
IWMP
INTEGRATED WATERSHED MANAGEMENT PROGRAMME
VETTIKAVALA BLOCK PANCHAYAT
KOLLAM DISTRICT
DETAILED PROJECT REPORT
TECHNICAL SUPPORT ORGANISATION
AGES
AGRICULTURE AND ECOSYSTEM MANAGEMENT GROUP
THIRUVANANTHAPURAM
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PART I

1.0 INTRODUCTION

Food security and social security are the two vital linkages of stability and well being of man-kind. Anyone who has concern for the 'mother earth' and 'future generation' cannot be a silent spectator to the excessive greediness of certain human beings for mere economic motives at the cost of our food and social security. Report of the World Commission on Environment and Development (the Brundtland Report) published in 1987 has brought in the terminology of 'sustainable development'

Inspite of substantial increase in food grain production, the rate of increase in population demands higher food production. In the words of Swaminathan (1991) "Intensive cultivation of land without conservation of soil fertility and soil structure would lead ultimately to the springing up of deserts". This can be mitigated by maintaining harmony with the environment, which is the core principle of 'sustainable agriculture'. As defined by the FAO (1989), sustainable agriculture is the successful management of the resources for agriculture to satisfy the changing human needs while maintaining or enhancing the quality of environment and conserving the natural resources. Sustainability highlights the importance of appropriate allocation of limited resources at par with efforts for maintaining and expanding the resource base itself. This needs proper evaluation of the resources in terms of its problems and potentials. . This will help for resource based planning process in crop selection and its management

appropriate to each locality. Land evaluation involves the basic surveys of physiography, hydrogeomorphology, soils, vegetation, climate, socio-economic conditions etc. of an area. Land evaluation for sustainable agriculture development can be best envisaged through the concept of watershed management. According to Sivanappan (2002) watershed has become an acceptable unit of planning for optimum use and conservation of soil and water resources. He also opined that it will help in preventing degradation resulting from interaction of physiographic features, it eliminates unscientific land use / inappropriate cropping pattern, reduces soil erosion and enhances productivity of the land resources. Watershed management helps in enhancing the ground water recharge and also restoration of the eco-system.

In land evaluation, the biophysical parameters will be assessed in terms of their problems and potentials in order to adopt a particular land use or cropping pattern. Land evaluation, considering the biophysical and socio-economic factors, is essential for sustainable agriculture development in the present context. This is termed as integrated land evaluation. The procedure of considering the biophysical factors alone for land evaluation did not yield the desired results and acceptability of the stakeholders of land. This gave rise to the concept of integrated land evaluation.

The sustainable utility of natural resources can take place only with the acceptability of the people. This needs the involvement of beneficiaries in resource evaluation, planning and implementation. Such an effort can be termed as ‘participatory approach in land evaluation and development’. This is based on

PRA principles which enable the local people to participate in knowledge building exercises, investigate and analyse their problems, evaluate constraints, opportunities and take optimum decisions regarding natural resource management. The understanding of the present situation must be through assessment of the potentials of agricultural development, assessment of the available physical, biological and human resources besides political, social, cultural and economic context of the agricultural system of the watershed community from planning to implementation stage.

2.0 ABOUT THE PROJECT

2.1. INTEGRATED WATERSHED MANAGEMENT PROGRAMME(IWMP)

The term ‘watershed-plus’ emerged in 1998 to adopt new approaches in watershed projects that would step beyond the usual boundaries in order to address the needs of marginalized groups of people, such as those with no land, women and the poorest of the community. IWMP very well testifies this contention. This Programme follows a set of Common Guidelines specifically drawn up with a view to unify all watershed development programmes implemented in the country by various agencies for ensuring cumulative as well as comprehensive impacts towards achieving the goals set by such programmes. Strengths of erstwhile Programmes like Drought Prone Area Programme (DPAP), Integrated Waste lands Development Programme (IWDP) and Desert Development Programme (DDP) implemented in the country have been appropriately contained in the guidelines for IWMP. Integrated approach and total participation of village communities are the main features of this programme. The focus of this programme is consolidation of optimum use of resources,

sustainable development and integrated planning in land and water resource management. Cluster approach was adopted in selection and preparation of projects. Adjacent and untreated micro watersheds covering an area of 1000-5000 ha are considered as the project area. Scientific planning of project using IT, remote sensing and GIS is also envisaged for planning, monitoring and evaluation.

2.2 OBJECTIVES: The major objectives of this project are to restore the ecological balance by harvesting, conserving and developing degraded natural resources such as soil, vegetation and water. The outcome envisages prevention of soil erosion, regeneration of natural resources, rain water harvesting and recharging of ground water table. This enables multiple cropping and introduction of diverse agro-based activities which help to provide sustainable livelihoods to the people of the watershed area.

2.3 ORGANISATIONAL SETUP: The organizational structure, as envisaged in the Guidelines, required for the conduct of the Project has already been set up and it includes-

i. The State Level Nodal Agency with multi-disciplinary experts at State level

ii. The Watershed Cell cum Data Center (WCDC) at district level

iii. The Project Implementation Agency at Block level

iv The Watershed Committee at Project level

v Self Help Groups and User Groups at grass roots level

ORGANIZATIONAL SET UP

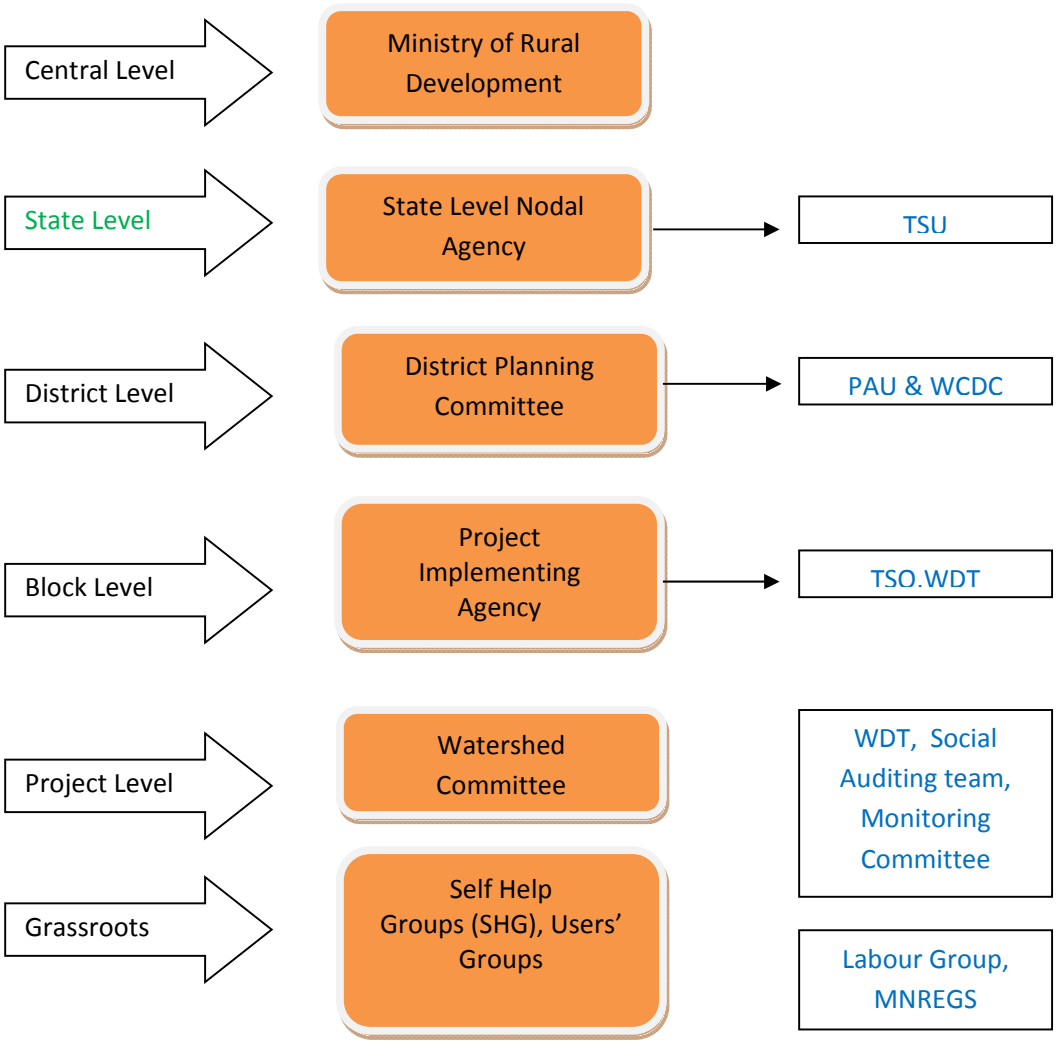

Fig: 1. Organisational setup

2.4. FUNDING PATTERN

The project Fund is derived as 90 % Central share and 10% State share. The release of Central share is in three installments of 20%, 50% & 30%

2.5. PROJECT BUDGET

Out of the total budget allotment 56% is provided for NRM activity followed by 10% each for for production system & microenterprises and administrative expenses and 9% for livelihood activities. The details of the breakup are given in the table below.

Table:1.Budget breakup for IWMP project

Sl No.	Components	Utilisation in %
01	Administrative expenses	10
02	DPR	01
03	Entry point activities	04
04	Institution & Capacity Building	05
05	Monitoring	01
06	Evaluation	01
07	NRM	56
08	Livelihood activities	09
09	Production system & Micro enterprises	10
10	Consolidation	03
	TOTAL	100

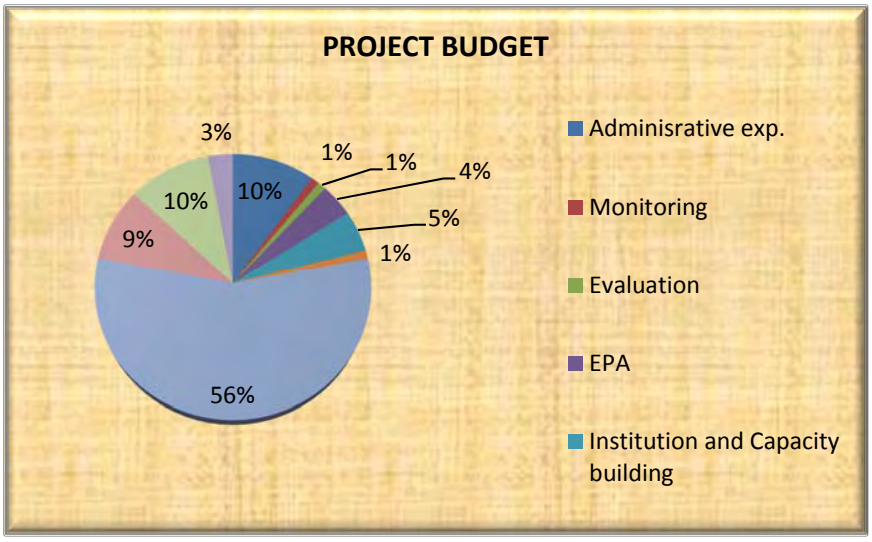

Fig:2. Diagram showing the funding pattern

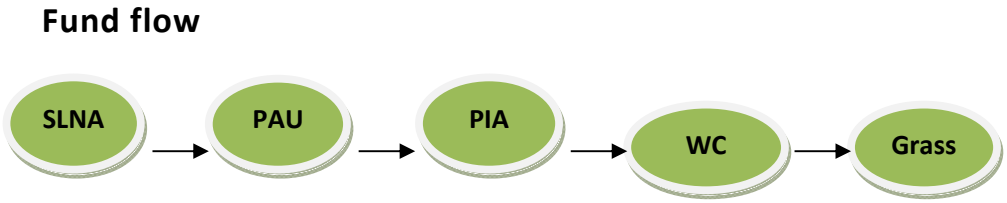

Fig:3. Diagram showing the fund flow

3.0 ABOUT THE BLOCK

3.1 BRIEF HISTORY

Vettikavala Block was formed as per the notification No. C.P (A) 1-10999/55 dated 17th June 1955, leading to the formation of NES Blocks. Initially Vettikavala covering an area of 63.20 sq.miles consisted of Vettikavala, Mylom, Melila, Kulakkada, Pavithreswaram and Ummannoor panchayats. The then population was 30,518 and the block started functioning in a private building

adjacent to the famous Vettikavala temple. On 8th April 1962 the office was shifted to its own building.

The main focus of development in the Block was Agriculture and allied sectors. This led to the appointment of extension workers in the field of Agriculture, Animal husbandry, Co-operation etc which was co-ordinated by the Block Development Officers. With the establishment of I.C.D.S, women/children development activities of the Block were transferred to the I.C.D.S project. As per Panchayat Raj Act of 1994, elections to the three-tier panchayat system was held on 25-09-1995. Since then Vettikavala Block administration commenced with BDO as the Secretary.

3.2 LOCATION

Vettikavala block falls in the midland region of the State and is part of Kollam district. It is located between 8^0 54'& 9^0 5' N Latitudes and between 76^0 40' & 76^0 54'E longitudes. The present area of the block is 169.47sq.kms. It is bordered in the north by Pathanapuram block, in the west by Kottarakkara block and Sasthamkotta block in the NW.

3.3 CRITERIA FOR SELECTION

The following criteria were used in the selection of the watershed

(i) Acuteness of drinking water scarcity.

(ii) Extent of over exploitation of ground water resources.

(iii) Preponderance of degraded lands/wastelands.

(iv) Contiguity of another watershed that has already been treated/developed.

(v) Willingness of village community to make voluntary contributions, enforce equitable social regulations for sharing of common property resources, make equitable distribution of benefit, create arrangements for operation and maintenance of assets created.

(vi) Proportion of SC/ST.

(vii) Area not covered under assured irrigation.

(viii) Productivity potential of the land.

Table:2. Criteria for selection

Project name	Project type	Weightage													
IWMP	Desert	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	Total
		5	3	0	10	1	0	10	5	5	10	5	0	5	59

Sl No	Criteria	Maximum score	Ranges & Score			
1	Poverty index (% of poor to population)	10	Above 80% (10)	80 to 50 %(7.5)	50 to 20%(5)	
2	% of SC/STpopulation	10	More than40% (10)	20 to 40%(5)	Less than 20%(3)	
3	Actual wages	5	Actual wages are significantly lower than minimum wages(5)	Actual wages are equal to or higher than minimum wages(0)		
4	% of small and marginal farmers	10	More than 80%(10)	50 to 80%(5)	Less than 80%(5)	
5	Ground water status	5	Over exploited(5)	Critical	Sub critical(20	
6	Moisture index/DPAP/DDP Block	15	-66.7 & below (15)DDP Block	0 to -32.2(0)Non DPAP/DDP Block	0 to -32(0)Non DPAP/DDP Block	
7	Area under rain-fed agriculture	15	More than 90%(15)	80 to 905(150	70 to 80%(5)	
8	Drinking water	10	No source(10)	Problematic village(7.5)	Partially covered(5)	
9	Degraded land	15	High-above 20%(15)	Medium-10 to 20%(10)	Low-less than 10% of TGA(5)	
10	Productivity potential of the land	15	Lands with low production & where productivity can be significantly enhanced with reasonable efforts(15)	Lands with moderate production & where productivity can be enhanced with reasonable efforts	Lands with high production & where productivity can be marginally enhanced with reasonable efforts(5)	
11	Contiguity to another watershed that has already been developed/treated	10	Contiguous to previously treated watershed & contiguity within the microwatersheds in the projects(10)	Contiguity within the microwatersheds in the project but non contiguous to previously treated watershed(5)	Neither contiguous to previously trated watershed nor contiguity within the microwatershedsin the project(10)	
12	Cluster approach in the plains (more than one contiguous microwatersheds in the project	15	Above 6 micro-watersheds in cluster(15)	4 to 6 microwatersheds in cluster(10)	2 to 4 microwatersheds in cluster(5)	

13	Cluster approach in the hills (more than one contiguous microwatersheds in the project)	15	Above 5 micro-watersheds in cluster(15)	3 to 5 microwatersheds in cluster(10)	2 to 3 microwatersheds in cluster(5)	
	Total	**150**	**150**	**90**	**41**	**2.5**

Source:ppr,Kollam

4.0 METHODOLOGY

4.1 WATERSHED APPROACH FOR DEVELOPMENT

Watershed development and managementhet involves integration of technology within a drainage area for conservation, development and management including rational utilisation of natural resources to meet the minimum needs of the people and the life systems depending on them. Watershed is a hydro-geological and bio-physical entity having a common draining outlet. Watershed is a drainage area with well defined natural boundaries. Watershed development and management is the most effective solution to mitigate the problems of flood, drought, landslides and other natural disasters. . Each watershed has its own carrying capacity within which it limits its function. The concept of watershed management has got great acceptance since twenty years back and is gaining more and more importance in Land use planning and management of the natural resources. The developmental efforts on watershed basis undertaken by developed countries like USA, Germany etc. had revealed that this philosophy has scope for replication in varied situations prevailing in less developed nations also. Hence watershed, as a globally accepted unit, is ideal for ensuring inter ecological linkages and it provides for integration and sustainable use of the basic resources namely land and water. It integrates the biophysical, social and economic inputs for optimum results from the developmental efforts undertaken for sustainable development.

Watershed management will help in preventing land degradation resulting from interaction of physiographic features, it eliminates unscientific land and water use, envisages appropriate cropping pattern and reduces soil erosion,

thereby improving the sustainable productivity of the land resources. Watershed management helps in enhancing the ground water recharge and also in regenerating the eco-system. Scientific Watershed Management is a very effective tool to develop and exploit the production potential of Natural Resources, in a sustained manner without deteriorating the resource base.

Integrated watershed management approach can help to bring out a dynamic and constructive balance between man and environment in hilly regions since such a management incorporate micro-planning, resource use integration and choice by local communities. Realizing the possibilities of natural resource conservation on watershed basis, the Government of India has issued a set of Common Guidelines for all integrated watershed management projects in the Country. This watershed development project, under IWMP, meant for the Vettikavala Block Panchayath also follows these Common Guidelines.

4.2. MAJOR PROCEDURE INVOLVED IN PREPARING THE DPR

The Common Guideline prescribed by Govt. of India for IWMP has been adopted for preparing this DPR. Accordingly, all thematic data and field information were collected on cadastral scale. The procurement of cadesral maps of the project area was one of the major tasks. After the compilation of cadastral maps, it was overlaid with the micro watershed boundaries already prepared. Their boundaries were corrected through ground verification. This exercise helped in identifying the portions of the two gramapanchayats covered under the project.

Various steps involved in the development of a DPR for the area succeeded this.A record of significant events in the process is described hereunder.

i) Block level Seminar

A Block level Seminar conducted on 31.05.2013 marks the beginning of the process for the preparation of the DPR. It was held for generating general awareness of IWMP among the people's representatives of the PRIs, officials of line departments, progressive farmers etc concerned with the project area and for familiarising them with the Common Guidelines for the programme. Officials of SLNA, Officials of WCDC, Kollam and Consultants of the Technical Support Organization made presentations on various aspects of IWMP. The seminar was attended by 83 participants.

ii) Cluster Approach

Instead of trying to develop isolated or far flung micro watersheds, an approach of treating and developing contiguous areas comprising in clusters of adjoining micro watersheds has been preferred under the Programme for comprehensive impacts. This envisages a broader perspective of managing Geo-hydrological units for sustainable results. As such, the IWMP-4 Project in Vettikkavala Block of Kollam district, Kerala covers two micro watersheds codified as **7K45c and 7K46a**. These micro watersheds are named as **Madathilkadavu and Attuvassery** respectively. The project area falls in the portions of two gram panchayats namely Kulakkuda and Mylom of Vettikkavala Block Panchayat covering an area of **1829 hectares**.

iii) Transect Walk

A set of Transect Walks has been conducted in the project areas to gather information on

the topography, water resources, land use pattern, cropping pattern, existing resources, soil type, problematic areas etc. A team consisted of selected members from Neighbour Hood Groups (NHGs) members, concerned gramapanchayat members of the watershed area, subject experts, officials etc participated in the Transect Walks.

The transects were highly useful in gathering very many pieces of valuable information on the hydro-geo-morphological as well as agro-ecological aspects of the project areas. During the process, the experts in the team also carried out a reconnaissance survey to identify the areas to be treated and to assess the feasibility. Necessary markings were made in cadastral level maps.

iv) Baseline Survey/ Household survey

A detailed baseline survey covering household socio-economic aspects too was conducted in the micro watersheds to develop necessary benchmark information required for planning various appropriate developmental interventions and implementing them in the project areas and for evaluating the impacts thereof. The survey was conducted with the help of NHGs formed in the watershed area and it involved collection of required data based on a detailed questionnaire. Each NHG consists of 50-60 families and have 7 office bearers. The NHG members identified for conducting the survey were properly trained in the process. The total number of NHGs formed in the two watersheds is 118.

The questionnaire covered aspects of Demographic information, Socio-economic information, Agriculture / Horticulture Activities, Animal Husbandry activities, Land ownership, Water resources, Nature of land, Agriculture productivity, Erosion problems, Present NRM activities, Drought conditions, Fertilizer used, Landuse, Cropping pattern etc. The data

pertaining to 7% of the house holds of the project area was not received inspite of repeated efforts. Hence to the extent possible the data for this area was extrapolated for the purpose of the study.

v) Secondary data

Required Secondary Data were also collected from different sources including Village Offices, Krishi Bhavans, Department of Economics and Statisticks, Primary Health Centres, Grama panchayats, Veterinary Hospitals, MGNRGES, Kudumbasree etc. Climatic information like annual rainfall with monthly distribution and temperatue have been gathered from records of Indian Meteorological Department. Required details of land use/land cover, drains, transport network, assets and other water resources have been extracted from the Watershed Master Plan developed by the Kerala State Land Use Board. The Detailed Soil Survey report prepared by Department of Soil Survey and Soil Conservation has been used to understand the soil details magnitude of soil erosion and land capability status with regard to the project area.

vi) Field Survey

To update certain information on water harvesting structures in the area, crops grown, cropping pattern, fertilizer used and various sources of irrigation in the field etc., a field survey was also carried out in the project area by the team members of the Technical Support Organisation with the involvement of local people where ever necessary. The field survey was also helpful in demarcating the terrain features in the cadastral map for a realistic ridge-to- valley planning. A ride-to-valley approach, particularly in the case of adopting NRM activities in watersheds, will amply provide for the following.

to ensure the cost effectiveness of structures.

to improve overall efficacy and longevity of the structural measures.

vii) Participatory Rural Appraisal (PRA)

Community participation is an important tool for the overall development of degraded watersheds. Integrated watershed Management Programme also aims to empower the poor, landless persons, women and other disadvantaged groups of the society so that they may contribute effectively and efficiently to conserve natural resources on sustainable basis.

Three sessions of Participatory Rural Appraisal (PRA) were conducted in the project area to assess the resources locally available, potential and extent of local and, indigenous skills, livelihood status, wealth structure, social dynamics and needs of the concerned communities. This exercise was very useful in

the collection of first hand information about the village community.

understanding the local community perspectives, perceptions and priorities.

in knowing the felt and unfelt needs of the community.

in diagnosing important problems and a common understanding of the community.

in finding out commonly acceptable and accessible solutions and to arrive at a common outline of an action plan for Watershed Development Programme.

viii) Focussed Group Discussion

Another major event in the process was the two sessions of Focused Discussions with specifically identified groups of stakeholders from the project area. The Group of participants included farmers, skilled labourers, kudumbasree groups, political leaders, officials, members of support organisation etc. In the sessions, participants discussed the problems and potentials of

the area relating to water, agriculture, NRM activities etc. The discussions focussed on NRM, Agricultural development, Livelihood activities, Sustainable development etc. with respect to the project area.

ix) Problems Identification

All the information collected during Baseline survey, PRA exercise, Field survey and Focussed Group Discussions were thoroughly analysed and the major problems prevailed in the project area were detected. Such problems include the shortage ofdrinking water, low agricultural production due to inappropriate methods of cultivation, low milk production due to local/ non descript breed and less availability of fodder, poor economic condition due to low production, soil erosion from farm lands, neglect on vegetables, lack of value addition practices etc.

x) Scope of convergence with other schemes

IWMP envisages enough opportunity to converge and integrate the resources and components of other parallel schemes and programmes like MGNREGS, RKVY, Soil and Water Conservation Schemes under RIDF, Biodiversity Programmes, Projects under Plan Schemes of PRIs, LADSs etc implemented in the project area. This DPR shall specifically elaborate gaps to be filled or watershed activities to be converged from MGNREGS, There is ample scope for converging suitable elements from schemes of VFPCK, Horticorp and SHM also in the case of marketing and value addition with related proposals contained in this document. All efforts shall be made to converge resources and interventions of other programmes as described above for more cost effectiveness and sustainability of the impacts of IWMP and vice versa.

xi) Use of GIS and Remote Sensing for planning

Remote Sensing and GIS plays an important role in the study of natural resource and in planning natural resources development and management. One of the greatest advantages of using Remote Sensing Data for investigations and monitoring is its potential to generate information in spatial and temporal domain, which is very crucial for successful analysis, predication and validation. Use of various related scientific tools has been promoted at various stages of IWMP.

Various thematic layers related to different aspects like Cadestral, Geo-morphological, Soil, Population, SC/ST population, Ground water Status, status of Drinkng water, Slope pertaining to the project area have been created Using Geographical Information System (GIS) for the development of this document.

Using observations from various thematic layers generated through GIS has been very effectively collated for generating reliable information pertaining to soil depth, soil texture, soil erosion, waste land, agricultural and forest lands within the boundaries of the project area. Global Positioning System (GPS) was used to identify and locate various structures in the project area. Action plan map was also prepared on GIS Platform.

xii) Watershed Sabha

The Grama Sabha is the grass roots level institution in the structure of democracy in our country. The creation of GS/WS was considered as a solemn step to make democracy direct to the extent possible at the tier of governance remaining closest to the people. This is essential for transparency and accountability in administration, enhancing people‘s participation in planning and implementation of

schemes and paving way for social audit. No doubt, GS/WS is a vital conceptual component of the local government which provides a constitutional platform for the local people to engage in local governance and development. Likewise, Watershed Sabha forms most important platform in the context of IWMP also. But this body is also sometimes commonly mentioned as Grama Sabha. This document envisages the constitution of a Watershed Sabha with all adult individuals holding landed property in and/or inhabiting the micro watersheds under this project as its members in each micro watershed as stipulated in the Common Guidelines. The related portions of this Plan Document has been got approved in the concerned Watershed Sabhas after detailed discussions and necessary modifications. But IWMP envisages another social institution at the virtual grassroots level of the organizational structure below the watershed sabha. It is comprised of the User's Groups and the Self Help Groups

xiii) Constitution of Self Help Groups (SHGs)

The poor, small and marginal farmers, landless agricultural labourers, SC/ST persons etc in the Watershed Communities shall be organised into small groups, each with 8-20 persons, on the basis of homogeneity in interests and skills and socio-economic status. Livelihood Activities of these groups shall be appropriately identified, technically systematized and supported under the project. Each of these groups shall be provided with Seed Money to an extent of RS 25,000 after proper grading and ranking of them on the basis of their level of performance and compliance. The WDT shall facilitate the formation of such SHGs in the Watersheds under this project.

xiv) Constitution of User Groups (UGs)

Agriculturists and farmersin the Watersheds shall be organised into small groups on the basis of homogeneity in interests. These Groups are called Users' Groups. Production Systems operationalised by the individuals shall be appropriately identified, technically systematized and supported under the project. Each of these persons shall be given production grant on the basis of priority determined on the basis of the level of performance and preparedness for compliance. The WDT shall facilitate the formation of such UGs in the Watersheds under this project.

So also, persons with common interests to maintain and use various community assets created/developed under the project can be organized into Users' Groups. Such Users shall execute a Resource Use Agreement based on the principles of equity and sustainability and shall remit required Resource Use Fees as decided by the Watershed Sabha to the WDF

xv) Constitution of Watershed Committee (WC)

Each Watershed Sabha will constitute a Watershed Committee (WC) as its executive arm to implement the Project. Each Watershed Committee has to be registered under the Societies Act. The president of the panchayat having the largest extend of area under the project will be the chairman of the Committee. It shall consist of 10 members. 5 of them shall represent five efficient SHGs (one active member from each SHG) and the other 5 shall represent five efficient UGs (one active member from each UG). The Watershed Committee shall have representation for sections like Small and Marginal Farmers, SCs, STs and Women Each WC shall open a separate bank account in any of the nearest Nationalised Banks for the purpose of the project and facilitate the decision making process in the context of IWMP. The WC shall perform as per the directions contained in the Common Guidelines.

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PART II

5.0. THE DPR

5.1. STUDY AREA

5.1.1. Location and extent

The study area covers two micro watersheds coded as 7K46a & 7K45c of Kallada River Basin. It is located between north latitudes 9^{o} 2'25"N & 9^{0}5'55" and east longitudes 76^{0}42'40" & 76^{0}47'20". The watersheds and belong to Vettikavala block of Kollam district in Kerala. The Project area is bordered in the north by Kallada River, in the south by Neduvathur gramapanchayat, in the west by Pavithreswaram gramapanchayat and in the east by Pulamon Thodu. The total study area comprises of1866 hectares and the balance area of these watersheds has already been treated under other schemes. **Effective area of the watershed covered under the project is 1829 hectares.** The terrain has an undulating to rolling topography. The major landuse of the area is agriculture with rubber as the major crop followed by mixed crops, built-up etc. The area under paddy cultivation has become quite nominal as major portion of the paddy fields have been converted for other uses.

5.1.2 Climate

The average annual rainfall of the Kollam district is 2742 mm (IMD) contributed by two monsoons viz. South-West and North-East. The average annual rainfall of Kottarakkara, an area adjacent to the project area, is 2306 mm (Anu Simon and Dr.Mohan Kumar, CUSAT, Spatial Variability and Rainfall Characteristics of Kerala). Of

this, the contribution from the SW Monsoon is about 57% and from NE monsoon contributes 22%. The rest is from summer and pre-monsoon showers. The climate

prevailing in the area can be categorized as wet and humid type with about 120 rainy days per year. The rainfall distribution of Kollam district is given in table below.

Table:3.Rainfall distribution of Kollam district for the period (2002-2011)

(Rainfall in mm)

Sl No	Period	Months												Annual Rain fall		
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Actual	Normal	Deviation
1	2001-2002	206	278	88	592	143	0	3	18	61	200	252	265	2104	2498	-394
2	2002-2003	297	240	66	511	89	62	1	50	103	166	105	335	2025	2430	-405
3	2003-2004	406	287	203	212	281	161	4	57	48	152	614	406	2427	2495	-68
4	2004-2005	464	104	284	240	311	193	26	17	31	257	213	392	2532	2495	37
5	2005-2006	464	104	284	240	311	193	18	9	149	96	351	307	2526	2495	31
6	2006-2007	377.3	254.3	382.9	575.1	306.2	5.2	0.0	11.7	39.7	185.9	161.3	499.0	2798.6	2494.8	303.8
7	2007-2008	574.1	263.1	408.1	445.0	128.8	26.0		41.0	224.9	137.6	120.8	207.1	2576.5	2494.8	81.7
8	2008-2009	454.8	265.1	247.0	360.8	122.7	25.6	2.2	3.0	39.7	121.9	136.4	272.3	2051.5	2494.8	-443.3
9	2009-2010	369.9	185,5	272.9	325.9	317	15.7	11.5	0	59.1	221.1	203.5	357	2339.1	2494.8	-155.7
10	2010-2011	362.3	3.4.8	258.3	527.6	388.4	95.0	57.1	98.6	46.7	177.4	148.2	417.3	2881.7	2430.2	451.5

*Source:Indian Meterological Department data provided by Dept of Economics and Statistics, Govt of Kerala***.**

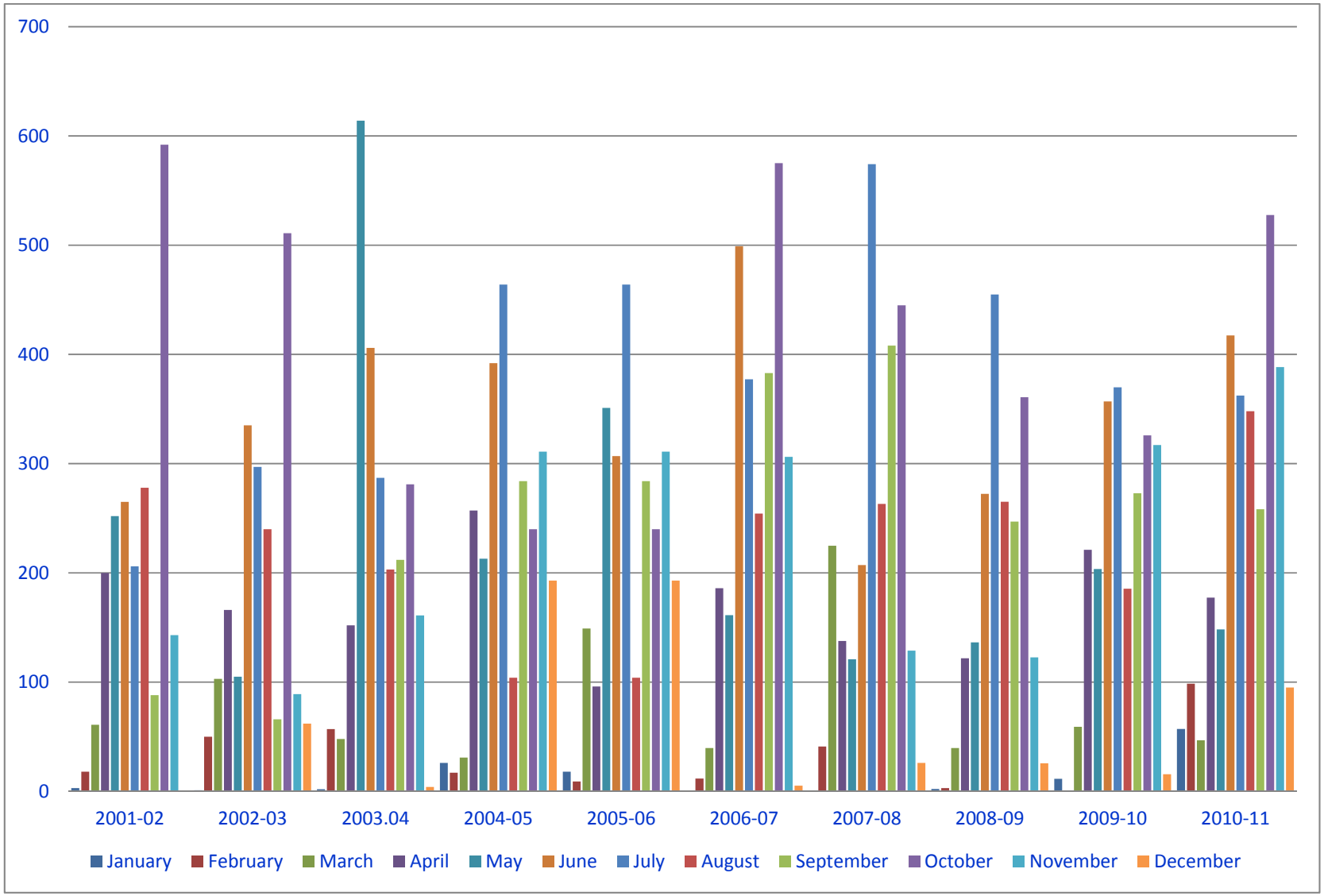

Fig:4.Bar diagram showing Rainfall distribution of Kollam district for the period(2002-2011)

TEMPERATURE 2007

Month	Temperature (Degree Celcius)	
	Maximum	Minimum
January	35.2	19.9
February	36.0	20.5
March	38.0	22.4
April	36.1	24.3
May	34.7	24.3
June	31.9	23.2
July	29.7	22.8
August	31.6	23.1
September	31.3	23.0
October	30.5	23.1
November	31.7	22.3
December	31.0	21.8
Average	33.1	22.6

Table:4.Data on temperature for 2007

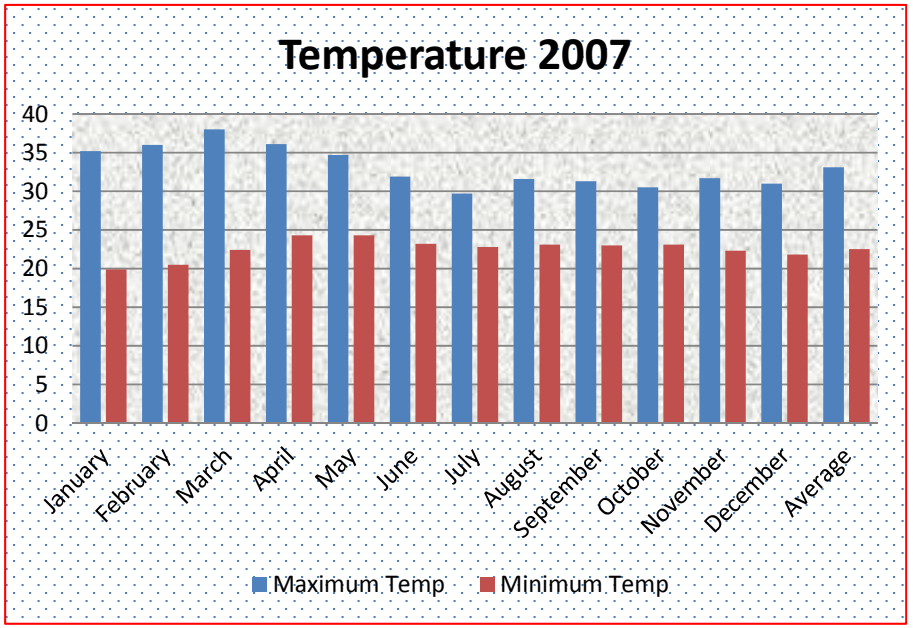

Fig:5. Bar diagram showing temperature for 2007

5.1.3.Geomorphology

Regionally the Kerala state has undergone multiple cycles of erosional processes. This study area also shows evidences of multiple planation surfaces. There are four geomorphologic units viz., lateritic lower plateau, valleys, natural levees and residual mounts. Lateritic lower plateau occupies about > 70% of the area. It comprises of laterites which are products of intense weathering of the precambrians. This planation surface is the product of weathering and denudational processes acting on the land form reducing its elevation and relief. The lateritization would have started since tertiaries.

Valleys are the second largest geomorphologic unit in this study area. These valleys are the result of fluvial dissection and erosional processes acting on the land forms. The valleys comprise of alluvial formations made up of an admixture of silt sand and clay. The formations are of Holocene period. These formations are conducive for ground water storage and act as good aquifers.

Though insignificant in terms of area and spread, two other units as natural levees and residual mounts have also been noticed in the locality. Natural levees are found in areas adjacent to the Kallada Ar. These are low ridges or embankments built by the stream along its flood plains, while it meanders through the regional landscape. Levees are usually formed in rivers with a high suspended material load. They are made up of a mud and silt admixture, and are of Holocene to present.

Residual mounts (remnants of high relief features which have under gone denudational actions and slope retreat processes to their present forms) to an insignificant areal extent, which comes to only two per cent of the project area, have also been detected in the locality. The geomorphology of the area is presented in the fig and table

Table:5.Geomorphology of the watershed area.

Type	**Area in sq km**	**Area %**
Lower plateau laterite	11.99	65.58
Residual mount	0.64	3.47
Valley	5.66	30.95
Total	**18.29**	**100**

5.1.4.Geology and Structure

Geologically the area belongs to the southern granulite type which has undergone weathering, and lateritization and planation processes. The rock types are Precambrian crystalline metamorphics – garnet biotite gneisses, pyroxene granulites and their weathered/lateritized variants and quaternary formations consisting of alluvial deposits.

Laterites are the products of intensive and long lasting tropical rock weathering which is intensified by high rainfall and tropical temperatures. The thickness of laterites varies from 3m to 26 m bgl. Quaternary formations consisting of alluvium – an admixture of silt sand and clay is seen the valley portions of the area.

5.1.5.Structural Analysis

Drainage patterns etched in the land scape of the area indicate structural controls which is indicative of the possible presence of fractures in the pre-cambrian underneath. It would be possible to identify potential fractures for development of confined and semi confined aquifers, in the area.

5.1.6.Hydrogeology

The watershed area forms part of the midland region of Kerala, the altitude ranging between 10m and110 m above m.s.l. The area is part of the peninsular shield made up of Archaean metamorphic rocks consisting mainly of garnetiferous biotite gneisses, pyroxene granulites and alluvial formations along the low lands and also lateritized metamorphics. The spurs and ridges are made up of weathered metamorphics underlain by the rock itself. Laterites derived from the metamorphics occupy side slopes of the hills and spurs. The laterites are the most widely distributed litho unit within the area. The thickness of the laterite ranges up to a maximum of 26 m. The thickness of the laterites is less towards the valleys, with the maximum thickness encountered along the side slopes and hill tops. The valleys in this area are composed of fluvial alluvium of few meters thickness which is underlain by laterite grading through lithomarge to weathered crystallines. Riverine alluvium consisting of sand and silt occurs along the flood plains of Kallada Ar and its tributaries. The major portion of the area is occupied by the alluvial formations. Well data from 21 dug wells were collected from the Panchayat during October 2013 (Table.No.6). Groundwater occurs under water table conditions in the laterite formation, weathered metamorphic formations and in alluvium.

Groundwater occurs in semi confined and confined conditions in the underlying fracture zones within the crystalline rock. The dug wells in the area have depths varying from 2.40 m to 26.00 m. The wells in these watersheds are perennial in the valleys. The laterite aquifers in the gently sloping plains and slopes sustains large number of wells but they are with lesser yield compared to the wells in the lower reaches of watersheds as water levels begin to decline on cessation of rains. Along the ridges and on the hill tops wells are seasonal. The wells dry up in summer and water scarcity is felt immediately after cessation of the rains. Many of the open wells in the valleys, and also along the other areas cave in due to presence of lithomarge. In general the availability of water decreases with the cessation of rains and scarcity is experienced as water table recedes.

Table:6.Well inventory

1	2	3	4	5	6	7	8	9	10	11	12	13
well no	name and address	Wd no	H no	Dtw	W c thickness	Td	Use	pump	pumping pattern	topography	soil type	Geology
1	OMANA VISWANATHAN, pezhumvila, vadakkathil muttambalam, pallickal east po	9	55	2.40	3	5.40	D	0.5	DAILY	V	l	
2	Y.Thomas.Elamkunnathu, muttambalam, pallickal east po	9	98	3.30	3.50	6.80	do	do	Do	do	L	
3	Achan Kunju, shalom bhavan, muttambalam, pallickal east po	9	157	7.50	4.65	12.15	do	1.5	Do	Hill	laterite	Laterite
4	Muraleedharan,Charuvila veedu, Vellaramkunnu Pallickal East.	10	83	8.50	5.75	14.25	do	1.5	Do	Hill slope	do	Do
5	Shaji T, charuvila thekkathil, Plamoodu Pallickal	17	409	4.35	3.55	7.90	do	0.5	Alternate days	slope	L	Do
6	Savithry, Kochuthundathi veedu, Inchakkadu	16	351	4.85	6.10	10.95	do	0.5	daily	slope	L	Do
7	Radhakrishnan, Paraviula veedu, Inchakkadu	17	519	6.65	7.25	13.90	do	--	--	do	do	Do
8	Somanathan pilla, Kadoorazhikathu veedu,	19	309	6.50	2.30	8.80	do	1.0	Alternate days	slope	do	Do
9	Thankappan, sonumandiram, puthoor Mukku	7	84	5.25	5.30	10.55	do	1.0	do	hill	Do	Do

10	Rabecca, prakash bhavan puthoor mukku	7	188	5.80	4.65	10.45	do	0.5	daily	Hill	do	Do
11	Sasi, Vaikundapuram, Puthoormukku	7	329	7.50	3.0	10.50	do	--	--	Hill	do	Do
12	Udayakumar, Ambadi. ITC, puvathur east	7	558	7.65	5.15	12.80	do	1.0	Alternate days	slope	L	L
13	Shibu, pallathuveedu ITC, poovathur east	7	593	9.90	7.00	16.90	D0	--	--	hill	L	L
14	Mosha , Vellarackal Veedu, Poovathur East	8	526	5.5	3.0	8.50	do	1.0	daily	slope	L	L
15	Sathyaneshan, nithin nivas poovathodu, mavadi PO	14	88	5.150	3.50	8.65	DO	1.0	ALTERNAT E DAYS	HILL	L	L
16	RAveendran Raveendra sadanam, Kulakkada	5	405	5.15	3.40	8.55	do	1.0	do	slope	l	L
17	Suresh kumar, sujabhavan, Kulakkada	6	380	4.70	5.50	10.20	do	1	daily	slope	l	L
18	Madhavan Nair, chaithram	2	206	11.15	15.15	26.30	Do	1.50	do	Hill	l	L
19	Vijayakumar, rohini, Attuvassery	19	104	2.70	1.70	4.40	do	0.5	daily	slope	l	L
20	Narayanapilla, kuzhivila veedu, attuvassery	19	59	9.95	2.60	12.55	do	1.50	daily	hill	l	L
21	Pt Well, Kanjiramvila Jn	16	---	6.45	4.80	11.25	D	--	--	hill	l	L

Wd no.: ward number H no.: house number Td : total depth W c : water column D t w :depth to water table L,l : laterite

Table:7.Details of wells drilled in the area

Sl no	location	Total depth (M)	Overburden (m)	Yield in lph	Static water level m bgl	Dia In mm
MYLOM GP						
1	Sariga Jn	100	20	4000	1.5	110
2	Vellaramkunnu	110	15	3000	6.0	110
3	Koliyakode	90	20	6000	3.0	110
4	Kureekadu Harijan colony	90	20	5000	6.0	110
KULAKKADA GP						
1	Naduvilamuri	85	15	5000		110
2	Kannanvila	90	--	4000	--	110

The data of the wells drilled by ground water department in the area reveals that the wells are 85 to 110 m deep, with overburden ranging between 15 to 20 m bgl. The wells have a yield ranging between 3000 lph to 6000 lph. The static water levels in the wells are between 1.5 and 6.0 m bgl.

i)*Ground water levels:*

The monsoon water levels in the valley and low lands are near surface levels to 3.40 m bgl. The water column has thickness of up to three meters in the valley portions and the total depth of open wells inventoried in the geomorphic unit varies between three meters and five meters. In comparison, wells in the slopes are little deeper and the depth to water table in the monsoon period varies between 2.70 to 7.65 m bgl. The wells have depths ranging between 4.40 m to 13.90 m, and the water column thickness ranges between 1.70 m and 7.25 m. The wells along the ridges are deeper and are seasonal in water availability. Depth of wells in these areas ranges upto a maximum of 26 m bgl.

The water column thickness during the monsoon period of 2013 is between 3 and 15 meters. The depth to water table ranges between 5.15 and 11.15 m.

ii) Water quality

There are no severe water quality issues in the watersheds. The chemical quality of groundwater does not show specific problems as per the studies of CGWB. The pathogenic contamination is wide spread in Kerala and it will not be different in the case of these water sheds also.

iii)Surface water potential: The project area is bordered by the Kallada River. This river has been harnessed through construction of Kallada irrigation project and it provides water to the various parts of the district through a network of canals. The benefit of canal irrigation is enjoyed by these watersheds as well.

iv) Availability of water resources in the watersheds

The watersheds in the study area forms part of the Kallada river basin. The Kallada basins have a run-off coefficient of 0.49, which means 51 % of the annual rainfall in the area infiltrates into the phreatic aquifers and the balance goes off as surface run-off. The area will receive 23060 m^3/per hectare of water from rains annually. Out of this 11300 m^3 flows out as surface run-off. The remaining water after excluding the surface runoff will reach the phreatic aquifers, the quantity of which is worked out as 11760 m^3 per annum.

Assuming that the average area of each of the water sheds as 6.22 km^2 each of the watersheds receive 14.34 mcm water from rains. Of this, the surface runoff is estimated to be 7.03 mcm and the infiltration into phreatic aquifer is 7.31 mcm. After

providing for losses due to subsurface run-off, evapotranspiration etc by providing 70 % of the water in phreatic aquifer, the balance available will be 2.19 mcm in each of these micro-watersheds. This means these water sheds have sufficient water resources. However movement of ground water towards higher order streams causes the depletion in the upper reaches. This needs proper rain water harnessing programs to be implemented in these units through which the water resources can be harnessed and conserved and sustainability ensured.

v) Estimation of Ground water

The watersheds' ground water availability is dependent on many factors viz. the geology, topography, structure, rainfall etc. The computation of the ground water resources within the phreatic aquifers is done following the guidelines of the Ground Water Estimation Committee of Ministry of Water Resources Government of India. Accordingly the ground water balance in the watersheds is worked out using the rainfall infiltration method:

vi) Annual ground water recharge:

Area of the water sheds : More 18.29 km^2

The rainfall infiltration factor is taken as 6 % for laterites and is applied for the entire area as it is the largest litho unit. :

Average annual rainfall : 2306 mm(Anu Simon & Dr. Mohan Kumar, CUSAT)

Natural run off : 10%

Annual ground water recharge: = 2.58 mcm

Net ground water available = 2.32 mcm

vii) Ground water draft

Annual domestic draft : for 17500 persons @150 lpd = 0.96 mcm

Annual agricultural draft @ 100 x 0.12 = 0.12 mcm

Do energised @ 10 X 0.54= 0.05 mcm

Irrigation drilled wells annual draft @ 5 nos. X 1.0 = 0.05 mcm

Total annual agricultural draft : 0.22 mcm

Total annual draft == 1.18 mcm

Ground water balance=1.14 mcm

Annual ground water recharge : 2.32 mcm

Stage of development 50.86 % and hence is in safe category

The 2009 CGWB/GWD computation shows the block has a development of 54.69%.

viii) Ground water conservation

The water resources of any given area remain more or less constant, temporally, with vagaries of weather causing occasional variations regionally. With increase in population, increased developmental activities, and changes in life style the water consumption is on the rise. The availability is decreasing due to constraints of quantity as well as threats of pollution. Water contamination is due to geogenic as well as anthropogenic reasons. It is affecting surface water resources as well as ground water resources. Activities of man have its impacts on water resources as well- on surface as well as ground water. For ensuring the development of the watersheds and ensuring their sustainability, water has to be available in the watershed. Hence integrated watershed management program can be complete only with a component for ground water recharge as well.

The Vettikkavala block, of which these watersheds are part of, is categorized as safe in the ground water estimations of CGWB and state GWD. The ground water stage of development in the water sheds taken up for study here is 50%, indicating a balance of 50% and also that the area is safe for further development. However the availability of water in the watersheds during the summer months is inadequate, especially in the upper reaches. This is due to the down ward movement of the ground water towards higher order streams causing shortage of water in the upper reaches of the water sheds and consequent water table decline. Hence ground water recharge and micro water shed based rainwater harvesting has to be implemented in the area to improve the ground water availability.

The ground water recharge programs can be synchronized with soil conservation measures and agricultural practices. Good soil conservation measures would enhance the ground water availability in the watershed. Similarly good agricultural practices would also increase the ground water availability.

ix) Suggested Groundwaterrecharge plan

The recharge plan for this Panchayath has to give emphasis for ground water retention within the concerned watersheds. Even in the present status there remains many chances for recharge due to the landuse and slope distribution within the watershed. The major landuse is mixed crops. Further, it is reported by the local population that the water level in all the wells in the valley section is almost at the surface during the monsoon season but rapidly lowers to 3 or 5m after the monsoon. This shows that there is adequate recharge to the groundwater to saturate the regolith during monsoons but saturation is not maintained due to excessive overland flow / run-

off and accelerated ground water flow due to quality wise and structural degradation of soil profile. The run-off co-efficient calculated for the basin is 0.49 (CGWB, Coastal Kerala Groundwater project).

Both the micro watersheds have a number of open wells. Most of the wells are house hold wells supporting the need for a family or two. The wells are mostly localized in the flat valley as well as in the first order valley heads on the slopes. There is no deficiency in any of these wells during the rainy season but availability in summer is very limited or nil. By construction of perculation pits recharging of ground water into the soil takes place resulting in the increase in the water table. The soil itself will act as a big reservoir of rain water , which will help in providing the required ground water to the ope wells during summer season .

5.1.7. Slope

Slope of an area plays an important role in the developmental activities. The natural phenomenon like erosion, geology, landuse pattern, water availability etc.depends on the slope gradient. The present project area have 7 types of slope categories. 0-1% type slope is more in the study area. 53.38% of the toal area comes under this category. The details are given in the table below.

Table.8. Types of Slope in the project area

Sl.No.	Type of slope	Area in sq.km	Percentage of slope
1	0-1% Level to nearly level	9.76	53.38
2	1-3% Very gently sloping	0.74	4.04
3	3-5% Gently sloping	1.04	5.67
4	5-10% Moderately sloping	3.69	20.17
5	10-15% Moderately steeply sloping	1.79	9.79
6	15-30% Steeply sloping	1.19	6.51
7	>30% Very steeply sloping	0.08	0.44
	Total	**18.29**	**100**

5.1.8. Soils

Soils, their condition, and connective relationships play extremely important roles in controlling the water movement over and through a watershed, studying the relationships among soil properties, soil positions in the landscape and watershed hydrology. This gives us a better understanding and thus helps for better decisions regarding watershed plans and activities.

The physical properties of soil help to determine to a large extent, how a soil can best be used in a watershed development project.Information on soils is vital in planning and management of any watershed programme. For the purpose of the preparation of this DPR, the status of soil of the study area was assessed in terms of its basic parameters namely texture, depth, erosion status and land capability. This was attempted using the data base prepared by the State Soil Survey Organisation.

i)Soil Series

The soils of the study area can be grouped into 10 numbers of soil series. Of these the predominant series Ummannoor,Kottarakkara, Chadayamangalam, Kallada and they occupy 37.88%, 21.25%, 10.66%, 5.02% of the total area respectively. The details are given in table below. Mylom series are located mainly in the valleys and Ummannoor in the side slopes.

Table: 9.Soil series of the study area

Sl.No	Series	Area (sq.km)	Percentage
1	Chadayamangalam	1.95	10.66
2	Kallada	0.92	5.02
3	Karali	0.06	0.34
4	Kottarakkara	3.89	21.25
5	Kunnakkara	0.48	2.64
6	Kureepuzha	0.35	1.93
7	Miscellaneous	0.32	1.74
8	Mylom	3.19	17.44
9	Pooyappalli	0.20	1.10
10	Ummannoor	6.93	37.88
	Total	**18.29**	**100**

ii)Soil Texture

Soil texture refers to the relative proportion of sand, silt and clay particles in a soil. This is an important parameter for the management of the land. The various crop management activities under watershed management have to be decided taking into consideration of the soil texture also.

The study area comprises of 10number of textural classes. Of these the predominant classes are Gravelly loam, Gravelly clay loam and Clay loam.. The details of the different textural classes are given in table below.

Table: 10. Soil textures of the study area

Sl.No	Textural classes	Area (sq.km)	Percentage
1	Clay	0.55	3.00
2	Clay loam	3.42	18.72
3	Gravelly clay loam	5.68	31.09
4	Gravelly loam	6.86	37.53
5	Gravelly sandy loam	0.11	0.60
6	Loam	0.11	0.61
7	Loamy sand	0.28	1.52
8	Miscellaneous	0.34	1.85
9	Sandy loam	0.93	5.04
10	Silty clay loam	0.01	0.04
	Total	**18.29**	**100**

***iii) Depth*:**

Morphological properties of the soil include depth, presence or absence of impermeable layers like clay pan, duricrest etc. The soil must be deep enough to encourage the development of a deeper root system. Impermeable layers like clay pan and duricrest prevent the root system from going deeper into the soil. Similarly operation of different farm implements and selection of cropping pattern is also dependent on the soil depth. The study area in general has moderate to deep soils. The details are given in table below.

Table: 11. Soil depth of the study area

Sl.No	Depth classes	Area (sq.km)	Percentage
1	Deep	5.27	28.79
2	Moderately deep	7.79	42.59
3	Very deep	5.23	28.62
	Total	**18.29**	**100**

iv) Erosion status:

Soil erosion is the process which moves soil from one location to another by wind, water, or other natural actions. It is a natural process unless accelerated by human beings. From a human centered perspective, soil erosion may have several harmful effects. Soil erosion leads to the loss of top soil, depletion of productivity, reduction in moisture retention capacity etc. Silt from eroded soil accumulates in our crop lands in the lower reaches of the watersheds, waterways, reservoirs etc. causative run-off results also in flooding of lower palins. Since the project area is of undulating to steep topography and high intensity of rainfall the problem of erosion is accelerated through unscientific landuse, ignorance, greediness of human beings etc. Hence Erosion status is an important parameter which needs consideration in the selection of different structures and other management practices for developing the watersheds in a sustainable manner. Predominantly the study area is subjected to moderate erosion status. The details of the erosion status in the study area are given in table below.

Table: 12. Erosion status of the study area

Sl.No	Erosion status	Area (sq.km)	Percentage
1	Moderate erosion	12.00	65.65
2	Severe erosion	1.13	6.20
3	Slight erosion	5.16	28.15
Total		**18.29**	**100**

5.1.9.Land use

Landuse pattern of the project area plays an important role in the watershed development programme. It gives the information about the land condition of the area. Watershed development programme mainly aims to develop agriculture in the area. So the study of different types of landuse pattern is very important. The landuse condition of an area reflects the attitude of the community. The present area is under varying types of landuses. The main landuse in the watershed area is rubber plantation. About 48% of the project area is under rubber plantaions (873 hectres). Next to rubber 29.93% (547hectres) of the land is under mixed crops like coconut, banana, arecanut tapioca etc. In addition, homestead farming is also included in the mixed crop category. Paddy cultivation is declining day by day. Presently the extent of paddy field in the watershed is only 15.5 hectares. Lack of agriculture labourers high production cost low income are the main factors dissuading the farmers from this sector. Most of the paddy fields are reclaimed for other crops like rubber,coconut, mixed crops banana and residential purposes. Major builtup includes area under road junctions, hospitals, educational institutions, worship centres, market etc, which is 2.19%of the total project area. In the landuse map this unit has been merged with

the mixed crops/mixed trees categories. The details of landuse in the watershed area is given below

Table:13.Landuse of the project area

No	Landuse	Area in sq.km	Area in percentage
1	Banana	0.019	0.10
2	Coconut+Banana	0.017	0.09
3	Cultivable waste land	0.023	0.13
4	Marshy land	0.218	1.19
5	Mixed crops	5.474	29.93
6	Mixed trees	0.320	1.75
7	Paddy field	0.155	0.85
8	Paddy reclaimed to banana	0.600	3.28
9	Paddy reclaimed to cultivable waste land	0.330	1.80
10	Paddy reclaimed to mixed crops	1.663	9.09
11	Paddy reclaimed to rubber	0.146	0.79
12	Paddy reclaimed to tapioca	0.048	0.26
13	Pond	0.004	0.02
14	Railway land	0.028	0.15
15	Tapioca	0.003	0.01
16	Teak	0.002	0.01
17	Thodu	0.115	0.62
18	Plantation Rubber	8.725	47.74
19	Builtup land	0.40	2.19
Total		**18.29**	**100**

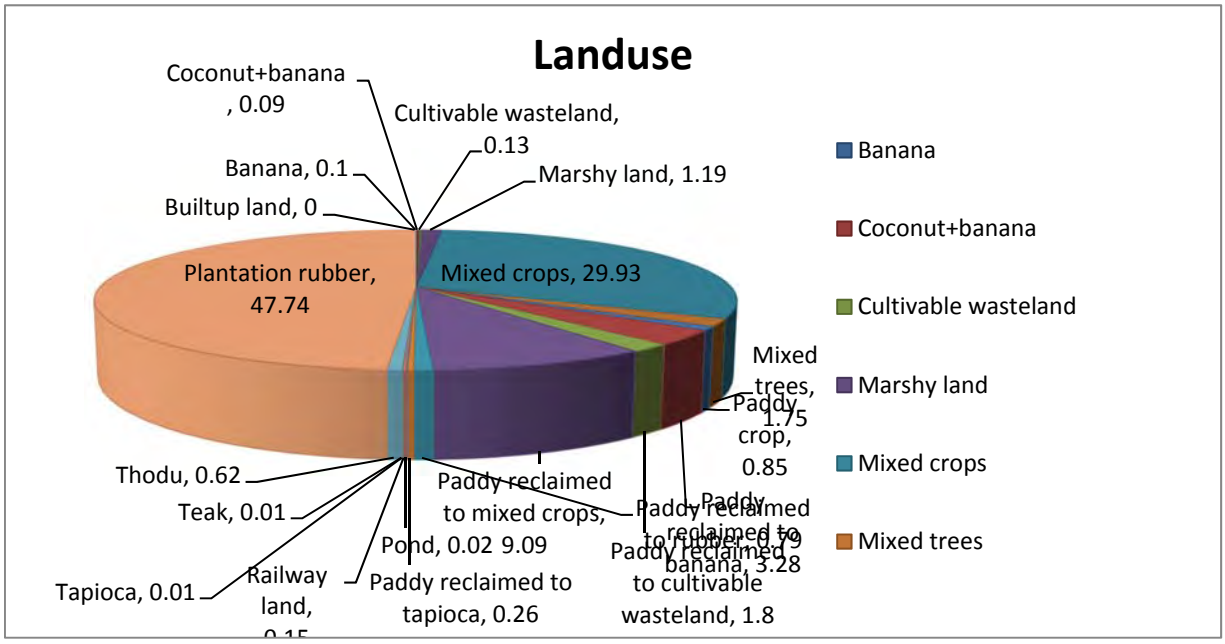

Fig:6. Pie diagram showing the landuse of the study area

5.1.10. Land Capability

Land capability is defined as the inherent capacity of land to be productive under sustained use and specific management methods. Land capabilities are derived by combining the land systems information with climatic, agronomic, and forestry data. Land capability classification shows in a general way the suitability of soils for most kinds of field crops, plantations, forestry etc. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, plantations, risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive land forming that would change slope, depth, and other characteristics of the soils nor

do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Capability classes are the broadest groups and are designated by either Arabic or Roman numerals (I to VIII), which represent progressively greater limitations and narrower choices for practical land use. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have nil or slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to slight erosion but have other limitations, impractical to remove that restrict their use mainly to pasture, rangeland, silvipasture, forestland etc.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to silvipasture, rangeland, tree crops, forestland etc.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter **e, w, s,** to the class numeral, for example, **IIe** represents Class II land with the letter **e** showing that the main hazard is the risk of erosion unless close-growing plant cover is maintained; **w** shows that water in or on the soil interferes with plant growth or cultivation; **s** shows that the soil is limited mainly because it is shallowness, drought, or stones.

The present study area has been grouped into five major capability classes such as Class II, III, IV, V and VI for the purpose of under taking various management activities under the IWMP. Their details are given in the table below.

Table: 14. Land Capability Classes of the study area

Sl.No	Capability Classes	Area (sq.km)	Percentage
1	Class II	4.03	22.03
2	Class III	3.91	21.37
3	Class IV	9.47	51.79
4	Class V	0.03	0.14
5	Class VI	0.85	4.67
Total		**18.29**	**100.00**

5.1.11. Socio-economic situation

i)Demography

Detailed baseline survey was conducted in the area with a view to generate required data base in connection with the DPR. As per the consolidated statistics, the total population of the study area is 19655,of which 9434.are male and 10221 are female (population has been extrapolated for the area from which he data of baseline survey was not received). The socio-economic condition of the people in the study area is comparatively satisfactory. The main source of income is agriculture and from growing rubber. A few cashew factories are functioning in this area. A small fraction of the Watershed Community is engaged in Government jobs. Being a weak sector, farming in the area has a little scope in accommodating much labour force at increased wage rates. This causes labourers to migrate to construction sectors etc. This, in a vicious cycle, restricts the development of agriculture in the area.

However, various schemes are being operated in the areas by State and Central Governments for the socio-economic development of the locality. MGNREGS is playing an exceptionally leading role in ensuring a regular household income in the case of BPL families inhabiting the project areas. The Watershed Community enjoys adequate banking facilities. Puthur, Kulakkada, Kalayapuram and Mylom are some of the prominent locations in the watersheds

Table:15.Population of the study araea

Name of the Watershed	Population			General			SC			ST		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Attuvassery 7K46a	4203	4554	8757	3882	4207	8089	321	347	688			
Madathilkadavu 7K45c	5631	6101	11732	4797	5198	9995	834	903	1737	4	3	7
Total	9834	10655	20489	8679	9405	18084	1155	1250	2425	4	3	7

ii) Animal Husbandary

The Livestock sector is not enterprising in the watershed area. Shortage in fodder supply, higher costs of maintenance and want of adequate grazing lands etc are the major constraints. Most of the paddy fields have been converted for other purposes. Chances of availability of grazing lands have been stolen by rubber. Diseases form another major issue affecting livestock management in the project areas. Despite these bottlenecks, some of the farmers show interest in livestock since they don't have any livelihood options. Certain Milk Marketing Cooperatives are functioning in the area helping these farmers for marketing the produce. But, considerable sections of the Watershed Communities depend on external markets to meet their milk requirements. This document proposes certain measures as indicated below to revive and strengthen the livestock sector of the project area.

Proper guidance and training to the farmers

Introduction of scientific cattle management systems

Provision of adequate economic supported to Farmers

Encouragement of the fodder cultivation in the area

Strengthening of the infrastructure for better livestock management

Ensuring local level marketing facilities

Table:16.Livestock in the watershed area

No	Name of the Watershed	Cow	Goat	Cock	Duck	Rabbit	Buffalo	Others
1	Attuvassery(7K46a)	288	149	923	67	5	1	5
2	Madathil kadavu(7K45c)	376	452	3475	204	59	1	7

5.2. SWOT

SWOT analysis is a tool that identifies the strengths, weaknesses, opportunities and threats of an organization. Specifically, SWOT is a basic and straight forward model that an organization can and cannot do as well as its potentials, opportunities and threats. The method of SWOT analysis is to take the information from an environmental analysis and separate it into internal (strengths and weaknesses) and external issues (opportunities and threatsOnce this is completed, SWOT analysis determines what may assist the organisation in accomplishing its objectives, and what obstacles must be overcome or minimized to achieve the desired results.

When using SWOT analysis,one should be realistic about the strengths and weaknesses of the organization. Distinguish between the present status of the organization and where it could be in the future. Also remember to be specific by avoiding gray areas and always analyze in relation to the competition. Finally, keep the SWOT analysis short and simple, and avoid complexity and over-analysis since much of the information is subjective. Thus, use it as a guide and not as a prescription. To get the most complete, objective results, a SWOT analysis is best conducted by a group of people with different perspectives and stakes in the organisation. Different stake-holders can contribute valid insight for achieving the desired results. Moreover, the SWOT analysis process is an opportunity to bring all together and encourage their participation in and adherence to resulting strategy.

A typical SWOT analysis has been conducted for the project area using a four-square SWOT analysis templateThis method made it easy to organize and understand the results. Brainstorming sessions of people's representatives, local people, progressive farmers and officials were held as a part of this study to identify the factors in each of the four categories for successful planning and implementation of the IWMP and the outcome was compiled. Then **a final, prioritized version of the SWOT analysis**, listing the factors relevant in each of the four areas in order from highest priority at the top to lowest priority at the bottom was prepared which was used in preparing the DPR.

5.3.BUDGET

Table:17.Financial outlay for IWMP of Vettikavala block panchayat

INTERGRATED WATERSHED MANAGEMENT PROGRAMME - VETTIKAVALA (IWMP- 1V)

VETTIKAVALA BLOCK PANCHAYATH, KOLLAM

FUNDING PATTERN - Master Plan for 4 Years

(Amount in rupees)

Year	Administtration	Monitoring	Evaluation	Entry Point Activity	Institution & Capacitybuilding	DPR	Natural Resource Management	Livelihood Activities	Production System &Micro Enterprises	Consolidation	Total IWMP
1st	548700	54870	27435	1097400	274350	274350	2194800	274350	548700		5569305
%	2	0.2	0.1	4	1	1	9	1	2		20.3
2nd	685875	68588	68588		274350		3840900	823050	1097400		7133100
%	2.5	0.25	0.25		1		14	3	4		26
3rd	685875	68588	68588		548700		3840900	1097400	823050		6858750
%	2.5	0.25	0.25		2		14	4	3		25
4th	823050	82305	109740		274350		5487000	274350	274350	823050	7873845
%	3	0.3	0.4		1		19	1	1	3	28.7
Total	**2743500**	**274350**	**274350**	**1097400**	**1371750**	**274350**	**15363600**	**2469150**	**2743500**	**823050**	**27435000**
%	10	1.0	1.0	4	5	1	56	9	10	3	100

Table:18.Financial outlay for Entry Point Activity

Sl..No	Name of the Watershed	IWMP Fund (Rs)
1	7K46a- Attuvassery	430200
2	7K 45c- Madathil kadavu	667200
	Total	**1097400**

Table:19.Financial outlay for NRM activities

INTERGRATED WATERSHED MANAGEMENT PROGRAMME - VETTIKAVALA (IWMP- 1V) VETTIKAVALA BLOCK PANCHAYATH, KOLLAM NATURAL RESOURCE MANAGEMENT ACTIVITIES - Master Plan for 4 Years					
Year	**Name of Watershed**	**Year wise**	**IWMP Fund (Rs)**	**Convergence (Rs.)**	**Total (Rs)**
1	7K 46a Attuvassery	First Year	1073290	2298170	3371460
		Second Year	1567596	3931770	5499366
		Third Year	1638715	3903270	5541985
		Fourth Year	1743199	5328690	7071889
2	7K 45c Madathil kadavu	First Year	1334400	3410415	4744815
		Second Year	2335199	5470391	7805590
		Third Year	2335196	5490391	7825587
		Fourth Year	3336005	7032471	10368476
	Total		**15363600**	**36865568**	**52229168**

Table:20.Financial outlay for Livelihood activities

INTERGRATED WATERSHED MANAGEMENT PROGRAMME - VETTIKAVALA (IWMP- 1V) VETTIKAVALA BLOCK PANCHAYATH, KOLLAM LIVELIHOODS FOR LANDLESS/ASSETLESS - Master Plan for 4 Years					
No.	**Name of Watershed**	**Year wise**	**IWMP Fund (Rs)**	**Convergence (Rs)**	**Total (Rs)**
1	7K 46a Attuvassery	First Year	107550	46093	**153643**
		Second dYear	322650	107550	**430200**
		Third Year	430200	190067	**620267**
		Fourth Year	107550	108000	**215550**
2	7K 45c Madathil kadavu	First Year	166800	71486	**238286**
		Second Year	500400	233538	**733938**
		Third Year	667200	315539	**982739**
		Fourth Year	166800	166800	**333600**
	Total		**2469150**	**1239073**	**3708223**

Table:21.Financial outlay for Production system & Microenterprises

INTERGRATED WATERSHED MANAGEMENT PROGRAMME - VETTIKAVALA (IWMP- 1V) VETTIKAVALA BLOCK PANCHAYATH, KOLLAM PRODUCTION SYSTEM&MICRO ENTERPRISES - Master Plan for 4 Years					
No.	**Name of Watershed**	**Year wise**	**IWMP Fund (Rs)**	**Convergence (Rs)**	**Total (Rs)**
1	7K 46a Attuvassery	First Year	215100	215100	430200
		Second Year	430200	430200	860400
		Third Year	322650	322650	645300
		Fourth Year	107550	107550	215100
2	7K 45c Madathilkadavu	First Year	333600	333600	667200
		Second Year	667200	667200	1334400
		Third Year	500400	500400	1000800
		Fourth Year	166800	166800	333600
	Total		**2743500**	**2743500**	**5487000**

5.4. INSTITUTION BUILDING

Various institutions as stipulated in the Common Guidelines have been set up in Kerala for the purpose of implementing IWMP in the State. They are as shown below.

i) State Level Nodal Agency

The State Level Nodal Agency (SLNA) is constituted by the State Government with Agricultural Production Commissioner as the Chairman and Rural Development Commissioner as the CEO. SLNA is having an independent bank account for the purpose. The SLNA sanctions watershed projects for the State as per the guidelines and on the basis of approved state perspective and strategic plan as per procedure in vogue.

ii) Watershed Cell cum Data Center (WCDC)

Watershed Cell cum Data Center (WCDC) is a separate district level unit of Experts from the related fields. The WCDC functions under the leadership of a Project Manager. WCDC of Kollam is established with its head quarters at PAU, Kollam. This cell looks after the implementation of watershed programmes in the district. WCDC maintains a separate independent account for this purpose. WCDC function in close co-ordination with the District Planning Committee. There is another District Level Coordination Committee to ensure Co-ordination among technologies and line agencies in the implementation of IWMP at the District Level.

iii) Project Implementing Agency (PIA)

Vettikavala Block Panchayat is the PIA of this project as approved by the SLNA. The Project Implementing Agency (PIA) of this project shall discharge all of its duties as per the stipulations in the Guidelines of the programme. The **'Agriculture and Ecosystem System Management Group' - AGES** – is an Organization identified and contracted, on the basis of the clauses in the Guidelines of the programme, as the Technical Support Organisation –TSO-

to provide necessary technical support to the PIA in the preparation of the DPR and in formulating and carrying out the Capacity Building Action Plans related to this Project.

iv) Watershed Development Team (WDT)

Watershed Development Team is an integral part of the PIA and is set up by the PIA as per the directions of SLNA. WDT has seven members, broadly with knowledge and experience in agriculture, soil science, water management, social mobilization and institutional building. WDT functions in close collaboration with the team of experts at the district and state level. The expenses towards the salaries of the WDT members are met from the administrative provision of the PIA. WDT guides the Watershed Communities to organize into SHGs and UGs.WDT shall assist the Watershed Sabha in constituting the Watershed Committee and in their proper functioning. WDT shall attend to duties and responsibilities including the conduct of engineering surveys, preparation of engineering drawings and cost estimates for the structures to be built, preparation of action plans, monitoring, checking, assessing, undertaking physical verification and measurements of the works as specified in the Guidelines for the success of the project.

v) Self Help Groups and User Groups

The process of organizing the total Watershed Community is under progress. Details regarding the principles of Group Formation are described in Part I of this document.. Assessment of their performance is on with a view to rank them on the basis of eligibility for assistance under the programme. The process shall be continued by the WDT till completing the grading and ranking all the Groups formed in the watersheds.

vi) Watershed Committee(WC)

It is the executive committee of Watershed Sabha pertaining to each micro watershed to implement the watershed projects with technical support of WDT in the micro watershed areas. WC consists of 10 members including the Chairperson. 5 of them shall represent five efficient SHGs (one active member from each SHG) and the other 4 shall represent five efficient UGs (one active member from each UG). The Watershed Committee bears representation of sections like Small and Marginal Farmers, SCs, STs and WomenEach Watershed Committee has to be registered under the Societies Act or it may act as the subcommittee of the Panchayath Grama Sabha on the basis of specific orders.The Watershed Committee has a separate bank account to operate the funds for the watershed project.The WC shall perform as per related directions/orders.

5.5 CAPACITY BUILDING

Capacity building, also referred to as 'Community capacity development', is a conceptual approach to development that focuses on understanding the obstacles that inhibit people, governments, international organizations and non-governmental organizations from realizing their developmental goals while enhancing the abilities that will allow them to achieve measurable and sustainable results.

Community capacity building often refers to strengthening the skills, competencies and abilities of people and communities in developing societies so they can overcome the causes of their exclusion and suffering.

IWMP emphasises the essentiality for building the capacity of different stake holders during the different phases of the project period from planning to

implementation covering baseline survey, preparation of DPR, watershed development works, livelihood activities, production systems and microenterprises etc. Specific Action Plans of Capacity Building and IEC have been developed for each micro watershed under this project and the same has been incorporated into this document.

As part of preparing this DPR, Capacity building activities were carried out for the benefit of the people's representatives, farmer's, officers, NHG members etc of Vettikavala block panchayat. The details are given below.

Table:.22. Summary of Capacity building activities adopted for preparing this DPR

No.	Activities	Location	Date	No of Participants
1	Block Level Seminar	Vettikavala Block Panchayat Office	30.05.2013	83
2	Gramapanchayat Level Seminar-Kulakkada GP	Auditorium,Mavady	12.06.2013	83
3	Gramapanchayat Level Seminar-Mylom GP	Mylom Gramapanchayat Office hall	20.06.2013	86
4	118 NHG formation training meetings	Different parts of Kulakkada and Mylom gramapanchayat project area.	Between 10.07.2013 and 09.08.013	
5	Baseline survey training	Vellaramkunnu LPS	10.08.2013	155
6	Baseline survey training	Puthurmukku Librarary	14.08.2013	50
7	Baseline survey training	Bharath Tutorial	14.08.2013	42
8	Baseline survey training	Poovattur HSS	15.08.2013	69
9	Baseline survey training	Poovattur HSS	16.08.2013	156
10	Baseline survey training	Ray Tutorial, Puthur	16.08.2013	50
12	PRA	Kulakkada HSS	30.08.2013	72
13	PRA	Perumkulam Anganvadi	10.09.2013	63
14	PRA	Mar Ivanios Bethany HSS,Kalayapuram	21.09.2013	85
15	Officer's Training	Vettikavala Block	01.10.2013	

		Panchayat Office		
16	Focussed Group Discussion(Kulakkada gramapanchayat)	Aiswarya auditorium	09.10.2013	50
16	Farmer's Training	Vettikavala Block Panchayat Office	25.10.2013	
17	Review Meeting(Attuvassery WS)	Aiswarya auditorium	13.11.2013	51
18	Review Meeting(Madathil kadavu WS)	Kalayapuram	13.11.2013	86
19	Block Level meeting for finalisinf DPR	Vettikavala Block Panchayat Office	27.11.2013	25

5.5.1Training plan

The main aim of the training plan is to strengthen the skills, competencies and abilities of people and communitiesin developing socities in order to overcome the causes of their exclusion and suffering.The following training programme will be carry out during the project period . These trainings wiil help to equip various stakeholders for effective participation and implementation of the project. The action plan for the coming years is given in the table.23.

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Table:No.23. CAPACITY BUILDING ACTION PLAN (Broad)*

No.	CLIENTILE GROUP	FOCUS TOPICS	TRAINING DURA-TION	PARTICI-PANTS	BATCHES	No of TRAIN-INGS FOR EACH BATCH	*TOTAL COST IN RS
01	Elected Members of PRIs	1.Watershed concept and approach 2. Features of IWMP 3. involvement and responsibilities of Community 4.Role of PRIs	1 day	25 (inclusive of next term also)	1	3	**11050**
02	Officers of Line Departments	1.Watershed concept and SPSP 2. Features and components of IWMP 3. Convergence of Inputs and Technology in IWMP 4.Modality of Planning and implementation	1 day	30	1	4	**18000**
03	NHGs, Focus Groups, Interface Groups, Key Persons, Survey Volunteers etc	1.Watershed concept and SPSP 2. Features and components of IWMP 3. Convergence of Inputs and Technology in IWMP 4.Modality of Planning and implementation	1day	300	6	5	**274350**
04	Watershed Committee	1.IWMP Guidelines 2.Role and Responsibilities of WC 3.NRM activities in IWMP 4.Production Systems in IWMP 5.Livelihood Activities and Seed Money in IWMP 6.Common Property Resources Management 7. Consolidation Phase 8. Field Visit and Discussion	3Days	30 (inclusive of ex-officio members)	1	4	**54000**
05	PERSONNEL OF MGNREGS including ADS and CDS members	1. Watershed concept and approach 2. Features and components of IWMP 3. Convergence of IWMP and MGNREGS 4. Modality of convergence and implementation	1 day	150	3	3	**67500**
06	Land owners	1.Watershed concept and approach 2.Significance of Natural Resources 3.Conservation and Management of NRs 4.Important features of Common Guidelines 5.Role of Watershed Community in NRM	1 Day	300	10	3	**135000**
07	SHGs and Joint Liability Groups	1.IWMP Guidelines 2.Role and Responsibilities of SHGs and JLGs 3.Livelihood Activities under IWMP 4.Group Action and Seed Money Management 5.Common Property Resources Management 6. Consolidation Phase 7. Field Visit and Discussion	2Days	300	10	2	**165000**
08	Users' Groups	1. Watershed concept and approach 2.Features of IWMP 3 Production Systems under IWMP 4 .Users' Groups: their Roles and Responsibilities 5.Field Visit and appraisal	2 Days	300	10	2	**165000**
09	Block Development Society and Watershed Development Society	1. Watershed concept and approach 2.Features of IWMP 3.Livelihood Systems under IWMP 4. Production Systems under IWMP 5 .Social Groups and their Roles and Responsibilities 6. Project assistance to the SHGs under IWMP	2 Days	15	1	2	**9000**
10	PROJECT STAFF and Local Resource Persons	1. Watershed concept and approach 2.Features of IWMP 3. Modality of convergence and implementation 4. Responsibilities of Project Staff under IWMP 5.Management of Project Funds 6.Book Keeping and Accounting and Auditing 7.Reporting	2 Days	20	1	2	**11000**

11	Selected SHG Members	Skill Development in livelihood options	5 Days	50	5	1	**37500**
12	Seleted innovative Members of UGs and SHGs	Exposure -cum –Study Visits to Success Stories and institutions	4 Days	20	1	1	**150000**
	TOTAL			1545	58		**1097400**

*Since Trainings under the Project are organized at the WCDC and PIA levels, Detailed Training (Capacity Building) Action Plans for **each level and year** shall be drawn up at the corresponding levels separately in accordance with the organizational convenience and requirement within the limits of this broad Action Plan and subsequently made a part of this document

5.6.IEC ACTION PLAN

The message of IWMP should be passed on to the total watershed community. For this some informatic and educative event's and programmes should be taken up during the project. The following events will be considered to be undertaken in the project as the part of IEC. Suitable schedule shall be drawn up and executed during the relevant junctures of the project.

Table:24.IEC ACTION PLAN (BROAD) *

No	Particulars	*Amount in Rs.
01	**Watershed Carole distributing brochures and Stickers in potential areas**	4000
02	**World Water day, World Environment Day, World Earth Day celebrations**	3850
03	**Demonstrating Watershed by means of Models and Pictures**	2500
04	**Posters, Stamps, calendar, Watershed message-cum-greeting cards etc for School Children, installing Watershed Notice Boards**	4000
05	**Publication of Yearly Watershed Bulletins**	15000
06	**Gramapanchayat Level Seminars**	25000
07	**Organising Environment Gramasabha and Parliaments in Educational institutions**	15000
08	**Distribution of planting materials**	50000
09	**Cleaning and renovation of water resources**	75000

10	**Film show/puppet show/monkey show/street drama/Quiz competitions**	30000
11	**Enviromental notice boards**	15000
12	**Formation of Environmental clubs**	10000
13	**Scrolling in local TV channels**	15000
14	**Organising cycle rallies**	10000
	Total	**274350**

*Since IEC programmes are organized at the WCDC and PIA levels, Detailed IEC Action Plans for each level and year shall be drawn up at the corresponding levels separately in accordance with the organizational convenience and requirement within the limits of this broad Action Plan and subsequently made a part of this document

5.7. WATERSHED DEVELOPMENT WORKS

Watershed development conceived in this report mainly involves the construction/formation and installation of various means to conserve rain water in-situ and to reduce soil erosion is as water and soil are the basic resources needed to realize the objectives of this project and efficacy of it. A ridge to valley approach is followed in the practice.Enhancement of Biomass and Biodiversity is another major focus. All these constitute the Natural Resources Management(NRM) component of this project. 56% of the total project cost is tobe utilized for this. Major interventions proposed under this component are described hereunder.

5.7.1. Natural Resources Management (NRM)

NRM Component of this project includes the conservation, implementation and rational utilization of rain water, top soil and biomass in the watershed for productive purposes in a sustainable manner. A ridge to valley approach is followed in the implementation of soil and water conservation activities. The strategy covers the following principles.

a) Protect sloppy land from the hazards of erosion and excessive runoff.

b) Avoid siltation of structures in the middle and lower catchments.

c) Ensure the cost effectiveness of structures in the valley.

d) Improve overall efficacy of the measures.

e) Enhance the soil moisture and ground water status of the watersheds.

g) Sustain productivity of the watersheds.

Soil and Water Conservation Works

The watershed development works proposed in this document are to be implemented from ridges to valley. Accordingly, the treatments are divided into ridge area treatments, slope area treatments, plains or flat level area treatments and drainage line treatments. Different treatments are planned for each microwatershed on the basis of the hydro-geological and topographic conditions of the concerned areas. Brief descriptions of the various activities are given below:

i) Earthen bund:

It is a method popularly used in watershed management. These are earth structures constructed along the countours in areas with lesser slopes. The structures are designed on hydrologic principles. The vertical intervals are determined using Ramser formula. The material used for this method is the earth collected from the same area where it is constructed. Earthen bund is constructed in moderately slopping areas

ie. < 20% to prevent the erosion and to increase the seepage of water to the underground.

***ii)Contour Trenches* :**

It is a simple, and a low-cost intervention for checking the velocity of runoff in the ridge area of the watersheds. Contour trench can be formed in lands having slope upto 20%. Excavated soil shall be used to form Bunds along the downstream edges of the trenches. This will better soil moisture conditions and enhance rechargein the upper catchments. But, if trenches are not to follow contour, it would cause complex erosion problems.

***iii)Staggered Trenches*:**

In medium rainfall areas with highly dissected topography, staggered Contour Trenches are adopted. The work involves excavating trenches of shorter lengths in rows with inter spaces between them. The length of the trenches is kept short around 2-3 m and the spacing between the rows may vary from 3-5 m. The chances of breaches of SCT are less as compared to Continuous Contour Trenches. The staggered trenches are also usually recommended in slopes upto 20%. Therefore instead of making trenches continuously, they should be made in a staggered and discontinuous manner.

iv) Centripetal Terracing:

These are circular terraces formed around trees with inward slope towards the base of the plants, to retain the stem flow about the root zone. It would be appropriate to

make the circle bigger enough to trap the direct fall from canopy also. In Kerala it is a common method adopted in the case of coconut trees. By adopting this technique in coconut plantations, we can store and increase the seepage of water during the rainy season. This will subsantially enhance the productivity of coconut palms.

***v)Percolation pits*:**

These are small pits with varying dimensions opened in areas with gentle to moderate slope. These pits can also be called rain water harvesting pits. These pits are useful for entrapping and utilizing run-off for enhancing the recharge of ground water. The size of the pits shall be 1MX1MX1M, 2MX2MX1M, 3MX3MX1M etc. This can be taken in the open ground or between trees. This intervention shall improve soil moisture status. It is recommended to remove and recycle the silt collected in them during the monsoons to sustain the efficiency of these pits.

vi) Live Fencing:

Live fencing is a low cost multipurpose method used in watershed management practices. It involves the process of establishing live fences along borders of holdings using cuttings of sps like Cassia, Hybiscus, Lettuce, Glaricida, Tapioca, etc This will help to check erosion, to improve the biomass and protect the crops by enabling shelter to natural predators. Foliage of these sps can be used for a variety of purposes.

vii) Fodder Grass/Cover crops:

This is the practice of raising fodder grasses and cover crops with the objectives of preventing soil erosion, providing fodder and increasing the biomass. These practices

are ideal for the management of waste lands, sloppy lands and plantations. The root binding action of these species stabilizes the soil, improve the water holding capacity, improve the soil structure etc. Raising of cover crops is a common practice in the rubber plantations of Kerala. Certain species of fodder grass/cover crops enhance the soil nitrogen fixing, thereby improving the fertility of the soil.

viii) Ridges and Furrows

This is a very effective method for harvesting rain water and for controlling soil erosion by way of run-off in gently sloping lands. It involves the formation of alternate ridges and furrows along close contours.This intervention will enhance recharge of the local water table in a tremendous way. The ridges can be used for raising fodder or pulses also.

ix) Stone pitched contour bunding (SPCB):

Stone pitched contour bunds are embankment like structures, constructed across the slopes along the contour. Usage of jungle stones locally available for making these bunds will substantially reduce the cost of bunds. This is recommended in land holding having slopes upto 30% and in all types of relatively permeable soils in accordance with need and availability of funds. The contour bunds will divided the entire area into several small parts thereby the effective slope length of the area gets reduced. The main criterion for spacing of bunds is to intercept the water before it attains the erosive velocity. The vertical interval depends on the slope, soil, rainfall, cropping pattern,

conservation practices adopted etc. The reductions in slope length reduces the soil erosion and also retain the runoff water from the upstream area of the bunds.

x) SPCB Repair:

Repairs and maintenance of partially damaged existing conservation structures are very important to ensure the cost effectiveness of investments already made in the project.area. As part of follow up and maintenance, the top layers of old Stone pitched bunds can be repaired by replacing the loose top layers with new set of stones.

xi) Agrostology:

Agrostology is the scientific management of the grass species. Suitable grass species are often included in the process of watershed management. The fibrous roots of grass will bind and protect soil from erosion and will help enriching them. The decaying roots add to the humus content of the soil also. It also improves the soil structure. It also provides substantial quantity of fodder for the livestock in the area. This document strongly proposes to establish fodder grass to reinforce all contour treatments undertaken in the watershed.

xii)Agro:-forestry:

It is an integrated approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock.It combines agriculture and forestry technologies to create more diverse, productive, profitable, healthy, and sustainable land-use systems. In Kerala this can also be adopted as part of waste land management . This

practice also involves planting fuel wood trees and fodder value species on about the bunds and boundaries of agricultural fields.

xiii)Horticulture:

Horticulture is the science, technology, and business involved in intensive fruit plant cultivation and management for human use. It is practiced from the individual level in a garden up to the activities of a multinational corporation. It is an important activity in watershed management. It is very diverse in its activities, incorporating plants for food eg. fruits, vegetables, mushrooms, culinary herbs and non-food crops such as flowers, trees and shrubs, turf-grass, hops, medicinal herbs etc. It also includes related services in plant conservation, landscape restoration, landscape and garden design/construction/maintenance, arboriculture, horticultural therapy, and much more. This range of food, medicinal, environmental, and social products and services are all fundamental to developing and maintaining human health and well-being. This project suggests planting of adequate number of horticulture plants in the area.

B) Renovation and protection of existing water sources

This includes activities such as stream bank stablisation, embankment protection and desiltation of reservoirs, tanks ponds etc. This will enhance their life and will provide safe and sufficient quantity of water to the human beings and the livestock. The under mentioned activities are also envisaged under the IWMP.

Stream bank protection activities

Stream bank protection is the stabilization of the side slopes of a stream. Stream bank protection can be vegetative, structural, or a combination of both (bio-engineering) in which live plant materials are incorporated into a structure. Vegetative protection is the least costly and the most compatible with natural stream characteristics. Additional protection is required when hydrologic conditions have been greatly altered and stream velocities are excessively high. Stream bank protection is often necessary where the stream banks fail and erode because they exist in a dynamic environment that is constantly subjected to various forces.

Providing vegetative support using suitable sps, construction of various structural supports to the stream banks are the major interventions proposed in this DPR for the protection of the banks of drainage lines in the project area. The ephemeral drainage lines originating in the ridge areas need to be given deserving priority.

Desiltation and protection of ponds, tanks and wells:

Ponds, tanks and wells are the other common source of safe water for domestic use especially among the rural community. Often these sources lose their desired quality as part of siltation from the upper catchments, due to unscientific land management, severe erosion and other biotic activities etc. This needs frequent desilting either through manual or mechanical means depending upon the quantity of silt to be collected. In addition to desiltation, protection of the embankments and sides of these sources also needs to be taken up. The protection measures can be vegetative, mechanical or in combination of both. On the basis of individual requirement, estimates

have been prepared and the same are incorporated into this document. the works are to be executed in accordance with related directions .

Gully Plugging

This involves the adoption of various measures taken up in connection with the control of the advancement of gullies identified in the watershed area:Major interventions are as indicated below.

i)Brushwood checks dams

Brushwood check dams are made of sprouting plant stem/root cuttings and brushwood placed across the gullies. The main objective of brushwood check dams is to hold fine material carried by flowing water in the gully. Small gully heads which are not deeper than one meter can also be stabilized by brushwood check dams. Brushwood check dams are gentle structures and should not be used to treat ongoing problems such as concentrated run-off from roads or cultivated fields. They can be employed in connection with land use changes such as reforestation or improved range management until vegetative and slope treatment measures become effective

ii)Structural measures

Some of the gullies in the watersheds become excessively active during the monsoons. Gullies are secondary symptom of misuse of land over a period of time. When the rain water runs through sloppy terrains, gullies are formed. The width and length of the gullies depend upon the velocity of the runoff and nature of the surface material. This problem can be controlled with the help of arranging checks made of appropriate cost effective materials like wood logs, boulders, Rubble, cement concrete

etc across the flow direction and at suitable vertical intervals. Loose Boulder Checks, Check dams, Cross Bars, Ramps etc are the major proposals

5.8. LIVELIHOOD ACTIVITIES

One of the key activities that forms an integral part of IWMP is the adequancy of opportunity for a variety of livelihood options for the assetless of the concerned watershed community.. Nine percent of the total project cost has been assigned for this purpose. This component aims to maximize the utilization of potential generated by watershed activities to sustain livelihoods mainly based on natural resources and to facilitate enhanced incomes for households within the watershed area. This will facilitate inclusiveness through enhanced livelihood opportunities for the poor through investment into assets, improvements in productivity and income, and access of the poor to common resources and benefits and augment the livelihood strategy at household level.

5.8.1 Guiding Principles

Livelihood improvement initiative under IWMP emphasizes on natural resource based activities on the basis of the principles of equity, gender sensitivity and transparency. It strives to:-

a. Enhance livelihood opportunities for the poor through investment into asset creation and improvement in productivity and income.

b. Improve access of the marginalized communities, including SC/ST, landless/assetless people, women, etc., to the benefits.

c. Select the beneficiaries in a transparent manner.

Livelihood guidelines for landless/ assetless households aims at improved house hold income, participation and division of labour, access to information, knowledge, appropriate technologies and resources.

5.8.2 Planning and Implementation

The most important aspect is the inclusion of ‘micro level livelihood planning’ as an empowerment tool for the marginalized communities. This planning helps in understanding existing livelihood assets/capitals managed by various SHGs in a participatory manner to augment the existing livelihood platform and in promoting suitable livelihood options among newly formed SHGs in the watershed area.

a) Planning

i) An awareness drive was undertaken at Panchayat level for communicate with & sensitise the target beneficiaries.

ii. A "Livelihood Action Plan" (LAP) was prepared by analyzing the socio-economic conditions and existing livelihood capitals of the watershed by means of PRA and focus group discussion and included in this DPR. The Livelihood action plan contains schedule of activities/ interventions, No. of SHGs to be assisted, expected outcome etc.

iv. The DPR conceives convergence of activities/components, from other employment generating programmes such as MGNREGS, NRLM, Kudumbasree, VFPCK, NHM, etc.

b) Mode of Operation

i. The livelihood action plan will be implemented through Self Help Groups and/or their federation. Individual Groups proving their eligibility by performance shall be given Seed Money to an extent of Rs. 25,000 by the WC on the basis of grading and ranking which should be returned to the WC in 18 installments.

ii. Livelihood activities will be carried out either through the existing SHGs maintaing good performance level or new SHGs formed with a group of 5-20 persons.

iii. SHGs selected for implementing livelihood action plan will be homogeneous in-terms of their existing livelihood capitals, common interest and need.

iv. SHGs can undertake any permissible activity jointly as a group or the group may decide to support individual(s) for the activities under the umbrella of the main SHG. In case of individual support under the SHGs, the individuals will be accountable to the main SHG for finances and performance.

v. The financial support to enterprising individuals who prepare and submit a viable livelihood proposal, will be considered by Watershed Cell cum Data Centre (WCDC) on the recommendation of the Watershed Committee (WC). The plan has to be approved by the WCDC before extending financial support. However, support to individuals should not exceed 10 % of funds under the livelihood component.

5.8.3 Funding pattern

The funding pattern under the livelihood components will be as follows

1.	Seed money for SHGs	70% of 9% of project fund
2	Funding for Major Livelihood activities	30 %of 9% of project fund

5.8.4 Capacity Building for Beneficiaries

The capacity of the SHGs in the Watershed needs to be developed through a series of focused trainings and skill development process. An action plan related to this has also been developed and included in this DPR. It has been prepared after a detailed livelihood analysis. The expenditure for the training for livelihood component will be met from 5% of the budget component of the project cost earmarked for institution and capacity building.

5.8.5 .Budget

The distribution of project budget under the livelihood activities for the landless/asset less households for the two micro watersheds under the project has been worked out as follows.

Table:25.Financial outlay of livelihood activities

No	Name of micro watershed	Amount in Rs.
1	Attuvassery (7K46a)	967950
2	Madathi kadavu (7K45c)	1501200
	Total	**2469150**

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5.8.6. Major proposals

Certain livelihood proposals suitable for the project area are as follows

Table:26. Suggested activities under livelihood

	Activities		
	SHGs	**Enterprising Individuals**	**Major Livelihoods**
1	Pickle making	Cow rearing	Goat farm
2	Curry powder	Goat rearing	Poultry unit
3	Flour making	Rabbit rearing	Small restaurant
4	Soap making	Bee keeping	Cover making unit
5	Bakery	Mushroom cultivation	Agri-Horti Collection centre
6	Dairy Products	Cloth bag making	Agro-based processing unit
7	Inland Fisheries	Vending vegetables/Fruits	Vermi-composting
8	Sale of vegetables/Fruits		Nursery
9	Cloth bag making		Agricultural Labour bank
10	Mushroom cultivation		
11	Nursery		

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5.9. PRODUCTION SYSTEM AND MICROENTERPRISES

One of the important components in this watershed development project under IWMP includes support to production/farming systems and related microenterprises. Ten percent of the total project cost is assigned to support the production systems and microenterprises of land owning households. This component aims to diversify and maximize the production and productivity of agriculture system as a whole and targets the land holders with cascading benefits to landless agriculture labour, leased -in farmers and share -croppers.

i) Objectives:

a) Promote diversified production/farming systems based livelihood activities/ interventions.

b) Encourage farmers to adopt and up-scale successful experiences of proven technologies, integrated farming systems and improved farming practices for livelihood augmentation.

ii) Planning and Implementation:

a. The status of natural resources potential in the area was analysed to determine the befitting production system and microenterprises based livelihoods conducive to the socio economic situation and existing livelihood capitals of the watersheds in a participatory manner, during the group discussions and user interactive workshops organised as part of the DPR preparation of the project.

b. An action plan was prepared for production systems and related microenterprises such as aquaculture, horticulture, agriculture, agro-forestry, animal husbandry, microenterprise, agro- processing, value addition, marketing etc for the project area.

c. To ensure convergence with other production system and microenterprises. The PIA should work in close association with schemes such as MGNREGS, NRLM, VFPCK, Kudumbasree, NHM, RKVY, NFSM, etc.

iii) Mode of Operation and Eligibility for Availing the Production System Funds:

a. Individual land holders/owners can avail the benefits of production system on their private land. The small and marginal farming households, women headed farming households, SC & ST farmers will be given preference based on the wealth ranking exercise conducted during PRA. Those households whose land is in close proximity to the developed natural resources may be preferred to make full use of natural resource potential.

b. Selection of beneficiaries will be done by PIA, in consultation with WC.

c. Beneficiaries having common interest will be organised into User Groups to pool and manage their resources as well as manage aggregating their produce for effective disposal and marketing, besides maintaining their natural resource base. This may also provide a means for deciding resource use arrangements based on equity and sustainability.

d. The funds were earmarked for cost intensive farming system based livelihood activities/interventions such as aquaculture, agriculture, horticulture, agroforestry, animal husbandry, agro-processing, value addition, etc.

e. The beneficiary contribution of farmers will be 20 percent for general category and 10 percent for SC/ST.

iv) Capacity Building of Beneficiaries:

The capacity building action plan for the concerned beneficiaries is also included in this document. The capacity building aims at skill enhancement and not just knowledge and information. The expenditure for the training for livelihood, production systems and micro enterprises and IEC will be met from 4% of the budget component of the project cost earmarked for institution and capacity building.

v) Major interventions suggested

Some of the activities preferable under this component in the project areas are found to be as follows.

Plantain Units	Fruit plant Units	Mini Dairy Units
Pepper plant Units	Vegetable Units on terraces	Tuber crops Units
Cow rearing Goat rearing	Rabbit rearing	Bee keeping

Mushroom cultivation Organic Vegetable cultivation Inland Fisheries Organic banana cultivation Bush jasmine cultivation Bio-industrial watershed

5.10.BUDGET

The distribution of budget provision under the Production Systems and Micro Enterprises for the micro watersheds under the project isindicatedbelow **T**

Table:27.Financial outlay of Production system and MicroEnterprises

No	Micro watershed	Amount in Rs.
1	Attuvassery (7K46a)	1075500
2	Madathilkadavu(7K45c)	1668000
	Total	2743500

6.0.ENTRY POINT ACTIVITY

The Common Guidelines suggests taking up certain activities demanded by the watershed Community at the Entry Point of the project. This Entry Point Activity shall be carried out before the commencement of the Works Phase of the Project. It shall be carried out in a very participatory and decentralized manner. The group of individuals proposing and carrying out the EPA shall contribute at least 5% of the cost involved towards the Watershed Development Fund. They can contribute in labour and kind also. in the case of contribution as labour or in kind, amount equal to the value of the same shall be withdrawn from the project fund and deposited in the WDF.

PRA can be a proper tool in identifying suitable activities to be taken up at the entry point. The primary purpose of EPA is to meet a part of the felt needs of the Watershed Community in the preparatory phase itself so that the community can

understand the methodology of participatory implementation of the project. So also it helps developing the capacity of the Community in the process and building up its capacity to take up the project in a proper manner.4 % of the project cost can be utilized for completing the EPA.Certain Entry Point Activities have been identified in the watersheds under the project. The activities were identified in a participatory manner during the process of PRA, Focus Group discussions and Transect walks. An action plan of EPAs in the watersheds has been prepared and the same is furnished below.

6.1. ENTRY POINT ACTIVITIES PROPOSED IN THE PROJECT AREA

The entry point activities of the IWMP in the two micro watersheds namely Attuvassery (7K46a) and Madathilkadavu (7K45c) of Vettikavala Block Panchayat includes construction of field bund, percolation pits, gully checks, stream bank stabilization, cross bar, ramps, concrete foot slabs, distribution of Hot box and water quality analysis. The total financial outlay earmarked for these activities is Rs. 430200 and Rs. 667200 for Attuvassery (7K46a) and Madathilkadavu (7K45c) respectively.

Construction of three tractor ramps and 15 numbers of concrete foot slabs are proposed for the paddy field in Attuvassery micro watershed which is presently under good paddy crop. The tractor ramps will provide easy movement for the farm machineries there by promoting farm mechanisations in paddy cultivation. The portable 15 numbers of concrete slabs will help the farmers to cross the streams during farm operations and for carrying various inputs and products within the paddy fields. This will

help and motivate farmers to make the paddy farming more economical and sustainable. The total anticipated expense for these activities are Rs.97305.00.

Recharging of rainwater will help in increasing the ground water table which is an essential component for mitigation of drought in the watershed area. One of the activity proposed for its fulfillment is preparation of percolation pits at appropriate locations in the watershed area before the onset of monsoon. The pits suggested are of three specifications as mentioned in this DPR. This recharge mechanism will increase the water table level in wells which are a main source of water resource for domestic use in the watershed area. The total amount earmarked for the purpose is Rs.70818.00. Another activity proposed is the distribution of 400 and 500 numbers of Hot Boxes in Attuvassery (7K46a) and Madathilkadavu (7K45c) watersheds respectively. The Hot Boxes will be supplied by Kerala Sasthra Sahithya Parisha for which an amount of Rs. 2,25,000.00 has been provided. This will help in energy saving of conventional energy and also in promoting the use of non-conventional energy for domestic purposes.

It is seen that in some locations, the quality of ground water is not up to the desired level for domestic consumption. Hence under this project it is proposed to undertake water quality analysis in the two micro watersheds. The analysis will be under taken for 2000 well samples in the study area. This will be carried out through selected local volunteers using field kits. The selected volunteers will be given required training with the support of Capacity and Community Development Unit of Ministry of Water Resources, Government of Kerala. An amount of Rs. 30000.00 has been provided for the purpose to meet the related expenses.

Some of the locations in both the micro watersheds are under moderate to severe soil erosion hazards which is evident for the formation of rills and gullies in these areas. In such locations it is proposed to construct gully control structures and cross bars to reduce the velocity of runoff and to check the soil erosion. Total number of 55 gully control structures and 35 numbers of cross bars are proposed under EPA in the project area by expanding a total amount of Rs.4,09,775.00. Similarly as part of EPA, stream bank stabilization through engineering measures up to a height of 1.00 mt are also proposed for 75 RM in the study area. An amount of Rs.2,18,715.00 is earmarked for the purpose.

In addition to all the above mentioned activities, construction of a field bund has been included as one of the entry point activity in the Attuvassery micro watershed by expending an amount of Rs.45928.00. This will provide necessary protection for the crop fields from erosion problems and also will serve as foot path for the movement for school students and local people.

Table:28.Entry point activities

TOTAL	: 1829 Ha Rs.247.35 L EPA 1097400/-
ATTUVASSERY	: 717 Ha Rs 107.55 L EPA Rs 430200/-
MADATHILKADAV	: 1112 Ha Rs 166.8 L EPA 667200/-

Items	Attuvassery Watershed		Madathilkadav Watershed	
	Qnty	Amt	Qnty	Amt
Water Quality Analysis	1000 Wells	15000	1000 Wells	15000
Percolation Pits	168 M3	18648	470 M3	52170
Gully Check s	15 Nos	92580	40 Nos	246880
Cross Bars	10 Nos	20090	25 Nos	50225
Bank Stabilisation	15 RM	40695	60 RM	178020
Cooking Box	400 Nos	100000	500 Nos	125000
Ramps	3 Nos	79380		0
Slabs	15 Nos	17925		0
Field Bund		45928		0
Total		**430246**		**667295**
		+46		**+95**

7.0.PROJECT PERIOD

Implementation of IWMP in the identified areas will be completed in 4-7 years and in three Phases. The phases and major activities under each Phase are as indicated below.

7.1.PREPARATORY PHASE

A. The major objective of this phase is to build appropriate mechanisms for adoption of participatory approach and empowerment of local institutions (WC,SHG, and UG). WDT will assume a facilitating role during this phase. This phase will include:

a. Taking up entry point activities to establish credibility of the Watershed

Development Team (WDT) and create a rapport with the village community. The entry point activities, inter-alia, will include:

i.Works based on urgent needs of the local communities such as revival of common natural resources, drinking water, development of local energy potential, augmenting ground water potential etc.

ii. Repair, restoration and upgradation of existing common property assets and structures (such as village tanks) may be undertaken to obtain optimum and sustained benefits from previous public investments and traditional water harvesting structures.

iii. Productivity enhancement of existing farming systems could also be an activity that helps in community mobilization and building rapport.

b.Initiating the development of Village level institutions such as Watershed Committees (WCs), Self-Help Groups (SHGs) and User Groups (UGs) and capacity building of different stakeholders on institutional and work related aspects.

c.Environment building, awareness generation, undertaking of intensive IEC activities,creating involvement and participatory responses.

d. Baseline surveys needed for preparation of Detailed Project Report (DPR), selection of sites and beneficiaries. Every effort must be made to collect gender-disaggregated data to adequately reflect the situation and priorities of women.

e. Hydro-geological survey of the watershed to map out zones of potential ground water recharge, storage and sustainable groundwater utilisation.

f. Building up a network of technical support agencies.

g.Preparation of the DPR, including activities to be carried out,selection of beneficiaries and work-sites and design and costing of all works, ensuringthat the interests, perceptions and priorities of women, dalits, adivasis and the landless are adequately reflected in the DPR.

h. Working out detailed resource-use agreements (for surface water,groundwater and common/forest land usufructs) among User Group members in a participatory manner based on principles of equity and sustainability.

i.Participatory monitoring of progress and processes.

B. Preparation of DPR: DPR preparation is a crucial activity at the district level,which is to be facilitated by the WDT for an identified project area. The technical inputs in the form of resource maps and cadastral maps have to be made available at local

level. It is necessary to capture the entire database of DPR in a systematic manner as a structured document at the initial stage itself.

C. DPR preparation requires a strong PR exercise and development of appropriate and comprehensive beneficiary level database separately for private land and community land development with linkages to the cadastral database. This will facilitate spatial depiction of the action plan. The DPR should include, among other things, the following:

a. Basic Information on Watershed including rainfall, temperature, location including geographical coordinates, topography, hydrology, hydrogeology, soils, forests, demographic features, ethnographic details of communities, land-use pattern, major crops & their productivity, irrigation, livestock, socio-economic status etc.

b. Details of expected/proposed User Groups & Self Help Groups, master tables for private land / common land activities, contribution to watershed development funds, information on soil and land-use, existing assets related to water harvesting, recharging and storage etc. needs to be provided plot-wise.

c. Problems Typology of the Watershed including an account of the major problems requiring intervention from the perspective of enhancing livelihood potential/carrying capacity as well as conservation and regeneration of resources.

d.Description of Proposed Interventions (physical and financial, including time-table of interventions) along with technical details and drawings certified by the WDT.

e.Detailed Mapping exercises.

f.Institutional mechanisms and agreements for implementing the plan,ensuring emphasis on participatory decision-making, equity and sustainability of benefits, and post-project sustainability.

g. Statement of Expected Outcomes and Benefits, especially with respect to livelihoods for different segments, benefits to women and regeneration/conservation of resources, etc.

D. The DPR will be prepared by the WDT or by suitable TSO for integrated development of the watershed area with active participation of the Watershed Committee (WC). The WDT/TSO should utilize various thematic maps relating to land and water resources in the preparation and finalization of the DPR. This DPR shall necessarily include the clear demarcation of the watershed with specific details of survey numbers, ownership details and a map depicting the location of proposed work/activities for each year.

E. The DPR for the watershed shall be in tune with the District Perspective Plan. The permissible works relating to soil and moisture conservation under MGNREGS, BRGF, and Artificial Ground Water Recharge must complement the micro watershed plan. District agricultural plans may also be consulted while formulating the District Perspective Plans.

F. This DPR will be a part of the MIS from which details will be arranged into various layers on GIS as a monitoring, management, accounting and analytical tool besides serving as a source of information and a link to the state level data cell in the SLNA and National Data Centre. The DPR may be summed up using a standard planning tool such as Logical Framework Analysis (LFA) that includes goals, purpose,

outputs, activities, inputs, challenges and measurable indicators of progress

G.The overall responsibility for the preparation of a technically sound and high quality DPR would lie with the Project Implementing Agency (PIA). After approval by the Gram Sabha, the PIA shall submit the DPR for approval to the WCDC/ DRDA/DP. Alternatively, the mechanism of approval and implementation of projects by district level committee / collector may continue to prevail.

H.Each watershed has unique characteristics and problems. Its treatment and management would therefore require careful consideration of various site specific factors like topography, nature and depth of soil cover, type of rocks, water absorbing capacity of land, rainfall intensity, land use etc. All works must be planned in a location-specific manner, taking into account the above factors along with local demands and socio-economic conditions of the watershed.

I.The ridge-to-valley principle with multi tier sequenced approach has been stipulated for implementing NRM component.

7.2.WATERSHED WORKS PHASE

This phase is the heart of the programme in which the DPR will be implemented. Some of the important activities to be included in this phase are:

a.Ridge Area Treatment: All activities required to restore the health of the catchment area by reducing the volume and velocity of surface runoff including regeneration of vegetative cover in forest and common land,afforestation, staggered trenching, contour and graded bunding, bench terracing etc.

b. Drainage line treatment with a combination of vegetative andengineeringstructures, such as earthen checks, brushwood checks, gully plugs, loose boulder checks, gabion structures, underground dykes etc.

c. Development of water harvesting structures such as low-cost farm ponds, nalla bunds, check-dams, percolation tanks and ground water recharge through wells, bore wells and other measures.

d.Nursery raising for fodder, fuel, timber and horticultural species. As far aspossible local species may be given priority.

e. Land development including in-situ soil and moisture conservation and drainage management measures like field bunds, contour and graded bunds fortified with plantation, bench terracing in hilly terrain etc.

f. Crop demonstrations for popularizing new crops/varieties, water saving technologies such as drip irrigation or innovative management practices. As far as possible varieties based on the local germplasm may be promoted.

g.Pasture development, sericulture, bee keeping, back yard poultry, smallruminant, other livestocks and micro-enterprises.

h.Veterinary services for livestock and other livestock improvement measures

i.Fisheries development in village ponds/tanks, farm ponds etc.

j.Promotion and propagation of non-conventional energy saving devices, energy conservation measures, bio fuel plantations etc.

7.3.CONSOLIDATION PHASE

This is an important phase of the IWMP and will be spread over the last two years of this project. This phase is very important as is comprehensively concerned with the sustainability of IWMP in the project area.

i). Major activities under this phase include:

Completion of various works under taken during work phase

Preparation of detailed Project completion report

Documentation of success stories and experiences for future guidance

Derive mechanisms for user right over common property resources

Derive mechanisms to collect user charges for common property resources

Derive mechanisms to improve the sustainability of various development activities

Derive consensus among the villagers to take up any new works out of any unspent amount

Awareness and capacity building of the community for repairs,maintenance and conservation of common property resources

Capacity building of user groups for optimum use of the developed natural resources

Popularising successful experiences related to farm production system and off farm livelihood activities undertaken using revolving fund under the project as well as credit and technical support from external institutions

Evolving markets for farm produce as well as the off-farm and other micro enterprises

Formation of Farmers Groups for credit, input procurement, sale of produce etc

Inter linkages of the SHGs and User groups for sustainable livelihoods

Empowering Watershed Committee and its smooth management on a long term basis

Deriving mechanism for utilising the Watershed Development Fund.

ii)Monitoring Plan

To control the activities at the various stage of implementing, proper plans will be formed for monitoring and Evaluation. Project monitoring is one of the important components in watershed development programmes. A three Tiers of Monitoring system as mentioned are planned:

iii)Vigilance and Monitoring Committees*:*

1. For every work there should be a local vigilance and monitoring committee, consisting of members of the locality where the work is undertaken, to monitor the progress and quality of work. The Gram Sabha will elect the members of this committee and ensure the participation of SC/STs and women.

2. The Project Implementing Agency(PIA) should apprise this committee of the estimates regarding the work, time frame and quality parameters. The final report of the committee should be attached along with the Completion Certificate of the work, and should also be placed at the next meeting of the Gram Sabha in the Panchayat where work has been executed.

3. Local beneficiary committees may also be constituted for effective articulation of their entitlements and their access to them. The PIA members will be responsible for ensuring that local monitoring committees/beneficiary committees are constituted.

iv Research support in watershed management*:*

Watershed projects will be used as on-farm sites for research designed and implemented with the involvement of farmers and extension workers to produce site-specific technological solutions. There are problems in adoption and up-scaling of research findings within specific watersheds. There is also the question of up-scaling technologies and approaches beyond a designated watershed. At the same time, researchers will be able to relate research activities to the real problems. Yet there is a need to give technologies appropriate technical and scientific definition and to disseminate them widely.

v) Farmer organization and empowerment*:*

Effective management of natural resources can be achieved only through effective farmer organisationnns. These organisations can empower farmers for the transfer, adoption and use of new technologies. They also can help in negotiating for inputs at favorable prices and also meet the felt needs such as information to improve production, marketing, credit and demand driven approaches that ensure ownership and sustainability of interventions. More over such organization allows the use of participatory approaches that recognize indigenous knowledge and gives key role for farmers in planning and implementation of watershed management activities. Empowerment of farmers also allows farmers to demand services and to ensure the continued role of the state in supporting watershed development.

vi) Withdrawal Mechanism:

At the end of the project, The Watershed Committee is to take the responsibility for post project management. Memorandum of Agreement is to be formulated between the PIA and

Watershed Committee on the basis of the following terms and conditions.

1. The list of assets created under EPA, NRM, Farm production system and Livelihood support system is to be prepared with joint signature of the Chairman, Secretary of the Watershed committee and PIA. The Watershed Committee will retain one copy of the list for future reference.

2. The amount unspent as on closing date will be transferred to the Watershed Development Fund.

3. Watershed Committee will be authorised to use only one Bank account i.e WDF account.

4. Yearly auditing of the accounts by the Chartered Accountant will be mandatory.

5. The office bearer of the Watershed Committee shall involve all the community irrespective of caste, creed and religion.

6. The Gram Sabha shall have the right to decide the user charges to be collected from the beneficiaries which shall be deposited under the watershed development fund.

7. The cost on repair and maintenance of the assets created out of NRM component shall be borne out of Watershed development fund by using maximum 50% of the amount collected or from the interest accreed on the fund

8. The WDF account will primarily run as revolving fund.

9.Individual beneficiary should not be granted any sort of grant or financial assistance.

10.The SHGs and UGs shall have the eligibility to take loan from the WDF with marginal interest as decided by the Gram Sabha.

11. The Watershed Committee is also at their liberty to start new profit making ventures by utilising WDF as security deposit and the profit earned should go to the WDF.

13. The remuneration for the Watershed secretary will be finalised in the Gram Sabha.

14. The Watershed Committee may collect financial assistance from any other sources to augment the WDF. All donations, interests, fines and fees shall be deposited in the WDF.

15. The WDF shall be jointly operated by the Chairman and Secretary of the watershed committee.

16. All the expenditure shall be authenticated by the Watershed committee.

17. Annual meering of the Gram Sabha is mandatory. However it may meet at any time if required.

18. The Watershed Committee should meet once in every quarter to review the income expenditure and progress of implementation.

19. Any change in the Watershed Committee or its office bearer shall be made once it is resolved in the Gram Sabha. The Gram Sabha should believe in rotational leadership.

20. It shall also be attempted that all the group representatives, at least one from each group shall be ensured in the Watershed Committee.

21. The decision approved and resolved in the Gram Sabha will only be implemented by the Watershed Committee.

22. In case of any embezzlement of fund, the Administrative system shall proceed according to Rules and Laws.

23. In the event of Gram Sabha and watershed Committee become defunct, the assets created under the project and WDF will be transferred to the Panchayat.

8.0. .EXPECTED OUTCOME

This project under IIWMP is aimed at conservation, development and management of the natural resources on sustainable basis and to improve the socio-economic condition of the people living in the watershed areas. This is a need based and participatory project right from its planning to the post project phase. The project also focuses on employment generation through diversification and strengthening of various Livelihood Activities and Production Systems and microenterprises. Another important aspect of the progamme is strengthening the knowledge and skill of the local people and the local leaders on the appropriate technologies for sustainable livelihood activities in the area. A table indicating the expected outcomes of the project is given below.

Table:29.Expected outcome of the project

Sl.No	Area	Outcome
01	Soil and water conservation	In-situ rain water conservation in the project area of 950. Ha. Control of the erosion of valuable top soil. Enhance productivity of the land in a sustainable manner. Protection of farm land Enhancement of gross cropped area by…20..%
02	Drinking Water	Availability of Drinking Waters shall be increased by 25…..%
03	Ground Water	General GW Level of the area shall be elevated by 1.5 t0 3…..mtrs
04	Production	Coconut (food&fibre), Tapioca, Pulses, Vegetables, Mushroom, Honey, Milk, Egg, Fish — 20 to 25% increase in production
05	Employment	264440 .Labour days from conservation works 8000 Labour days from livelihood options

		10000.Labour days from production systems management
06	Biodiversity	Bio-diversity conservation of the area.
08	Environment	Mitigation of drought . flood, landslip, stream bank sliding, improvement in quantity and quality of the water resources

9.0.POST PROJECT MANAGEMENT AND SUSTAINABILITY

9.1. WATERSHED DEVELOPMENT FUND (WDF):

A sizable Watershed development Fund is to be developed under the project by each watershed community by aggegating voluntary contributions from the beneficiaries. Such contributions will provide a feeling of "ownership" of the programme among stakeholders. The voluntary contributions are saved in the Watershed Development Fund (WDF) and is to be used for the, maintenance and proper management of assets created under the project.. The mode of contributions has been stipulated as follows

Table: 30.Mode of community contribution fixed.

Sl.No.	**Financial Details**	**Minimum Contribution**
1	**Natural Resource Management(NRM)**	
	General Category SC/ST Category	10 percent 5 percent
2	**Production System and Micro Enterprises**	

	General Category SC/ST Category	20 percent 10 percent

9.2. USER CHARGES:

The user groups will collect user charges according to the designated rules framed at the time of formation of user group. These funds will be transferred to the WDF or as stipulated in related ordersissued from the authorities.. The secretary of watershed committee (WC) will maintain all files and records related to the project..

PART III

11.MICRO WATERSHEDS

11.1.ATTUVASSERRY MICROWATERSHED

The Attuvassery watershed area is situated in the Kulakkada gramapanchayat of Vettikavala block panchayat. This watershed falls in the portion of Kallada river basin. A portion of this watershed has already been treated under the Western Ghat Development Programme. The remaining untreated area of 717 hectares is covered under the IWMP.

Name of the watershed: Attuvassery

Watershed Code	:7K 46a
River basin	:Kallada
Gramapanchayat	:Kulakkada
Block	:Vettikavala:
Village	:Puthur, Kulakkada
District	:Kollam
Wards	:1(part),2(part),4,5(part),6(part),14(part),15(part) 16,18(part),19
Latitude	:$9^0$2’25”- $9^0$5’55”N
Longitude	: 76^0 42’40”-76^0 45’00”E
Area	:717 hectres
River basin	:Kallada

11.1.1 Location

North:Kallada River

East: Madathilkadavu watershed

South:Neduvathur gramapanchayat

West:Pavithreswaram, Kunnathur gramapanchayts

11.1.2Topography

Topographically this watershed is located in the midland area. has an undulating topography. Most of the area falls in elevation ranging between 10-70 mts above MSL. The highest portion is situated in the northern portion of the watershed namely Kulakada area.

11.1.3. Geomorphology

Geomorphologically the area can be divided into mainly 3 units namely, Lower plateau-Laterite, Residual mount and Valley. The details are given below.

Table 30. Geomorphplogy

Sl.No	Type	Area (Sq.km)	Percentage
1	Lower plateau-Laterite	4.64	64.7
2	Residual mount	0.26	3.6
3	Valley	2.28	31.7
	Total	717	100

11.1.4. Slope

The watershed area is divided into 7slope classes according to the topography of the land. The northern portion is comparatively more slopping than southern portions. The details are furnished below.

Table 31. Slope Categories

Sl.No.	Slope Class	Area (Sq.km)	Peccentage
1	0-1% Level to nearly level	4.32	60
2	1%-3%Very gently slopping	0.42	6
3	10%-15%Moderately steeply sloping	0.45	6
4	15-30% Steeply sloping	0.21	3
5	3%-55 Gently sloping	0.44	6
6	5%-10% Moderately sloping	1.3	18
7	>30% Very steeply sloping	0.03	0.4
	Total	7.17	100

11.1.5. Soils

Soils, their condition, and connective relationships play extremely important roles in controlling the water movement over and through a watershed, studying the relationships among soil properties, soil positions in the landscape and watershed hydrology.

i) Soil Series

The soils of the study area can be grouped falls into 10 numbers of soil series. Of this the predominant series are Ummannoor, Kottarakkara,Mylom, Chadayamangalam, Kallada and they occupy 29.56%, 29.7%, 13.11%, 7.53%, 6.97% of the total area respectively. The details are given in table below. Mylom series are located mainly in the valleys and Ummannoor in the side slopes.

Table:32.Soil series of Attuvassery watershed

Sl.No	Soil type	Area in sq.km	Area in %
1	Chadayamangalam	0.54	7.53
2	Kallada	0.5	6.97
3	Kottarakkara	2.13	29.7
4	Kunnakkara	0.48	6.69
5	Kureepuzha	0.31	4.32
6	Miscellaneous	0.08	1.11
7	Mylom	0.94	13.11
8	Ummannoor	2.12	29.56
9	Karali	0.06	0.83
10	Pooyappalli	0.00	0.02
	Total	7.17	100

ii) Soil Texture

Soil texture refers to the relative proportion of sand, silt and clay particles in a soil. This is an important parameter for the management of the land. Finer the texture of the soil, lesser the rapid will be the movement and diffusion of ions through water.

The study area comprises of 10 number of textural classes. Of these the predominant classes are Gravelly loam, Gravelly clay loam and Clay loam.. The details of the different textural classes are given in table below.

Table: 33.Soil texture of Attuvassery watershed

Sl.No	Soil texture	Area in sq.km	Area in %
1	Clay	0.55	7.67
2	Clay loam	0.97	13.52
3	Gravelly clay loam	1.98	27.61
4	Gravelly loam	2.62	36.54
5	Gravelly sandy loam	0.11	1.53
6	Loamy sand	0.28	3.9
7	Miscellaneous	0.09	1.25
8	Sandy loam	0.51	7.11
9	Silty clay loam	0.01	0.13
10	Loam	0.07	0.97
	Total	**7.17**	**100**

iii) Depth:

Morphological properties of the soil include depth, presence or absence of impermeable layers like clay pan, duricrest etc. The soil must be deep enough to encourage the development of a deeper root system. Impermeable layers like clay pan and duricrest prevent the root system from going deeper into the soil. Similarly operation of different farm implements and selection of cropping pattern is also dependent on the soil depth. The study area in general has moderate to deep soils. The details are given in table below.

Table:34.Soil depth

Sl.No	Soil depth	Area in sq.km	Area in %
1	Deep	2.56	35.70
2	Moderately eep	2.81	39.19
3	Very deep	1.81	25.24
	Total	**7.17**	**100**

iv) Erosion status:

Soil erosion is the process which moves soil from one location to another by wind, water, or other natural actions. It is a natural process unless accelerated by human beings. From a human centered perspective, soil erosion may have several harmful effects. Soil erosion leads to the loss of top soil, depletion of productivity, reduction in moisture retention capacity etc.

Predominantly the study area is subjected to moderate erosion status. The details of the erosion status in the study area are given in table below

Table:35.Soil erosion

Sl.No.	Type of erosion	Area in sq.km	Area in %
1	Moderate erosion	4.72	65.82
2	Severe erosion	0.46	6.41
3	Slight erosion	2	27.89
	Total	**7.17**	**100**

11.1.6. Landuse

Landuse is one of the important component in the watershed area. Agriculture is the main activity in the area. The major crop noticed in the watershed area is rubber plantation. About 354 hectares are occupied with rubber plantation. It is planted in side slopes, hill tops and even in valleys also. Mixed crops covering an area of 198 hectares is another important landuse next to rubber. Paddy cultivation is present in the northern portion of the watershed area . Coconut, banana, arecanut, tapioca, tuber crops etc are also cultivated in the watershed area.. Details of the different landuse types are given in the table below.

Table .36.Landuse categories in the Attuvassery watershed

No.	Landuse categories	Area in Sq.km	Percentage
1	Banana		0.11
2	Banana+Coconut	0.014	0.19
3	Cultivable waste land	0.022	0.3
4	Marshy land	0.218	3.04
5	Mixed crops	1.981	27.62
6	Mixed trees	0.074	1.03
7	Paddy field	0.155	2.59
8	Paddy reclaimed to banana	0.195	2.71
9	Paddy reclaimed to cultivable wasteland	0.287	4
10	Paddy reclaimed to mixed crops	0.577	8.04
11	Paddy reclaimed to rubber	0.084	1.17
12	Paddy reclaimed to tapioca	0.015	0.2
13	Plantation rubber	3.539	49.35
14	Pond	0.004	0.05
15	Teak	0.002	0.02
	Total	**717**	**100**

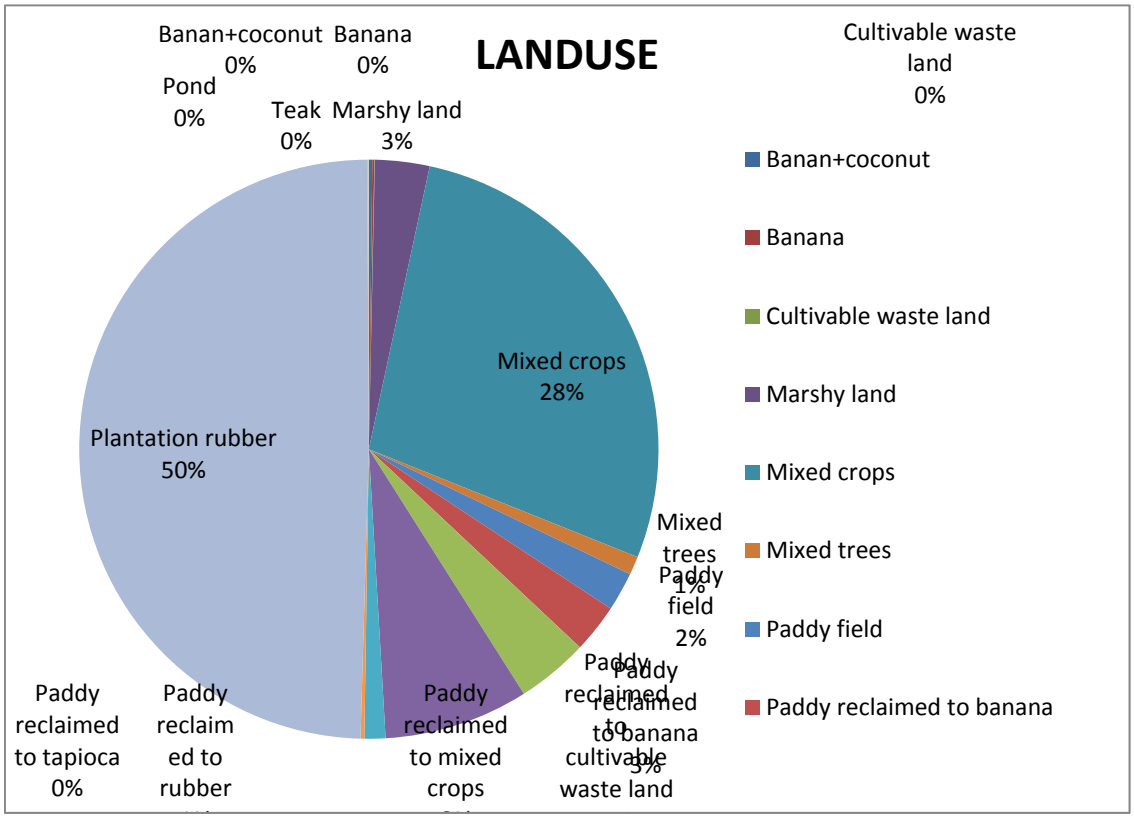


Fig: Pie diagram showing present landuse in Attuvasserry watershed

11.1.7.Land Capability

Land capability is defined as the inherent capacity of land to be productive under sustained use and specific management methods. Land capabilities are derived by combining the land systems information with climatic, agronomic, and forestry data. Land capability classification shows in a general way the suitability of soils for most kinds of field crops, plantations, forestry etc.

The present study area has been grouped into five major capability classes such as Class II, III, IV, and V for the purpose of under taking various management activities under the IWMP. Their details are given in the table below.

Table: 37. Land Capability

Sl.No	Class type	Area in sq.km	Area in %
1	Class II	1.52	21.19
2	Class III	2.5	34.86
3	Class IV	3.1	43.23
4	Class V	0.07	0.97
	Total	**7.17**	**100**

11.1.8 Drainage

The Pulamon thodu, one of the main tributaries of Kallada river is the main drainage in this watershed area. About 10 major and minor thodus originates from different parts of this watershed and drains into the Pulamon thodu. The watershed also has 7 number of ponds distributed throughout the watershed area. The details of the drains and ponds in the watershed area are given in table below.

Table. 38. Details of Thodus

Sl.No	Name of the thodus	Length (in metre)	Width (in metre)
1	Kaniyam poika ela thodu	1500	4
2	Mylomkulam ela thodu	1650	4
3	Mylomkulam ela kaithodu	425	1
4	Mavady-Attuvassery ela thodu	2400	3.5
5	Mavady ela kara thodu	225	1
6	Plakkulam ela thodu	450	1.5
7	Thengampuzha ela thodu	650	1
8	Thengampuzha- Kurissady ela thodu	450	1
9	.Ilanjiyode ela thodu	1000	2
10	Kurungottu ela thodu	700	1.5
11	Vettikottu ela thodu	450	1.5
12	Pullampallil ela thodu	400	1.5
13	Karaikkattu ela –Kattussery ela-Thottothu ela thodu	3000	4
14	Neduvamkodu ela thodu	375	1.5
15	Munnamchira thodu	625	1.5
16	Kaitharakonam ela thodu	475	1
17	Poovakkara ela thodu	425	1.5
18	Thevaruvathukkal ela thodu	500	1
19	Thevaruvathukkal ela karathodu	350	1

11.1.9 Other Water resources

In addition to the streams/thodus, ponds and wells there are other major water resources in the area. A number of ponds are located in the study area. Many of them are found to be perennial and are good source for water resource. Presently most of them are not used properly due to siltation and various types of

pollutions. In addition to household wells, there are also a number of public wells which can be used on community basis if managed properly. Their details are given below.

Table 39. Other Water Resources

Sl.No	Name of the ponds/ Public wells	Survey No
1	Mavady panchayat pond	288
2	Kumbazha chira	251
3	Pottan kulam	206
4	Attuvassery Rudhira Bhayankari temple pond	239
5	Vettikottu pond	
6	Kaniyampoika temple pond	83
7	Plakkulam	181
8	Komalathukulam	41
9	Kaitharakonam ela pond	57
10	Poovakkara ela pond	142

11.1.10.Infrastructure

The infrastructure available in the study area include the assets, roads, educational institutions etc.

i) Major asset

The watershed area have many assets distributing different part of the area. It include Govt. offices, Community centres, Schools, Hospitals, Worship centres, factories etc. The list of major assets in the area is given below

Table:40.Major asset

Sl.No	Asset	Numbers
1	Village office	1
2	Temples	6
3	Kavu	3
4	Church	4
5	Agricultural farm	1
6	Auditorium	2
7	YMCA Hall,Thuruthiyambalam	1
8	Kudumbasree production and marketing centre	1
9	Reading room	1
10	Cashew factory	2
11	Milk society,Poovattur	1

ii) Eductional Institutions

Attuvassery watershed have some educational institutions. It include High schools, Higher Secondary Schools, LPS and Anganvadies.

Table:41.Educational Institutions

Sl.No	Name of the Institution
1	Puthur Govt.HSS
2	NSS HSS,Attuvassery
3	NSS LPS
4	Anganvadi 7Nos.

iii) Major Roads

The watershed area have very good net work of roads. Most of the roads are tarred and in good condition.Every part of the project area is connected with roads.

11.1.11.Neighour Hood Groups (NHGs*)*

Neighbour Hood Groups are constituted in the watershed area combining 20-70 adjacent house holds which are living in a cluster. From this group seven members were selected and formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is women. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. The details of the NHG Committee in Attuvassery watershed ia as follows.

Table:43.Details of NHG

No.	Ward No.	Name of the NHG	Total households
1	1		23
			7
2	2	Anugraha	45
		Nalanda	29
3	4	Mahathma	56
		Mahathma-A	60
		Mahathma-B	
		Mahathma-C	51
		Mahathma-D	40
4	5	Ganga	54
		Saubhagya	24
		Kaveri	15
		Nila	42

		Tharangini	65
		Sreebhadra	61
5	7	Sreedurga	45
		Soorya	51
		Pulari	39
		Shilpi	62
		Aiswarya	65
		6Nanma	70
		Bhagyadhara	70
		Kairali	62
	14	Neerdhara	36
		Samridhi	32
		Karunya	38
	15	Navajeevan	78
7	19		50

11.1.12. Budget

The distribution of amount for the Attuvassery watershed for various component as per IWMP guidelines isgiven below.

Table:44.Distribution of fund for project period

No	Budget Component	%age	Amount in Rs
.1	Administrative cost	10	1075500
2	Monitoring	1	107550
3	Evaluation	1	107550
Preparatory phase			
4	Entry Point Activities	4	430200

5	Institution and Capacity Building	5	537750
6	Detailed Project Report	1	107550
Watershed work phase			
7	Natural Resources Conservation Works	56	6022800
8	Livilihood activities for assetless	9	967950
9	Production system and micro enterprises	10	1075500
10	Consolidation phase	3	322650
	Total	**100**	**10755000**

Table:45. Attuvasserry Watershed (7K46a)-Action Plan
Sector-I Natural Resources Conservation and Management

SL.No.	Item	Unit	Qty	Rate (Rs)	Amount (Rs)	IWMP (Rs)	Convergence (Rs)
1	Earthen Bund Type A	Rm	160650	25.00	4016250.00		4016250.00
2	Earthen Bund Type B	Rm	154400	84.00	12969600.00		12969600.00
3	SPCB [Q.S]	m2	15000	143.00	2145000.00	2145000.00	
4	SPCB [N.Q.S]	m2	4000	114.00	456000.00	456000.00	
5	SPCB repair	m2	11000	43.00	473000.00	473000.00	
6	Contour trenches	Rm	16650	66.00	1098900.00		1098900.00
7	Staggered Trenches	Rm	5550	133.00	738150.00		738150.00
8	Contour trenches -slope 20%	Rm	14020	80.00	1121600.00		1121600.00
9	Percolation pits [Type A] 1x1x1 m	nos	1250	111.00	138750.00		138750.00
10	Percolation pits [Type B] 2x2x1m	nos	750	446.00	334500.00		334500.00
11	Percolation pits [Type C]3x3x1	nos	500	1004.00	502000.00		502000.00
12	Agrostolory	Rm	71675	8.80	630740.00	630740.00	
13	Agro-Forestry	nos	1500	25.00	37500.00	37500.00	
14	Horticulture	nos	900	60.00	54000.00	54000.00	
15	Live fencing	Rm	2500	57.00	142500.00	142500.00	
16	Brushwood checks	nos	40	722.00	28880.00	28880.00	
17	Checks / Gully Plugs						
	Cross bar	nos	120	2009.00	241080.00	241080.00	
	Cross Checks	nos	100	6172.00	617200.00	617200.00	
18	Stream bank stabilization [vegetative]	Rm	720	102.00	73440.00	73440.00	
19	Stream bank stabilization [Engineering]		120				

	1.5m height	Rm	24	3475.00	83400.00	83400.00	
	1m height	Rm	16	2713.00	43408.00	43408.00	
	0.5m height	Rm	80	1950.00	156000.00	156000.00	
20	Pond Rejuvenation				648000.00	426500.00	221500.00
21	Desilting of Drain	Rm	2000	133.00	266000.00		266000.00
22	Tractor Ramp	Nos	3	26460.00	79380.00	79380.00	
23	Centripetal Terraces	Nos	1	334770.00	334770.00	334770.00	
					1610958	**6022798**	**21407250**

Table:46. Attuvasserry Watershed (7K46a)-Action Plan
Sector-I Natural Resources Conservation and Management- First ytear

SL.No.	Item	Unit	Qty	Rate (Rs)	Amount (Rs)	IWMP (Rs)	Convergence (Rs)
1	Earthen Bund Type A	Rm	12500	25.00	312500.00		312500.00
2	Earthen Bund Type B	Rm	12000	84.00	1008000.00		1008000.00
3	SPCB [Q.S]	m2	1000	143.00	143000.00	143000.00	
4	SPCB [N.Q.S]	m2	300	114.00	34200.00	34200.00	
5	SPCB repair	m2	800	43.00	34400.00	34400.00	
6	Contour trenches	Rm	1300	66.00	85800.00		85800.00
7	Staggered Trenches	Rm	444	133.00	59052.00		59052.00
8	Contour trenches -slope 20%	Rm	1200	80.00	96000.00		96000.00
9	Percolation pits [Type A] 1x1x1 m	nos	100	111.00	11100.00		11100.00
10	Percolation pits [Type B] 2x2x1m	nos	60	446.00	26760.00		26760.00
11	Percolation pits [Type C]3x3x1	nos	40	1004.00	40160.00		40160.00
12	Agrostolory	Rm	5202	8.80	45777.60	45777.60	
13	Agro-Forestry	nos	100	25.00	2500.00	2500.00	
14	Horticulture	nos	100	60.00	6000.00	6000.00	
15	Live fencing	Rm	200	57.00	11400.00	11400.00	
16	Brushwood checks	nos	3	722.00	2166.00	2166.00	
17	Checks / Gully Plugs						
	Cross bar	nos	10	2009.00	20090.00	20090.00	
	Cross Checks	nos	8	6172.00	49376.00	49376.00	
18	Stream bank stabilization [vegetative]	Rm	720	102.00	73440.00	5610.00	
19	Pond Rejuvenation				648000.00	426500.00	221500.00

20	Desilting of Drain	160	160	133.00	21280.00		21280.00
21	Tractor Ramp	3	3	26460.00	79380.00	79380.00	
22	Centripetal Terraces	800	800	44.00	35200.00		35200.00
						860400	**1917352**

Table:49. Attuvassery Watershed (7K46a)-Action Plan
Sector-I Natural Resources Conservation and Management- Second year

Table:47.Attuvassery Watershed (7K46a)- Action Plan
Sector II- Livelihood Support System forlandless/assetless – First Year

Sl.No.	Name of Activity	Unit	Unit cost	Target	IWMP Fund	Beneficiary Contribution	Total
A.	**Enterprising Individuals (10%)**						
1	Cow rearing	Nos.	20000	3	42000	18000	60000
2	Goat rearing	Nos.	9000	2	12600	5400	18000
3	Rabbit rearing	Nos.	8000	2	11200	4800	16000
4	Beekeeping	Nos.	10000	3	21000	9000	30000
5	Mushroom cultivation	Nos.	10000	2	14000	6000	20000
6	Tailoring	Nos.	10000	1	7000	3000	10000
	Total				**107800**	**46200**	**154000**

Table:48.Attuvassery Watershed (7K46a)- Action Plan
Sector III- Production System& Microenterprises – First Year

Sl.No.	Name of Activity	Unit	Unit cost	Target	IWMP Fund	Convergence	Total
1	Vegetable cultivation in terrace	Nos.	1500	240	180000	180000	360000
2	Planting 5 banana plants	Nos.	170	413	35105	35105	70210
	Total				**215105**	**215105**	**430210**

Note:20% of the beneficiaries will be SC/ST. Contribution to WDF is 20% for General and 10% for SC/ST

SL.No.	Item	Unit	Qty	Rate (Rs)	Amount (Rs)	IWMP (Rs)	Convergence (Rs)
1	Earthen Bund Type A	Rm	20000	25.00	500000.00	0	500000.00
2	Earthen Bund Type B	Rm	20000	84.00	1680000.00	0	1680000.00
3	SPCB [Q.S]	m2	4000	143.00	572000.00	572000.00	0
4	SPCB [N.Q.S]	m2	1000	114.00	114000.00	114000.00	0
5	SPCB repair	m2	1000	43.00	43000.00	43000.00	0
6	Contour trenches	Rm	1500	66.00	99000.00	0	99000.00
7	Staggered Trenches	Rm	750	133.00	99750.00	0	99750.00
8	Contour trenches -slope 20%	Rm	2000	80.00	160000.00	0	160000.00
9	Percolation pits [Type A] 1x1x1 m	nos	200	111.00	22200.00	0	22200.00
10	Percolation pits [Type B] 2x2x1m	nos	100	446.00	44600.00	0	44600.00
11	Percolation pits [Type C]3x3x1	nos	100	1004.00	100400.00	0	100400.00
12	Agrostolory	Rm	15000	8.80	132000.00	132000.00	0
13	Agro-Forestry	nos	638	25.00	15950.00	15950.00	0
14	Horticulture	nos	200	60.00	12000.00	12000.00	0
15	Live fencing	Rm	400	57.00	22800.00	22800.00	0
16	Brushwood checks	nos	7	722.00	5054.00	5054.00	0
17	Checks / Gully Plugs					0	0
	Cross bar	nos	25	2009.00	50225.00	50225.00	0
	Cross Checks	nos	18	6172.00	111096.00	111096.00	0
18	Stream bank stabilization [vegetative]	Rm	112	102.00	11424.00	11424.00	0
19	Stream bank stabilization [Engineering]					0	0
	1.5m height	Rm	10	3475.00	34750.00	34750.00	0

	1m height	Rm	10	2713.00	27130.00	27130.00	0
	0.5m height	Rm	10	1950.00	19500.00	19500.00	0
20	Desilting of Drain	Rm	160	133.00	21280.00	0	21280.00
21	Ridge and Furrow	HA	1	334770.00	334770.00	334770.00	0
22	Centrpetal Terraces	Nos	800	44.00	35200.00	0	35200.00
		Total				**1505699**	**2762430**

Table:50.Attuvassery Watershed (7K46a)- Action Plan
Sector II- Livelihood Support System forlandless/assetless – Second Year

Table:52. Attuvasserry Watershed (7K46a)-Action Plan
Sector-I Natural Resources Conservation and Management- Third year

Sl.No.	Name of Activity	Unit	Unit cost	Target	IWMP Fund	Beneficiary Contribution	Total
B.Revolving fund to SHGs(60%)							
1	Soap making	Nos.	25000	3	56250	18750	75000
2	Curry powder	Nos.	20000	6	90000	30000	120000
3	Bakery unit	Nos.	15000	8	90000	30000	120000
4	Animal husbandary	Nos.	10000	5	37500	12500	50000
					273750	**91250**	**365000**

Table:51.Attuvassery Watershed (7K46a)- Action Plan
Sector III- Production System& Microenterprises – Second Year

Sl.No.	Name of Activity	Unit	Unit cost	Target	IWMP Fund	Convergence	Total
1	Backyard poultry	Nos.	1000	100	50000	50000	100000
2	Planting 10 pepper seedlings	Nos.	200	500	50000	50000	100000
3	Mushroom cultivation(10 bed)	Nos.	350	100	17500	17500	3500
4	Planting 2 fruit plants	Nos.	80	1000	40000	40000	80000
5	Goat rearing	Nos.	10000	30	150000	150000	300000
6	Cow rearing	Nos.	20000	10	100000	100000	200000
7	Coconut cultivation	Nos.	75	605	22688	22688	45375
	Total				**430188**	**430188**	**828875**

Note:20% of the beneficiaries will be SC/ST. Contribution to WDF is 20% for General and 10% for SC/ST

SL.No.	Item	Unit	Qty	Rate (Rs)	Amount (Rs)	IWMP (Rs)	Convergence (Rs)
1	Earthen Bund Type A	Rm	20000	25.00	500000.00		500000.00
2	Earthen Bund Type B	Rm	20000	84.00	1680000.00		1680000.00
3	SPCB [Q.S]	m2	5000	143.00	715000.00	715000.00	
4	SPCB [N.Q.S]	m2	1200	114.00	136800.00	136800.00	
5	SPCB repair	m2	1001	43.00	43043.00	43043.00	
6	Contour trenches	Rm	1500	66.00	99000.00		99000.00
7	Staggered Trenches	Rm	750	133.00	99750.00		99750.00
8	Contour trenches -slope 20%	Rm	2000	80.00	160000.00		160000.00
9	Percolation pits [Type A] 1x1x1 m	nos	200	111.00	22200.00		22200.00
10	Percolation pits [Type B] 2x2x1m	nos	100	446.00	44600.00		44600.00
11	Percolation pits [Type C]3x3x1	nos	100	1004.00	100400.00		100400.00
12	Agrostolory	Rm	24998	8.80	219982.40	219982.40	
13	Agro-Forestry	nos	762	25.00	19050.00	19050.00	
14	Horticulture	nos	319	60.00	19140.00	19140.00	
15	Live fencing	Rm	1100	57.00	62700.00	62700.00	
16	Brushwood checks	nos	10	722.00	7220.00	7220.00	
17	Checks / Gully Plugs						
	Cross bar	nos	35	2009.00	70315.00	70315.00	
	Cross Checks	nos	18	6172.00	111096.00	111096.00	
18	Stream bank stabilization [vegetative]	Rm	200	102.00	20400.00	20400.00	
19	Stream bank stabilization [Engineering]						
	1.5m height	Rm	13	3475.00	45175.00	45175.00	

	1m height	Rm	6	2713.00	16278.00	16278.00	
	0.5m height	Rm	10	1950.00	19500.00	19500.00	
20	Desilting of Drain	Rm	160	133.00	21280.00		021280.00
22	Centrpetal Terraces	Nos	800	44.00	35200.00		035200.00
		Total				**1505700**	**2762430**

Table:53.Attuvassery Watershed (7K46a)- Action Plan
Sector II- Livelihood Support System forlandless/assetless – Third Year

Sl.No.	Name of Activity	Unit	Unit cost	Target	IWMP Fund	Beneficiary Contribution	Total
B.Revolving fund to SHGs(60%)							
1	Soap making	Nos.	25000	10	187500	62500	250000
2	Curry powder	Nos.	20000	10	150000	50000	200000
3	Bakery unit	Nos.	15000	17	191250	63750	255000
4	Animal husbandary	Nos.	10000	8	60000	20000	80000
					588750	**196250**	**785000**
C.Major livelihood activities(30%)							
1	Goat rearing	Nos.	100000	2	80000	120000	200000
					80000	120000	200000
	Total				**668750**	**216250**	**885000**

Note:20% of the beneficiaries will be SC/ST. Contribution to WDF is 20% for General and 10% for SC/ST

Table:54.Attuvassery Watershed (7K46a)- Action Plan
Sector III- Production System& Microenterprises – Third Year

Sl.No.	Name of Activity	Unit	Unit cost	Target	IWMP Fund	Convergence	Total
1	Carpet making	Nos.	22500	3	33750	33750	67500
2	Cloth bag making	Nos.	22500	3	33750	33750	67500
3	Tailoring unit	Nos.	10000	10	50000	50000	100000
4	Cow rearing	Nos.	20000	10	100000	100000	200000
5	Goat rearing	Nos.	10000	20	100000	100000	200000
6	Coconut cultivation	Nos.	75	138	5175	5175	10350
	Total				**322675**	**322675**	**645350**

Table:55. Attuvasserry Watershed (7K46a)-Action Plan
Sector-I Natural Resources Conservation and Management- Fourth year

SL.No.	Item	Unit	Qty	Rate (Rs)	Amount (Rs)	IWMP (Rs)	Convergence (Rs)
1	Earthen Bund Type A	Rm	108150	25.00	2703750.00		2703750.00
2	Earthen Bund Type B	Rm	102400	84.00	8601600.00		8601600.00
3	SPCB [Q.S]	m2	5000	143.00	715000.00	715000.00	
4	SPCB [N.Q.S]	m2	1500	114.00	171000.00	171000.00	
5	SPCB repair	m2	8199	43.00	352557.00	352557.00	
6	Contour trenches	Rm	12350	66.00	815100.00		815100.00
7	Staggered Trenches	Rm	3606	133.00	479598.00		479598.00
8	Contour trenches -slope 20%	Rm	8820	80.00	705600.00		705600.00
9	Percolation pits [Type A] 1x1x1 m	nos	750	111.00	83250.00		83250.00
10	Percolation pits [Type B] 2x2x1m	nos	490	446.00	218540.00		218540.00
11	Percolation pits [Type C]3x3x1	nos	260	1004.00	261040.00		261040.00
12	Agrostolory	Rm	26475	8.80	232980.00	232980.00	
13	Horticulture	nos	281	60.00	16860.00	16860.00	
14	Live fencing	Rm	800	57.00	45600.00	45600.00	

1	Brushwood checks	nos	20	722.00	14440.00	14440.00	
16	Checks / Gully Plugs						
	Cross bar	nos	50	2009.00	100450.00	100450.00	
	Cross Checks	nos	56	6172.00	345632.00	345632.00	
17	Stream bank stabilization [vegetative]	Rm	353	102.00	36006.00	36006.00	
18	Stream bank stabilization [Engineering]						
	1.5m height	Rm	1	3475.00	3475.00	3475.00	
	0.5m height	Rm	60	1950.00	117000.00	117000.00	
19	Desilting of Drain	Rm	1520	133.00	202160.00		202160.00
20	Centrpetal Terraces	Nos	6600	44.00	290400.00		290400.00
	Total					**2151000**	**14361038**

Table:56.Attuvassery Watershed (7K46a)- Action Plan
Sector II- Livelihood Support System forlandless/assetless – Fourth Year

Sl.No.	Name of activity	Unit	Unit cost	IWMP Fund (Amount in Rs.)	Beneficiary contribution
1	Small restaurant	100000	1	50000	50000
2	Goat rearing	100000	1	50000	50000
3	Duck rearing	4000	4	8000	8000
	Total			**108000**	**108000**

Note:20% of the beneficiaries will be SC/ST. Contribution to WDF is 20% for General and 10% for SC/ST

Table:57.Attuvassery Watershed (7K46a)- Action Plan Sector III- Production System& Microenterprises – Fourth Year					
Sl.No.	**Name of activity**	**Unit**	**Unit cost**	**IWMP Fund (Amount in Rs.)**	**Beneficiary contribution**
1	Organic vegetable cultivation	25000	4	50000	50000
2	Jasmine cultivation	15000	3	22500	22500
3	Organic banana cultivation	30000	1	15000	15000
4	Coconut cultivation	75	535	20062	20062
	Total			**107562**	**107562**

11.2.MADATHILKADAVUMICROWATERSHED

The Madathil kadavu watershed area is situated in the Kulakkada and Mylom gramapanchayats of Vettikavala block panchayat. This watershed falls in the portion of Kallada river basin. The area of of the wayershed is 1112 hectares is covered under the IWMP.

Name of the watershed	: Madathil kadavu
Watershed Code	:7K 45c
River basin	:Kallada
Gramapanchayat	:Kulakkada,Mylom
Block	:Vettikavala:
Village	:Mylom, Kalayapuram, Kulakkada
District	:Kollam
Wards	:Kulakkada-5(part),6(part),7,8,9,10(part)
	Mylom-10,16,17(part),18,19
Latitude	:$9^0$1’5”- $9^0$5’15”N
Longitude	: 76^0 45’00”-76^0 47’20”E
Area	: 1112 hectres
River basin	:Kallada

11.2.1. Location

North:Kallada River

East:Pulamon thodu(Mylomgrama panchayat)

South:Mylom watershed

West:Kottarakkara-Poovattur road

11.2.2.Topography

Topographically this watershed is located in the midland area with anundulating topography. Most of the area falls in elevation ranging between 10-70 mts above MSL.

11.2.3. Geomorphology

Geomorphologically the watershed area can be divided into Lower plateau-Laterite, Residual mount and Valley. The details are given below.

Table.58. Geomorphplogy

Sl.No	Type	Area (Sq.km)	Percentage
1	Lower plateau	7.36	66.2
2	Residual mount	0.38	3.40
3	Valley	3.38	30.4
	Total	**11.12**	**100**

11.2.4.Slope

The watershed area is divided into 7.slope classes according to the topography of the land. The northern portion is comparatively more slopping than southern portions. The details are furnished below.

Table.59. Slope Categories

Sl.No.	Slope Class	Area (sq.km)	Peccentage
1	0-1% Level to nearly level	5.43	49
2	1%-3%Very gently slopping	0.33	3
3	10%-15%Moderately steeply sloping	1.33	12
4	155-30% Steeply sloping	0.98	9
5	3%-55 Gently sloping	0.6	5.3
6	5%-10% Moderately sloping	2.38	21.4
7	>30% Very steeply sloping	0.05	0.4
	Total	11.12	100

11.2.5. Soils

Soils, their condition, and connective relationships play extremely important roles in controlling the water movement over and through a watershed, studying the relationships among soil properties, soil positions in the landscape and watershed hydrology.

i) Soil Series

The soils of the study area can be grouped falls into 10 numbers of soil series. Of this the predominant series are Ummannoor , Kottarakkara, Chadayamangalam, Kallada and they occupy 37.88%, 21.24%, 10.66%, 5.02% of the total area respectively. The details are given in table below. Mylom series are located mainly in the valleys and Ummannoor in the side slopes.

Table:60. Soil series

Sl.No.	Soil type	Area in sq.km	Area in %
1	Chadayamangalam	1.41	12.67
2	Kalada	0.41	3.69
3	Kottarakkara	1.75	15.75
4	Kureepuzha	0.04	0.36
5	Miscellaneous	0.24	2.16
6	Mylom	2.25	20.25
7	Pooyappalli	0.20	1.80
8	Ummannoor	4.81	43.29
	Total	**1112**	**100**

ii) Soil Texture

Soil texture refers to the relative proportion of sand, silt and clay particles in a soil. This is an important parameter for the management of the land. Finer the texture of the soil, lesser the rapid will be the movement and diffusion of ions through water.

The study area comprises of 10 number of textural classes. Of these the predominant classes are Gravelly loam, Gravelly clay loam and Clay loam.. The details of the different textural classes are given in table below.

Table: 61Soil texture

Sl.No.	Soil type	Area in sq.km	Area in %
1	Clay loam	2.47	22.23
2	Gravelly clay loam	3.71	33.39
3	Gravelly loam	4.25	38.25
4	Loam	0.04	0.36
5	Miscellaneous	0.25	2.25
6	Sandy loam	0.41	3.69
	Total	**1112**	**100**

iii) Depth

Morphological properties of the soil include depth, presence or absence of impermeable layers like clay pan, duricrest etc. The soil must be deep enough to encourage the development of a deeper root system. Impermeable layers like clay pan and duricrest prevent the root system from going deeper into the soil. Similarly operation of different farm implements and selection of cropping pattern

is also dependent on the soil depth. The study area in general has moderate to deep soils. The details are given in table below.

Table: 62.Soil depth

Sl.No	Soil depth	Area in sq.km	Area in %
1	Deep	2.7	24.28
2	Moderately eep	4.97	44.73
3	Very deep	3.43	30.87
	Total	**11.12**	**100**

iv) Erosion status

Soil erosion is the process which moves soil from one location to another by wind, water, or other natural actions. It is a natural process unless accelerated by human beings. From a human centered perspective, soil erosion may have several harmful effects. Soil erosion leads to the loss of top soil, depletion of productivity, reduction in moisture retention capacity etc.Predominantly the study area is subjected to moderate erosion status. The details of the erosion status in the study area are given in table below

Table:63.Soil erosion

Sl.No.	Type of erosion	Area in sq.km	Area in %
1	Moderate erosion	4.72	65.82
2	Severe erosion	0.46	6.41
3	Slight erosion	2	27.89
	Total	**7.17**	**100**

11.2.6. Landuse

Landuse is one of the important component in the watershed area. Agriculture is the main activity in the area. The major crop noticed in the watershed area is rubber plantation. About518 hectares are occupied with rubber plantation. It is planted in side slopes, hill tops and even in valleys also. Mixed crops covering an area of 389 hectares is another important landuse next to rubber. Coconut, banana, arecanut, tapioca, tuber crops etc are also cultivated in the watershed area. Details of the different landuse types are given in the table below.

Table.64.Landuse categories in the Muttambalam watershed

No.	Landuse categories	Area in sq.km	Percentage
1	Banana		0.09
2	Banana+coconut	0.003	0.03
3	Cultivable waste land	0.002	0.02
4	Mixed crops	3.893	35
5	Mixed trees	0.246	2.21
6	Paddy reclaimed to banana	0.406	3.65
7	Paddy reclaimed to banana cultivable waste land	0.043	0.39
8	Paddy reclaimed to mixed crops	1.087	9.78
9	Paddy reclaimed to rubber	0.061	0.55
10	Paddy reclaimed to tapioca	0.033	0.3
11	Plantation rubber	5.183	46.61
12	Thodu	0.115	1.03
13	Railway land	0.028	0.25
14	Tapioca	0.003	0.03
	Total	**11.12**	**100**

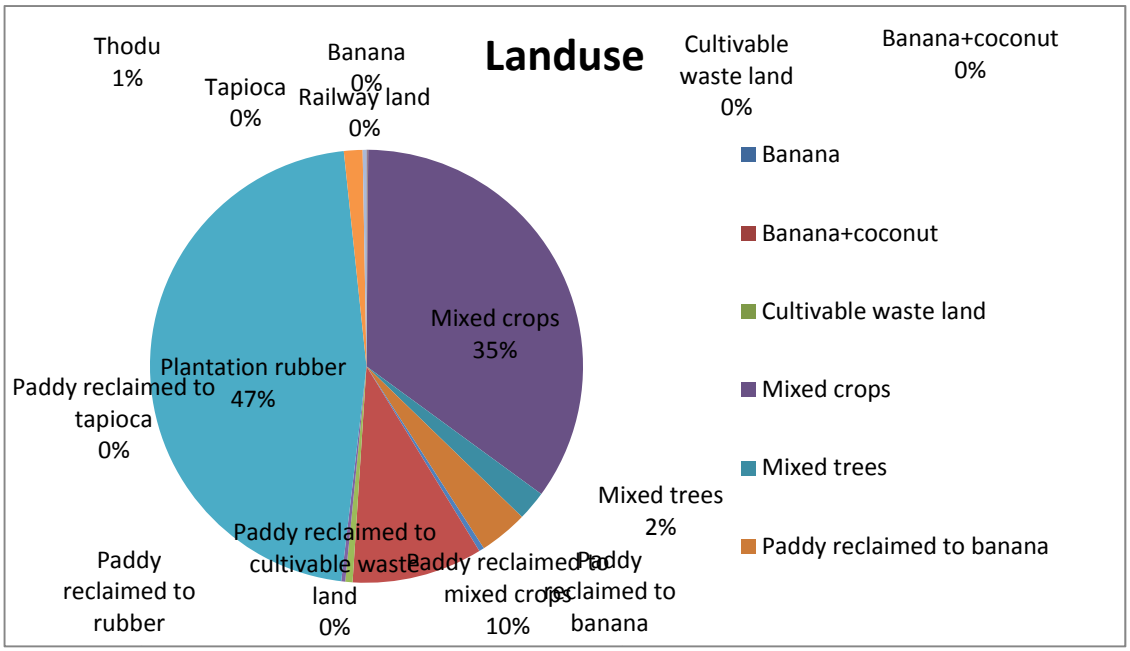


Fig:8. Pie diagram showing landuse pattern of the project area

11.2.7.Land Capability

Land capability is defined as the inherent capacity of land to be productive under sustained use and specific management methods. Land capabilities are derived by combining the land systems information with climatic, agronomic, and forestry data. Land capability classification shows in a general way the suitability of soils for most kinds of field crops, plantations, forestry etc.The present study area has been grouped into five major capability classes such as Class II, III, IV, V and VI for the purpose of under taking various management activities under the IWMP. Their details are given in the table below.

Table: 65. Land Capability

Sl.No	Class type	Area in sq.km	Area in %
1	Class II	2.52	22.66
2	Class III	1.41	12.67
3	Class IV	7.78	57.28
4	Class V	0.81	7.28
	Total	**7.17**	**100**

11.2.8. Drainage

The Pulamon thodu, one of the main tributaries of Kallada river is the main drainage in this watershed area. About 18 major and minor thodus originates from different parts of this watershed and drains into the Pulamon thodu. The watershed also has 5 number of ponds distributed throughout the watershed area. The details of the drains and ponds in the watershed area are given in table below.

Table.66. Details of Thodus

Sl.No	Name of the thodus	Length (in metre)	Width (in metre)
1	Kurundakuzhi thodu	250	1
2	Alappatubhagam thodu	375	1
3	Kakkathottukuzhi ela thodu	350	1
4	Kakkathottukuzhi ela kaithodu	350	1
5	Rakkuzhi vayal thou	200	1
6	Pappanad ela thodu	1200	2
7	Peramathu kulam bhagam ela thodu	425	2
8	Kulathur vayal thodu	1250	2.5
9	Thiruchenthurthekkepuram-kizhekkepuram ela thodu	1850	3.5
10	Thiruchenthur ela kaithodu	575	1.5
11	Paraikattu el thodu	600	1
12	Poovattur Jn.kizhakkubhagam ela kaithodu	500	1
13	Chanthannur ela thodu	1100	2
14	Manraikodu ela thodu	1550	3.5

15	Ammonathu ela thodu	360	1
16	Vendumkonam ela thodu	350	1
17	Meembad ela thodu	700	1
18	Perumkulam ela thodu	1650	2
19	Chadayamkonam ela thodu	300	1
20	Thevarani vayal pazhaya thodu	800	2.5
21	Kozhi vayal –Mannaravayal thodu	1750	2.5
22	Ettara vayal ela thodu	1750	2.5
23	Mullikkinad ela thodu	1500	2.5
24	Poovattur Laksham veedu bhagam thodu	325	1
25	Kuzhivilamukku- Varapuzha bhagam kaithodu	600	1
26	Kuzhivilamukku- Anganvadi bhagam kaithodu	250	1
27	Kumbikkottu ela thodu	200	1

11.2.9. Other Water resources

In addition to the streams/thodus, ponds and wells there are other major water resources in the area. A number of ponds are located in the study area. Many of them are found to be perennial and are good source for water resource. Presently most of them are not used properly due to siltation and various types of pollutions. In addition to household wells, there are also a number of public wells which can be used on community basis if managed properly. Their details are given below.

Table.67. Other Water Resources

Sl.No	Name of the ponds/ Public wells	Survey No
1	Karur chira	318
2	Perumkulam kizhakku Nagaraja kavu pond	334
3	Aruvi chira	350
4	Ammonathu ela pond pond	347
5	Alappattu temple pond	47
6	Peramathu pond	305
7	Kulangara pond	209
8	Amakulam	246

11.1.10.Infrastructure

The infrastructure available in the study area include the assets, roads, educational institutions etc.

ii) Major asset

The watershed area have many assets distributing different part of the area. It include Govt. offices, Community centres, Schools, Hospitals, Worship centres, factories etc. The list of major assets in the area is given below

Table:68.Major asset

Sl.No	Asset	Numbers
1	Govt.Homeo hospital	1
2	Temples	11
3	Church	12
4	Mosque	2
5	Veternary Hospital	2
6	Auditorium	3
7	Water Authority Office	1
8	PHC, Perumkulam	1
9	Reading room	3
10	Cashew factory	3
11	Village Office, Kalayapuram	1
12	ICDP Sub centre	1
13	BSNL	1
14	KSEB	1
15	Govt.Ayurveda Hospital	1
16	Public Library,Kulakkada	1
17	SC Coperative Society	1
18	ITC, Poovattur	1

i) Eductional Institutions

Madathi kadavu watershed have some educational institutions. It include High schools, Higher Secondary Schools, LPS and Anganvadies etc. The details are given in the table.

Table:69.Educational Institutions

Sl.No	Name of the Institution
1	LPS, Perumkulam
2	GHS, Perumkulam
3	MGM HSS Muttambalam
4	Inchakkad LPS
5	Mar Ivanios HSS, Kalayapuram
6	St.Therasses Badani School,Kalayapuram
7	LPS, Kulakkada
8	HSS, Kulakkada
9	B.Ed Centr, Kulakkada
10	LPS, Puthur mukku
11	Anganvadi -11Nos.

i) Major Roads

The watershed area have very good net work of roads. Most of the roads are tarred and in good condition.Every part of the project area is connected with roads.MC road which is passing through the western patt of the watershed. The list of major roads are given below

Table:70.Major roads

No.	Name of the Road
1	.MC Road(Muttambalam-Enath)
2	Kottarakkara-Poovattur-Thazhathukulakkada road
3	Mylom-Vellaramkunnu-Alancharry road
4	Muttambalam-Vellaramkunnu road
5	Mylom-Chamavila road
6	Plamoodu-Inchakkad road
7	Perumkulam-Inchakkad road
8	Perumkulam-Shilpa Jn. road
9	Kottathalamukku-Kalayapuram road
10	Poovattur-Puthurmukku road
11	Poovattur-Mathundil-NSS Karayogom road
12	Puthurmukku-ITC road
13	Perumkulam-Kodithookumugal-Kottathala road
14	Kalayapuram Homeo-Kureekuzhivathukkal road
15	Puthurmukku-Anthamon road
16	Laksham veedu-Moolamukku-Ettiyodu road
17	SC Cooperative Society-Painummoodu road
18	Kulakkada-Oorali Ayyathukavu road
19	Kulakkada-Rakkuzhi ela road
20	Kulakkada=Nambimonkadavu road
21	Kulakkada-Vaikundapuram temple road
22	Kulakkada-Madathilkadavu road
23	Kulakkada-Chittayathu road

11.2.11.Neighour Hood Groups (NHGs)

Neighbour Hood Groups are constituted in the watershed area combining

20-70 adjacent house holds which are living in a cluster. From this group seven members were selected and formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is women. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. The setails of the NHG Committee in Attuvassery watershed ia as follows.

Table:71.Details of NHG

No.	Ward No.	Name of the NHG (Kulakkada GP)	Total households
1	5	Ganga	54
		Saubhagya	24
		Kaveri	15
		Nila	42
		Tharangini	65
		Sreebhadra	61
		Triveni	1
2	6		
3	7	Sreedurga	45
		Soorya	51
		Pulari	39
		Shilpi	62
		Aiswarya	65
		Nanma	70
		Bhagyadhara	70
		Kairali	62
4	8	Mayuri	50
		Thiruvonam	60

		Devi	60
		Kudumbadayani	62
		Mazhavillu	57
		Haritha	48
		Bhavana	52
		Navajyothy	61
		Harithasree	57
		Avani	54
5	9	Sreebhadra	50
		Aiswarya	51
		Mahathma	52
		Sneha	53
		Sneha	47
		Karuna	56
		Aiswarya	38
6	10	Thanal	54
		Deepam	47
		Sivasakthy	42
		Jalanidhi	47
		Aiswarya	40
		Gramasree	50
		Navodhaya	46
No.	**Ward No.**	**Name of the NHG (Mylom GP)**	**Total households**
7	9	Mahathma-A	62
		Mahathma-B	60
8	10	Janani	42
		Sneham	51
		Udayam	50

	17	Pallikkal	31
		Jaladhara	43
		Nanma	45
		Thalir	36
		Haritha	48
9	18	Priyadarshini	61
		Karuna	41
		Samridhi	35
		Udayam	51
10	19		180

11.2.12.BUDGET

The distribution of amount for the Madathil kadavu watershed for various component as per IWMP guidelines isgiven below.

Table:72.Distribution fund allotment for Madathilkadavu watershed

No	Budget Component	%age	Amount in Rs
1	Administrative cost	10	1668000
2	Monitoring	1	166800
3	Evaluation	1	166800
Preparatory phase			
4	Entry Point Activities	4	667200
5	Institution and Capacity Building	5	834000
6	Detailed Project Report	1	166800
Watershed work phase			

7	Natural Resources Conservation Works	56	9340800
8	Livilihood activities for assetless	9	1501200
9	Production system and micro enterprises	10	1668000
10	Consolidation phase	3	500400
	Total	**100**	**16680000**

Table:73. Madathil kadavu Watershed (7K45c)-Action Plan
Sector-I Natural Resources Conservation and Management

SL.No.	Item	Unit	Qty	Rate	Amount	IWMP	Convergence
1	Earthen Bund Type A	Rm	160650	25.00	4016250		4016250
2	Earthen Bund Type B	Rm	154400	84.00	12969600		12969600
3	SPCB [Q.S]	m2	30000	143.00	4290000	4290000	
4	SPCB [N.Q.S]	m2	5000	114.00	570000	570000	
5	SPCB repair	m2	20000	43.00	860000	860000	
6	Contour trenches	Rm	16650	66.00	1098900		1098900
7	Staggered Trenches	Rm	5550	133.00	738150		738150
8	Contour trenches -slope 20%	Rm	14020	80.00	1121600		1121600
9	Percolation pits [Type A] 1x1x1 m	nos	1250	111.00	138750		138750
10	Percolation pits [Type B] 2x2x1m	nos	750	446.00	334500		334500
11	Percolation pits [Type C]3x3x1	nos	500	1004.00	502000		502000
12	Agrostolory	Rm	69975	8.80	615780	615780	
13	Agro-Forestry	nos	3500	25.00	87500	87500	
14	Horticulture	nos	2000	60.00	120000	120000	
16	Live fencing	Rm	5000	57.00	285000	285000	
17	Brushwood checks	nos	100	722.00	72200	72200	
18	Checks / Gully Plugs						
	Cross bar	nos	190	2009.00	381710	381710	
	Cross Checks	nos	135	6172.00	833220	833220	
19	Stream bank stabilization [vegetative]	Rm	1800	102.00	183600	183600	
20	Stream bank stabilization [Engineering]						
	1.5m height	Rm	60	3475.00	208500	208500	
	1m height	Rm	40	2713.00	108520	108520	
	0.5m height	Rm	200	1950.00	390000	390000	
21	Desilting of Drain	Rm	2000	133.00	266000		266000
22	Ridge and Furrow	HA	1	334770.00	334770	334770	
23	Centripetal Terraces	Nos	9000	44.00	396000		396000
					30922550	**9340800**	**21581750**

Table:74. Madathil kadavu Watershed (7K45c)-Action Plan
Sector-I Natural Resources Conservation and Management- First year

SL.No.	Item	Unit	Qty	Rate (Rs)	Amount (Rs)	IWMP (Rs)	Convergence (Rs)
1	Earthen Bund Type A	Rm	12852	25.00	321300.00		321300.00
2	Earthen Bund Type B	Rm	12350	84.00	1037400.00		1037400.00
3	SPCB [Q.S]	m2	2500	143.00	357500.00	357500.00	
4	SPCB [N.Q.S]	m2	500	114.00	57000.00	57000.00	
5	SPCB repair	m2	1700	43.00	73100.00	73100.00	
6	Contour trenches	Rm	1332	66.00	87912.00		87912.00
7	Staggered Trenches	Rm	444	133.00	59052.00		59052.00
8	Contour trenches -slope 20%	Rm	1121	80.00	89680.00		89680.00
9	Percolation pits [Type A] 1x1x1 m	nos	100	111.00	11100.00		11100.00
10	Perculation pits [Type B] 2x2x1	nos	750	446.00	334500.00		334500.00
11	Percolation pits [Type C]3x3x1	nos	40	1004.00	40160.00		40160.00
12	Agrostolory	Rm	7000	8.80	61600.00	61600.00	
13	Agro-Forestry	nos	520	25.00	13000.00	13000.00	
14	Horticulture	nos	500	60.00	30000.00	30000.00	
15	Live fencing	Rm	1000	57.00	57000.00	57000.00	
16	Brushwood checks	nos	10	722.00	7220.00	7220.00	
17	Checks / Gully Plugs						
	Cross bar	nos	20	2009.00	40180.00	40180.00	
	Cross Checks	nos	20	6172.00	123440.00	123440.00	
18	Stream bank stabilization [vegetative]	Rm	165	102.00	16830.00	16830.00	
19	Stream bank stabilization [Engineering]		149				

	1.5m height	Rm	20	3475.00	69500.00	69500.00	
	1m height	Rm	20	2713.00	54260.00	54260.00	
	0.5m height	Rm	20	1950.00	39000.00	39000.00	
20	Desilting of Drain	Rm	160	133.00	21280.00		21280.00
21	Rdge and Furrow	HA	1	334770.00	334770.00	334770.00	
22	Centripetal Terraces	Nos	720	44.00	31680.00		31680.00
	Total				**3368464**	**1334400**	**2034064**

Table:75. Madathil kadavu Watershed (7K45c)- Action Plan
Sector II- Livelihood Support System forlandless/assetless – First Year

Sl.No.	Name of Activity	Unit	Unit cost	Target	IWMP Fund	Beneficiary Contribution	Total
A.	**Enterprising Individuals (10%)**						
1	Cow rearing	Nos.	20000	3	42000	18000	60000
2	Goat rearing	Nos.	9000	3	18900	8100	27000
3	Rabbit rearing	Nos.	8000	4	22400	9600	32000
4	Beekeeping	Nos.	10000	5	35000	15000	50000
5	Mushroom cultivation	Nos.	10000	5	35000	15000	50000
6	Tailoring	Nos.	10000	2	14000	6000	20000
	Total				**167300**	**71700**	**239000**

Note:20% of the beneficiaries will be SC/ST. Contribution to WDF is 20% for General and 10% for SC/ST

Table:76. Madathil kadavu Watershed (7K45c)- Action Plan Sector III- Production System& Microenterprises – First Year							
Sl.No.	**Name of Activity**	**Unit**	**Unit cost**	**Target**	**IWMP Fund**	**Convergence**	**Total**
1	Vegetable cultivation in terrace	Nos.	1500	300	225000	225000	450000
2	Planting 5 banana plants	Nos.	170	1277	108545	108545	217090
	Total				**333545**	**333545**	**667090**

Table:77. Madathil kadavu Watershed (7K45c)-Action Plan Sector-I Natural Resources Conservation and Management- Second year							
SL.No.	**Item**	**Unit**	**Qty**	**Rate (Rs)**	**Amount (Rs)**	**IWMP (Rs)**	**Convergence (Rs)**
1	Earthen Bund Type A	Rm	25704	25.00	642600.00		642600.00
2	Earthen Bund Type B	Rm	24700	84.00	2074800.00		2074800.00
3	SPCB [Q.S]	m2	6000	143.00	858000.00	858000.00	
4	SPCB [N.Q.S]	m2	1500	114.00	171000.00	171000.00	
5	SPCB repair	m2	3999	43.00	171957.00	171957.00	
6	Contour trenches	Rm	2664	66.00	175824.00		175824.00
7	Staggered Trenches	Rm	888	133.00	118104.00		118104.00
8	Contour trenches -slope 20%	Rm	2242	80.00	179360.00		179360.00
9	Percolation pits [Type A] 1x1x1 m	nos	200	111.00	22200.00		22200.00
10	Percolation pits [Type C]3x3x1	nos	80	1004.00	80320.00		80320.00
11	Agrostolory	Rm	14961	8.80	131656.80	131656.80	
12	Agro-Forestry	nos	1499	25.00	37475.00	37475.00	
13	Horticulture	nos	1001	60.00	60060.00	60060.00	
14	Live fencing	Rm	2000	57.00	114000.00	114000.00	
15	Brushwood checks	nos	30	722.00	21660.00	21660.00	
16	Checks / Gully Plugs						
	Cross bar	nos	55	2009.00	110495.00	110495.00	
	Cross Checks	nos	51	6172.00	314772.00	314772.00	

17	Stream bank stabilization [vegetative]	Rm	332	102.00	33864.00	33864.00	
18	Stream bank stabilization [Engineering]						
	1.5m height	Rm	40	3475.00	139000.00	139000.00	
	1m height	Rm	20	2713.00	54260.00	54260.00	
	0.5m height	Rm	60	1950.00	117000.00	117000.00	
19	Desilting of Drain	Rm	320	133.00	42560.00		42560.00
20	Centripetal Terraces	Nos	1440	44.00	63360.00		63360.00
	Total					**2335200**	**3399128**

Table:78. Madathil kadavu Watershed (7K45c)- Action Plan
Sector II- Livelihood Support System forlandless/assetless – Second Year

Sl.No.	Name of Activity	Unit	Unit cost	Target	IWMP Fund	Beneficiary Contribution	Total
B.Revolving fund to SHGs(60%)							
1	Soap making	Nos.	25000	6	112500	37500	150000
2	Curry powder	Nos.	20000	8	120000	40000	160000
3	Bakery unit	Nos.	15000	11	123750	41250	165000
4	Animal husbandary	Nos.	10000	6	45000	15000	60000
					401250	**133750**	**535000**
C.Major livelihood activities(30%)							
1	Vermi composting	Nos.	50000	4	100000	100000	200000
					100000	100000	200000
	Total				**501250**	**275000**	**1000000**

Table:79 Madathil kadavu Watershed (7K45c)- Action Plan Sector III- Production System& Microenterprises – Second Year							
Sl.No.	**Name of Activity**	**Unit**	**Unit cost**	**Target**	**IWMP Fund**	**Convergence**	**Total**
1	Backyard poultry	Nos.	1000	100	50000	50000	100000
2	Planting 10 pepper seedlings	Nos.	200	500	50000	50000	100000
3	Mushroom cultivation(10 bed)	Nos.	350	98	17150	17150	34300
4	Planting 2 fruit plants	Nos.	80	2000	80000	80000	160000
5	Goat rearing	Nos.	10000	30	150000	150000	300000
6	Cow rearing	Nos.	20000	20	200000	200000	400000
8	Rabbit rearing	Nos.	8000	30	120000	120000	240000
	Total				**667100**	**667100**	**1334200**

Table:80. Madathil kadavu Watershed (7K45c)-Action Plan Sector-I Natural Resources Conservation and Management- Third year							
SL.No.	**Item**	**Unit**	**Qty**	**Rate (Rs)**	**Amount (Rs)**	**IWMP (Rs)**	**Convergence (Rs)**
1	Earthen Bund Type A	Rm	25704	25.00	642600.00		642600.00
2	Earthen Bund Type B	Rm	24700	84.00	2074800.00		2074800.00
3	SPCB [Q.S]	m2	7000	143.00	1001000.00	1001000.00	
4	SPCB [N.Q.S]	m2	1850	114.00	210900.00	210900.00	
5	SPCB repair	m2	3999	43.00	171957.00	171957.00	
6	Contour trenches	Rm	2664	66.00	175824.00		175824.00
7	Staggered Trenches	Rm	888	133.00	118104.00		118104.00
8	Contour trenches -slope 20%	Rm	2242	80.00	179360.00		179360.00
9	Percolation pits [Type A] 1x1x1 m	nos	200	111.00	22200.00		22200.00

10	Percolation pits [Type C]3x3x1	nos	80	1004.00	80320.00		80320.00
11	Agrostolory	Rm	14967	8.80	131709.60	131709.60	
12	Agro-Forestry	nos	1481	25.00	37025.00	37025.00	
13	Horticulture	nos	499	60.00	29940.00	29940.00	
14	Live fencing	Rm	2000	57.00	114000.00	114000.00	
15	Brushwood checks	nos	50	722.00	36100.00	36100.00	
16	Checks / Gully Plugs		0				
	Cross bar	nos	55	2009.00	110495.00	110495.00	
	Cross Checks	nos	51	6172.00	314772.00	314772.00	
17	Stream bank stabilization [vegetative]	Rm	400	102.00	40800.00	40800.00	
18	Stream bank stabilization [Engineering]		0				
	0.5m height	Rm	70	1950.00	136500.00	136500.00	
19	Desilting of Drain	Rm	320	133.00	42560.00		42560.00
20	Centripetal Terraces	Nos	1440	44.00	63360.00		63360.00
	Total				**5734327**	**2335199**	**3399128**

Table:81. Madathil kadavu Watershed (7K45c)- Action Plan Sector II- Livelihood Support System forlandless/assetless – Third Year							
Sl.No.	**Name of Activity**	**Unit**	**Unit cost**	**Target**	**IWMP Fund**	**Beneficiary Contribution**	**Total**
B.Revolving fund to SHGs(60%)							
1	Soap making	Nos.	25000	10	187500	62500	250000
2	Curry powder	Nos.	20000	10	150000	50000	200000
3	Bakery unit	Nos.	15000	17	191250	63750	255000
4	Animal husbandary	Nos.	10000	8	60000	20000	80000
					588750	**196250**	**785000**
C.Major livelihood activities(30%)							
1	Goat rearing	Nos.	100000	2	80000	120000	200000
					80000	120000	200000
	Total				**668750**	**216250**	**885000**

Table:82. Madathil kadavu Watershed (7K45c)- Action Plan Sector III- Production System& Microenterprises – Third Year							
Sl.No.	**Name of Activity**	**Unit**	**Unit cost**	**Target**	**IWMP Fund**	**Convergence**	**Total**
1	Carpet making	Nos.	22500	4	45000	45000	90000
2	Cloth bag making	Nos.	22500	4	45000	45000	90000
3	Tailoring unit	Nos.	10000	10	50000	50000	100000
4	Cow rearing	Nos.	20000	15	150000	150000	300000
5	Goat rearing	Nos.	10000	30	150000	150000	300000
6	Coconut cultivation	Nos.	75	544	20400	20400	40800
7	Rabbit rearing	Nos.	8000	10	40000	40000	80000
	Total				**500400**	**500400**	**1000800**

Table:83. Madathil kadavu Watershed (7K45c)-Action Plan
Sector-I Natural Resources Conservation and Management- Fourth year

SL.No.	Item	Unit	Qty	Rate (Rs)	Amount (Rs)	IWMP (Rs)	Convergence (Rs)
1	Earthen Bund Type A	Rm	160650	25.00	4016250.00		4016250.00
2	Earthen Bund Type B	Rm	154400	84.00	12969600.00		12969600.00
3	SPCB [Q.S]	m2	14500	143.00	2073500.00	2073500.00	
4	SPCB [N.Q.S]	m2	1150	114.00	131100.00	131100.00	
5	SPCB repair	m2	10302	43.00	442986.00	442986.00	
6	Contour trenches	Rm	16650	66.00	1098900.00		1098900.00
7	Staggered Trenches	Rm	5550	133.00	738150.00		738150.00
8	Contour trenches -slope 20%	Rm	14020	80.00	1121600.00		1121600.00
9	Percolation pits [Type A] 1x1x1 m	nos	1250	111.00	138750.00		138750.00
10	Percolation pits [Type C]3x3x1	nos	500	1004.00	502000.00		502000.00
11	Agrostolory	Rm	14967	8.80	131709.60	131709.60	
12	Brushwood checks	nos	50	722.00	36100.00	36100.00	
13	Checks / Gully Plugs		0				
	Cross bar	nos	55	2009.00	110495.00	110495.00	
	Cross Checks	nos	51	6172.00	314772.00	314772.00	
14	Stream bank stabilization [vegetative]	Rm	400	102.00	40800.00	40800.00	
15	Stream bank stabilization [Engineering]		0				
	0.5m height	Rm	70	1950.00	136500.00	136500.00	
16	Desilting of Drain	Rm	320	133.00	42560.00		42560.00
17	Centripetal Terraces	Nos	1440	44.00	63360.00		63360.00
	Total				**24583252**	**3336002**	**21247250**

	Table:84. Madathil kadavu Watershed (7K45c)- Action Plan Sector II- Livelihood Support System forlandless/assetless – Fourth Year						
Sl.No.	**Name of activity**	**Unit**	**Unit cost**	**Target**	**IWMP FUND (Amount in Rs.)**	**Beneficiary contribution**	**Total**
1	Small restaurant	Nos.	100000	1	50000	50000	100000
2	Goat rearing	Nos.	100000	1	50000	50000	100000
3	Duck rearing	Nos	4000	4	6000	6000	12000
4	Jasmine cultivation	Nos	15000	3	30000	30000	60000
5	Planting of tubercrops	Nos.	20000	3	30000	30000	60000
6	Coconut cultivation	Nos.	75	21	788	788	1576
	Total				**168000**	**166788**	**333576**

Table:85. Madathil kadavu Watershed (7K45c)- Action Plan Sector III- Production System& Microenterprises – Fourth Year					
Sl.No.	**Name of activity**	**Unit**	**Unit cost**	**IWMP Fund (Amount in Rs.)**	**Beneficiary contribution**
1	Organic vegetable cultivation	25000	4	50000	50000
2	Jasmine cultivation	15000	3	22500	22500
3	Organic banana cultivation	30000	1	15000	15000
4	Coconut cultivation	75	535	20062	20062
	Total			**107562**	**107562**

Note:20% of the beneficiaries will be SC/ST. Contribution to WDF is 20% for General and 10% for SC/ST

DETAILED ESTIMATE FOR EARTHEN BUND [TYPE - A]

SL.NO	ITEM	UNIT	NOS	L	B	H	QTY	Amount
1	Earth work excavation in ordinary soil and depositing within the initial lead and lift including neat banking etc. complete							
	For formation of bund	m3	1.00	1.00	[0.6+0.3] / 2	0.40	**0.18**	
	Say 0.18 m3 @ Rs.1115.92/10m3							20.00
2	Consolidation by ramming in 15cm layers including all labour charges. Etc.							
	Say 0.18 m3 @ Rs.286.65/10m3							5.16
	Total Amount per R.m							**25.16**

Rs. Say 25.00/Rm

DETAILED ESTIMATE FOR EARTHEN BUND [TYPE - B]

SL. NO	ITEM	UNIT	NOS	L	B	H	QTY	Amount
1	Earth work excavation in ordinary soil and depositing within the initial lead and lift including neat banking etc. complete							
	For formation of bund	m3	1.00	1.00	[0.3+0.9] / 2	1.00	**0.60**	
	Say 0.60 m3 @ Rs.1115.92/10m3							66.95
2	Consolidation by ramming in 15cm layers including all labour charges. Etc.							
	Say 0.60 m3 @ Rs.286.65/10m3							17.20
	Total Amount per R.m							**84.15**

Say Rs. 84.00/Rm

DETAILED ESTIMATE FOR STONE PITCHED CONTOUR BUND

[a] QUARRIED STONE

SL.NO	ITEM	Unit	Nos	QTY	RATE	AMOUNT
1	Contour bunding with dry rubble, granite, or jungle stone pitched bunds with lead up to 50 m. and lift up to 1.50m laying and filling the uphill portion with uniform slopeearth packing etc. complete [using 15 to 22 cm size quarried and non quarried stone]					
	Quarried stone	m2	1	1	14352 / 100 m2	143.52
	Total					**143.52**

Say Rs.143/m2

DETAILED ESTIMATE FOR STONE PITCHED CONTOUR BUND

[b] Non Quarried Stone

SL.NO	ITEM	Unit	Nos	QTY	RATE	AMOUNT
1	Contour bunding with dry rubble,					
	granite, or jungle stone pitched bunds with lead up to 50 m. and lift up to 1.50m laying and filling the uphill portion with uniform slopeearth packing etc. complete [using 15 to 22 cm size quarried and non quarried stone]					
	nonQuarried stone	m2	1	1	11484 / 100 m2	114.84
	Total					**114.84**

Say Rs. 114/ m2

DETAILED ESTIMATE FOR STONE PITCHED CONTOUR BUND
[Repair]

SL.NO	ITEM	Unit	Nos	QTY	RATE	AMOUNT
1	Repairing contour bund with dry rubble,					
	granite, or jungle stone pitched bunds with lead up to 50 m. and lift up to 1.50m laying and filling					
	the uphill portion with uniform slope					
	earth packing etc. complete [using 15 to 22 cm size quarried and non quarried stone]					
	nonQuarried stone	m2	1.00x 0.30	0.30	143.52	43.05
	Total					**43.05**

Say Rs. 43.00/m2

DETAILED ESTIMATE OF CONTOUR TRENCHES [Slope 15%]

Sl.No	Item	Unit	Nos	L	B	H	Qty
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	1	1	0.6	0.6
	Say 0.60 m3@ Rs.111.59						**66.95**

Say 66 /RM

DETAILED ESTIMATE OF CONTOUR TRENCHES [Slope 20 %]

Sl.No	Item	Unit	Nos	L	B	H	Qty
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	2	0.6	0.6	0.72
	Say 0.72 m3@ Rs.111.59						**80.34**

Say 80.00/RM

STAGGEDRED TRENCHES

Sl.No	Item	Unit	Nos	L	B	H	Qty
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	2	1	0.6	1.2
	Say 1.20 m3@ Rs.111.59						**133.9**

Say 133/RM

PERCOLATION PITS -TYPE A

Sl.No	Item	Unit	Nos	L	B	H	Qty
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	1	1	1	1
	Say 1.00m3@ Rs.111.59						**111.59**

Say 111/No

PERCOLATION PITS -TYPE B

Sl.No	Item	Unit	Nos	L	B	H	Qty
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	2	2	1	4
	Say 4m3@ Rs.111.59						**446.36**

Say 446.00/No

PERCOLATION PITS -TYPE C

Sl.No	Item	Unit	Nos	L	B	H	Qty
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	3	3	1	9
	Say 9m3@ Rs.111.59						**1004.31**

Say 1004.00/No

DESILT OF DRAIN

Sl.No	Item	Unit	Nos	L	B	H	Qty
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	1	1.5	0.8	1.2
	Say 1.20m3@ Rs.111.59						**133.9**

Say 133/RM

ESTIMATE OF CENTRIPETAL TERRACES

1	Earth work excavation in ordinary soil and depositing within the initial lead and lift including neat banking etc. complete		
	$1 \times 3.14 \times [1.20^2 - 0.40^2] \times \frac{[0+0.20]}{2}$	0.40 m3	
	Say 0.40 m3 @ Rs.111.59/m3		**Rs. 44.63**
	Say Rs. 44.00/ E		

DETAILED ESTIMATE OF LIVE FENCING

S.l.No	Item	Qty	Rate	Amount
1	3 Nos of green cutting of glyricedia,muringa or any other easily available vegetative cuttings 1m length having approximate 3 to 5 cm between two cuttings [3 nos / 1m] including conveyance charges source to site			
	Green cuttings L.S	3 Nos	10.00/E	30.00
2	Reepers required for cross fencing for stabilization of plants Cuttings 2 nos [L.S]	3 Nos	3.00/E	9.00
3	Coir yarn required for tying reepers and planted cuttings	0.05 kg	60.00/kg	3
4	Labour cost for planting the cuttings at a depth of 20 cm and filling hole with completely and across tying the green cuttings etc. complete.	0.04 man	377	15.08
	Total			**57.08**

Rs. 57.00 /Rm

DETAILED ESTIMATE OF BRUSHWOOD CHECKS

S.l.No	Item	Qty	Rate	Amount
	Earth work excavation in ordinary soil			
	1x2x1/2 x1x0.5	0.50m3	111.59	55.79
1	3 Nos of green cutting of glyricedia,muringa or any other easily available vegetative cuttings 1m length having approximate 3 to 5 cm diameter between two cuttings [2nos / 1m] including conveyance charges source to site			
	Green cutting - 2x3	6 Nos	10.00/E	60.00
2	Reepers required for cross fencing for stabilization of plants Cuttings - 2x2	4 Nos	3.00/E	12.00
3	Coir yarn required for tying reepers and planted cuttings	0.1 kg	60.00/kg	6.00
4	Labour cost for planting the cuttings at a depth of 20 cm and filling hole with completely and across tying the green cuttings etc. complete.	0.04 man	377	15.08
	Consolidation by ramming in 15cm layers including all labour charges. Etc			
	1x2x1x1	2m3	286.65	573.3
				722.17

Rs. 722.00/Nos

STREAM BANK STABILIZATION [ENGINEERING] PULAMON THODU 1.5m height

Sl .No.	Item	Unit	Nos	L	B	H	Qty	Amount
1	Earth work excavation in ordinary soil and depositing within the initial lead and lift including neat banking etc. complete							
	For side cutting	M3	1	1.00	0+0-70 / 2	1.1	0.39	
	For Foundation		1	1.00	1.00	0.50	0.50	
	Total	**m3**					**0.885**	
	Say 0.885 m3 @ Rs. 1115.92/10m3							**98.76**
2	D.R. Masonry for foundation and super structure using blasted rubble including the cost of materials ,conveyance of materials ,labour charges etc. complete							
	For Foundation	m3	1	1.00	1.00	0.5	0.50	
	For Super structure	m3	1	1	0.9+0.50 / 2	1.5	1.05	
	Total	m3					**1.55**	
	Say 1.55 m3 @ Rs.2178							**3376**
	Total							**3475**
	Rs.3475/R.m							

Say Rs.3475/R.m

STREAM BANK STABILIZATION [ENGINEERING] PULAMON THODU 1.00 m height

Sl.No.	Item	Unit	Nos	L	B	H	Qty	Amount
1	Earth work excavation in ordinary soil and depositing within the initial lead and lift including neat banking etc. complete							
	For side cutting	M3	1	1.00	$\frac{0+0-70}{2}$	1.1	0.39	
	For Foundation		1	1.00	0.50	0.5	0.50	
	Total	**m3**					**0.885**	
	Say 0.885 m3 @ Rs. 1115.92/10m3							**98.76**
2	D.R. Masonry for foundation and super structure using blasted rubble including the cost of materials ,conveyance of materials ,labour charges etc. complete							
	For Foundation	m3	1	1.00	1	0.50	0.50	
	For Super structure	m3	1	1	$\frac{0.9+0.50}{2}$	1	0.70	
	Total	m3					**1.20**	
	Say 1.20 m3 @ Rs.2178							**2614**
	Total							**2713**
	Rs.2713/R.m							

Say Rs. 2713/R.m

STREAM BANK STABILIZATION [ENGINEERING] 0.5 m height

Sl. No.	Item	Unit	Nos	L	B	H	Qty	Amount
1	Earth work excavation in ordinary soil and depositing within the initial lead and lift including neat banking etc. complete							
	For side cutting	M3	1	1.00	0+0-70 / 2	1.1	0.39	
	For Foundation		1	1.00	0.50	0.5	0.50	
	Total	**m3**					**0.885**	
	Say 0.885 m3 @ Rs. 1115.92/10m3							**98.76**
2	D.R. Masonry for foundation and super structure using blasted rubble including the cost of materials ,conveyance of materials ,labour charges etc. complete							
	For Foundation	m3	1	1.00	1	0.50	0.50	
	For Super structure	m3	1	1	0.9+0.50 / 2	0.5	0.35	
	Total	m3					**0.85**	
	Say 0.85 m3 @ Rs.2178							**1851**
	Total							**1950**
	Rs.1950/R.m							

Say Rs.1950/R.m

DETAILED ESTIMATE OF CROSS BAR

Sl.No	Item	Unit	Nos	L	B	H	Qty	Rate	Amount
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	3	0.45	0.5	0.675	111.59	75.32
2	Dry Rubble packing , including the cost of rubble ,labour charge ,conveyance etc.complete	m3	1	3	0.45	0.5	0.675	2178	1470.15
3	Cement concrete belt 1:2:4 above the rubble packing includin the cost of materials ,labour etc. complete	m3	1	3	0.45	0.05	0.068	6878	464.27
	Toatal								**2009.74**

Say 2009 /No

DETAILED ESTIMATE OF GULLY CROSS CHECKS

Sl.No	Item	Unit	Nos	L	B	H	Qty	Rate	Amount
1	Earth work excavation in ordinary soil ,depositing the soil on bank with initial lead and lift	m3	1	5	0.5	0.5	1.25	111.59	139.49
2	Dry Rubble packing , including the cost of rubble ,labour charge ,conveyance etc.complete								
	For foundation	m3	1	5	0.5	0.5	1.25	2178	2722.50
	for super structure	m3	1	5	0.5	0.45	1.13	2178	2450.25
3	Cement concrete belt 1:2:4 above the rubble packing includin the cost of materials ,labour etc. complete	m3	1	5	0.5	0.05	0.125	6878	859.75
									6171.99

Say 6172 /No

STREAM BANK STABILISATION -VEGETATIVE

S.l.No	Item	Qty	Rate	Amount
1	Consolidation by ramming in 15cm layers including all labour charges. Etc			
	1x1x1x1	1m3	28.66	28.66
2	2 Nos of Kaitha or any other easily available vegetative [2nos / 1m] including cost, conveyance charges source to site	2Nos	10/E	20.00
3	3 Nos of ramacham or any other easily available vegetative [3nos / 1m] including cost, conveyance charges source to site	3Nos	10/E	30.00
4	Agrostological measures @ Rs. 8.80/Rm			8.8
4	Labour cost for planting the cuttings at a depth of 20 cm and filling hole with completely and across tying the green cuttings etc. complete.	0.04 man	377	15.08
				102.54

Say Rs. 102/RM

ESTIMATE OF TRACTOR RAMP

SL.No	Item	Unit	Qty	Rate	Amount
1	Earth work excavation in ordinary soil for foundation 1 x [5.01+5.00] x[0.50+0.30] x3.3 2 2	m3	6.6	111.59	736.49
2	Dry Rubble masonry for foundation including the cost of all labour, materials and conveyance etc.complete				
	1 x [5.01+5.00] x[0.50+0.30] x3.3 2 2	m3	6.6	2178	14374.80
3	Cement concrete 1:2:4 above the rubble work				
	1x5.01x3.30x0.10	m3	1.65	6878	11348.7
	Total				26459.99

Say Rs. 26460.00/No

R.C.C Slab across the stream

1	Cement Concrete 1:2:4 using 20mm broken stone for slab				
	1 x 1.2x 0.9x0.10	0.108 m3 @ Rs.6878/m3 =			742.82
2	Reinforcement for R.c.c work				
	0.108 m3 @ 80 kg/m3	8.64 kg @ Rs. 52.42/kg		=	452.90
	Total				**1195.72**

Say 1195/no

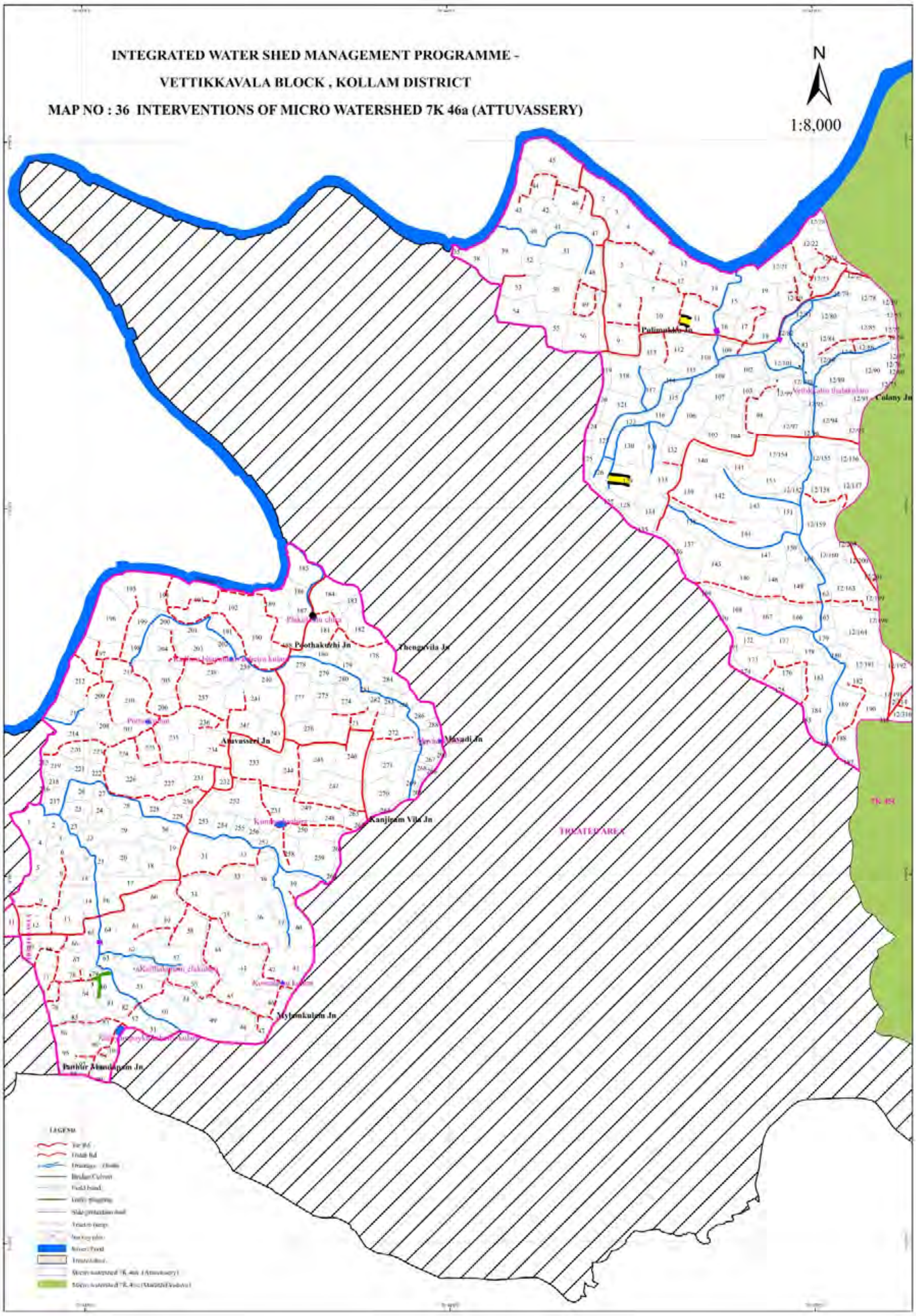
FIELD BUND

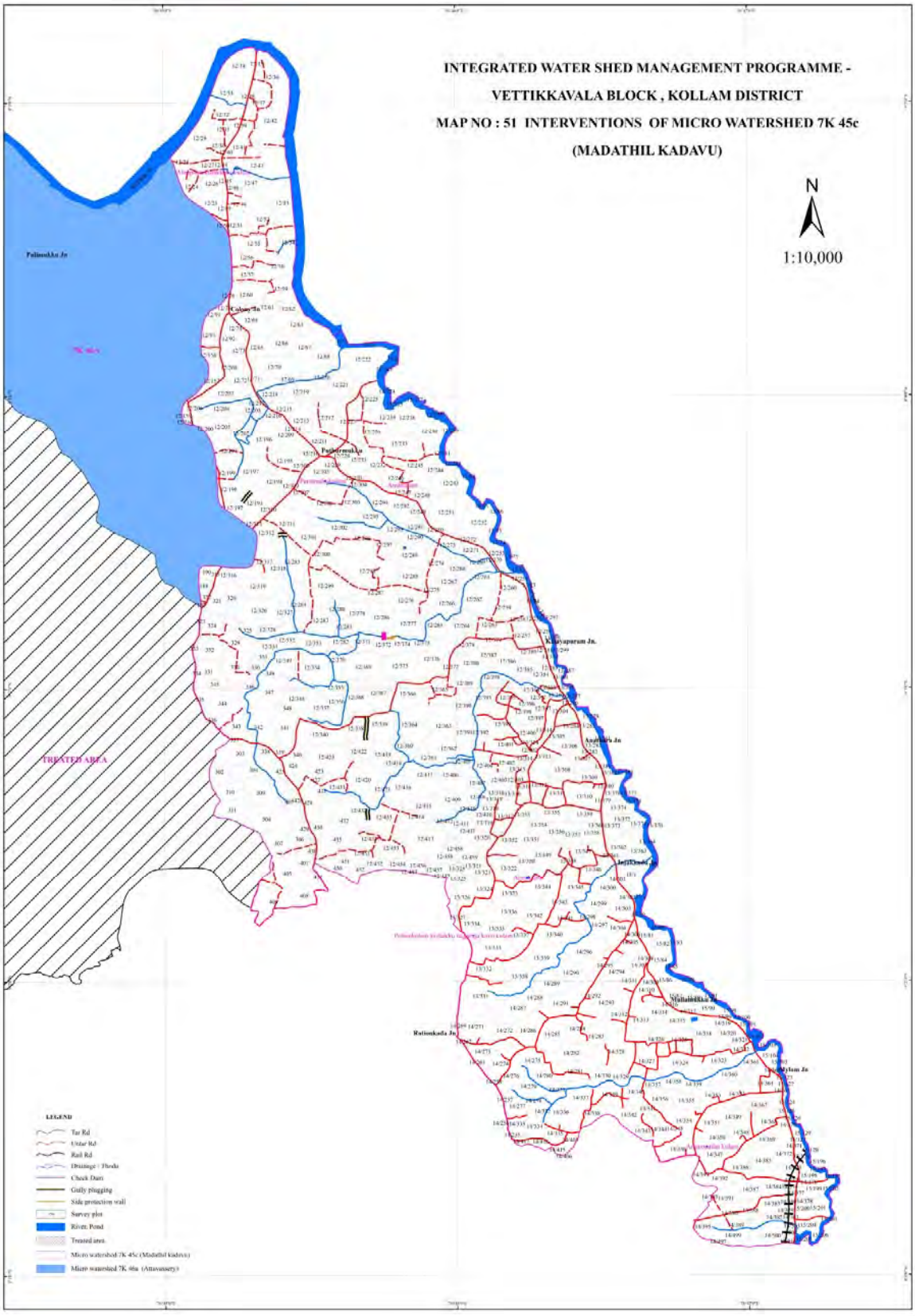
SL.NO	ITEM	UNIT	NOS	L	B	H	QTY	Amount

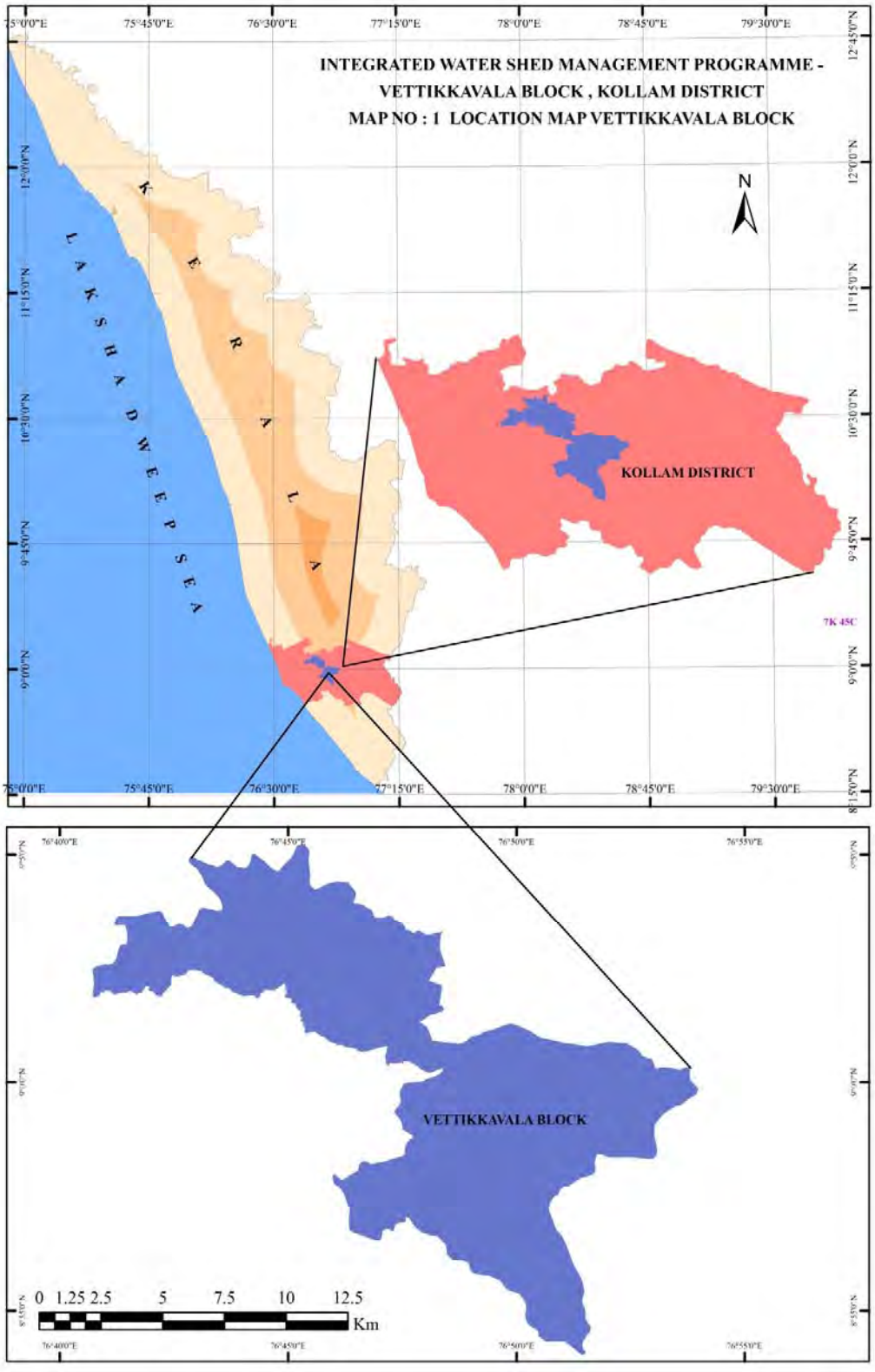
1	Earth work excavation in ordinary soil under water and depositing within the initial lead and lift including neat banking etc. complete	m3	1.00	221.00	[1.50+1.00] 2	1.00	**276.25**	
	Say 276.25 m3 @ Rs.133.90/m3							36989.87
2	For formation of bund							
	Consolidation by ramming in 15cm layers including all labour charges. Etc.							
	Say 276.25 m3 @ Rs.286.65/10m3	m3					**276.25**	7918.70
3	Supply and fixing of AC pipe	LS						1000.00
	Total							**45928.57**

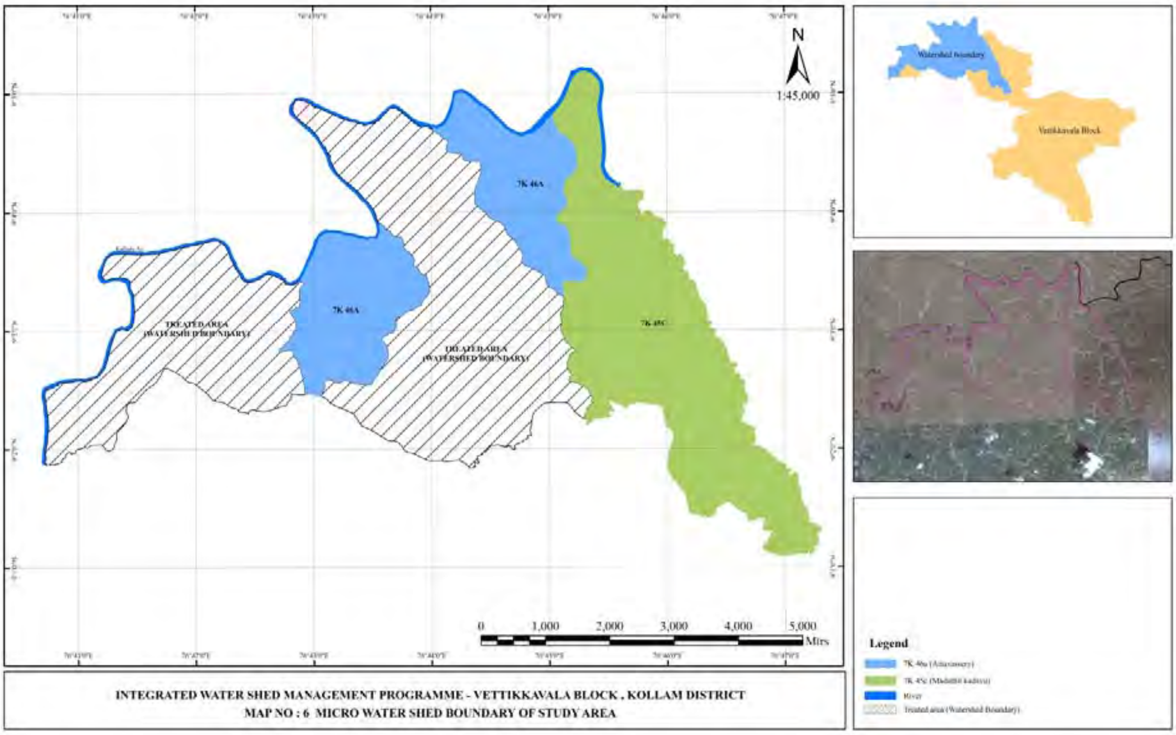
Rs. Say Rs.45928/-

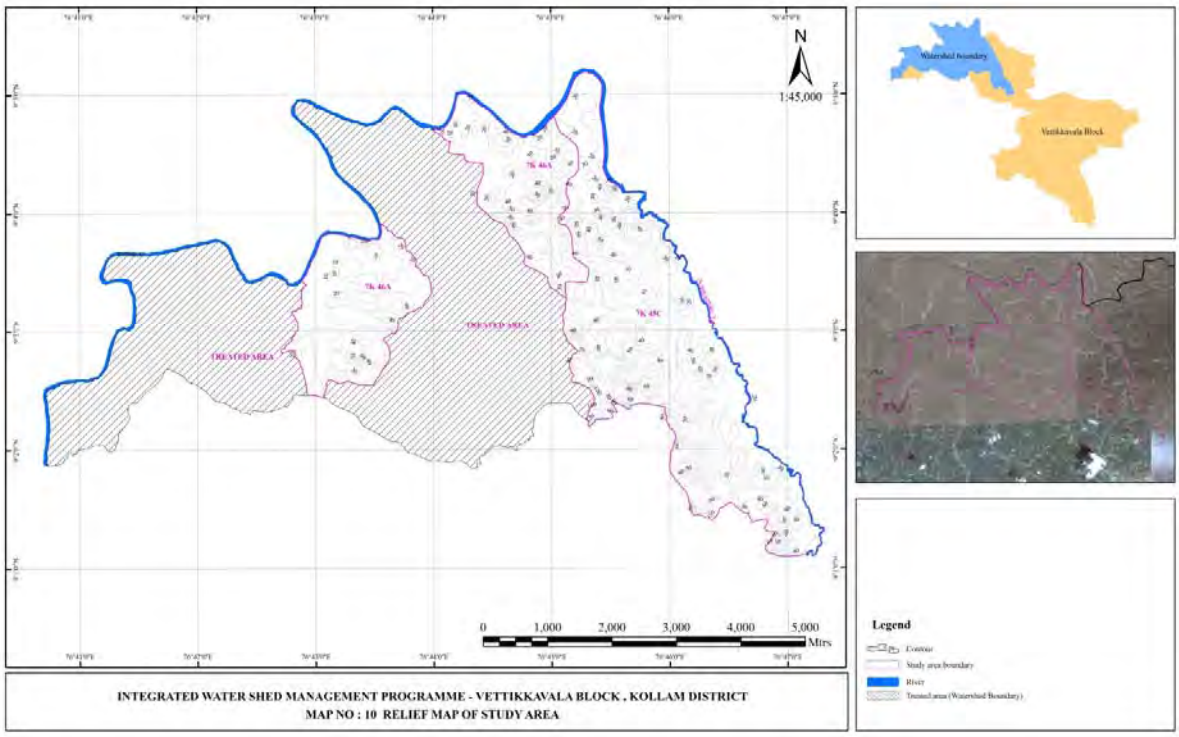
THEMATIC MAPS


INTEGRATED WATER SHED MANAGEMENT PROGRAMME -
VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 36 INTERVENTIONS OF MICRO WATERSHED 7K 46a (ATTUVASSERY)
N
1:8,000
Pulimukku Jn
Colany Jn
Poothakuzhi Jn
Thengavila Jn
Attuvasseri Jn
Mayadi Jn
Kanjiram Vila Jn
Mylonkulam Jn
TREATED AREA
LEGEND

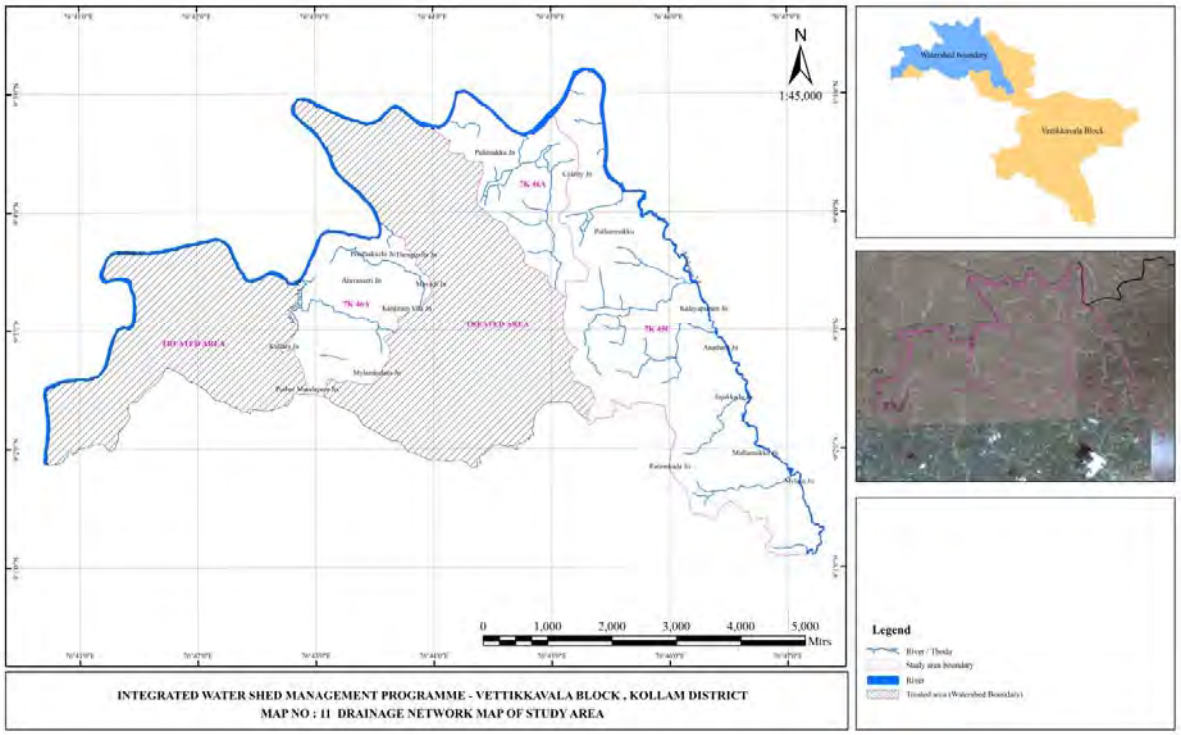

INTEGRATED WATER SHED MANAGEMENT PROGRAMME -
VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 51 INTERVENTIONS OF MICRO WATERSHED 7K 45c
(MADATHIL KADAVU)
N
1:10,000
TREATED AREA
LEGEND
Tar Rd
Under Rd
Rail Rd
Drainage / Thodu
Check Dam
Gully plugging
Side protection wall
Survey plot
River, Pond
Treated area
Micro watershed 7K 45c (Madathil Kadavu)
Micro watershed 7K 46a (Attavassery)


INTEGRATED WATER SHED MANAGEMENT PROGRAMME -
VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 1 LOCATION MAP VETTIKKAVALA BLOCK
N
KERALA
LAKSHADWEEP SEA
KOLLAM DISTRICT
VETTIKKAVALA BLOCK
0 1.25 2.5 5 7.5 10 12.5
Km

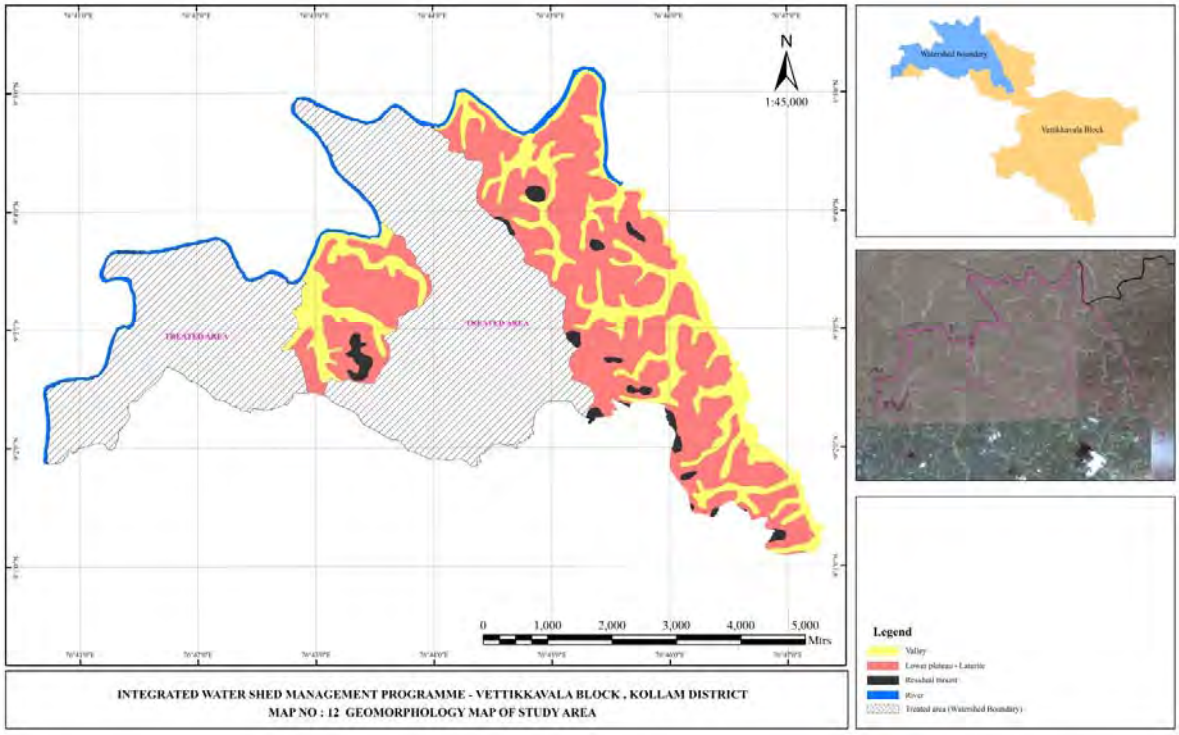

N
1:45,000
7K 46A
7K 46A
7K 45C
TREATED AREA (WATERSHED BOUNDARY)
TREATED AREA (WATERSHED BOUNDARY)
0 1,000 2,000 3,000 4,000 5,000
Mtrs
Watershed boundary
Vettikkavala Block
Legend
River
Treated area (Watershed Boundary)
INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 6 MICRO WATER SHED BOUNDARY OF STUDY AREA



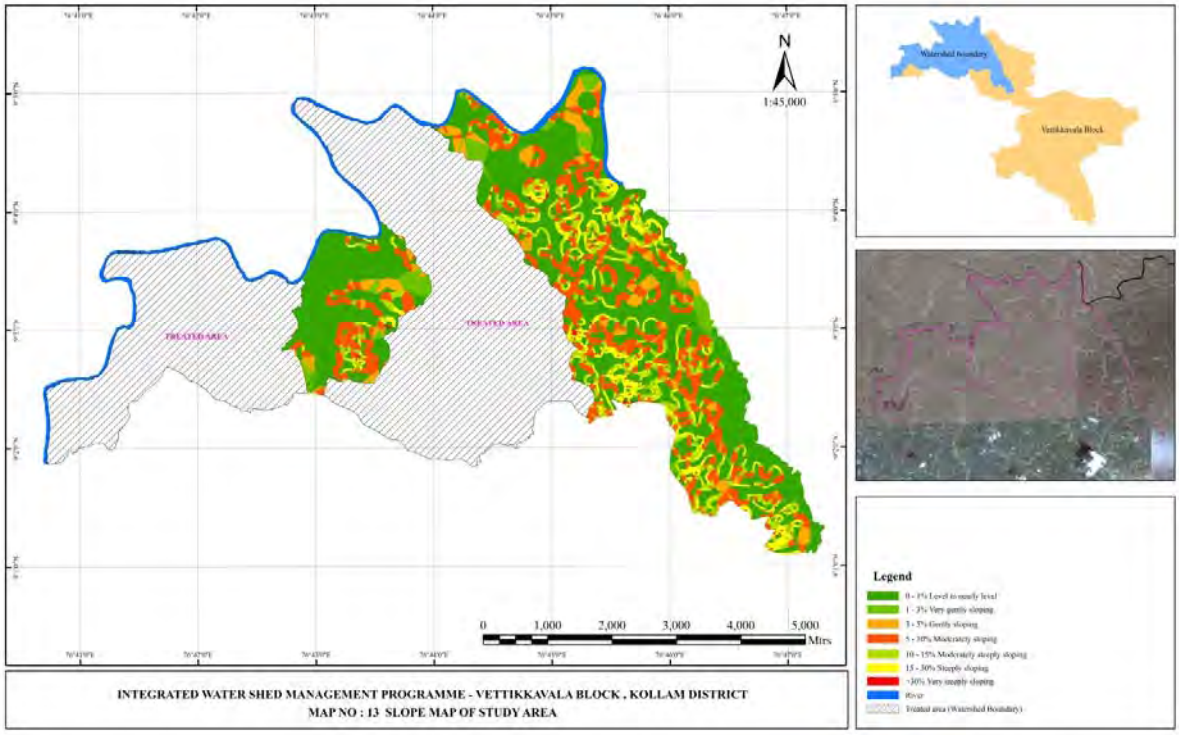
INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 10 RELIEF MAP OF STUDY AREA



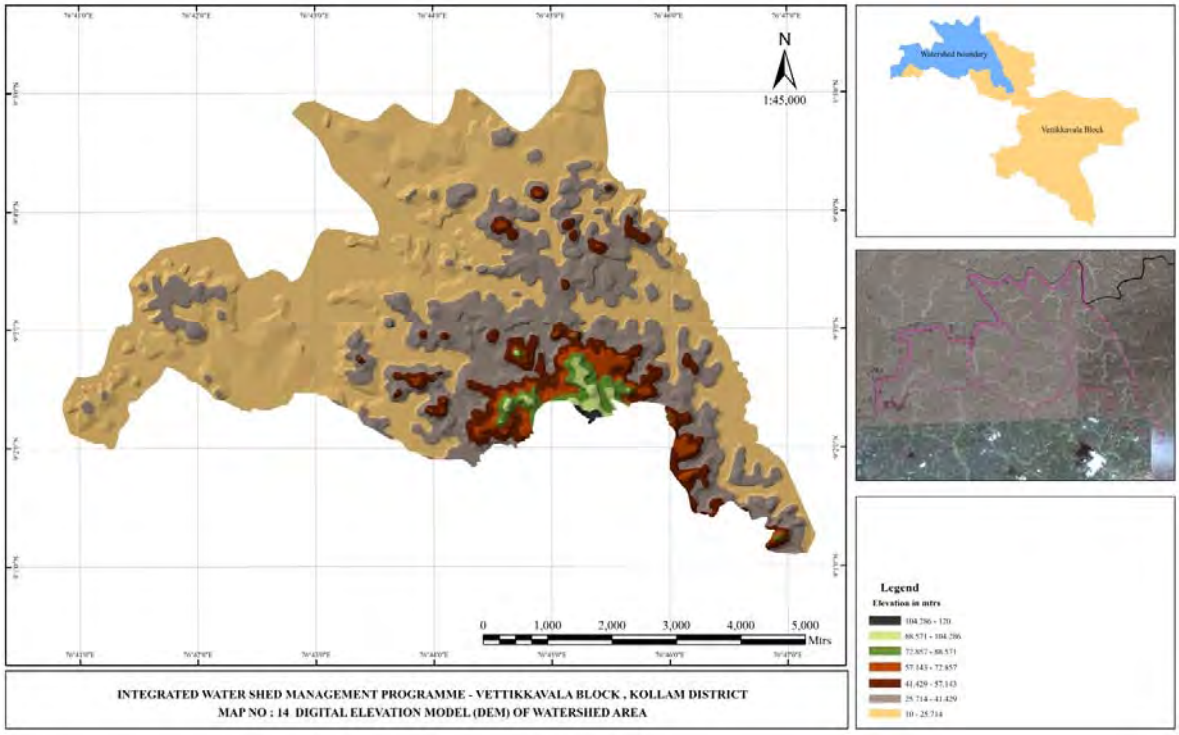
INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 11 DRAINAGE NETWORK MAP OF STUDY AREA

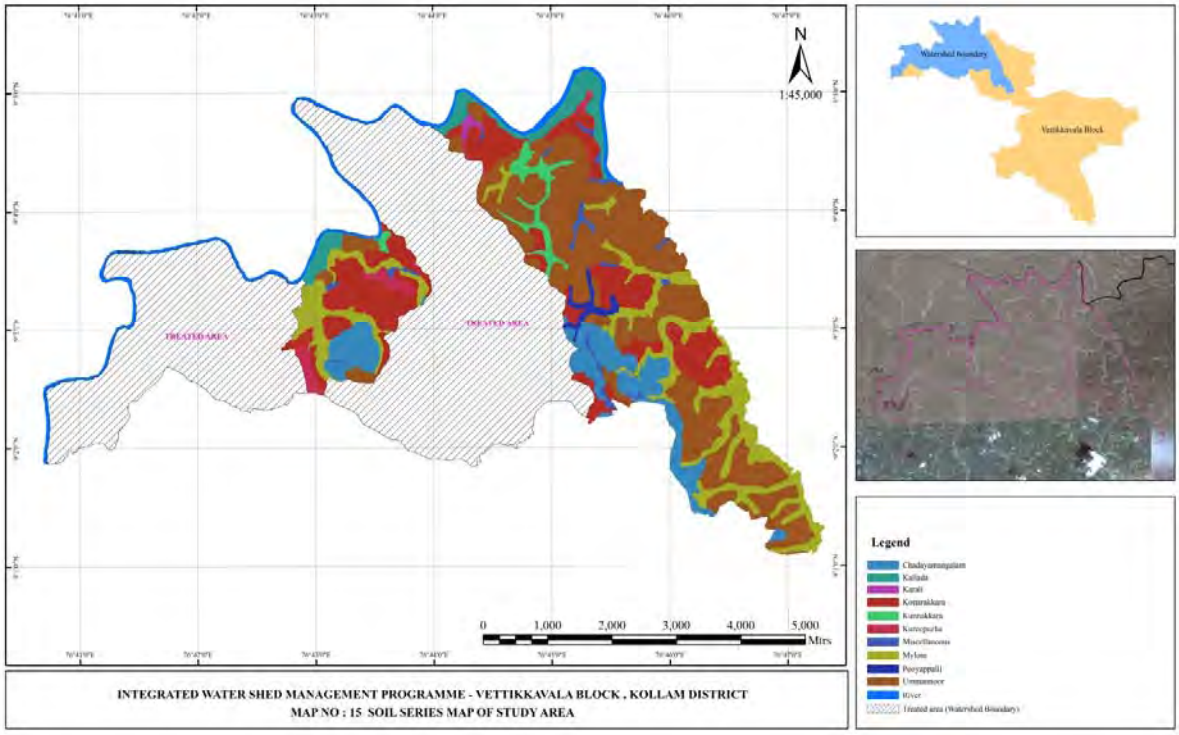


INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 12 GEOMORPHOLOGY MAP OF STUDY AREA

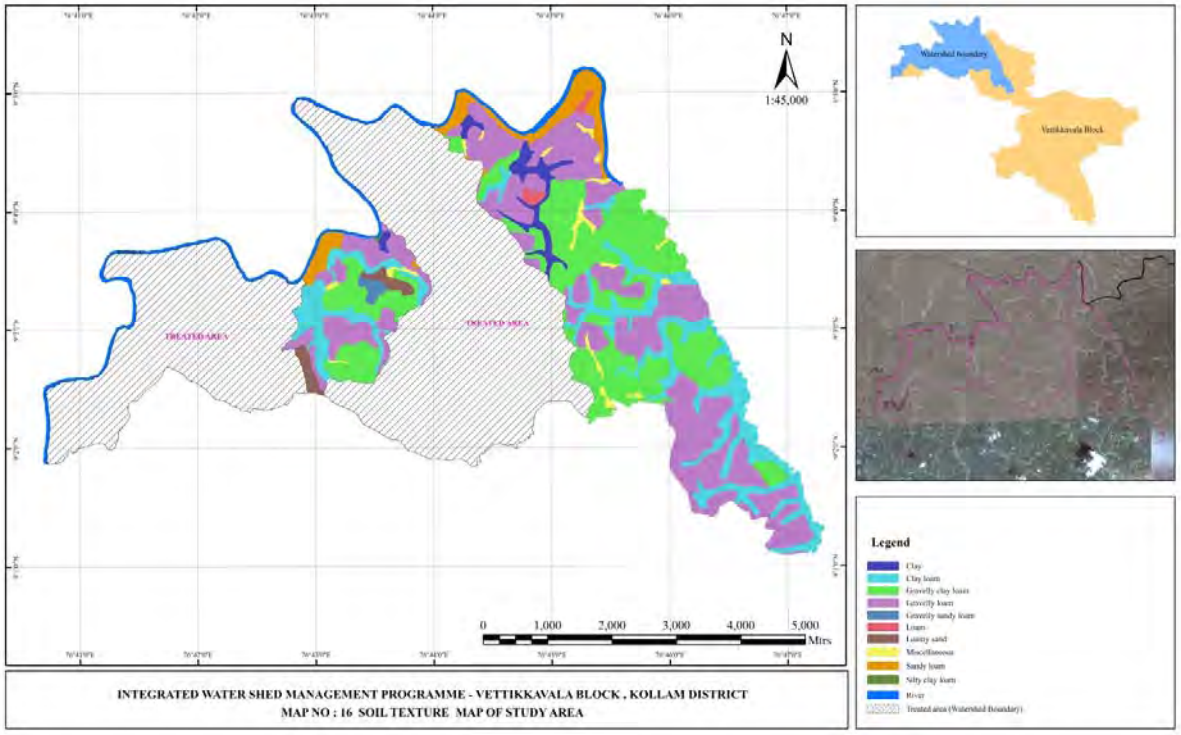


INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 13 SLOPE MAP OF STUDY AREA

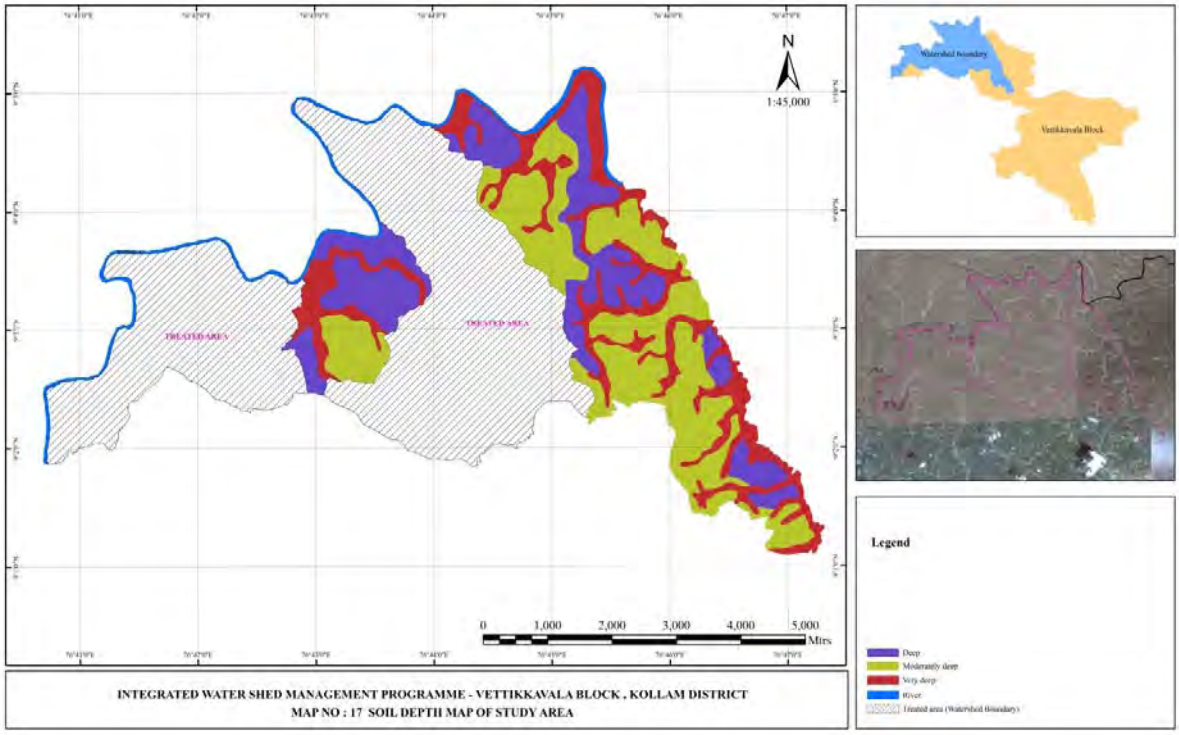

N
1:45,000
0 1,000 2,000 3,000 4,000 5,000
Mtrs
Watershed boundary
Vettikkavala Block
Legend
Elevation in mtrs
104.286 - 120
88.571 - 104.286
72.857 - 88.571
57.143 - 72.857
41.429 - 57.143
25.714 - 41.429
10 - 25.714
INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 14 DIGITAL ELEVATION MODEL (DEM) OF WATERSHED AREA

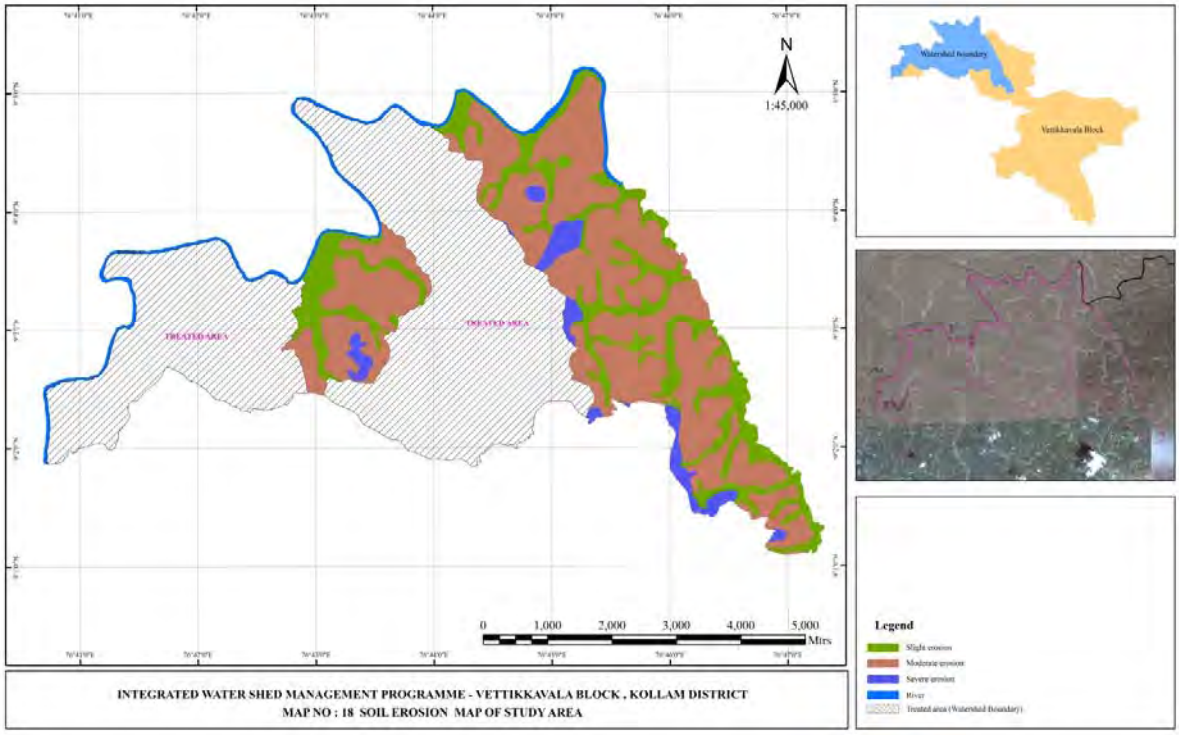


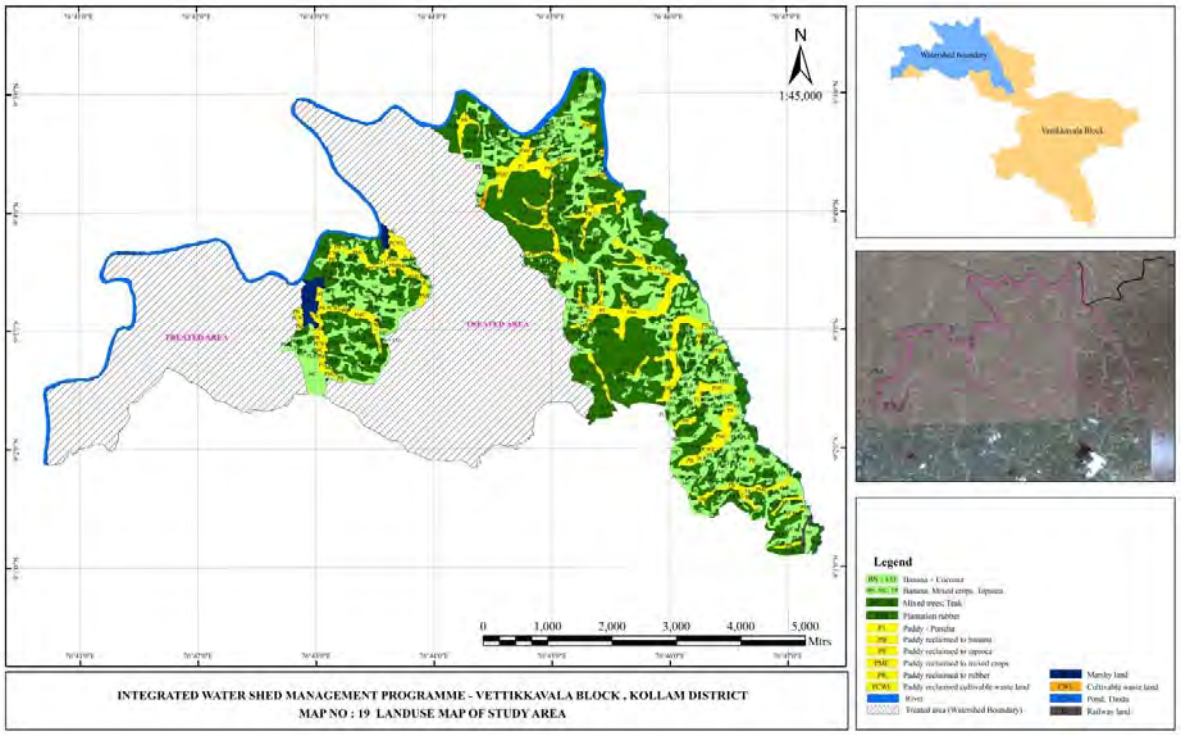
INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 15 SOIL SERIES MAP OF STUDY AREA



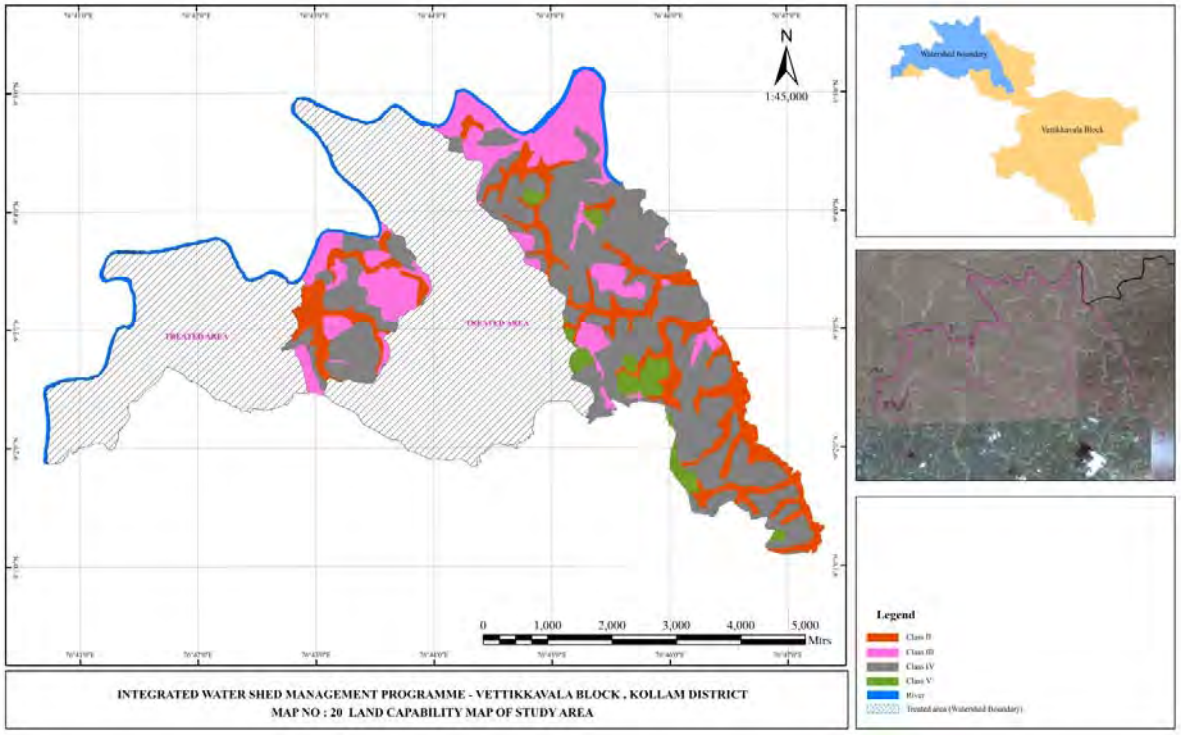
INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 16 SOIL TEXTURE MAP OF STUDY AREA


N
1:45,000
0 1,000 2,000 3,000 4,000 5,000
Mtrs
Watershed boundary
Vettikkavala Block
Legend
Deep
Moderately deep
Very deep
River
Treated area (Watershed Boundary)
INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 17 SOIL DEPTH MAP OF STUDY AREA


N
1:45,000
0 1,000 2,000 3,000 4,000 5,000
Mtrs
Watershed boundary
Vettikkavala Block
Legend
Slight erosion
Moderate erosion
Severe erosion
River
Treated area (Watershed Boundary)
INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 18 SOIL EROSION MAP OF STUDY AREA



INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 19 LANDUSE MAP OF STUDY AREA



INTEGRATED WATER SHED MANAGEMENT PROGRAMME - VETTIKKAVALA BLOCK , KOLLAM DISTRICT
MAP NO : 20 LAND CAPABILITY MAP OF STUDY AREA