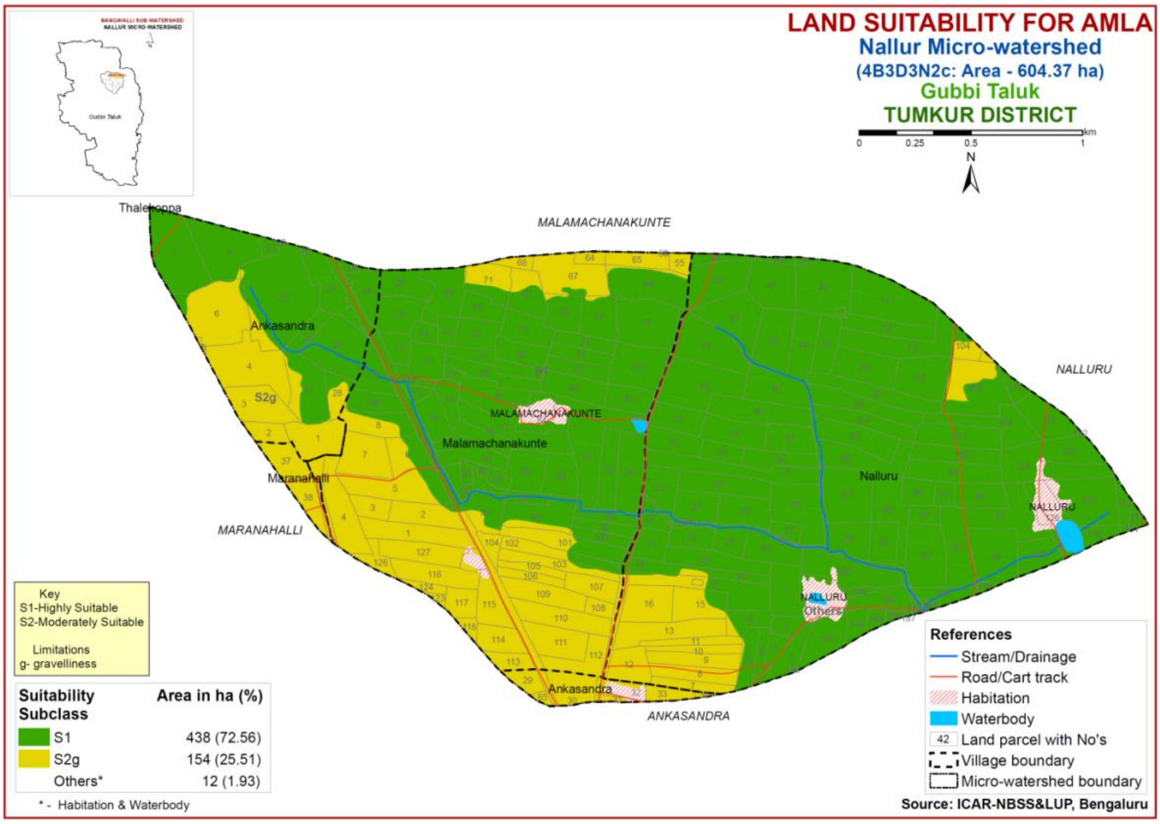


Fig. 7.27 Land Suitability map of Amla

7.28 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is the most important spice crop grown in 14897 ha in all the districts of the state. The crop requirements for growing tamarind were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tamarind (Table 7.28) was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Fig. 7.28.

Major area of about 357 ha (59%) is highly suitable (Class S1) for growing tamarind and are distributed in the major part of the microwatershed. Moderately suitable (Class S2) lands occupy an area of about 220 ha (36%) and are distributed in the southern, western and southeastern part of the microwatershed and have minor limitations of gravelliness, rooting depth and calcareousness. Marginally suitable (Class S3) lands occupy a small area of about 16 ha (3%) and are distributed in small patches in the northeastern and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.28 Land suitability criteria for Tamarind

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

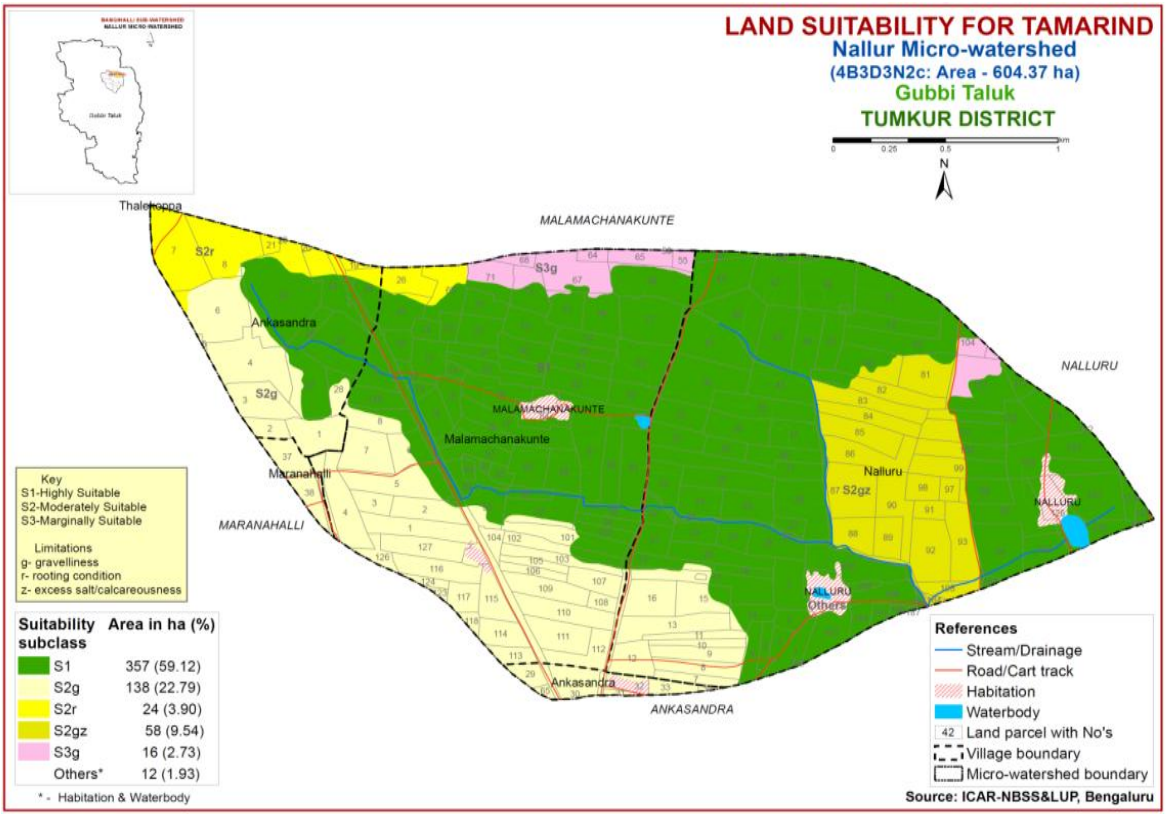


Fig. 7.28 Land Suitability map of Tamarind

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

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

An area of about 381 ha (63%) is highly suitable (Class S1) for growing Marigold and are distributed in major part of the microwatershed. An area of about 209 ha (34%) is moderately suitable (Class S2) and are distributed in the northern, western, southern and southeastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable (Class S3) lands occupy a very small area of about 4 ha (1%) and are distributed in northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.29 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		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	-

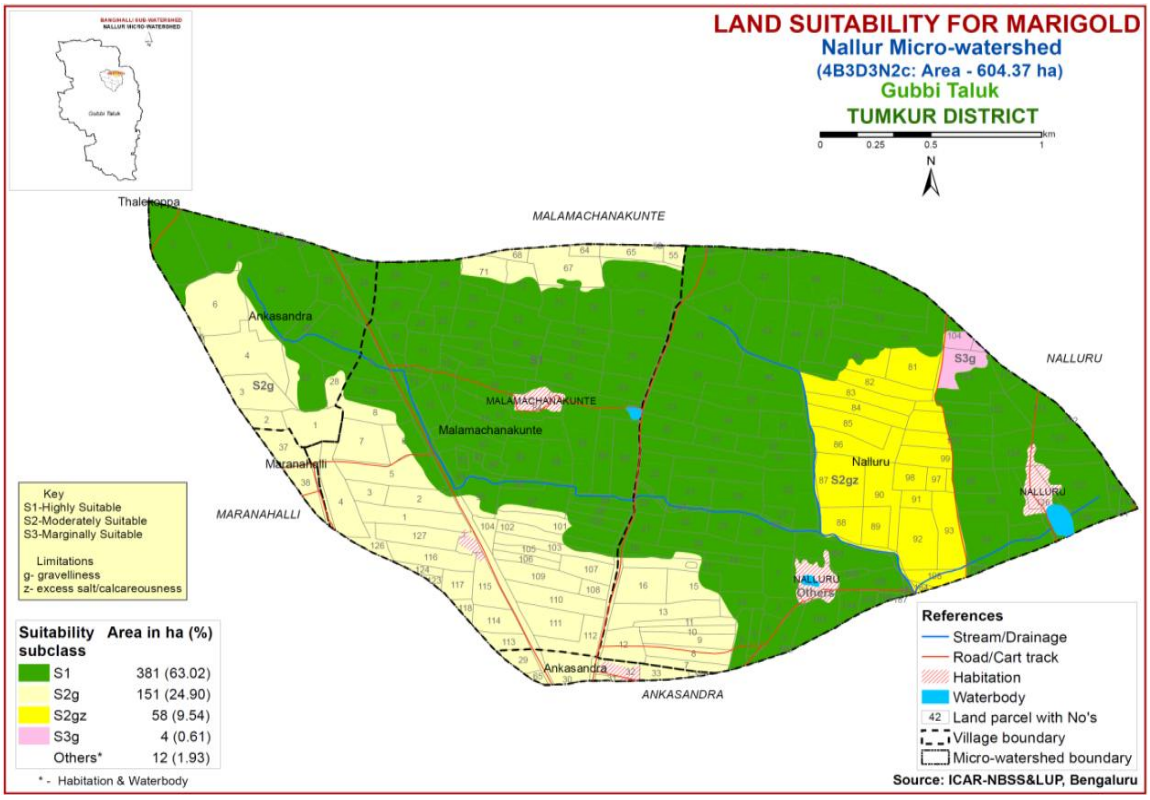


Fig. 7.29 Land Suitability map of Marigold

7.30 Land Suitability for Chrysanthemum (*Dendranthema grandiflora*)

Chrysanthemum is the most important flower crop grown in an area of 803 ha in almost all the districts of the State. The crop requirements (7.30) for growing chrysanthemum were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing chrysanthemum was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.30.

Major area of about 381 ha (63%) is highly suitable (Class S1) for growing Chrysanthemum and are distributed in major part of the microwatershed. An area of about 209 ha (34%) is moderately suitable (Class S2) and are distributed in the northern, western, southern and southeastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable (Class S3) lands occupy a very small area of about 4 ha (1%) and are distributed in the northeastern part of the microwatershed. They have moderate limitation of gravelliness.

Table 7.30 Land suitability criteria for Chrysanthemum

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

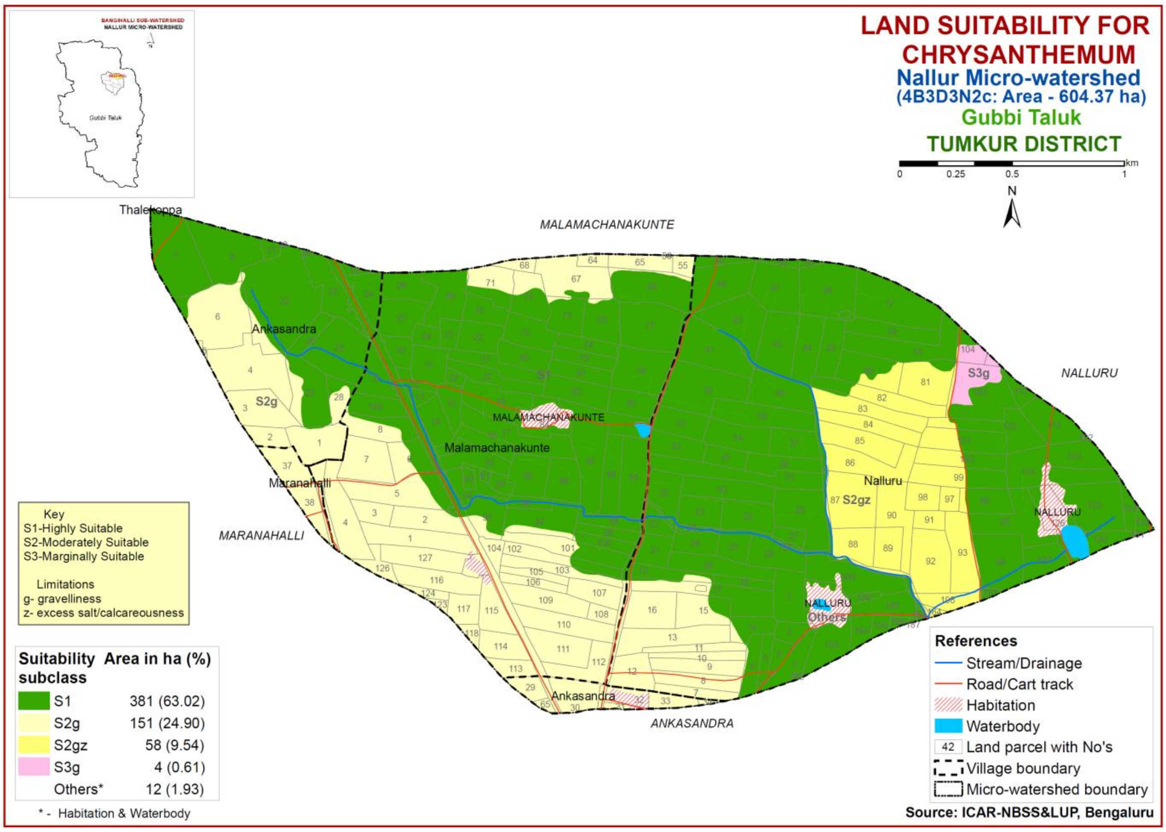


Fig. 7.30 Land Suitability map of Chrysanthemum

7. 31 Land Suitability for Jasmine *(Jasminum sp.)*

Jasmine is the most important flower crop grown in an area of 803 ha in almost all the districts of the State. The crop requirements (Table 7.31) for growing Jasmine were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Jasmine was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.31.

Highly suitable (Class S1) lands occupy major area of about 381 ha (63%) for growing Jasmine and are distributed in major part of the microwatershed. An area of about 209 ha (34%) is moderately suitable (Class S2) for growing Jasmine and are distributed in the northwestern, northern and southeastern part of the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable (Class S3) lands occupy a very small area of about 4 ha (1%) and are distributed in the northeastern part of the microwatershed with moderate limitation of gravelliness.

Table 7.31 Land suitability criteria for jasmine (irrigated)

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

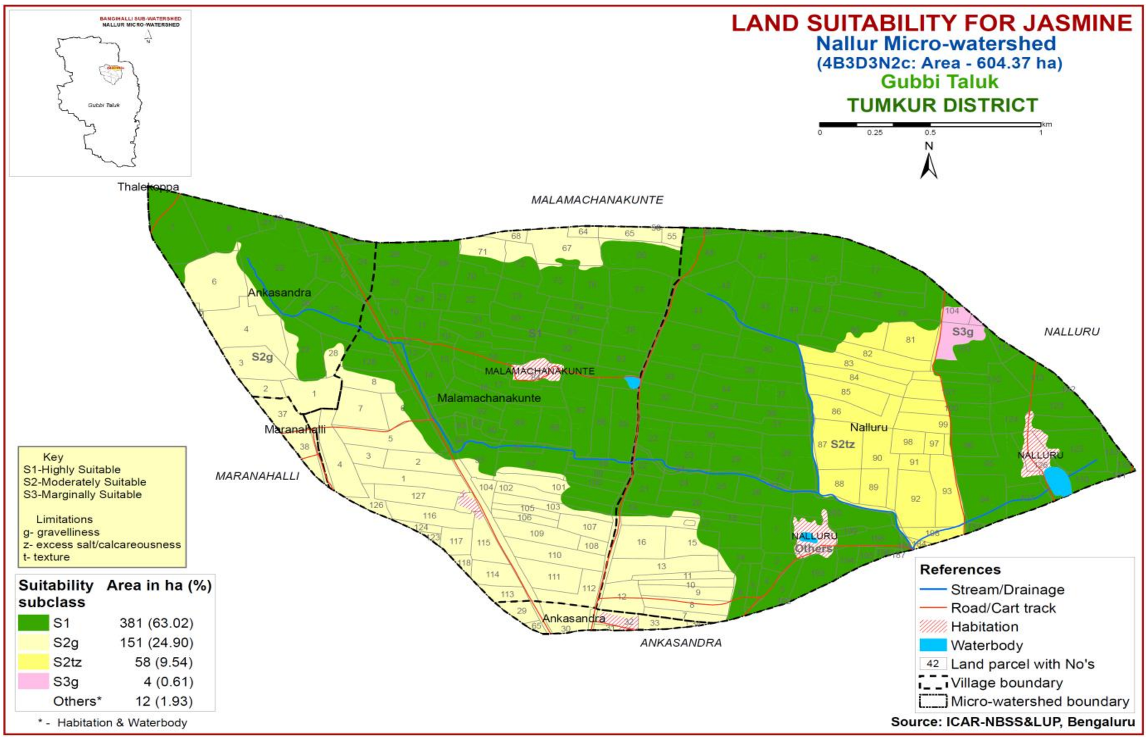


Fig. 7.31 Land Suitability map of Jasmine

7.32 Land Suitability for Coconut (*Cocos nucifera*)

Coconut is the most important nut crop grown in almost all the districts of the State. The crop requirements (7.32) for growing Coconut were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Coconut was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.32.

Maximum area of about 381 ha (63%) is highly suitable (Class S1) for growing coconut and are distributed in the major part the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) for growing Coconut and are distributed in the southern, western and southeastern part the microwatershed. They have minor limitations of gravelliness and calcareousness. Marginally suitable lands (Class S3) occupy a small area of about 16 ha (3%) and occur in small patches in the northeastern and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7. 32 Land suitability criteria for Coconut

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Slope	%	0-3	3-5	5-10	>10
Soil drainage	class	Well drained	Mod. drained	Poorly	Very poorly
Soil reaction	pH	5.1-6.5	6.6-7.5	7.6-8.5	-
Surface soil texture	Class	Sc, cl, scl	C (red), sl	C (black), ls	-
Soil depth	Cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	35-60	>60

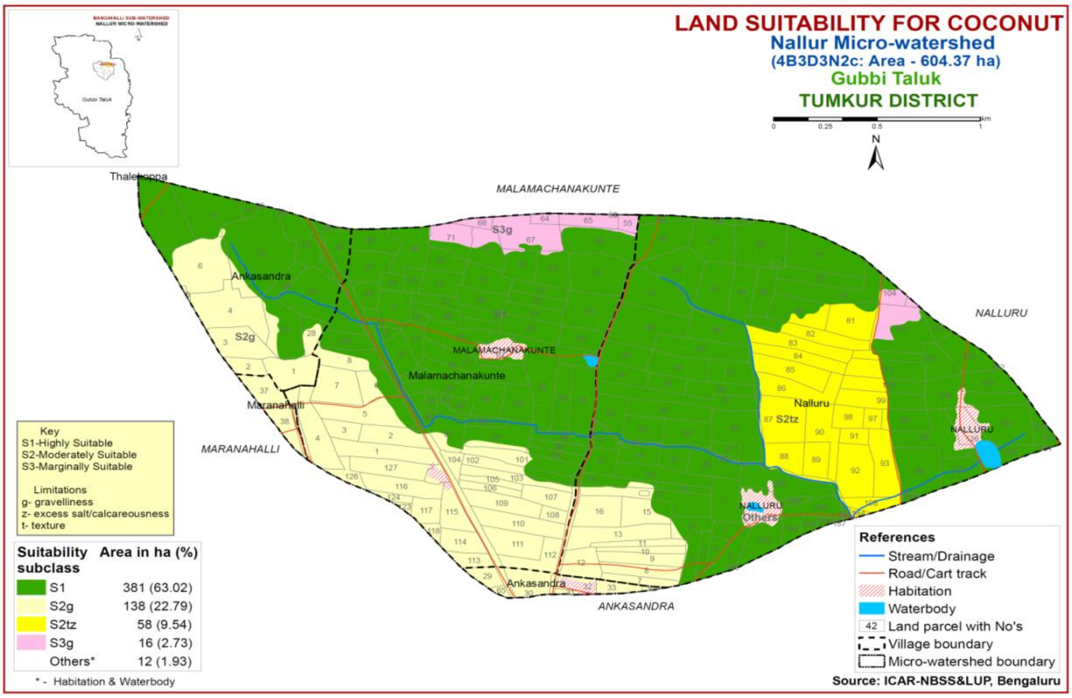


Fig. 7.32 Land Suitability map of Coconut

7.33 Land Suitability for Arecanut (*Areca catechu*)

Arecanut is the most important nut crop grown in almost all the districts of the State. The crop requirements (7.33) for growing Areca nut were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Arecanut was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.33.

Highly suitable (Class S1) lands occupy maximum area of about 381 ha (63%) for growing arecanut and are distributed in the major part the microwatershed. An area of about 196 ha (32%) is moderately suitable (Class S2) for growing arecanut and are distributed in the southern, western and southeastern part of the microwatershed. They have minor limitations gravelliness and calcareousness. Marginally suitable lands (Class S3) occupy a small area of about 16 ha (3%) and occur in small patches in the northeastern and northern part of the microwatershed with moderate limitation of gravelliness.

Table 7.33 Land suitability criteria for Arecanut

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable S1**	**Moderately suitable S2**	**Marginally suitable S3**	**Not suitable N**
Slope	%	0-3	3-5	5-10	>10
Soil drainage	class	Well drained	Mod. to poorly drained	-	Very poorly
Soil reaction	pH	5.0-6.5	6.6-7.5	7.6-8.5	
Surface soil texture	Class	Sc, cl, scl	C (red), sl	C (black), ls	-
Soil depth	Cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	35-60	>60

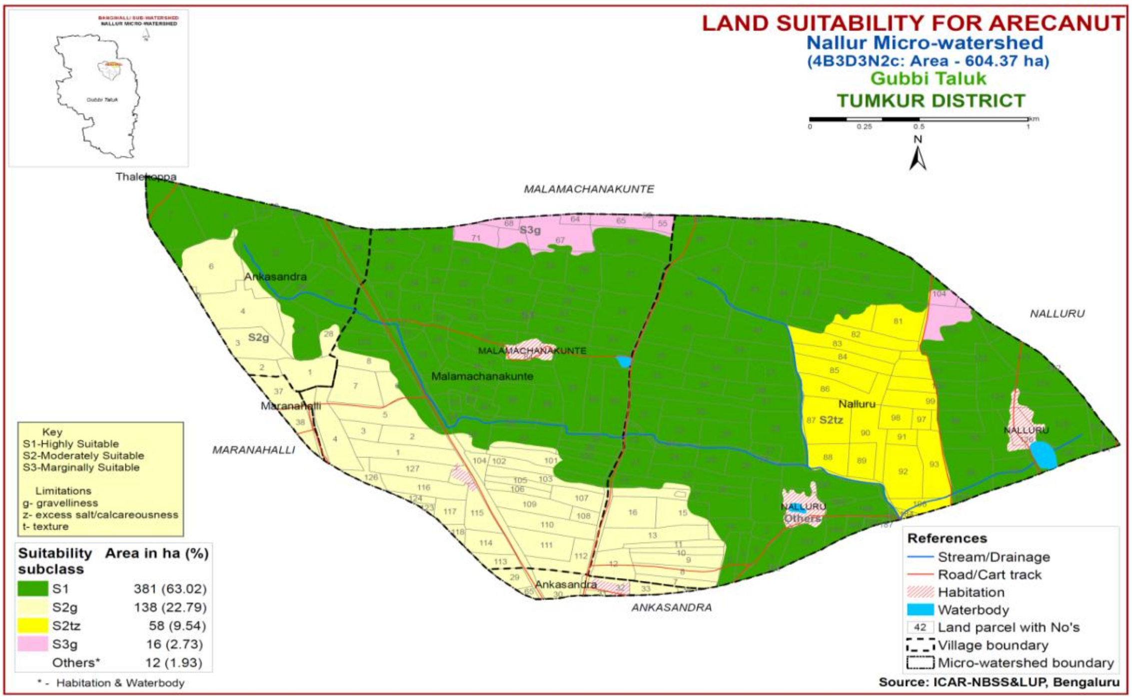


Fig. 7.33 Land Suitability map of Areca nut

7.34 Land Suitability for Mulbery (*Morus nigra*)

Mulbery is the most important crop grown in about 1.66 lakh ha in all the districts of the state. The crop requirements for growing mulbery (Table 7.34) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mulbery 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 suitable (Class S1) lands for growing mulbery. Moderately suitable (Class S2) lands occupy maximum area of about 223 ha (37%) and occur in the northern, western and southern part of the microwatershed. They have minor limitations of gravelliness and texture. Marginally suitable lands cover an area of about 370 ha (61%) and occur in the northern and central part of the microwatershed. They have moderate limitation of texture.

Table 34 Land suitability criteria for Mulberry

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

Note: Suitability evaluation only for Mulberry leaf not for Silk worm rearing

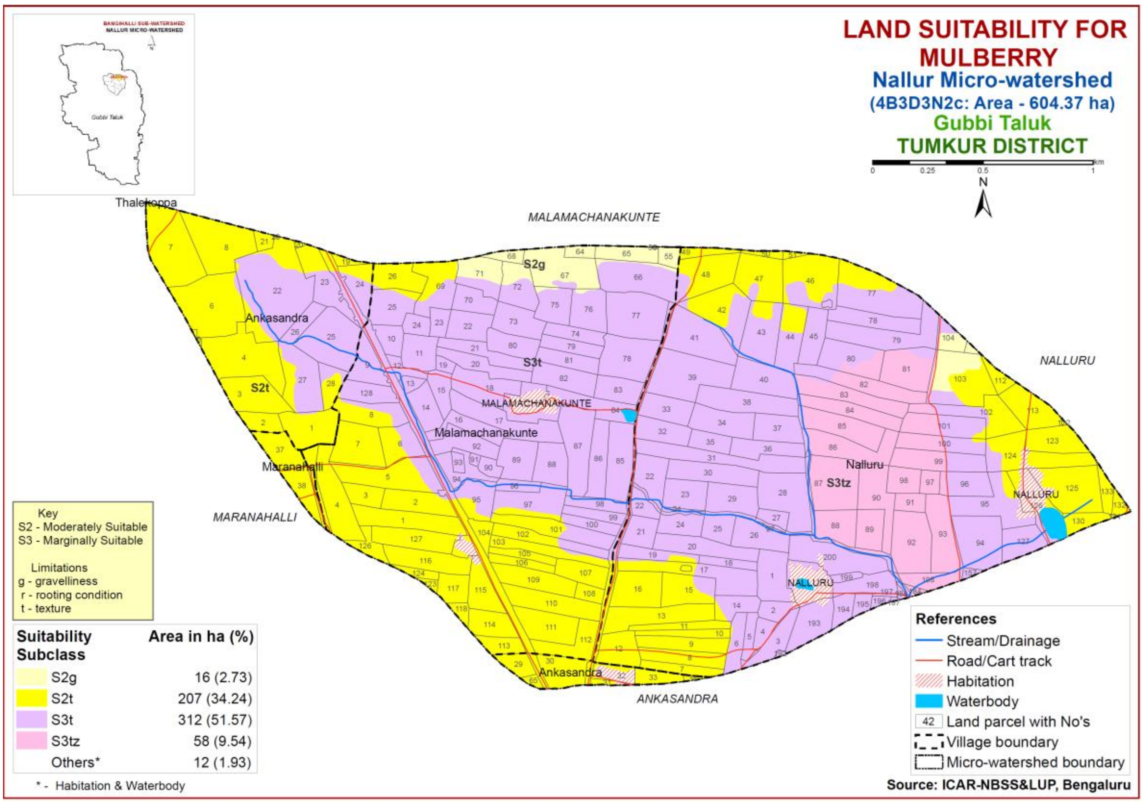


Fig. 7.33 Land Suitability map of Mulbery

7.35 Land Use Classes (LUCs)

The 13 soil map units identified in Nallur microwatershed have been regrouped into 4 Land Use Classes (LUC's) for the purpose of preparing a Proposed Crop Plan. Land Use Classes 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 Use Classes map (Fig.7.35) has been generated. These Land Use Classes are expected to behave similarly for a given level of management.

The map units that have been grouped into 4 land use classes along with brief description of soil and site characteristics are given below.

LUC NO.	Managing Units	Soil map units	Soil and site characteristics
1	6, 1	HLKhB1 MNLhB2	Deep to very deep (100- >150 cm), red sandy clay loam soils with slopes of 1-3 % and slight to moderate erosion
2	7, 8, 9	BGPcA1 BGPhB1 BGPiA1	Very deep (>150 cm), black calcareous clayey soils with slopes of 1-3%, gravelly (15-35%) and slight erosion
3	11, 12, 13	KDTcA1 KDTcB1 KDThB1	Very deep (>150 cm), sandy loam to sandy clay loam with slopes of 0-3% and slight erosion
4	2, 3, 4, 5, 10	BPRcA1 NGPcA1 NGPhB1 NGPhB2 NDLcB1	Deep to very deep (100- >150 cm), gravelly sandy loam to sandy clay loam soils with slopes of 1-3% and slight to moderate erosion

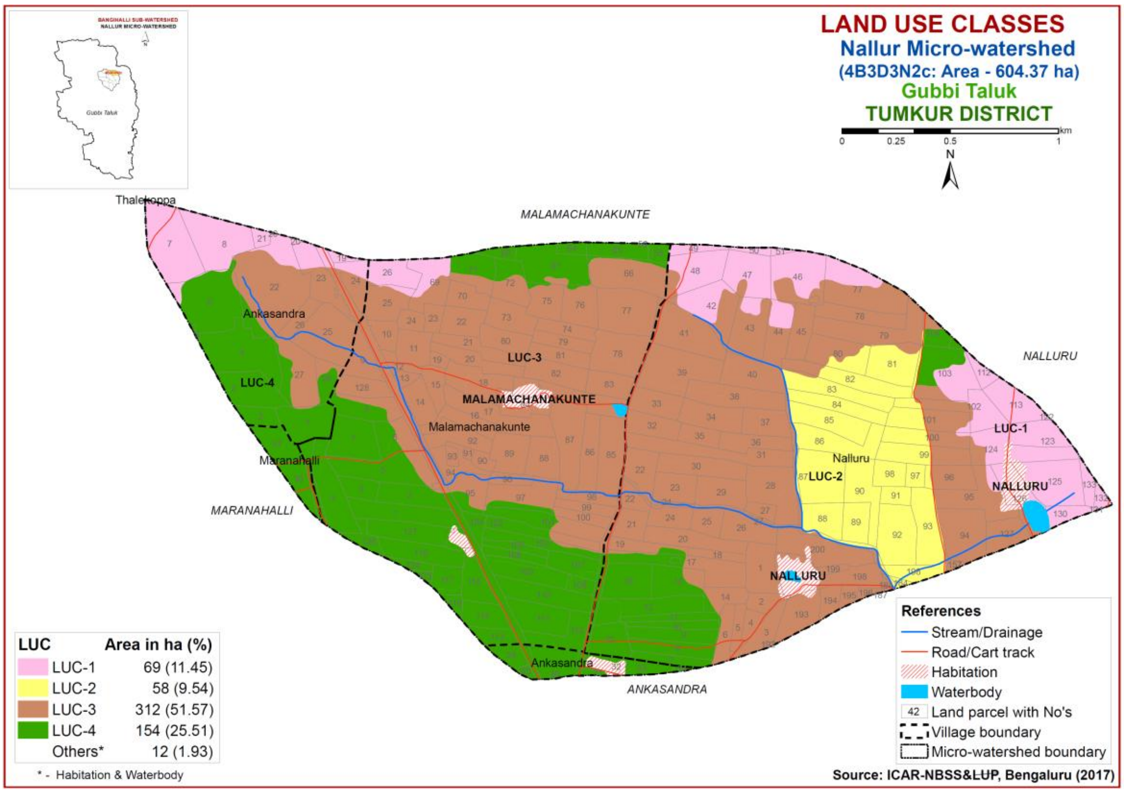


Fig. 7.35 Land Use Classes Map- Nallur Microwatershed

7.34 Proposed Crop Plan for Nallur Microwatershed

After assessing the land suitability for the 34 crops, the proposed crop plan has been prepared for the 4 identified LUCs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 34 crops. The resultant proposed crop plan is presented below in Table 7.35.

Table 7.35 Proposed Crop Plan for Nallur Microwatershed

LUC No	Mapping Units	Survey Number	Soil and site characteristics	Field Crops	Forestry/ Grasses	Horticulture Crops with suitable interventions	Suitable Interventions
LUC-1 (69 ha.)	6, 1	Ankasandra: 7,8,19,20,21 Malamachanakunte: 26,69 Nalluru: 42,46,47,48,49,50,51,102, 103,112,113,122,123,124, 125,130,131, 132,133	Deep to very deep (100->150 cm), red sandy clay loam soils with slopes of 1-3 % and slight to moderate erosion	**Sole Crops:** Ragi, Upland paddy, Maize, Sorghum, Fodder sorghum, Sunflower, Groundnut, Redgram, Fieldbean, Cowpea **Intercropping:** Redgram+Fodder sorghum Ragi+Cowpea Ragi+Redgram Ragi+Fieldbean	Neem, Silver Oak **Grasses** *Styloxanthes hamata*, *Styloxanthes Scabra*, Hybrid Napier, Sesbania,	**Vegetables**: Onion, Tomato, Brinjal Chillies, Coriander, Drumstick **Flower crops:** Chrysanthemum, Jasmine, China aster, Marigold, Crossandra **Fruit crops/ Plantation crops:** Mango, Sapota, Guava, Cashew, Pomegranate Jackfruit, Musambi, Arecanut, Coconut	Summer ploughing, cultivation on raised beds with mulches, Drip irrigation and suitable conservation practices (Crescent Bunding with Catch Pit etc)
LUC-2 (58 ha.)	7, 8, 9	Nalluru: 81,82,83,84,85,86,87,88, 89,90,91,92,93,97,98,100, 184	Very deep (>150 cm), black calcareous clayey soils with slopes of 1-3%, gravelly (15-35%) and slight erosion	**Sole crops**: Sorghum, Sunflower, Fodder sorghum, Redgram, Field bean, Horse gram **Intercropping:** Redgram+Fodder sorghum	Hebbevu, Silveroak **Grasses:** *Styloxanthes hamata*, *Styloxanthes scabra*, Hybrid napier	**Vegetables:** Brinjal, Chillies, Cucurbits **Flower crops:** Marigold, Chrysanthemum **Fruit crops:** Pomegranate, Tamarind, Custard Apple, Amla, Lime, Musambi	Application of gypsum, FYM and micronutrients, drip irrigation, Mulching, suitable conservation practises
LUC-3 (312 ha.)	11, 12, 13	Ankasandra: 22,23,24,25,26,27 Malamachanakunte: 10,11,12,13,14,15,16,17,1	Very deep (>150 cm), sandy loam to sandy clay loam soils with slopes of 0-3% and slight erosion	**Sole crops**: Sorghum, Sunflower, Fodder sorghum, Redgram, Field bean, Horse gram	Hebbevu, Silveroak **Grasses:** *Styloxanthes*	**Vegetables:** Brinjal, Tomato, Chillies, Cucurbits **Flower crops:**	Application of FYM and micronutrients, drip

		8,19,20,21,22,23,24,25,66, 70,72,73,74,75,76,77,78, 79,80,81,82,83,84,85,86, 87,88,89,90,91,92,93,94, 95, 96,97,98,99,100,128 Nalluru: 1,2,3,4,5,6,14,17,18,19,20,21,22,23,24,25,26,27,28, 29,30,31,32,33,34,35,36, 37,38,39,40,41,43,44,45, 77,78,79,80,94,95,96,99, 101,127,157,185,187,192, 193,194,195,196,197,198, 199,200,STREAM		**Intercropping:** Redgram+Fodder sorghum	*hamata*, *Styloxanthes scabra*, Hybrid napier	Marigold, Chrysanthemum **Fruit crops/ Plantation crops:** Pomegranate, Tamarind, Custard Apple, Amla, Lime, Musambi, Arecanut, Coconut	irrigation, mulching, use of medium duration varieties, suitable conservation practises
LUC-4 (154 ha.)	2, 3, 4, 5, 10	Ankasandra: 1,2,3,4,5,6,28,29,30,31,33,34,65 Malamachanakunte: 1,2,3,4,5,6,7,8,55,56,64,65,67,68,71,101,102,103,104,105,106,107,108,109,110,111, 112,113,114,115,116, 117,118,123,124,126,127 Nalluru: 7,8,9,10,11,12,13,15,16,104,TANK	Deep to very deep (100->150 cm), gravelly sandy loam to sandy clay loam soils with slopes of 1-3% and slight to moderate erosion	**Sole Crop:** Maize, Ragi, Upland paddy, Sorghum, Fodder sorghum, Groundnut, Redgram, Fieldbean, Cowpea **Intercropping:** Redgram+Fodder sorghum Ragi+Cowpea Ragi+Redgram Ragi+Fieldbean	Neem, Silver Oak **Grasses** *Styloxanthes hamata*, *Styloxanthes Scabra*, Hybrid Napier, Sesbania,	**Vegetables**: Onion, Tomato, Brinjal Chillies, Coriander, Drumstick **Flower crops:** Chrysanthemum, Jasmine, China aster, Marigold **Fruit crops/ Plantation crops:** Mango, Sapota, Guava, Cashew, Custard apple, Amla, Pomegranate, Jackfruit, Musambi, Arecanut, Coconut	Drip irrigation, Mulching, suitable conservation practices (Crescent Bunding with Catch Pit etc)

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil 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 characterististics 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 Nallur Microwatershed

- The soil phases identified in the microwatershed belonged to the soil series of KDT 312 ha (52%), NGP 137 ha (23%), BGP 58 ha (10%), HLK 46 ha (8%), MNL 24 ha (4%), NDL 13 ha (2%) and BPR 4 ha (1%).
- As per land capability classification, entire area in the microwatershed falls under arable land category (Class II & III). The major limitations identified in the arable lands were soil and erosion.

- ❖ On the basis of soil reaction, maximum area of about 413 ha (68%) is slightly acid to moderately and strongly acid (pH 5.0 -6.5). A very small area of about 15 ha (2%) is slightly alkaline (pH 7.3-7.8) and 165 ha (27%) is neutral (pH 6.5-7.3).
- ❖ **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.

Acid soils

(Slightly acid to strongly acid soils)

1. Application of lime in the form of calcium carbonate or limestone ($CaCO_3$)
2. 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.
3. Use of rock phosphate (30-50 % of CaO, which helps in improving soil pH).
4. Application of basic fertilizers (Sodium nitrate, basic slag etc, reduces acidity in acid soils)

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 604 ha area in the microwatershed, an area of about 92 ha is suffering from moderate erosion. These areas need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of information and Communication of benefits

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

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning in IWMP is focusing on preparation of

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

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

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

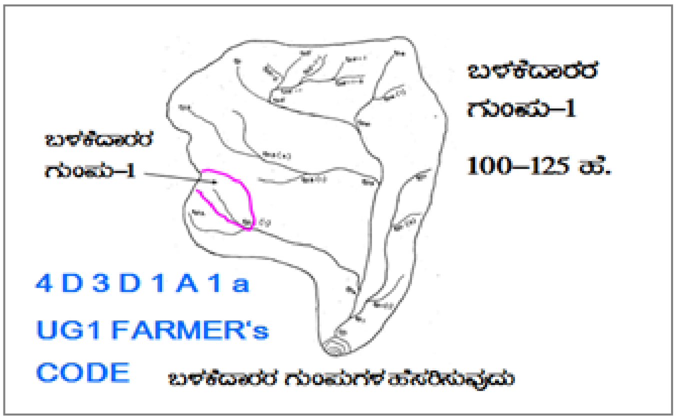
- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Nallur microwatershed.
- **Organic Carbon:** The OC content is medium (0.5-0.75%) in about 65 ha (10%) area and low (<0.5%) in about 528 ha (87%). The areas that are low and medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops costs Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be supplemented by 25% in addition to the recommended level in 65 ha area where OC is medium (0.5-0.75%) and 528 ha is low (<0.5%). 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**: An entire area in the microwatershed is high (>57 kg/ha) in available phosphorus.
- **Available Potassium:** Available potassium is medium in maximum area of 482 ha (80%) in the microwatershed, 30 ha (5%) is high (>337 kg/ha) and 80 ha (13 %) is low (<145 kg/ha) in available potassium. Hence, areas where available potassium is low and medium, for all the crops, additional 25 % potassium may be applied.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. Medium in 586 ha (97%) and low in an area of about 7 ha (1%). These areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** Available boron is medium in an area of 262 ha (43%) and low in 330 ha (55%) in the microwatershed. These areas need to be applied with sodium borate @ 10 kg/ha as soil application or 0.2% borax as foliar application to correct the boron deficiency.
- **Available Iron:** Entire area is sufficient in available iron in the microwatershed.
- **Available Manganese and Available Copper:** Entire area in the microwatershed is sufficient for both available manganese and copper.
- **Available Zinc:** It is deficient (<0.6 ppm) in 187 ha (31%) area of the microwatershed. Application of zinc sulphate @ 25 kg/ha is to be recommended and about 406 ha (67%) area is sufficient (>0.6 ppm) in available Zinc.

- **Soil acidity:** The microwatershed has 413 ha (68%) area with soils that are slightly to moderately and strongly acid. These areas need application of lime (Calcium Carbonate).
- **Land Suitability for various crops:** Areas that are highly, moderately and marginally suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Nallur microwatershed, the land resource inventory database prepared 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) prepared were



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

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

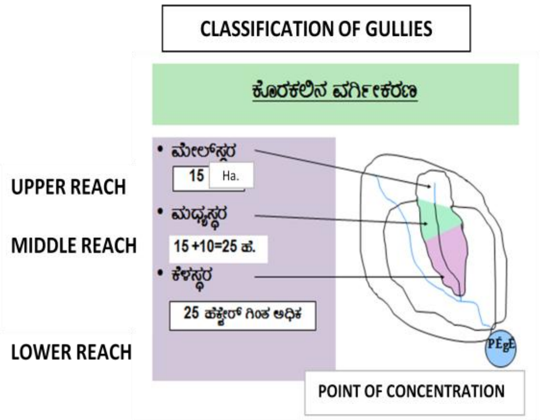
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below.

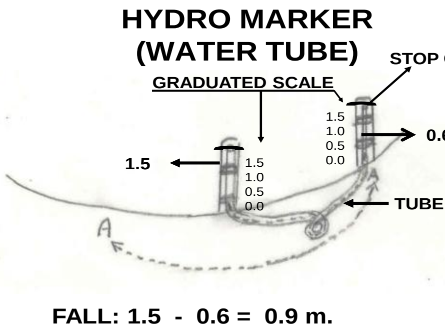
9.1.1 Arable Land Treatment

A. BUNDING

<table>
<tr><td colspan="2">Steps for Survey and Preparation of Treatment Plan</td><td rowspan="6">USER GROUP-1

</td></tr>
<tr><td colspan="2">• 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</td></tr>
<tr><td>Small gullies</td><td>(up to 5 ha catchment)</td></tr>
<tr><td>Medium gullies</td><td>(5-15 ha catchment)</td></tr>
<tr><td>Ravines</td><td>(15-25 ha catchment) and</td></tr>
<tr><td>Halla/Nala</td><td>(more than 25ha catchment)</td></tr>
</table>

Measurement of Land Slope

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



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

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

Note: i) The above intervals are maximum.

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

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

Section of the Bund

Bund section is decided considering the soil texture class and gravelliness class (bg_0 ...b= loamy sand, g_0= <15% gravel). The recommended sections for different soils are given below.

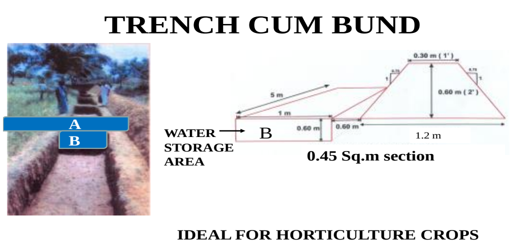
Recommended Bund Section

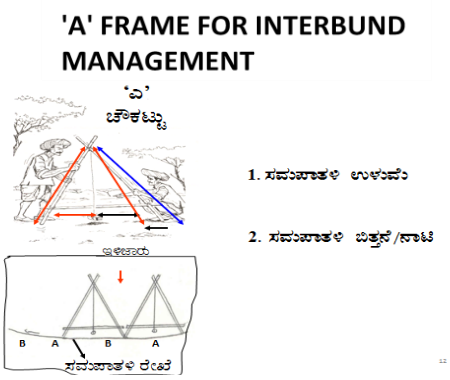
Top width (m)	Base width (m)	Height (m)	Side slope (Z:1;H:V)	Cross section (sq m)	Soil Texture	Remarks
0.3	0.9	0.3	01:01	0.18	Sandy loam	Vegetative bund
0.3	1.2	0.3	1.5:1	0.225	Sandy clay	
0.3	1.2	0.5	0.9:1	0.375	Red gravelly soils	
0.3	1.2	0.6	0.75:1	0.45		
0.3	1.5	0.6	01:01	0.54	Red sandy loam	
0.3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

Formation of Trench cum Bund

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

Details of Borrow Pit dimensions are given below





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

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

B. Waterways

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

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

c) The design details are given in the Manual.

C. Farm Ponds

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

D. Diversion channel

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

9.1.2 Non-Arable Land Treatment

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

9.1.3 Treatment of Natural Water Course/ Drainage Lines

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

9.2 Recommended Soil and Water Conservation Measures

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

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

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been generated which shows the spatial distribution and extent of area. A maximum area of about 187 ha (31%) requires trench cum bunding, about 155 ha (26%) area is Bunding / Strengthening of existing bunds and an area of about 251 ha (41%) requires Graded Bunding. The conservation plan generated may be presented to all the stakeholders including farmers and after noting their suggestions, the conservation plan for the microwatershed may be finalised in a participatory approach.

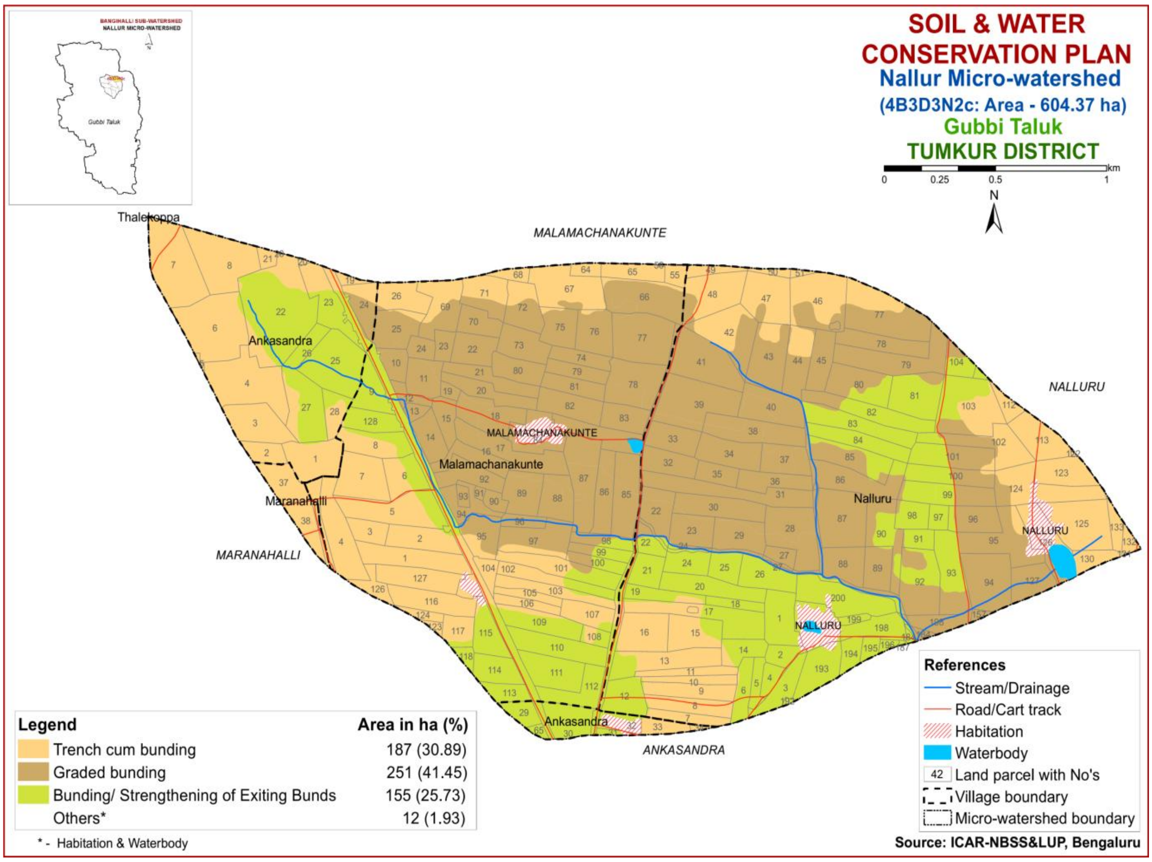


Fig. 9.1 Soil and Water Conservation Plan - Nallur Microwatershed

9.3 Greening of Microwatershed

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

It is recommended to open 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

Nallur Microwatershed

Soil Phase Information

Village	Survey No	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Nalluru	1	3.25	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut+Ragi (CN+Ra)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	2	1.26	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	3	2.22	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Arecanut+Coconut (Ar+CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	4	0.97	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	NA	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	5	1.06	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	6	1.82	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	7	1.58	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIIs	Trench cum bundig
Nalluru	8	2.49	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Open well	IIIs	Trench cum bundig
Nalluru	9	2.57	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIIs	Trench cum bundig
Nalluru	10	1.43	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIIs	Trench cum bundig
Nalluru	11	1.5	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIIs	Trench cum bundig
Nalluru	12	2.68	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	13	4.3	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	3 Bore well	IIIs	Trench cum bundig
Nalluru	14	1.88	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	15	3.27	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	1 Bore well	IIIs	Trench cum bundig
Nalluru	16	3.59	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	2 Bore well	IIIs	Trench cum bundig
Nalluru	17	4.74	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	3 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	18	1.02	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	19	1.78	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	20	3.4	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Arecanut+Coconut (Ar+CN)	2 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	21	1.87	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	22	3.77	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	2 Bore well	IIs	Graded bunding
Nalluru	23	2.57	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Nalluru	24	2.1	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	NA	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	25	1.71	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	26	2.87	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	27	0.99	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Nalluru	28	4.95	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut+Mango (Ar+CN+MN)	3 Bore well	IIs	Graded bunding
Nalluru	29	3.01	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	1 Bore well	IIs	Graded bunding
Nalluru	30	3.58	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Nalluru	31	4.84	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	3 Bore well	IIs	Graded bunding
Nalluru	32	2.44	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	Not Available	IIs	Graded bunding
Nalluru	33	2.57	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Nalluru	34	3.29	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Nalluru	35	1.56	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Nalluru	36	2.4	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	2 Bore well	IIs	Graded bunding
Nalluru	37	2.64	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	1 Bore well	IIs	Graded bunding
Nalluru	38	4.25	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	2 Bore well	IIs	Graded bunding
Nalluru	39	6.17	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	3 Bore well	IIs	Graded bunding
Nalluru	40	3.81	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Nalluru	41	5.21	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	5 Bore well	IIs	Graded bunding
Nalluru	42	4.84	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	Not Available	IIs	Trench cum bundig
Nalluru	43	4.37	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	2 Bore well	IIs	Graded bunding
Nalluru	44	3.26	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	2 Bore well	IIs	Graded bunding
Nalluru	45	2.45	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	2 Bore well	IIs	Graded bunding
Nalluru	46	5.62	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Trench cum bundig
Nalluru	47	4.13	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango+Tamarind (Mn+Td)	Not Available	IIs	Trench cum bundig
Nalluru	48	4.5	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	5 Bore well	IIs	Trench cum bundig

Village	Survey No	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Nalluru	49	0.93	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Trench cum bundig
Nalluru	50	0.48	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Trench cum bundig
Nalluru	51	0.27	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Trench cum bundig
Nalluru	77	6.53	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	1 Bore well	IIs	Graded bunding
Nalluru	78	2.84	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	Not Available	IIs	Graded bunding
Nalluru	79	5.02	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Nalluru	80	3.85	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	1 Bore well	IIs	Graded bunding
Nalluru	81	4.07	BGPcA1	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	82	3.77	BGPcA1	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	83	3.7	BGPcA1	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	84	2.97	BGPcA1	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut+Ragi (CN+Ra)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	85	3.88	BGPhB1	LUC-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	1 Bore well	IIs	Graded bunding
Nalluru	86	4.25	BGPhB1	LUC-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut +Ragi (Ar+CN+Ra)	1 Bore well	IIs	Graded bunding
Nalluru	87	5.12	BGPhB1	LUC-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Nalluru	88	2.74	BGPhB1	LUC-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	1 Bore well	IIs	Graded bunding
Nalluru	89	2.25	BGPhB1	LUC-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	2 Bore well	IIs	Graded bunding
Nalluru	90	3.8	BGPhB1	LUC-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Nalluru	91	1.15	BGPiA1	LUC-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Ragi (Ra)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	92	4.77	BGPhB1	LUC-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	1 Bore well	IIs	Graded bunding
Nalluru	93	4.19	BGPiA1	LUC-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Ragi (Ra)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	94	4.8	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	2 Bore well	IIs	Graded bunding
Nalluru	95	4.92	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	3 Bore well	IIs	Graded bunding
Nalluru	96	2.57	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Nalluru	97	0.93	BGPiA1	LUC-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Ragi (Ra)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	98	1.74	BGPiA1	LUC-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Paddy (Pd)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds

Village	Survey No	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Nalluru	99	3.68	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Paddy (CN+Pd)	Not Available	IIs	Graded bunding
Nalluru	100	2.89	BGPcA1	LUC-2	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut+Ragi (CN+Ra)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	101	3.62	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Nalluru	102	4	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	2 Bore well	IIs	Trench cum bundig
Nalluru	103	6.31	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	1 Bore well	IIs	Trench cum bundig
Nalluru	104	1.44	BPRcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	112	0.97	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Trench cum bundig
Nalluru	113	3.28	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	1 Bore well	IIs	Trench cum bundig
Nalluru	122	0.05	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIs	Trench cum bundig
Nalluru	123	2.88	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIs	Trench cum bundig
Nalluru	124	5.08	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Trench cum bundig
Nalluru	125	5.4	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	Not Available	IIs	Trench cum bundig
Nalluru	126	3.97	Habitation	Others	Others	Others	Others	Others	Others	Others	NA	Not Available	Others	Others
Nalluru	127	2.47	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Nalluru	130	1.43	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Trench cum bundig
Nalluru	131	0.03	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIs	Trench cum bundig
Nalluru	132	0.6	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Trench cum bundig
Nalluru	133	1	HLKhB1	LUC-1	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Trench cum bundig
Nalluru	157	0.3	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Nalluru	184	0.45	BGPhB1	LUC-2	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIs	Graded bunding
Nalluru	185	0.01	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	NA	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	187	0.05	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	NA	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	192	0.12	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	NA	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	193	3.16	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Arecanut+Coconut (Ar+CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	194	1.21	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds

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Nalluru	195	0.71	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	196	0.36	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	NA	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	197	0.16	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	NA	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	198	4.04	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	199	0.48	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Nalluru	200	4.67	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Arecanut+Coconut (Ar+CN)	2 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	1	4.03	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Coconut+Mango (CN+Mn)	2 Bore well	IIIes	Trench cum bundig
Malamachan akunte	2	2.99	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	3	1.56	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	4	4.58	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	5	5.33	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	6	2.68	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Coconut (CN)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	7	4.03	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Arecanut+Coconut+Mango (Ar+CN+MN)	2 Bore well	IIIes	Trench cum bundig
Malamachan akunte	8	3.23	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	9	2.4	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	NA	3 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	10	1.5	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Malamachan akunte	11	2.47	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Malamachan akunte	12	0.92	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	13	0.62	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	14	2.21	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	1 Bore well	IIs	Graded bunding
Malamachan akunte	15	1.63	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	16	2.26	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	17	4.53	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	1 Bore well	IIs	Graded bunding
Malamachan akunte	18	3.56	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	1 Bore well	IIs	Graded bunding
Malamachan akunte	19	0.52	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Malamachan akunte	20	2.53	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIs	Graded bunding
Malamachan akunte	21	2.47	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Mango+Ragi (Ar+Ma+Ra)	Not Available	IIs	Graded bunding
Malamachan akunte	22	2.44	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	23	1.07	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	24	1.08	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	25	3.1	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	26	2.63	MNLhB2	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIe	Trench cum bundig
Malamachan akunte	55	0.84	NDLcB1	LUC-4	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	56	0.05	NDLcB1	LUC-4	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIIs	Trench cum bundig
Malamachan akunte	64	0.77	NDLcB1	LUC-4	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIIs	Trench cum bundig
Malamachan akunte	65	1.86	NDLcB1	LUC-4	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	66	5.24	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Arecanut+Coconut (Ar+CN)	1 Bore well	IIs	Graded bunding
Malamachan akunte	67	5.06	NDLcB1	LUC-4	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	68	0.8	NDLcB1	LUC-4	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	69	3.73	MNLhB2	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIe	Trench cum bundig
Malamachan akunte	70	1.95	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	71	3.06	NDLcB1	LUC-4	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	72	2.97	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	73	2.79	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	74	1.65	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	75	2.53	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	76	3.01	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	77	5.4	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	1 Bore well	IIs	Graded bunding
Malamachan akunte	78	4.48	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	79	1.69	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding

Village	Survey No	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Malamachan akunte	80	2.27	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	81	1.96	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIs	Graded bunding
Malamachan akunte	82	3	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	Not Available	IIs	Graded bunding
Malamachan akunte	83	2.25	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	Not Available	IIs	Graded bunding
Malamachan akunte	84	5.52	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	85	3.99	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	86	2.83	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	87	4.84	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	2 Bore well	IIs	Graded bunding
Malamachan akunte	88	2.73	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	4 Bore well	IIs	Graded bunding
Malamachan akunte	89	2.95	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	90	0.77	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	91	0.23	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIs	Graded bunding
Malamachan akunte	92	2.63	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	2 Bore well	IIs	Graded bunding
Malamachan akunte	93	0.48	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIs	Graded bunding
Malamachan akunte	94	1.91	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIs	Graded bunding
Malamachan akunte	95	2.76	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	96	1.04	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Malamachan akunte	97	4.02	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	98	1.45	KDThB1	LUC-3	Very deep (>150 cm)	Sandy clay loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIs	Graded bunding
Malamachan akunte	99	1.3	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	100	1.3	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	101	3.66	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	2 Bore well	IIIs	Trench cum bundig
Malamachan akunte	102	2.52	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Mango (CN+Mn)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	103	2.44	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIIs	Trench cum bundig
Malamachan akunte	104	0.98	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIIs	Trench cum bundig

Village	Survey No	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Malamachan akunte	105	1.09	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	106	1.19	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Ragi (Ra)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	107	2.19	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut (CN)	Not Available	IIIs	Trench cum bundig
Malamachan akunte	108	0.91	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	1 Bore well	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	109	3.23	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	110	3.82	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	111	3.49	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut+Mango+Ragi (CN+Mn+Ra)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	112	2.73	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	113	1.42	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	114	2.32	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	115	2.51	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	116	3.36	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	117	1.77	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Ragi (Ra)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	118	0.62	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Malamachan akunte	123	0.33	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	124	0.71	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	126	1.3	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Malamachan akunte	127	3.27	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Coconut (CN)	2 Bore well	IIIes	Trench cum bundig
Malamachan akunte	128	2.15	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Mango (Mn)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	1	3.79	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Coconut+Ragi (CN+Ra)	Not Available	IIIes	Trench cum bundig
Ankasandra	2	1.51	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Coconut (CN)	Not Available	IIIes	Trench cum bundig
Ankasandra	3	3.9	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Coconut+Mango (CN+Mn)	1 Bore well	IIIes	Trench cum bundig
Ankasandra	4	6.69	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIes	Trench cum bundig
Ankasandra	5	0.12	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	NA	Not Available	IIIes	Trench cum bundig
Ankasandra	6	7.23	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango+Ragi (Mn+Ra)	Not Available	IIIes	Trench cum bundig

Village	Survey No	Area (ha)	Soil Phase	LUC	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	WELLS	Land Capability	Conservation Plan
Ankasandra	7	6.93	MNLhB2	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Mode rate	Ragi (Ra)	Not Available	IIIe	Trench cum bundig
Ankasandra	8	5.84	MNLhB2	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Mode rate	Coconut (CN)	1 Bore well	IIIe	Trench cum bundig
Ankasandra	19	0.45	MNLhB2	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Mode rate	Mango (Mn)	Not Available	IIIe	Trench cum bundig
Ankasandra	20	0.14	MNLhB2	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Mode rate	NA	Not Available	IIIe	Trench cum bundig
Ankasandra	21	0.63	MNLhB2	LUC-1	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Mode rate	Ragi (Ra)	Not Available	IIIe	Trench cum bundig
Ankasandra	22	11.65	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	3 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	23	3.54	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut+Mango (CN+Mn)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	24	2.32	KDTcB1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Slight	Mango (Mn)	Not Available	IIs	Graded bunding
Ankasandra	25	5.58	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	2 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	26	1.43	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	Not Available	IIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	27	4.7	KDTcA1	LUC-3	Very deep (>150 cm)	Sandy loam	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	28	1.73	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Ragi (Ra)	Not Available	IIIes	Trench cum bundig
Ankasandra	29	1.33	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Ragi (Ra)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	30	2.78	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Coconut (CN)	1 Bore well	IIIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	31	0.38	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	NA	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Ankasandra	32	1.42	Habitation	Others	Others	Others	Others	Others	Others	Others	NA	Not Available	Others	Others
Ankasandra	33	1.27	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Coconut+Ragi (CN+Ra)	Not Available	IIIs	Trench cum bundig
Ankasandra	34	0.19	NGPhB1	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	NA	Not Available	IIIs	Trench cum bundig
Ankasandra	65	0.36	NGPcA1	LUC-4	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Nearly level (0-1%)	Slight	Ragi (Ra)	Not Available	IIIs	Bunding/ Strengthening of Exiting Bunds
Maranahalli	37	2.53	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Coconut (CN)	Not Available	IIIes	Trench cum bundig
Maranahalli	38	2.08	NGPhB2	LUC-4	Deep (100-150 cm)	Sandy clay loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Mode rate	Ragi (Ra)	Not Available	IIIes	Trench cum bundig

Appendix II

Nallur Microwaterhed

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
Nalluru	1	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	2	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	3	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	4	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	5	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	6	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	7	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	8	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	9	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	10	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	11	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	12	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	13	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	14	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	15	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	16	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	17	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	18	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	19	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	20	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	21	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	22	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	23	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>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
Nalluru	24	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	25	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	26	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	27	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	28	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	29	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	30	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	31	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	32	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	33	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	34	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	35	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	36	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	37	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	38	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	39	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	40	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	41	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	42	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	43	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	44	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	45	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	46	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	47	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	48	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>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
Nalluru	49	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	50	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	51	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	77	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	78	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	79	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	80	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	81	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	82	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	83	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	84	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	85	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	86	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	87	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	88	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	89	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	90	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	91	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	92	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	93	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	94	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	95	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	96	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	97	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	98	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>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
Nalluru	99	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	100	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	101	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	102	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	103	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	104	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	112	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	113	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	122	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	123	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	124	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	125	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	126	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Nalluru	127	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	130	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	131	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	132	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	133	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	157	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Nalluru	184	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	185	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	187	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	192	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	193	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	194	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Village	Survey	Soil Reaction	Salinity	Organic	Available	Available	Available	Available	Available	Available	Available	Available

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Nalluru	195	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	196	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	197	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	198	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	199	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Nalluru	200	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	1	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	2	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	3	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	4	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	5	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	6	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	7	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	8	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	9	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	10	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	11	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	12	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	13	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	14	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	15	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	16	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	17	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	18	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	19	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>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
Malamacha nakunte	20	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	21	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	22	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	23	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	24	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	25	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	26	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	55	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	56	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	64	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	65	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	66	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	67	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	68	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	69	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	70	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	71	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	72	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	73	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	74	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	75	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	76	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	77	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	78	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	79	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)

	No			Carbon	Phosphorus	Potassium	Sulphur	Boron	Iron	Manganese	Copper	Zinc
Malamacha nakunte	80	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	81	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	82	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	83	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	84	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	85	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	86	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	87	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	88	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	89	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	High (>337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	90	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	91	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	92	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	93	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	94	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	95	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	96	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	97	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	98	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	99	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	100	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	101	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	102	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	103	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	104	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Village	Survey	Soil Reaction	Salinity	Organic	Available	Available	Available	Available	Available	Available	Available	Available

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Malamacha nakunte	105	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	106	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	107	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	108	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	109	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	110	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	111	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	112	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	113	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	114	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	115	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	116	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	117	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	118	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	123	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	124	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	126	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Malamacha nakunte	127	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Sufficient (>0.6 ppm)
Malamacha nakunte	128	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	1	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	2	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	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 (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	3	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	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 (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	4	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	5	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	6	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1.0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

	No			Carbon	Phosphorus	Potassium	Sulphur	Boron	Iron	Manganese	Copper	Zinc
Ankasandra	7	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	8	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	19	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	20	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	21	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	22	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	23	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	24	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	25	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	26	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	27	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Medium (0.5-1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	28	Slightly acid (pH 6.0 – 6.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	29	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	30	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	31	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	32	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ankasandra	33	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	34	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Low (<145 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Ankasandra	65	Moderately acid (pH 5.5 – 6.0)	Non saline (<2 dsm)	Medium (0.5-0.75 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	37	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)
Maranahalli	38	Strongly acid (pH 5.0 – 5.5)	Non saline (<2 dsm)	Low (<0.5 %)	High (> 57 kg/ha)	Medium (145-337 kg/ha)	Medium (10-20 ppm)	Low (<0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient(>1 .0 ppm)	Sufficient (>0.2 ppm)	Deficient (<0.6 ppm)

Appendix III

Nallur Microwaterhed

Soil Suitability Information

Village	Survey No	Mango	Maize	Sapota	Sorgham	Coconut	Guava	Tamarind	Lime	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cowpea
Nalluru	1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	2	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	3	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	4	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	5	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	6	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	7	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	8	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	9	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	10	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	11	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	12	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	13	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	14	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	15	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	16	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Nalluru	17	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	18	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	19	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	20	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	21	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	22	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	23	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	24	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	25	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	26	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	27	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1

Village	Survey No	Mango	Maize	Sapota	Sorghum	Coconut	Guava	Tamarind	Lime	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horsegram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cowpea
Nalluru	28	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	29	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	30	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	31	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	32	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	33	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	34	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	35	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	36	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	37	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	38	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	39	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	40	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	41	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	42	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	43	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	44	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	45	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	46	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	47	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	48	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	49	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	50	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	51	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	77	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	78	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	79	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	80	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	81	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	82	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz

Village	Survey No	Mango	Maize	Sapota	Sorghum	Coconut	Guava	Tamarind	Lime	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cow pea
Nalluru	83	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	84	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	85	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	86	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	87	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	88	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	89	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	90	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	91	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	92	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	93	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	94	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	95	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	96	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	97	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	98	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	99	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	100	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	101	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	102	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	103	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	104	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2tg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g
Nalluru	112	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	113	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	122	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	123	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	124	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	125	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	126	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Nalluru	127	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1

Village	Survey No	Mango	Maize	Sapota	Sorghum	Coconut	Guava	Tamarind	Lime	Sunflower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cow pea
Nalluru	130	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	131	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	132	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	133	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	157	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	184	S2gz	S2tz	S2gz	S2gz	S2tz	S2tz	S2gz	S2gz	S2gz	S2gz	S1	S2gz	S1	S2tz	S2gz	S2gz	S3tz	S2tz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz	S2gz	S2gz	S2gz	S2tz	S2gz
Nalluru	185	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	187	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	192	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	193	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	194	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	195	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	196	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	197	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	198	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	199	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Nalluru	200	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamachanakunte	1	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	2	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	3	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	4	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	5	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	6	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	7	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	8	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	9	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamachanakunte	10	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1

Village	Survey No	Mango	Maize	Sapota	Sorghum	Coconut	Guava	Tamarind	Lime	Sunflower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cow pea
Malamacha nakunte	11	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	12	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	13	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	14	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	15	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	16	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	17	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	18	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	19	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	20	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	21	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	22	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	23	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	24	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	25	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	26	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	55	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S2g	S2g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Malamacha nakunte	56	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S2g	S2g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Malamacha nakunte	64	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S2g	S2g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Malamacha nakunte	65	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S2g	S2g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Malamacha nakunte	66	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	67	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S2g	S2g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Malamacha nakunte	68	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S2g	S2g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g

Village	Survey No	Mango	Maize	Sapota	Sorghum	Coconut	Guava	Tamarind	Lime	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cow pea
Malamacha nakunte	69	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	70	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	71	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S2g	S2g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Malamacha nakunte	72	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	73	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	74	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	75	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	76	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	77	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	78	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	79	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	80	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	81	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	82	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	83	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	84	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	85	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	86	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	87	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	88	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	89	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	90	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	91	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1

Village	Survey No	Mango	Maize	Sapota	Sorghum	Coconut	Guava	Tamarind	Lime	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cow pea
Malamacha nakunte	92	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	93	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	94	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	95	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	96	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	97	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	98	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	99	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	100	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Malamacha nakunte	101	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	102	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	103	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	104	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	105	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	106	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	107	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	108	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	109	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	110	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	111	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	112	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	113	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamacha nakunte	114	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g

Village	Survey No	Mango	Maize	Sapota	Sorghum	Coconut	Guava	Tamarind	Lime	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cow pea
Malamachanakunte	115	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	116	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	117	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	118	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	123	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	124	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	126	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	127	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Malamachanakunte	128	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	1	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	2	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	3	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	4	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	5	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	6	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	7	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	8	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	19	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	20	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	21	S2r	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	22	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	23	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	24	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	25	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	26	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	27	S1	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2t	S2t	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Ankasandra	28	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g

Village	Survey No	Mango	Maize	Sapota	Sorghum	Coconut	Guava	Tamarind	Lime	Sun flower	Red gram	Amla	Jack fruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Banana	Horse gram	Field-bean	Arecanut	Finger-Millet	Brinjal	Fodder-Sorghum	Upland-Paddy	Jasmine	Cow pea
Ankasandra	29	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	30	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	31	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	32	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Ankasandra	33	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	34	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Ankasandra	65	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Marana halli	37	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g
Marana halli	38	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g	S2g

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

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Chapter 1

EXECUTIVE SUMMARY

Baseline socioeconomic characterisation is prerequisite to prepare action plan for program implementation and to assess the project performance before making any changes in the watershed development program. The baseline provides appropriate policy direction for enhancing productivity and sustainability in agriculture.

Methodology: *Nallur micro-watershed (Bangihalli sub-watershed, Gubbi taluk, Tumkur district) is located in between $13^0$27' – $13^0$28' North latitudes and $76^0$53' – $76^0$55' East longitudes, covering an area of about 604.37 ha, bounded by Malamachanakunte, Maranahalli, Ankasandra and Nallur villages with length of growing period (LGP) 120-150 days. We used soil resource map as basis for sampling farm households to test the hypothesis that soil quality influence crop selection, and conservation investment of farm households. The level of technology adoption and productivity gaps and livelihood patterns were analyses. The cost of soil degradation and eco system services were quantified.*

Results: *The socio-economic outputs for the Nallur micro-watershed (Bangihalli sub-watershed, Gubbi taluk, Tumkur district) are presented here.*

Social Indicators;

- *Male and female ratio is 50 to 50 per cent to the total sample population.*
- *Younger age 18 to 50 years group of population is around 69.6 per cent to the total population.*
- *Literacy population is around 82.6 per cent.*
- *Social groups belong to general caste among the all sample housholds.*
- *Liquefied petroleum gas (LPG) is the source of energy for a cooking all among sample households.*
- *About 72.7 per cent of households have a yashaswini health card.*
- *About 18.2 percent households are having MGNREGA card for rural employment.*
- *Dependence on ration cards for food grains through public distribution system is around 63.6 per cent.*
- *Swach bharath program providing closed toilet facilities around 90.9 per cent of sample households.*
- *Institutional participation is only 15.2 per cent of sample households.*
- *Women participation in decisions making are around 90.9 per cent of households were found.*

Economic Indicators;

- *The average land holding is 1.14 ha indicates that majority of farm households are belong to marginal and small farmers. The rainfed land is 53.6 per cent and 46.4 per cent of irrigated land is cultivated land area among the sample farmers.*

- *Agriculture is the main occupation among 36.4 per cent and Agriculture is the main and agriculture labour is predominant subsidiary occupation for 23.6 per cent of sample households.*
- *The average value of domestic assets is around Rs.10282 per household. Mobile and television are popular media mass communication.*
- *The average value of farm assets is around Rs. 52312 per household, about 9.1 per cent of sample farmers having plough and sprayer.*
- *The average value of livestock is around Rs.48750 per household; about 54 per cent of household are having livestock.*
- *The average per capita food consumption is around 542.7 grams (1411.8 kilo calories) against national institute of nutrition (NIN) recommendation at 827 gram. Among the all sample households are consuming less than the NIN recommendation.*
- *The annual average income is around Rs.145239 per household. Around 36.4 per cent of households were below poverty line.*
- *The per capita average monthly expenditure is around Rs.1103.*

Environmental Indicators-Ecosystem Services;

- *The value of ecosystem service helps to support investment to decision on soil and water conservation and in promoting sustainable land use.*
- *The onsite cost of different soil nutrients lost due to soil erosion is around Rs. 379 per ha/year. The total cost of annual soil nutrients is around Rs. 334887 per year for the total area of 604.37 ha.*
- *The average value of ecosystem service for food grain production is around Rs 68305/ ha/year. Per hectare food grain production services is maximum in areca nut (Rs. 191183) followed by coconut (Rs. 85204), mango (Rs. 42561), sorghum (Rs. 14276) and ragi (Rs. 8300).*
- *The average value of ecosystem service for fodder production is around Rs. 2936/ ha/year. Per hectare fodder production services is maximum in ragi (Rs. 3588) followed by sorghum (Rs. 2284).*
- *The data on water requirement for producing one quintal of grain is considered for estimating the total value of water required for crop production. The per hectare value of water used and value of water was maximum in coconut (Rs. 3349955) followed by sorghum (Rs. 84626), mango (Rs. 52678), ragi (Rs. 18956) and areca nut (Rs. 7763).*

Economic Land Evaluation;

- *The major cropping pattern is by areca nut 24.9 %) coconut (20.4 %), ragi (20.4 %) mango (12.6 %), maize (11.4 %) and sorghum (10.3 %).*
- *In Nallur micro-watershed, major soil is Budagumpa (BGP) series is having very deep soil depth cover around 9.55 per cent of area. On this soil farmers are presently*

growing areca nut (82.1 %) coconut (13.0 %) and ragi (4.8%) and Kadagathur (KDT) are also having very deep soil depth cover 51.57 per cent of area, the crops are areca nut (11.1%), coconut (36.6 %), mango (15.6 %), ragi (23.9 %) and sorghum (12.8 %).

- ❖ *The total cost of cultivation and benefit cost ratio (BCR) in study area for areca nut range between Rs 14431/ha in BGP soil (with BCR of 16.25) and Rs.11849/ha in KDT soil (with BCR of 10.46).*
- ❖ *In coconut the cost of cultivation range between is Rs.60522/ha in BGP soil (with BCR of 4.50) and Rs. 38855/ha in KDT soil (with BCR of 3.72).*
- ❖ *In ragi the cost of cultivation range between is Rs 76501/ha in BGP soil (with BCR of 1.09) and Rs.22269/ha in KDT soil (with BCR of 1.72).*
- ❖ *In mango the cost of cultivation in KDT soil is Rs 17223/ha (with BCR of 5.04) and sorghum cost of cultivation in KDT soil is Rs. 19179/ha (with BCR of 4.21).*
- ❖ *The land management practices reported by the farmers are crop rotation, tillage practices, fertilizer application and use of farm yard manure (FYM). Due to higher wages farmer are following labour saving strategies is not prating soil and water conservation measures. Less ownership of livestock limiting application of FYM.*
- ❖ *It was observed soil quality influences on the type and intensity of land use. More fertilizer applications in deeper soil to maximize returns.*

Suggestions;

- ❖ *Involving farmers is watershed planning helps in strengthing institutional participation.*
- ❖ *The per capita food consumption and monthly income is very low. Diversifying income generation activities from crop and livestock production in order to reduce risk related to drought and market prices.*
- ❖ *Majority of farmers reported that they are not getting timely support/extension services from the concerned development departments.*
- ❖ *By strengthing agricultural extension for providing timely advice improved technology there is scope to increase in net income of farm households.*
- ❖ *By adopting recommended package of practices by following the soil test fertiliser recommendation, there is scope to increase yield in areca nut (52 to 55 %) coconut (0 to 18.4 %), ragi (0 to 19%) and sorghum (38.8 %).*

Chapter 2

INTRODUCTION

Watershed Development program aim to restore degraded watersheds in rainfed regions to increase their capacity to capture and store rain water, reduce soil erosion, and improved soil nutrients and carbon contents so they can produce greater agricultural yields and other benefits. As majority of rural poor live in these regions and dependent on natural resources for their livelihood and sustenance, improvements in agricultural yields improve human welfare and simultaneously improve national food security.

Sujala–III watershed development project conceptualised and implemented by the Watershed Development Department of Government of Karnataka with tripartite cost-sharing arrangements. The World Bank through International Development Association provided major portion of plan outlay as a loan to Government of India and in turn loan to Government of Karnataka.

The objectives of Sujala-III is to demonstrate more effective watershed management through greater integration of programs related to rain fed agriculture, innovative and science based approaches and strengthened institutions and capacities. The project is implemented in 11 districts of Bidar, Vijayapura, Gulbarga, Yadgir, Koppal, Gadag, Raichur, Davanagere, Tumkur, Chikkamangalur and Chamarajanagar which have been identified by the Watershed Development Department based on rainfall and socio-economic conditions. The project will be implemented over six years and linked with the centrally financed integrated watershed management programme.

Economic evaluations can better guide in watershed planning and implementation, as well as raise awareness of benefits of ecosystem restoration for food security and poverty alleviation program. The present study aims to characterize socio-economic status of farm households, assess the land and water use status, evaluate the economic viability of land use, prioritize farming constraints and suggest the measures for soil and water conservation for sustainable agriculture.

Objectives of the study

1. To characterize socio-economic status of farm households
2. To evaluate the economic viability of land use and land related constraints
3. To estimate the ecosystem service provided by the watershed and
4. To suggest alternatives for sustainable agriculture production.

METHODOLOGY

Study area

Nallur micro-watershed is located in Eastern Dry Zone of Karnataka (Figure 1). The zone covers entire Bangalore and Kolar districts and 2 taluks of Tumkur. It has an area of 1.80 M ha with 0.85 M ha under cultivation. About 0.23 M ha are irrigated mainly from tanks and wells. Elevation ranges from 800 to 1500m MSL with major area falling between 800 and 900 m. The major soil type is non-gravelly red loam with a narrow belt of lateritic soil. Average annual rainfall ranges between 680 and 890mm. The principal crops of the zone are ragi, rice, pulses, maize, oil seeds and mulberry. A sizeable area is also under vegetables and flowering plants. It's represented Agro Ecological Sub Region (AESR) 8.2 having LGP 120-150 days.

Nallur micro-watershed (Bangihalli sub-watershed, Gubbi taluk, Tumkur district) is located in between $13^{0}27'$ – $13^{0}28'$ North latitudes and $76^{0}53'$ – $76^{0}55'$ East longitudes, covering an area of about 604.37 ha, bounded by Malamachanakunte, Maranahalli, Ankasandra and Nallur villages.

Sampling Procedure:

In this study we have followed soil variability as criterion for sampling the farm households. In each micro-watershed the survey numbers and associated soil series are listed. Minimum three farm households for each soil series were taken and summed up to arrive at total sample for analysis.

Sources of data and analysis:

For evaluating the specific objectives of the study, primary data was collected from the sample respondents by personal interview method with the help of pre-tested questionnaire. The data on socio-economic characteristics of respondents such as family size and composition, land holdings, asset position, occupational pattern and education level was collected. The present cropping pattern and the level of input use and yields collected during survey. The data collected from the representative farm households were analysed using Automated Land Potential Evalution System (Figure 2).

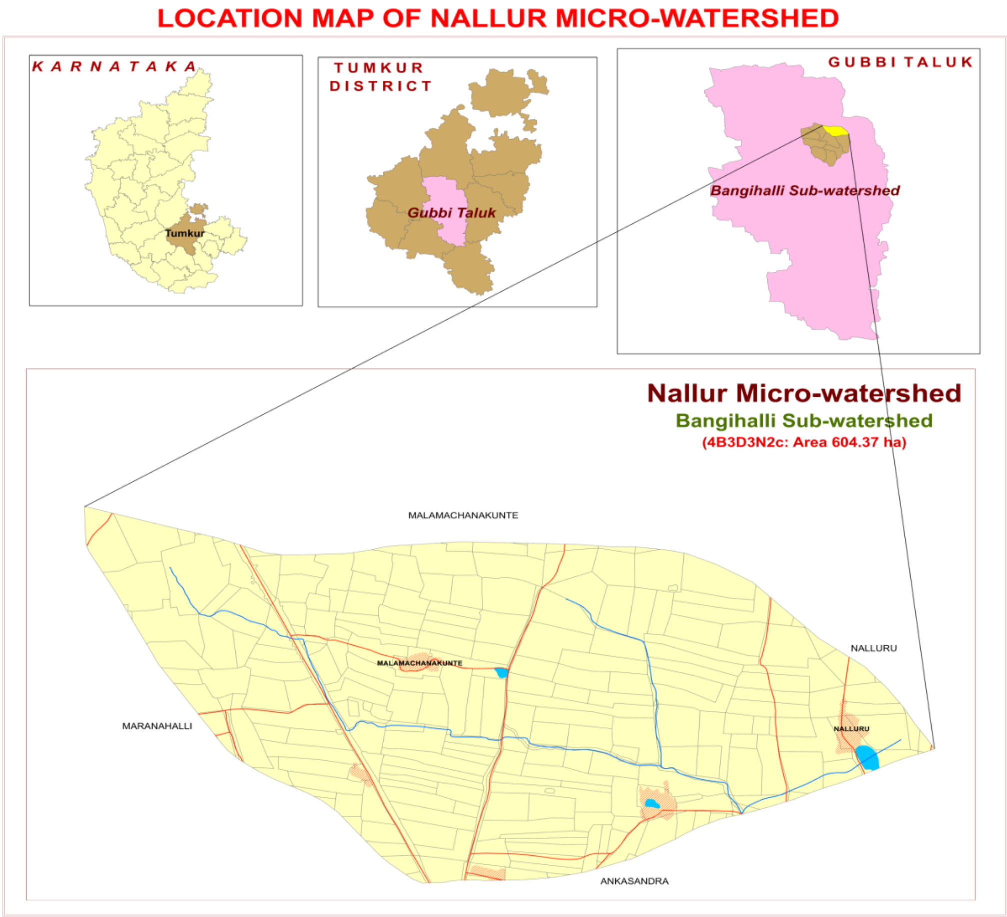

Figure 1: Location of study area

Steps followed in socio-economic assessment

1. After the completion of soil profile study link the cadastral number to the soil profile in the micro watershed.
2. Download the names of the farmers who are owning the land for each cadastral number in the Karnataka BHOOMI Website.
3. Compiling the names of the farmers representing for all the soil profiles studied in the micro watershed for socio-economic Survey.
4. Conducting the socioeconomic survey of selected farm households in the micro watershed .
5. Farm households database created using the Automated Land Potential Evaluation System (ALPES) for analysis of socio economic status for each micro watershed .
6. Synthesis of tables and preparation of report for each micro watershed .

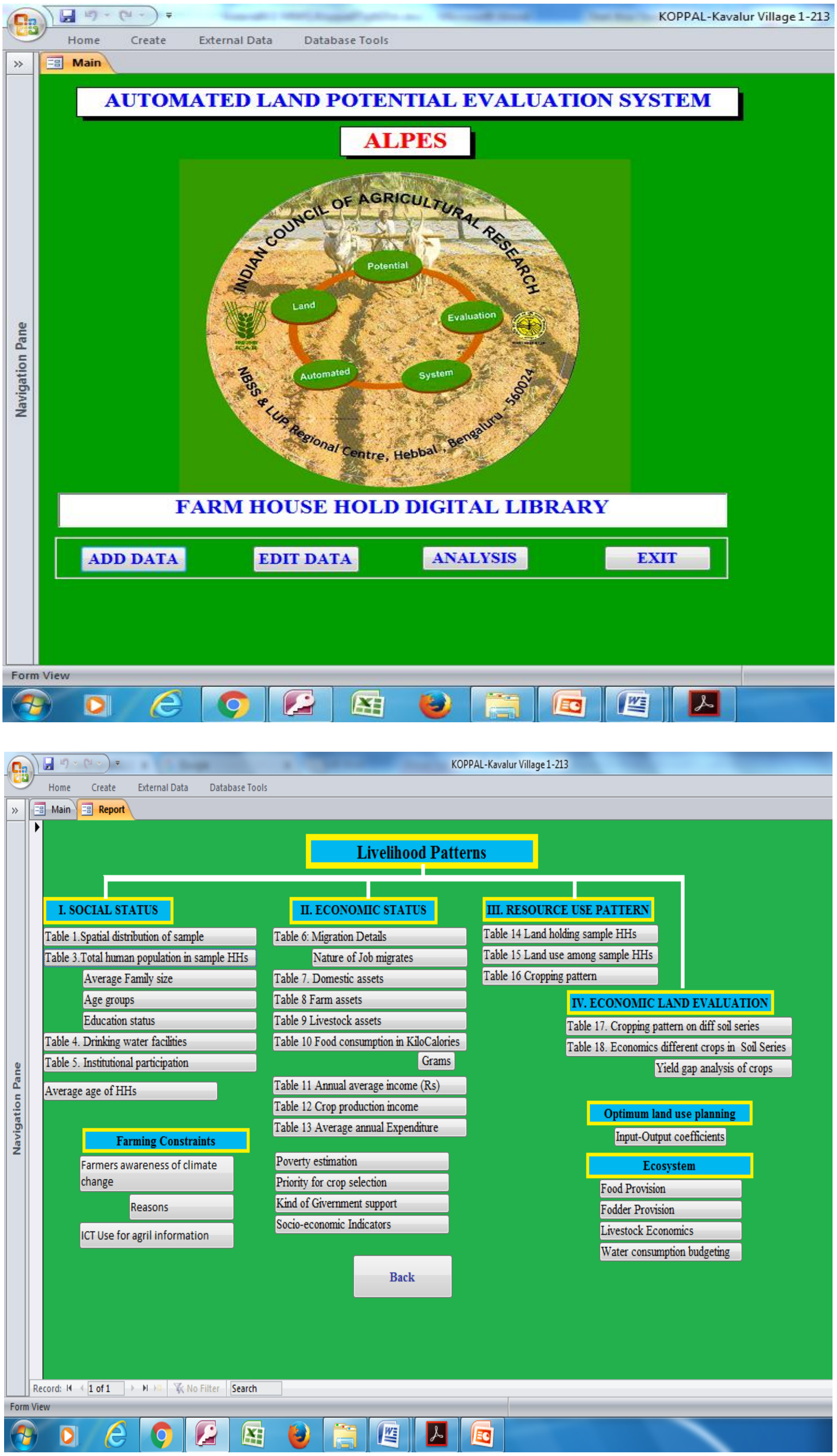

Figure 2: ALPES FRAMEWORK

The sample farmers were post classified in to marginal and small (0.0 to <=2 ha), medium and semi medium (>2 to <=10 ha) and large (>10 ha). The steps involved in estimation of soil potential involve estimation of total cost of cultivation, the yield/gross returns and net income per hectare. The cost of inputs such seed, manure and fertilizer, plant protection chemicals, payment towards human and bullock labour and interest on working capita are included under operational costs. In the case of perennial crops, the cost of establishment was estimated by using actual physical requirements and prevailing market prices. Estimation cost included maintenance cost up to bearing period. The value of main product and by product from the crop enterprise at the market rates were the gross returns of the crop. Net returns were worked out by deducting establishment and maintained cost from gross returns.

Operational Cost = cost of seeds, fertilizers, pesticides. Cost of human and bullock labour, cost of machinery, cost of irrigation water + interest on working capital.
Gross returns = Yield (Quintals/hectare)*Price (Rs/Quintal)
Net returns = Gross returns-Operational cost.
Benefit Cost Ratio = Net returns/Total cost.

Economic suitability classes: once each land use –land area combination has been assigned an economic value by the land evaluation, the question arises as to its 'suitability', that is, the degree to which it satisfies the land user. The FAO framework defines two suitability orders: 'S'(suitable if benefit cost ratio (BCR)>1) and 'N'(not suitable if (BCR<1), which are dived into five economic suitability classes:'S1'(highly suitable if BCR>3), 'S2'(suitable if BCR>2 and <3),'S3'(Marginally suitable if BCR >1 and <2), 'N1'(Not suitable for economic reasons but physically suitable) and 'N2'(not suitable for physical reasons). The limit between 'S3' and 'N1'must be at least at the point of financial feasibility (i.e. net returns, NPV, or IRR>0 and BCR>1). The other limits depend on social factors such as farm size, family size, alternative employment or investment possibilities and wealth expectations; these need to be specified for the Soil series.

Economic Valuation of Soil ecosystem services:

The replacement cost approach was followed for estimating the onsite cost of soil erosion, Market price method was followed for estimating the value of food and fodder production. Value transfer methods was followed for estimating the value of water demand by different crops in the micro watershed.

Steps followed in Replacement cost methods for estimation of onsite cost of soil erosion

1. Collect the Soil Map Units (SMU) / Land Use Type (LUT) with soil fertility analysis.
2. Integrate the erosion rates per SMU/LUT.
3. Estimate the nutrients lost per tone of soil erosion for each SMU/LUT.
4. Estimate the value of soil nutrients lost per ton of soil erosion for each SMU/LUT by taking the market price of soil nutrients.

Chapter 4

RESULTS AND DISCUSSIONS

The demographic information shows that the household population dynamics encompasses the socioeconomic status of the farmer. For a rural family, the household size should be optimal to earn a comfortable livelihood through farm and non-farm wage earning. The total number of population in watershed area was 46, out of which 50 per cent were males and 50 per cent females. Average family size of the households is 4.2 Age is an important factor, which affects the potential employment and mobility status of respondents. The data on age wise distribution of farmers in the sample households indicated that majority of the farmers are coming under the age group of 18 to 30 years (37 %) followed by 30 to 50 years (32.6 %) more than 50 years (28.3 %) and 0 to18 years (2.2 %). Hence, in the study area in general, the respondents were of young and middle age, indicating thereby that the households had almost settled with whatever livelihood options they were practicing and sample respondents were young by age who could venture into various options of livelihood sources. Data on literacy indicated that 82.6 per cent of respondents were literate and 17.4 per cent illiterate (Table 1).

Table 1: Human population among sample households in Nallur Microwatershed

Particulars	**Units**	**Value**
Total human population in sample HHs	Number	46
Male	% to total Population	50.0
Female	% to total Population	50.0
Average family size	Number	4.2
Age group		
0 to 18 years	% to total Population	2.2
18 to 30 years	% to total Population	37.0
30 to 50 years	% to total Population	32.6
>50 years	% to total Population	28.3
Average age	Age in years	37.5
Education Status		
Illiterates	% to total Population	17.4
Literates	% to total Population	82.6
Primary School (<5 class)	% to total Population	15.2
Middle School (6- 8 class)	% to total Population	8.7
High School (9- 10 class)	% to total Population	13.0
Others	% to total Population	45.7

The ethnic groups among the sample farm households found to be among all the households belonging to general caste (Table 2 and Figure 3). Among the sample households are using liquefied petroleum gas as source of fuel for cooking. All the sample farmers are having electricity connection. About 72.7 per cent are sample households having health cards. About 18.2 per cent households are having MNREGA job cards for employment generation. About 63.6 per cent of farm households are having ration cards for taking food grains from public distribution system. About 90.9 per cent of farm households are having toilet facilities.

Table 2: Basic needs of sample households in Nallur Microwatershed

Particulars	**Units**	**Value**
Social groups		
General	% of Households	100.0
Types of fuel use for cooking		
Gas	% of Households	100.0
Energy supply for home		
Electricity	% of Households	100.0
Number of households having Health card		
Yes	% of Households	72.7
No	% of Households	27.3
MGNREGA Card		
Yes	% of Households	18.2
No	% of Households	81.8
Ration Card		
Yes	% of Households	63.6
No	% of Households	36.4
Households with toilet		
Yes	% of Households	90.9
No	% of Households	9.1
Drinking water facilities		
Tube Well	% of Households	100.0

The data collected on the source of drinking water in the study area is presented in Table 2. All the sample respondents are having Tube well source for water supply for domestic purpose.

Only 15.2 per cent of the farmers are participating in community based organizations (Table 3). Among them majority were participating in diary co-operatives Societies (15.2 %).

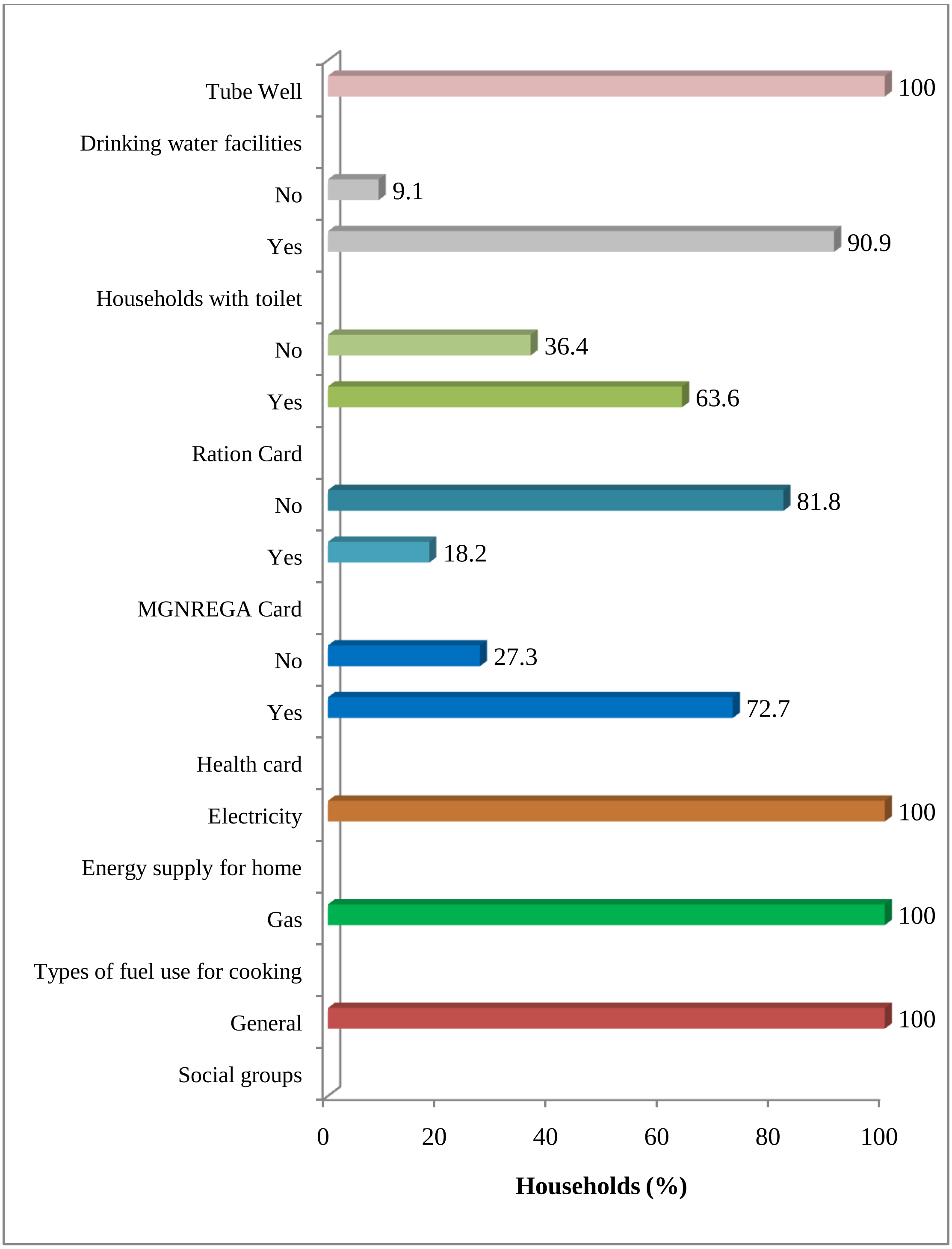

Figure 3: Basic needs of sample households in Nallur Microwatershed

Table 3: Institutional participation among the sample population in Nallur Microwatershed

Particulars	Units	Value
No. Of people participating	% to total	**15.2**
Co-operative Societies-Dairy	% to total	15.2
No. Of people not participating	% to total	**84.8**

The occupational pattern (Table 4) among sample households shows that agriculture is the main occupation around 36.8 per cent of farmers followed by subsidiary occupations like agriculture labour (23.7 %), non agricultural labour (17.4 %), private service (13.4 %), trade and business (2.2 %) and government service and self-employment around 2.2 per cent and 4.3 per cent respectively as a main occupation.

Table 4: Occupational pattern in sample population in Nallur Microwatershed

Occupation		**% to total**
Main	**Subsidiary**	
Agriculture	Agriculture	36.8
	Agriculture labour	23.7
	Non Agriculture Labour	17.4
	Private service	13.4
	Trade and business	2.2
Govt .service		2.2
Self employed		4.3
Grand Total		100
Family labour availability		**Man days/month**
Male		42.5
Female		30
Total		36.3

The important assets especially with reference to domestic assets were analyzed and are given in Table 5 and Figure 4. The important domestic assets possessed by all categories of farmers are television (100 %) followed by mobile phones (90 %), mixer/grinder (50 %), motorcycle (50 %), and refrigerator (20 %), bicycle (10 %) and computer/laptop (10 %). The average value of domestic assets is around Rs. 10282 per households.

Table 5: Domestic assets among the sample households in Nallur Microwatershed

Particulars	**% of households**	**Average value in Rs**
Bicycle	10.0	600
Computer/laptop	10.0	12100
Mixer/grinder	50.0	1220
Mobile Phone	90.0	1767
Motorcycle	50.0	42000
Refrigerator	20.0	12000
Television	100	2290
Average value	10282	

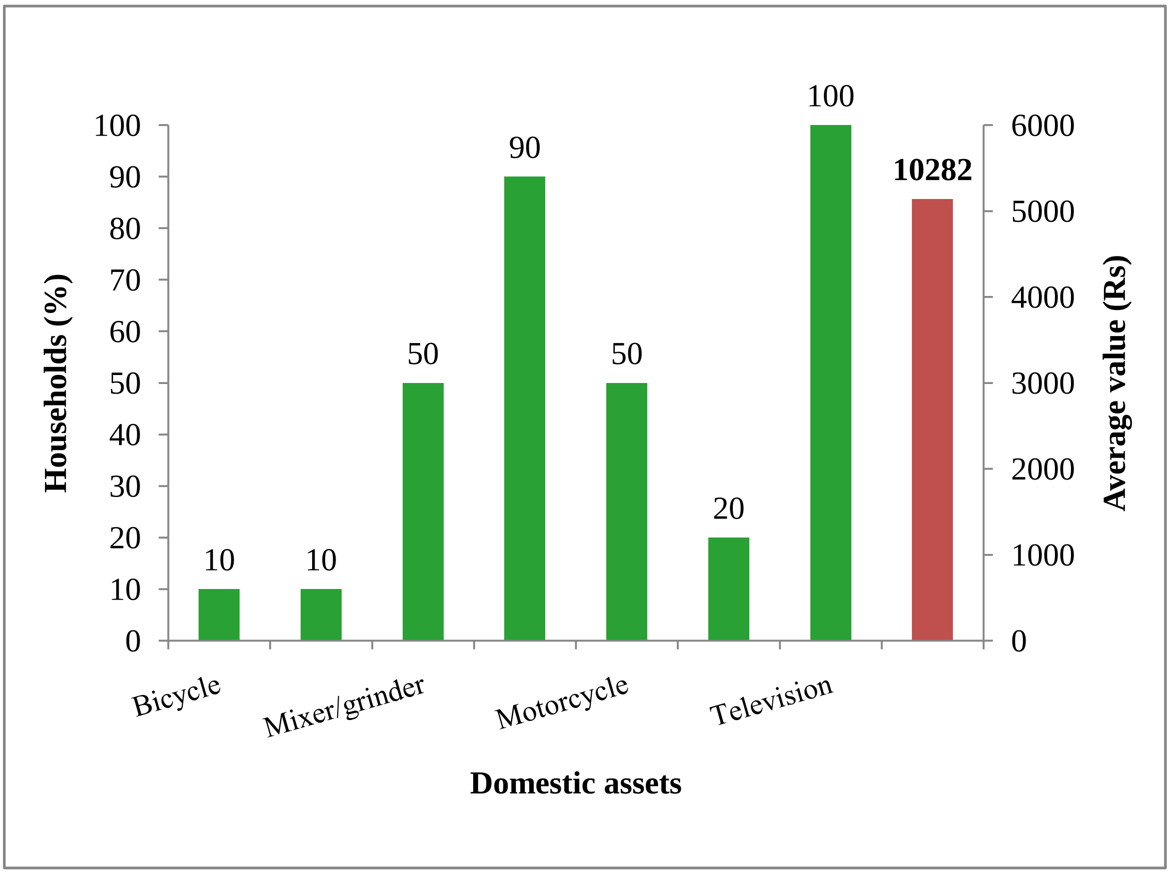

Figure 4: Domestic assets among the sample households in Nallur Microwatershed

The most popularly owned farm equipments were sickles, plough, cattle shed; pump sets, chaff cutter, bullock cart, sprayer and thresher. Plough and sickle were commonly present in all the sampled farmers; these were primary implements in agriculture. the per cent of households owned weeder (9.1 %), plough (9.1 %), sprayer (9.1 %), drip sprinkler (9.1%), and tractor (9.1 %) was found highest among the sample farmers. the average value of farm assets is around Rs 52312 per households (Table 6 and Figure 5).

Table 6: Farm assets among samples households in Nallur Microwatershed

Particulars	% of households	Average value in Rs
Drip/sprinkler	9.1	7000
Plough	9.1	2100
Sprayer	9.1	2400
Tractor	9.1	250000
Weeder	9.1	60
Average Value	52312	

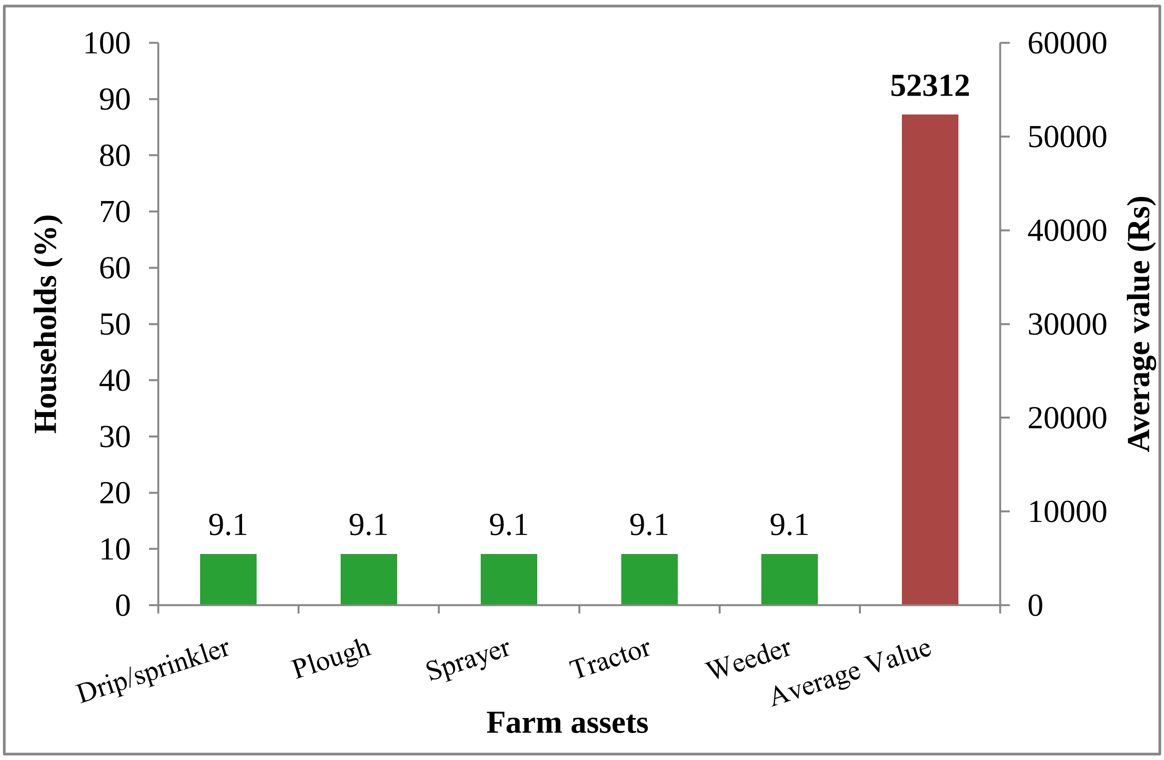

Figure5: Farm assets among samples households in Nallur Microwatershed

Livestock is an integral component of the conventional farming systems (Table 7 and Figure 6). The livestock population is, among local milching cow (28.6 %), cross breed milching cow (28.6%), milching buffalos (28.6 %) and local dry cow (14.3%). The average livestock value was Rs. 48750 per household.

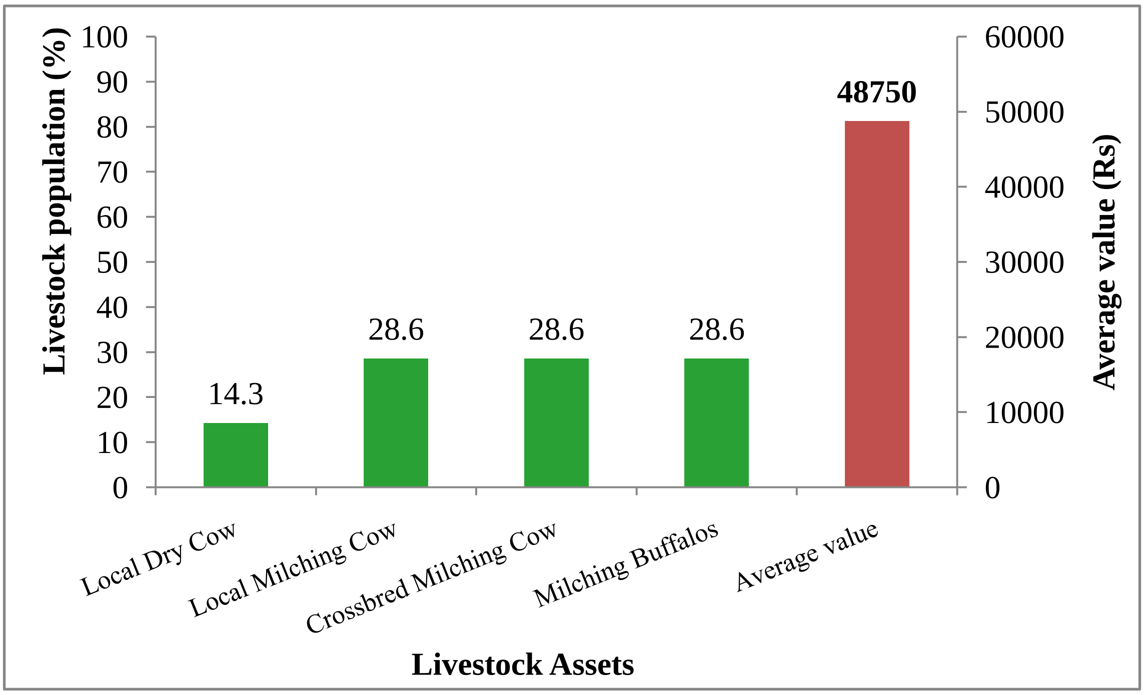

Figure 6: Livestock assets among sample households in Nallur Microwatershed

Table 7: Livestock assets among sample households in Nallur Microwatershed

Particulars	% of livestock population	Average value in Rs
Local Dry Cow	14.3	3000
Local Milching Cow	28.6	13000
Crossbred Milching Cow	28.6	145000
Milching Buffalos	28.6	34000
Average value	48750	

Average milk produced in sample households is 1590 litters/ annum. Among the farm households, sorghum, bajra and maize are the main crops for domestic food and fodder for animals. About 1980.7 kg /ha of average fodder is available per season for the livestock feeding (Table 8).

Table 8: Milk produced and fodder availability of sample households in Nallur Microwatershed

Particulars	
Name of the Livestock	**Ltr./Lactation/animal**
Crossbred Milching Cow	2100
Local Milching Cow	360
Milching Buffalos	2310
Average Milk Produced	**1590**
Fodder produces	**Fodder yield (kg/ha.)**
Maize	1316
Sorghum	1541
Ragi	3085
Average of fodder availability	**1981**
Livestock having households (%)	54
Livestock population (Numbers)	9

A woman participation in decision making is in this micro-watershed is presented in Table 9. About 9.1 per cent of women participation in local organisation activates, 18.2 per cent women earning for her family requirement and 90.9 per cent of women taking decision in her family and agriculture related activities.

Table 9: Women empowerment of sample households in Nallur Microwatershed

% to Grand Total

Particulars	Yes	No
Women participation in local organization activities	9.1	90.9
Women elected as panchayat member	0.0	100.0
Women earning for her family requirement	18.2	81.8
Women taking decision in her family and agriculture related activities	90.9	9.1

The food intake in terms of kilo calorie (kcal) per person per day was calculated and presented in the Table 10 and Figure 7. More quantity of cereals are consumed by sample farmers which accounted for 1006 kcal per person. The other important food items consumed was followed by cooking oil 208.1 kcal, pulses 89 kcal, milk 78.7 kcal, vegetables 12.4 kcal and egg 17 kcal. In the sampled households, farmers were consuming less (1411.8 kcal) than NIN- recommended food requirement (2250 kcal).

Table 10: Per capita daily consumption of food among the sample households in Nallur Microwatershed

Particulars	**NIN recommendation (gram/per day/person)**	**Present level of consumption (gram/ per day/ person)**	**Kilocalories /day/person**
Cereals	396	296.0	1006.43
Pulses	43	26.0	89
Milk	200	121.1	78.7
Vegetables	143	51.8	12.4
Cooking Oil	31	36.5	208.1
Egg	0.5	11.4	17.0
Meat	14.2	0.0	0.00
Total	**827.7**	**542.7**	**1411.8**
Threshold of NIN recommendation		827 gram*	2250 Kcal*
% Below NIN		100	100.0
% Above NIN		0.00	0.00

Note: * day/person

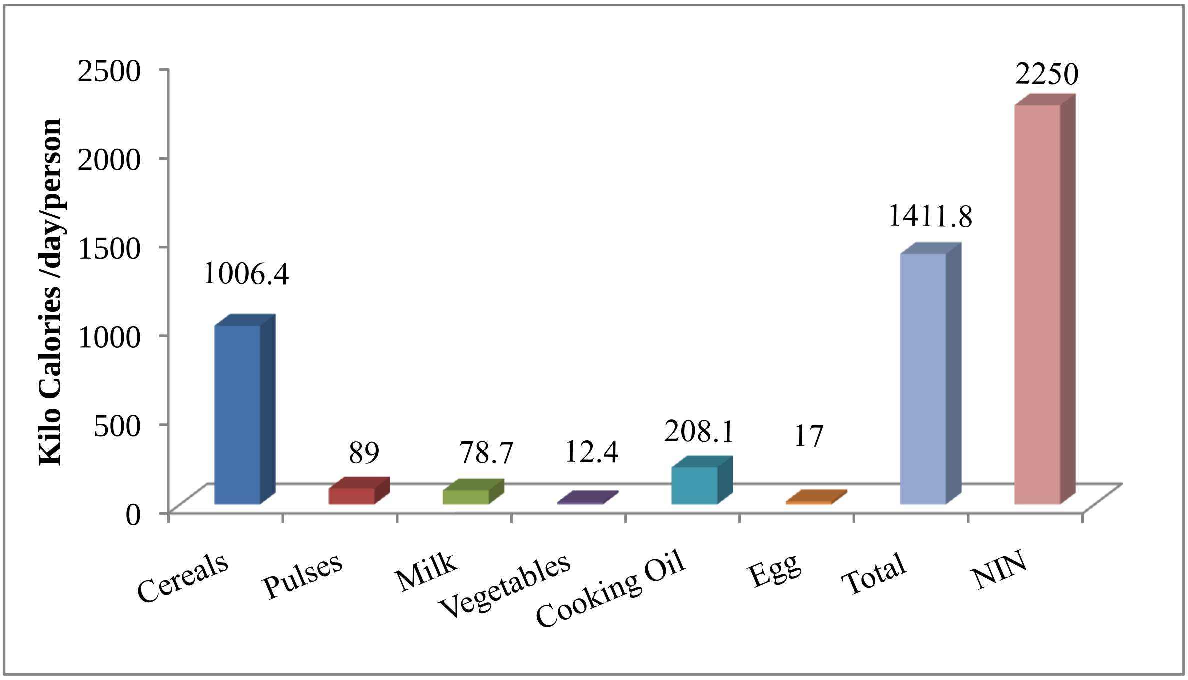

Figure 7: Per capita daily consumption of food among the sample households in Nallur Microwatershed

Annual income of the sample HHs: The average annual household income is around Rs. 145239. Major source of income to the farmers in the study area is from crop production (Rs. 106307) followed by livestock (Rs. 38932). The monthly per capita income is Rs.2894, which is more than the threshold monthly income of Rs 975 for considering above poverty line. Due to the fact that erratic rainfall and shortage of water, farmers are diverting from crop production activities to enable the household for a comfortable livelihood. The incomes from the other aforesaid sources are very meagre (Table 11).

Table 11: Annual average income of HHs from various sources in Nallur Microwatershed

Particulars	**Income ***
Nonfarm income (Rs)	0 (0)
Livestock income (Rs)	38932 (45.5)
Crop Production (Rs)	106307 (100)
Total Annual Income (Rs)	***145239***
Average monthly per capita income (Rs)	2894
Threshold for Poverty level (Rs 975 per month/person)	
% of households below poverty line	36.4
% of households above poverty line	63.6

* Figure in the parenthesis indicates % of Households

The average annual expenditure of farm households indicated that farmers in the study area spend highest on food (Rs. 25775) followed by education, clothing, social function and health. Now a day’s education is most important among all of us. In today’s competitive world, education is a necessity for man after food, clothing, and shelter. It is the only fundamental way by which a desired change in the society can happen. The average per capita monthly expenditure is around Rs 1103 and 63.6 per of farm households are above poverty line and below poverty line is 36.4% (Table 12 and Figure 8).

Table 12: Average annual expenditure of sample HHs in Nallur Microwatershed

Particulars	**Value in Rupees**	**Per cent**
Food	25775	46.6
Education	191	0.3
Clothing	4727	8.5
Social functions	15545	28.1
Health	9091	16.4
Total Expenditure (Rs/year)	55329	100.0
Monthly per capita expenditure (Rs)	1103	

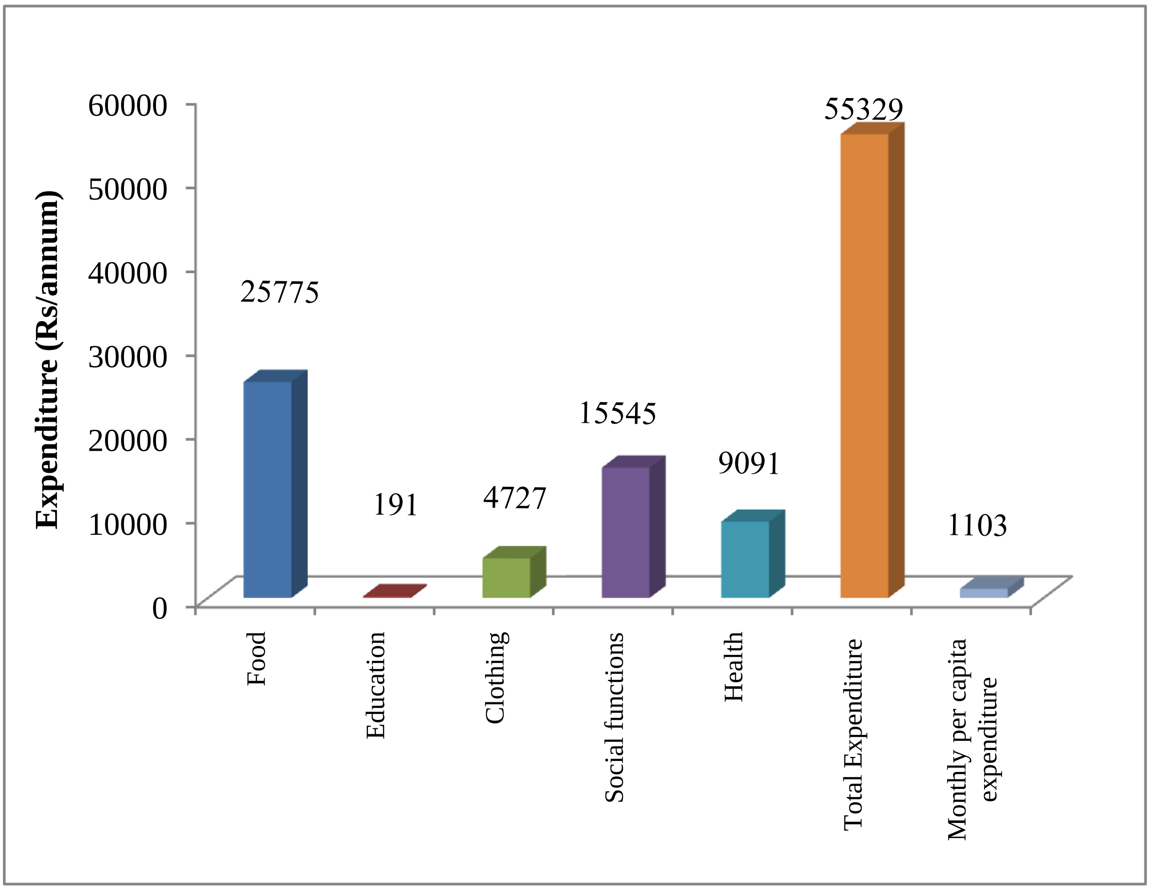

Figure 8: Average annual expenditure of sample HHs in Nallur Microwatershed

Land use: The total land holding in the Nallur Microwatershed is 14.8 ha (Table 13). Of which 7.9 ha is rain fed land and 6.9 ha is irrigated land. The average land holding per household is worked out to be 1.14 ha.

Table 13: Land use among samples households in Nallur Microwatershed

Particulars	**Per cent**	**Area in ha**
Irrigated land	46.5	6.9
Rainfed Land	53.5	7.9
Fallow Land	0.0	0.0
Total land holding	100.0	14.8
Average land holding	1.14	

In the Microwatershed, the prevalent present land uses under perennial plants are coconut (84.9 %) followed by mango (10.9 %), teak (2.6 %), acacia (0.7 %), neem tree (0.5 %), banyan trees (0.2 %) and guava (0.2%) (Table 14).

Table 14: Number of trees/plants covered in sample farm households in Nallur Microwatershed

Particulars	**Number of Plants/trees**	**Per cent**
Banyan tree(Alada)	1	0.2
Coconut	490	84.9
Mango	63	10.9
Neem trees	3	0.5
Acacia	4	0.7
Guava	1	0.2
Teak	15	2.6
Grand Total	577	100.0

The land use decisions are usually based on experience of farmers, tradition, expected profit, personal preferences, resources and social requirements. The present dominant crops grown in dry lands in the study area were by areca nut (24.9 %) followed by coconut (20.4 %), ragi (10.3 %), maize (11.4 %) which are taking during kharif; ragi (10.1 %) and sorghum (10.3 %) during rabi and mango (12.6 %) during summer season respectively. The cropping intensity was 149 per cent (Table 15 and Figure 9).

Table 15: Present cropping pattern and cropping intensity in Nallur Microwatershed

% to Grand Total

Crops	**Kharif**	**Rabi**	**Summer**	**Grand Total**
Areca nut	24.9	0.00	0.0	24.9
Coconut	20.4	0.0	0.0	20.4
Maize	11.4	0.0	0.0	11.4
Mango	0.0	0.0	12.6	12.6
Ragi	10.3	10.1	0.0	20.4
Sorghum	0.0	10.3	0.0	10.3
Grand Total	***66.9***	***20.4***	***12.6***	***100.0***
Cropping intensity (%)	149			

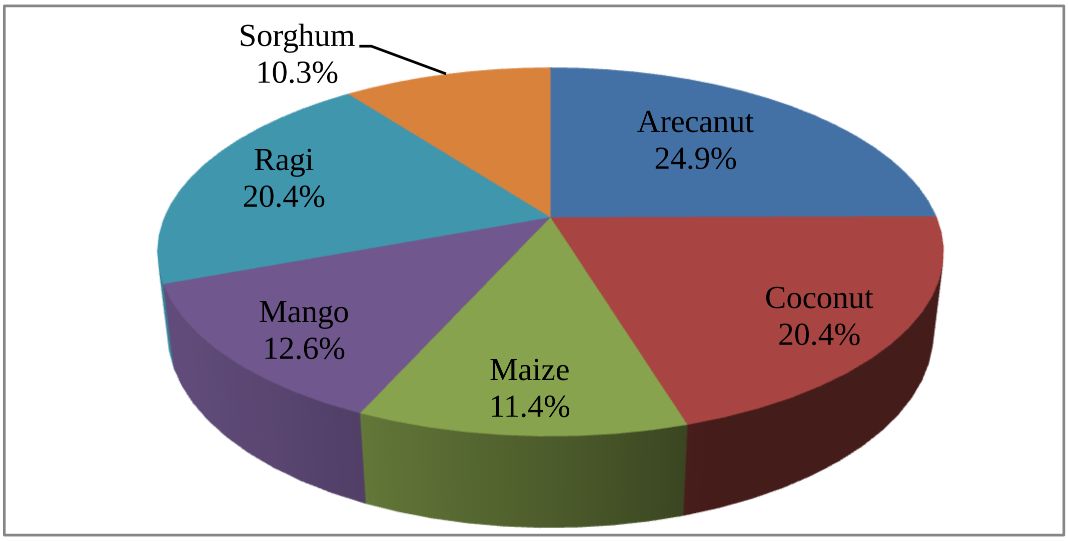

Figure 9: Present cropping pattern in Nallur Microwatershed

Economic land evaluation

The main purpose of economic land evaluation in the watershed is to identify the existing production constraints and propose the potential/alternate options for agro-technology transfer and for bridging the adoption and yield gap.

In Nallur Microwatershed, 7 soil series are identified and mapped (Table 16). The distribution of major soil series are Mornal soil covering an area around 24 ha (3.9%) followed by Balapur 4 ha (0.61 %), Nagalapur 137 ha (22.78 %), Hallikere 46 ha (7.5 %), Budagumpa 58 ha (9.55 %), Niduvalalu 13 ha (2.12 %) and Kadagathur 312ha (51.57%).

Table 16: Distribution of soil series in Nallur Microwatershed

Soil No.	Soil Series	Mapping Unit Description	Area In ha (%)
SOILS OF GRANITE GNEISS LANDSCAPE			
1	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands under cultivation	24 (3.90)
2	BPR	Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on very gently sloping uplands under cultivation	4 (0.61)
3	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on very gently sloping uplands under cultivation	137 (22.78)
4	HLK	Hallikere soils are very deep (>150 cm), well drained, have dark brown to dark reddish brown clayey soils occurring on very gently sloping uplands under cultivation	46 (7.55)
5	BGP	Budagumpa soils are very deep (>150 cm), moderately well drained, black calcareous cracking gravelly clay soils occurring on nearly level to very gently sloping uplands under cultivation	58 (9.55)
6	NDL	Niduvalalu soils are very deep (>150 cm), well drained, have red to dark reddish brown gravelly sandy clay soils occurring on very gently sloping uplands under cultivation	13 (2.12)
7	KDT	Kadagathur soils are very deep (>150 cm), moderately well drained, have dark brown to very dark grayish brown sandy clay to clay soils occurring on very gently sloping uplands under cultivation	312 (51.57)
Others			12 (1.93)

Present cropping pattern on different soil series are given in Table 17. Crops grown on Budagumpa soils are areca nut, coconut and ragi. Mango, sorghum, coconut ragi and areca nut on Kadagathur soils can grow.

Table 17: Cropping pattern on major soil series in Nallur Microwatershed

(Area in per cent)

Soil Series	Soil Depth	Crops	Dry		Irrigated		Grand Total
			Kharif	Rabi	Kharif	Rabi	
BGP	Very deep (>150 cm)	Areca nut	82.1	0.0	0.0	0.0	82.1
		Coconut	0.0	0.0	13.0	0.0	13.0
		Ragi	0.0	4.8	0.0	0.0	4.8
KDT	Very deep (>150 cm)	Areca nut	0.0	0.0	11.1	0.0	11.1
		Coconut	0.0	0.0	36.6	0.0	36.6
		Mango	15.6	0.0	0.0	0.0	15.6
		Ragi	4.9	11.1	7.9	0.0	23.9
		Sorghum	0.0	4.9	0.0	7.9	12.8

Land is used for agricultural use for growing cereals, pulse, oilseeds and commercial crops. The soil/ land potential are measures in terms of physical yield and net income. The alternative land use options for each Microwatershed are given below (Table 18).

Table 18: Alternative land use options for different size group of farmers (Benefit Cost Ratio) in Nallur Microwatershed.

Soil Series	Small Farmers	Medium Farmers
BGP	Areca nut (16.3),Coconut (4.5) & Ragi 1.1	
KDT	Coconut (2.7) & Mango (5.0) Ragi (1.7) & Sorghum (4.2)	Areca nut (10.5) & Coconut(5.8)

The productivity of different crops grown in Nallur Microwatershed under potential yield of the crops is given in Table 19.

The data on cost of cultivation and benefit cost ratio (BCR) of different crops is given in Table 19. The total cost of cultivation in study area for areca nut range between Rs 14431/ha in BGP soil (with BCR of 16.25) and Rs.11849/ha in KDT soil (with BCR of 10.46), coconut range between is Rs.60522/ha in BGP soil (with BCR of 4.50) and Rs. 38855/ha in KDT soil (with BCR of 3.72), ragi range between is Rs 76501/ha in BGP soil (with of 1.09) and Rs.22269/ha in KDT soil (with BCR of 1.72), mango cost of cultivation in KDT soil is Rs 17223/ha (with BCR of 5.04) and sorghum cost of cultivation in KDT soil is Rs. 19179/ha (with BCR of 4.21).

The data on FYM, Nitrogen, Phosphorus and Potash application by the farmers to different crops and recommended FYM for different crops is given in Table 19 There is a huge gap between FYM application by farmers and recommended FYM in all the crops across the soils. There is a larger yield gap in crops grown across different soil series. Adequate knowledge about recommended package of practices is the pre-requisite for their use in cultivation of crops. It is a fact that, recommended practices are major contributing factors to yield. Inadequate knowledge about recommended practices leads to their improper adoption. Strengthening of extension services by concerned agency is required to increase adoption of recommended cultivation practices and ultimately reducing the gap. By adopting soil-test fertiliser recommendation, there is scope to increase yield and income to a maximum of Rs 227650 in areca nut and a minimum of Rs 167 in areca nut cultivation.

Table 19: Economic land evaluation and bridging yield gap for different crops in Nallur Microwatershed

Particulars	KDT (>150 cm)					BGP (>150 cm)		
	Areca nut	Coco nut	Mango	Ragi	Sorg hum	Areca nut	Coco nut	Ragi
Total cost (Rs/ha)	11849	38855	17223	22269	19179	14431	60522	76501
Gross Return (Rs/ha)	123912	128698	86743	37030	58639	234454	272194	83012
Net returns (Rs/ha)	112063	89843	69520	14761	39460	220023	211672	6511
B:C	10.46	3.72	5.04	1.72	4.21	16.25	4.50	1.09
Farmers Practices (FP)								
FYM (t/ha)	4.0	10.0	6.8	0.0	3.5	2.4	3.0	0.0
Nitrogen (kg/ha)	0.0	80.0	60.8	17.1	52.8	47.4	30.6	32.6
Phosphorus (kg/ha)	0.0	57.5	155.4	37.4	131.8	42.7	50.7	48.9
Potash (kg/ha)	0.0	75.0	0.0	25.0	30.8	35.5	22.9	28.6
Grain (Qtl/ha)	5.6	200.0	27.0	10.0	102.7	29.6	12.6	28.1
Price of Yield (Rs/Qtl)	38000	1200	3000	12000	1100	2000	2930	2050
Soil test based fertilizer Recommendation (STBR)								
FYM (t/ha)	27.0	8.8	6.3	27.0	8.8	61.8	6.3	7.5
Nitrogen (kg/ha)	168.8	111.0	50.0	168.8	111.0	231.6	50.0	81.3
Phosphorus (kg/ha)	40.5	42.5	30.0	40.5	42.5	37.1	30.0	30.0
Potash (kg/ha)	185.0	212.3	0.0	231.3	238.9	172.9	0.0	40.0
Grain (Qtl/ha)	12.4	167.7	15.5	12.4	167.7	61.8	15.5	18.8
% of Adoption/yield gap (STBR-FP) / (STBR)								
FYM (%)	85.3	-13.2	-8.1	100.0	60.5	96.2	52.5	100.0
Nitrogen (%)	100.0	28.0	-21.6	89.9	52.5	79.5	38.8	59.8
Phosphorus (%)	100.0	-35.3	-418.0	7.7	-210.2	-15.1	-68.8	-63.1
Potash (%)	100.0	64.7	0	89.2	87.1	79.4	0	28.4
Grain (%)	55.0	-19.2	-74.4	19.0	38.8	52.0	18.4	-49.9
Value of yield and Fertilizer (Rs)								
Additional Cost (Rs/ha)	30539	1293	-6154	33083	6272	64091	2150	7477
Additional Benefits(Rs/ha)	258189	-38720	-34581	28200	71586	64258	8368	-19171
Net change Income (Rs/ha)	227650	-40013	-28427	-4883	65314	167	6218	-26648

Economic valuation of Ecosystem Services (ES) was aimed at combining use and non-use values to determine Total Economic Value (TEV) of ES. Ecosystem Services (ES) were valued based on their annual flow or utilization in common monetary units, Rs/year. The valuation of ES was based on market price in 2017 or market cost approaches whichever is applicable, and in other cases on value or benefit transfer from previous valuation studies.

The onsite cost of different soil nutrients lost due to soil erosion is given in Table 20 and Figure 10. The average value of soil nutrient loss is around Rs 379 per ha/year. The total cost of annual soil nutrients is around Rs 224887 per year for the total area of 604.37 ha.

Table 20: Estimation of onsite cost of soil erosion in Nallur Microwatershed

Particulars	**Quantity (kg)**		**Value (Rs)**	
	Per ha	**Total**	**Per ha**	**Total**
Organic matter	49.06	29092	309.1	183280
Phosphorous	0.3	162	12	7140
Potash	0.6	345	11.6	6897
Iron	0.1	73	5.9	3484
Manganese	0.1	73	33.9	20116
Cupper	0.01	3	3.3	1938
Zinc	0.00	3	0.2	107
Sulpher	0.1	46	3.1	1848
Boron	0.00	2	0.1	77
Total	50.25	29799	379.2	224887

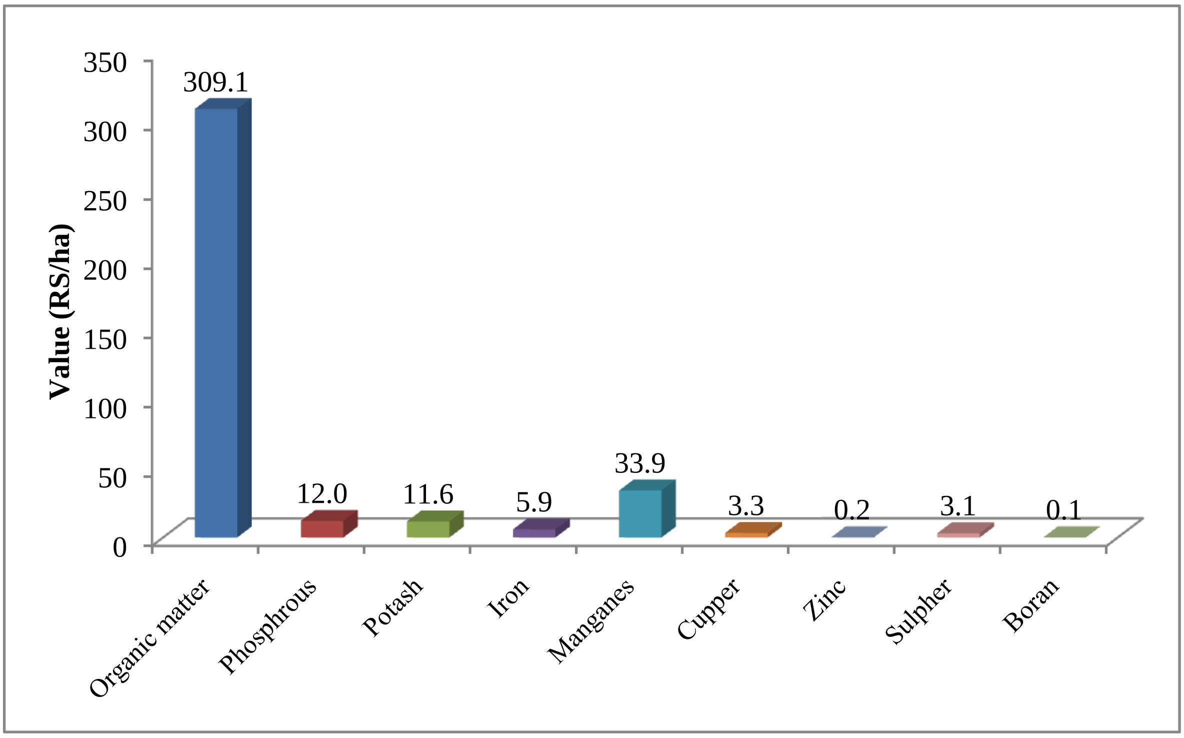

Figure 10: Estimation of onsite cost of soil erosion in Nallur Microwatershed

The average value of ecosystem service for food grain production is around Rs 68305/ ha/year (Table 21 and Figure 11). Per hectare food grain production services is maximum in areca nut (191183) followed by coconut (Rs. 85204), mango (Rs. 42561), sorghum (Rs. 14276) and ragi (Rs. 8300).

Table 21: Ecosystem services of food grain production in Nallur Microwatershed

Production items	**Crops**	**Area in ha**	**Yield (Qtl/ha)**	**Price (Rs/Qtl)**	**Gross Returns (Rs/ha)**	**Cost of Cultivation (Rs/ha)**	**Net Returns (Rs/ha)**
Cereals	Ragi	2.8	13	2938	38214	29915	8300
	Sorghum	1.4	17	2050	35223	20947	14276
Oil seeds	Coconut	4.4	118	1100	129679	44475	85204
Commercial Crops	Areca nut	3.8	7	29333	203943	12759	191183
Fruits	Mango	1.7	29	2000	58531	15970	42561
Average value		14.1	36.8	7484.2	93118	24813	68305

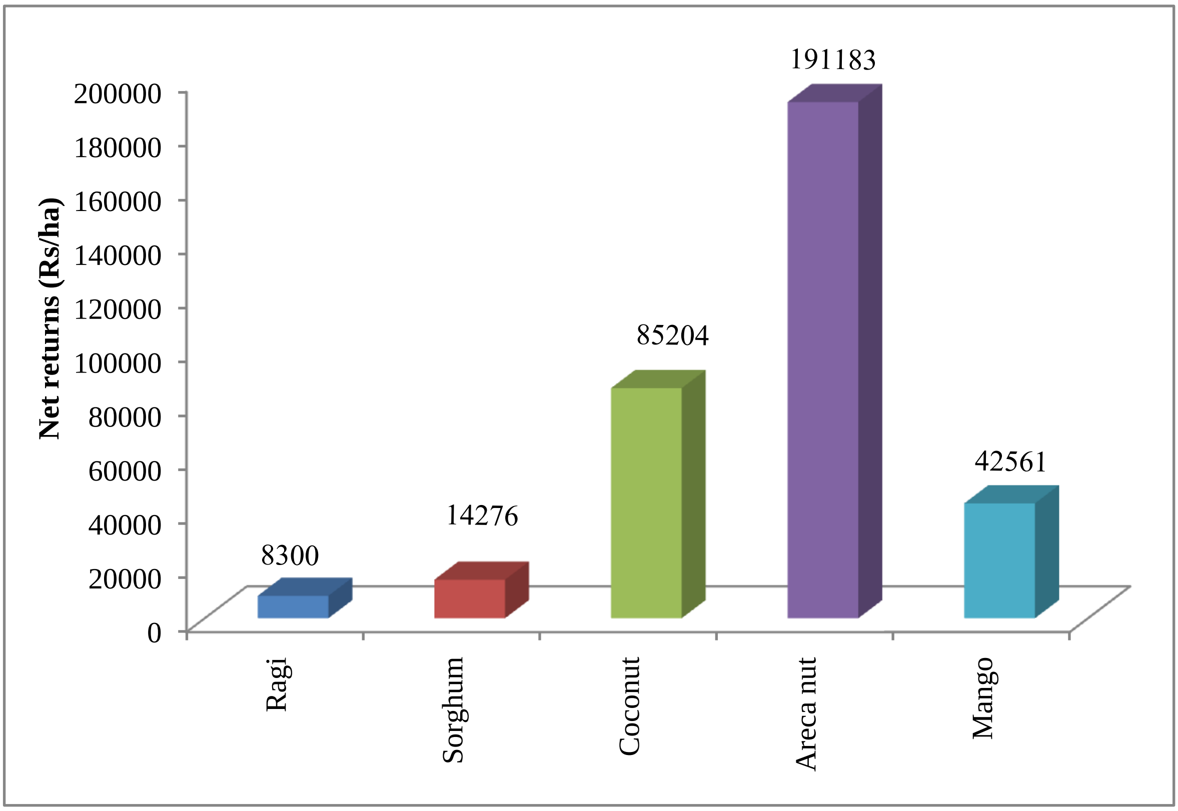

Figure 11: Ecosystem services of food grain production in Nallur Microwatershed

The average value of ecosystem service for fodder production is around Rs. 2936/ ha/year (Table 22). Per hectare fodder production services is maximum in ragi (Rs. 3588) and sorghum (Rs. 2284).

Table 22: Ecosystem services of fodder production in Nallur Microwatershed

Production items	Crops	Area in ha	Yield (Qtl/ha)	Price (Rs/Qtl)	Net Returns (Rs/ha)
Cereals	Ragi	2.8	2.8	1263	3588
	Sorghum	1.4	1.5	1500	2284
Average value		4.2	2.15	1381.5	2936

The water demand for production of different crops was worked out in arriving at the ecosystem services of water support to crop growth. The data on water requirement for producing one quintal of grain is considered for estimating the total value of water required for crop production. Per hectare value of water used and value of water was maximum (Table 23 and Figure 12) in coconut (Rs. 3349955) followed by sorghum (Rs. 84626), mango (Rs. 52678), ragi (Rs. 18956) and areca nut (Rs. 7763).

Table 23: Ecosystem services of water supply in Nallur Microwatershed

Crops	Yield (Qtl/ha)	Virtual water (cubic meter) per ha	Value of Water (Rs/ha)	Water consumption (Cubic meters/Qtl)
Areca nut	7.0	776	7763	112
Coconut	130.2	34996	349955	269
Mango	29.3	5268	52678	180
Ragi	15.5	1896	18956	122
Sorghum	27.8	8463	84626	305
Average value	42.0	10280	102796	198

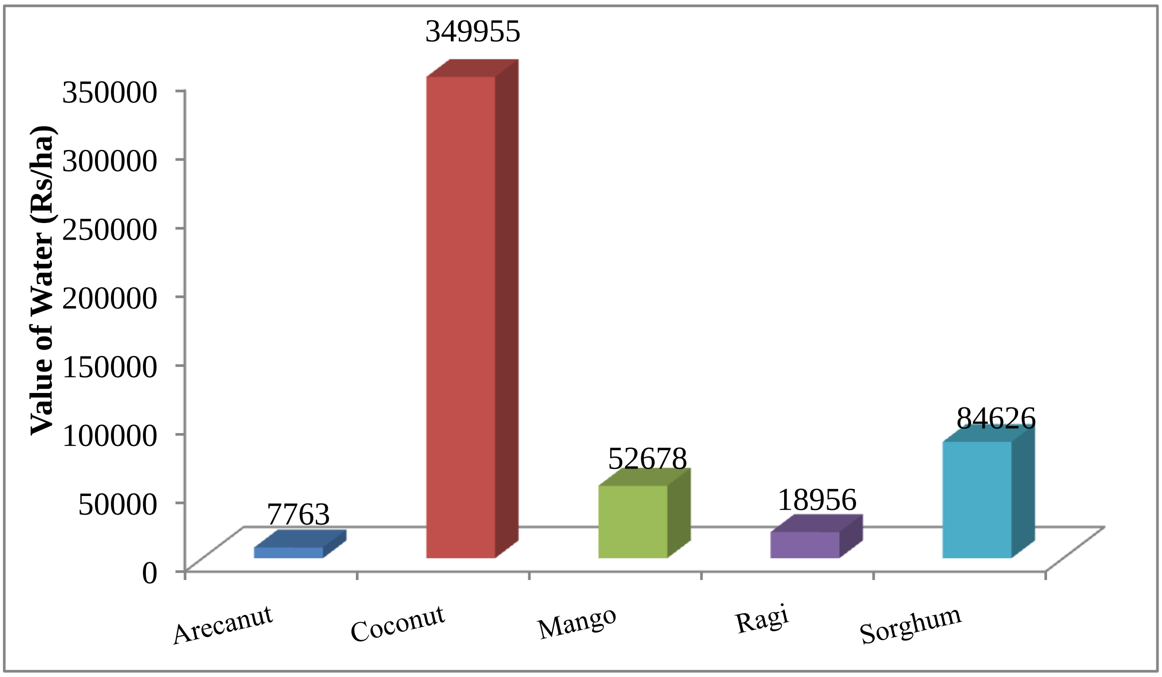

Figure 12: Ecosystem services of water supply in Nallur Microwatershed

The main farming constraints in Nallur Microwatershed to be found are less rainfall, lack of good quality seeds, non availability fertilizers, high crop pests & diseases, animal pests & diseases, lack of transportation, lack of storage, damage of crops by wild animals and non availability of plant protection chemicals. Majority of farmers depend up on bank and money lender of the sources of loan for purpose of crop production. Farmers to sell the agriculture produce through village market, regulated and the farmers getting the agriculture related information on newspaper and television. Farmers reported that they are not getting timely support/extension services from the concerned development department (Table 24).

Table 24: Farming constraints related land resources of sample households in Nallur Microwatershed

Sl.No	Particulars	Per cent
1	Less Rainfall	
2	Lack of good quality seeds	9.1
3	Lack of transportation	27.3
4	Lack of storage	9.1
5	Damage of crops by Wild Animals	100.0
6	Non availability of Plant Protection Chemicals	90.9
7	**Source of loan**	
	Money Leander	100.0
8	**Market for selling**	
	Village market	100.0
9	**Sources of Agri-Technology information**	
	Newspaper	45.5
	Television	54.5

The findings of the study would be very much useful to the planners and policy makers of the study area to identify the irrationality in the existing production pattern and to suggest appropriate production plans for efficient utilization of their scarce resources resulting in increased net farm incomes and employment. The study also throws light on future potentialities of increasing net farm income and employment under different situations viz., with existing and recommended technology.