

Contents

No	DESCRIPTION	PAGE NO
CHAPTER 1 :	INTRODUCTION -----	1
CHAPTER 2 :	PROJECT AREA -----	13
CHAPTER 3 :	METHODOLOGY -----	22
CHAPTER 4 :	ACTIVITIES PROPOSED -----	26
CHAPTER 5 :	PULINTHRUTHU MICRO WATERSHED -----	37
CHAPTER 6 :	KOLICHIRA MICRO WATERSHED -----	48
CHAPTER 7 :	THEKKUMBHAGOM MICRO WATERSHED-----	61
CHAPTER 8 :	ELAMBA MICRO WATERSHED-----	77
CHAPTER 9 :	VILAYINMOOLA MICRO WATERSHED-----	90
CHAPTER 10 :	KIZHUVILAM MICRO WATERSHED-----	105
CHAPTER 11 :	SARKARA MICRO WATERSHED-----	119
CHAPTER 12 :	MELATINGAL MICRO WATERSHED-----	132
CHAPTER 13 :	CAPACITY BUILDING PROGRAM-----	147
CHAPTER 14 :	ESTIMATE OF WORKS-----	160
CHAPTER 15 :	EXPECTED OUTCOMES-----	218

CHAPTER 1

INTRODUCTION

1.1 Background

Soil, Water and Bio-Resources are nature's gift to mankind. These resources are the most important and vital natural resources for the existence of man and animals. Soil, water and plant are so interdependent that one cannot be managed efficiently without the other two. But due to high rate of population growth-both human and livestock, there is indiscriminate exploitation of natural resources for meeting the ever increasing demand for food, fodder, fuel, fibers and fertilizers. Thus, continuous degradation of production base and imbalance in land-water-plant and human-animal system, leads to ecological imbalance and economic insecurity. As a result there is threat to the quality of our life and cultivation. Therefore, it is highly felt that the natural resources are to be managed efficiently and collectively. Simultaneously one has to find out the suitability under "unit of management" of the three resources soil, water and vegetation or plants, since soil and vegetation are subjected to easier manipulation whereas water is the climatic parameter that need to be disciplined once it comes in contact with vegetation and the soil.

The mounting pressure on arable and non-arable land due to increasing human and animal population has resulted in environmental degradation. The declining per capita land and fresh water availability coupled with soil erosion and depleting degrading land and water resources are posing serious threat to food, environmental, social and economic security in the country. Rain fed area that constitute 75% (108 mha) of total cultivated land of the Nation (142 mha) are inhibited by resource poor farmers who with low level of productivity suffers the most from such degradation and vagaries of nature. It is estimated that rain fed areas contribute 45% to total food grain production of the country. With the projection made about 20 mha additional land is likely to be brought under irrigation, but nearly 69 mha will still be left under rain fed condition. Soil and water being a natural source for meeting the demand, holistic and sustainable development of these resources is to be taken up in order to achieve the target of over 4% agricultural growth envisaged in the National Agriculture Policy.

However, water can be managed conveniently and efficiently only if watershed is taken as a unit. Since soil, plant and water are interdependent resources, "watershed" is considered to be the ideal unit for most effective and gainful management of these resources.

1.2 Watershed Management

Watershed is defined as a hydro-geological unit of area from which the rainwater drains through a single outlet. Watershed development refers to the conservation, regeneration and judicious use of all the natural resources (like land, water, plants, animals) by human beings. Watershed Management

brings about the best possible balance between natural resources on the one side and human beings on the other. Human beings and the ecology are interdependent. The changes in the environment directly affect the lives of the people depending on it. A degraded environment means a degraded quality of life of the people. This degradation can be tackled effectively through the holistic development of the watershed. A watershed provides a natural geo-hydrological unit for planning any developmental initiative. The approach would be treatment from “ridge to valley”

1.3 Integrated Watershed Management Programme (IWMP)

Watershed management may mean different things to different people but “integrated watershed management’ deals with the use and conservation of natural resources to meet the basic needs of land users. The new approach to watershed management is ‘people-friendly’ and ‘process-based’ rather than physical target-oriented (as was the case in most of the past watershed programs). A watershed is made up of the natural resources in a basin, especially water, soil, and vegetative factor. The comprehensive development and management of a basin so as to make productive use of all its natural resources and also protect them is termed “Integrated watershed management”. It is important that integrated watershed management must consider the social, economic, and institutional factors operating with and outside the watershed area. Since integrated watershed management involves decision-making, a multidisciplinary and multi-institutional approach is essential for utilization and protection of natural resources.

The provisions in the Common Guidelines and the observations of the Parthasarathy Committee have necessitated modifications in the watershed schemes of the Department of Land Resources. Accordingly, Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP) and Integrated Wastelands Development Programme (IWDP) of the Department of Land Resources have been integrated and consolidated into a single modified programme called Integrated Watershed Management Programme (IWMP). This consolidation is for optimum use of resources, sustainable outcomes and integrated planning. The scheme has been approved by the Government on 26.2.2009 with major revisions of the older program which made the IWMP more sustainable, the difference are detailed in Table no 1.1

1.8 Developmental Objectives of Watershed Development

The main developmental objectives of watershed development are:

- (1) To provide a method of integrated basic resources development of the watershed in such a manner that short term and long term goals of development are in harmony with one another
- (2) To optimize land use and increase productivity
- (3) To reduce land degradation by impeding surface runoff;

- (4) To conserve water and enhance ground water recharge
- (5) To prevent floods and siltation in rivers, dams and lakes and,
- (6) To develop scientifically appropriate agri-horti-silvi-,pastoral -hydro systems.

For successful watershed management, a participatory, integrated, multidisciplinary and multi-sectoral approach is essential and even after withdrawal of economic resources, technical expertise and infrastructure, the programme should survive, and then the programme is sustainable. Hence it is important to note that people's participation right from pre-planning stage along with local level people's institution is required.

1.9 Institutional Set up for Implementation of IWMP

Ministry Level: A Steering Committee has been constituted at National Level under the Chairmanship of Secretary (LR) with members from Planning Commission, NRAA/ related Ministries/ Departments/ organizations including NGOs to administer the IWMP.

State Level: A State Level Nodal Agency (SLNA) has been constituted with professional support. SLNA with professional support is the dedicated institution for implementation of IWMP in the State.

District Level: Watershed Cell-cum-Data Centre at DRDA/ZP has been created in all programme districts to supervise and coordinate IWMP projects in the district.

Project Level: Project would be supervised by Project Implementing Agency (PIA).

Under Common Guidelines, 2008 both Government and Non-Government agencies may act as PIAs for providing technical back up for IWMP projects. Each PIA will have Watershed Development Team (WDT) comprising of 3 to 4 technical experts.

Village Level: Watershed Committee (WC) will be constituted by the Gram Sabha for implementation of the project at field level. This will comprise of at least 10 members. Half of which would be representatives of SHGs and User Groups (UGs), SC/ST community, women and landless. One member from WDT would also represent WC.

1.10 Funding pattern

Implementation of Integrated Watershed Management Programme (IWMP) is as per the "**Common Guidelines for Watershed Development Projects**" issued by the Department of Land Resources, Ministry of Rural Development, Government of India, which have been formulated to have a unified perspective by all the Ministries /Departments/Implementing Agencies. Under the Common Guidelines the Programs are implemented in three phases viz.

1.	Preparatory Phase	-	1-2 years
2.	Watershed Works Phase	-	2-3 years
3.	Consolidation & Withdrawal Phase	-	1-2 years

1.12 Distribution of budget for various components

• Administrative costs	10 %
• Monitoring	1 %
• Evaluation	1 %
• Entry point activities	4 %
• Institution and capacity building	5 %
• DPR	1 %
• Water shed development works	56 %
• Livelihood activities – asset less	9 %
• Production system & micro enterprises	10 %

CHAPTER 2

PROJECT AREA

2.1 Chirayinkeezhu Block

Chirayinkeezhu Block Panchayat is one of the 11 Blocks in Thiruvananthapuram district. It was established as NES Block on June 17th of 1955. It is situated in Chirayinkeezhu Taluk and has an area of 84.64 Sq. Km. There are 6 Grama Panchayats viz. Mudakkal, Kizhuvilam, Chirayinkeezhu, Kadakkavoor, Vakkom and Anchuthengu and 11 Villages viz. Alankode, Azhur, Chirayinkeezhu, Edakode, Elamba, Kadakkavur, Kizhattingal, Kizhuvilam, Kuntalur, Melethonnakkal Vakkom and Sarkara. In the administration side, the Block has an elected Block Committee with Block President O.S. Ambika, Vice President G.Venugopal, Members, K. AnilaKumar secretary (Block Development Officer), Joint Block Development Officers, Extension Officer and supporting staff at its office to perform the day to day activities.

The total population of the Block as per 2001 census is 173663 of which 81755 are male and 91908 are female. The literacy rate of this block is 74.04 %. Physiographically the Block consists of low hills with isolated hillocks, laterite mounds, coastal land, wetlands and valleys. There are a number of schools upto higher secondary levels in the block. There are two Arts and Science Colleges, one Engineering college, and several other educational institutions. The State Highway passes through the eastern part of the Block. The Block has excellent transport network and is well connected to all parts of the district including state capital. The railway line crosses the major part of the Block and has two major stations Chirayinkeezhu and Kadakkavur. The Trivandrum – Shoranour Water way (TS canal) passes through the Block.

Agriculture is the primary occupation of the people. Cultivable lands are classified as wet, dry, garden and plantations. Rubber is the major plantation crop and coconut, banana and vegetables are also cultivated. The major river draining through the Block is the Vamanapuram and Mamam River. The Block falls in the category of 'white' which means that less than 65 percent of the ground water is utilized.

2.2 Project area

The project area lies between 8° 43' 21" to 8° 41' 53" North latitudes and 76° 47' 38" to 76° 50'00" East longitudes and is spread over the northern part of the Thiruvananthapuram district in Kerala State. It is bounded by Varkala Block in the North, Kilimanoor Block in west, Pothencode Block in the south and Arabian Sea in the West. The watershed has a total area of 68.03 sq.km (6803 ha) covering 10 villages spread over 9 Panchayats. viz. Mudakkal, Kizhuvilam, Chirayinkeezhu, Kadakkavoor, Vakkom Managlapuram, Azhoor, Karavaram and Anchuthengu

The project is a cluster of eight micro watersheds viz. Pulinthruthu (3M1a), Kolichira (3M2a), Thekkumbhagom (4V1a), Elamba (4V28b), Vilayinmoola (4V29a), Kizhuvallom (4V29e), Sarkara (4V30a) & Melattingal (4V4b)

Table 2.1
Area and Grama Panchayats of each Watershed

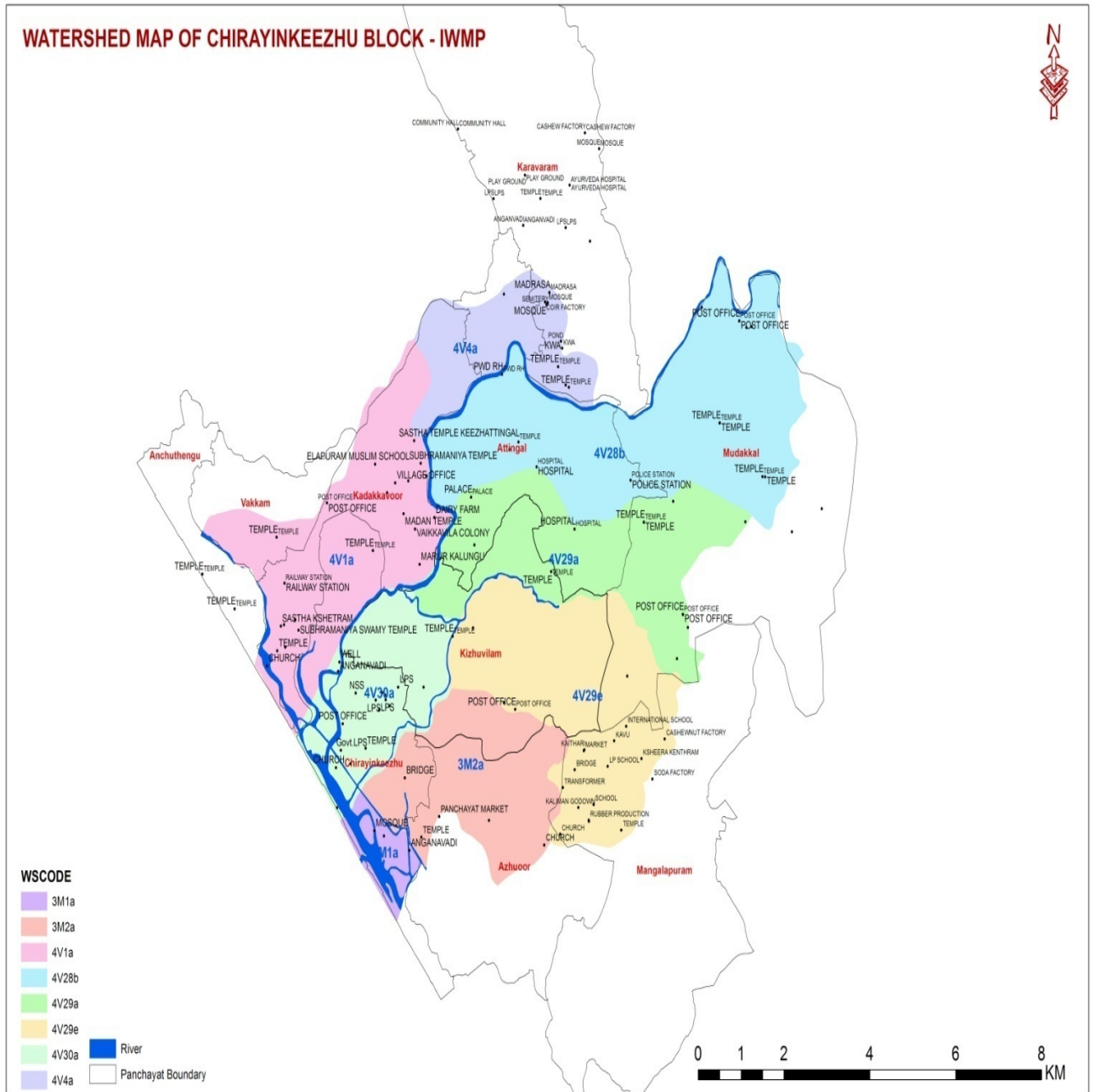
Sl.No	Watershed code	Name of the watershed	Area in Ha	Grama panchayat under the watershed
1	3M1a	Pulinthruthu	170	Chirayinkeezhu
2	3M2a	Kolichira	920	Chirayinkeezhu , Azhoor & Kizhuvilam
3	4V1a	Thekkumbhagom	1423	Chirayinkeezhu, Kadakkavoor & Vakkom
4	4V28b	Elamba	978	Mudakkal
5	4V29a	Vilayinmoola	891	Mudakkal & Kizhuvilam
6	4V29e	Kizhuvilam	1321	Managlapuram, Mudakkal & Kizhuvilam
7	4V30a	Sarkara	618	Chirayinkeezhu & Kizhuvilam
8	4V4b	Melattingal	481	Kadakkavoor &

				Karavaram
--	--	--	--	-----------

The Micro watershed is delineated based on the two rivers, Vamanapuram and Mamam flowing through the project area which is overlaying three block area Chirayinkeezhu, Pothencode and Kilimananur.

State government has decided that Chirayinkeezhu Block Panchayat will be the Project Implementation Agency. A Coordination Committee at Block level to guide and supervise the implementation of the project is formed with Smt. O.S.Ambika, President, Chirayinkeezhu Block as Chairman and Block Presidents of Pothencode and Kilimananur Blocks as co- chairmen. The Block Secretary, Sri K. Anilakumar is the Secretary of the committee and in order to support the PIA, the Watershed Development Team has been formulated with Agriculture Expert, Engineer, Social Development Expert and Data Entry Operator as members of the team.

In order to develop the Detailed Project Report (DPR), the Project Implementation Agency has engaged Centre for Environment and Development (CED) as the Technical Support Organization (TSO). CED, an ISO 9001-2008 certified institution, is an independent research and development, training and consultancy organisation focussing in fields related to Environment and Development and the Centre of Excellence of Ministry of Urban Development, Government of India and Regional Resource Agency of Ministry of Environment and Forests, Government of India and also the Accredited Agency of Government of Kerala for Solid Waste Management and Participatory Resource Mapping. CED has carried out projects sponsored by various agencies during the last 20 years.



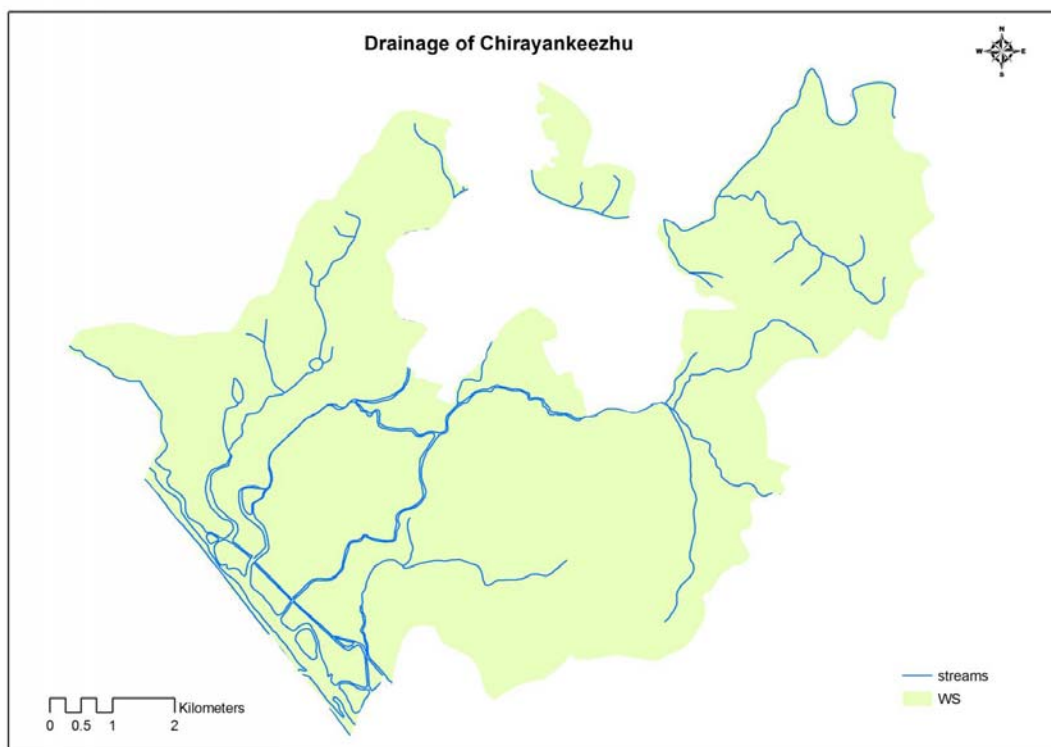
2.3 Physiography

The Project area is undulating Hilly terrain with complex topography and costal terrain in the western part of the project area. The major physiographic units are lowland, midland and highland. The Slope is 0-34 degree. The slope and DEM maps were derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure 1 of the report. The relief is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the Vamanapuram and Manam River.

2.4. Drainage

The Vamanapuram River is 88 km Long River in southern Kerala. The river originates in the Chemunjimotta hills (alt. 1860m) on the southern side of the Western Ghats, and flows through Thiruvananthapuram and Kollam districts of Kerala and finally drains into the Anjengo Lake (Anchuthengu Lake) near Varkala at Chirayankeezhu. The general elevation ranges from 76m to 1717 m in the upper region, 45 m in the middle region to less than 4 m the lower region.

The two tributaries of this river are the Upper Chittar and Manjaprayar streams. After emerging it traverses a distance of 7 km, it receives the Kalaiparai Ar. From Kallar, the river takes a slightly meandering course till its confluence with the upper Chit Ar. The river then flows west wards upto Manjappara. It continues to the westward course till Choodal, where the Chit Aar joins the main river. From there it meanders westwards till Vamanapuram where the SH-1 road crosses it. The river again flows westwards and falls into the Anjengo Lake at Chirayankeezhu. The Vamanapuram River flows from the North Western portion of the Chirayinkeezhu watershed.



Mamam River originates in Thalacode hills in Thiruvananthapuram district and flows 27 km westwards and drains in to the Anjengo Lake (Anchuthengu Lake) near Varkala at Chirayankeezhu. The catchment area is 114 Sq Km. The Mamam river flows through the southern part of Mudakkal

Panchayat and Northern part of Kiluvallam Panchayat .It divides in to two streams at Andoorkonam near Kunnathu Mahadevan temple one flows westward and reaches Vamanapuram river and the other part flows southwards through small check dam at Changanam and continues to Enchakkal and then drains in to Anjengo Lake (Anchuthengu Lake) near Varkala.

The broad landforms at the upper region are low hills with isolated hillocks Coastal ,Low land and lateritic mounds. The land forms of the middle region include midland laterites with valleys and low hills with isolated hillocks. The landforms at the lower region are coastal laterites.

2.5 Water Resources

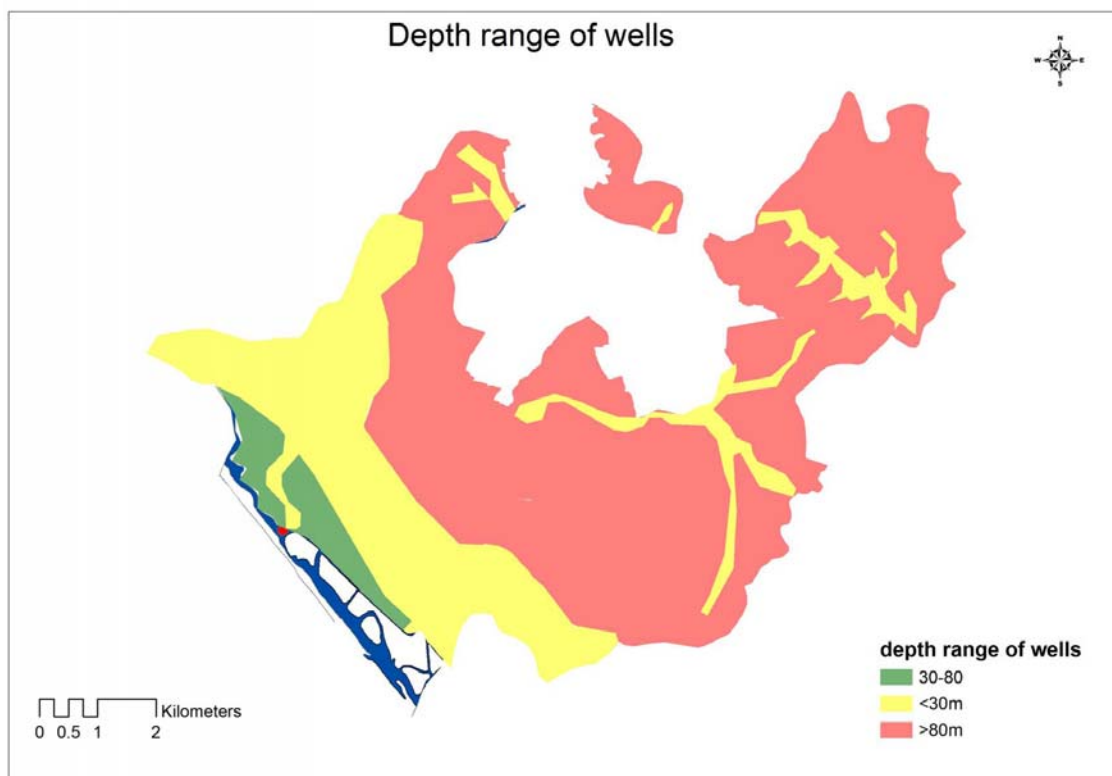
2.5.1 Surface Water Resources

Vamanapuram and Mamom rivers are flowing through the project area. The combined total yield of these two rivers and the annual utilisable yield are 1324 Mm³ and 687 Mm³ respectively. Vamanapuram river has thirteen tributaries, including major and minor ones. Kozhithottam Kayal and Mungottu Kayal occupy the western part of the watershed. The project area mostly relies on the open wells for drinking and irrigation purpose. The depth of the open well ranges from 2-9 m.

2.5.2 Ground Water Resources

The area falls in the category of 'White' which means that only less than 65 percent of the ground water is utilized. There is no restriction for further development. The area under Chirayinkeezhu block will be in the category of 'dark' in the near future. The eastern part of the upper region of the watershed is suitable for domestic wells whereas the western part and the middle region are suitable for large diameter dug wells.

The lower region is suitable for heavy duty as well as medium capacity tube wells. The depth of the ground water level in the bore well are 55-100 mt depth and the ground water depth is highest in the Kizhuvilam and Chirayinkeezhu area.



2.6 Climate

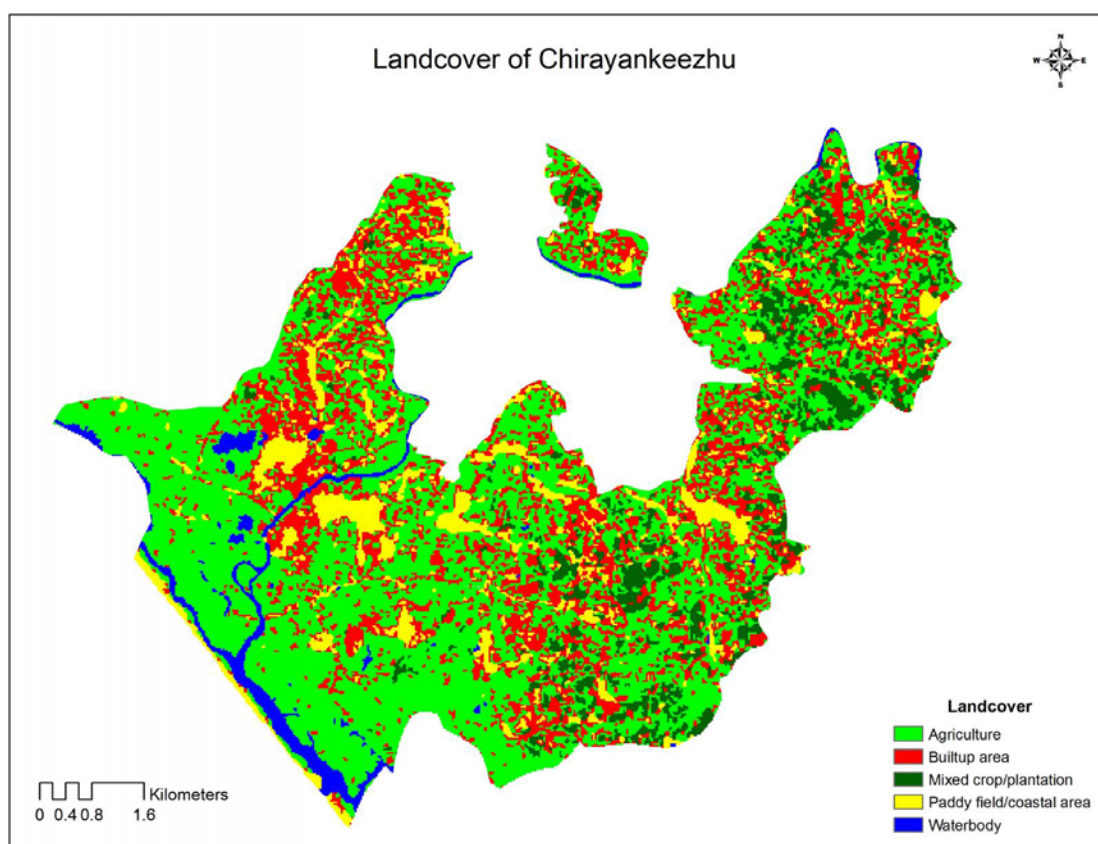
The project area has a tropical humid climate with an oppressive hot season lasting from January to May followed by plentiful monsoon season starting from June to September. October to December forms the retreating monsoon season. As per the rainfall data the annual rainfall received for the year 2012 was 1502 mm. The district received 851 mm of rainfall during the south west monsoon, and 388 mm of rainfall during north east monsoon period

Monthly rainfall (m.m)												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	9.2	69.3	37.8	135.1	11.2	271.1	89.0	352.1	139.1	189.4	131.3	67.9
Temperature												
Max :	31.5	31.9	32.6	32.6	31.6	29.7	29.2	29.4	30.8	29.9	30.3	30.0
Mini :	22.2	22.8	24.1	24.9	24.7	23.5	23.1	23.2	23.3	23.3	23.1	22.3

2.7 Agriculture and present land use

The total area of the watershed is 6803 Ha in which 6165 ha of land area is under agricultural use and 638 ha land is non cultivable area with 3ha as cultivable wasteland. As the Project area lies under mid land agro-climatic zone, the forest area are not identified and the topography shows very gentle to costal.

The major land use category mapped in the project area is mixed crops (4643 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. The second major land use category is rubber plantation (926 Ha). Rice is being cultivated in the valley portions in an area of 475 ha during different seasons with productivity of 2.5 tons per ha. The paddy fields are converted to garden land for cultivating other horticulture crops



2.8. Slope

Slope refers to the ground surface configuration for scale that exceeds about 10 m and range upward to the landscape as a whole. Slope has gradient, complexity, length and aspect. Slope gradient is the inclination of the surface of the land from the horizontal. It is generally measured with a hand level. The difference in elevation between two points is expressed as percentage of the distance between these points. If the difference in elevation is 1 m over a horizontal distance of 100 m, slope gradient is 1%. A slope of 450 is a slope of 100%, because the difference in elevation between two points 100 m apart horizontally is 100 m on a 450 slope. Slope complexity refers to the surface form on the scale of mapping. Slope complexity has an important influence on the amount and rate of run-off and on sedimentation associated with run-off. Slope aspect is the direction towards which the surface of the land faces. The direction is expressed as an angle between 0 degree and 360 degrees (measured clockwise from true north) or as a compass point such as east or north- north west. Slope aspects may affect soil temperature, evapo-transpiration and winds received. Generally with increase in slope of the land, soil is subjected to erosion and the intensity of the erosion depends upon slope percentage. Steep slopes are prone to landslides.

The table showing the slope class, description, area and percentage are given below in table 2.2

Table 2.2
Slope class, description, area and percentage

Sl.no	Slope	Description	Area in Ha	Percentage
1	0-3 percent	Very gentle slope	3969	58
2	3-5 percent	Gentle slope	1126	16
3	5-10 percent	Moderately sloping	900	13
4	10-15 percent	Strongly sloping	400	5
5	15-35 percent	Moderately steep to steep	312	4
6	More than 35	Very steep	96	1

	percent			
7	Water body		227	3

2.8 Soils

Sandy loam soil constitutes the major portion of the soil in the project area having an extent of 4831 ha followed by sandy clay and loamy soil association. Sandy clay is very deep, medium textured, well drained, dark reddish brown soil, developed from gneissic parent material. The surface texture ranges from sandy clay loam to clay loam followed by clay loam to clay subsurface horizons. This soil is well drained with moderate slow permeability. This soil is intensively cultivated to rubber, coconut and vegetables.

Soil erosion is vastly found in the area with moderate effect. 3010 ha land is under moderate soil erosion and 3793 ha land is under slight soil erosion. Since the entire area is subjected to soil erosion, appropriate remedial measures are to be undertaken.

The summary of the watershed area is detailed in table 2.3

Table 2.3
General Features of Chirayinkeezhu Watershed Project

Name of Project	Integrated Watershed Management Project- Chirayinkeezhu
Name of Program IWMP	IWMP-II/2011-12
Type of project	Hilly
District	Thiruvananthapuram
Blocks	Chirayinkeezhu, Pothankode& Kilimanoor
Grama Panchayats	Mudakkal, Kizhuvilam ,Chirayinkeezhu ,Kadakkavoor ,Azhoor Managlapuram , Vakkom ,Anchuthengu and Karavaram
Villages	Alankode, Azhur, Chirayinkeezhu ,Edakode, Elamba, Kadakkavur, Kizhattingal, Kizhvalam, Kuntalur, Melethonnakkal, Vakkom & Veilur
Name of Micro watersheds	Pulinthruthu (3M1a), Kolichira (3M2a),Thekkumbhagom

	(4V1a), Elamba (4V28b), Vilaynmoola (4V29a), Kizhuvilam (4V29e), Sarkara (4V30a) & Melattingal (4V4b)
Total Watershed Committees	8
Total Geographical Area	6803 Ha
Total Treatable Area	6803 Ha
Agro climate zone	Southern midland zone
Major crops	Coconut, Rubber, Banana, Tapioca, Vegetables and paddy
Major slope range	0-34.44 degrees
Major streams	First and second order
River Basin	Vamanapuram and Mamam
Project Area	6803 Ha
Total Sanctioned Cost	Rs. 816 Lakhs
Project Implementation Agency	Chirayinkeezhu Block, Mudapuram, Thiruvananthapuram
Technical Support Organization	Centre for Environment and Development (CED) Thozhuvancode, Vattiyookavu P.O Thiruvananthapuram – 695 013 Kerala

The details of financial investment under different sub heads are shown in the table 2.4

Table 2.4.
Detailed Costing of the Project under various heads

Sl. No	Name of the watershed	Area in Ha	Total amount (Rs)	Admin expense (Rs)	Monitoring (Rs)	Evaluation (Rs)	EPA (Rs)	Capacity Building (Rs)	DPR preparation (Rs)	NRM (Rs)	Livelihood (Rs)	Production & microenterprises (Rs)	Consolidation (Rs)
1	Pulinthruthu	170	2040000	204000	20400	20400	81600	102000	20400	1142400	183600	204000	61200
2	Kolichira	920	11040000	1104000	110400	110400	441600	552000	110400	6182400	993600	1104000	331200
3	Thekkumbhagom	1423	17076000	1707600	170760	170760	683040	853800	170760	9562560	1536840	1707600	512280
4	Elamba	978	11736000	1173600	117360	117360	469440	586800	117360	6572160	1056240	1173600	352080
5	Vilaynmoola	891	10692000	1069200	106920	106920	427680	534600	106920	5987520	962280	1069200	320760
6	Kizhuvallom	1321	15852000	1585200	158520	158520	634080	792600	158520	8877120	1426680	1585200	475560

7	Sarkara	618	7416000	741600	74160	74160	296640	370800	74160	4152960	667440	741600	222480
8	Melattungal	481	5772000	577200	57720	57720	230880	288600	57720	3232320	519480	577200	173160
Total		6803	81636000	8163600	816360	816360	3265440	4081800	816360	45716160	7347240	8163600	2449080

CHAPTER 3

METHODOLOGY

Adoption of strategies that can ensure sustainable watershed development will lead to success of the project. The methodology adopted here are scientific planning with participatory approach in line with the guidelines of IWMP, as suggested by Government. The methodologies followed are detailed below:

3.1 Collected and Digitized the Cadastral and Land use maps of the project area

The maps from Kerala State Land Use Board and other departments were collected and digitalized. The digitalized cadastral maps and resource maps were overlaid with the micro watershed boundaries to identify the distribution of micro watersheds on each panchayat. The GIS layers for various themes was overlaid having a geo-referenced base layer up to the level of village boundaries in the first instance. This core GIS data was given controlled access/distribution over network for project planning. Application softwares for spatial & non-spatial data standards and meta-data was also worked out. Once such a knowledge base was developed, it was possible to define watershed project boundaries. It was also be possible to map treatment area with respect to their respective administrative formations in terms of villages, Gram Panchyat and blocks panchyat.

Remote sensing data was utilized for finalizing elevation maps for assessment of run-off and for identifying structures best suited for location of projects.

3.2 Initial Orientation training was given for the project staff on Resource Mapping, Concept of maps, watersheds, and PRA techniques

Orientation training was conducted in Chirayinkeezhu Block panchayat which was attended by elected representatives of Block Panchayat and the Grama Panchayats concerned and the TSO. The training was intended to provide a first hand information on the Project, watershed based

development, different types of maps to be used under the project, PRA techniques, roles and responsibilities of different agencies etc.

3.3 Formation of Coordination Committee

For effective implementation, supervision and coordination of the activities a Coordination Committee was set up under the Chairmanship of the Block President. Block Presidents of other Block Panchayats (Kilimanoor and Pothencode) are Vice Chair persons. Presidents of Grama panchayats and Block panchayat members, WDT, TSO and officers of line Department are members. Secretary of the Block Panchayat is the Secretary of the Committee.

3.4 Transect walk to collect information and to finalize micro watershed boundaries

Transect walk is an exploratory walk, undertaken by the team with the villagers, ward representatives, ADS/CDS members to finalize the micro watershed boundaries and to collect information on the soil type, land use pattern, cropping pattern, existing resource etc. In order to identify the areas to be treated, proposed work sites and to assess the feasibility, the experts carried out a reconnaissance survey through transect walk. The sites were marked and the different treatment measures required for the treatment of the area were also recommended. During the exploratory walk the present status of the watershed is observed along with their problems. The ground water level was observed. The transect walk also enabled to understand the plantation crops and vegetables grown in the watershed area.

3.5 Conducted orientation programs

There were different types of orientation programs.

- For Elected Representatives and Officials: Orientation programs were conducted at State Level (at SIRD, Kottarakkara) and at Block level and Panchayat level on various aspects of project implementation
- For Survey Team: There had been different types of surveys/studies undertaken as part of the project. Eg: resource mapping, social mapping, transect walk, need assessment etc)
- For NHG members: on need identification, livelihood activities, production system etc
- For Grama Panchayat Members: NHG formation, facilitative support for NHGs etc
- For conducting the orientation programs, the SLNA and the WCDC extended necessary support. Printed handbooks were distributed providing vital and concise information regarding the IWMP programme, different stages and guidelines for implementation.

3.6 Formation of WC

Panchayat Level Watershed Committees (WC) were constituted at Grama Panchayats. The WC is responsible for selection and approval of the projects, implementation and monitoring of the project at Watershed level.

3.7 Base line survey

On launching the programme, one of the immediate activities conducted was a baseline survey to understand the present situation and to collect required data. The information gathered in the baseline survey acts as a benchmark for any intervention during and post implementation of any development programme. A detailed baseline survey was undertaken which involved household survey, bio-physical survey and village level data collection. Household survey includes a detailed questionnaire which was filled by visiting each and every household in the village.

3.8 Formation of NHG

The neighbourhood groups are homogenous groups having common identity and interest. The NHGs are formed with 40 to 50 neighboring households. They will identify the local needs; prioritise activities to be implemented in their area, deciding upon the livelihood activities, and subsequently to facilitate implementation of the program. On constitution of the NHG, it is ensured that the members belong to the same watershed and face similar problems/issues.

3.9 Identification of Entry point activities

Once the ground work for implementing the project is set, entry point activities intended to gain rapport and support of the local community is planned in a participatory manner and implemented with the support of the local community. The EPA generally will address a common problem and gains the confidence of the community.

3.10 Social mapping

The watershed level social mapping was done in each watershed area with the active participation of the NHG members, ward members, implementing officers, CDS/ADS, and members of CBOs. This activity obtained valuable information on resources that are already present in the community and what are the gaps to be filled.

To fill the gap, information on soil and water conservation activities to be taken up through MGNREGS and other schemes are collected; agricultural / horticultural / veterinary/ fisheries activities

to be taken up is listed, list of drains/ponds/ wells to be rejuvenated/ renovated prepared; and the details of production system activities/livelihood activities to be taken up in each NHG are collected.

Panchayat level interactions were organized on drainage line and common property treatment. Various resources like different water bodies, wells and farm ponds, major drains and drainage lines were identified and marked in the cadastral map with the help of the facilitators.

3.11 Identification of Works

Interventions for drainage line treatment and common property treatment were identified and plotted on cadastral maps through transect walk and field survey. Focus Group Discussions were organized at panchayat level for Ward Members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, and Veterinary & Soil.

The information gathered on soil and water conservation activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated /renovated and the details of production system activities/livelihood activities to be taken up were also finalized. The livelihood action plan and the activities under production system were also consolidated.

3.12 Preparation and Presentation of DPR in PIA

The NHGs recommend to the WC, the interventions needed in their area. The WC, in turn will shortlist and prioritise the recommendations received from the NHGs. Once the final list is prepared, it is approved by the PIA and then estimates are prepared and the DPR prepared. The DPR is presented before the PIA. The PIA approves the DPR.

CHAPTER 4

ACTIVITIES PROPOSED

4.1 Introduction

An elaborate exercise preceded the selection of activities under the project. Initially the local level needs were discussed at Neighbourhood Groups (NHGs). The suggestions came from the NHGs were subsequently discussed at the Watershed Committee level and finalized. There was total community participation and ownership in the selection of activities to be undertaken. The activities are classified into the following 5 groups:

- soil and water conservation
- agricultural activities

- animal husbandry
- fisheries, and
- processing of agricultural produces.

4.2 Approach

Participatory planning: All activities to be implemented under the project are conceived and identified by the beneficiary community after identifying their felt needs.

Prioritization of activities: The demands raised at the neighbourhood group level are discussed in the watershed committee and the activities to be implemented under the project are finalized.

Convergence: While finalizing the activities those activities coming under other schemes/programs that can be clubbed with the project are identified for convergence and for deriving better results.

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, contour and graded bunding, bench terracing etc.

Drainage line treatment with a combination of vegetative and engineering structures. Development of water harvesting structures such as low-cost farm ponds, check-dams, percolation tanks and ground water recharge through wells, bore wells and other measures.

4.3. Specific approach

- i. Land development including in-situ soil and water conservation measures like field bunds, contour and graded bunds fortified with plantation, bench terracing in hilly terrain etc. Pasture development, sericulture, bee keeping, backyard poultry, small ruminant, other livestock and micro-enterprises. Veterinary services for livestock and other livestock improvement measures, Fisheries development in village ponds/tanks, farm ponds etc.
- ii. Promotion and propagation of non-conventional energy saving devices, energy conservation measures etc.
- iii. Formation of micro level farmer's organization to help and strengthen the solidarity among people which ensures genuine participation of people in developmental activities. It is possible to accomplish good results of development to backward sections of society, and those who need special social support. Women should have greater role in watershed development as they are worst affected by natural resource depletion and hence the project

envisages various programs to improve the status of women socially, culturally and economically.

- iv. Productivity enhancement and livelihoods are given priority along with conservation measures. Information technology and remote sensing inputs are utilized in planning and developing the DPR
- v. Capacity Building and training of all functionaries and stakeholders was undertaken so that there is informed decision making in the planning process and implementation is effective and ultimately there is sustainability of investments.

4.4. Entry point activities

In a major project, entry point activities are envisaged with an intention to gain the support and create a rapport of the beneficiary community right from the beginning of the project. Taking up entry point activities will also establish credibility of the PIA, WDT and the WC. 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 to obtain optimum and sustained benefits from previous public investments.
- iii. Productivity enhancement of existing farming systems which could also help in community mobilization and building rapport.

According to the common guidelines of Integrated Watershed Management Programme, 4% of the total project cost is earmarked for Entry Point Activities. Thus a total amount of Rs 32 lakhs is available for EPA and the details showing the amount earmarked for each watershed under EPA is presented below in table 4.1

Table 4.1
Details of Amount Allotted for EPA of Micro-Watershed

Sl.No	Watershed code	Name of the watershed	Area in Ha	Amount in lakhs
1	3M1a	Pulinthruthu	170	0.816

2	3M2a	Kolichira	920	4.416
3	4V1a	Thekkumbhagom	1423	6.8304
4	4V28b	Elamba	978	4.6944
5	4V29a	Vilayinmoola	891	4.2768
6	4V29e	Kizhuvallom	1321	6.3408
7	4V30a	Sarkara	618	2.9664
8	4V4a	Melattungal	481	2.3088

Selection of activities under EPA was discussed at the Block Panchayat level and it was decided to discuss the details at panchayat,SHG and ward level. After a series of discussions, trainings and ward level group discussions the entry point activities to be undertaken were finalized. Based on the suggestions of the participatory group, the works thus selected were discussed in the Panchayat Level Watershed Co-ordination Committee (PLWCC) of each Grama Panchayat and approved. The summary of the interventions planned under EPA are as detailed in table 4.2

Table 4.2
Details of Entry Point Activities Suggested

No	Name of the watershed	Name of the panchayat	Entry Point Activities suggested
1	Pulinthruthu	Chirayinkeezhu	Renovation of Public well in Pulinthruthu Pottan Mukku in ward no 13
2	Kolichira	Azhoor and Kizhuvillam panchayats	Improvement of Mukkolithodu and construction of check dam across the thodu
3	Thekkumbhagom	Kadakkavoor panchayat	Renovation of Ayyankulam and maintenance of existing water supply scheme in ward no

			7.
4	Elamba	Muddakkal Panchayat	Providing solar lighting system in the Mudakkal Panchayat office.
5	Vilayinmoola	Mudakkal panchayat	Maintenance of check dam and restructuring the irrigation canal at perapankkadu ela at ward no 16 of Mudakkal panchayat
6	Kizhuvilam	Mudakkal panchayat	Renovation of Irrigation pump house at Edakkode ela ward no 17 of Mudakkal panchayat
		Kizhuvilam panchayat	Renovation of Parayathukonam Chera at ward no 6 of Kizhuvilam Grama panchayat
7	Sarkara	Chirayinkeezhu	Providing solar lighting system at Sarkara UP school
8	Melattungal	Kadakkavoor panchayat	Renovation of Irrigation Tank at melattungal ward no 1 of Kadakkavoor panchayat

The finalized work sites were visited by the expert team consisting of TSO team members, WDT and elected representatives to check the technical feasibility and financial viability of the identified activities and then detailed estimates were prepared based on the identified works. The final estimates with feasibility report was presented before the PIA and Co-ordination committee. The co-ordination committee and the PIA has approved the work. The details of the estimated cost is given in table 4.3

Table 4.3
Estimated Amounts for the EPA Works

No	Watershed code	Name of the watershed	Area in Ha	Amount allotted in Rs	Project cost sharing pattern		
					IWMP share in Rs	Convergence share in Rs	Total
1	3M1a	Pulinthruthu	170	81,600.00	63,401.00	197.00	63,599.00
2	3M2a	Kolichira	920	4,41,600.00	4,33,790.00	11,70,630.00	16,04,420.00

3	4V1a	Thekkumbhagom	1423	6,83,040.00	6,90,838.00	30,840.00	7,21,678.00
4	4V28b	Elamba	978	4,69,440.00	4,69,000.00	5,31,000.00	10,00,000.00
5	4V29a	Vilayinmoola	891	4,27,680.00	3,58,463.00	15,88,487.00	19,46,950.00
6	4V29e	Kizhuvallom	1321	634080.00	1,82,983.00	1,770.00	1,84,753.00
					4,25,048.00	4,85,006.00	9,10,054.00
7	4V30a	Sarkara	618	2,96,640.00	4,20,000.00	1,80,000	6,00,000.00
8	4V4b	Melattungal	481	2,30,880.00	2,21,437.00	47,510.00	2,68,947.00
Total				32,64,960.00	32,64,960.00	40,35,441.00	73,00,401.00

4.5 Natural Resource Management

Watershed development works are to be done during second phase of watershed project. A multi-tier ridge to valley approach should be followed in implementation of watershed development projects. A net budget of 56 percent is allotted for this item of work. Various activities are identified considering the technical and social aspects.

4.5.1 Identified Interventions for Soil and Water Conservations

Mainly the watershed development works are divided into two area treatments, viz., the ridge area and drainage line treatment. The following treatment measures are planned for different micro watersheds, which are suited for slopes, soil topography, vegetation and socio economic condition of the locality.

Ridge Area Treatment Plans

Engineering measures

- Strip terraces
- Stone pitched bunds
- Contour earthen bunds
- Field bunding
- Staggered trenches
- Moisture collection pits

Agronomic and biological measures

- Centripetal terracing and mulching
- Tillage
- Cover cropping
- Horticulture
- Agroforestry
- Biofencing (live hedge)

Drainage line treatment plans

Water conservation structures in streams

- Gully plugging
- Vented Cross Bars New
- Vented Cross Bars Repair

Stream Management Activities

- Geotextiles
- Embankment Protection
- Side varambu Earthening
- Side wall Protection (DR) New
- Side wall Protection (DR) Repair

Water Conveyance Structures in Farm Irrigation

- Culvert Repair
- Canal Desiltation
- Canal outlet (Spout) Repair

Increasing the storage capacity of surface and subsurface water resources

- Desiltation of streams, ponds and Public wells.
- Construction of wells.
- Recharge of wells.
- Side wall Protection of Ponds (New)
- Side wall Protection of Ponds (Repair)
- Biofencing around Pond

Water Harvesting Methods

Mini Drinking Water Supply Schemes

Rainwater harvesting from rooftop catchments

Biogas plant

Vermi Compost

4.5.2 Budget for NRM

The distribution of budget under the natural resources management activities for different micro watersheds as per IWMP guidelines is given below in table 4.4:

Table 4.4
Details of fund available for NRM works

Sl.No	Watershed code	Name of the watershed	Area in Ha	Amount in lakhs
1	3M1a	Pulinthruthu	170	1142400
2	3M2a	Kolichira	920	6182400
3	4V1a	Thekkumbhagom	1423	9562560
4	4V28b	Elamba	978	6572160
5	4V29a	Vilayinmoola	891	5987520
6	4V29e	Kizhuvallom	1321	8877120
7	4V30a	Sarkara	618	4152960
8	4V4a	Melattungal	481	3232320
Total			6803	45716160

4.5.2. Mode of implementation

The Watershed Committee (WC) shall also constitute User Groups in the watershed area with the help of WDT. These shall be homogenous groups of persons most affected by each work/ activity and shall include those having land holdings within the watershed areas. Each User Group shall consist of those who are likely to derive direct benefits from a particular watershed work or activity.

The Watershed Committee (WC) with the help of the WDT shall facilitate resource-use agreements among the User Groups based on the principles of equity and sustainability. These agreements must be worked out before the concerned work is undertaken. It must be regarded as a pre-condition for that activity. The WDT with the bare foot engineers and the user group secretary will oversee the work and document (Photograph before the work started and after completion of the work, M book Recording and Muster roll) the work for the payment. The payment shall be made after satisfactory

report of the WDT, User group and WC. The Watershed Committee (WC) through the User Group shall put in place mechanism for collecting user charges. No charge will be taken from landless, destitute or disabled / widow headed households for work done on private or public land. The user charges collected shall be credited to the Watershed Development Fund (WDF) for maintenance of assets created during the project. The User Groups will be responsible for the operation and maintenance of all the assets created under the project in close collaboration with the Gram Panchayat and the Gram Sabha.

The Watershed Development Fund (WDF) shall be a minimum 10% of the cost of NRM works executed on Public and private lands. However, in case of SC/ST, small and marginal farmers, the minimum contribution shall be 5% of the cost of NRM works executed on their lands. In case of public land works the direct user has to provide the amount and in case of works in school the entire person of the watershed has to pay the amount. However, for other cost intensive farming system activities such as Aquaculture, Horticulture, Agro-forestry, Animal Husbandry etc on private land directly benefiting the individual farmers, the contribution of farmers will be 40% for General category and 20% for SC & ST beneficiaries and the remaining cost of the activities i.e. 60% for the General and 80% for SC/ST category will come from the project funds subject to a maximum limit of an amount equal to double of the standard unit cost norm. These contributions would be acceptable either in cash at the time of execution of works or voluntary labour. A sum equivalent to the monetary value of the voluntary labour would be transferred from the watershed project account to the WDF bank account that will be distinct from the Watershed Committee (WC) bank account. User charges, sales proceeds and disposal amounts of intermediate rights shall also be deposited in the WDF bank account and used for the operation and maintenance.

4.6 Livelihood Activities for the Landless / Assetless Households

Productivity enhancement and livelihoods are given priority along with conservation measures under the project. This involves resource development and usage to promote farming and allied activities to promote local livelihoods while ensuring resource conservation and regeneration. Livelihood activities are intended for the landless / assetless persons. This component aims to maximize the potential generated by watershed activities and creation of sustainable livelihoods and increased income for households.

4.6.1 Mode of Operation

1. The livelihood action plan will be implemented through Self Help Groups and / or their federation.
2. Livelihood activities will be carried out either through the existing SHGs having good

- performance or new SHGs formed with a group of 5-20 persons.
- SHGs selected for implementing livelihood action plan will be homogeneous in-terms of their existing livelihood capitals, common interest and need.

4.6.2 Funding pattern

The funding pattern adopted is as follows;

1	Composite loan (clubbing grand in aid and bank loan) for enterprising SHGs to upscale/diversify their activities	Maximum of 30% of the total fund limited to 50% cost of activity or Rs. 2 lakh whichever is less.
2	Seed money/ revolving fund to existing SHGs and newly formed SHGs for continuing/ undertaking their major livelihood activities.	Initial amount upto a maximum Rs. 25000/-

4.6.3 Major interventions suggested

The activities identified can be broadly classed in to the following:

- Formation of skilled and unskilled labour groups
- Establishing nurseries
- Activities that promotes and encourages the major livelihood of the landless, women and SC community of the region.
- Assistance to labour banks/ agencies that enjoy undisputable reputation asa major livelihood donor within the region.

4.6.4 List of activities include

1. Nursery (Tray method vegetable seedling)
2. Nursery (Fruit Plants)
3. Skilled labour group for coconut climbing
4. Skilled labour group for Mechanised farming
5. Lease land Paddy farming
6. Banana cultivation by lease farmers
7. Vegetable lease cultivation
8. Goat rearing
9. Cattle rearing
10. Processing Unit
11. Paddy Farming (Dryland)
12. Floriculture

13. Ginger/ Turmeric farming
14. Compost Production
15. Fodder cultivation
16. Bee keepnig
17. Aqua Culture
18. Arecanut leaf plate making
19. Medicinal plant cultivation
20. Paddy Processing Unit
21. Agro Service Centre
22. Vegetable Market

4.6.5 Budget for Livelihood Activities

The outlay for the livelihood activities for the landless/asset less households for different micro watersheds as per IWMP guidelines is given below in table 4.5

Table 4.5.

Details of fund available for livelihood activities:

Sl.No	Watershed code	Name of the watershed	Area in Ha	Amount in lakhs
1	3M1a	Pulinthruthu	170	183600
2	3M2a	Kolichira	920	993600
3	4V1a	Thekkumbhagom	1423	1536840
4	4V28b	Elamba	978	1056240
5	4V29a	Vilayinmoola	891	962280
6	4V29e	Kizhuvallom	1321	1426680
7	4V30a	Sarkara	618	667440
8	4V4a	Melattungal	481	519480
Total			6803	7347240

4.7 Production System and Microenterprises based Livelihood Activities

The main activities falling within the productive sector is broadly classified under four categories;

- a) Activities that come under agriculture and horticulture.
- b) Activities that come under the animal husbandry
- c) Microenterprises based on the products of the above two categories
- d) Activities that promote the sale of products from agriculture and horticulture.

4.7.1 Major interventions suggested

The major interventions suggested under the Production System and Microenterprises based livelihood activities are the following:

1. Paddy Farming
2. Vegetable Farming
3. Compost Production
4. Mushroom Cultivation
5. Floriculture
6. Fodder nursery
7. Backyard Poultry
8. Cattle rearing
9. Goat Rearing
10. Aqua Culture Tank
11. Renovation of cattle Shed floor, urine tank & fodder trough for cattle
12. Calf Rearing
13. Rabbit Rearing
14. Aqua Culture paddy field
15. Marketing Centre

4.7.2 Budget for the Production System and Microenterprises

The budget under the livelihood activities for the landless/asset less households for different micro watersheds as per IWMP guidelines is given below in table 4.6:

Table 4.6
Budget for the Production System and Microenterprises

Sl.No	Watershed code	Name of the watershed	Area in Ha	Amount in lakhs
1	3M1a	Pulinthruthu	170	204000
2	3M2a	Kolichira	920	1104000
3	4V1a	Thekkumbhagom	1423	1707600
4	4V28b	Elamba	978	1173600
5	4V29a	Vilayinmoola	891	1069200
6	4V29e	Kizhuvallom	1321	1585200
7	4V30a	Sarkara	618	741600

| 8 | 4V4a | Melattingal | 481 | 577200 |

CHAPTER 5

PULINTRUTHU MICRO WATERSHED (3M1A)

5.1 Location and extent

Pulinthruthu Micro watershed is the smallest watershed in the IWMP cluster of Chirayinkeezhu PIA with an area of 170 ha (2.5 % of total geographical area). This micro watershed is located mainly in Chirayinkeezhu Grama Panchayat .

Name of micro watershed	:	Pulinthruthu
Micro watershed code	:	3M1a
River basin	:	Mamam
District	:	Thiruvananthapuram
Block Panchayat	:	Chirayinkeezhu
Grama Panchayat	:	Chirayinkeezhu
Wards	:	Chirayinkeezhu Panchayat- 12,13 and 14
Total Area	:	170 ha
Latitude	:	8°37'40" to 8°38'45"
Longitude	:	76°46'50" to 76°47'50"

5.2 Physiography

The Project area covers 3 wards of Chirayinkeezhu Grama panchayat. The general slope of the watershed is from North East to west, with the Slope of 0-6.06 degree. The slope and DEM maps were derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The entire watershed area shows a Costal nature with topography of nearly level to very gentle coastal plain with an elevation, up to 15 m. The major physiographic units delineated are very gentle to level where the relief is excessive and the watershed is drained to a perennial water bodys. The sub streams of the project areas are merging with the Anjengo Lake.

The pH of soil at various sites lies above the neutral range. The sodium levels in the soil in some parts of the watershed indicate salt water intrusion and potential for soil salinization or adverse impacts on soil productivity.

5. 3 Slope

The 90 % of area is under the category of very gentle slope having 0-3 degree. This category of slope spreads over the total 170 ha. 71 ha land is under 0-1 degree slope and 77 ha land under 1-3 degree slope and the remaining 22 ha land is under 3-6 degree slope.

5. 4. Drainage

The Mamam River is the major drain of this watershed but most of the streams drain into Anjengo Lake. The broad landforms at the upper region with isolated gentle hillocks and Coastal Low . The land forms of the middle region include sandy loam with valleys and low hills with isolated hillocks. The landforms at the lower region are coastal sandy loam. The water body in the watershed spreads to about 51 ha area which is 30 % of the total area.

5. 5 Water Resources

The area falls in the category of 'White' which means that only less than 65 percent of the ground water can be utilized. The area under Chirayinkeezhu block will be in the category of 'dark' in the near future. The eastern part of the upper region of the watershed is suitable for domestic wells whereas the western part and the middle region are suitable for large diameter dug wells. The lower region is suitable for heavy duty as well as medium capacity tube wells. The depth of the ground water level in the bore well is 55-100 mt and the ground water depth is highest in the western part of the watershed.

5. 6. Agriculture and present land use

The total area of the watershed is 170 Ha in which 93 ha of land area is under agricultural use in which 68 ha land is non cultivated area with 3ha as cultivable wasteland. As the Project area lies under coastal zone, there is no forest area and the topography shows nearly gentle to coastal plain.

The major land use category mapped in the project area is mixed crops (94 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein different crop species are grown together that cannot be spatially mapped separately. The second major land use category is coconut plantation (8 Ha).

5. 7. Soils

The major sandy loam soil association which is distributed in an area of 156 ha followed loamy soil association. This soil is well drained with moderate to slow permeability. This soil is intensively cultivated to coconut and vegetables. Soil erosion is vastly found in the area with moderate effect.

5. 8. Socio economic details

The water shed has about 1587 families with the population of 6700 in which 20 % belongs to SC. The male population of the area depending on the fishing in the sea as their livelihood and the women population is relayed on the marketing of the sea catch. The families live in the small holding near to the sea with average land holding per family is 0.11 ha. The BPL families are 18% of the total population.

5. 9 SWOT Analysis of Pulinthruthu (3M1a) watershed

The Strength, Weakness, Opportunities and threat of different sectors of the micro watershed has been analyzed and the details are given in table 5.1

Table 5.1.

SWOT Analysis of Pulinthruthu (3M1a) watershed

Area of Intervention	Strength	Weakness	Opportunities	Threat
Agriculture	Costal ecosystem	Poor maintenance of irrigation system leads to decrease in banana cultivation, coconut plantation etc. The land remains unutilized.	Unutilized land can be cultivated.	Flooding during rainy seasons
Horticulture	Coconut based farming system intercropped with banana, plantain varieties, ginger, pepper, turmeric & fruit plants	Coconut tree affected by root wilt disease and betel disease. Lack of availability of skilled labour for in situ harvesting of coconut	Homestead farming can be promoted by way of implementation of IWMP project	Poor management of coconut, decline in cultivated area, and productivity. Lack of main stay in farming
Animal Husbandry	Backyard poultry practiced by the community by and large.	Lack of availability of fodder. Lack of knowledge regarding scientific cattle rearing. High investment for modern dairy farm.	Scope for increasing backyard poultry as additional source of income.	Poor management of poultry will lead to decline in area and productivity
Natural Resources	The Anchuthengu lake, which is of high value in terms of mangroves and retention of surface water. Majority of the watershed area, the landform is gentle	The vegetation is poor. The soil erosion causes reduction in soil fertility.	Area treatment with suitable soil and water conservation measures such as afforestation, mulching, cover cropping, water harvesting measures such as staggered trenches.	Reduction in ground water level.

	slope or valley.		
--	------------------	--	--

5. 10 Problem analysis

The problems were analyzed based on the SWOT. The constrains and possible solutions are detailed in table 5.2

Table 5.2
Problem analysis

No	Problem Area	Constraints	Solutions	Project Support
1	Soil	<ul style="list-style-type: none"> 90% of the area sandy loam soil texture - sandy Soil erosion - erodability medium 	<ul style="list-style-type: none"> Soil & water conservation measures Agroforestry using deep rooted and costal growing tree species of medicinal and timber value. Cover cropping, Mulching Construction of contour bunds & staggered trenches & pits. Formation of mangroves in the lake 	<ul style="list-style-type: none"> Construction of new stone pitched contour bunds Construction of staggered trenches pits & centripetal terracing for coconut. Cover cropping for coconut basins Mulching basins Field bund construction Agroforestry using tree species of timber, medicinal and fodder value Live fencing using species of medicinal and green leaf manure value
2	Vegetation	Coconut and mixed crops like banana are grown	Promoting homestead garden as part of area treatment	Promoting Live fencing, Agroforestry and Fodder Cultivation
3	Water Resource	Surface water is not good for drinking as salt water intrusion is high	<ul style="list-style-type: none"> Embankment protection using bamboo, reed Recharging Wells Desilting of wells 	As part of drainage line treatment, embankment protection of lake using bamboo, reed etc
4	Common Property	The side wall of lake is eroded during monsoon season	Strengthening of bund	Afforestation on lake side with provision for mangrove planting and

				live fencing
--	--	--	--	--------------

5.11 Work interventions proposed

The work plan was prepared through the methodology proposed and after analysis of the data available. The general information of the Pulinthruthu micro watershed are detailed in table 5.3

Table 5.3
General information of the Pulinthruthu micro watershed

Name of Watershed	Pulinthruthu
Watershed Code	3M1a
Treatable Area in Ha	170 ha
Total Cost in Lakhs	Rs.20,40,000

The fund earmarked for each component of the project in respect of Pulinthruthu micro watershed are in accordance with the guidelines of IWMP, the details of which are shown in table 5.4.

Table 5.4.
Fund allocated to each component

Sl.No	Component	Percentage	Total amount
1	Administration	10	204000.00
2	DPR Preparation	1	20400.00
3	Entry point activities	4	81600.00
4	Capacity Building	5	102000.00
5	Productivity Enhancement & Microenterprises	10	204000.00
6	Livelihoods for Asset less	9	183600.00
7	Natural Resource Management	56	1142400.00
8	Monitoring	1	20400.00
9	Evaluation	1	20400.00
10	Consolidation phase	3	61200.00
	Total	100	2040000.00

5.11.1. Entry Point activities of Pulinthuruthu watershed

The Entry point activities were selected on participatory approach. It was decided that renovation of public well in Pulinthuruthu Pottan Mukku in ward no 13 could be taken up for implementation since there is drinking water

shortage during summer and a lot of people are depending on this well as their water source. The details are given in table 5.5

Table 5.5
Entry Point activity of Pulinthuruthu watershed

Details of Activities	Qty	Unit	Rate	IWMP	Convergence	WDF	Total	First year	
								Physical	Financial
Renovation of Public well in Pulinthuruthu Pottan Mukku in ward no 13	1	Nos	63,598.00	63,401.00	197	0.00		1	63,598.00

5.11.2. Year wise work plan

The year wise work plan is summarized in table 5.6.

Table 5.6
The summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	1,740,050.00	738,800.00	365,125.00
2	Livelihoods for Asset less	92,300	57,450	22,450
3	Productivity Enhancement &	94,250	55,875	53,875

5.11.3. Natural Resource Management

The NRM works were identified based on methodology specified in the chapter 2. The summary of estimated amount of NRM works are shown in table 5.7.

Table 5.7
The summary of estimated amount of NRM works

Details of Activities	Qty	Unit	Rate	IWMP	Convergence	WDF	Total
Ridge Area Treatment Plans							
Strip terraces	3000.00	Nos	142.00	0	426,000.00	42,600.00	426000.00
Stone pitched bunds	500.00	Cu.M	900.00	0	450,000.00	45,000.00	450000.00
Contour earthen bunds	2500.00	Sq.M	142.00	0	355,000.00	35,500.00	355000.00
Staggered trenches	2500.00	mt	60.00	0	150,000.00	15,000.00	150000.00
Water harvesting pits	4000.00	Cu.M	80.00	0	320,000.00	32,000.00	320000.00
Centripetal terracing and mulching	125.00	nos	400	50000	0.00	5,000.00	50000.00
Cover cropping	100.00	Sq.M	4	400	0	40.00	400.00
Horticulture	125.00	nos	42	5250	0	525.00	5250.00
Agro-forestry	150.00	nos	35	5250	0.00	525.00	5250.00
Bio-fencing (live hedge)	25.00	rmt	35	875	0.00	87.50	875.00
Drainage line treatment plans							
Gully plugging	1	nos	6000	6000	0	600.00	6000.00
Side wall Protection (DR) New	290	Cu.M	1500	435000	0	43,500.00	435000.00
Deepening of Kai Thodu	200	Cu.M	126	25200	0	2,520.00	25200.00
Recharge of wells.	95	nos	500	47500	0	4,750.00	47500.00
Rainwater harvesting from rooftop catchments	105	nos	3500	367500	0	36,750.00	367500.00
Allied Activities							

Biogas plant of 100kg/day	1	Nos	200000	200000	0	20000	200,000.00
Total				1142975	1,701,000	284397	2,843,975

5.11.4. Year wise work plan of NRM works

The year wise activity of NRM works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 5.8.

Table 5.8
The summary of estimated amount of NRM identified on year wise

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Physical	Financial	Physical	Financial
Strip terraces	2,000.00	284,000.00	750.00	106,500.00	250.00	35,500.00
Stone pitched bunds	250.00	225,000.00	150.00	135,000.00	100.00	90,000.00
Contour earthen bunds	1,750.00	248,500.00	500.00	71,000.00	250.00	35,500.00
Staggered trenches	1,750.00	105,000.00	500.00	30,000.00	250.00	15,000.00
Moisture collection pits	3,000.00	240,000.00	500.00	40,000.00	500.00	40,000.00
Centripetal terracing and mulching	75.00	30,000.00	25.00	10,000.00	25.00	10,000.00
Cover cropping	50	200	25	100	25	100
Horticulture	125.00	5,250.00	0.00	0.00	0.00	0.00
Agro-forestry	75.00	2,625.00	50.00	1,750.00	25.00	875.00
Bio-fencing (live hedge)	25.00	875.00	0.00	0.00	0.00	0.00
Gully plugging	1.00	6,000.00	0.00	0.00	0.00	0.00
Side wall Protection (DR) New	290.00	435,000.00	0.00	0.00	0.00	0.00
Deepening of Kai Thodu	100.00	12,600.00	75.00	9,450.00	25.00	3,150.00
Recharge of wells.	45.00	22,500.00	25.00	12,500.00	25.00	12,500.00

Rainwater harvesting from rooftop	35.00	122,500.00	35.00	122,500.00	35.00	122,500.00
Biogas plant	0	0.00	1	200,000.00	0	0.00
		1,740,050.00		738,800.00		365,125.00

5.11.5. Natural Resource Management work location

The identified NRM works are detailed in table 5.9 which also shows the location and survey numbers of the work to be done are also indicated.

Table 5.9.

Natural Resource Management work location of Pulinthruthu micro watershed

Details of Activities	First year		Second year		Third year	
	Physical	Location / Survey numbers	Physical	Location / Survey numbers	Physical	Location / Survey numbers
Strip terraces	2,000	715-719	750.00	722-728	250	742,743
Stone pitched bunds	1,750	750-758	500.00	772-780	250	790-92
Contour earthen bunds	1,750	716-19	750.00	742-43	250	742,743
Staggered trenches	1,750	753,54	500.00	790-92	250	778,779
Moisture collection pits	3,000	715-719	750.00	722-728	250	742,743
Centripetal terracing and mulching	300	743,748,750, 790,792,738	50	751,753,7568, 800,798,799	50	728-33
Cover cropping	50	743,748,750, 790,792,738	50	751,753,75 68,800,798,	50	728-33
Horticulture	150	Kadakam	150	Pulinthruthu	125	Thotapalli
Agro-forestry	75	Kadakam	150	Pulinthruthu	125	Thotapalli
Bio-fencing (live hedge)	10.	Pulinthruthu	150	739,750,79 8	125	Thotapalli
Gully plugging	1	787,789	0.00		0.	
Side wall Protection (DR) New	50	786	20.00	769	20	758

Deepening of Kai Thodu	100	787,789	75.00	794	25	795
Recharge of wells.	25	Kadakam	150	Pulinthruthu	125	Thotapalli
Rainwater harvesting from rooftop	35	Kadakam	150	Pulinthruthu	125	Thotapalli
Biogas plant	0		1	Kadakam market	0	

5.11.6. Livelihoods for Assetless

The Livelihood Activities were identified based on need analysis. The summary of Livelihood Activities is shown in table 5.10.

Table 5.10.
List of Livelihoods Activities and estimated amount.

Details of Activities	Quantity	Unit	Total Project cost	Total Cost	IWMP Share	Beneficiary share	Total IWMP share
Nursery (vegetable)	1	unit	33000	33000	19800	13200	19800
Nursery (Fruit Plants)	2	unit	34000	68000	20400	13600	40800
Skilled labour group for coconut climbing	2	unit	25000	50000	15000	10000	30000
Floriculture	1	unit	60000	60000	25000	35000	25000
Pepper nursery unit	1	unit	30000	30000	18000	12000	18000
Compost Production	1	unit	15000	15000	9000	6000	9000
Vegetable Market	1	unit	50000	50000	25000	25000	25000
Total			247000	306000	132200	114800	183600

5.11.7. Year wise work plan of Livelihoods Activities

The year wise plan of Livelihood Activities are shown in table 5.11.

Table 5.11
Year wise Physical and Financial target of Livelihoods Activities

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Physical	Financial	Physical	Financial
Nursery (vegetable)	1	19800	0	0.00	0	0.00
Nursery (Fruit Plants)	1	20400	1	20400	0	0.00

Skilled labour group for coconut climbing	1	15000	1	15000	0	0
Floriculture	0	0	0	0.00	1	25000
Pepper nursery unit	0	0	1	18000	0	0.00
Compost Production	0	0	1	9000	0	0
Vegetable Market	0	0	1	25000	0	0

5.11.8. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its success chance and sustainability. The summary of activities are shown in table 5.12.

Table 5.12
Productivity Enhancement & Microenterprises and estimated amount.

Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share to WDF	Total
Scientific management of existing coconut	150	nos	190.00	28500.00	2850.00	28500.00
Intensification of crop density of Banana	1000	House hold	40.00	40000.00	4000.00	40000.00
Organic kitchen garden	196	House hold	500.00	98000.00	9800.00	98000.00
Backyard poultry rearing (BYP) 5 birds 61 – 70	100	unit	375.00	37500.00	3750.00	37500.00

5.11.9. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise implementation plan of Productivity Enhancement & Microenterprises is shown in table 5.13.

Table 5.13
Year wise Physical and Financial target of Productivity Enhancement & Microenterprises

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Physical	Financial	Physical	Financial
Scientific management of existing coconut	50	9500.00	50	9500.00	50	9500.00

Intensification of crop density of Banana	400	16000.00	300	12000.00	300	12000.00
Organic kitchen garden	100	50000.00	50	25000.00	46	23000.00
Backyard poultry rearing (BYP) 5 birds 61 – 70	50	18750.00	25	9375.00	25	9375.00

CHAPTER 6

KOLICHIRA MICRO WATERSHED (3M2A)

6.1 Location and extent

Kolichira Micro watershed is the Mamam river based watershed in the IWMP cluster of Chirayinkeezhu PIA. Kolichira micro watershed lies in the north east of pulinthuruthu micro watershed. The total area of the water shed is 920 ha which is 13.5 % of the Chirayinkeezhu- IWMP watershed cluster. The land use of the area is mostly under agriculture where the southern part of the watershed is dominated by plantation crops and mixed crops. The watershed lies in the southern part of Chirayinkeezhu panchayat. The Mamam River flows through the northwest of the watershed.

Name of micro watershed	:	Kolichira
Micro watershed code	:	3M2a
River basin	:	Mamam
District	:	Thiruvananthapuram
Block Panchayat	:	Chirayinkeezhu & Pothencode
Grama Panchayat	:	Chirayinkeezhu, Azhoour and Kizhuvilam
Area in panchayat:	:	Chirayinkeezhu Grama panchayat – 155 ha Azhoour Grama panchayat – 534 ha Kizhuvilam Grama panchayat – 185 ha
Latitude	:	8°38'0" to 8°40'0"
Longitude	:	76°47'0" to 76°49'30"

6.2. Physiography

The entire watershed is extremely hilly with complex topography with an elevation up to delineated are steep to very steep hill slopes, moderately steep to very steep hill slopes, hill terraces, hill slopes

with pasture and hill slopes. The relief is excessive and the watershed is drained by perennial streams. All local streams are merging in Mamam River. The general slope is from North West to South East. The major physiographic units of the Watershed area are southern mid land with plain land in the western part. The Slope is 0-19 degree. The slope and DEM maps were derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure 1 of the report. The eastern part of the watershed is elevated in the Azhoor Gram panchayat area where 396 ha is under the elevation of 0-22 mt and 274 ha is under 2-40 mt and the 230 ha comes under the 40-77 mt height. The relief is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the Mamam river. Majority of the area falls in the relief category of 22-75 m above msl, which covers an area of 500 Ha.

6.3 Slope

The watershed area is divided into three categories of slope classes. The 55% of area is under the category of very gentle slope having 0-3 degree slope (471 ha). The gentle category of slope spreads over Kizhuvilam grama panchayat and the highest slope degree falls in Azhoor Grama panchayat. The 3-8 degree slope is covering an area of 408 ha and 5% area lies under high slope (8-18 degree). The map showing the slope of the watershed is in the annexure of the report.

6.4. Drainage

The Mamam River is the major drain of this watershed. The broad landforms at the upper region with isolated hillocks and Coastal Low. The watershed has about 9.8 ha of waterbody. The land forms of the middle region include sandy loam with valleys and low hills with isolated hillocks. The landforms at the lower region are coastal sandy loam.

6.5 Water Resources

Surface Water Resources

The watershed area is mostly relied on the open well for the drinking and irrigation purpose with the water table depth of the open well are 2-4 mt depth. The major river of this watershed is the Mamam River. The total watershed has small streams which drain into Mamam river. The streams flow from east to west and join the river in Kolichara near the Chembumoola area.

Ground Water Resources

The depth of the ground water level in the bore well are 55-75 mt depth and the ground water depth is highest in the Azhoor Grama panchayat area. The area falls in the category of 'White' which means that only less than 65 percent of the ground water is utilized. The area under Chirayinkeezhu block is in the category of 'dark' in the near future. The eastern part of the watershed is suitable for domestic

wells whereas the western part and the middle region is suitable for large diameter dug wells. The lower region is suitable for heavy duty as well as medium capacity tube wells.

6.6. Agriculture and present land use

The total area of the watershed is 920 Ha in which 877 ha of land area is under agricultural use and 42 ha land is non cultivable area with 5 ha as cultivable wasteland. As the Project area lies under midland zone, the forest area are not identified and the topography shows very gentle to costal slope. The major land use category mapped in the project area is mixed crops (677 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. The second major land use category is Coconut plantation (73 Ha). And the rubber (62 ha) are widely seen and being replaced by the other crops. The paddy(65 ha) is cultivated in the Chirayinkeezhu and Kizhuvilam Grama panchayat area. The map showing the slope of the land use is in the annexure of the report.

6.7. Soils

The major sandy loam soil association which is distributed in an area of 156 ha followed loamy soil association.. This soil is well drained with moderate slow permeability. This soil is intensively used to cultivated coconut and vegetables. The soil erosion is vastly found in the area with moderate effect.

6.8. Socio economic details

The water shed has about 4027 families of which 20 % belongs to SC .The population of the watershed is 18052 and the average land holding per family is 0.11 ha. The BPL families of the watershed are about 30 % of the total population

6.9 SWOT Analysis of Kolichira (3M2a) watershed

The strength, Weakness, Opportunities and treat of the micro watershed was analyzed and the details are given in table 6.1

Table 6.1
SWOT Analysis of Kolichira (3M2a) watershed

Area of Intervention	Strength	Weakness	Opportunities	treat
Agriculture	Paddy Cultivation is vastly promoted in the area as the formation of SHG for group farming has reduced the cultivable wasteland	Paddy land are being converted in to rubber, tapioca and vegetable	Promotion by the way of new farming techniques and subsided activity	Conversion of wetland ecosystem into crops such as rubber adversely affect the water table, natural drainage

				& food security
Horticulture	80% area under mixed crops, coconut based farming system plantain, ginger, turmeric, tuber crops & pepper as intercrops. Coconut cluster functioning inside the watershed.	70% of area under Mono crops of rubber. 80% of the area of the watershed is rainfed	Scope for promoting banana and vegetable in paddy converted land. Scope for bee keeping in rubber plantation, nursery of medicinal plants, forest nursery.	Poor management of crops which lead to decline in the total area and productivity. lack of mainstay in farming
Animal Husbandry	Goat, Cattle and poultry rearing is the taken up by many women in their backyard as livelihood.	Lack of availability of fodder. Lack of knowledge base regarding scientific management of cattle rearing & goat rearing. Lack of infrastructure facility for scientific cattle shed	Scope for fodder cultivation in wasteland & as inter crop in coconut Garden.	Poor management of poultry will lead to decline in area and productivity
Natural Resources	The Mamam river which flow on the boundary Majority of the watershed area, the landform is gentle slope or valley.	30 total area of the micro watershed is with steep slope subject to erosion hazards. Major soil in this area belongs to loamy soil with erodability as the major limitation.	Area treatment with suitable soil and water conservation measures such as Afforestation in very steep sloppy areas mulching, cover cropping, water harvesting measures such as staggered trenches.	Adverse situation affecting the water table.

6.10 Problem analysis

The project area was analyzed after finding out the SWOT with its constrain and possible solution and detailed in table 6.2.

Table 6.2
Problem analysis

No	Problem Area t	Constraints	Solutions	Project Support
1	Surface water Recourses	Reduced in water holding & capacity due to siltation from upstream catchment	First order Streams – Gully formation Desiltation, widening of	Gully plugging as part of drainage line treatment. Area treatment with suitable

		poor maintenance of sluices resulting in leakage & water Valley head ponds silted up. Sunken pond embankment subject to bank erosion	thodu, embankment protection of thodu using earth silt & strengthening by agrostological measures using Dry rubble in specific areas and repair of existing VCB's	conservation measures such as terracing, trenching & cover crop. Widening of thodu, desiltation of thodu, sidevarambu, earthening, embankment protection (vegetative) side wall protection. VCB repair, construction of brushwood check dam
2	Vegetation	Coconut and mixed crops like banana are grown	Promoting homestead garden as part of area treatment	As part of Natural Resource Management promoting Live fencing, Agroforestry and Fodder Cultivation

6.11. Work interventions proposed

The work plan was prepared through the methodology proposed and the after analysis of the basic secondary data available. The general information of the Kolichira micro watershed are detailed in table 6.3.

Table 6.3.
General information of the Kolichira micro watershed

Name of Watershed	Kolichira
Watershed Code	3M2a
Treatable Area in Ha	920 ha
Total Cost in Lakhs	Rs.1,10,40,000

The fund available for each components of the Kolichira micro water shed Fund Allocated according to the guideline are detailed in table 6.4.

Table 6.4.
Fund allocated to each components of the Kolichira micro water shed

Sl.No	Component	Percentage	Total amount in Rs
1	Administration	10	1104000
2	DPR Preparation	1	110400
3	Entry point activities	4	441600
4	capacity Building	5	552000
5	Productivity Enhancement	10	1104000

6	Livelihoods for Asset less	9	993600
7	Natural Resource Management	56	6182400
8	Monitoring	1	110400
9	Evaluation	1	110400
10	Consolidation phase	3	331200
	Total	100	1,10,40,000

6.11.2. Entry Point activities of Kolichira watershed

The Entry point activities was selected under participatory activity and the activity has importance during the summer season which provides water for irrigation as no check dam is provided the water does not store and it runs off to the river and the farmers around the area rely on it. The details of the activity are detailed in table 6.5.

Table 6.5
Entry Point activities of Kolichira watershed

Details of Activities	Qty	Unit	Rate	IWMP	Convergence	Total	First year	
							Phy	Financial
Improvement of Mokkalithodu and construction of check dam across the thodu in Ward no 8 of Azhur panchayat and ward no 13 of Kizhuvilam panchayat	1	nos	16,04,420.00	4,33,790.00	11,70,630.00	16,04,420.00	1	16,04,420.00

6.11.3. Year wise work plan

The year wise activity of watershed works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 6.6.

Table 6.6
The summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	54,32,907	31,54,001	21,39,526
2	Livelihoods for Asset less	3,48,000	3,92,400	2,52,800
3	Productivity Enhancement & Microenterprises	6,21,325	2,43,825	2,38,775

6.11.4. Natural Resource Management

The NRM works were identified based on the PRI methodology and the works were analyzed for the need and importance based on the watershed. Based on the analysis the summary of estimated amount of NRM works are shown in table 6.7.

Table 6.7
The summary of estimated amount of NRM works

Details of Activities	Quantity	Unit	Rate	IWMP	Convergence-NREAGS	WDF	Total
Ridge Area Treatment Plans							
Strip terraces	5000	Nos	142	0.00	710,000.00	71,000.00	710,000.00
Stone pitched bunds	4000	Sq.M	900	0.00	3,600,000.00	360,000.00	3,600,000.00
Contour earthen bunds	5000	Sq.M	142	0.00	710,000.00	71,000.00	710,000.00
Staggered trenches	4000	mt	60	0.00	240,000.00	24,000.00	240,000.00
Moisture collection pits	6000	nos	80	0.00	480,000.00	48,000.00	480,000.00
Centripetal terracing and mulching	1500	nos	400	600,000.00	0.00	60,000.00	600,000.00
Cover cropping	126000	sqm	4	504,000.00	0.00	50,400.00	504,000.00
Horticulture	9500	nos	42	400000	0.00	105,000.00	1,050,000.00
Agroforestry	610	nos	35	21,350.00	0.00	2,135.00	21,350.00
Biofencing (live hedge)	750	rmt	35	26,250.00	0.00	2,625.00	26,250.00
Drainage line treatment plans							
Gully plugging	1	nos	6000	6,000.00	0.00	600.00	6,000.00
Stream Sidewall Construction	4	Works		2,680,079.00	748,905.00	342,898.40	3,428,984.00
Desiltation of streams, ponds and Public wells.	5	nos	65000	325,000.00	0.00	32,500.00	325,000.00
Recharge of wells.	240	nos	500	120,000.00	0.00	12,000.00	120,000.00

Rainwater harvesting from rooftop	240	nos	2500	600,000.00	0.00	60,000.00	600,000.00
Allied Activities							
Solar Paneling-Block office 5 Kva	1	Ls	1000000	700000	300000	0	1000000
Biogas plant in Block Office of 100 kg /day	1		200000	200000		0	200000
Total				6,181,679.00	6,788,905.00	1,297,058	12,970,584

6.11.5. Year wise work plan of NRM works

The year wise activity of NRM works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 6.8.

Table 6.8
The summary of estimated amount of NRM identified on year wise

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Phy	Financial	Physical	Financial
Strip terraces	2,000	284,000.00	2000	284,000.00	1000	142,000.00
Stone pitched bunds	2,500	2,250,000.00	1000	900,000.00	500	450,000.00
Contour earthen bunds	2,000	284,000.00	2000	284,000.00	1000	142,000.00
Staggered trenches	2,000	120,000.00	1000	60,000.00	1000	60,000.00
Moisture collection pits	3,000	240,000.00	1500	120,000.00	1500	120,000.00
Centripetal terracing and mulching	1,000	400,000.00	250	100,000.00	250	100,000.00
Cover cropping	0	0.00	1000 00	400,000.00	26000	104,000.00
Horticulture	5,000	210,000.00	2000	84,000.00	2500	105,000.00
Agroforestry	0	0.00	500	17,500.00	110	3,850.00
Biofencing (live hedge)	750	26,250.00	0	0.00	0	0.00
Gully plugging	0	0.00	1	6,000.00	0	0.00

Strem Sidewall Construction	2	1,446,432.00	1	1,054,351.00	1	928,201.00
Vented Cross Bars New	3	195,000.00	1	65,000.00	1	65,000.00
Canal Desiltation	100	50,000.00	100	50,000.00	40	20,000.00
Desiltation of streams, ponds and Public wells.	100	250,000.00	100	250,000.00	40	100,000.00
Recharge of wells.	0	0.00	1	6,000.00	0	0.00
Rainwater harvesting from rooftop	2	1,446,432.00	1	1,054,351.00	1	928,201.00
Solar Paneling-Block office			1	1,000,000.00		
Biogas plant in Block Office 5 M ³	1	200,000.00	0	0.00	0	0.00
Total		5955682		4,674,851.00		2,340,051.00

6.11.6. Natural Resource Management work location

The identified NRM works are detailed in table 6.9 which shows the location and survey numbers of the work to be done

Table 6.9
Natural Resource Management work location of Kolichira micro watershed

Details of Activities	First year		Second year		Third year	
	Physical	Location / Survey numbers	Physical	Location / Survey numbers	Physical	Location / Survey numbers
Strip terraces	2,000.00	375.179,130,194,188	2000	494,498,494	1000	490,172,176,175
Stone pitched bunds	2,500.00	174,188,490,489,493	1000	94,306,604	500	308,332,260
Contour earthen bunds	2,000.00	244,241,214,374	2000	215,213,212	1000	220,211
Staggered trenches	2,000.00	188,490,489,	1000	179,130	1000	172,176
Moisture collection pits	3,000.00	375.179,130,194,188,174,188,490,489,493,494	1500	306,604	1500	308,332,260,172,176
Centripetal terracing and	750	502,503,504	750	184,183,130,197	0	
Cover cropping	500	375.179,130,194,188	125	306,604	125	308,332,260,172,176

Horticulture	1000	Perumkuzli area, Chempakamangalam and Kailathukonam	400		400	
Agroforestry	75	98,44,43,514,517,51 8,527,523,546 ,469	50	468,485,481,490 ,491,496,498,50	25	508,509,51 6,517,519
Biofencing (live hedge)	500	Punnakunam, Madanvil, Ganapathiyam kovil	125	Mavintamoodu, Kolicira, Krishnapuram Muttappalam.	125	Injakal
Recharge of wells.	5		3		2	
Rainwater harvesting from	50		200		90	
Solar Paneling- Block office	1	398	0		0	
Biogas plant in Block Office	1	398				

6.11.7. Livelihoods for Assetless

The Livelihoods Activities were identified based on the need analysis and participatory interaction projects were analyzed for the successfulness and sustainability. Based on the analysis the summary of estimated amount of Livelihoods Activities projects are shown in table 6.10.

Table 6.10.

List of Livelihoods Activities and estimated amount

Details of Activities	Quantity	Unit	Unit cost	Total Project cost	IWMP Share	Beneficiary share	Total IWMP share
Nursery (Tray method vegetable seedling)	10	unit	33000	330000	25000	8000	250000
Nursery (Fruit Plants)	8	unit	34000	272000	25000	9000	200000
Lease land Paddy farming	2	unit	8000	16000	6400	1600	12800
Skilled labour group for coconut climbing	10	unit	25000	250000	20000	5000	200000
Banana (N) cultivation by lease farmers	3	unit	25000	75000	20000	5000	60000
Vegetable lease cultivation	3	unit	20000	60000	16000	4000	48000

Floriculture	1	unit	60000	60000	25000	24000	25000
Bee keeping	1	unit	18000	18000	10800	7200	10800
pepper nursery unit	2	unit	30000	60000	24000	6000	48000
Compost Production	3	unit	15000	45000	12000	3000	36000
Vegetable Market	4	unit	50000	200000	25000	25000	100000
Total							9,90,600

6.11.8. Year wise work plan of Livelihoods Activities

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 6.11.

Table 6.11

The summary of estimated amount of Livelihoods Activities identified on year wise

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Physical	Financial	Physical	Financial
Nursery (Tray method vegetable seedling)	3	75000	4	100000	3	75000
Nursery (Fruit Plants)	2	50000	4	100000	2	50000
Lease land Paddy farming	0	0	1	6400	1	6400
Skilled labour group for coconut climbing	8	160000	1	20000	1	20000
Banana (N) cultivation by lease farmers	1	20000	1	20000	1	20000
Vegetable lease cultivation	1	16000	1	16000	1	16000
Floriculture	0	0	1	25000	0	0
Bee keeping		0		0	1	10800

pepper nursery unit	0	0	1	24000	1	24000
Compost Production	1	12000	1	12000	1	12000
Vegetable Market	1	25000	2	50000	1	25000

6.11.9. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its successfulness and sustainability. Based on the analysis the summary of estimated amount of Productivity Enhancement & Microenterprises are shown in table 6.12.

Table 6.12.

Productivity Enhancement & Microenterprises and estimated amount

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share to WDF	Total
1	Scientific management of existing coconut gardens	750	nos	190	142500	14250	142500
2	Intensification of crop density of Banana ,Ginger, tuber crops - Klt	800	per kit	50	40000	4000	40000
3	Organic garden- Seed distribution	721	per packet	50	36050	3605	36050
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	300	per lot	375	112500	11250	112500
5	Scientific Paddy seed Farming	90	cent	50	4500	450	4500
6	Vegetable Farming	80	per 10 cent	5000	400000	40000	400000
7	Bio fertilizer production	2	per unit	5000	10000	1000	10000
8	Bio- control agent production	100	cent	40	4000	400	4000

9	Fodder Production	175	cent	25	4375	437.5	4375
10	Fish farming in public pond	3	nos	20000	60000	6000	60000
11	Renovation of cattle Shed.	10	per unit	20000	200000	20000	200000
12	Rabbit Rearing	3	per unit	10000	30000	3000	30000
13	Marketing Centre	3	per unit	20000	60000	6000	60000
	Total			80780	1103925	110392.5	1103925

6.11.10. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise activity, which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 6.12.

Table 6.12

The summary of estimated amount of Productivity Enhancement & Microenterprises identified

Sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Scientific management of existing coconut gardens	450	85500	150	28500	150	28500
2	Intensification of crop density of Banana ,Ginger, tuber crops - Kit	480	24000	160	8000	160	8000
3	Organic garden- Seed distribution	432	21600	145	7250	144	7200
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	180	67500	60	22500	60	22500
5	Scientific Paddy seed Farming	54	2700	18	900	18	900
6	Vegetable Farming	48	240000	16	80000	16	80000
7	Bio fertilizer production	1	5000	1	5000	0	0
8	Bio- control agent production	60	2400	20	800	20	800
9	Fodder Production	105	2625	35	875	35	875
10	Fish farming in public pond	1	20000	1	20000	1	20000

11	Renovation of cattle Shed.	6	120000	2	40000	2	40000
12	Rabbit Rearing	1	10000	1	10000	1	10000
13	Marketing Centre	1	20000	1	20000	1	20000
	Total	1819	621325	610	243825	608	238775

CHAPTER 7

THEKKUMBHAGOM MICRO WATERSHED (4V1A)

7.1. Location and extent

Thekkumbhagom micro watershed lies in the north of Sarkara micro watershed covering major portion of Chirayinkeezhu, Kadakkavoor and Vakkom Grama Panchayat. The total area of the water shed is 1423 ha which is 21.5 % of the Chirayinkeezhu- IWMP watershed cluster. The soil in the area are of sandy loam and the area is mostly under agriculture with the topography of gently sloping to flat. The Vamanapuram River flows through the southeast of the watershed.

General Description

Name of micro watershed	:	Thekkumbhagom
Micro watershed code	:	4V1a
River basin	:	Vamanapuram
District	:	Thiruvananthapuram
Block Panchayat	:	Chirayinkeezhu
Grama Panchayat	:	Chirayinkeezhu, Kadakkavoor, Anchuthengu and Vakkom
Area in panchayat:	:	<ol style="list-style-type: none"> 1. Chirayinkeezhu Grama Panchayat – 299 ha 2. Kadakkavoor Grama Panchayat –815 ha 3. Anchuthengu Grama Panchayat – 27 ha 4. Vakkom Grama Panchayat – 167 ha
Latitude	:	8 ^o 42'45" to 8 ^o 39'13" N
Longitude	:	76 ^o 45'00" to 76 ^o 48'10" E

7.2 Physiography

The Project area is southern mid land with costal terrain in the western part. The thematic map on geomorphology reveals that there are four geomorphological units in the project area. Terrain basement rocks like Khondalite and Migmatite has an undulating to rolling topography and is characterized by undulating spurs. Thick columns of laterite soils in the area supports the growth of coconut. A quantitative analysis of the ground water potential of these units are also made through interpretation of lineaments supported by necessary ground truth. The various geomorphological units identified in the project area and their spatial extent.. The Slope is 0-19 degree. The slope and DEM maps was derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure 1 of the report. The eastern part of the water shed is elevated in the Kadakkavoor Gram panchayat area. The relief is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the vamamapuram river . The relief of the watershed ranges above msl. About 65 % of the area falls in the relief category of 0-19 m above msl, which covers an area of 836 Ha .

7.3 Slope

The watershed area is dived in to three categories of slope classes. The majority of area is under the category of very gentle slope having 0-3 degree slope. This category of steep slope spreads over 65% of the area on the northern part near Melatingal. The 872 ha is categorized as gentle slope and 304 ha is under moderated slope.

7.4. Drainage

The Vamanapuram River is the major drain of this watershed. The broad landforms at the upper region with lower plateau (lattrite) and the pediplain weathered nature is found on the middle of the water shed. The land forms of the middle region include sandy loam with valleys and low hills with gentle slope to flat bottom.

7.5 Water Resources

Surface Water Resources and Ground Water Resources

The depth of the water level in the of midland areas in watershed varies from 3- 16 M below Ground Level. The midland area sustains medium capacity dugwells. Borewells tapping deeper fractured aquifer are feasible along potential features in the midland and hill ranges. Potential fractures are seen down to 240 M and the most productive zone is between 60 M and 175 M. The discharge of borewells range between 3,600 lph and 1,25,000 lph. In laterites, which is the most widely distributed lithological area in the state having a thickness from a 3 M to 30 M, the depth of water level ranges from less than a meter to 25 M. below Ground Level . Lateries from potential aquifer along valleys and can sustain wells with yields in the range of 0.5 M³ to 6 M³ per day. Along the coastal plains the ground water occurs at depth ranging from less than a meter to 6 M.bgl. Wells are feasible wherever

the saturated availability indicate that ground water depths are farthest for laterite regions and shallowest for coastal alluvium during all times of the year. The availability of the groundwater level between the post and pre monsoon levels varies widely.

The water level fluctuations in the post monsoon and ore monsoon vary between coastal alluvium, river alluvium and valley hills. As the area falls in the category of 'White' which means that only less than 65 percent of the ground water is utilized. The area under Chirayinkeezhu block is in the category of 'dark' in the near future. The eastern part of the watershed is suitable for domestic wells whereas the western part and the middle region is suitable for large diameter dug wells. The lower region is suitable for heavy duty as well as medium capacity tube wells. The depth of the ground water level in the bore well are 45-65 mt depth and the ground water depth is highest in the Kadakkavoor Grama panchayat area.

7.6. Agriculture and present land use

The total area of the watershed is 1423 Ha in which 1324 ha of land area is under agricultural use and 99 ha land is non cultivable area with 4 ha as cultivable wasteland. As the Project area lies under midland zone, the forest area are not identified and the topography shows very gentle to coastal slope.

The major land use category mapped in the project area is mixed crops (1201 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. The second major land use category is Coconut plantation (4 Ha). And the rubber (22 ha) are widely seen and being replaced by the other crops. The paddy (97 ha) is cultivated in the Chirayinkeezhu and Vakkom Grama panchayat area.

7.7. Soils

The major lower plateau (laterite) soil association which is distributed in an area of 11150 ha followed pediplain weathered soil association.. This soil is well drained with moderate slow permeability. This soil is intensively used to cultivated coconut and vegetables.

7.8. Socio economic details

The water shed has about 12939 families of which 28 % belongs to SC .The population of the watershed is 57632 and the average land holding per family is 0.11 ha. The BPL families of the watershed are about 15 % of the total population

7.9 SWOT Analysis of Thekkumbhagom (4V1a) watershed

The strength, Weakness, Opportunities and treat of the micro watershed was analyzed and the details are given in table 7.1

**Table 7.1 .
SWOT Analysis of Thekkumbhagom (4V1a) watershed**

Area of Intervention	Strength	Weakness	Opportunities	treat
Agriculture	40 % of wetland of the watershed lying in the valley portion under two crops paddy	60% of wetland of the watershed converted into crops such as coconut, vegetable, arecanut, banana etc	Raising of third crop (pulses & vegetables) in 24 ha. Raising of paddy in 1st season in 1 ha which is remaining as cultivable fallow at present	Conversion of wetland ecosystem which is suitable for raising paddy into rubber adversely affects the natural drainage and water table.
Horticulture	1% of total area of watershed under coconut based farming system with intercrops such as plantains, tuber crops ginger turmeric and pepper.	57% of garden land suitable for raising mixed crop converted into monocrop of rubber & rubber based farming system	Raising of intercrops of banana & pineapple in rubber based farming system (new plantations). Increase in area under banana & vegetable, pineapple, pepper, in coconut/ rubber based farming system, bee keeping in rubber plantation. Value addition of jack, mango, turmeric & pepper	Attack of horticulture crops especially banana & tuber crops by disease.

Animal Husbandry	Cattle rearing as major livelihood by many households. Goat rearing taken up as livelihood especially women. Backyard poultry at subsistent level by many households.	50% of the total area of watershed under medium slope belonging to geomorphological classified pediment zone. 43% of the total area of watershed belongs to the land capability subject to severe erosion hazards. Rubber, a shallow rooted crop is the main crop in this area increases the hazard of erosion.	Increase in area under fodder as intercrop in coconut garden, scope for increasing cattle rearing, goat rearing as major livelihood for women	Land use change to rubber plantations (50% of total area of watershed) has adversely affected the perenniality of streams and water table. Quarrying of critical catchment adversely affect the water table.
Natural Resources	The Vanmanapuram river which flow on the boundary Majority of the watershed area, the landform is gentle slope or valley.	total area of the micro watershed is with steep slope subject to erosion hazards. Major soil in this area belongs to loamy soil with erodability as the major limitation.	Area treatment with suitable soil and water conservation measures such as Afforestation in very steep sloppy areas mulching, cover cropping, water harvesting measures such as staggered trenches.	Afforestation in very steep slopes. Soil & water conservation measures such as contour bunding, repair of old bunds, terracing in rubber, cover cropping in rubber, agrostological measures on bunds with soil bunding crops such as pineapple/ fodder, staggered trenching.

7.10 Problem analysis

The project area was analysed after finding out the SWOT with its constrain and possible solution and detailed in table 7.2

Table 7.2
Problem analysis

No	Problem Area t	Constraints	Solutions	Project Support
1	Surface water Recourses	Reduced in water holding & capacity due to siltation from upstream catchment poor maintenance of sluices resulting is	First order Streams – Gully formation Desiltation, widening of thodu, embankment protection of thodu using	Gully plugging as part of drainage line treatment. Area treatment with suitable conservation measures such as

		leakage & water Valley head ponds silted up. Sunken pond embankment subject to bank erosion	earth silt & strengthening by agrostological measures using Dry rubble in specific areas and repair of existing VCB's	terracing, trenching & cover crop. Widening of thodu, desiltation of thodu, sidevarambu, earthening, embankment protection (vegetative) side wall protection. VCB repair, construction of brushwood check dam
2	Vegetation	Coconut and mixed crops like banana are grown	Promoting homestead garden as part of area treatment	As part of Natural Resource Management promoting Live fencing, Agroforestry and Fodder Cultivation

7.11 Work plan

The work plan was prepared through the methodology proposed and the after analysis of the basic secondary data available. The general information of the Thekkumbhagom micro watershed are detailed in table 7.3

Table 7.3.
General information of the Thekkumbhagom micro watershed

Name of Watershed	Thekkumbhagom
Watershed Code	4V1a
Treatable Area in Ha	1423 ha
Total Cost in Lakhs	Rs.17076000

The fund available for each components of the Thekkumbhagom micro water shed Fund Allocated according to the guideline are detailed in table 7.4.

Table 7.4.
Fund allocated to each components of the Thekkumbhagom micro water shed

Sl.No	Component	Percentage	Total amount in Rs
1	Administration	10	1707600
2	DPR Preparation	1	170760

3	Entry point activities	4	683040
4	Capacity Building	5	853800
5	Productivity Enhancement	10	1707600
6	Livelihoods for Asset less	9	1536840
7	Natural Resource Management	56	9562560
8	Monitoring	1	170760
9	Evaluation	1	170760
10	Consolidation phase	3	512280
	Total	100	17076000

7.11.1. Entry Point activities of Thekkumbhagom watershed

The Entry point activities was selected under participatory activity and the activity has importance during the summer season which gives pure drinking water and the peoples around the area rely on it. The details of the activity are detailed in table 7.5.

Table 7.5
Entry Point activities of Thekkumbhagom watershed

Details of Activities	Unit	Rate	IWMP	Convergence	WDF	Total	First year	
							Physical	Financial
Renovation of Ayyankulam and maintenance of existing water supply scheme in ward no 7, Kadakkavoor panchayat.	nos	7,21,678.00	6,90,838.00	30,840.00	0.00	7,21,678.00	1	16,04,420.00

7.11.2. Year wise work plan

The year wise activity of watershed works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 7.6.

Table 7.6
summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	90,35,588	38,85,479	25,23,962
2	Livelihoods for Asset less	407800	434400	212800
3	Productivity Enhancement &	621325	243825	238775

7.11.3. Natural Resource Management

The NRM works were identified based on the PRI methodology and the works were analyzed for the need and importance based on the watershed. Based on the analysis the summary of estimated amount of NRM works are shown in table 7.7.

Table 7.7
The summary of estimated amount of NRM works

Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total
Ridge Area Treatment Plans							
Strip terraces	5000	Nos	142	0.00	710,000.00	71,000.00	710,000.00
Stone pitched bunds	4000	Cu.M	900	0.00	3,600,000.00	360,000.00	3,600,000.00
Contour earthen bunds	5000	Sq.M	142	0.00	710,000.00	71,000.00	710,000.00
Staggered trenches	4000	rmt	60	0.00	240,000.00	24,000.00	240,000.00
Moisture collection pits	6000	nos	80	0.00	480,000.00	48,000.00	480,000.00
Centripetal terracing and	1550	nos	400	620,000.00	0.00	62,000.00	620,000.00

Cover cropping	100000	Sq.M	4	400,000.00	0.00	40,000.00	400,000.00
Horticulture	10000	nos	42	420,000.00	0.00	42,000.00	420,000.00
Agroforestry	1000	nos	35	35,000.00	0.00	3,500.00	35,000.00
Biofencing (live hedge)	1000	rmt	35	35,000.00	0.00	3,500.00	35,000.00
Drainage line treatment plans							
Gully plugging	1	nos	6000	6,000.00	0.00	600.00	6,000.00
pond renovation		Works		1963572	381,500.00	234,507.20	2,345,072.00
Stream Sidewall Construction		Works		4,338,600	2,313,372.00	665,197.20	6,651,972.00
Desiltation of streams, ponds	4	nos	65000	260,000.00	0.00	26,000.00	260,000.00
Recharge of wells.	500	nos	500	250,000.00	0.00	25,000.00	250,000.00
Rainwater harvesting from	415	nos	2500	1,037,500	0.00	103,750.00	1,037,500.00
Allied Activities							
Biogas plant	1	nos	200000	200,000.00	0.00	20,000.00	200,000.00
Total				9,565,672.00	8,434,872.00	1,800,054.40	18,000,544.00

7.11.4. Year wise work plan of NRM works

The year wise activity of NRM works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 7.8.

Table 7.8

The summary of estimated amount of NRM identified on year wise

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Physical	Financial	Physical	Financial
Strip terraces	2,000	284,000.00	2000	284,000.00	1000	142,000.00
Stone pitched bunds	2,500	2,250,000.00	1000	900,000.00	500	450,000.00
Contour earthen bunds	2,000	284,000.00	2000	284,000.00	1000	142,000.00
Staggered trenches	2,000	120,000.00	1000	60,000.00	1000	60,000.00
Moisture collection pits	3,000	240,000.00	1500	120,000.00	1500	120,000.00
Centripetal terracing and	1,000	400,000.00	250	100,000.00	300	120,000.00

Cover cropping	50,000	200,000.00	35000	140,000.00	15000	60,000.00
Horticulture	4,000	168,000.00	4000	168,000.00	2000	84,000.00
Agroforestry	0	0.00	250	8,750.00	750	26,250.00
Biofencing (live hedge)	500	17,500.00	500	17,500.00	0	0.00
Gully plugging	0	0.00	1	6,000.00	0	0.00
pond renovation	3	698,735.00	1	1,209,984.0	1	436,352.00
Stream Sidewall Construction	3	5,208,506.00	1	1,443,465.00	0	0.00
Desiltation of streams, ponds	2	130,000.00	1	65,000.00	1	65,000.00
Recharge of Rainwater	250	125,000.00	250	125,000.00	0	0.00
harvesting from Biogas plant	200	500,000.00	115	287,500.00	100	250,000.00
0	0	0.00	1	200,000.00	0	0.00
Total		106,25,741		5,419,199.00		1,955,602.00

7.11.5. Natural Resource Management work location

The identified NRM works are detailed in table 7.8 which also shows the location and survey numbers of the work to be done are also indicated.

Table 7.8.

Natural Resource Management work location of Thekkumbhagom micro watershed

Details of Activities	First year		Second year		Third year	
	Physical	Location / Survey numbers	Physical	Location / Survey numbers	Physical	Location / Survey numbers
Strip terraces	2,000	69,11,81,64,76,87,88,89,114,	2000	115,160,82,83,85,91,90,111,110,200,	250	118,123,116,154,157,
Stone pitched bunds	2,500	493,48,1486,79,81,179,68,64,65,77,62	1000	82,87,75,90,73,115,143	250	67,154,179,190,197
Contour earthen bunds	2,000	200,189,181,227,450,448	2000	211,212,213,442,440,453,463	250	179,194,197,194
Staggered trenches	2,000	753,54	1000	790-92	250	778,779
Moisture collection pits	3,000	69,11,81,64,76,87,88,89,114	1500	118,123,116,154,157	250	115,160,82,83,85,91,90,111,110,200

Centripetal terracing and mulching	750	743,748,750,790,792,738	750	751,753,7568,800,798,799	50	728-33
Cover cropping	500	743,748,750,790,792,738	125	751,753,7568,800,798,799	50	728-33
Horticulture	400	Kadakkavoor	300	Melakadakavoor	125	Mukkalvattom
Agro-forestry	200	Along the road side	200	Along the road side	125	Along the road side
Bio-fencing (live hedge)	500	Anjuthengu	150	Chakalamuku, keelantiangal and malakadakavoor	125	Kaikara and nelakamukku
Gully plugging	1	Near sub tesury	0.00		0.	
Biogas plant	0		1	Police station	0	

Details of Activities	First year		Second year		Third year	
	Phy	Location	Phy	Location	Phy	Location
Pond renovation	4	Vadail pond renovation, In Vakkom gram panchayat, Ward no 12 near Mukkalvattom temple	2	Panikakuam/Asarikulam ,in Kadakkavoor gram panchayat, Ward no 5 near Villinmoola	1	
		Vellivilakam - Kulangarakulam pond renovation, In Vakkom gram panchayat, Ward no 11 near Mukkalvattom temple		Palayachera Renovation , In Cherayinkeezhu gram panchayat, Ward no 2 & 3		
		Kiindanvila thodi pond renovation , In Vakkom gram panchayat, Ward no 12 near Kaddakavoor railway station				
		Melathu Kullam Renovation ,In Kadakkavoor gram panchayat, Ward no 5 near Villinmoola				
Strem Sidewall Construction	2	Palya chera ela thodu-kallupallam - In Cherayinkeezhu gram panchayat, Ward no 2,3	1	kelugu Vilakam - lyyampudukal thodu , In Kaddakavoor	1	Palyachera elathodu-allinmoodu Thodu

		and 19 near Palyachera pallam		gram panchayat, Ward no 9 near Thevarunada temple		, In Cheyinkeezhu gram panchayat, Ward no 1,2&3 near palyachera
		Melathukulam -elapuram thodu - In Kaddakavoor gram panchayat, Ward no 1 near madanada kullapadam ela				
Desiltation of streams, ponds and Public wells.	2	Public well near Vaduku Nathan temple in ward no 3 of Chirayinkeezhu grama panchayat	1	Public well in Chetithoudi mukku in Vakkom Grama Panchyat in ward no 12	1	Well near Puthen villa colony in ward no 4 of Kaddakavoor Grama Panchayat
		Public well near Guruthapan agapan temple temple in ward no 3 of Chirayinkeezhu grama panchayat		Public well near Guruthapan agapan temple temple in ward no 3 of Chirayinkeezhu grama panchayat		

7.11.5. Livelihoods for Assetless

The Livelihoods Activities were identified based on the need analysis and participatory interaction projects were analyzed for the successfulness and sustainability. Based on the analysis the summary of estimated amount of Livelihoods Activities projects are shown in table 7.9.

Table 7.9.
List of Livelihoods Activities and estimated amount.

Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share	Total IWMP share
Nursery (Tray method vegetable seedling)	5	unit	34000	25000	9000	125000
Nursery (Fruit Plants)	8	unit	34000	25000	9000	200000
Lease land Paddy farming	4	unit	8000	6400	1600	25600
Skilled labour group for coconut climbing	9	unit	25000	20000	5000	180000
Banana cultivation by lease farmers	9	unit	25000	20000	5000	180000

Vegetable lease cultivation	6	unit	20000	16000	4000	96000
Floriculture	1	unit	85500	25000	60500	25000
Bee keeping	1	unit	18000	14400	3600	14400
pepper nursery unit	2	unit	30000	24000	6000	48000
Compost Production	3	unit	15000	12000	3000	36000
Vegetable Market	5	unit	50000	25000	25000	125000
Total	53		344500	212800	131700	1055000

7.11.6. Year wise work plan of Livelihoods Activities

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 7.10.

Table 7.10

The summary of estimated amount of Livelihoods Activities identified on year wise

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Physical	Financial	Physical	Financial
Nursery (Tray method vegetable seedling)	3	75000	1	25000	1	25000
Nursery (Fruit Plants)	2	50000	4	100000	2	50000
Lease land Paddy farming	2	12800	1	6400	1	6400
Skilled labour group for coconut climbing	7	140000	1	20000	1	20000
Banana cultivation by lease farmers	1	20000	7	140000	1	20000
Vegetable lease cultivation	3	48000	2	32000	1	16000
Floriculture	0	0	1	25000	0	0
Bee keeping		0		0	1	14400
pepper nursery unit	0	0	1	24000	1	24000

Compost Production	1	12000	1	12000	1	12000
Vegetable Market	2	50000	2	50000	1	25000
Total	21	407800	21	434400	11	212800

7.11.7. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its successfulness and sustainability. Based on the analysis the summary of estimated amount of Productivity Enhancement & Microenterprises are shown in table 7.11.

Table 7.11.

Productivity Enhancement & Microenterprises and estimated amount

	Details of Activities	Quantity	Unit	Rate	IWMP	Benificary share to WDF	Total
1	Scientific management of existing coconut gardens	750	Nos	190	142500	14250	142500
2	Intensification of crop density of Banana ,Ginger, tuber crops – Kit	800	per kit	50	40000	4000	40000
3	Organic kitchen garden- Seed distribution	721	per packet	50	36050	3605	36050
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	300	per lot	375	112500	11250	112500
5	Scientific Paddy seed Farming	90	cent	50	4500	450	4500
6	Vegetable Farming	80	per 10 cent	5000	400000	40000	400000
7	Bio fertilizer production	2	per unit	5000	10000	1000	10000
8	Bio- control agent Production	100	cent	40	4000	400	4000
9	Fodder Production	175	cent	25	4375	437	4375
10	Fish farming in public pond	3	Nos	20000	60000	6000	60000

11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle)	10	per unit	20000	200000	20000	200000
12	Rabbit Rearing	3	per unit	10000	30000	3000	30000
13	Marketing Centre	3	per unit	20000	60000	6000	60000
	Total	3037		80780	1103925	110392	1103925

7.11.8. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise activity, which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 7.12.

Table 7.12

The summary of estimated amount of Productivity Enhancement & Microenterprises identified

	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Scientific management of existing coconut gardens	450	85500	150	28500	150	28500
2	Intensification of crop density of Banana ,Ginger, tuber crops – Kit	480	24000	160	8000	160	8000
3	Organic kitchen garden- Seed distribution	432	21600	145	7250	144	7200
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	180	67500	60	22500	60	22500
5	Scientific Paddy seed Farming	54	2700	18	900	18	900
6	Vegetable Farming	48	240000	16	80000	16	80000
7	Bio fertilizer production	1	5000	1	5000	0	0
8	Bio- control agent Production	60	2400	20	800	20	800
9	Fodder Production	105	2625	35	875	35	875
10	Fish farming in public pond	1	20000	1	20000	1	20000

11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle)	6	120000	2	40000	2	40000
12	Rabbit Rearing	1	10000	1	10000	1	10000

CHAPTER 8

ELAMBA MICRO WATERSHED (4V28B)

8.1 Location and extent

Elamba micro watershed lies in the north of north eastern part of watershed .The micro watershed covering major portion of Mudakkal Grama Panchayat. The total area of the water shed is 978 ha which is 21.5 % of the Chirayinkeezhu- IWMP watershed cluster. The soil in the area are of sandy loam and the area is mostly under agriculture with the topography of gently sloping to flat. The Vamanapuram River flows through the northwest of the watershed.

General Description

Name of micro watershed	:	Elamba
Micro watershed code	:	4V28b
River basin	:	Vamanapuram
District	:	Thiruvananthapuram
Block Panchayat	:	Chirayinkeezhu
Grama Panchayat	:	Mudakkal
Area in panchayat:	:	Mudakkal – 978 ha
Latitude	:	8 ⁰ 43'29" to 8 ⁰ 41'15" N
Longitude	:	76 ⁰ 47'50" to 76 ⁰ 52'37" E

8.2 Physiography

The Project area is southern mid land with costal terrain in the western part.. The Slope is 0-30 degree. The slope and DEM maps was derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure 1 of the report. The elevation of 0-39 mt from the MSL is 398 ha and 39-63 mt is about 510 the remaing 78 ha land is above 63 m height. The relief

is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the Vamanapuram river. The relief of the watershed ranges above msl.

8.3 Slope

The watershed area is divided into three categories of slope classes. The 70% of area is under the category of very gentle slope covering 604 ha and moderate slope covers about 394 ha. The category of steep slope spreads over 10% of the area on the northern part.

8.4. Drainage

The Vamanapuram River is the major drain of this watershed. The broad landforms at the upper region with lower plateau (latrite) and the pediplain weathered nature is found on the middle of the watershed. The land forms of the middle region include sandy loam with valleys and low hills with gentle slope to flat bottom.

8.5 Water Resources

Surface Water Resources

The major river of this watershed is the Vamanapuram River. The water body of the watershed is 11 ha. The ground water level varies from 2-4 mt in the surface well of the project area. As the catchment area depleting the ground water in the area is found drastically going down.

Ground Water Resources

The depth of the ground water level in the bore well are 45-65 mt depth and the ground water depth is highest in the Kaipatimukku near Attingal Municipality area. The area falls in the category of 'White' which means that only less than 65 percent of the ground water is utilized. The area under Chirayinkeezhu block is in the category of 'dark' in the near future. The eastern part of the watershed is suitable for domestic wells whereas the western part and the middle region is suitable for large diameter dug wells. The lower region is suitable for heavy duty as well as medium capacity tube wells.

8.6. Agriculture and present land use

The total area of the watershed is 978 Ha in which 873 ha of land area is under agricultural use and 106 ha land is non cultivable area with 4 ha as cultivable wasteland. As the Project area lies under midland zone, the forest area are not identified and the topography shows very gentle slope to flat bottom.

The major land use category mapped in the project area is mixed crops (435 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that

cannot be spatially mapped separately. The second major land use category is Rubber plantation (400 Ha). And the cocunut (1 ha) were widely seen in between rubber plantation and being replaced by the other crops. The paddy (37 ha) is cultivated in the Elamba and Azilam area .

8.7. Soils

The major lower plateau (latrite) soil association which is distributed in an area of 450 ha followed pediplain weathered soil association.. This soil is well drained with moderate slow permeability. This soil is intensively used to cultivated coconut and vegetables.

8.8. Socio economic details

The water shed has about 2502 families of which 13 % belongs to SC .The population of the watershed is 11340 and the average land holding per family is 0.39 ha. The BPL families of the watershed are about 14 % of the total population

8.9 SWOT Analysis of Elamba (4V28b) watershed

The strength, Weakness, Opportunities and treat of the micro watershed was analyzed and the details are given in table 8.1

Table 8.1
SWOT Analysis of Elamba (4V28b) watershed

Area of Intervention	Strength	Weakness	Opportunities	treat
Agriculture	38% of watershed area under paddy cultivation raising two crops. One padasekharasamithi functioning inside the watershed	60% of wetland ecosystem suitable for paddy cultivation converted into mixed crops and rubber	3 Ha cultivable fallow land where two crops can be raised. Raising of pulse & vegetable as third crop in 10 ha.	Conversion of wetland ecosystem which is suitable for raising paddy into rubber adversely affects the natural drainage and water table.
Horticulture	35% of area of watershed under coconut based farming system with intercrops such as nutmeg, plantain,	23% of area of watershed under monocrop of rubber.	Incent with suitable soil and water conservation measures such as stone pitched	A number of abandoned quarries situated in the micro watershed. Unscientific

	pepper, ginger, turmeric, tuber crops.		contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting such as staggered trenches and pits.	quarrying leads to depletion of water table
Natural Resources	The Vanmanapuram river which flow on the boundary Majority of the watershed area, the landform is gentle slope or valley.	total area of the micro watershed is with steep slope subject to erosion hazards. Major soil in this area belongs to loamy soil with erodability as the major limitation.	Area treatment with suitable soil and water conservation measures such as Afforestation in very steep sloppy areas mulching, cover cropping, water harvesting measures such as staggered trenches.	Afforestation in very steep slopes. Soil & water conservation measures such as contour bunding, repair of old bunds, terracing in rubber, cover cropping in rubber, agros – tological measures on bunds with soil bunding crops.

8.10 Problem analysis

The project area was analysed after finding out the SWOT with its constrain and possible solution and detailed in table 8.2

Table 8.2
Problem analysis

No	Problem Area t	Constraints	Solutions	Project Support
1	Surface water Recourses	encroachment, bank erosion, poor maintenance of VCB Silting up of irrigation channel. Leakage of water through side wall of distributary channel	Desiltation, embankment protection of thodu using earth silt and using cement concrete in specific areas. Repair of existing VCB's Desiltation of irrigation channel Repair of side wall of field Channel	Deepening of thodu, desiltation of thodu, side varambu earthening, and embankment stabilization side wall protection. VCB repair. Desiltation of irrigation channel Repair of side wall of field channel
		Presence of plutonic rock	Recharging wells	Rain water harvesting

		in hill crust decrease the yield of well wells dry up in December onwards in the upper reaches of the micro watershed		Recharging wells
--	--	---	--	------------------

8.11 Work plan

The work plan was prepared through the methodology proposed and the after analysis of the basic secondary data available. The general information of the Elamba micro watershed are detailed in table 8.3

Table 8.3.
General information of the Elamba micro watershed

Name of Watershed	Elamba
Watershed Code	4V28b
Treatable Area in Ha	978 ha
Total Cost in Lakhs	Rs.11736000

The fund available for each components of the Elamba micro water shed Fund Allocated according to the guideline are detailed in table 8.4.

Table 8.4.
Fund allocated to each components of the Elamba micro water shed

Sl.No	Component	Percentage	Total amount in Rs
1	Administration	10	1173600
2	DPR Preparation	1	117360
3	Entry point activities	4	469440
4	capacity Building	5	586800
5	Productivity Enhancement	10	1173600
6	Livelihoods for Asset less	9	1056240
7	Natural Resource Management	56	6572160
8	Monitoring	1	117360
9	Evaluation	1	117360
10	Consolidation phase	3	352080
	Total	100	11736000

8.11.1. Entry Point activities of Elamba watershed

The Entry point activities were selected under participatory activity and the activity has importance in saving electricity and it gives wide awareness hence the proposal to solve the gramapanchayat office is taken. The details of the activity are detailed in table 8.5.

Table 8.5.
Entry Point activities of Elamba watershed

Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total	First year	
								Physical	Financial
Providing solar lighting system in the Mudakkal Panchayat office	1	nos	10 lakhs	4.69 lakhs	5.31 lakhs	0.00	10 lakhs	1	10 lakhs

8.11.2. Year wise work plan

The year wise activity of watershed works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 8.6.

Table 8.6
The summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	4675439.00	34,43,914.00	25,75,724.00
2	Livelihoods for Asset less	441800	367400	241800
3	Productivity Enhancement &	563725	349825	259075

8.11.3. Natural Resource Management

The NRM works were identified based on the PRI methodology and the works were analyzed for the need and importance based on the watershed. Based on the analysis the summary of estimated amount of NRM works are shown in table 8.7.

Table 8.7

The summary of estimated amount of NRM works

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total
A Ridge Area Treatment Plans								
1	Strip terraces	5000	Nos	142	0.00	710,000.00	71,000.00	710,000.00
2	Stone pitched bunds	4000	Cu.M	900	0.00	3,600,000.00	360,000.00	3,600,000.00
3	Contour earthen bunds	5000	Sq.M	142	0.00	710,000.00	71,000.00	710,000.00
4	Staggered trenches	4000	mt	60	0.00	240,000.00	24,000.00	240,000.00
5	Moisture collection pits	6000	nos	80	0.00	480,000.00	48,000.00	480,000.00
6	Centripetal terracing and mulching	180	nos	400	72,000.00	0.00	7,200.00	72,000.00
7	Cover cropping	100000	Sq.M	4	400,000.00	0.00	40,000.00	400,000.00
8	Horticulture	450	cent	42	18,900.00	0.00	1,890.00	18,900.00
9	Agroforestry	490	nos	35	17,150.00	0.00	1,715.00	17,150.00
10	Biofencing (live hedge)	100	rmt	35	3,500.00	0.00	350.00	3,500.00
B Drainage line treatment plans								
1	Gully plugging	1	nos	6000	6,000.00	0.00	600.00	6,000.00
2	pond renovation		Works		913,407.00	336,291.00	124,969.90	1,249,699.00
3	Strem Sidewall Construction		Works		4,066,163.00	676,419.00	474,258.30	4,742,583.00
4	Vented Cross Bars New	1	nos	50000	50,000.00	0.00	5,000.00	50,000.00
5	Canal Desiltation	2	nos	25000	50,000.00	0.00	5,000.00	50,000.00
6	Desiltation of streams, ponds and Public wells.	4	nos	75000	300,000.00	0.00	30,000.00	300,000.00
7	Recharge of wells.	4	nos	1500	6,000.00	0.00	600.00	6,000.00
8	Rainwater harvesting from rooftop catchments	135	nos	3500	472,500.00	0.00	47,250.00	472,500.00
C Allied Activities								
1	Biogas plant	1	nos	200000	200,000.00	0.00	20,000.00	200,000.00
	Total				6,575,620.00	6,752,710.00	1,332,833.20	13,328,332.00

8.11.4. Year wise work plan of NRM works

The year wise activity of NRM works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 8.8.

Table 8.8
The summary of estimated amount of NRM identified on year wise

Sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
A							
Ridge Area Treatment Plans							
1	Strip terraces	2,000	284,000.00	2000	284,000.00	1000	142,000.00
2	Stone pitched bunds	2,500	2,250,000.00	1000	900,000.00	500	450,000.00
3	Contour earthen bunds	2,000	284,000.00	2000	284,000.00	1000	142,000.00
4	Staggered trenches	2,000	120,000.00	1000	60,000.00	1000	60,000.00
5	Moisture collection pits	3,000	240,000.00	1500	120,000.00	1500	120,000.00
6	Centripetal terracing and mulching	80	32,000.00	50	20,000.00	50	20,000.00
7	Cover cropping	50,000	200,000.00	25000	100,000.00	25000	100,000.00
8	Horticulture	400	16,800.00	0	0.00	50	2,100.00
9	Agroforestry	400	14,000.00	0	0.00	90	3,150.00
10	Biofencing (live hedge)	100	3,500.00	0	0.00	0	0.00
1	Gully plugging	0	0.00	1	6,000.00	0	0.00
2	pond renovation	2	315,131.00	1	616,975.00	1	317,592.00
3	Stream Sidewall Construction	2	1,830,444.00	2	2,001,742.00	1	910,397.00
4	Vented Cross Bars New	1	50,000.00	0	0.00	0	0.00
5	Canal Desiltation	1	25,000.00	1	25,000.00	0	0.00
6	Desiltation of streams, ponds and Public wells.	2	150,000.00	1	75,000.00	1	75,000.00
7	Recharge of wells.	2	3,000.00	1	1,500.00	1	1,500.00
8	Rainwater harvesting from rooftop catchments	50	175,000.00	50	175,000.00	35	122,500.00

1	Biogas plant	0	0.00	1	200,000.00	0	0.00
	Total		5992875		4,869,217.00		2,466,239.00

8.11.5. Natural Resource Management work location

The identified NRM works are detailed in table 8.9 which also shows the location and survey numbers of the work to be done are also indicated.

Table 8.9

Natural Resource Management work location of Elamba micro watershed

Details of Activities	First year		Second year		Third year	
	Phy	Location	Phy	Location	Phy	Location
Pond renovation	2	Perigathu konnam chera - Location: In Mudakkal gram panchayat, Ward no 1 near Elamba ela	1	Paraidi- Mavoor Konam Chera Renovation- In Mudakkal gram panchayat, Ward no 6 near Paraidi Jn	1	Pariadi Chera - In Mudakkal gram panchayat, Ward no 9 near Paraidi.Jn
		Varuvila kulam renovation - In Mudakkal gram panchayat, Ward no 8 near Varuvila Jn				
Strem Sidewall Construction	3	Allalorore Ela thodu - In Mudakkal gram panchayat, Ward no 1 near Kaipatimuuku Kallinmoodu Thodu Location: In Mudakkal gram panchayat, Ward no 2 near Kallinmoodu	1	Madithivadukal attu kadvu thodu - Maaiveali Ela Thodu In Mudakkal gram panchayat, Ward no 6 near Ayilam Jn	1	Paraidi - chenkotu konam thodu - In Mudakkal gram panchayat, Ward no 9 near Pariadi Jn
		Edathiman Kilingu thodu Location: In Mudakkal gram panchayat, Ward no 3 near Kaipatimukku				
Desiltation of streams, ponds and Public wells.	2	Well in aganwadi near Kapitumukku in Mudakkal Grama panchayat ward no 1	1	Well near paliyara madam templein Mudakkal Gram Panchyat in ward no 1	1	Elamba school Mudakkal Gram Panchyat in ward no 9
		Well near Kindigal kulam in ward no 2 od Mudakkal Grama Panchayat				
Biogas plant	0		1	Elamba school	0	

8.11.5. Livelihoods for Assetless

The Livelihoods Activities were identified based on the need analysis and participatory interaction projects were analyzed for the successfulness and sustainability. Based on the analysis the summary of estimated amount of Livelihoods Activities projects are shown in table 8.10.

Table 8.10.
List of Livelihoods Activities and estimated amount.

Sl.No	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share	Total IWMP share
1	Nursery (Tray method vegetable seedling)	10	Unit	34000	25000	9000	250000
2	Nursery (Fruit Plants)	8	Unit	34000	25000	9000	200000
3	Lease land Paddy farming	4	Unit	8000	6400	1600	25600
4	Skilled labour group for coconut climbing	10	Unit	25000	20000	5000	200000
5	Banana cultivation by lease farmers	7	Unit	25000	20000	5000	140000
6	Vegetable lease cultivation	6	Unit	20000	16000	4000	96000
7	Floriculture	1	Unit	85500	25000	60500	25000
8	Bee keeping	1	Unit	18000	14400	3600	14400
9	pepper nursery unit	2	Unit	30000	24000	6000	48000
10	Compost Production	3	Unit	15000	12000	3000	36000
11	Vegetable Market	4	Unit	5000	4000	1000	16000
		57		299500	191800	107700	1051000

8.11.6. Year wise work plan of Livelihoods Activities

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 8.11.

Table 8.11
The summary of estimated amount of Livelihoods Activities identified on year wise

Sl.No	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Nursery (Tray method vegetable seedling)	3	75000	4	100000	3	75000
2	Nursery (Fruit Plants)	2	50000	4	100000	2	50000
3	Lease land Paddy farming	2	12800	1	6400	1	6400
4	Skilled labour group for coconut climbing	8	160000	1	20000	1	20000
5	Banana (N) cultivation by lease farmers	4	80000	2	40000	1	20000
6	Vegetable lease cultivation	3	48000	2	32000	1	16000
7	Floriculture	0	0	1	25000	0	0
8	Bee keeping		0		0	1	14400
9	pepper nursery unit	0	0	1	24000	1	24000
10	Compost Production	1	12000	1	12000	1	12000
11	Vegetable Market	1	4000	2	8000	1	4000
		24	441800	19	367400	13	241800

8.11.8. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its successfulness and sustainability. Based on the analysis the summary of estimated amount of Productivity Enhancement & Microenterprises are shown in table 8.12.

**Table 8.12.
Productivity Enhancement & Microenterprises and estimated amount.**

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share to WDF	Total
1	Scientific management of existing coconut gardens	900	Nos	190	171000	17100	171000
2	Intensification of crop density of Banana , Ginger,tuber crops - KIt	900	per kit	50	45000	4500	45000
3	Organic kitchen garden-Seed distribution	900	per packet	50	45000	4500	45000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	450	per lot	375	168750	16875	168750
5	Scientific Paddy seed Farming	90	Cent	50	4500	450	4500
6	Vegetable Farming	80	per 10 cent	5000	400000	40000	400000
7	Bio fertilizer production	2	per unit	5000	10000	1000	10000
8	Bio- control agent production	100	Cent	40	4000	400	4000
9	Fodder Production	175	Cent	25	4375	437.5	4375
10	Fish farming in pond	3	Nos	20000	60000	6000	60000
11	Renovation of cattle Shed	9	per unit	20000	180000	18000	180000
12	Rabbit Rearing	2	per unit	10000	20000	2000	20000
13	Marketing Centre	3	per unit	20000	60000	6000	60000
	Total	3614		80780	1172625	117262.5	1172625

8.11.9. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise activity of Productivity Enhancement & Microenterprises Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 8.12.

Table 8.12

The summary of estimated amount of Productivity Enhancement & Microenterprises identified

Sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Scientific management of existing coconut gardens	400	76000	400	76000	100	19000
2	Intensification of crop density of Banana , Ginger,tuber crops - Klt	400	20000	400	20000	100	5000
3	Organic kitchen garden-Seed distribution	400	20000	400	20000	100	5000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	200	75000	150	56250	100	37500
5	Scientific Paddy seed Farming	54	2700	18	900	18	900
6	Vegetable Farming	48	240000	16	80000	16	80000
7	Bio fertilizer production	1	5000	1	5000	0	0
8	Bio- control agent production	60	2400	20	800	20	800
9	Fodder Production	105	2625	35	875	35	875
10	Fish farming in public pond	1	20000	1	20000	1	20000
11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle	4	80000	2	40000	3	60000
	Total		563725		349825		259075

CHAPTER 9**VILAYINMOOLA MICRO WATERSHED (4V29A)****9.1 Location and extent**

Vilayinmoola micro watershed lies in the south of Elamba micro watershed covering major portion of Kizhuvilam , and Mudakkal Grama Panchayats. The total area of the water shed is 891 ha which is 21.5 % of the Chirayinkeezhu- IWMP watershed cluster. The soil in the area are of sandy loam and the area is mostly under agriculture with the topography of gently sloping to flat. The Vamanapuram River flows through the northwest of the watershed.

General Description

Name of micro watershed	:	Vilayinmoola
Micro watershed code	:	4V29a
River basin	:	Vamanapuram
District	:	Thiruvananthapuram
Block Panchayat	:	Chirayinkeezhu
Grama Panchayat	:	Mudakkal and Kizhuvilam
Area in panchayat:	:	1. Mudakkal Grama Panchayat – 655 ha 2. Kizhuvilam Grama Panchayat – 263 ha
Latitude	:	8 ⁰ 41'37" to 8 ⁰ 39'43" N
Longitude	:	76 ⁰ 47'40" to 76 ⁰ 51'55" E

9.2 Physiography

The Project area is southern mid land with plain in the south western part.. The Slope is 0-26 degree. The slope and DEM maps was derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure 1 of the report. The western part of the water shed is elevated in the Kizhuvilam panchayat area. The relief is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the Vamamapuram River. The relief of the watershed ranges above msl. Majority of the area falls in the relief category of 0-54 m above msl, which covers an area of 700 Ha.

9.3 Slope

The watershed area is dived in to three categories of slope classes. The majority of area is under the category of very gentle slope having 0-5 degree slope. This category of steep slope spreads over 85% of the area.

9.4. Drainage

The Vamanapuram River is the major drain of this watershed. The broad landforms at the upper region with lower plateau (lattrite) and the pediplain weathered nature is found on the middle of the watershed. The land forms of the middle region include sandy loam with valleys and low hills with gentle slope to flat bottom.

9.5 Water Resources

Surface Water Resources

The surface water in the area is 2-5 mt where the level are higher in the Kizhuvilam Grama Panchayat. The water body of the area is 5 ha and the Vamanapurma River flow through the boundary.

Ground Water Resources

The area falls in the category of 'White' which means that only less than 65 percent of the ground water is utilized. The area under Chirayinkeezhu block is in the category of 'dark' in the near future. The eastern part of the watershed is suitable for domestic wells whereas the western part and the middle region is suitable for large diameter dug wells. The lower region is suitable for heavy duty as well as medium capacity tube wells. The depth of the ground water level in the bore well are 60-70 mt depth and the ground water depth is highest in the Kizhuvilam Grama panchayat area

9.6. Agriculture and present land use

The total area of the watershed is 748 Ha in which 1324 ha of land area is under agricultural use and 143 ha land is non cultivable area with 1 ha as cultivable wasteland. As the Project area lies under midland zone, the forest area are not identified and the topography shows very gentle to flat slope.

The major land use category mapped in the project area is mixed crops (497 Ha). The second major land use category is rubber plantation (156 Ha). And the Coconut (1 ha) are widely seen and being replaced by the other crops. The paddy (94 ha) is cultivated in the Kizhuvilam , and Mudakkal Grama Panchayat area.

9.7. Soils

The major lower plateau (lattrite) soil association which is distributed in an area of 480 ha followed pediplain weathered soil association.. This soil is well drained with moderate slow permeability. This soil is intensively used to cultivated coconut and vegetables.

9.8. Socio economic details

The water shed has about 2483 families of which 16% belongs to SC .The population of the watershed is 11149 and the average land holding per family is 0.36 ha. The BPL families of the watershed are about 12 % of the total population

9.9 SWOT Analysis of Vilayinmoola (4V29a) watershed

The strength, Weakness, Opportunities and treat of the micro watershed was analyzed and the details are given in table 9.1

Table 9.1
SWOT Analysis of Vilayinmoola (4V29a) watershed

Area of Intervention	Strength	Weakness	Opportunities	treat
Agriculture	38% of watershed area under paddy cultivation raising two crops. One padasekharasamithi functioning inside the watershed	60% of wetland ecosystem suitable for paddy cultivation converted into mixed crops and rubber	3 Ha cultivable fallow land where two crops can be raised. Raising of pulse & vegetable as third crop in 10 ha.	Conversion of wetland ecosystem which is suitable for raising paddy into rubber adversely affects the natural drainage and water table.
Horticulture	35% of area of watershed under coconut based farming system with intercrops such as nutmeg, plantain, pepper, ginger, turmeric, tuber crops.	23% of area of watershed under monocrop of rubber.	Incent with suitable soil and water conservation measures such as stone pitched contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting such as staggered trenches and pits.	A number of abandoned quarries situated in the micro watershed. Unscientific quarrying leads to depletion of water table
Natural Resources	The Vanmanapuram river which flow on the boundary Majority of the watershed area, the landform is gentle slope or valley.	Total area of the micro watershed is with steep slope subject to erosion hazards. Major soil in this area belongs to loamy soil with erodability as the major limitation.	Area treatment with suitable soil and water conservation measures such as Afforestation in very steep sloppy areas mulching, cover cropping, water harvesting measures such as staggered trenches.	Afforestation in very steep slopes. Soil & water conservation measures such as contour bunding, repair of old bunds, terracing in rubber, cover cropping in rubber, agrostological measures on bunds with soil bunding crops such as pineapple/fodder, staggered trenching.

9.10 Problem analysis

The project area was analysed after finding out the SWOT with its constrain and possible solution and detailed in table 9.2

Table 9.2
Problem analysis

No	Problem Area t	Constraints	Solutions	Project Support
1	Surface water Recourses	encroachment, bank erosion, poor aintenance of VCB Siltng up of irrigation channel. Leakage of water through side wall of distributary channel	Desiltation, embankment protection of thodu using earth silt and using cement concrete in specific areas. Repair of existing VCB's Desiltation of irrigation channel Repair of side wall of field Channel	Deepening of thodu, desiltation of thodu, sidevarambu earthening, and embankment stabilization side wall protection. VCB repair Desiltation of irrigation channel Repair of side wall of field channel
		Presence of plutonic rock in hill crust decrease the yield of well wells dry up in December onwards in the upper reaches of the micro watershed	Recharging wells	Rain water harvesting Recharging wells

9.11 Work plan

The work plan was prepared through the methodology proposed and the after analysis of the basic secondary data available. The general information of the Vilayinmoola micro watershed are detailed in table 9.3

Table 9.3.
General information of the Vilayinmoola micro watershed

Name of Watershed	Vilayinmoola
Watershed Code	4V29a
Treatable Area in Ha	978 ha
Total Cost in Lakhs	Rs. 10692000

The fund available for each components of the Vilayinmoola micro water shed Fund Allocated according to the guideline are detailed in table 9.4.

Table 9.4.
Fund allocated to each components of the Vilayinmoola micro water shed

Sl.No	Component	Percentage	Total amount in Rs
1	Administration	10	1069200
2	DPR Preparation	1	106920
3	Entry point activities	4	427680
4	capacity Building	5	534600

5	Productivity Enhancement	10	1069200
6	Livelihoods for Asset less	9	962280
7	Natural Resource Management	56	5987520
8	Monitoring	1	106920
9	Evaluation	1	106920
10	Consolidation phase	3	320760
	Total	100	10692000

9.11.1. Entry Point activities of Vilayinmoola watershed

The Entry point activities was selected under participatory activity and the activity has importance in Irrigation of the farm land adjacent to the Ela.. The details of the activity are detailed in table 9.5.

Table 9.5
Entry Point activities of Vilayinmoola watershed

Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total	First year	
								Phy	Financial
Maintenance of check dam and restructuring the irrigation canal at parppankadu ela at ward no 16 of Mudakkal panchayat	1	nos	19,46,950.00	3,58,463.00	15,88,487.00	0.00	19,46,950.00	1	19,46,950.00

9.11.2. Year wise work plan

The year wise activity of watershed works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 9.6.

Table 9.6
The summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	47,41,120	26,62,533.00	7,81,394.00
2	Livelihoods for Asset less	407200	283600	271200
3	Productivity Enhancement &	507625	351125	210375

9.11.3. Natural Resource Management

The NRM works were identified based on the PRI methodology and the works were analyzed for the need and importance based on the watershed. Based on the analysis the summary of estimated amount of NRM works are shown in table 9.7.

Table 9.7
The summary of estimated amount of NRM works

Sl. no	Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total
A	Ridge Area Treatment Plans							
1	Strip terraces	5000	Nos	142	0.00	7,10,000.00	71,000.00	7,10,000.00
2	Stone pitched bunds	4000	Cu.M	900	0.00	36,00,000.00	3,60,000.00	36,00,000.00
3	Contour earthen bunds	5000	Sq.M	142	0.00	7,10,000.00	71,000.00	7,10,000.00
4	Staggered trenches	4000	mt	60	0.00	2,40,000.00	24,000.00	2,40,000.00
5	Moisture collection pits	6000	nos	80	0.00	4,80,000.00	48,000.00	4,80,000.00
6	Centripetal terracing	100	nos	400	40,000.00	0.00	4,000.00	40,000.00
7	Cover cropping	10000	Sq.M	4	40,000.00	0.00	4,000.00	40,000.00
B	Drainage line treatment plans							
1	Gully plugging	1	nos	6000	6,000.00	0.00	600.00	6,000.00
2	pond		Work		2,14,572.00	1,32,759.00	34,733.10	3,47,331.00

	renovation		s					
3	Stream Sidewall Construction		Works		58,25,534.00	16,39,501.00	7,46,503.50	74,65,035.00
7	Recharge of wells.	4	nos	500	2,000.00	0.00	200.00	2,000.00
8	Rainwater harvesting	50	nos	2500	1,25,000.00	0.00	12,500.00	1,25,000.00
	Total				62,53,106.00	75,12,260.00	13,76,536.60	1,37,65,366.00

9.11.4. Year wise work plan of NRM works

The year wise activity of NRM works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 9.8.

Table 9.8
The summary of estimated amount of NRM identified on year wise

Sl. no	Details of Activities	First year		Second year		Third year	
		Phy	Financial	Phy	Financial	Phy	Financial
1	Strip terraces	2,000	2,84,000.00	2000	2,84,000.00	1000	1,42,000.00
2	Stone pitched bunds	2,500	22,50,000.00	1000	9,00,000.00	500	4,50,000.00
3	Contour earthen bunds	2,000	2,84,000.00	2000	2,84,000.00	1000	1,42,000.00
4	Staggered trenches	2,000	1,20,000.00	1000	60,000.00	1000	60,000.00
5	Moisture collection pits	3,000	2,40,000.00	1500	1,20,000.00	1500	1,20,000.00
6	Centripetal terracing	80	32,000.00	20	8,000.00	0	0.00
7	Cover cropping	0	0.00	5000	20,000.00	5000	20,000.00
1	Gully plugging	0	0.00	1	6,000.00	0	0.00
2	pond renovation	1	3,47,331.00	0	0.00	0	0.00

3	Stream Sidewall Construction	1	26,39,715.00	3	25,62,074.00	3	22,63,246.00
7	Recharge of wells.	2	1,000.00	1	500.00	1	500.00
8	Rainwater harvesting	0	0.00	0	0.00	50	1,25,000.00
	Total		6198046		42,44,574.00		33,22,746.00

9.11.4. Natural Resource Management Work Location

Details of Activities	First year		Second year		Third year	
	Phy	Location	Phy	Location	Phy	Location
Pond renovation	2	Tamara Kulam, In Mudakkal gram panchayat, Ward no 15 near OOrupoika	1	Sivan koil Kulam , In Killuvallam gram panchayat, Ward no 5	0	
Strem Sidewall Construction	3	Katuvila thodu Erathu vilakam Chaimbbail-panial thodu Location: In Mudakkal gram panchayat, Ward no 16 near Orriapoika	3	Vavour thodu, In Killuvalam gram panchayat, Ward no 2 near Attingal SWM plant	2	Vellor Konam, In Killuvallam gram panchayat, Ward no 3 near Ramachanvila
		Tamarakulam - Madathil temple thodu, In Mudakkal gram panchayat, Ward no 15 near Orrupoika Jn		Pukotukonam chera thodu, In Mudakkal gram panchayat, Ward no 20		Kakkotu thodu, In Killuvallam gram panchayat, Ward no 1
		Punuthu muudu annupara thodu, In Mudakkal gram panchayat, Ward no 19 near Annupara bridge		Keelakonam- Puravoor thodu, In Killuvallam gram panchayat, Ward no 5 near puravoor		
Desiltation of streams, ponds and Public wells.	2	Well in aganwadi near Puravoor society in Killuvallam Grama panchayat ward no 4	2	Well in aganwadi on Ramachamvila to mamam road in Killuvallam Grama panchayat ward no 3	1	Anganvadi, In Mudakkal gram panchayat, Ward no 15 near Orrupoika Jn
		Puthenvila , In Mudakkal gram panchayat, Ward no 15 near Orrupoika Jn		Managathu moola colony, In Mudakkal gram panchayat, Ward no 15 near Orrupoika Jn		
Biogas plant	0		1	In aganwadi on Ramachamvila to	0	

			mamam road in Killuvallam Grama panchayat ward no 3	
--	--	--	---	--

9.11.6. Livelihoods for Assetless

The Livelihoods Activities were identified based on the need analysis and participatory interaction projects were analyzed for the successfulness and sustainability. Based on the analysis the summary of estimated amount of Livelihoods Activities projects are shown in table 9.9.

Table 9.9
List of Livelihoods Activities and estimated amount.

sl. no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share	Total IWMP share
1	Nursery (Tray method vegetable seedling)	6	unit	34000	25000	9000	150000
2	Nursery (Fruit Plants)	7	unit	34000	25000	9000	175000
3	Lease land Paddy farming	8	unit	8000	6400	1600	51200
4	Skilled labour group for coconut climbing	10	unit	25000	20000	5000	200000
5	Banana cultivation by lease farmers	3	unit	25000	20000	5000	60000
6	Vegetable lease cultivation	7	unit	20000	16000	4000	112000
7	Floriculture	1	unit	85500	25000	60500	25000
8	Bee keeping	2	unit	18000	14400	3600	28800
9	pepper nursery unit	2	unit	30000	24000	6000	48000
10	Compost Production	3	unit	15000	12000	3000	36000
11	Vegetable Market	3	unit	50000	25000	25000	75000
		52		344500	212800	131700	961000

9.11.7. Year wise work plan of Livelihoods Activities

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 9.10.

Table 9.10**The summary of estimated amount of Livelihoods Activities identified on year wise**

sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Nursery (Tray method vegetable seedling)	3	75000	0	0	3	75000
2	Nursery (Fruit Plants)	2	50000	3	75000	2	50000
3	Lease land Paddy farming	2	12800	4	25600	2	12800
4	Skilled labour group for coconut climbing	8	160000	1	20000	1	20000
5	Banana (N) cultivation by lease farmers	1	20000	1	20000	1	20000
6	Vegetable lease cultivation	3	48000	2	32000	2	32000
7	Floriculture	0	0	1	25000	0	0
8	Bee keeping	1	14400		0	1	14400
9	pepper nursery unit	0	0	1	24000	1	24000
10	Compost Production	1	12000	1	12000	1	12000
11	Vegetable Market	1	25000	1	25000	1	25000
		22	417200	15	258600	15	285200

9.11.8. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its successfulness and sustainability. Based on the analysis the summary of estimated amount of Productivity Enhancement & Microenterprises are shown in table 9.12.

Table 9.12

Productivity Enhancement & Microenterprises and estimated amount

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share to WDF	Total
1	Scientific management of existing coconut gardens	900	nos	190	171000	17100	171000
2	Intensification of crop density of Banana ,Ginger, tuber crops - KIt	900	per kit	50	45000	4500	45000
3	Organic kitchen garden- Seed distribution	900	per packet	50	45000	4500	45000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	450	per lot	375	168750	16875	168750
5	Scientific Paddy seed Farming	90	cent	50	4500	450	4500
6	Vegetable Farming	80	per 10 cent	5000	400000	40000	400000
7	Bio fertiliser production	2	per unit	5000	10000	1000	10000
8	Bio- control agent production	100	cent	40	4000	400	4000
9	Fodder	435	cent	25	10875	1087.5	10875
10	Fish farming in public pond	3	nos	20000	60000	6000	60000
11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle)	4	per unit	20000	80000	8000	80000

12	Rabbit Rearing	1	per unit	10000	10000	1000	10000
13	Marketing Centre	3	per unit	20000	60000	6000	60000
	Total	3868		80780	1069125	106912.5	1069125

9.11.9. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 9.13.

Table 9.13

The summary of estimated amount of Productivity Enhancement & Microenterprises identified

Sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Scientific management of existing coconut gardens	400	76000	400	76000	100	19000
2	Intensification of crop density of Banana ,Ginger, tuber crops - Klt	400	20000	400	20000	100	5000
3	Organic kitchen garden- Seed distribution	400	20000	400	20000	100	5000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	200	75000	150	56250	100	37500
5	Scientific Paddy seed Farming	54	2700	18	900	18	900
6	Vegetable Farming	48	240000	16	80000	16	80000
7	Bio fertiliser production	1	5000	1	5000	0	0
8	Bio- control agent production	60	2400	20	800	20	800
9	Fodder Production	261	6525	87	2175	87	2175
10	Fish farming in public	1	20000	1	20000	1	20000

	pond						
11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle)	1	20000	2	40000	1	20000
12	Rabbit Rearing	0	0	1	10000	0	0
13	Marketing Centre	1	20000	1	20000	1	20000

CHAPTER 10

KIZHUVILAM MICRO WATERSHED (4V29E)

10.1 Location and extent

Kizhuvilam micro watershed lies in the south of Viliyinmoola micro watershed covering major portion of Mudakkal Managalapuram and Kizhuvilam Grama Panchayat. The total area of the water shed is 1321 ha which is 19.5 % of the Chirayinkeezhu- IWMP watershed cluster. The soil in the area are sandy loam and the area is mostly under agriculture with the topography of gently sloping to flat. The Vamanapuram River flows through the southeast of the watershed.

General Description

Name of micro watershed	:	Kizhuvallim
Micro watershed code	:	4V29e
River basin	:	Mamam
District	:	Thiruvananthapuram
Block Panchayat	:	Chirayinkeezhu and Pothencode
Grama Panchayat	:	Mudakkal, Managalapuram and Kizhuvilam

Area in panchayat:	:	1. Mudakkal Grama Panchayat – 206 ha 2. Managalapuram Grama Panchayat- 430 ha 3. Kizhuvilam Grama Panchayat –685 ha
Latitude	:	8 ^o 41'37" to 8 ^o 39'43" N
Longitude	:	76 ^o 47'40" to 76 ^o 51'55" E

10.2 Physiography

The Project area is southern mid land with plain terrain in the western part.. The Slope is 0-23 degree. The slope and DEM maps was derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure 1 of the report. The southern part of the watershed is elevated in the Managlapuram Gram panchayat area. The relief is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the vamamapuram river . The relief of the watershed ranges above msl. Majority of the area falls in the relief category of 30-80 m above msl, which covers an area of 980 Ha .

10.3 Slope

The watershed area is dived in to three categories of slope classes. The majority of area is under the category of very gentle slope having 0-4 degree slope. This category of steep slope spreads over 90% of the area on the southern part near Managlapuram

10.4. Drainage

The Mamam River is the major drain of this watershed. The broad landforms at the upper region with lower plateau (latrite) and the pediplain weathered nature is found on the middle of the water shed. The land forms of the middle region include sandy loam with valleys and low hills with gentle slope to flat bottom.

10.5 Water Resources

Ground Water Resources

The depth of the ground water level in the bore well are 45-65 mt depth and the ground water depth is highest in the Managlapuram Grama panchayat area. The area falls in the category of 'White' which

means that only less than 65 percent of the ground water is utilized. The area under Chirayinkeezhu block is in the category of 'dark' in the near future. The eastern part of the watershed is suitable for domestic wells whereas the western part and the middle region is suitable for large diameter dug wells. The lower region is suitable for heavy duty as well as medium capacity tube wells.

10.6. Agriculture and present land use

The total area of the watershed is 1321 Ha in which 1258 ha of land area is under agricultural use and 61 ha land is non cultivable area with 2 ha as cultivable wasteland. As the Project area lies under midland zone, the forest area are not identified and the topography shows very gentle to costal slope. The major land use category mapped in the project area is mixed crops (900 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. The second major land use category is rubber plantation (259Ha). And the Coconut (27 ha) are widely seen and being replaced by the other crops. The paddy (73 ha) is cultivated in the Kizhuvilam and Mudakkal Grama panchayat area.

10.7. Soils

The major lower plateau (latrite) soil association which is distributed in an area of 702 ha followed pediplain weathered soil association.. This soil is well drained with moderate slow permeability. This soil is intensively used to cultivated coconut and vegetables.

10.8. Socio economic details

The water shed has about 3896 families of which 20 % belongs to SC .The population of the watershed is 17654 and the average land holding per family is 0.16 ha. The BPL families of the watershed are about 13 % of the total population

10.9 SWOT Analysis of Kizhuvilam (4V29e) watershed

The strength, Weakness, Opportunities and treat of the micro watershed was analyzed and the details are given in table 10.1

Table 10.1 .

SWOT Analysis of Kizhuvilam (3M2a) watershed

Area of Intervention	Strength	Weakness	Opportunities	treat
Agriculture	38% of watershed area under paddy cultivation raising two crops. One	60% of wetland ecosystem suitable for paddy cultivation converted into	3 Ha cultivable fallow land where two crops can be raised. Raising of pulse & vegetable as third	Conversion of wetland ecosystem which is suitable for raising paddy into rubber adversely

	padasekharasamithi functioning inside the watershed	mixed crops and rubber	crop in 10 ha.	affects the natural drainage and water table.
Horticulture	35% of area of watershed under coconut based farming system with intercrops such as nutmeg, plantain, pepper, ginger, turmeric, tuber crops.	23% of area of watershed under monocrop of rubber.	Incent with suitable soil and water conservation measures such as stone pitched contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting such as staggered trenches and pits.	A number of abandoned quarries situated in the micro watershed. Unscientific quarrying leads to depletion of water table
Natural Resources	The Vanmanapuram river which flow on the boundary Majority of the watershed area, the landform is gentle slope or valley.	Total area of the micro watershed is with steep slope subject to erosion hazards. Major soil in this area belongs to loamy soil with erodability as the major limitation.	Area treatment with suitable soil and water conservation measures such as Afforestation in very steep sloppy areas mulching, cover cropping, water harvesting measures such as staggered trenches.	Afforestation in very steep slopes. Soil & water conservation measures such as contour bunding, repair of old bunds, terracing in rubber, cover cropping in rubber, agrostological measures on bunds with soil bunding crops such as pineapple/fodder, staggered trenching.

10.10 Problem analysis

The project area was analysed after finding out the SWOT with its constrain and possible solution and detailed in table 10.2

Table 10.2
Problem analysis

No	Problem Area	Constraints	Solutions	Project Support
1	Surface water Recourses	encroachment, bank erosion, poor maintenance of VCB Silting up of irrigation channel. Leakage of water through side wall of distributary channel	Desiltation, embankment protection of thodu using earth silt and using cement concrete in specific areas. Repair of existing VCB's Desiltation of irrigation channel Repair of side wall of field Channel	Deepening of thodu, desiltation of thodu, sidevarambu earthening, and embankment stabilization side wall protection. VCB repair Desiltation of irrigation channel Repair of side wall of field channel
		Presence of plutonic rock in	Recharging wells	Rain water harvesting

		hill crust decrease the yield of well wells dry up in December onwards		Recharging wells
--	--	--	--	------------------

10.11. Work plan

The work plan was prepared through the methodology proposed and the after analysis of the basic secondary data available. The general information of the Kizhuvilam micro watershed are detailed in table 10.3

Table 10.3
General information of the Kizhuvilam micro watershed

Name of Watershed	Kizhuvilam
Watershed Code	4V29e
Treatable Area in Ha	978 ha
Total Cost in Lakhs	Rs.11736000

The fund available for each components of the Kizhuvilam micro water shed Fund Allocated according to the guideline are detailed in table 10.4.

Table 10.4
Fund allocated to each components of the Kizhuvilam micro water shed

Sl.No	Component	Percentage	Total amount in Rs
1	Administration	10	1585200
2	DPR Preparation	1	158520
3	Entry point activities	4	634080
4	capacity Building	5	792600
5	Productivity Enhancement	10	1585200
6	Livelihoods for Asset less	9	1426680
7	Natural Resource	56	8877120

	Management		
8	Monitoring	1	158520
9	Evaluation	1	158520
10	Consolidation phase	3	475560
	Total	100	15852000

10.11.1. Entry Point activities of Kizhuvilam watershed

The Entry point activities were selected under participatory activity and the activity has importance increasing productivity and water storage.. The details of the activity are detailed in table 10.5.

Table 10.5
Entry Point activities of Kizhuvilam watershed

Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total	First year	
								Phy	Financial
Renovation of Irrigation pump house at Edakkode ward no 17 of Mudakkal panchayat	1	nos	1,84,753.00	1,82,983.00	1,770.00	0	1,84,753.00	1	1,84,753.00
Renovation of Parayathukonam Chera at ward no 6 of Kizhuvilam Grama panchayat	1	nos	9,10,054.00	4,25,048.00	4,85,006.00	0	9,10,054.00	1	9,10,054.00

10.11.2. Year wise work plan

The year wise activity of watershed works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 10.6.

Table 10.6
the summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	47,41,120	26,62,533.00	7,81,394.00

2	Livelihoods for Asset less	6,97,200	4,17,000	4,00,200
3	Productivity Enhancement & Microenterprises	507625	351125	210375

10.11.3. Natural Resource Management

The NRM works were identified based on the PRI methodology and the works were analyzed for the need and importance based on the watershed. Based on the analysis the summary of estimated amount of NRM works are shown in table 10.7.

Table 10.7
Summary of estimated amount of NRM works

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total
A	Ridge Area Treatment Plans							
1	Strip terraces	5000	Nos	142	0.00	710,000.00	71,000.00	710,000.00
2	Stone pitched bunds	4000	Sq.M	900	0.00	3,600,000.00	360,000.00	3,600,000.00
3	Contour earthen bunds	5000	Sq.M	142	0.00	710,000.00	71,000.00	710,000.00
4	Staggered trenches	4000	mt	60	0.00	240,000.00	24,000.00	240,000.00
5	Moisture collection pits	6000	nos	80	0.00	480,000.00	48,000.00	480,000.00
6	Centripetal terracing and mulching	3000	nos	400	1,200,000.00	0.00	120,000.00	1,200,000.00
7	Cover cropping	200000	Sq.M	4	800,000.00	0.00	80,000.00	800,000.00
8	Horticulture	5000	cent	42	210,000.00	0.00	21,000.00	210,000.00

9	Agroforestry	2500	nos	35	87,500.00	0.00	8,750.00	87,500.00
10	Biofencing (live hedge)	2000	rmt	35	70,000.00	0.00	7,000.00	70,000.00
B	Drainage line treatment plans							
1	Gully plugging	1	nos	6000	6,000.00	0.00	600.00	6,000.00
2	pond renovation		Work s		1,070,236.0 0	165,499.00	123,573.60	1,235,736.00
3	Strem Sidewall Construction		Work s		1,662,633.0 0	1,222,974.00	288,560.70	2,885,607.00
4	Vented Cross Bars New	1	nos	50000	50,000.00	0.00	5,000.00	50,000.00
5	Canal Desiltation	2	nos	25000	50,000.00	0.00	5,000.00	50,000.00
6	bio-park in school	2	nos	15000 0	250,000.00	50,000.00	30,000.00	300,000.00
7	Desiltation Public wells.	10	nos	75000	750,000.00	0.00	75,000.00	750,000.00
8	Recharge of wells.	1000	nos	500	500,000.00	0.00	50,000.00	500,000.00
9	Rainwater harvesting	750	nos	2500	1,875,000.0 0	0.00	187,500.00	1,875,000.00
C	Allied Activities							
1	Biogas plant	1	nos	20000 0	200,000.00	0.00	20,000.00	200,000.00
	Total				8,781,369.0 0	7,178,473.00	1,595,984	15,959,843

10.11.4. Year wise work plan of NRM works

The year wise activity of NRM works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 10.8.

Table 10.8
Summary of estimated amount of NRM identified on year wise

Sl. no	Details of Activities	First year		Second year		Third year	
		Phy	Financial	Phy	Financial	Phy	Financial

1	Strip terraces	2,000	284,000.00	2000	284,000.00	1000	142,000.00
2	Stone pitched bunds	2,500	2,250,000.00	1000	900,000.00	500	450,000.00
3	Contour earthen bunds	2,000	284,000.00	2000	284,000.00	1000	142,000.00
4	Staggered trenches	2,000	120,000.00	1000	60,000.00	1000	60,000.00
5	Moisture collection pits	3,000	240,000.00	1500	120,000.00	1500	120,000.00
6	Centripetal terracing and mulching	2,000	800,000.00	500	200,000.00	500	200,000.00
7	Cover cropping	100,000	400,000.00	10000	400,000.00	0	0.00
8	Horticulture	4,000	168,000.00	500	21,000.00	500	21,000.00
	Agroforestry	1,000	35,000.00	1000	35,000.00	500	17,500.00
10	Biofencing (live hedge)	1,000	35,000.00	500	17,500.00	500	17,500.00
1	Gully plugging	0	0.00	1	6,000.00	0	0.00
2	pond renovation	2	55,312.00	1	559,871.00	1	452,326.00
3	Stream Sidewall Construction	1	2,237,677.00	1	647,930.00	0	0.00
4	Vented Cross Bars New	1	50,000.00	0	0.00	0	0.00
5	Canal Desiltation	1	25,000.00	1	25,000.00	0	0.00
6	Bio-park in school	1	150,000.00	1	150,000.00	0	0.00
7	Desiltation Public wells.	5	375,000.00	3	225,000.00	2	150,000.00
8	Recharge of wells.	500	250,000.00	250	125,000.00	250	125,000.00
9	Rainwater harvesting	500	1,250,000.00	250	625,000.00	0	0.00
1	Biogas plant	0	0.00	1	200,000.00	0	0.00
	Total		9008989		4,885,301.00		1,897,326.00

10.11.5. Natural Resource Management Work Location

Details of Activities	First year		Second year		Third year	
	Phy	Location	Phy	Location	Phy	Location
Strem Sidewall Construction	1	Edakode ela thodu, In Azhoour Grama panchyat ward no 7 & 8, Managlapuram Grama panchyat Ward no 1 and Mudakkal gram panchayat, Ward no 17	0	0	0	
Pond renovation		Pottan Kulam In Mudakkal gram panchayat, Ward no 18 near Korani	2	Kavadi kullam renovation, In Killuvallam gram panchayat, Ward no 11 near Mudapuram	1	Kunnavaram Punja Chera, In Killuvallam gram panchayat, Ward no 15 near Decent mukku, Kunnuvaram
	2	Moola vilakam Kulam, In Killuvallam gram panchayat, Ward no 11 near Mudapuram		Pukotukonam chera thodu, In Mudakkal gram panchayat, Ward no 20		
Desiltation of streams, ponds and Public wells.		In Koccualmoodu school on in Killuvallam Grama panchayat ward no 8	2	In Naiyanvanam in Killuvallam Grama panchayat	1	In Pukaila thopu SC coolony
	2	In Decent Muuku in Killuvallam Grama panchayat		In Katoorkoanm coolony		
Biogas plant	0		1	Andor school	0	
Bio park in school	1	In Andoor school on in Killuvallam Grama panchayat ward no 8	1	In Koccualmoodu school on in Killuvallam Grama panchayat ward no 8		

10.11.6. Livelihoods for Assetless

The Livelihoods Activities were identified based on the need analysis and participatory interaction projects were analyzed for the successfulness and sustainability. Based on the analysis the summary of estimated amount of Livelihoods Activities projects are shown in table 10.9.

Table 10.9.
List of Livelihoods Activities and estimated amount.

sl. no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share	Total IWMP share
1	Nursery vegetable	6	unit	34000	25000	6800	163200
2	Nursery (Fruit lants)	7	unit	34000	25000	6800	190400
3	Lease land Paddy farming	8	unit	8000	6400	1600	51200
4	coconut climbing -Skilled labour	16	unit	25000	20000	5000	320000
5	Banana (N) cultivation by lease farmers	25	unit	25000	20000	5000	500000
6	Vegetable cultivation	1	unit	20000	16000	4000	16000
7	Floriculture	1	unit	85500	68400	17100	68400
8	Bee keeping	2	unit	18000	14400	3600	28800
9	pepper nursery unit	2	unit	30000	24000	6000	48000
10	Compost Production	3	unit	15000	12000	3000	36000
11	Vegetable Market	1	unit	50000	25000	25000	4000
		72		299500	239600	59900	1426000

10.11.7. Year wise work plan of Livelihoods Activities

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 18.

Table 18

The summary of estimated amount of Livelihoods Activities identified on year wise

sl. no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Nursery vegetable	3	75000	0	0	3	75000
2	Nursery (Fruit lants)	2	50000	3	75000	2	50000
3	Lease land Paddy farming	2	12800	4	25600	2	12800
4	coconut climbing -Skilled labour	8	160000	4	80000	4	80000
5	Banana (N) cultivation by lease farmers	15	300000	5	100000	5	100000
6	Vegetable cultivation	3	48000	2	32000	2	32000
7	Floriculture	0	0	1	68400	0	0
8	Bee keeping	1	14400		0	1	14400
9	pepper nursery unit	0	0	1	24000	1	24000
10	Compost Production	1	12000	1	12000	1	12000
11	Vegetable Market	1	25000	0	0	0	0
		36	697200	21	417000	21	400200

10.11.8. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its successfulness and sustainability. Based on the analysis the summary of estimated amount of Productivity Enhancement & Microenterprises are shown in table 18.

Table 19.
Productivity Enhancement & Microenterprises and estimated amount.

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Benificary share to WDF	Total
-------	-----------------------	----------	------	------	------	-------------------------	-------

1	Scientific management of existing coconut gardens	900	nos	190	171000	17100	171000
2	Intensification of crop density of Banana ,Ginger,tuber crops - Klt	900	per kit	50	45000	4500	45000
3	Organic kitchen garden- Seed distubution	900	per packet	50	45000	4500	45000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	450	per lot	375	168750	16875	168750
5	Scientific Paddy seed Farming	90	cent	50	4500	450	4500
6	Vegetable Farming	183	per 10 cent	5000	915000	91500	915000
7	Bio fertilizer production	2	per unit	5000	10000	1000	10000
8	Bio- control agent production	125	cent	40	5000	500	5000
9	Fodder Production	435	cent	25	10875	1087.5	10875
10	Fish farming in public pond	3	nos	20000	60000	6000	60000
11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle)	4	per unit	20000	80000	8000	80000
12	Rabbit rearing	1	per unit	10000	10000	1000	10000
13	Marketing Centre	3	per unit	20000	60000	6000	60000
	Total	3996		80780	1585125	158512.5	1585125

10.11.9. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 18.

Table 18

The summary of estimated amount of Productivity Enhancement & Microenterprises identified

Sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Scientific management of existing coconut gardens	400	76000	400	76000	100	19000

2	Intensification of crop density of Banana ,Ginger, tuber crops - KIt	400	20000	400	20000	100	5000
3	Organic kitchen garden-Seed distubution	400	20000	400	20000	100	5000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	200	75000	150	56250	100	37500
5	Scientific Paddy seed Farming	54	2700	18	900	18	900
6	Vegetable Farming	100	500000	50	250000	33	165000
7	Bio fertilizer production	1	5000	1	5000	0	0
8	Bio- control agent production	75	3000	25	1000	25	1000
9	Fodder Production	261	6525	87	2175	87	2175
10	Fish farming in public pond	1	20000	1	20000	1	20000
11	Renovation of cattle Shed	1	20000	2	40000	1	20000
12	Rabbit Rearing	0	0	1	10000	0	0

CHAPTER 10

KIZHUVILAM MICRO WATERSHED (4V29E)

10.1 Location and extent

Kizhuvilam micro watershed lies in the south of Viliyinmoola micro watershed covering major portion of Mudakkal Managalapuram and Kizhuvilam Grama Panchayat. The total area of the water shed is 1321 ha which is 19.5 % of the Chirayinkeezhu- IWMP watershed cluster. The soil in the area are of sandy loam and the area is mostly under agriculture with the topography of gently sloping to flat. The Vamanapuram River flows through the southeast of the watershed.

General Description

Name of micro watershed	:	Kizhuvallim
-------------------------	---	-------------

Micro watershed code	:	4V29e
River basin	:	Mamam
District	:	Thiruvananthapuram
Block Panchayat	:	Chirayinkeezhu and Pothencode
Grama Panchayat	:	Mudakkal, Managalapuram and Kizhuvilam
Area in panchayat:	:	<ol style="list-style-type: none"> 1. Mudakkal Grama Panchayat – 206 ha 2. Managalapuram Grama Panchayat- 430 ha 3. Kizhuvilam Grama Panchayat –685 ha
Latitude	:	8 ^o 41'37" to 8 ^o 39'43" N
Longitude	:	76 ^o 47'40" to 76 ^o 51'55" E

10.2 Physiography

The Project area is southern mid land with plain terrain in the western part.. The Slope is 0-23 degree. The slope and DEM maps was derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure 1 of the report. The southern part of the watershed is elevated in the Managalapuram Gram panchayat area. The relief is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the vamamapuram river . The relief of the watershed ranges above msl. Majority of the area falls in the relief category of 30-80 m above msl, which covers an area of 980 Ha .

10.3 Slope

The watershed area is divided in to three categories of slope classes. The majority of area is under the category of very gentle slope having 0-4 degree slope. This category of steep slope spreads over 90% of the area on the southern part near Managalapuram

10.4. Drainage

The Mamam River is the major drain of this watershed. The broad landforms at the upper region with lower plateau (lattrite) and the pediplain weathered nature is found on the middle of the water shed. The land forms of the middle region include sandy loam with valleys and low hills with gentle slope to flat bottom.

10.5 Water Resources

Ground Water Resources

The depth of the ground water level in the bore well are 45-65 mt depth and the ground water depth is highest in the Managlapuram Grama panchayat area. The area falls in the category of 'White' which means that only less than 65 percent of the ground water is utilized. The area under Chirayinkeezhu block is in the category of 'dark' in the near future. The eastern part of the watershed is suitable for domestic wells whereas the western part and the middle region is suitable for large diameter dug wells. The lower region is suitable for heavy duty as well as medium capacity tube wells.

10.6. Agriculture and present land use

The total area of the watershed is 1321 Ha in which 1258 ha of land area is under agricultural use and 61 ha land is non cultivable area with 2 ha as cultivable wasteland. As the Project area lies under midland zone, the forest area are not identified and the topography shows very gentle to costal slope. The major land use category mapped in the project area is mixed crops (900 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. The second major land use category is rubber plantation (259Ha). And the Coconut (27 ha) are widely seen and being replaced by the other crops. The paddy (73 ha) is cultivated in the Kizhuvilam and Mudakkal Grama panchayat area.

10.7. Soils

The major lower plateau (lattrite) soil association which is distributed in an area of 702 ha followed pediplain weathered soil association.. This soil is well drained with moderate slow permeability. This soil is intensively used to cultivated coconut and vegetables.

10.8. Socio economic details

The water shed has about 3896 families of which 20 % belongs to SC .The population of the watershed is 17654 and the average land holding per family is 0.16 ha. The BPL families of the watershed are about 13 % of the total population

10.9 SWOT Analysis of Kizhuvilam (4V29e) watershed

The strength, Weakness, Opportunities and treat of the micro watershed was analyzed and the details are given in table 10.1

Table 10.1 .

SWOT Analysis of Kizhuvilam (3M2a) watershed

Area of Intervention	Strength	Weakness	Opportunities	treat
Agriculture	38% of watershed area under paddy cultivation raising two crops. One padasekharasamithi functioning inside the watershed	60% of wetland ecosystem suitable for paddy cultivation converted into mixed crops and rubber	3 Ha cultivable fallow land where two crops can be raised. Raising of pulse & vegetable as third crop in 10 ha.	Conversion of wetland ecosystem which is suitable for raising paddy into rubber adversely affects the natural drainage and water table.
Horticulture	35% of area of watershed under coconut based farming system with intercrops such as nutmeg, plantain, pepper, ginger, turmeric, tuber crops.	23% of area of watershed under monocrop of rubber.	Incent with suitable soil and water conservation measures such as stone pitched contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting such as staggered trenches and pits.	A number of abandoned quarries situated in the micro watershed. Unscientific quarrying leads to depletion of water table
Natural Resources	The Vanmanapuram river which flow on the boundary Majority of the watershed area, the landform is gentle slope or valley.	Total area of the micro watershed is with steep slope subject to erosion hazards. Major soil in this area belongs to loamy soil with erodability as the major limitation.	Area treatment with suitable soil and water conservation measures such as Afforestation in very steep sloppy areas mulching, cover cropping, water harvesting measures such as staggered trenches.	Afforestation in very steep slopes. Soil & water conservation measures such as contour bunding, repair of old bunds, terracing in rubber, cover cropping in rubber, agrostological measures on bunds with soil bunding crops such as pineapple/fodder, staggered trenching.

10.10 Problem analysis

The project area was analysed after finding out the SWOT with its constrain and possible solution and detailed in table 10.2

Table 10.2

Problem analysis

No	Problem Area	Constraints	Solutions	Project Support
1	Surface water Recourses	encroachment, bank erosion, poor maintenance of VCB Silting up of irrigation channel. Leakage of water through side wall of distributary channel	Desiltation, embankment protection of thodu using earth silt and using cement concrete in specific areas. Repair of existing VCB's Desiltation of irrigation channel Repair of side wall of field Channel	Deepening of thodu, desiltation of thodu, sidevarambu earthening, and embankment stabilization side wall protection. VCB repair Desiltation of irrigation channel Repair of side wall of field channel
		Presence of plutonic rock in hill crust decrease the yield of well wells dry up in December onwards	Recharging wells	Rain water harvesting Recharging wells

10.11. Work plan

The work plan was prepared through the methodology proposed and the after analysis of the basic secondary data available. The general information of the Kizhuvilam micro watershed are detailed in table 10.3

Table 10.3
General information of the Kizhuvilam micro watershed

Name of Watershed	Kizhuvilam
Watershed Code	4V29e
Treatable Area in Ha	978 ha
Total Cost in Lakhs	Rs.11736000

The fund available for each components of the Kizhuvilam micro water shed Fund Allocated according to the guideline are detailed in table 10.4.

Table 10.4
Fund allocated to each components of the Kizhuvilam micro water shed

Sl.No	Component	Percentage	Total amount in Rs
-------	-----------	------------	--------------------

1	Administration	10	1585200
2	DPR Preparation	1	158520
3	Entry point activities	4	634080
4	capacity Building	5	792600
5	Productivity Enhancement	10	1585200
6	Livelihoods for Asset less	9	1426680
7	Natural Resource Management	56	8877120
8	Monitoring	1	158520
9	Evaluation	1	158520
10	Consolidation phase	3	475560
	Total	100	15852000

10.11.1. Entry Point activities of Kizhuvilam watershed

The Entry point activities was selected under participatory activity and the activity has importance increasing productivity and water storage.. The details of the activity are detailed in table 10.5.

Table 10.5
Entry Point activities of Kizhuvilam watershed

Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total	First year	
								Phy	Financial
Renovation of Irrigation pump house at Edakkode ela ward no 17 of Mudakkal panchayat	1	nos	1,84,753.00	1,82,983.00	1,770.00	0	1,84,753.00	1	1,84,753.00
Renovation of Parayathukonam Chera at ward no 6 of Kizhuvilam Grama panchayat	1	nos	9,10,054.00	4,25,048.00	4,85,006.00	0	9,10,054.00	1	9,10,054.00

10.11.2. Year wise work plan

The year wise activity of watershed works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 10.6.

Table 10.6
the summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	47,41,120	26,62,533.00	7,81,394.00
2	Livelihoods for Asset less	6,97,200	4,17,000	4,00,200
3	Productivity Enhancement & Microenterprises	507625	351125	210375

10.11.3. Natural Resource Management

The NRM works were identified based on the PRI methodology and the works were analyzed for the need and importance based on the watershed. Based on the analysis the summary of estimated amount of NRM works are shown in table 10.7.

Table 10.7
Summary of estimated amount of NRM works

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total
A	Ridge Area Treatment Plans							
1	Strip terraces	5000	Nos	142	0.00	710,000.00	71,000.00	710,000.00
2	Stone pitched bunds	4000	Sq.M	900	0.00	3,600,000.00	360,000.00	3,600,000.00
3	Contour earthen bunds	5000	Sq.M	142	0.00	710,000.00	71,000.00	710,000.00
4	Staggered trenches	4000	mt	60	0.00	240,000.00	24,000.00	240,000.00
5	Moisture collection pits	6000	nos	80	0.00	480,000.00	48,000.00	480,000.00

6	Centripetal terracing and mulching	3000	nos	400	1,200,000.00	0.00	120,000.00	1,200,000.00
7	Cover cropping	200000	Sq.M	4	800,000.00	0.00	80,000.00	800,000.00
8	Horticulture	5000	cent	42	210,000.00	0.00	21,000.00	210,000.00
9	Agroforestry	2500	nos	35	87,500.00	0.00	8,750.00	87,500.00
10	Biofencing (live hedge)	2000	rmt	35	70,000.00	0.00	7,000.00	70,000.00
B	Drainage line treatment plans							
1	Gully plugging	1	nos	6000	6,000.00	0.00	600.00	6,000.00
2	pond renovation		Works		1,070,236.00	165,499.00	123,573.60	1,235,736.00
3	Strem Sidewall Construction		Works		1,662,633.00	1,222,974.00	288,560.70	2,885,607.00
4	Vented Cross Bars New	1	nos	50000	50,000.00	0.00	5,000.00	50,000.00
5	Canal Desiltation	2	nos	25000	50,000.00	0.00	5,000.00	50,000.00
6	bio-park in school	2	nos	150000	250,000.00	50,000.00	30,000.00	300,000.00
7	Desiltation Public wells.	10	nos	75000	750,000.00	0.00	75,000.00	750,000.00
8	Recharge of wells.	1000	nos	500	500,000.00	0.00	50,000.00	500,000.00
9	Rainwater harvesting	750	nos	2500	1,875,000.00	0.00	187,500.00	1,875,000.00
C	Allied Activities							
1	Biogas plant	1	nos	200000	200,000.00	0.00	20,000.00	200,000.00
	Total				8,781,369.00	7,178,473.00	1,595,984	15,959,843

10.11.4. Year wise work plan of NRM works

The year wise activity of NRM works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 10.8.

Table 10.8
Summary of estimated amount of NRM identified on year wise

Sl. no	Details of Activities	First year		Second year		Third year	
		Phy	Financial	Phy	Financial	Phy	Financial
1	Strip terraces	2,000	284,000.00	2000	284,000.00	1000	142,000.00
2	Stone pitched bunds	2,500	2,250,000.00	1000	900,000.00	500	450,000.00
3	Contour earthen bunds	2,000	284,000.00	2000	284,000.00	1000	142,000.00
4	Staggered trenches	2,000	120,000.00	1000	60,000.00	1000	60,000.00
5	Moisture collection pits	3,000	240,000.00	1500	120,000.00	1500	120,000.00
6	Centripetal terracing and mulching	2,000	800,000.00	500	200,000.00	500	200,000.00
7	Cover cropping	100,000	400,000.00	10000	400,000.00	0	0.00
8	Horticulture	4,000	168,000.00	500	21,000.00	500	21,000.00
	Agroforestry	1,000	35,000.00	1000	35,000.00	500	17,500.00
10	Biofencing (live hedge)	1,000	35,000.00	500	17,500.00	500	17,500.00
1	Gully plugging	0	0.00	1	6,000.00	0	0.00
2	pond renovation	2	55,312.00	1	559,871.00	1	452,326.00
3	Stream Sidewall Construction	1	2,237,677.00	1	647,930.00	0	0.00
4	Vented Cross Bars New	1	50,000.00	0	0.00	0	0.00
5	Canal Desiltation	1	25,000.00	1	25,000.00	0	0.00
6	Bio-park in school	1	150,000.00	1	150,000.00	0	0.00

7	Desiltation Public wells.	5	375,000.00	3	225,000.00	2	150,000.00
8	Recharge of wells.	500	250,000.00	250	125,000.00	250	125,000.00
9	Rainwater harvesting	500	1,250,000.00	250	625,000.00	0	0.00
1	Biogas plant	0	0.00	1	200,000.00	0	0.00
	Total		9008989		4,885,301.00		1,897,326.00

10.11.5. Natural Resource Management Work Location

Details of Activities	First year		Second year		Third year	
	Phy	Location	Phy	Location	Phy	Location
Strem Sidewall Construction	1	Edakode ela thodu, In Azhoour Grama panchyat ward no 7 & 8, Managlapuram Grama panchayat Ward no 1 and Mudakkal gram panchayat, Ward no 17	0	0	0	
Pond renovation		Pottan Kulam In Mudakkal gram panchayat, Ward no 18 near Korani	2	Kavadi kullam renovation, In Killuvallam gram panchayat, Ward no 11 near Mudapuram	1	Kunnavaram Punja Chera, In Killuvallam gram panchayat, Ward no 15 near Decent mukku, Kunnuvaram
	2	Moola vilakam Kulam, In Killuvallam gram panchayat, Ward no 11 near Mudapuram		Pukotukonam chera thodu, In Mudakkal gram panchayat, Ward no 20		

Desiltation of streams, ponds and Public wells.	2	In Kocculmoodu school on in Killuvallam Grama panchayat ward no 8	2	In Naiyanvanam in Killuvallam Grama panchayat	1	In Pukaila thopu SC coolony
		In Decent Muuku in Killuvallam Grama panchayat		In Katoorkoanm coolony		
Biogas plant	0		1	Andor school	0	
Bio park in school	1	In Andoor school on in Killuvallam Grama panchayat ward no 8	1	In Kocculmoodu school on in Killuvallam Grama panchayat ward no 8		

10.11.6. Livelihoods for Assetless

The Livelihoods Activities were identified based on the need analysis and participatory interaction projects were analyzed for the successfulness and sustainability. Based on the analysis the summary of estimated amount of Livelihoods Activities projects are shown in table 10.9.

Table 10.9.
List of Livelihoods Activities and estimated amount.

sl. no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share	Total IWMP share
1	Nursery vegetable	6	unit	34000	25000	6800	163200
2	Nursery (Fruit lants)	7	unit	34000	25000	6800	190400
3	Lease land Paddy farming	8	unit	8000	6400	1600	51200
4	coconut climbing -Skilled labour	16	unit	25000	20000	5000	320000
5	Banana (N) cultivation by lease farmers	25	unit	25000	20000	5000	500000
6	Vegetable cultivation	1	unit	20000	16000	4000	16000
7	Floriculture	1	unit	85500	68400	17100	68400
8	Bee keeping	2	unit	18000	14400	3600	28800

9	pepper nursery unit	2	unit	30000	24000	6000	48000
10	Compost Production	3	unit	15000	12000	3000	36000
11	Vegetable Market	1	unit	50000	25000	25000	4000
		72		299500	239600	59900	1426000

10.11.7. Year wise work plan of Livelihoods Activities

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 18.

Table 18

The summary of estimated amount of Livelihoods Activities identified on year wise

sl. no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Nursery vegetable	3	75000	0	0	3	75000
2	Nursery (Fruit plants)	2	50000	3	75000	2	50000
3	Lease land Paddy farming	2	12800	4	25600	2	12800
4	coconut climbing -Skilled labour	8	160000	4	80000	4	80000
5	Banana (N) cultivation by lease farmers	15	300000	5	100000	5	100000
6	Vegetable cultivation	3	48000	2	32000	2	32000
7	Floriculture	0	0	1	68400	0	0
8	Bee keeping	1	14400		0	1	14400
9	pepper nursery unit	0	0	1	24000	1	24000
10	Compost Production	1	12000	1	12000	1	12000
11	Vegetable Market	1	25000	0	0	0	0
		36	697200	21	417000	21	400200

10.11.8. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its successfulness and sustainability. Based on the analysis the summary of estimated amount of Productivity Enhancement & Microenterprises are shown in table 18.

Table 19.
Productivity Enhancement & Microenterprises and estimated amount.

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Benificary share to WDF	Total
1	Scientific management of existing coconut gardens	900	nos	190	171000	17100	171000
2	Intensification of crop density of Banana ,Ginger,tuber crops - Klt	900	per kit	50	45000	4500	45000
3	Organic kitchen garden- Seed distubution	900	per packet	50	45000	4500	45000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	450	per lot	375	168750	16875	168750
5	Scientific Paddy seed Farming	90	cent	50	4500	450	4500
6	Vegetable Farming	183	per 10 cent	5000	915000	91500	915000
7	Bio fertilizer production	2	per unit	5000	10000	1000	10000
8	Bio- control agent production	125	cent	40	5000	500	5000
9	Fodder Production	435	cent	25	10875	1087.5	10875
10	Fish farming in public pond	3	nos	20000	60000	6000	60000
11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle)	4	per unit	20000	80000	8000	80000
12	Rabbit rearing	1	per unit	10000	10000	1000	10000
13	Marketing Centre	3	per unit	20000	60000	6000	60000
	Total	3996		80780	1585125	158512.5	1585125

10.11.9. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 18.

Table 18

The summary of estimated amount of Productivity Enhancement & Microenterprises identified

Sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Scientific management of existing coconut gardens	400	76000	400	76000	100	19000
2	Intensification of crop density of Banana ,Ginger, tuber crops - KIt	400	20000	400	20000	100	5000
3	Organic kitchen garden- Seed distubution	400	20000	400	20000	100	5000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	200	75000	150	56250	100	37500
5	Scientific Paddy seed Farming	54	2700	18	900	18	900
6	Vegetable Farming	100	500000	50	250000	33	165000
7	Bio fertilizer production	1	5000	1	5000	0	0
8	Bio- control agent production	75	3000	25	1000	25	1000
9	Fodder Production	261	6525	87	2175	87	2175
10	Fish farming in public pond	1	20000	1	20000	1	20000
11	Renovation of cattle Shed	1	20000	2	40000	1	20000
12	Rabbit Rearing	0	0	1	10000	0	0
13	Marketing Centre	1	20000	1	20000	1	20000

CHAPTER 11

SARKARA MICRO WATERSHED (4V30A)

11.1 Location and extent

Sarkara micro watershed lies in the south of Thekkumbagam micro watershed covering major portion of Chirayinkeezhu and Kizhuvilam Grama Panchayat. The total area of the water shed is 618 ha which is 11.5 % of the Chirayinkeezhu- IWMP watershed cluster. The soil in the area are of sandy loam and the area is mostly under agriculture with the topography of gently sloping to flat. The Vamanapuram River flows through the North east and Mamam river flows through the southeast and south of the watershed.

The watershed is completely surrounded by water body.

General Description

Name of micro watershed :	:	Sarkara
Micro watershed code	:	4V30a
River basin	:	Vamanapuram
District	:	Thiruvananthapuram
Block Panchayats	:	Chirayinkeezhu
Grama Panchayats	:	Chirayinkeezhu and Kizhuvilam
Latitude	:	8° 40'34" to 8°38'41" North
Longitude	:	76°46'11" to 76° 48'15 East
Area in panchayat:	:	Chirayinkeezhu – 197 ha Kizhuvilam – 169 ha

11.2 Physiography

The Project area is southern mid land with costal terrain in the western part.. The Slope is 0- 3degree. The slope and DEM maps was derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure of the report. The eastern part of the water shed is elevated area. The relief is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the Vamamapuram and Mamam river. The relief of the watershed ranges above msl. Majority of the area falls in the relief category of 11-18 m above msl, which covers an area of 386 Ha .

11.3 Slope

The watershed area is divided into three categories of slope classes. The majority of area is under the category of very gentle slope having 0-3 degree slope. This category of steep slope spreads over 86 % of the area.

11.4. Drainage

The Vamanapuram and Mamam River is the major drain of this watershed. The broad landforms at the upper region with lower plateau (latrite) and the pediplain weathered nature is found on the middle of the watershed. The land forms of the middle region include sandy loam with valleys and low hills with gentle slope to flat bottom.

11.5 Water Resources

Surface Water Resources

The major river of this watershed is the Vamanapuram and Mamam River. The combined total yield and the annual utilisable yield of Vamanapuram, are 1324 Mm³ and 687 Mm³ respectively. The Vamanapuram river has thirteen tributaries, including major and minor ones. Kozhithottam Kayal and Mungottu Kayal occupy the western part of the watershed.

Ground Water Resources

The area falls in the category of 'White' which means that only less than 65 percent of the ground water is utilized. The area under Chirayinkeezhu block is in the category of 'dark' in the near future. The eastern part of the watershed is suitable for domestic wells whereas the western part and the middle region is suitable for large diameter dug wells. The lower region is suitable for heavy duty as well as medium capacity tube wells. The depth of the ground water level in the bore well are 80-100 mt depth and the ground water depth is highest in the Chirayinkeezhu Grama panchayat area

11.6. Agriculture and present land use

The total area of the watershed is 618 Ha in which 513 ha of land area is under agricultural use and 105 ha land is non cultivable area with 5 ha as cultivable wasteland. As the Project area lies under midland zone, the forest area are not identified and the topography shows very gentle to costal slope. The major land use category mapped in the project area is mixed crops (449 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. The second major land use category is Coconut plantation (0.05 Ha). And the rubber is not seen in the area but the chance of being replaced by the rubber is felt. The paddy (63 ha) is cultivated in the Chirayinkeezhu and Kizhuvilam Grama panchayat area.

11.7. Soils

The major lower plateau (latrite) soil association which is distributed in an area of 11150 ha followed pediplain weathered soil association.. This soil is well drained with moderate slow permeability. This soil is intensively used to cultivated coconut and vegetables.

11.8. Socio economic details

The water shed has about 12939 families of which 28 % belongs to SC .The population of the watershed is 57632 and the average land holding per family is 0.11 ha. The BPL families of the watershed are about 15 % of the total population

11.9 SWOT Analysis of Sarkara (4V30a) watershed

The strength, Weakness, Opportunities and treat of the micro watershed was analyzed and the details are given in table 11.1

Table 11.1
SWOT Analysis of Sarkara (4V30a) watershed

Area of Intervention	Strength	Weakness	Opportunities	treat
Agriculture	38% of watershed area under paddy cultivation raising two crops. One sate seed farm is functioning inside the watershed	60% of wetland ecosystem suitable for paddy cultivation converted into mixed crops and rubber	3 Ha cultivable fallow land where two crops can be raised. Raising of pulse & vegetable as third crop in 10 ha.	Conversion of wetland ecosystem which is suitable for raising paddy into rubber adversely affects the natural drainage and water table.
Horticulture	35% of area of watershed under coconut based farming system with intercrops such as nutmeg, plantain, pepper, ginger, turmeric, tuber crops.	23% of area of watershed under mono crop of rubber.	Incent with suitable soil and water conservation measures such as stone pitched contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting such as staggered trenches and pits.	A number of abandoned quarries situated in the micro watershed. Unscientific quarrying leads to depletion of water table
Natural Resources	The Vanmanapuram river which flow on the boundary Majority of the watershed area, the landform is gentle slope or valley.	Total area of the micro watershed is with steep slope subject to erosion hazards. Major soil in this area belongs to loamy soil with erodability as the	Area treatment with suitable soil and water conservation measures such as Afforestation in very steep sloppy areas mulching, cover	Afforestation in very steep slopes. Soil & water conservation measures such as contour bunding, repair of

		major limitation.	cropping, water harvesting measures such as staggered trenches.	old bunds, terracing in rubber, cover cropping in rubber, agrostological measures on bunds with soil bunding crops, staggered trenching.
--	--	-------------------	---	--

11.10 Problem analysis

The project area was analysed after finding out the SWOT with its constrain and possible solution and detailed in table 11.3

Table 11.3
Problem analysis

No	Problem Area t	Constraints	Solutions	Project Support
1	Surface water Recourses	Encroachment, bank erosion, poor maintenance of VCB Silting up of irrigation channel. Leakage of water through side wall of distributary channel	Desiltation, embankment protection of thodu using earth silt and using cement concrete in specific areas. Repair of existing VCB's	Deepening of thodu, desiltation of thodu, side varambu earthening, and embankment stabilization side wall protection. VCB repair
		Presence of plutonic rock in hill crust decrease the yield of well wells dry up in December.	Recharging wells	Rain water harvesting Recharging wells

11.11 Work plan

The work plan was prepared through the methodology proposed and the after analysis of the basic secondary data available. The general information of the Sarkara micro watershed are detailed in table 11.4

Table 11.4
General information of the Sarkara micro watershed

Name of Watershed	Sarkara
Watershed Code	4V30a
Treatable Area in Ha	618 ha
Total Cost in Lakhs	Rs.11736000

The fund available for each components of the Sarkara micro water shed Fund Allocated according to the guideline are detailed in table 11.5.

Table 11.5.
Fund allocated to each components of the Sarkara micro water shed

Sl.No	Component	Percentage	Total amount in Rs
1	Administration	10	741600
2	DPR Preparation	1	74160
3	Entry point activities	4	296640
4	capacity Building	5	370800
5	Productivity Enhancement	10	741600
6	Livelihoods for Asset less	9	667440
7	Natural Resource Management	56	4152960
8	Monitoring	1	74160
9	Evaluation	1	74160
10	Consolidation phase	3	222480
	Total	100	7416000

11.11.1. Entry Point activities of Kizhuvilam watershed

The Entry point activities was selected under participatory activity and the activity has importance increasing productivity and water storage.. The details of the activity are detailed in table 11.6

Table 11.6 Entry Point activities of Kizhuvilam watershed

Details of Activities	Qty	Unit	Rate	IWMP	Convergence	WDF	Total	First year	
								Phy	Financial
Providing solar lighting system at Sarkara UP school	1	nos	10 lakhs	4,20,000.00	1,80,000	0.00	6,00,000.00	1	1,84,753.00

11.11.2. Year wise work plan

The year wise activity of watershed works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 11.7.

Table 11.7

The summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	47,41,120	26,62,533.00	7,81,394.00
2	Livelihoods for Asset less	407200	283600	271200
3	Productivity Enhancement &	507625	351125	210375

11.11.3. Natural Resource Management

The NRM works were identified based on the PRI methodology and the works were analyzed for the need and importance based on the watershed. Based on the analysis the summary of estimated amount of NRM works are shown in table 11.8.

Table 11.8
Summary of estimated amount of NRM works

Sl. no	Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total
A	Ridge Area Treatment Plans							
1	Strip terraces	5000	Nos	142	0.00	710,000.00	71,000.00	710,000.00
2	Stone pitched bunds	4000	Sq.M	900	0.00	800,000.00	80,000.00	800,000.00
3	Contour earthen bunds	5000	Sq.M	142	0.00	1,000,000.00	100,000.00	1,000,000.00
4	Staggered trenches	4000	mt	60	0.00	204,000.00	20,400.00	204,000.00
5	Moisture collection pits	6000	nos	80	0.00	306,000.00	30,600.00	306,000.00
6	Centripetal terracing	178	nos	400	36,134.00	0.00	3,613.40	36,134.00
7	Cover cropping	105	cent	4	3,150.00	0.00	315.00	3,150.00

8	Horticulture	450	cent	42	45,000.00	0.00	4,500.00	45,000.00
9	Agro-forestry	250	nos	35	25,750.00	0.00	2,575.00	25,750.00
10	Bio-fencing (live hedge)	100	rmt	35	40,000.00	0.00	4,000.00	40,000.00
B	Drainage line treatment plans							
1	Gully plugging	1	nos	6000	15,000.00	0.00	1,500.00	15,000.00
2	pond renovation		Works		1,042,980.00	116,223.00	115,920.40	1,159,204.00
3	Stream Sidewall Construction		Works		1,678,501.00	591,215.00	226,971.70	2,269,717.00
4	Bio- park	2	nos	150000	150,000.00	0.00	15,000.00	150,000.00
5	Canal Desiltation	2	nos	25000	50,000.00	0.00	5,000.00	50,000.00
6	Desiltation of streams, ponds and Public wells.	10	nos	65000	750,000.00	0.00	75,000.00	750,000.00
7	Recharge of wells.	10	nos	1500	15,000.00	0.00	1,500.00	15,000.00
8	Rainwater harvesting	86	nos	3500	301,000.00	0.00	30,100.00	301,000.00
	Total				4,152,515.00	3,727,438.00	787,995.50	7,879,955.00

10.11.4. Natural Resource Management year wise program

Table 11.9
Summary of year wise program of NRM works

Sl No	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Strip terraces	2,000	284,000.00	2000	284,000.00	1000	142,000.00
2	Stone pitched bunds	2,500	500,000.00	1000	200,000.00	500	100,000.00
3	Contour earthen	2,000	400,000.00	2000	400,000.00	1000	200,000.00

	bunds						
4	Staggered trenches	2,000	102,000.00	1000	51,000.00	1000	51,000.00
5	Moisture collection pits	3,000	153,000.00	1500	76,500.00	1500	76,500.00
6	Centripetal terracing	80	16,240.00	50	10,150.00	48	9,744.00
7	Cover cropping	0	0.00	105	3,150.00	0	0.00
8	Horticulture	400	40,000.00	0	0.00	50	5,000.00
9	Agro-forestry	100	10,300.00	100	10,300.00	50	5,150.00
10	Bio-fencing (live hedge)	100	40,000.00	0	0.00	0	0.00
11	Gully plugging	0	0.00	1	15,000.00	0	0.00
12	pond renovation	1	539,877.00	1	619,326.00	0	0.00
13	Strem Sidewall Construction	1	2,269,717.00	0	0.00	0	0.00
14	Bio Park	1	150,000.00	0	0.00	1	150,000.00
15	Canal Desiltation	1	25,000.00	1	25,000.00	0	0.00
16	Desiltation of streams, ponds and Public wells.	2	150,000.00	1	75,000.00	7	525,000.00
17	Recharge of wells.	2	3,000.00	1	1,500.00	7	10,500.00
18	Rainwater harvesting	50	175,000.00	6	21,000.00	30	105,000.00
	Total		4708134		1,791,926.00		1,379,894.00

11.11.4. Natural Resource Management Work Location

Details of Activities	First year		Second year		Third year	
	Phy	Location	Phy	Location	Phy	Location

Strem Sidewall Construction	1	Viliya ela thodu, In Killuvallam gram panchayat, Ward no 17,18,19 and 20 near Chairyinkeezhu	0		0	Tuesday palli - guru mandiram to vamanapuram river
Pond renovation	2	Althara Moodu Sree kerishna Temple Pond, In Killuvallam gram panchayat, Ward no 4 near Altharamoodu temple	0		0	
		Panaiyara pond renovation (State Seed Farm), In Killuvallam gram panchayat, Ward no 19 near Cherayinkeezhu				
Desiltation of streams, ponds and Public wells.	1	Public well near Sarakara temple	2	Public well in Chirayinkeezhu Railway station	0	
		Public well in Sarkara school				
Biogas plant	0		1	Andor school	0	
Bio park in school	1	In Sarakara school	1	Village office		

11.11.6. Livelihoods for Assetless

The Livelihoods Activities were identified based on the need analysis and participatory interaction projects were analyzed for the successfulness and sustainability. Based on the analysis the summary of estimated amount of Livelihoods Activities projects are shown in table 11.12.

Table 11.12

List of Livelihoods Activities and estimated amount.

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share	Total IWMP share
1	Nursery (Tray method vegetable seedling)	3	unit	34000	25000	9000	75000
2	Nursery (Fruit Plants)	5	unit	34000	25000	9000	125000
3	Lease land Paddy farming	1	unit	8000	6400	1600	6400
4	Skilled labour group for coconut climbing	6	unit	25000	20000	5000	120000
5	Banana (N) cultivation by lease farmers	3	unit	25000	20000	5000	60000

6	Vegetable lease cultivation	5	unit	20000	16000	4000	80000
7	Floriculture	1	unit	85500	25000	60500	25000
8	Bee keeping	3	unit	18000	14400	3600	43200
9	pepper nursery unit	1	unit	30000	24000	6000	24000
10	Compost Production	3	unit	15000	12000	3000	36000
11	Vegetable Market	3	unit	50000	25000	25000	75000
		34		344500	212800	131700	669600

11.11.7. Year wise work plan of Livelihoods Activities

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 11.13.

Table 11.13
Summary of estimated amount of Livelihoods Activities identified on year wise

sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Nursery (Tray method vegetable seedling)	3	75000	0	0	3	75000
2	Nursery (Fruit Plants)	2	50000	3	75000	2	50000
3	Lease land Paddy farming	2	12800	4	25600	2	12800
4	Skilled labour group for coconut climbing	8	160000	1	20000	1	20000
5	Banana cultivation by lease farmers	1	20000	1	20000	1	20000
6	Vegetable lease cultivation	3	48000	2	32000	2	32000

7	Floriculture	0	0	1	25000	0	0
8	Bee keeping	1	14400		0	1	14400
9	pepper nursery unit	0	0	1	24000	1	24000
10	Compost Production	1	12000	1	12000	1	12000
11	Vegetable Market	1	25000	0	0	0	0
		22	417200	14	233600	14	260200

11.11.8. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its successfulness and sustainability. Based on the analysis the summary of estimated amount of Productivity Enhancement & Microenterprises are shown in table 11.14.

Table 11.14
Productivity Enhancement & Microenterprises and estimated amount.

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share to WDF	Total
1	Scientific management of existing coconut gardens	450	nos	190	85500	8550	85500
2	Intensification of crop density of Banana ,Ginger,tuber crops - Klt	900	per kit	50	45000	4500	45000
3	Organic kitchen garden-Seed distubution	900	per packet	50	45000	4500	45000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	450	per lot	375	168750	16875	168750
5	Scientific Paddy seed Farming	90	cent	50	4500	450	4500
6	Vegetable Farming	40	per 10 cent	5000	200000	20000	200000
7	Bio fertiliser production	2	per unit	5000	10000	1000	10000
8	Bio- control agent production	100	cent	40	4000	400	4000
9	Fodder Production	354	cent	25	8850	885	8850
10	Fish farming in public pond	1	nos	20000	20000	2000	20000

11	Renovation of cattle Shed	4	per unit	20000	80000	8000	80000
12	Rabbit Rearing	1	per unit	10000	10000	1000	10000
13	Marketing Centre	3	per unit	20000	60000	6000	60000
	Total	3295		80780	741600	74160	741600

11.11.9. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 11.15.

Table 11.15

The summary of estimated amount of Productivity Enhancement & Microenterprises identified

Sl.no	Details of Activities	First year		Second year		Third year	
		Physical	Financial	Physical	Financial	Physical	Financial
1	Scientific management of existing coconut gardens	400	76000	400	76000	100	19000
2	Intensification of crop density of Banana ,Ginger,tuber crops - Kit	400	20000	400	20000	100	5000
3	Organic kitchen garden-Seed distubution	400	20000	400	20000	100	5000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	200	75000	150	56250	100	37500
5	Scientific Paddy seed Farming	54	2700	18	900	18	900
6	Vegetable Farming	24	120000	8	40000	8	40000
7	Bio fertiliser production	1	5000	1	5000	0	0
8	Bio- control agent production	60	2400	20	800	20	800
9	Fodder Production	212.4	5310	70.8	1770	70.8	1770
10	Fish farming in public pond	1	20000	1	20000	1	20000
11	Renovation of cattle Shed	1	20000	2	40000	1	20000
12	Rabbit Rearing	0	0	1	10000	0	0
13	Marketing Centre	1	20000	1	20000	1	20000
	Total		386410		310720		169970

CHAPTER 12

MELATINGAL MICRO WATERSHED (4V4A)**12.1 Location and extent**

Melatingal micro watershed lies in the north of Thekkumbhagom micro watershed covering major portion of Kadakkavoor and Karavaram Grama Panchayats. The total area of the water shed is 481 ha which is 9.5 % of the Chirayinkeezhu- IWMP watershed cluster. The soil in the area are of sandy loam and the area is mostly under agriculture with the topography of gently sloping to flat. The Vamanapuram River flows through the southeast of the watershed.

General Description

Name of micro watershed :	:	Melatingal
Micro watershed code	:	4V4a
River basin	:	Vamanapuram
District	:	Thiruvananthapuram
Block Panchayats	:	Chirayinkeezhu and Kilimanoor
Grama Panchayats	:	Kadakkavoor and Karavaram
Latitude	:	8° 43'21" to 8°41'53" North
Longitude	:	76°47'38" to 76° 50'00 East
Area in panchayat:	:	Kadakkavoor – 197 ha Karavaram – 169 ha

12.2 Physiography

The total Geographical Area of this Project is 471.19Ha and the Project area is southern mid land in the Northern part. The Agricultural land mass is 251 Ha and the agriculture is depending rain for irrigation hence the area falls under rain fed Area. According to the Geomorphology and geo-hydrology this area is mainly scattered hills with sparse to minor forest coverage. Northern high lands comprise of two hill rocks and its slope spread over parallel towards south as well as north east. Mainly different order drainages are originates from the northern and eastern hill range in south direction. The existences of the streambeds are not perceptible due to the excessive agricultural practices along the streams. Most of the lands in and around the streams are formed mainly by silt and clay deposition of these streams. The north eastern portion of this watershed is being affected by gully erosion while the down streamside is suitable for agricultural practices.. The Slope is 0-17 degree. The slope and DEM map was derived using SRTM (Shuttle Radar topographic Mission) data of 90 m resolution. The Maps derived are in annexure 1 of the report. The eastern part of the watershed is elevated in the Karavaram Gram panchayat area. The relief is excessive and the watersheds are drained by perennial streams. The sub streams of the project areas are merging with the vamanapuram river . The relief of the watershed ranges above msl. Majority of the area falls in the relief category of 9-36 m above msl, which covers an area of 300 Ha .

12.3 Slope

The watershed area is divided in to three categories of slope classes. The majority of area is under the category of very gentle slope having 0-6 degree slope. This category of steep slope spreads over 90 % of the area on the northern part near melattingal and Karavaram.

12.4. Drainage

The Vamanapuram River is the major drain of this watershed The overall topography of the area varies from plain to undulating. The project area is mainly mid land area surrounded by hills in northern side. The project area is having some low-lying and marshy areas. The upper region with lower plateau (latrite) and the pediplain weathered nature is found on the middle of the water shed. The land forms of the middle region include sandy loam with valleys and low hills with gentle slope to flat bottom. The areas near to river Vamanapuram are low lying and marshy land, which become flood affected during rainy season. The elevation ranges from 0 to 60 m. The general slope in the plain area is less than 10 m per km with some steep slope. The ground water potential is very high and is suitable for dug well and shallow well. The drainage pattern in the project area is subdendritic. The river Vamanapuram passes through the Southern boundary of the project area. The Streams originating from the northern part passes through the project area and meets the river Vamanapuram at keeleatingal village.

12.5 Water Resources

The Project area is with 15 ha of water body and the drains meet vamanapuram river. The area falls in the category of 'White' which means that only less than 65 percent of the ground water is utilized. The area under Chirayinkeezhu block is in the category of 'dark' in the near future. The eastern part of the watershed is suitable for domestic wells whereas the western part and the middle region is suitable for large diameter dug wells. The lower region is suitable for Surface well as well as medium capacity tube wells. The depth of the ground water level in the bore well are 60-90 mt depth and the ground water depth is highest in the Melatingal in Kadakkavoor Grama panchayat area.

12.6. Agriculture and present land use

The total area of the watershed is 481 Ha in which 470 ha of land area is under agricultural use and 11 ha land is non cultivable area with 10 ha as cultivable wasteland. As the Project area lies under midland zone, the forest area are not identified and the topography shows very gentle to flat bottom.

The major land use category mapped in the project area is mixed crops (390 Ha). Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. The second major land use category is rubber (30 ha). And the Coconut plantation (3 Ha) are being replaced by the other crops. The paddy (47 ha) is cultivated in the Kadakkavoor Grama panchayat area.

12.7. Soils

The major lower plateau (latrite) soil association which is distributed in an area of 478 ha followed pediplain weathered soil association.. This soil is well drained with moderate slow permeability. This soil is intensively used to cultivated coconut and vegetables.

12.8. Socio economic details

The water shed has about 1725 families of which 5 % belongs to SC .The population of the watershed is 7681 and the average land holding per family is 0.28 ha. The BPL families of the watershed are about 15 % of the total population

12.9 SWOT Analysis of *Melatingal (4V4a)* watershed

The strength, Weakness, Opportunities and treat of the micro watershed was analyzed and the details are given in table 12.1

Table 12.1 .

SWOT Analysis of *Melatingal (4V4a)* watershed

Area of Intervention	Strength	Weakness	Opportunities	treat

Agriculture	38% of watershed area under paddy cultivation raising two crops. One padasekharasamithi functioning inside the watershed	60% of wetland ecosystem suitable for paddy cultivation converted into mixed crops and rubber	3 Ha cultivable fallow land where two crops can be raised. Raising of pulse & vegetable as third crop in 10 ha.	Conversion of wetland ecosystem which is suitable for raising paddy into rubber adversely affects the natural drainage and water table.
Horticulture	35% of area of watershed under coconut based farming system with intercrops such as nutmeg, plantain, pepper, ginger, turmeric, tuber crops.	23% of area of watershed under monocrop of rubber.	Incent with suitable soil and water conservation measures such as stone pitched contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting such as staggered trenches and pits.	A number of abandoned quarries situated in the micro watershed. Unscientific quarrying leads to depletion of water table
Natural Resources	The Vanmanapuram river which flow on the boundary Majority of the watershed area, the landform is gentle slope or valley.	Total area of the micro watershed is with steep slope subject to erosion hazards. Major soil in this area belongs to loamy soil with erodability as the major limitation.	Area treatment with suitable soil and water conservation measures such as Afforestation in very steep sloppy areas mulching, cover cropping, water harvesting measures such as staggered trenches.	Afforestation in very steep slopes. Soil & water conservation measures such as contour bunding, repair of old bunds, terracing in rubber, cover cropping in rubber, agrostological measures on bunds with soil bunding crops

12.10 Problem analysis

The project area was analysed after finding out the SWOT with its constrain and possible solution and detailed in table 12.2

Table 12.2
Problem analysis

No	Problem Area t	Constraints	Solutions	Project Support
1	Surface water Recourses	encroachment, bank erosion, poor aintenance of VCB Silting up of irrigation channel. Leakage of water through	Desiltation, embankment protection of thodu using earth silt and using cement concrete in specific areas. Repair of existing VCB's	Deepening of thodu, desiltation of thodu, sidevarambu earthening, and embankment stabilization side wall

		side wall of distributary channel	Desiltation of irrigation channel Repair of side wall of Channel	protection. VCB repair Desiltation of irrigation channel
		Presence of plutonic rock in hill crust decrease the yield of well wells dry up in December onwards in the upper reaches	Recharging wells	Rain water harvesting Recharging wells

12.11 Work plan

The work plan was prepared through the methodology proposed and the after analysis of the basic secondary data available. The general information of the *Melatingal* micro watershed are detailed in table 12.3

Table 12.3.

General information of the *Melatingal* micro watershed

Name of Watershed	<i>Melatingal</i>
Watershed Code	4V4a
Treatable Area in Ha	618 ha
Total Cost in Lakhs	Rs.11736000

The fund available for each components of the *Melatingal* micro water shed Fund Allocated according to the guideline are detailed in table 12.4.

Table 12.4

Fund allocated to each components of the *Melatingal* micro water shed

Sl.No	Component	Percentage	Total amount in Rs
1	Administration	10	577200
2	DPR Preparation	1	57720
3	Entry point activities	4	230880
4	capacity Building	5	288600
5	Productivity Enhancement	10	577200

6	Livelihoods for Asset less	9	519480
7	Natural Resource Management	56	3232320
8	Monitoring	1	57720
9	Evaluation	1	57720
10	Consolidation phase	3	173160
	Total	100	5772000

12.11.1. Entry Point activities of *Melatingal* watershed

The Entry point activities was selected under participatory activity and the activity has importance increasing productivity and water storage.. The details of the activity are detailed in table 12.5.

Table 12.5
Entry Point activities of *Melatingal* watershed

Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	Total	First year	
							Phy	Financial
Renovation of Irrigation Tank at melattingal ward no 1 of Kadakkavoor panchayat	1	nos	2,68,947.00	2,21,437.00	47,510.00	2,68,947.00	1	2,68,947.00

12.11.2. Year wise work plan

The year wise activity of watershed works are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 12.6.

Table 12.6
The summary of estimated amount of watershed works identified on year wise

Sl. No	Details of Activities	First Year	Second Year	Third year
1	Natural Resource Management	47,41,120	26,62,533.00	7,81,394.00
2	Livelihoods for Asset less	407200	283600	271200
3	Productivity Enhancement & Microenterprises	507625	351125	210375

The NRM works were identified based on the PRI methodology and the works were analyzed for the need and importance based on the watershed. Based on the analysis the summary of estimated amount of NRM works are shown in table 12.7.

Table 12.7
The summary of estimated amount of NRM works

Sl. no	Details of Activities	Quantity	Unit	Rate	IWMP	Convergence	WDF	Total
A	Ridge Area Treatment Plans							
1	Strip terraces	5000	Nos	142	0.00	710,000.00	71,000.00	710,000.00
2	Stone pitched bunds	4000	Sq.M	900	0.00	800,000.00	80,000.00	800,000.00
3	Contour earthen bunds	5000	Sq.M	142	0.00	1,000,000.00	100,000.00	1,000,000.00
4	Staggered trenches	4000	Mt	60	0.00	204,000.00	20,400.00	204,000.00
5	Moisture collection pits	6000	Nos	80	0.00	306,000.00	30,600.00	306,000.00
6	Centripetal terracing and mulching	178	Nos	400	36,134.00	0.00	3,613.40	36,134.00
7	Cover cropping	105	Cent	4	3,150.00	0.00	315.00	3,150.00
8	Horticulture	900	Cent	42	90,000.00	0.00	9,000.00	90,000.00

9	Agroforestry	250	Nos	35	25,750.00	0.00	2,575.00	25,750.00
10	Biofencing (live hedge)	100	Rmt	35	40,000.00	0.00	4,000.00	40,000.00
B	Drainage line treatment plans							
1	Gully plugging	1	Nos	6000	15,000.00	0.00	1,500.00	15,000.00
2	pond renovation		Works		73,111.00	44,924.00	11,803.50	118,035.00
3	Strem Sidewall Construction		Works		1,344,454.00	471,231.00	181,568.50	1,815,685.00
4	Vented Cross Bars New	1	Nos	150000	150,000.00	0.00	15,000.00	150,000.00
5	Canal Desiltation	1	Nos	25000	25,000.00	0.00	2,500.00	25,000.00
6	Desiltation of streams, ponds and Public wells.	2	Nos	65000	150,000.00	0.00	15,000.00	150,000.00
7	Recharge of wells.	4	Nos	500	6,000.00	0.00	600.00	6,000.00
8	Rainwater harvesting from rooftop catchments	364	Nos	2500	1,274,000.00	0.00	127,400.00	1,274,000.00
	Total				3,232,599.00	3,536,155.00	676,875.40	6,768,754.00

12.11.4. Year wise work plan of NRM works

The year wise activity of NRM woks are identified and estimated accordingly to the ridge to valley analysis and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 12.8.

Table 12.8
the summary of estimated amount of NRM identified on year wise

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Physical	Financial	Physical	Financial
Ridge Area Treatment Plans						

Strip terraces		284,000.00	2000	284,000.00	1000	142,000.00
	2,000.00					
Stone pitched bunds		500,000.00	1000	200,000.00	500	100,000.00
	2,500.00					
Contour earthen bunds		400,000.00	2000	400,000.00	1000	200,000.00
	2,000.00					
Staggered trenches		102,000.00	1000	51,000.00	1000	51,000.00
	2,000.00					
Moisture collection pits		153,000.00	1500	76,500.00	1500	76,500.00
	3,000.00					
Centripetal terracing and mulching	750	152,250.00	750	152,250.00	0	0.00
Cover cropping	500	15,000.00	125	3,750.00	125	3,750.00
Horticulture		40,000.00	300	30,000.00	290	29,000.00
	400					
Agroforestry		20,600.00	200	20,600.00	210	21,630.00
	200					
Biofencing (live hedge)		200,000.00	125	50,000.00	125	50,000.00
	500					
Drainage line treatment plans						
		0.00	0	0.00	2	30,000.00
Gully plugging	0					
		885,922.00	1	122,876.00	1	239,135.00
pond renovation	4					
		4,654,816.00	2	1,768,003.00	1	903,947.00
Strem Sidewall Construction	2					
		50,000.00	0	0.00	0	0.00
Vented Cross Bars New	1					
		25,000.00	1	25,000.00	0	0.00
Canal Desiltation	1					
		150,000.00	2	150,000.00	1	75,000.00
Desiltation of streams, ponds and Public wells.	2					
Recharge of wells.		3,000.00	1	1,500.00	2	3,000.00
	2					
Rainwater harvesting from rooftop catchments		1,400,000.00	100	350,000.00	114	399,000.00
	400					
Allied Activities						
Biogas plant		0.00		200,000.00	1	200,000.00
	0		1			
Total		9035588		3885479		2,523,962

12.11.5. Natural Resource Management Work Location

Details of Activities	First year		Second year		Third year	
	Phy	Location	Phy	Location	Phy	Location
Pond renovation	1	Pattala Talakulam , In Karavaram gram panchayat, Ward no 12 near Kollurkonam	0		0	
Stream Sidewall Construction	2	Kuruthapan kavu Kulam to Katadimukku,in Kadakavoor gram panchayat, Ward no 1	1	Ayampalli Thaburan nada todou, in Karavaram gram panchayat, Ward no 13	1	Pattala Kallianti todou,In Karavaram gram panchayat, Ward no 12
		Kollur konam ela thodu, In Karavaram gram panchayat, Ward no 12 near kallianthi kadvu				
Mini Drinking water scheme	0	SC colony near kuruthapan kavu temple in ward no 1 of Kadakavoor Gram panchyat	1		0	

12.11.6. Livelihoods for Assetless

The Livelihoods Activities were identified based on the need analysis and participatory interaction projects were analyzed for the successfulness and sustainability. Based on the analysis the summary of estimated amount of Livelihoods Activities projects are shown in table 12.9.

Table 12.9.
List of Livelihoods Activities and estimated amount.

sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Benificary share	Total IWMP share
1	Nursery (Tray method vegetable seedling)	10	unit	34000	25000	9000	250000
2	Nursery (Fruit Plants)	8	unit	34000	25000	9000	200000
3	Lease land Paddy farming	2	unit	8000	6400	1600	12800
4	Skilled labour group for coconut climbing	10	unit	25000	20000	5000	200000
5	Banana (N) cultivation by lease farmers	3	unit	25000	20000	5000	60000
6	Vegetable lease cultivation	3	unit	20000	16000	4000	48000
7	Floriculture	1	unit	85500	25000	60500	25000
8	Bee keeping	1	unit	18000	14400	3600	14400
9	pepper nursery unit	2	unit	30000	24000	6000	48000
10	Compost Production	3	unit	15000	12000	3000	36000
11	Vegetable Market	4	unit	50000	25000	25000	100000
		47		344500	212800	131700	994200

12.11.7. Year wise work plan of Livelihoods Activities

The year wise activity of Livelihoods Activities which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 12.10.

Table 12.10
Summary of estimated amount of Livelihoods Activities identified on year wise

Details of Activities	First year		Second year		Third year	
	Physical	Financial	Physical	Financial	Physical	Financial
Nursery (Tray method vegetable seedling)	3	75000	4	100000	3	75000
Nursery (Fruit Plants)	2	50000	4	100000	2	50000
Lease land Paddy farming	0	0	1	6400	1	6400
Skilled labour group for coconut climbing	8	160000	1	20000	1	20000
Banana (N) cultivation by lease farmers	1	20000	1	20000	1	20000
Vegetable lease cultivation	1	16000	1	16000	1	16000
Floriculture	0	0	1	25000	0	0
Bee keeping		0		0	1	14400
pepper nursery unit	0	0	1	24000	1	24000
Compost Production	1	12000	1	12000	1	12000
Vegetable Market	1	25000	2	50000	1	25000
	17	358000	17	373400	13	262800

12.11.8. Productivity Enhancement & Microenterprises

The Productivity Enhancement & Microenterprises were identified based on the need analysis and possibility of production enhancement and its successfulness and sustainability. Based on the analysis the summary of estimated amount of Productivity Enhancement & Microenterprises are shown in table 12.11.

Table 12.11.

Productivity Enhancement & Microenterprises and estimated amount.

Sl.no	Details of Activities	Quantity	Unit	Rate	IWMP	Beneficiary share to WDF	Total
1	Scientific management of existing coconut gardens	350	nos	190	66500	6650	66500
2	Intensification of crop density of Banana, Ginger, tuber crops - KIt	800	per kit	50	40000	4000	40000
3	Organic kitchen garden- Seed distribution	800	per packet	50	40000	4000	40000
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	75	per lot	375	28125	2812.5	28125
5	Scientific Paddy seed Farming	90	cent	50	4500	450	4500
6	Vegetable Farming	41	per 10 cent	5000	205000	20500	205000
7	Bio fertiliser production	2	per unit	5000	10000	1000	10000
8	Bio- control agent production	100	cent	40	4000	400	4000
9	Fodder Production	366	cent	25	9150	915	9150
10	Fish farming in public pond	1	nos	20000	20000	2000	20000
11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle)	4	per unit	20000	80000	8000	80000
12	Rabbit Rearing	1	per unit	10000	10000	1000	10000
13	Marketing Centre	3	per unit	20000	60000	6000	60000
	Total	2633		80780	577275	57727.5	577275

12.11.9. Year wise work plan of Productivity Enhancement & Microenterprises

The year wise activity, which were identified and estimated accordingly to the project and its importance of the work. Based on the analysis the summary of estimated amount are shown in table 12.12.

Table 12.12

The summary of estimated amount of Productivity Enhancement & Microenterprises identified

Sl.no	Details of Activities	First year	Second year	Third year

		Physical	Financial	Physical	Financial	Physical	Financial
1	Scientific management of existing coconut gardens	450	85500	150	28500	150	28500
2	Intensification of crop density of Banana ,Ginger,tuber crops - Klt	480	24000	160	8000	160	8000
3	Organic kitchen garden- Seed distubution	432	21600	145	7250	144	7200
4	Backyard poultry rearing (BYP) 5 birds 61 – 70 days old @75/bird	180	67500	60	22500	60	22500
5	Scientific Paddy seed Farming	54	2700	18	900	18	900
6	Vegetable Farming	48	240000	16	80000	16	80000
7	Bio fertiliser production	1	5000	1	5000	0	0
8	Bio- control agent production	60	2400	20	800	20	800
9	Fodder Production	105	2625	35	875	35	875
10	Fish farming in public pond	1	20000	1	20000	1	20000
11	Renovation of cattle Shed floor, urine tank & fodder trough for cattle)	6	120000	2	40000	2	40000
12	Rabbit Rearing	1	10000	1	10000	1	10000
						1	

CHAPTER 13

CAPACITY BUILDING PROGRAM

13.1 Introduction

Capacity Development has been recognized as a precursor for the success of any participatory project. It is envisaged that the Capacity Development Strategy should take into consideration not only planning and implementation level activities but also should go further so that sustainability of investments and benefits should continue. The capacity development strategy should be intended to provide the required professionalism and competence to the stakeholders associating with the project. The Capacity Development Strategy would include Organizational Development, Human Resource Development, Cooperation and Network Development and Institutional Development. All these processes are seen as a continuous process enabling functionaries to enhance their knowledge and skills and to develop the required orientation and perspectives thereby becoming more effective in

performing their roles and responsibilities. Within Human Resource Development, Capacity Building of the primary stakeholders, viz. farmers, SHGs, UGs, WC members including village volunteers, community link workers etc would be carried out by the Project Implementation Agencies (PIAs). Capacity Building activities would cover a variety of thrust areas ranging from natural resources management, cropping systems development, skill development, development of Self Help Group (SHG), micro enterprise development, sanitation, general awareness building etc. These will be addressed through trainings, skill development programs, exposure visits, hands on demonstrations etc.

The training should include Human Resource Development, Organizational Development and Institutional Development activities for the secondary stakeholders namely the PIAs, Grama Panchayats, WDTs and Line department staff etc who in turn act as the trainers for the primary stakeholders.

As per the Common Guidelines for Watershed Development, there has been separate provision of funds over and above the earmarked Capacity Development under the IWMP to support development of Capacity Development strategies and for establishment of consortium of resource organization.

13.2 Capacity Development Strategy

The term Capacity Development is understood as the development of capability of people, organizations and societies to manage resources effectively and efficiently in order to realize their own goals on a sustainable basis. In this context, four important aspects have to be given special focus:

1. The development of the human resource or personnel development.
2. The strengthening of the effectiveness and efficiency of organization or organizational development.
3. The strengthening of cooperation between organizations and network development.
4. The promotion of institutional frameworks for development.

Capacity Development is the key mechanism to introduce participatory approach for planning, implementation and management of watershed activities through Gram Panchayats (GPs) in the IWMP. It is the major means by which Panchayat Raj Institutions (PRIs) and project staff shall be enabled to successfully undertake their work with the communities of the project areas, including women and other vulnerable sections of the society. For smooth implementation of project activities, capacity building of all the stakeholders is essential, to build their conceptual, managerial, technical and operational capabilities. Participatory approach in Project Implementation requires the project participants to go in for a novel approach and experience of working in collaboration with each other.

Hence, orientation of both project personnel and watershed communities according to the changing perspective is imperative.

In this perspective, a Capacity Development Program has multiple roles to play. It will enhance skills and competence of project staff to work with GPs. It will deepen the participatory process through imparting participatory rural appraisal skills and will initiate change in attitude among project staff. The success of trainings will be measured by the degree of institutional, organizational and attitudinal change, while recognizing that trainings have always to be reinforced by management. It will also be measured by the acquisition of new skills and competence, the performances of new tasks, and the performance of old tasks in a different way.

13.3 Objectives of Capacity Development under IWMP

The wider objective of capacity development is to lay the foundation for the achievement of project objectives. This will include strengthening community participation, ensuring positive involvement of communities in managing their common property resources, integration of resources in all projects activities and improvement in the socio-economic conditions of disadvantaged groups, especially women. However, the following will be the specific objectives of the capacity building program:

1. Develop proper conceptual understanding about Integrated Participatory Watershed Management including Equity and Environmental and Social sustainability among all the implementing agencies including PRIs as well as local communities.
2. Build necessary skills and competence among the project officials, PRIs, especially GPs and other Communities Based Organizations (CBOs) about planning, implementation and management of various project activities.
3. Create an atmosphere conducive for implementing the project adopting participatory approach through inculcating changes in attitudes.
4. Help in the institutional development of Watershed Committees at the Gram Panchayat level and organizational development of watershed perspective at the district level.
5. Develop understanding about the Environmental and Social issues and enhance the capability of all stakeholders for the sustainability of program initiated by the project.

13.4 Training Need Assessment

The first and foremost task in the process of Capacity Development is to assess the training requirements of the stakeholders at different levels. Watershed management being a multidisciplinary approach, it has to address the multi-dimensional needs of all the stakeholders. The training needs and requirements, thrust areas of training, contents and coverage and the project phase during which it is essential to be imparted are assessed for the concerned group of stakeholders. Emphasis is also given for topics such as communications and listening sensitivity, interpersonal relations, leadership,

teamwork and so on. This training will enhance the quality of the output of various individuals and organizations who are involved in Community Participation in Natural Resource Management. The training need assessment done is detailed in table 13.1

Table 13.1
Training need assessment

Sl.no	Target Groups	Broad Objectives	Coverage/ Topic
1	Policy makers and executives of all three tiers of PRIs viz. Members of Zila Panchayat, Block Panchayat, Gram Panchayat, and other leaders	<ul style="list-style-type: none"> To sensitive the policy makers on various dimensions of integrated participatory Watershed management Understanding about planning, implementation and management of project activities 	<ul style="list-style-type: none"> Orientation on project concept, Participatory Watershed approach for development- concept, need and methodology Roles and responsibilities of PRIs and other CBOs in IWMP Institutional and financial arrangements, Operational issues, constraints, coordination and linkages Gender sensitization, women and other vulnerable sections in IWMP Transparency and Participatory Monitoring and Evaluation Impact assessment and social audit Vision building for broad based project decision making and mutual role clarity Conceptual, legal and practical issues of management Consolidation and withdrawal plan
2	Project implementation agency	<ul style="list-style-type: none"> To work with various instruments of project management and capacity development. Develop technical and Participatory skills and capabilities for IWMP To prepare the detailed project 	<ul style="list-style-type: none"> Training on how to use various instruments of project management and capacity development. Orientation on project concept, integrated Participatory Watershed approach for development- concept, need and methodology. Preparation of detailed project reports. Roles and responsibilities of PRIs and other CBOs in IWMP Roles and responsibilities of other

		<p>report.</p> <ul style="list-style-type: none"> • To work with PRIs as facilitators • Developing necessary skills to work with communities • To impart technical skills to the community • To develop the training, capability and competence of trainers and resource persons 	<p>stakeholder in IWMP/ multi stakeholder analysis</p> <ul style="list-style-type: none"> • Organizational management of IWMP • Vision building for broad based project decision making and mutual role clarity • Introduction of PPP approach in watershed development <p>Social and Institutional</p> <ul style="list-style-type: none"> • Techniques for community mobilization Communication, negotiation and conflict resolution skills • Understanding of group dynamics and implication • Knowledge about functioning of HG, UG • Motivation and Sensitization on Gender issues and those dealing with other vulnerable sections • Decision making and networking • Vision building for broad based project decision making and mutual role clarity Transparency and Participatory Monitoring and Evaluation • Impact assessment and social audit • Institutional arrangements for income generation activities, coordination and linkages • Program/Schemes & their convergence • Conceptual, legal and practical issues of management • Organizational Management and Operational issue • Documentation and Report Writing Skills
--	--	--	--

			<ul style="list-style-type: none"> • Fund flow mechanism, and accounting procedures, Maintenance of records, Budget Estimation, Reporting systems, preparation of report Survey and data collections, PRA tools and techniques and all practical issues • Planning for Integrated participatory Watershed development at various levels • Consolidation of Village level Committee proposals for preparation of WC level Watershed Development Plan, implementation and monitoring process. • Consolidation and withdrawal plan • Training on farming systems (Agriculture, Horticulture, Livestock), Forestry, Conservation practices, production measures and Extension methods
3	WDT	<ul style="list-style-type: none"> • To work with various tools of project management. • Develop technical & Participatory skills and capabilities for IWMP. • To work with PRIs as facilitators 	<ul style="list-style-type: none"> • Develop skills to use various tools of project management • Orientation on project concept, Participatory Watershed approach for development- concept, need and methodology • Roles and responsibilities of PRIs and other CBOs in IWMP • Roles and responsibilities of other stakeholder in IWMP/ multi stakeholder analysis • ToT on domain specific modules • Evaluating Capacity building impacts • Impart Participatory skills under IWMP • Motivation and Sensitization on Gender issues and those dealing with other vulnerable sections

			<ul style="list-style-type: none"> • Women confidence building and empowerment • Transparency and Participatory Monitoring and Evaluation • Impact assessment and social audit • Institutional arrangements for income generation activities, coordination and linkages • Operational Issues • Women Confidence Building, Decision Making and Empowerment, Formation of CBOs and their functioning • Fund flow mechanism and accounting procedures and Maintenance of records, Budget Estimation, Reporting systems, preparation of report, Documentation and Report Writing Skills , Planning Survey and data collections, use of PRA tools and techniques and all practical issues • Planning for Integrated participatory Watershed development at various levels • Consolidation of proposals for preparation of WC level Watershed Development Plan, implementation and monitoring process. • Preparation of Annual Action Plans • Consolidation and withdrawal plan
4	Watershed committee	<ul style="list-style-type: none"> • Develop technical and Participatory skills and capabilities for IWMP • To build the capacity of members for planning, implementation and 	<ul style="list-style-type: none"> • Orientation on project concept, Participatory Watershed approach for development- concept, need and methodology • Roles and responsibilities of PRIs and other CBOs in IWMP • Roles and responsibilities of other stakeholder in IWMP Communication, negotiation and conflict resolution skills

		management of Watershed on participatory basis	<ul style="list-style-type: none"> • Leadership and decision making, Motivation and Sensitization on Gender issues and dealing with other vulnerable sections • Transparency and Participatory Monitoring and Evaluation • Impact assessment and social audit • Fund flow mechanism, and accounting procedures, Maintenance of records, Budget Estimation, Capacity building for internal audit arrangement • Survey and data collections, PRA tools and techniques and all practical issues • Planning for Integrated Watershed Management through CBOs and other Community Members viz. SHGs, UGs, Panchayat, Grama sabha and, villager leaders and vulnerable sections • Develop technical and participatory skills and capabilities for IWMP • Socio-economic empowerment • Preparation of Annual Action Plans • Consolidation and withdrawal plan • Training on farming systems (Agriculture, Horticulture, Livestock), Forestry NRM, Engineering aspects operation and Maintenance practices • Conservation practices, production measures
5	SHGs, UGs CBOs and other Community Members viz. Panchayat, Karashka snagaam and Kudumbashree and their Apex bodies, villager	<ul style="list-style-type: none"> • Develop technical and Participatory skills and capabilities for IWMP • To build the capacity of members for planning, implementation and management of 	<ul style="list-style-type: none"> • Orientation on project concept, Participatory Watershed approach for development- concept, need and methodology • Roles and responsibilities of PRIs and other CBOs in IWMP • Roles and responsibilities of other stakeholder in IWMP • Communication, conflict resolution skills

	<p>leaders and vulnerable sections</p>	<p>Watershed on participatory basis</p>	<ul style="list-style-type: none"> • Leadership and decision making • Motivation and Sensitization on Gender issue and dealing with other vulnerable sections • Transparency and Participatory Monitoring and Evaluation, Impact assessment and social audit, Fund flow mechanism, and accounting procedures • Maintenance of records, Budget Estimation • Capacity building for internal audit arrangement, Survey and data collections, PRA tools and techniques and all practical issues • Planning for Integrated Watershed management through CBOs and other Community Members viz. SHGs, UGs, Panchayat, Grama saba and karaska sangam their Apex bodies, villager leaders and vulnerable sections • Develop technical and participatory skills and capabilities for IWMP • Socio-economic empowerment • To build and enhance the capacity of members for planning, implementation and management of Watershed on participatory basis development at various levels Individual lands • Consolidation of proposals for preparation of WC level Watershed Development Plan, implementation and monitoring process. • Preparation of Annual Action Plans Consolidation and withdrawal plan • Training on farming systems (Agriculture, Horticulture, Livestock), Forestry NRM, Engineering aspects operation and Maintenance practices
--	--	---	---

			Conservation practices, production measures
--	--	--	---

13.5 Training plan

Training Plan: Implementation of IWMP at Chirayinkeezhu Watershed

Program 1

Target Group: Policy makers and executives of all three tiers of PRIs viz. Members of Zila Panchayat, Block Panchayat, Gram Panchayat, Officers of line departments and other leaders							
I	Name of Training	No of trainings	No of days per program	No of participants in each program	Total No of participants	Cost per participant per day	Total cost
a	Orientation on project concept, Participatory Watershed approach for development-concept, need and methodology	5	1	50	250	250	62500
b	Institutional and financial arrangements, Operational issues, constraints, coordination and linkages						
c	Vision building for broad based project decision making and mutual role clarity						
d	Roles and responsibilities of PRIs and other CBOs in IWMP	6	2	50	300	250	150000
e	Gender sensitization, women and other vulnerable sections in IWMP						

f	Conceptual, legal and practical issues of CPR management Consolidation and withdrawal plan						
g	Transparency and Participatory Monitoring and Evaluation	6	1	40	240	250	60000
h	Impact assessment and social audit						
Sub Total							2,72,500

Program 2:

II Orientation on implementation of IWMP-Target Group: Project Implementation Agency							
a	Orientation on implementation of IWMP- concept, philosophy, approach, methodology, components of the project, institutional arrangements,	2	1	50	100	250	25000
b	DPR, financial aspects, monitoring and evaluation	1	1	50	50	250	12500
c	Project management tools	1	1	50	50	250	12500
d	Program/Schemes, activities & their convergence	2	2	50	100	250	50000
	Social equity, gender aspects						
	Roles and responsibilities of different stakeholders Community Mobilization and community capacity building						
e	Understanding of group dynamics and implication	1	2	50	50	250	25000
	Formation of SHGs, Ugs						

	Livelihood and Production						
	Transparency and Participatory Monitoring and Evaluation						
	Decision making and networking						
	Impact assessment and social audit						
	Documentation and Report Writing Skills						
f	Consolidation and withdrawal plan	1	2	50	50	250	25000
g	Financial Aspects	1	1	50	50	250	12500
	Sub Total						162500

Program 3:

III	Orientation Training to WDT & other key functionaries-Target Group: WDT, Block staff, Line department staff						
a	Orientation on implementation of IWMP- concept, philosophy, approach, methodology, components of the project, institutional arrangements,	1	1	30	30	250	7500
b	Preparation of plan, design, estimate and drawings for individual works	3	1	30	90	250	22500
c	Financial aspects, monitoring and evaluation	1	1	30	30	250	7500
d	Project management tools	2	1	30	60	250	15000
e	Program/Schemes, activities & their convergence						
	Social equity, gender aspects	1	1	30	30	250	7500
f	Roles and responsibilities of different stakeholders						
	Community Mobilization and community capacity building						
	Understanding of group dynamics and implication						
	Formation of SHGs, Ugs	1	2	30	30	250	15000

g	Livelihood and Production (Institutional arrangements, coordination and linkages)	4	2	30	120	250	60000
h	Transparency and Participatory Monitoring and Evaluation	1	2	30	30	250	15000
	Decision making and networking						
	Impact assessment and social audit						
	Documentation and Report Writing Skills						
i	Preparation of Annual Action Plans	4	2	30	120	250	60000
	Consolidation and withdrawal plan						
Total							210000

Program 4:

IV	Orientation Training to Watershed Committee - Target Group: Members of WC						
a	Orientation on implementation of IWMP- concept, philosophy, approach, methodology, components of the project, institutional arrangements,	9	1	50	450	250	112500
b	Program/Schemes, activities & their convergence	9	2	50	450	250	225000
	Social equity, gender aspects						
	Roles and responsibilities of different stakeholders						
c	Community Mobilization and community capacity building	9	1	50	450	250	112500
	Understanding of group dynamics and implication						
	Formation of SHGs, UGs						
	Transparency and Participatory Monitoring and Evaluation						

d	Livelihood and Production	9	2	50	450	250	225000
e	Decision making and networking						
	Impact assessment and social audit						
	Consolidation and withdrawal plan						
	Survey and data collections, PRA tools and techniques and all practical issues	9	2	50	450	250	225000
f	Training on farming systems (Agriculture, Horticulture, Livestock), Forestry NRM, Engineering aspects operation and Maintenance practices	18	2	50	900	250	450000
g	Conservation practices, production measures	9	1	50	450	250	112500
h	Financial aspects, monitoring and evaluation	9	1	45	405	250	101250
	Total						15,63,750

Program 5 :

V	Training to Community Organizations -Target group: Community Organizations like SHGs, UGs, Panchayat Karashka snagaam and Kudumbashree and their Apex bodies, village leaders and vulnerable sections						
a	General orientaton on IWMP	18	1	50	450	250	112500
b	Establishment of livelihood and production groups						
	Roles and responsibilities of User Groups in Project Implementation, management, Monitoring and Evaluation	9	1	40	360	250	90000
c	Transparency, Impact assessment, social audit, Fund flow mechanism, and accounting procedures, Maintenance of records, Budget Estimation	9	1	40	360	250	90000
d	Training on farming systems (Agriculture, Horticulture, Livestock), Forestry NRM, Engineering aspects operation and Maintenance practices Conservation practices, production measures	90	2	35	3150	250	1575000
Total							18,67,500

Summary of the programs and cost

Sl.no	Trainings	Cost in Rs
1	Orientation on implementation of IWMP Policy makers and executives of all three tiers of PRIs viz. Members of Zila Panchayat, Block Panchayat, Gram Panchayat, Officers of line departments and other leaders	2,72,500
2	Orientation on implementation of IWMP to Project Implementation Agency	162500
3	Orientation Training to WDT & other key functionaries-Target Group: WDT, Block staff, Line department staff	210000
4	Orientation Training to Watershed Committee - Target Group: Members of WC	15,63,750
5	Training to Community Organizations like SHGs, UGs, Panchayat Karashka snagaam and Kudumbashree and their Apex bodies, village leaders and vulnerable sections	18,67,500
Grand Total		40,76,250

CHAPTER 14

EXPECTED OUTCOMES

The project aims to bring about improvement in conserving the natural resources necessary for human survival, i.e., water, soil and the bio mass on the one hand and an overall improvement in the economic and social life of the people living in the watershed area. Project interventions are need based and is expected to increase the agricultural productivity in the villages of Chirayinkeezhu Watershed area thereby increasing the individual income through agricultural activities and self employment.

Table 15.1

Sl.no	Present status	Treatment area	Expected outcome
Conservation of natural resource	2500	2500 ha	4700 ha
Ground water	2-9 m	2500 ha	2-5
Drinking water	10 months availability	1400 ha	Available all around the year
Expected Crop Yield.	Productivity reduced due to non availability of water in summer.		Productivity to reach at improved level.
Horticulture	568 ha	1450 ha	2000 ha
Livestock	Productivity of 3-7 lit milk	250 ha of fodder cultivation	Productivity of 5-10 lit milk
Quality fodder	Available only 3 months	250 ha	Available round the year
Employment	Women employment has to be improved	110 schems of livelihood	Increase in employment women and BPL families

Conservation of Natural resources

Most of the activities taken up as part of the project are intended to conserve the natural resources. For example, check dams, contour bunds, renovation of water bodies, afforestation, desilting of canals etc will contribute much towards water conservation and preventing soil erosion. Since the entire watershed area is covered under the project, substantial improvement is expected.

By way of capacity development, there will be positive change in the attitude of the people towards taking up new ventures for conservation of natural resources and creation of a positive spirit to sustain the developmental effects achieved through the project.

Ground water table

At present, the ground water level of open wells varies from 2 meter to 9 meter, from village to village. The groundwater has gone down due to rapid increase in population and increased use of water. The watershed activities like roof water harvesting, well recharging, rain water harvesting pits,

staggered trenches, etc. will help in ground water recharging and it is expected that the ground water level will improve reaching 2 to 5 meter level.

Drinking water

The villages in the project area totally depend upon hand pumps and open wells for drinking and other domestic activities. Generally the water availability is only for 10 months. The activities of watershed will increase the ground water table thus increasing the period of drinking water availability.

Expected Crop Yield.

Due to improvement in availability of water, farmers of the project area will be able to take more crops in their available land. The productivity will also increase due to (i) availability of more water for irrigation, and (ii) use of modern farming techniques. This in turn will fetch them more income.

Horticulture

The watershed area holds good potential for horticultural activities. It is expected that due to increase in horticulture plantation area, the production will go up fetching more money for the farmers which will boost up other economic activities. It is also proposed to diversify horticulture activity by bringing more area under money fetching horticulture plants. The expansion of horticulture in the area will directly increase the income levels of the entire household engaged in the horticulture activities. There will be significant increase in the area covered under horticulture.

Livestock

Milch-animals include cows and buffalos. Productivity of the cow is 3-7 liters per day where as the buffalo give 5-10 liters of milk per day. Advanced breeds will be promoted in the watershed area in order to enhance milk production. The introduction of the model farm is expected to increase the quality and quantity of milk production. Due to the various interventions, milk productivity will substantially increase.

Quality and quantity of fodder

With the distribution of good quality fodder seeds and fodder plants to all households involved in livestock activities, the farmers will be able to produce the required fodder in their own lands and attain self-sufficiency in fodder. This will ensure fodder availability throughout the year encouraging the farmers to take up animal husbandry activities on a broader scale to improve their living conditions.

Employment

The project envisages livelihood activities whereby the landless and assetless people can have opportunity for a decent living and through the self sustenance and self reliance, a general improvement in their social status. IWMP creates employment opportunities during the work phase for labour intensive activities like construction of gully plug, earthen dam, farm bund, check dam, check wall and through the asset created under watershed program a direct impact on agriculture

and natural resource development. As the net employment increases, the percapita income of agriculture, animal husbandry and other allied activities will also increase.

Expected Outcomes of the Project

Sectors	Expected outcomes	Indicators
Agriculture	Improved irrigation	Increment in gross irrigated area
	Enhancement in agriculture production	Increment in quantity of agriculture produces
	Good organic farming	Number of functional compost units
Horticulture	Enhancement in crop production	Rise in quantity produced
Natural resources	Pasture land development	Increment in pasture land area
	Improvement in water resources	Physical existence of the water bodies
Animal husbandry	Dairy development	Number of dairy farming units
	Improved bee keeping practices	Number of farmers with commercial production of honey
Micro enterprises	Improvement in women's status	Number of women engaged in successful enterprises.
	Increment in income of women and their institutions (SHGs)	Additional income for women
	Nursery Raising	Physical existence of new nurseries
	Honey and fruit processing unit	Well functioning honey and fruit processing units
	Better market facility	Number of well functioning vegetable and fruit collection centers, milk and honey preservation units
Development of BPL families	Increment in the income of BPL families. Improvement in social status BPL families will have ownership over the generated resources.	Improvement in economic status of BPL HHs

Pre-intervention and expected post intervention status

Sectors	Present Status	Post Intervention Status

Agriculture	Agricultural products are being practiced as a major livelihood option for the watershed population	Increase in the area under agriculture cultivation and increase the socio-economic status of the population in the watershed area.
Horticulture	Horticulture is the major livelihood activity of the villagers, which is dominated by banana and vegetable production.	The cultivation area under horticulture production will be increased with diversification of crops and quality. It will also increase the economic status of the population.
Processing and Marketing	Right now there is no structured marketing procedure for the products. Also there is no collection centre to store and gradation of the products.	The marketing system will be strengthened, and linkage will be established with corporate houses and as a result of the collection centre available, which further prevents loss of products. Farmers will get competitive price also
Cattle Management	Low level of awareness and expertise in cattle Management.	Increased awareness and expertise about cattle management.
Milk production	Current Milk Production per cow is 3 litres per day.	Milk production will be increased to 5 – 6 litres per cow as a result of increased fodder availability and balanced food and scientific Technique.
Milk Marketing	Milk Production is not an income generation activity. Only for self consumption.	Milk production will become a commercial activity and the people will form a co-operative & SHG with the help of Govt. and access to the organized Markets
Fodder Availability	There is not enough good quality fodder available in the watershed area throughout the area.	Increased availability of cattle balanced fodder production. The households who practice animal husbandry will be able to meet the fodder requirement locally throughout the years.
Irrigation	No Irrigation systems prevalent in the water shed area at present	All the cultivated lands will be covered by digging new wells and renovating the existing ones.

Soil Erosion and Landslides and Rain Water Harvesting	Soil erosion and landslide are very prevalent in the watershed area.	The soil erosion will be checked through the creation of stone pitched const our buns and other measures. Landslide will be minimized
Nursery Raising	Activity being practiced not in a systematic manner	Nursery raising will be carried out in an organized way and it will improve the economic condition of the people under the watershed area.
Bee keeping	Activity being practiced not in a systematic manner	Bee keeping will be carried out in an organized way and it will increase the income level of the community
Mushroom	Activity being practiced not in a systematic manner	Mushroom cultivation will be carried out in an organized way and it will increase the income level of the community.
Vermi compost	Vermi- Compost is not practiced The knowledge base of the community regarding organic farming is not sufficient	Vermi Compost will be carried out in a planned manner and income level will be increased. Community will get knowledge about organic farming. Over time, more people will go for organic framing in the watershed area
Interventions for BPL families	There are only limited interventions which are exclusively aimed at BPL families of that area.	The livelihood enhancement programmes under the IWMP will directly benefit all the BPL families in the area and bring remarkable changes in their standard of living by creating sustainable livelihoods options.
BPL Status	At present there are 65 % BPL families in the watershed area	The BPL status of the families will be improved and they are expected to attain the status of APL over time after the proper implementation of watersheds projects.