

# **Master Plan for Thirurangadi Development Block**

*Submitted to*  
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## FOREWORD

Watershed based development was an important development concept popularized by people's planning movement. During the formulation of the Tenth Five Year Plan, it was emphasized that development activities in the agricultural and related sectors must be watershed based. But our Development Blocks are not properly equipped with the expertise to make watershed based development master plans for sustainable development, particularly in Natural Resource Management (NRM) context. Therefore, we at Centre for Earth Science Studies decided, to create a model for participatory NRM concept wherein the stakeholders freely interact with the technocrats such as earth scientists and engineers at local level. We have designed the development of this master plan to suit the guidelines for preparation of Tenth Five Year Plan so that the outcome of this project can directly be used. We have provided technical support, but the success of this programme is due to the involvement of the people of the Thirurangadi Block Panchayath.

Meanwhile, we are happy that, we could instill confidence among the farmers, that production and productivity can be increased and sustainable development is possible, through conservation of soil, water and bio-mass.

The work was completed through the joint efforts of scientists from Centre for Earth Science Studies and State Institute for Rural Development, Peoples' Representatives of Block and Grama-Panchayaths, Government officials and voluntary activists.

I place on record our sincere gratitude to all those who actively participated in this activity, which was the first of its kind in Malappuram District. Further, we are happy to see that there are already efforts to replicate such programmes in other Block Panchayats in the district, which we take as a recognition to the model.

**M. BABA**

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## PROJECT TEAM

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**Mooniyur Grama Panchayat**

Cheranur Watershed  
Kizhakkanthodu Watershed  
Mannattam Para Watershed  
Parakkadavu Watershed  
Vaikkathu Padam Watershed

**Nannambra Gram Panchyat**

Chiramukku Watershed  
Kondur Watershed  
Thyyala Watershed  
Thiruthy Watershed

**Parappangadi Gram Panchyat**

Chiramangalam Watershed  
Parappangadi Watershed  
Ullannam Watershed

**Thirurangadi Gram Panchyat**

Kakkatupadom Watershed  
Pannampuzha Watershed  
Vaddakemumbaram Watershed  
Venchali Watershed

**Peruvallur Gram Panchyat**

Enavoor Watershed  
Kollamchina Watershed  
Parambilpeedika Watershed

**Thenipalam Gram Panchyat**

Koyyappa Watershed  
Thenipalam A & B Watersheds

**Vallikunnu Gram Panchyat**

Ariyaloor Watershed  
Kanjhirapotta Watershed

Keezhayil Watershed  
Kodakkadu Watershed

## **Acknowledgements**

The 9<sup>th</sup> Five-Year Plan, carried out as the People's Plan Campaign, remains as a milestone in the developmental history of Kerala. The people's planning campaign process could set the ball rolling for the people on participatory mode of democracy, decentralised power structure, local level planning, localized developments, all of which together happened to be far more impressive than the laudable physical or material attainments of the plan period. The participation of people in the planning process, implementation and monitoring, and the fact that people became conscious of a plan perspective, are going to have far-reaching and deeper influence and implications.

Beyond the delimitations of "wards", the natural boundaries of watershed areas gained prominence as sound basis for developmental plans, by the second half of 9<sup>th</sup> plan period. The direction that the 10<sup>th</sup> plan proposals related to agricultural sector shall be based on watershed zones is the natural outcome of such a shift in approach.

We have great pleasure in presenting this Watershed Based Master Plan of Thirurangadi Block Panchayath and the Grama Panchayaths to Kerala Research Programme of the Centre for Development Studies. We place on record our sincere gratitude to the Dr. Narayanan Nair, Programme co-coordinator of Kerala Research Programme for giving us this opportunity to prepare a Master Plan for Thirurangadi Block through financial support; his contribution through lively discussions and guidance have led to this unique endeavour. This reporting pertains to land and water conservation initiatives and will go long away in evolving multi-sect oral integrated action plans.

This mission would have seen light with out unstinted support of Smt. Ullatil Razia and Shri. M.A. Khader the President and Vic-President of Thirurangadi Development Block. The support rendered by the Secretary of Thirurangadi

Block deserve special mention the investigators are thankful number of logistic support including space for the project office. Master trainers numbering 91 selected from the block and grama panchayaths consisting of elected representatives, working group members and volunteers mainly students were given training to begin with. The days that followed were full of hectic activities. Rich field experience of resource personnel of the Integrated Rural Technology Centre, Palakkad have been used during various stages of preparation of this master plan document, particularly the expertise rendered by Shri.R..Sathish and C. Rajesh greatly appreciated. The sincere selfless and bountiful help given by the public, the volunteers, the officials of the block office and the grama panchayaths and elected representatives was the synergy of this mission.

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The Project Team

# PART – I

## 1. MASTER PLAN FOR DEVELOPMENT BASED ON MICRO WATERSHEDS

### 1.1 INTRODUCTION

A shift of paradigm from growth-centered development to human-centered development with increasing involvement of civil society groups is currently taking place. The UNDP for example, include natural resource security as one of the 7 areas of human security which would in turn address problems related to food security and poverty amelioration. Hence, civil society and community-based activities have developed and are seen as a new social movement active both at the local and trans-national levels. For ensuring productivity the natural requirements are soil and water. For these reasons soil and water are considered as basic natural resources. Of these soil is comparatively and ordinarily immobile, while water can flow from higher elevation to lower. When joined with water soil also become mobile. Their movement in nature is within certain limits. For example, let us imagine that we are standing by the side of a stream - during raining time. The water flows down the stream. Where all from the water has reached the stream? Along the hills, the valleys, the slopes and the fields the water has flow down to the stream. All of them together constitute the watershed (area) of the stream. Every drop of rain that falls

on this watershed and the adjoining soil, can flow only through the stream, by the side of which we stand.

It is this evident that ordinarily water and soil movement in nature is within such a natural boundary. The man made compartmentalisations such as "ward" and "panchayath" for the convenience of administration are not respected by boundaries of watershed.

Watershed based planning is of paramount importance because this brings enhancement of overall productivity in primary sector founded on basic natural resources into focus. The direction given by the state government that the 10<sup>th</sup> Five Year Plan proposals shall be framed by the PRIs on the basis of the respective watersheds in the locality was the main motivating factor for the Thirurangadi Block Panchayath to prepare such a watershed based comprehensive and exhaustive master plan for themselves with the help of Centre for Earth Science Studies.

This participation right from the grass-root level remains as the most creditable achievement, a milestone in decentralised planning. About 500 volunteers from the locality worked with the elected representatives and the officials along with the expert group from Centre for Earth Science Studies, for the completion of the project.

### **Why Thirurangadi Block ?**

Recent studies of decentralisation of natural-resource management through watershed based development have indicated two related aspects: (i) participation of local bodies have fluctuated with change in regime at local bodies, (ii) Strength of Neighbour-hood plays major role in determining. Both these aspects are congenial in this Block, the panchayats is consistently being ruled by UDF and the neighbourhood groups are strongly poised.

## **1.2 OBJECTIVES**

To delineate and mark the micro level watersheds in the field and the cadastral maps into 1:4000 scale in the following grama panchayaths of Thirurangadi Block; Thenhipalam Panchayat, Nannambra Panchayat, Parappanangadi Panchayat, Tirurangadi Panchayat, Moonniyur Panchayat, Peruvathur Panchayat and A.R. Nagar Panchayat in adjacent Vengara Block.

- a. To determine the nature of interventions and activities to be carried out for protecting soil and water in each of the survey plots of these panchayaths.
- b. To draw up annual and five-year plan projects based on watersheds for increasing agricultural productivity in these panchayaths.
- c. To provide belt protection with different appropriate fodder grasses and tree species along the ridgelines of highest level watersheds.
- d. To conserve and improve (by desilting, weeding out, deepening and repairing the bunds and banks) the surface sources of water such as ponds, streams, water channels, rivulets and rivers; and use them for fish cultivation. To convert after minor repair the quarries that have been neglected after use into water bodies fit for fish cultivation.
- e. To conduct repeated awareness building campaign to bring about change in the mind set and attitude of the people about "development"; to inculcate in them the concept and culture of "earth-soil-water literacy"; to enable them to create an alternate model of sustainable development by which they become conflict of building up programmes for meeting them own livelihood.

### **1.3 ANTICIPATED ACHIEVEMENTS**

- a. More employment opportunities can emerge directly by enhancement in agricultural productivity and indirectly through increase in availability of raw materials. The additional income generating activities are likely to be centered around the Kudumbasree - Self Help Groups and therefore they may be antipoverty measures too.
- b. The problem of drinking water scarcity may be solved to a substantial level, as the measures adopted for water conservation are helpful in increasing the ground water table.

- c. The activities for conserving soil and water are carried out in such a way that locally available materials and expertise are put to maximum use.
- d. The topographical feature of the block is with medium and steep slopes. By diverse biological interventions and certain types of constructions, the running water can be obstructed to some extent and made to "walk" instead. This act allows more water to percolate down the soil and increases the quantum of ground water.
- e. The seedlings required for each watershed can be raised by the nurseries of Kudumbasrees of that locality.
- f. As the paddy cultivation prospects become better, paddy fields which is the most effective water storage systems get conserved.
- g. As the major chunk of developmental programmes is implemented by Kudumbasree - SHG participation, the income generation opportunity and the empowerment of women can be achieved.

#### **1.4 BENEFICIARIES**

The entire populations of the Thirurangadi Block Panchayath are the beneficiaries of this multi-faceted project. The major beneficiaries are likely to be Kudumbasree/SGSY /SHG women members. The poor or weaker farmers and the volunteering farmers can be given special attention and consideration.

#### **1.5 THIRURANGADI BLOCK PANCHAYATH - A THUMP NAIL SKETCH**

Thirurangadi Block Panchayath, a predominantly agricultural land, is part of Thirurangadi Taluk of Malappuram District. It has an area of 142 km<sup>2</sup> and comprises of seven grama panchayaths; Thenhipalam Panchayat+ Peruvathur Panchayat 36.23 km<sup>2</sup>, Nannambra Panchayat 18.35 km<sup>2</sup>, Parappanangadi Panchayat 22.25 km<sup>2</sup>, Tirurangadi Panchayat 17.73 km<sup>2</sup>, Moonniyur Panchayat 22.40 km<sup>2</sup> and Vallikunnu Panchayat 25.14 km<sup>2</sup>.

##### **1.5.1 Geographical Features**

Malappuram district, in which the Thirurangadi Block is located with in latitudes: 10° 49' -- 11 ° 40' and longitudes: 75 ° 50' –76 ° 35' . The Nilgiri district of Tamilnadu and the Arabian Sea are the East – West boundaries, whereas the Palghat and Kozhikode districts are the South and North boundaries (Fig:1).

Thirurangadi block is sprawling in 142 Km<sup>2</sup> of mainly lateritic terrain. This consists of seven panchayats the western panchayat Parappangadi is with dominant coastal landform and the eastern Peruvallur and Thenipalam panchayats are dominant with undulating mid-land landform. The geographical features of the area chosen are in unison with their suitability and natural resource conservation.

In the project area the landscape elevations vary from 10 to 98 m from MSL. The low levels are situated in Parappanangadi Grama Panchayath and the higher ones in Peruvallur and Vallikunnu Grama Panchayaths. There are many medium and steep sloping lands in the block. Generally, geomorphological feature of the block is of rolling topography with medium and steep ridges and runnels which facilitates run-off. Therefore, by diverse geo-biological interventions and certain types of appropriate technology based constructions the running water can be hurdled to some extent and made to "walk"; thereby induce ground water recharge.

Soil types: Alluvium along the river beds and loamy soil along the valleys is the general soil distribution pattern. Of the total, 20% area possesses this type of soil. About 70% has broken powdery lateritic type and 10% displays brawny and powdery rock pattern of soil condition usually along the duri-crest.

In total the Thirurangadi has 5472 cadastral parcels spread over in 7 panchayats with and average area of 2.6 Ha. for each parcel (Fig: 3 ).

### **1.5.2 Population Features**

The total population of Thirurangadi block as per 2001 census is 2,96,034; men 1,43,437 and women 1,52,597. The panchayath wise population is shown in Table

## Population Details

Grama Panchayath	Area (km <sup>2</sup> )	Population			Population Density / km <sup>2</sup>	Ratio*	Scheduled Caste			Scheduled Tribe		
		M	F	Total			M	F	Total	M	F	Total
Vallikkunnu	25.14	20221	21619	41840	1664.28	1069	1495	1592	3087	0	0	0
Thenhippalam	17.32	13293	13980	27273	1574.65	1052	1326	1352	2678	7	4	11
Peruvallur	18.91	15005	15619	30624	1619.46	1041	1175	1133	2308	0	0	0
Moonniyur	22.40	23189	24183	47372	2114.82	1043	1341	1364	2705	2	4	6
Parappanangadi	22.25	30326	32455	62781	2821.62	1070	1603	1617	3220	8	8	16
Nannambra	18.35	16846	18686	35532	1936.35	1109	480	455	935	3	2	5
Tirurangadi	17.73	24557	26055	50612	2854.60	1061	634	679	1313	8	6	14
Total		143437	152597	296034								

\* No. of women/1000 men is expressed in ratio.

As revealed by Table the Parappanangadi Panchayath has got maximum and Thenhippalam panchayath minimum population density. In the case of sex ratio all the seven panchayats have preponderance of females over males.

This is opposed to the state ratio and this state of affairs deserve deeper enquiry. The literacy percentage of the block panchayath is 75.45 percent. The Parappanangadi panchayath has maximum number of scheduled tribes.

**The labour front:** A good percentage in the block belongs to peasants and agricultural labourers. The number of labourers, panchayath wise and gender wise is given in Table 4.

## Labourers Details

Panchatats	Regular (Main)			Nominal (Marginal)		
	M	F	Total	M	F	Total
	Vallikkunnu	14778	1710	16488	4566	928
Thenhippalam	9966	1814	11780	1942	366	2308
Peruvallur	9300	626	9926	2820	656	3476
Moonniyur	16154	1500	17654	2984	1042	4026
Parappanangadi	25544	2368	27912	1522	574	2096
Nannambra	10124	678	10802	2126	508	2634

Tirurangadi	1684 0	1368	18208	2306	562	2868
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*Regular workers includes Main workers, Main cultivators, Main Agricultural Labourers, Main Household workers and Main other workers.*

As can be made out from Table 4, 16.88% of the total labourers remain as nominal workers. The majority in most of the panchayaths happens to be agricultural labourers. The women labourers are generally less. 24% of the population of Parapanangadi panchayath has find out some job. Labour participation of men also is more in Parapanangadi. Nearly 80.95% of total population cannot claim any regular job which is a sorry state of affairs.

### 1.5.3 Climate

Thirurangadi Block Panchayath is one of the blocks that receive maximum average annual rainfall in Kerala, to the tune of 400cm. The precipitation data based on the metre reading in the Krishi Vigyan Kendram at Peruvannamuzhi during the last 12 years, is given in Table 1, below. The temperature variation during 1991-92 is given in Table 2.

#### Rainfall Data

Year		Month												Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1990	No.of rainy days	2	0	0	0	16	25	26	25	5	12	3	0	114
	Total rain-fall (mm)	72	0	0	0	635	728	1096	931	113	377	76	0	4028
1991	No.of rainy days	0	0	1	8	10	25	30	20	5	15	5	0	119
	Total rain-fall (mm)	0	0	3.5	259.5	139	1163.4	1518.5	635.4	110.9	534.5	115	0	4479.7
1992	No.of rainy days	0	0	0	4	10	24	29	29	22	15	14	0	147
	Total rain-fall (mm)	0	0	0	81	287.2	1497	1117.3	1080.7	557.9	278.2	251.4	0	5150.7
1993	No.of rainy days	0	0	3	7	14	26	30	29	13	27	10	3	162
	Total rain-fall (mm)	0	0	28	89	414	771	1207	708.5	128	792.7	157.8	79	4375
1994	No.of rainy days	2	0	2	12	10	29	31	28	17	23	11	0	165
	Total rain-fall (mm)	68	0	54	242	155.5	1369	1616.8	796.7	337	578	153	0	5370
1995	No.of rainy days	1	3	1	12	16	22	31	28	15	17	15	0	161
	Total rain-fall (mm)	9	34	8	368	448	760	1247	814	337	368	332	0	4725
1996	No.of rainy days	0	1	0	4	5	16	25	25	22	15	9	7	129

1997	Total rain-fall (mm)	0	30	0	31	72	836	1177	817.4	452	426	134	106.6	4082
	No.of rainy days	2	0	3	2	12	19	31	30	13	18	17	11	158
1998	Total rain-fall (mm)	2.5	0	15	3.5	208	812	1970	1287	356.5	452	412	263	5781.5
	No.of rainy days	0	0	1	8	13	25	30	25	23	20	10	4	159
1999	Total rain-fall (mm)	0	0	5.5	54.9	160	1070.6	1306.2	561.2	655	432	155	43	4443.4
	No.of rainy days	0	1	7	21	24	28	23	9	27	8	1	1	150
2000	Total rain-fall (mm)	0	34.6	2.5	54.6	635.3	869	1362	768	122	685.5	42.5	12	4588
	No.of rainy days	5	2	0	9	9	28	21	26	26	16	5	4	151
2001	Total rain-fall (mm)	76	7	0	86	152	1120	281.3	1002.5	499	493	40	185	3941.8
	No.of rainy days	0	2	0	12	14	26	27	28	12	18	13	1	153
2002	Total rain-fall (mm)	0	43	0	247	349	1048	927	632	204	333	285	10	4078
	No.of rainy days	2	5	1	14	18	25	30	26	8	-	-	-	129
	Total rain-fall (mm)	16	90	3	204	570	807	580	728	120	-	-	-	3118
	No.of rainy days													

### Temperature -1991 ( in °C)

Month	Max.	Min.
January	29	23.1
February	31.8	24.7
March	32.7	28
April	32.1	26.8
May	32.9	31.9
June	28.4	26.4
July	27.6	25.2
August	28.6	25.8
September	32.6	27.6
October	28.9	24.4
November	29	25
December	25.9	20.9

#### 1.5.4 Developmental Sectors

The different developmental sectors do not project consistent progress or growth. The agricultural production and productivity register declining trend. Due to heavy migration to gulf countries, trend of leaving agricultural field fallow is on the increase. The performance of public institutions, quality wise, is not at all in tune with the expectations and requirements of the public. The health, the drinking

water availability and the educational scenarios are just few examples. The participation of women in employment and labour fronts is nominal. Social and financial status is poor and gender discrimination is rampant. The problem of pollution in Thirurangadi threatens public health and hygiene.

There are about 26 drainage channels of second order onwards and most of them are rain fed. There are about 79 canals and 7 lift irrigation systems. Only one perennial river Kadalundipuzha is recharging the open wells. Well density is high varying from a few to over 100 wells per Km<sup>2</sup>.

In general the different development related line departments do not properly co-ordinate and integrate resources to give consistent progress or growth. The agricultural production and productivity register declining trend. The trend of leaving agricultural field fallow is on the increase, particularly with increasing migratory trend. The participation of women in employment and labour fronts is nominal. The problem of pollution mainly due to solid waste disposal in Thirurangadi block threatens public health and hygiene. The vested forest lands need to be protected. These initiations are very much significant for maintaining the ecological balance of the block.

The continuous impoverishment of agriculturists and agricultural laborers, the latter losing more and more agricultural jobs day by day; the stagnation in various production fronts, public works and constructions and loss of labour in such areas; the unemployment among educated youth - all these are burning issues facing the developmental sectors of the block. It is in this background that an attempt for watershed based planning is undertaken.

**Economic base (main economic features of the project region  
agriculture/livestock resources) (on village/micro watershed basis)**

The major crops are coconut, pepper fruit crops (cashew, mango etc) followed by cereals. During the past five years, a decline in area under paddy and an increase in area in pepper, rubber and coconut can be observed. The reason for the shift from annual crops to cash crops is the degradation of land in the lower topographic regions. Rearing of milk animals, goat, hen are additional source of income for the farmers.

### Land use, farming systems and cropping patterns (Theme wise)

Out of the total geographical area of 13617 hectares, the net area sown constitutes about 7600 hectares or about 55.81 percent of the total geographical area. The intensity of cropping is hardly around 126.97 per cent. Forest area in the block is negligible at 2 per cent though land under miscellaneous tree crops accounts for 29.48 per cent of the geographical area. Current and other fallow lands, as also cultivable wastes are also not significant. Land put to non-agricultural uses constitutes 9.56 per cent of the geographical area. Thus, it appears that there is little scope for bringing more area under cultivation. Therefore intensive cropping pattern need to be encouraged and attempts to rehabilitate the cultivable waste (188.86 Ha.) should be the top priority. The land use pattern of Tirurangadi Block is set-forth in the following table

Sl.No.	Land Use	Area (Hectors)	% to Total Area
1.	Total Geographical area	13,617	100.00
2.	Forest	2.00	0.015
3.	Cultivable waste	188.86	1.38
4.	Barren & uncultivable land	374.86	2.75
5.	Land put to Non-agricultural	1301.57	9.56
6.	Land under miscellaneous tree crops not included in area sown	4014.00	29.48
.	Pasture – grazing land	34.68	0.26
8.	Current fallow	74.5	0.55
9.	Other fallow	28.00	0.21
10.	Net area sown	7600.00	55.81
11.	Area sown more that once Intensity of cropping	1650.00	126.97
12.	Gross Cropped area (GCA)	9250.00	-

Since the population pressure is very high, most of the land is put to use for various purposes. Due to unscientific use, the degradation of land is very fast, resulting in reduced productivity, year after year. This process has innumerable indirect effects on the total system and socio economic life of the locality. In the watersheds proposed for integrated treatment most of the land is held by private farmers who are also concerned about annual degradation of their lands.

Watershed development can become successful only through the complete participation of the local farmers and as a matter of facts all schemes have to be implemented through the farmers so as to ensure continued maintenance of the works completed under the programme, On preliminary verification, the farmers have expressed their willingness to participate in the process of watershed development in their respective areas and individual holdings. Their involvement is going to be ensured right from planning stage Through Participatory Rural Appraisal (PRA) before launching the programme.

Cropping system followed in this area is mainly oriented in the plantation sector. The important crops cultivated are coconut, areca nut, cashew and other miscellaneous crops such as mango, jack, etc. In plains, crops such as tapioca, ginger and oil seeds are grown. On coconut plantations inter-cropping with pepper, ginger, turmeric, banana, etc. are done.

Sl.No.	Crops	Area (Hectares)	Total Production (MT/Qntl.)	Productivity per ha (MT/Qntl.)
I	<b>CEREALS</b>			
	Paddy			
	Virippu	900	3600	4.0
	Mundakan	1640	6560	4.0
	Punja	114	570	5.0
II	<b>PULSES</b>	114	570	5.0
III	<b>PLANTATION CROPS</b>			
	Coconut	4811	6552	0.84
	Arecanut	347	948	2.7
	Cashew	67	33	0.5
	Pepper	30	60	2.0
IV	<b>FRUITS</b>			
	Banana	450	11250	25
	Mango	10	8	0.8
	Jack	50	150	30.0
	Pineapple	4	30	7.5
V	<b>VEGETABLES</b>			
	Bittergourd	10	75	7.5
	Snakegourd	8	60	7.5
	Bottle Gourd	11	135	15.0
	Bhindi	16	47	0.3
	Pumpkin	5	250	50.0
VI	<b>FLOWERS</b>			
	Bush Jasmine	0.4	12	30.0

Best-accepted fruit plants in the area are as follows: Mango, Jack, Guava, Annona, Sapota, Pappaya, Tamarind and Nutmeg

**General problems in agricultural sector can be categorised and rated as follows:**

Sl. No.	Important Problems	Munni yoor	Nann ambr a	Parapp ananga di	Tenhi palam	Tirura ngadi	Vallik unnu	Peruv allur
1	Low availability of Irrigation	A	A	A	B	B	A	A
2	Fragmentation of Land	B	C	A	B	A	B	C
3	Non-availability of Labour	A	A	A	A	A	A	B
4	Low fertility	B	B	B	B	C	C	B
5	Water shed	A	A	A	C	B	B	C
6	Exploitation of Middle man	B	C	B	B	B	B	B
7	Diseases	C	B	C	C	C	C	C
8	Low price of Agri. Commodity	A	A	A	A	A	A	A

A = More Critical, B = Critical & C = Some Problems but not Critical

#### **Livestock rearing/Fodder availability. (on village/micro watershed basis)**

Panchayat wise cattle distribution pattern is given below:

##### **Livestock and Animal Husbandry**

Sl. No.	Name of Panchayat	Cattle	Buffalo	Goat
1	Moonniyoor	1316	92	1370
2	Nannambra	2202	250	1457
3	Parappanangadi	3906	216	3392
4	Thenhippalam	4251	266	1622
5	Tirurangadi	2217	149	2052
6	Vallikunnu	2384	28	1420

The problems related livestock stake holders are listed and weighed in the following table:

Sl. No.	Problems	Munniyoor	Nannambra	Parappanangadi	Tenhipalam	Tirurangadi	Vallikunnu	Peruvallur
1	Low price of Milk	B	A	B	B	A	B	B
2	Higher price of cattle feed	A	A	A	A	A	A	A
3	Lack of slaughter house	A	A	A	A	A	A	A
4	Higher cattle diseases	A	A	B	B	B	B	B
5	Lack of fodder grass	A	A	A	A	A	A	A
6	Deficiency of Veterinary Hospitals	A	A	B	B	B	B	A
7	Lack of production of milk, egg, meat	B	B	B	B	B	B	B
8	Lack of awareness of proteins in cattle	A	A	A	A	A	A	A
9	Lack of Milk Co-operative Societies	B	A	C	C	A	C	B
10	Lack of high breeds of domestic animals/birds	B	A	B	B	A	B	B

A = More Critical, B = Critical & C = Some Problems but not Critical  
Economic activities (other than agriculture i.e. forestry rural handicrafts etc. (on village/micro watershed basis))

**Pottery, Small industries, Petty shop, Ready made garments etc are the main secondary occupations of the rural peoples.**

**Details of working Populations:**

SI.No.	Nature	Male	Female	Total
1	Main/Full time workers	45987	5935	51920
2	Agriculture/Cultivation	4818	222	5040
3	Agril. Labour	10170	1589	11759
4	Animal Husbandry	-	-	-
5	Household/SSI/Handicrafts	-	-	-
6	Manufacturing/Service	-	-	-

7	Construction	2984	55	3039
8	Trade and Commerce	9540	169	9709
9	Transport / Communication	-	-	-
10	Other Services	6069	2511	8580

## **2. THE PREPARATION OF WATERSHED BASED DEVELOPMENT MASTER PLAN: THE METHODOLOGY ADOPTED**

A major goal in participatory natural resource management (NRM) has long been balancing the multiple uses of land and water resources. Water harvesting remains an important component of natural resource utilization, but must be approached in such a way that ecosystem dynamics and other considerations are not sacrificed. One way in which water harvesting practices are made sustainable in NRM programmes is to ensure stakeholders' participation in local level development plans. Through the use of scheduling optimization models, constraints can be structured and connect water harvesting to local area development in phased manner according to availability of funds. Therefore the estimates are made panchayats wise and given year wise break-up of fund requirement (Tables:10.1 to 10.8) Block level requirement is consolidated in Table 11.

Time-line of progress after the administrative decision in this regard by the block panchayath to co-ordinate the field work various activities, is given below.

In Jan 2003 the Block Panchayath discussed the State Government guidelines to prepare 10<sup>th</sup> five year plan proposals and came to understand that it should be based on watersheds of the different localities. Subsequently discussions took place at different levels on the same, and finally Centre for Earth Science Studies, with the financial support from the Kerala Research Programme of Centre for Development Studies, undertook the task of providing technical help to this project. The Thirurangadi Block Panchayath council and the grama panchayaths councils of Thenhipalam Panchayat, Peruvathur Panchayat, Nannambra Panchayat, Parappanangadi Panchayat, Tirurangadi Panchayat, Moonniyur Panchayat and Vallikunnu Panchayat in the block, together made a Memorandum of Understanding (MoU) to co-operate with Centre for Earth Science Studies to undertake the intervention and resource mapping. Detailed discussions were held on the necessity of formulating watershed based 10<sup>th</sup> five year plan proposal, and subsequently the activity calendar was also drawn up for the timely completion of the work. The cadastral maps in 1:4000 scale of all grama panchayths were collected from village offices. It was decided that the grama panchayaths and the block panchayath will select "master trainers" for watershed based master plan preparation. The understanding was that the

number of Master Trainers will be proportional to the area of the concerned grama panchayath. The number of such master trainers is given Table below.

#### **No. of Master Trainers**

<b>Panchayath</b>	<b>No. of Master trainers</b>
Thenipalam & Peruvallur	27
Muniyur & Thiruranadi	15
Kayanna, Nochad	16
Parappangadi & Nannambra	11
Vallikunnu	22
<b>Total</b>	<b>91</b>

The master trainers hailed from varied backgrounds. Students constitute the single largest category among the master trainers as given in the following Table.

#### **The Employment of Master Trainers**

<b>Employment</b>	<b>No. of Master trainers</b>
Farmers	10
Volunteers/Politicians/ people's representatives	15
Agriculture Officers	5
Students	30
Govt. Employees	5
Surveyor	1
Agriculture Assistants	3
Engineers	2
Teachers	10
Others	10
<b>Total</b>	<b>91</b>

### **2.1 TRAINING OF MASTER TRAINERS**

During May 27<sup>th</sup> to 31<sup>st</sup> the Master Trainers were given intensive training at S M S M Polytechnic at Tirur on the significance of watershed based master plan preparation and the method of preparing such master plans.

On the third day the trainers were given field training. The module of training is provided as Annexure 1. On the final day of training for the effective management of the watershed master plan preparation work the block area was divided into five units. As per the watershed review document of the block, there are 26 micro watersheds in Thirurangadi Block. The segregation into five units was made in such

a way that each one will comprise of 4 to 10 micro watersheds. In Chakkittappara, the biggest panchayath, there happened to be two such units when the activities commenced. It was decided to have a camp office which is the co-ordinating point in the block panchayath building, and the offices of units in respective places. A Chief Organiser and an Organiser were entrusted with duties of co-ordinating the master plan activities of units.

Sl. No.	Name of Watershed	Watershed Code Nos.	Name of Panchayath
1.	Cherunnur Watershed	23K 4a	Moonniyoor
2.	Kizhakkanthodu Wtershed	- - - - -	Moonniyoor
3.	Parakkadavu Watershed	23K 6a	Moonniyoor
4.	Mnnattampara Watershed	23K 5a	Moonniyoor
5.	Vaikkathupadom Watershed	23K 7p	Moonniyoor
6.	Thiruthi Watershed	23K 48g	Nannambra
7.	Theyyala Watershed	23K 48f	Nannambra
8.	Cirammukku Watershed	23K 48b(3)	Nannambra
9.	Kondur Watershed	23K 48b	Nannambra
10.	Ullanam Watershed	23K 49a (2)	Parappanangadi
11.	Parappanangdi Watershed	23K 49a (3)	Parappanangadi
12.	Chiramangalam Watershed	23K 49a (4)	Parappanangadi
13.	Kakkatupadam Watershed	23K 48b	Thirurangadi
14.	Panampuzha Watershed	23K 46d	Thirurangadi
15.	Venchali Wastershed	23K 48a	Thirurangadi
16.	Vadakkemumbaram Watershed	23K 47a	Thirurangadi
17.	Enavor Watershed	23K 7b	Peruvallur
18.	Kollamchina Watershed	23K 7p(1)	Peruvallur
19.	Parambilpeedika Watershed	23K 7o	Pervallur
20.	Koyappa Watershed	23K 7b	Thenhippalam
21.	Thenhippalam Watershed	23K 3a	Thenhippalam
22.	Koyyappa Watershed	23K 7b	Thenhippalam
23.	Keezhayil Watershed	23K 52a	Vallikunnu
24.	Kanhirapotta Watershed	23K 51a	Vallikunnu
25.	Ariyalloor Watershed	23K 50a(2)	Vallikunnu
26.	Kodakkadu Watershed	23K 49 a(1)	Vallidunnu

## 2.2 DELINEATION OF WATERSHEDS

The watershed map from the watershed review document of the block was used to delineate the micro watershed boundaries over the cadastral map. To achieve conservation targets and goals, NRM needs to build partnerships with the communities living within or nearby natural resources and to address their needs

for their livelihoods. Therefore, co-management approaches have been developed right from the data inventory phase to integrate natural resource utilization for the subsistence and development of local communities. The local volunteers undertook 'transect walks' in the company of technocrats to exchange ideas on traditional and modern technologies in NRM.

The watershed map and the cadastral map were together used during the transect walks taken to delineate the actual survey plots that make up the watersheds. Ridge lines could be earmarked and by extending the ridge lines in opposite directions Watersheds were delineated. On August 16, each master trainer was imparted with practical field training in watershed delineation in any one micro watershed coming in their unit.

### 2.3 UNIT LEVEL TRAINING

In each watershed two groups of seven members each together to collect data for the preparation of watershed master plan and to organise meetings of the neighbourhood groups were formed. Training was given to local voluntary activists in each unit. A meeting of master trainers was held on August 23<sup>rd</sup> in block panchayath hall to make preparations for regional training. Master trainers divided into different subject groups held discussions on presenting the various topics. Experts from Centre for Earth Science Studies, Integrated Rural Technology Centre, CCADA, Agriculture Department, Animal Husbandry and Kerala Forest Research Institute handled different subjects in the training programme. The details of the unit level training programme is given in the table below.

**Details of Regional Training**

Name of Unit	Date of Training	Place	Participants		
			Male	Female	Total
Thenipalam	July 25 & 26	Panchayath Community Hall, Thenipalam	10	30	40
Peruvallur	August 21 & 22	Panchayath Community Hall, Pervallur	12	22	36
Vallikunnu & Parappanangadi	August 25 & 26	Paramppangadi H.S.S	15	22	37

Muniyoor & Thirurangadi	Sept 25 & 26	Block Office Hall, Chemmad	30	22	52
Nannambra	Sept 25 & 26	Nannabra Panchayat Hall	37	4	41

## 2.4 FORMATION OF SURVEY TEAMS

On the last day of the unit level training, two teams of seven members each were formed. consisting of master trainers and trained persons from each watershed. From each group two members were selected as team leaders and a trained person was selected as captain for leading all survey works of the watershed. It was compulsory that each team should contain teachers, farmers, housewives and technically qualified hands from civil engineering, agriculture and fisheries. The structure of the team was an important factor in the successful preparation of watershed master plan.

## 2.5 FORMATION OF WATERSHED COMMITTEE

Watershed committee was formed in each of the panchayats. This committee was intended to guide the volunteers in the various exercises like field surveys, NHG meetings etc. as part of the master plan preparation. This committee includes members of the wards coming in the watershed, master trainers and volunteers trained at unit level. The committee convenor is the member of the ward which is having the highest area in the micro watershed.

## 2.6 CAMPAIGN ACTIVITIES

The main objective of this campaign programme was to carry the message of watershed based development to every doorsteps and get involve the process of preparing the watershed master plan. For this purpose different programmes were conducted. A task-force meeting of socio-political workers and district officials was held at the Thirurangadi Block Panchayath Hall on May 23<sup>rd</sup> was Inaugurated by the Hon. Minister for Rural Development Shri. C. F. Thomas and Presided over by the local MLA, Shri. Kutty Ahmed Kutty , who is also the co-Investigator of the project; Kerala Research Programme secretariat was represented by Dr. N. C. Narayanan.

## Banner

Banners with the message "sustainable development through watershed planning, co-operate in the preparation of block level master plan" were displayed at every prominent junctions of the block. It was also decided that all LSGIs and offices transferred to them should print the above message in their printing materials.

### **Explanation made in school assemblies**

A programme was planned to take the message of watershed based development to every student and teacher of the block. It is hoped to achieve the participation of every family in the master plan preparation in this way. Master trainers attended school assemblies and explained to the students and teachers about the importance of the watershed based development.

## **2.7 STREAM AND GULLY SURVEY**

A detailed field survey was conducted in every micro watershed to identify suitable locations for soil and water conservation like gully plugging, side bank protection, checkdam, etc. The survey on the left side of the main stream was done by one team, and the survey on the main stream and right side was done by another team. Topographical features, land use pattern and intervention points were recorded in the cadastral map. Micro details of each intervention point was recorded in the formats. In the afternoon of every alternate days team members came to the unit office and transferred the field data collected to a fair map kept there. Moreover, the data which could not be recorded in the map and formats were entered in a field diary.

## **2.8 TRANSECT WALK**

Transect walk is found to be most suitable PRA technique for quick data collection in this area. Route for walk was decided in consultation with the local agricultural officer in the Krish Bhavan, so that walk can lead through areas with different topographical features, land use and development prospects / problems . The transect team consisted of farmers, teachers, women, people with

technical qualification in agriculture, animal husbandry, fisheries, civil engineering or geology. Each team had a kit comprising two copies of the cadastral map, data collection formats, field diary, measuring tape, colour pencils, scale and hard board. One person recorded the features of the terrain and water resources, second person the land use pattern and intervention possibilities in cadastral maps. Measurements of the intervention proposals were recorded in the formats. Intervention proposals for important areas are formulated after conducting field interviews with stakeholders and discussion with experts. One team member continuously recorded the position of the team in the map after taking measurements.

## **2.9. NEIGHBOURHOOD GROUP (NHG) MEETINGS**

Neighbourhood Group (NHG) is the collective of about 50 households. Eventhough the NHGs were not very active in the block, the Women Self Help Groups (WSHGs, Kudumbashree) were functioning well. However one can assume farmers participation only by calling general NHG. It was decided to call the general NHGs for discussing the intervention possibilities suggested as part of the master plan preparation. As a prelude to this meeting all draft intervention proposals for an NHG area was consolidated. However, owing to various reasons these meetings are yet to happen.

### **Organisation**

Extensive campaign work was undertaken to bring people to watershed based masterplan preparation. Public system announcements were done at Panchayats. Posters and banners depicting the message of water/ soil conservation were displayed at important places of the block.

## **.2.11 FORMULATION OF INTERVENTION STRATEGIES**

Experts in the fields like agriculture, fisheries, soil and water conservation, geology and civil engineering visited the block many times and gave guidance for preparing master plan. Meetings of agriculture experts, veterinary experts, soil conservation officers and engineers were conducted for this purpose. In the meeting of engineers serving in the block panchayath a consensus was arrived on the use of appropriate technology in construction works.

### **Agriculture Sector**

Under the convenorship of the concerned agriculture officer, agriculture experts committee were formed for visits in each unit. These committees visited problem areas with agriculture assistants, people's representatives and survey volunteers and suggested solutions.

### **Fisheries Sector**

During the field survey, ponds , abandoned quarries with water conservation potential were identified. Expert visits were to be arranged from November 15<sup>th</sup> to 25<sup>th</sup> to identify suitable ponds from the preliminary list for fish farming.

### **Soil and Water Conservation**

Civil engineering structures like check dams, VCBs, side bank protection of streams and ponds, conversion of abandoned quarries to water conservation structures etc, suggested in the field survey required in-depth technical verification by experts.

## **3. ACTION PLAN FOR WATERSHED BASED DEVELOPMENT**

Prioritisation of different soil and water conservation activities were done based on ridge to valley approach. The surface run off and sediment load are reduced by making intervention measures like gully plugging, agroforestry, contour bunding, percolation pits, fodder grass cultivation, cover crops etc at the ridges in first and second years. Subsequently during the fourth and fifth year check dams, VCBs, side bank protection etc are done at lower areas. This will help to avoid sedimentation of costlier structures likely to be constructed in lower areas.

### **3.3 ENTRY POINT ACTIVITIES**

Cheaper interventions which can be done with high level of people's participation are included in initial years. One example is the construction of percolation pits, this activity is planned for June 2005. The other entry point activities planned are (i) awareness campaign among the people on watershed based development, (ii) video show of successful watershed development models and (iii) training to people's representatives, implementing officers and socio-cultural leaders. Through all these activities, it would be possible to make a structural change in the agriculture sector and create an attitude among the people for watershed based development.

### **3.4 ACTIVITIES IN DIFFERENT SECTORS**

The activities in the master plan are envisaged in four development sectors. The campaign activities which would have a catalytic role is included in initial years. A detailed account of the campaign activities and other development activities are given below.

### **3.3 CAMPAIGNING ACTIVITIES**

Extensive campaigning is planned for creating awareness on importance of watershed based development to the general public. This campaign has two approaches. One approach comprise training programme on various dimensions of watershed based development to those who are engaged in the orientation of the society. The other approach include exhibiting posters, video shows and arranging processions and voluntary activities conveying the message directly to the people through quiz competition, essay writing and poster creations, interest on this line can be generated among students who are the citizen of tomorrow.

### **3.5 ACTIVITIES**

#### **3.5.1 Agricultural Sector**

Increase in production capacity and total production through increase in density of intercrop is the policy of intervention in this sector. It also aims at developing a belt of trees along the ridgeline at all the watersheds. Growing trees, fodder grass, cover crops etc in areas having steep slope reduce soil erosion. Income of the farmers are to be improved through growing self sufficiency aimed through cultivation of vegetables in areas with moderate slope. The uniqueness of these activities include;

1. The seeding requirement is completely met by the nursery run by kudumbasree/SHG's.
2. The master plan targets cutting and replacement of 10% of diseased and unproductive coconut trees with high yielding varieties of coconut tree within a period of 5 years, Kadalavankku and Seemakonna (where ever necessary) are planted as biological fence so as to increase the production of biomanure and reduce soil erosion.
3. It is highly imperative to conserve the water holding system, the paddy fields. This is possible only when paddy farming become profitable. Keeping this as target, a project is included in the masterplan for mechanisation in paddy fields in the initial period of 3 years.

### Technical Known-How

The technical know how for the various activities recommended in the masterplan, are proposed to be made available for various research institutions. The activities and the institutions from which it is available are following.

Activities	Institution
1. Root slips of fodder grass	a. Cattle Breeding Farm, Kundurmuzhichal b. Dhoni Farm, Palakkad c. Livestock Research Station, Thiruvizhamkunnu, Mannarkkad, Palakkad
2. Seedlings of Bamboo	a. Kerala Forest Research Institute (KFRI), Peechi, Thrissur Dt.
3. Training on implementation	Centre for Earth Science Studies , CWRDM
4. Training on Soil and water conservation activities	(i) Central Soil and Water Conservation Research and Training Institute, 218, Kalagark Road, Dehra Dun; Dr. V. N. Sharda, Acting Director, Tel: 0135 758564 (Off), 754968 (Res.), E-mail: <a href="mailto:cswerti@icon.delhi.nic.in">cswerti@icon.delhi.nic.in</a> (ii) Central soil and Water Conservation Research and Training Institute, Research Centre, Fernhill P.O., Ootty, Tamil Nadu, 6430004, Tel: 0423 4440388 (Off)

5. Training on nursery making	(iii)	Krishi Vigyan Kendra, Peruvannamoozhi
6.Consultation on appropriate technology	(iv)	National Institute of Technology, Kozhikode

### 3.5.2 Animals Husbandry Sector

The availability of fodder grass is to be increased for development of animal husbandry sector. The activities in this line are need to be included in the masterplan. In order to increase the cattle population in each watershed; a project for calf rearing is suggested. These projects are to be implemented through Kudumbasree SHG groups. The groups engaged in farming of the fodders grass in the initial years are selected for this project. The cow-dung available through the rearing of the cattle can be utilised for improving fodder grass production.

It is intended to develop goat-breeding unit in each watershed for improvement in availability of Malabary variety of goat. This project also will be implemented through Kudumbasree SHGS.

### 3.5.3 Fisheries Sector

It is intended to develop fish culture in all suitable water bodies, live ponds and paddy fields, etc available in the block. All farmers interested in fish culture will be given training and technical support by the block panchayath. A fisheries extension center will be setup at block level to support fish farmers with regard to testing of water quality parameters, prevention of fish diseases, guidance in culture management, growth monitoring and marketing. Fish seeds will be made available to the farmers by the block panchayath.

The project for the fish culture in the Peruvannamoozhi reservoir is included in the masterplan. Integrated fish farming is designed for maximum utilization of resources available locally. In order to support the depleting natural fish resources, facilities to enhance breeding of the natural fishes need to be setup in the Kadalundi river. This will be done with the co-operation of district panchayath and fisheries resource management society. Fish seeds can be stocked in the Kadalundi river, for augmenting the fish population with the co-operation of the district Panchayath and the state department of fisheries.

### 3.5.4 Structures for Soil and Water Conservation

The structures for soil and water conservation includes, contour bunds, percolation pits, gully plugging, check dams, side protection of the streams, conservation of ponds etc. As mentioned earlier, the approach here is to proceed downward from the sideline. Contour bunds in areas with steep slope and rainpits in area with moderate and gentle slope are recommended. In the first years, the contour bunds and gully plugging will be done in the areas with higher elevations. As part of the campaigning activities, 1 lakh rain pits will be constructed in the second year.

### **Appropriate Technology**

For the construction of gully plugging, check dams and side protection the technology to be utilised is not the traditional one. Instead, the methods utilizing locally available building materials and skills are recommended. Like for instance, gully plugging is to be done using locally available bamboo stakes fixed in the soil and by using plastic bags and stones arranged as per requirement. As a result of this type of construction the major part of the money expended is received back by the local people via construction material and labour. This will strengthen the local economy. The protection and maintenance of these constructions can also be done locally. Training for such activities will be given by IRTC, Mundur.

### **Cross Bars and Side Protection of Streams**

These activities will be undertaken during the last year. For side protection of streams, instead of the traditional stone work, constructions using sandbags reinforced with bamboo will be used. This will reduce the expenditure by way of utilization of local resources. Traditional methods of construction will be utilised only in the case of cross bars. The various construction activities using appropriate technology are given in Annexure-8.

## **3.6 REVIEW OF PROJECTS**

If any agriculture intervention in the group of projects is found as not acceptable to the farmers in the interim review, the outlay of such project will be transferred and utilized for acceptable projects based on the unit cost. .

## **3.7 ORGANIZATION (Karshaka koottayma)**

In order to organize the above-mentioned activities efficiently an organisational setup extending from the lower levels to the block panchayath level is essential. The farmers network proposed would be the lowermost organization implementing the watershed based development. The members of farmers network (Karshaka kootayma) comprise of farmers owning agriculture land over 5 cents, residing in a particular place having an area of 20-40 acres. One person among the members is to be selected as the convener of the farmer's network.

### **Watershed Committee (WC)**

Watershed committee will be responsible for the implementation of watershed based development training and voluntary activities in a watershed. The chairman of this committee will be the block division member of the area and the convener will be the member of the biggest ward coming in the watershed. The other members are members of the wards coming partly or completely in the watershed, convenors of the farmers network, convenors of Kudumbasree neighbourhood groups, presidents and secretaries of the paddy farmers group, two representatives of agricultural labors (of which one person has to be from Scheduled caste). Besides this master trainers and captain of the watershed will be the members of the watershed committee.

One master trainee will be the joint convener and another ward member (if three wards are there, the second biggest wards) will be the vice-chairman of the watershed committee. If there is only one ward, a senior member can be appointed as the vice-chairman. The watershed committee will have to meet once in a month and review the activities.

### **Panchayath Level Watershed Development Committee (PWDC)**

Panchayath level watershed development committee is to be constituted with panchayath president as chairman and agricultural officer as the convener. This committee would do the organization, implementation, and financial expenditure of various projects of the partial and complete watersheds coming in the panchayath area. The block division members, panchayath members, implementing officers of agriculture and allied sectors, Engineers, chairman of TSG, convener of watershed committee, representative of master trainers, two representatives from farmers network, two representatives from Kudumbasree etc will be the members of this committee.

### **Technical Support Group (TSG)**

A Technical support group is to be constituted for the technical support of the watershed based development in the panchayath. The TSG is to be organized by including professional graduates and diploma holders in the field of agriculture, soil and water conservation, diary development, fish culture, civil engineering, geology etc. Besides them retired overseers/supervisors/Inspectors in the above fields and implementing officers should be included. The chairman and convenor of the TSG will have to be nominated by the panchayath. Retired professional and concerned agricultural officers are to be selected as chairman and convenor respectively. Meeting of the TSG is to be convened once in a month at panchayath level.

### **Block Level Watershed Development Committee (BWDC)**

It is required to constitute a block level watershed development committee for organization, implementation, financial expenditure and monitoring of the watershed based development programmes. The chairman of this committee will be block panchayath president and convenor will be the assistant director of agriculture. The members of this committee include grama panchayath presidents, district panchayath members, block panchayath members, panchayath level watershed development committee convenors, fisheries extension officer, soil conservation officer, representatives of research institutions, 3 retired officers from the concerned fields and five master trainees.

### **3.8 BLOCK LEVEL PROJECTS**

The details of the projects implemented directly by the block panchayath are given in Table: .

### **3.9 FINANCIAL ANALYSIS**

The total amount required for the implementation of the master plan is 10.397 crore, to be spread over for five years, out of which Rs.1.04 crore will be the beneficiary contribution.

# PART – II

## **CHERANUR WATERSHED (Mooniyur Grama Panchayat)**

Cheranur watershed is identified with watershed No: 23K4a in Landuse Board (LUB) document. It is located with in 124&5 wards of Mooniyur Panchayath.

### **Boundaries**

It is bounded by Chelari – Chenakalandi road in the north, the national highway on the east, Paddikkal – Chranur road on the south east and the Kaldlundipuzha river on the west.

### **Demographic Profile**

Population: Female 5736, Male 5564, the number of women slightly exceeds that of men. Majority of the people are small farmers and farm labourers.

### **Topographical Features**

This watershed is dotted with steep hills and the plains. General topography resembles moderately sloping undulating topography.

### **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with sand is seen.

### **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy. About 5 acres of land in different places is utilized for rubber cultivation.

## **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation are given in Table:1.1.1 to 1.1.4 and year wise fund allocation is suggested in Table:10.1. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **KIZHAKKANTHODU WTERSHED**

### **(Mooniyur Gram Panchyat)**

Cheranur watershed is identified with watershed No: 23K4a in Landuse Board (LUB) document. It is located with in 4,5,6,7,10 & 11 wards of Mooniyur Panchayath. This watershed has an approximate aerial extent of 4.65 Km<sup>2</sup>

### **Boundaries**

It is bounded by Mill road on the north, the national highway on the west, Thalappara – Chemad road on the south east and the Kaldlundipuzha river on the south.

### **Topographical Features**

This watershed is dotted with moderate hills and the plains. General topography resembles moderately sloping undulating topography. This watershed is located at about 60 m. above MSL.

### **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with sand is seen.

### **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy. About 5 acres of land in different places is utilized for rubber cultivation.

## **Conservational Problems and measures**

Side banks of all the streams and canals are damaged due to bank erosion. The following side banks of the streams should be protected by building rubble mounted or masonry walls: about 600m of Annithodu, Kannanchira and Avukandanchira. Details on interventions required for optimum water conservation is given in Table 1.2.1 to 1.2.4 and year wise fund allocation is suggested in Table: 10.1. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

### **Possibilities**

Gully plugging should be done in small streams.

1. Build check dams.
2. Build side penetration mud walls and contour bunds.
3. Penetration holes should also be built in large numbers.
4. Discourage leveling of paddy fields for non-agricultural purposes.
5. Renovate and conserve canals and ponds.
6. Grow grass and other plants.
7. Teach farmers scientific methods of cultivation.
8. Avoid excessive exploitation of natural resources.
9. Conserve forests.
10. Take necessary action to make people 'water literate'

## **MANNATTAM PARA WATERSHED (Mooniyur Gram Panchyat)**

Mannattmpara watershed is identified with watershed No: 23K 5a in Landuse Board (LUB) document. It is located with in 5,6, & 7 wards of Mooniyur Panchayath.

### **Boundaries**

It is bounded by Paddikal - Cheranur road in the north, the national highway on the east, Kuppa – Vellimukku road on the south and the Kaldlundipuzha river on the west.

### **Demographic Profile**

Population: Female 5736, Male 5564, the number of women slightly exceeds that of men. Majority of the people are small farmers and farm labourers.

### **Topographical Features**

This watershed is devoid of hills and dominated by moderately sloping mid-slope region which leads to gently sloping plains which covers about 4.87 Km<sup>2</sup>.

### **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with sand is seen.

### **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:1.3.1 to 1.3.3 and year wise fund allocation is suggested in Table:10.1. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and appropriate technology based vegetative protections such as vettiver / bamboo.

## **PARAKKADAVU WATERSHED (Mooniyur Grama Panchayat)**

### **Introduction**

Parakkadavu watershed is identified with watershed No: 23K6a in Kerala Watershed Atlas of the Landuse Board (LUB) document. It is located with in 7,8,9,10,11,12,13 & 14 wards of Mooniyur Panchayath.

### **Boundaries**

It is bounded by Vellimukku – Koopa road in the north, the National Highway on east, Mudicheri – Karatu road on the south east and the Kaldlundipuzha river on the west.

### **Topographical Features**

This watershed is dotted with moderately steep to steep hills and the plains. General topography resembles gently sloping undulating topography.

### **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with sand is seen.

### **Land Use**

Valley floors are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy.

### **Conservational Problems and Measures**

Side banks of all the streams and canals are damaged due to land slips. Details on interventions required for optimum water conservation is given in Table:1.4.1to 1.4.4 and year wise fund allocation is suggested in Table:10.1. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **VAIKKATHU PADAM WATERSHED (Mooniyur Gram Panchyat)**

Vaikkathu Padom watershed is identified with watershed No: 23K 7p in Landuse Board (LUB) document. It is located with in ward 3 of Mooniyur Panchayath and 6 & 7 wards of Thennipalam GP.

### **Boundaries**

It is bounded by Paddikal - Cheranur road in the north, the national highway on the east, Kuppa – Vellimukku road on the south and the Kaldlundipuzha river on the west.

### **Demographic Profile**

Population: Female 5736, Male 5564, the number of women slightly exceeds that of men. Majority of the people are small farmers and farm labourers.

### **Topographical Features**

This watershed is devoid of hills and dominated by moderately sloping mid-slope region which leads to gently sloping plains which covers about 4.87 Km<sup>2</sup>.

### **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with sand is also seen.

### **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:1.5.1.to 1.5.3.and year wise fund allocation is suggested in Table: 10.1. The side wall protection is given only in critical zones.

Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **CHIRAMUKKU WATERSHED ( Nannambra Gram Panchyat)**

Chiramukku watershed is identified with watershed No: 23K 48b in Landuse Board (LUB) document. It is located with in ward 1 & 2 of Nannambra Panchayath. Though known as Chiramukku watershed , the main stream is Kappu thodu.

### **Boundaries**

It is bounded by Thirurangadi Panchayat in the north, Kakkadu padom on the south and Palaambu – Kaddadu road on the west.

### **Demographic Profile**

Population: Female 1466, Male 1205, the number of women population is higher than that of men. Majority of the people are small farmers and farm labourers and immigrants to Gulf countries.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by steeply sloping highly undulating mid-slope region which leads to gently sloping flood plains which covers about 1.67 Km<sup>2</sup>. Laterite is the major constituent of the terrain.

### **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:2.1.1 to 2.1.4 and year wise fund allocation is suggested in Table:10.2. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **KONDUR WATERSHED ( Nannambra Gram Panchyat)**

Kondur watershed is identified with watershed No: 23K 48c in Landuse Board (LUB) document. It is located with in ward 3 & 4 of Nannambra Panchayath.

### **Boundaries**

It is bounded by Kappil padom of Thirurangadi Panchayat in the north, K T Haji N S S road on the south and Thurppin – Moodikkal padon road on the west.

### **Demographic Profile**

Population: Female 2066, Male 1785, the number of women population is higher than that of men. Majority of the people are small farmers and farm labourers and immigrants to Gulf countries.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by steeply sloping highly undulating mid-slope region which leads to gently sloping flood plains which covers about 4.17 Km<sup>2</sup>. Laterite is the major constituent of the terrain.

### **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

## **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy.

## **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:2.2.1. to 2.2.5 and year wise fund allocation is suggested in Table:10.2. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **THYYALA WATERSHED ( Nannambra Gram Panchyat)**

Thyyala watershed is identified with watershed No: 23K 48f in Landuse Board (LUB) document. It is located with in ward 5,6,7 & 9 of Nannambra Panchayath.

## **Boundaries**

It is bounded by Ollur Panchayat in the north, Ommapuzha padom on the south and the Kodunji U P School on the west.

## **Demographic Profile**

Population: Female 1466, Male 1744, the number of women population is higher than that of men. Majority of the people are small farmers and farm labourers and immigrants to Gulf countries.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by steeply sloping highly undulating mid-slope region which leads to gently sloping flood plains which covers about 6.67 Km<sup>2</sup>.

### **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with sand is seen in the upper reaches.

### **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:2.3.1 to 2.3.5 and year wise fund allocation is suggested in Table:10.2. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **THIRUTHY WATERSHED ( Nannambra Gram Panchyat)**

Thiruthy watershed is identified with watershed No: 23K 48g in Landuse Board (LUB) document. It is located with in ward 8, 9,& 11 of Nannambra Panchayath.

### **Boundaries**

It is bounded by Thirurangadi – Thirkulam road in the north, , Kalamthuruthi – Kodinji road on the south and the Poorapuzha river on the west.

## **Demographic Profile**

Population: Female 2736, Male 2564, the number of women population is lesser than that of men. Majority of the people are small farmers and farm labourers and migrants.

## **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by steeply sloping highly undulating mid-slope region which leads to gently sloping flood plains which covers about 5.84 Km<sup>2</sup>.

## **Type of Soil**

Loamy Soil is found in paddy fields and in the plains red soil mixed with sand is seen in the upper reaches.

## **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana, pepper, tapioca, yam and paddy.

## **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:2.4.1 to2.4.5. and year wise fund allocation is suggested in Table:10.2. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

# **CHIRAMANGALAM WATERSHED**

## **( Parappangadi Gram Panchyat)**

Chiramangalam watershed is identified with watershed No: 23K 49a (4) in Landuse Board (LUB) document. It is located with in ward 6, 7, 8 & 9 of Parappanangdi Panchayath.

## **Boundaries**

It is bounded by Chettipadi watershed in the north, Poorapuzha river on the south and Poorapuzha watershed is the eastern boundary. Altitude does not exceed 15m.

### **Demographic Profile**

Population: Female 6689, Male 6085, the number of women population is higher than that of men. Majority of the people are small farmers and farm labourers and immigrants to Gulf countries.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 2.68 Km<sup>2</sup>. Wheatered Laterite is the major constituent of the terrain.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:3.2.1 to 3.2.4 and year wise fund allocation is suggested in Table:10.3. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **PARAPPANGADI WATERSHED ( Parappangadi Gram Panchyat)**

Parappangadi watershed is identified with watershed No: 23K 49a (3) in Landuse Board (LUB) document. It is located with in ward 5, 10, 11 & 12 of Parappanangdi Panchayath.

## **Boundaries**

It is bounded by Ullanam watershed in the north, Chiramangalam watershed on the south and Chettipadi watershed on the east. Altitude does not exceed 15m.

## **Demographic Profile**

Population: Female 5579, Male 5285, the number of women population is higher than that of men. Majority of the people are small farmers and farm labourers and immigrants to Gulf countries.

## **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 4.17 Km<sup>2</sup>. Wheatered Laterite is the major constituent of the terrain.

## **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

## **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy.

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:3.3.1 to 3.3.5 and year wise fund allocation is suggested in Table:10.3. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **ULLANNAM WATERSHED ( Parappangadi Gram Panchyat)**

Ullanam watershed is identified with watershed No: 23K 49a (2) in Landuse Board (LUB) document. It is located with in ward 12, 13 & 14 of Parappanangdi Panchayath.

### **Boundaries**

It is bounded by Vallikunnu Panchayat in the north, Keezhchra on the south and Kadalundipuzha on the east.

### **Demographic Profile**

Population: Female 4579, Male 4285, the number of women population is higher than that of men. Majority of the people are small farmers and farm labourers and immigrants to Gulf countries.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 4.17 Km<sup>2</sup>. Wheatered Laterite is the major constituent of the terrain.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for cultivation. The important crops are coconut, arecanut, banana and paddy.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:2.4.1 to2.4.5. and year wise fund allocation is suggested in Table:10.2. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **KAKKATUPADOM WATERSHED**

### **( Thirurangadi Gram Panchyat)**

Kakkatupadom watershed is identified with watershed No: 23K 48b in Landuse Board (LUB) document.

#### **Boundaries**

It is bounded by NH-17 on the east, Malappuram – Parappangadi road on the north, Nannambra Panchayat on the south and Venjali watershed is the western boundary. Altitude does not exceed 15m.

#### **Demographic Profile**

Population: Female 6689, Male 6085, the number of women population is higher than that of men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

#### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 1.58 Km<sup>2</sup>. Wheatered Laterite is the major constituent of the terrain.

#### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

#### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy.

#### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:4.1.1 to 4.1.4 and year wise fund allocation is suggested in Table:10.4. The side wall protection is given only in critical zones.

Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **PANNAMPUZHA WATERSHED**

### **( Thirurangadi Gram Panchyat)**

Pannampuzha watershed is identified with watershed No: 23K 46d in Landuse Board (LUB) document.

#### **Boundaries**

It is bounded by Vengara Panchayat on the east, Malappuram – Parappangadi road on the north, A R Nagar Panchayat on the south and A R Nagar Panchayat is the western boundary.

#### **Demographic Profile**

Population: Female 5189, Male 5085, the number of women population is higher than that of men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

#### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 1.25 Km<sup>2</sup>. Wheatered Laterite is the major constituent of the terrain.

#### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

#### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

#### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble

mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table: 4.2.1 to 4.2.4, and year wise fund allocation is suggested in Table:10.4. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **VADDAKEMUMBARAM WATERSHED ( Thirurangadi Gram Panchyat)**

Vakkakemumbaram watershed is identified with watershed No: 23K 47a in Landuse Board (LUB) document.

### **Boundaries**

It is bounded by Kakkunnathupara road on the east, Kadalundipuzha river on north and west, Malappuram – Parappangadi road on the south.

### **Demographic Profile**

Population: Female 4189, Male 3995, the number of women population is higher than that of men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 2.50 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:4.3.1. to 4.3.4, and year wise fund allocation is suggested in Table:10.4. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **VENCHALI WATERSHED ( Thirurangadi Gram Panchyat)**

Venchali watershed is identified with watershed No: 23K 48a in Landuse Board (LUB) document.

### **Boundaries**

It is bounded by Kakkatupadom on the east, Malappuram – Parappangadi road on the north, Nannambra Panchayat on the south and Keeranallurpuzha is the western boundary.

### **Demographic Profile**

Population: Female 5289, Male 5195, the number of women population is higher than that of men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 3.50 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

## **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:4.4.1. to 4.4.4, and year wise fund allocation is suggested in Table:10.4. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **ENAVOOR WATERSHED ( Peruvallur Gram Panchyat)**

Enavoor watershed is identified with watershed No: 23K 7b in Landuse Board (LUB) document. Comprises 6, 7, 8, 9, 10 & 11

### **Boundaries**

It is bounded by Koyppathodu on the east, Kadapadi – Chuuliyalapuraya road on west, A R Nagar panchayats on the south, Panikodampadi – Kadappadi road on the north.

### **Demographic Profile**

Population: Female 6689, Male 6295, the number of women population is higher than that of men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 6.85 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:5.1.1. to 5.1.5, and year wise fund allocation is suggested in Table:10.5. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **KOLLAMCHINA WATERSHED ( Peruvallur Gram Panchyat)**

Kollamchena watershed is identified with watershed No: 23K 7p(1) in Landuse Board (LUB) document. Comprises 3, 4, 5 & 6

### **Boundaries**

It is bounded by Kunnamangalm Panchayat on the east, A R Nagar panchayat on the south, Pallikkal panchayat on the north.

### **Demographic Profile**

Population: Female 4589, Male 4495, the number of women and men population are almost equal. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 5.30 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

## **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

## **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:5.2.1. to 5.2.4, and year wise fund allocation is suggested in Table:10.5. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **PARAMBILPEEDIKA WATERSHED ( Peruvallur Gram Panchyat)**

Parambilpeedika watershed is identified with watershed No: 23K 7o in Landuse Board (LUB) document. Comprises 1, 2, 12, 13 & 14

## **Boundaries**

It is bounded by Kadapadi –Valakandi area on the east, Kadapadi – Panikodampadi road on the south, Pallikkal panchayat on the north.

## **Demographic Profile**

Population: Female 4589, Male 4495, the number of women and men population are almost equal. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

## **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 5.30 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain.

## **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

## **KOYYAPPA WATERSHED ( Thenipalam Gram Panchyat)**

Koyyappa watershed is identified with watershed No: 23K 7b in Landuse Board (LUB) document. Comprises 5, 6, 7& 8

### **Boundaries**

It is bounded by Koyyppathodu on the east, Muniyoor Panchayat on the south, Vallikunnu panchayat on the north.

### **Demographic Profile**

Population: Female 4489, Male 4395, the number of women and men population are almost equal. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 5.34 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:6.1.1 to 6.1.4 and year wise fund allocation is suggested in Table:10.6. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **THENIPALAM A & B WATERSHEDS ( Thenipalam Gram Panchyat)**

Thenipalam watershed is identified with watershed No: 23K 3a in Landuse Board (LUB) document. Comprises wards 1 to 4 & 9 to 13

### **Boundaries**

It is bounded by Kozhikode – Thrissur NH on the east, Kadalundipuzha river on the south, Vallikunnu and Chelamppra panchayats on the north.

### **Demographic Profile**

Population: Female 4489, Male 4395, the number of women and men population are almost equal. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 5.34 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain.

## **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

## **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

## **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table: 6.2.1 to 6.2.5 and 6.3.1 to 6.3.5; year wise fund allocation is suggested in Table:10.6. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **ARIYALLOOR WATERSHED ( Vallikunnu Gram Panchyat)**

Ariyalloor watershed is identified with watershed No: 23K 50a (2) in Landuse Board (LUB) document. Comprises wards 7, 8, 9, 10 & 11.

## **Boundaries**

It is bounded by Kadalundi river on the east, on the south, Annagadi watershed on the north and Arabian Sea on the west.

## **Demographic Profile**

Population: Female 3489, Male 4595, the number of women population is lower than men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

## **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which constitute 4.89

Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain. Nearly 50% of the land area is situated at >55m elevation.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table: 7.2.1 to 7.2.6 and year wise fund allocation is suggested in Table:10.7. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **KANJHIRAPOTTA WATERSHED ( Vallikunnu Gram Panchyat)**

Kanjhirapotta watershed is identified with watershed No: 23K 51a in Landuse Board (LUB) document. Comprises wards 5,6 &12

### **Boundaries**

It is bounded by Kanjhirapotta watershed on the east, Annagadi watershed on the south, Kalalundipuzha river on the north and Arabian Sea on the west.

### **Demographic Profile**

Population: Female 3489, Male 4595, the number of women population is lower than men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains. Weathered Laterite is the major constituent of the terrain. Nearly 50% of the land area is situated at >55m elevation.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:7.3.1 to 7.3.4 and year wise fund allocation is suggested in Table:10.7. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **KEEZHAYIL WATERSHED ( Vallikunnu Gram Panchyat)**

Watershed is identified with watershed No: 23K 52a in Landuse Board (LUB) document. Comprises wards 1 to 4.

### **Boundaries**

It is bounded by Kanjhirapotta watershed on the east, Annagadi watershed on the south, Kalalundipuzha river on the north and Arabian Sea on the west.

### **Demographic Profile**

Population: Female 5289, Male 4995, the number of women population is marginally higher than men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

## **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which covers about 5.75 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain. Nearly 50% of the land area is situated at >50m elevation.

## **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

## **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

## **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table: 7.4.1 to 7.4.5 and year wise fund allocation is suggested in Table:10.7. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

## **KODAKKADU WATERSHED ( Vallikunnu Gram Panchyat)**

Kodakkadu watershed (Also known as Ananganadi) is identified with watershed No: 23K 51 in Landuse Board (LUB) document. Comprises wards 1,2,3,4,5,7 & 8

## **Boundaries**

It is bounded by Kadalundi river on the east, on the south, Ariyaloor watershed on the north and Arabian Sea on the west.

## **Demographic Profile**

Population: Female 8589, Male 8095, the number of women population is higher than men. Majority of the people are small farmers, farm labourers, immigrants to Gulf countries and construction workers.

### **Topographical Features**

The terrain in this watershed is devoid of hills and dominated by gently sloping foot-slope region which leads to gently sloping flood plains which constitute 5.0 Km<sup>2</sup>. Weathered Laterite is the major constituent of the terrain. Nearly 50% of the land area is situated at >55m elevation.

### **Type of Soil**

Sandy Loam is the soil in paddy fields and in the plains red soil mixed with gravelly sand is seen in the higher planes.

### **Land Use**

Plains are mostly utilised for paddy cultivation. The important crops are coconut, arecanut, banana and paddy which make up 90% of cultivated land.

### **Conservational Problems and Solutions**

Side banks of all the streams and canals are damaged due to land slips. The following side banks of the streams should be protected by building rubble mounted or masonry walls. Details on interventions required for optimum water conservation is given in Table:7.5.1 to 7.5.5 and year wise fund allocation is suggested in Table:10.7. The side wall protection is given only in critical zones. Estimate is provided both for conventional masonry structures and vegetative protections such as vettiver / bamboo.

### **2.9.6 Civil Constructions for Water and Soil Conservation**

Details of civil constructions for soil and water conservation is given in tables. Annual expenditure statements of various construction activities are given in table and details of each activity separately are given in consecutive tables. Technical details that have to be followed while executing the work and the method used for the preparation of estimate rate are also given in the annexure.

## **2.10 FINANCIAL ANALYSIS**

In each of the watershed based action plan, suggested projects are grouped under various sectors. Plan fund and beneficiary contribution for each project are also given in tables. In projects under civil construction complete expenditure is given as plan fund. The expenditure for building contour bunds, side penetration mud walls and digging percolation pits is divided as 25% plan fund and 75% as labour contribution. Table 5 gives the consolidated expenditure statement for the Block.