

Soil, water and biomass are vital natural resources for human survival. The growing population in the world and increasing demand are placing tremendous pressure on these resources, which results in fast depletion of these resources in many countries posing serious problems to agriculture sustainability, livelihood opportunities and vulnerable communities. Soil, water and biomass conservation including micro-scale water resource development is the foundation of any watershed development programme. The Watershed approach represents the principle carrier for transfer of rainfed agriculture. A watershed is a geographic area that drains to a common point, which makes it an ideal planning unit for conservation of soil, water and biomass; and encourage the sustainable development of the area by empowering people at the local level to manage their own resources. Watershed development provides immense scope for effective integration of various sectoral programs, primarily based on a “ridge to valley” approach. Integrated watershed management is a prerequisite not only for land, water, and biomass management of degraded areas but also for improving the livelihood of farmers as well as for conservation of areas so that biodiversity is protected for future generations.

Food security and social security are the two vital linkages of stability and wellbeing of man-kind. Anyone who has concern for the ‘mother earth’ and ‘future generation’ cannot be a silent spectator to the excessive greediness of certain human beings for mere economic motives at the cost of our food and social security. Increasing biotic pressure, absence of appropriate technology, lack of strong policy and public participation coupled with the lack of proper understanding of environmental inter-linkages etc. have led to progressive decline of natural resources and environment. Sustainable development has been the key objective of development strategies since 1970s.

The increasing human and livestock population is continuously exerting pressure on the natural resource base for land, food, fuel and fodder. Due to ever increasing extension of agricultural land towards the marginal and steep hill slopes, deforestation, erosion and many such ill-effects on local environment have been on the rise. Faced with immediate survival needs, local people often have no alternative and are being involved in extracting more natural resources. The forests have been ruthlessly over-exploited by both the legal and illegal encroachments. Consequently, forest depletion has accentuated further soil erosion, decline in land productivity and mounting dearth of fuel, fodder and water resources. People who sustain their livelihood on the utilization of such fragile environment and natural resources have over exploited these resources over a period of time and they have further eroded the resource base on which they must subsist.

Among the various environmental issues, accelerated rate of soil erosion, massive deforestation, productivity decline, drying up of large number of springs, climatic changes etc. have stood as the main threats to the environment. All these go a long way

towards influencing the conditions of development. Thus human interference has caused a decrease in forest land ratio. Many efforts have been made in order to maintain the productivity of land resources after the initiation of the five year plan in the country. The output of such resources has also increased by many folds, but in practice most of the people in mountain and hill regions still suffer from malnutrition. In short, backwardness of a region is not caused by lack of resources but by the problem of resource development and management.

High level of coordination strongly associated with high quality of communication is necessary between the various stakeholders involved in participatory natural resource management. Forward and backward linkages between the various organisations (such as PRI, transferred institution, NHG, watershed committee etc.) has to be assured for achieving the coordination towards the common goal. Separate strategy has to be worked out to participate different strata of society incorporating diverse interests and various hydrological units including private land, water resources, drainage line, government land, etc. The new opportunities for natural resource management emerging during the 12th plan need to be seized and provided with socio political impetus in the above line for watershed management to take root in the state.

The Integrated Watershed Management Programme (IWMP) is planned with an aim of integrated sustainable eco-friendly development of the rural areas of the country. The objective of the Integrated Watershed Management Programme (IWMP) is to attach locally available natural resources in an optimum manner to achieve the overall goal of sustainable development in the area. These objectives can be realized by conserving, protecting and restoring the ecological balance by developing natural resources and by preventing soil erosion, degradation of top soil cover, regeneration of natural vegetation, rain water harvesting and recharging of the ground water table. The programme also gives specific importance to the productivity enhancement of agriculture/ horticulture/ animal husbandry activities and innovative sustainable livelihood development of the community. The activities for resource development and usage will be planned to promote farming and allied activities to promote local livelihoods while ensuring resource conservation and regeneration.

Sustainable development of an economy depends on many factors. Especially the critical sector like agriculture plays a key role not only for the development but also for livelihood security. India is no exception to this phenomenon. The progress in agricultural sector in India during the past 60 years has been significant by changing the food shortage situation to the surplus state.

However, the increasing population, development of other sectors and the liberalized trade policies pose greater challenge to agricultural sector. This situation becomes more complex when the resources especially land and water, available for agricultural sector is shrinking day by day due to its competing uses.

Watershed Development Programmes - Kerala experience

Watershed development programmes are being implemented in Kerala for the last three decades or more by central and state agencies and a host of Non-Governmental Organisations. The Western Ghat Development Programme (WGDP) was the beginning point as far as the state was considered. This is followed by the Integrated Wasteland Development programme, Hariyali and now the Integrated Watershed Management Programme (IWMP) implemented through the Rural Development Department. Departments like the Agricultural Department, Land Use Board & Soil Survey Department are also engaged in watershed development activities. Various NGOs also are in the field taking up projects funded by central and state agencies. The concept regarding watershed development has undergone considerable change during this period. The treatments carried out by the different agencies differed at conceptual and implementation levels. This has generated a lot of debate regarding the effectiveness of the development programmes being implemented.

Watershed development programmes were aimed at land and water management, emphasis being on enhancing water availability. The ridge to valley treatment mainly includes civil engineering works like gully plugging, contour bunding, terracing construction of water percolation pits etc. These were aimed at enhancing water availability and improving the ground water recharging as well as reducing soil erosion. To further enhance water retention & improve the biomass cover, tree planting including social forestry activities were resorted to. All these activities were expected to support agricultural activities. More area was brought under cultivation and agricultural productivity and agricultural production increased subsequently.

Relevance of Watershed Management in Kerala

The relevance of watershed management in Kerala is established for the following reasons.

1. Steep slopes.

90% of the geographical area of the State comes under the midland and hilly regions with steep slopes making the area more prone to erosion hazards.

2. Unscientific agricultural practices.

The increase in density of population has resulted in people migrating to the hilly and forest areas resulting in drastic changes in the agricultural setup and land use of the State. The unscientific land use, change in cropping pattern, deforestation, etc due to the encroachment hastened deterioration of the natural resources.

3. Intense rainfall confined to relatively lesser number of days.

Even though the State receives more than 3000mm of annual rainfall, the rainwater is not conserved or utilized effectively because of the improper water conservation and rain water harvesting measures. The per capita availability of water in the State is far below than the States of Rajasthan, Gujarat, etc

4. Degradation of upper catchments

Degradation of upper catchments due to human interference resulting in drying up of river and siltation of reservoirs.

5. Rapid land use change

Rapid land use change due to deforestation, plantation crops and setting up of human habitations.

6. Fast running and short rivers

Most of the rivers of the State originate from the Western Ghats. Because of the steepness of the hill slopes and minimal horizontal distance to the sea, rainwater flows rapidly to the sea as soon as it reaches the ground.

7. Unscientific human interventions

Sand mining, destabilization of hill slopes, filling of wetlands and marshes for commercial and industrial purposes, conversion of paddy lands for cultivation of other cash crops and nonagricultural purposes are the common human interventions encountered in the State leading to instability of the natural ecosystem

8. Degradation of forest resources.

The forest area lying adjacent to human settlements are being subjected to rapid degradation due to human interventions.

9. Flood and drought

Though Kerala is receiving more than 3000 mm rainfall the State is facing intermittent drought and flood due to unscientific land utilization and soil and water conservation practices.

10. Soil Erosion

About 9.5 lakh ha of land is prone to severe erosion in the State. Annually around 15 tons of soil is lost from 1ha of such land. At the same time the formation of one inch of soil require around 1000 years.

11. Ground water scenario of the state.

Because of the over exploitation of the ground water resources, 5 blocks have been classified as over exploited, 15 blocks as critical and 30 blocks as semi critical. Besides this deterioration, critical levels of iron, NO₃ and fluoride has been noticed in some places.

Principles of Watershed Management

Sound watershed management means controlling floods and reducing land degradation as well as improving livelihood of farmers. The main principles of watershed management are given below:

1. Utilizing the land according to its carrying capacity.
2. Maintaining adequate vegetative cover particularly during the rainy season
3. Conserving maximum possible rainwater at the place where it falls
4. Draining out excess water with a safe velocity to avoid soil erosion and diverting it to storage tanks for future use

5. Preventing gully formation and checking at suitable intervals to control soil erosion and recharge groundwater
6. Maximizing productivity per unit area, per unit time, per unit of water
7. Increasing cropping intensity and land equivalent ratio through intercropping and sequential cropping
8. Safe utilization of marginal lands through alternative land use systems
9. Ensuring sustainability of the ecosystem benefiting the man-animal-plant-land-water complex in the watershed
10. Maximizing the combined income from the interrelated and dynamic crop-livestock-tree-labour complex over the years
11. Stabilizing total income and cutting down risks during aberrant weather situations,
12. Improving infrastructural facilities with regard to storage, transportation, and marketing, systematic and proper delineation of the watersheds,
13. Emphasizing locals initiatives and acknowledging larger public interest,
14. Taking long-term approach to use the best available scientific information and
15. Formulation of action plans based on an ecosystem approach.

Even after withdrawal of economic resources, technical expertise and infrastructure if the program survives, then it 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.

Need and scope for watershed development

A large portion of the rainfed areas (65 per cent of arable land) in India is characterized by low productivity, high risk and uncertainty, low level of technological change and vulnerability to degradation of natural resources. The rainfed region houses a sizable number of unemployed, poverty ridden and undernourished population. The majority of the population in the region is depending on agriculture.

Water is critical for rainfed areas. Not because of scarcity *per se* but lack of proper management that accelerates shortages.

Broadly, the rain fed areas are confronted with two major technical and water-related problems:

- (i) heavy and intense rainfall and surface run-off during the monsoons leading to soil erosion and siltation or pollution of water bodies in downstream, and
- (ii) severe drought in the summer season leading to acute scarcity of water for post-rainy season crops.

These two extreme eventualities need to be managed for enhancing agricultural productivity, augmenting income and preventing degradation of soil and water resources. The watershed programme was initiated with the basic premise to overcome such anomalies in the country. It was viewed as the key programme, which could meet the emerging and complex challenges of rainfed areas: deplorable poverty, huge

unemployment and acute degradation of natural resources. The programme was reckoned as a catalyst to bring the second-generation green revolution in the rainfed areas. The programme was expected to benefit the poor marginal farmers and bridge the gap between irrigated and rainfed areas.

The Integrated Watershed Management Programme (IWMP) was taken up to reduce the severity of drought especially in dry lands and bring them under productive use through soil conservation and other water resource development activities such as construction of major and minor check dams, percolation ponds, renovation of tanks, farm ponds, developing agro forestry, plantation, horticulture, tree plantation, home-stead plantation etc.

The main objectives of the IWMP are

- (i) to promote the overall economic development and improvement of the socioeconomic conditions of rural poor people in the programme areas through optimum utilisation of resources,
- (ii) generation of employment and
- (iii) Augmentation of other income generating activities.

Further, it also aims at encouraging restoration of ecological balance in the village through simple, easy and affordable technological and sustained community action (peoples' participation).

All these would result in overall uplift of poor and disadvantaged sections of the community.

Watershed approach to IWMP

The watershed approach has conventionally aimed at treating degraded lands with the help of low cost and locally accessed technologies such as in-situ soil and moisture conservation measures, afforestation etc. and through a participatory approach that seeks to secure close involvement of the user-communities.

The broad objective was the promotion of overall economic development and improvement of the socio-economic conditions of the resource poor sections of people inhabiting the programme areas. Many projects designed within this approach, at different points of time, were taken up by the Government of India. The Drought Prone Area Programme (DPAP) and the Desert Development Programme (DDP) were brought into the watershed mode in 1987. The Integrated Wasteland Development Programme also aimed at the development of wastelands on watershed basis. Other major programmes now being implemented through this approach are the 'National Watershed Development Project for Rainfed Areas' (NWDPA) and the 'Watershed Development in Shifting Cultivation Areas' (WDSKA) of the Ministry of Agriculture (MoA). While the focus of these programmes may have differed, the common theme that underpinned their structure has been the basic objective of land and water resource management for sustainable development of natural resources and community empowerment. Prof. Hanumanta Rao Committee, constituted by the Ministry of Rural Development (MoRD)

studied the implementation and impact of the Drought Prone Area Programme and Desert Development Programme all over the country and recommended a common set of operational guidelines, objectives, strategies and expenditure norms of watershed development projects integrating the futures of these programmes under the Ministry of Rural Development (MoRD). Accordingly, the guidelines of Watershed Development were framed and brought into force with effect from 1st April 1995 and subsequently reformulated the guideline by 2001. Currently the common guidelines were issued by the Government of India to implement the programme. Now separate agency has been identified at the State level as well as at the district level to effectively implement and monitor the programme.

However, the concept of Watershed Association and Watershed Committee at the village level was retained for implementing the projects under these programmes. The Ministry of Rural Development is committed to empower Panchayati Raj Institutions (PRIs) and has been impressing upon the State Governments to devolve necessary financial and administrative powers to the PRIs for self-governance particularly in planning, implementation and management of economic development activities in rural areas. Watershed Development has been included in the list of subjects to be devolved to the PRIs. The institutional frameworks of Watershed Association and Watershed Committees for the implementation of Watershed Development Programmes are being perceived as parallel bodies, with very little coordination between them and the Gram Panchayats / Grama Sabhas. With the devolution of necessary powers, the Gram Panchayats / Grama Sabha are expected to perform far better than the Watershed Associations / Committees since they are:

- i. equipped with statutory rights and mandate for natural resource planning,
- ii. have potential to plan according to people's wishes and integrate watershed management into wider development activities,
- iii. have capacity to draw on the services of the departments in an integrated manner and press for political pressure on line departments at higher levels,
- iv. potentially equipped with the powers to impose local taxes or user charges, and
- v. Committed to "reservations" for representation of women and weaker section as per the Constitutional provisions.

Thus, it is necessary to bring in suitable modifications and amendments to the existing institutional framework for implementation of Watershed Development Programmes so that the Ministry of Rural Development can fulfill its constitutional obligation of empowering PRIs. With this objective, the Prime Minister of India launched a new initiative called HARIYALI on 27th January 2003, which seeks to empower the PRIs both administratively and financially in the implementation of the Watershed Development Programmes of the Ministry of Rural Development. Accordingly, the Ministry has modified the existing provisions and brought out Guidelines for the new initiative. These Guidelines are called the Guidelines for Hariyali and are applicable to Integrated Wastelands Development Programme, Drought Prone Areas Programme and

Desert Development Programme and any other Programmes notified by the Government of India. Now the common guidelines were followed for implementation of the programmes under IWMP since 2008.

The programme has been designed in such a way that it encourages peoples' participation in all the stages of project implementation. The programme activities therefore have to be evaluated at different stages in order to have clear understanding about the status of implementation and the impact on soil-moisture conservation by undertaking the works viz., contour bunding, landlevelling, summer ploughing; drainage line treatment activities such as construction of major and minor check dams, retaining wall and gully control measures; water resource development measures through percolation pond, renovation of tank, cattle pond and farm pond, afforestation and pasture development through developing social forestry, avenue plantation, fruit plantation, fodder development etc; and other activities such as coir pith compost training, sericulture, homestead plantation, formation of self help groups and other community organizational activities etc.

Key features of IWMP

It is in this context that in co-ordination with the Planning Commission, an initiative has been taken for Watershed Development Project in order to have a unified perspective by all Ministries. Hence common guidelines were formulated under IWMP, applicable to all Watershed Development Projects in all Departments. These guidelines broadly indicate a fresh frame work for the next generation watershed programmes.

The key features of this new unified approach is broadly outlined as follows:

- i. Delegating power to States
- ii. Dedicated Institutions
- iii. Financial Assistance to Dedicated Institutions
- iv. Specified Duration of Programme
- v. Livelihood Orientation
- vi. Cluster Approach
- vii. Scientific Planning
- viii. Capacity Building
- ix. Multitier Approach

Guiding Principles of IWMP

The common guidelines for watershed development projects are based on the following principles:

- I. **Equity and Gender Sensitivity:** Watershed Development Projects should be considered as levers inclusiveness. Project Implementing Agencies (PIAs), must facilitate the equity processes such as a) enhanced livelihood opportunities for the poor through investment in their assets and improvements in productivity and income, b) improving access of the poor, especially women to the benefits, c)

- enhancing role of women in decision making processes and their representation in the institutional arrangements and d) ensuring access to usufruct rights from the common property resources for the resource poor.
- II. **Decentralization:** Project management would improve with decentralization, delegation and professionalism. Establishing suitable institutional arrangements within the overall framework of the Panchayati Raj Institutions (PRIs), and the operational flexibility in norms to suit varying local conditions will enhance decentralization. Empowered committees with delegation to rationalize the policies, continuity in administrative support and timely release of funds are the other instruments for effective decentralization.
 - III. **Facilitating Agencies: Social** mobilization, community organization, building capacities of communities in planning and implementation, ensuring equity arrangements, etc need intensive facilitation. Competent organizations including voluntary organizations with professional teams having necessary skills and expertise would be selected through a rigorous process and may be provided financial support to perform the above specific functions.
 - IV. **Centrality of Community Participation:** Involvement of primary stakeholders is at the centre of planning, budgeting, implementation and management of watershed projects. Community organizations may be closely associated with and accountable to Gram Sabhas in project activities.
 - V. **Capacity Building and Technology Inputs:** Considerable stress would be given on capacity building as a crucial component for achieving the desired results. This would be a continuous process enabling functionaries to enhance their knowledge and skills and develop the correct orientation and perspectives thereby becoming more effective in performing their roles and responsibilities. With current trends and advances information technology and remote sensing, it is possible to acquire detailed information about the various field level characteristics of any area or region. Thus, the endeavour would be to build in strong technology inputs into the new vision of watershed programmes.
 - VI. **Monitoring, Evaluation and Learning:** A participatory, outcome and impact-oriented and user-focused monitoring, evaluation and learning system would be put in place to obtain feedback and undertake improvements in planning, project design and implementation.
 - VII. **Organizational Restructuring :** Establishing appropriate technical and professional support structures at national, state, district and project levels and developing effective functional partnerships among project authorities, implementing agencies and support organizations would play a vital role.

In order to implement effectively, under the umbrella of State Level Nodal Agency (SLNA) various institutional mechanisms are formed. They are:

- i. Watershed Cell cum Data Center (WCDC)
- ii. Project Implementation Agency (PIA)
- iii. Watershed Development Team (WDT)
- iv. Watershed Committee (WC)
- v. Neighbourhood Groups (NHGs)
- vi. Self Help Groups (SHGs)
- vii. User Groups (UGs)

Major activities of Watershed Development Programme are sequenced into well-defined three phases. The three phases are:

- i. Preparatory Phase
- ii. Works Phase
- iii. Withdrawal Phase

Preparatory Phase

The major objectives of this phase are to build appropriate mechanisms for adoption of participatory approach and empowerment of local institutions (WC, SHG, and UG). WDT will assume a facilitating role during this phase. In this phase, the main activities will include:

- a. Taking up entry point activities to establish credibility of the Watershed Development Team (WDT) and create with the village community. The entry point activities, *inter-alia*, will include
 - i. Works based on urgent needs of the local communities such as revival of common natural resources, drinking water, development of local energy potential, augmenting ground water potential etc.
 - ii. Repair, restoration and upgradation of existing common property assets and structures (such as village tanks) may be undertaken to obtain optimum and sustained benefits from previous public investment and traditional water harvesting structures.
 - iii. Productivity enhancement of existing farming systems could also be an activity that helps in community mobilization and building rapport.
- b. Initiating the development of Village level institution such as Watershed Committee (WCs), Self-Help Group (SHGs) and User Group (UGs) and capacity building of different stakeholders on institutional and work related aspects.
- c. Environment building, awareness generation, undertaking of intensive IEC activities, creating involvement and participatory responses.
- d. Baseline surveys needed for preparation of Detailed Project Report (DPR), selection of sites and beneficiaries. Every effort must be made to collect gender-disaggregated data to adequately reflect the situation and priorities of women.

- e. Hydro-geological survey of the watershed to map out zones of potential ground water recharge, storage and sustainable ground water utilization.
- f. Building up a network of technical support agencies.
- g. Preparation of the DPR, including activities to be carried out, selection of beneficiaries and work-sites and design and costing of all works, ensuring that the interests, perceptions and priorities of women, dalits, adivasis and landless are adequately reflected in the DPR
- h. Working out detailed resource-use agreement (for surface water, ground water and common/ forest land usufructs) among User Group members in a participatory manner based on principles of equity and sustainability.
- i. Participatory monitoring of progress and processes.

Watershed Works Phase

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

- a. Ridge Area Treatment: All activities required to restore the health of the catchment area by reducing the volume and velocity of surface runoff, including regeneration of vegetative cover in forest and common land, afforestation, staggered trenching, contour and graded bunding, bench terracing etc.
- b. Drainage line treatment with a combination of vegetative and engineering structures, such as earthen checks, brushwood checks, gully plugs, loose boulder checks, gabion structures, underground dykes etc.
- c. Development of water harvesting structures such as low-cost farm ponds, nalla bunds, check-dams, percolation tanks and ground water recharge through wells, bore wells and other measures.
- d. Nursery raising for fodder, fuel, timber and horticultural species. As per as possible local species may be given priority.
- e. Land development including in-situ soil and moisture conservation and drainage management measures like field bunds, contour and graded bunds fortified with plantation, bench terracing in hilly terrain etc.
- f. Crop demonstrations for popularizing new crops/varieties, water saving technologies such as drip irrigation or innovation management practices. As far as possible varieties based on the local germplasm may be promoted.
- g. Pasture development, sericulture, bee keeping, back yard poultry, small ruminant, other livestock and micro-enterprises.
- h. Veterinary services for livestock and other livestock improvement measures.
- i. Fisheries development in village ponds/tanks, farm ponds etc.
- j. Promotion and propagation of non-conventional energy saving devices, energy conservation measures, bio fuel plantations etc.

Consolidation and Withdrawal Phase

In this phase the resources augmented and economic plans developed in Phase II are made the foundation to create new nature- based, sustainable livelihoods and raise productivity levels. The main objectives under this phase are:

- a. Consolidation and completion of various works.
- b. Building the capacity of the community based organizations to carry out the new agenda items during post project period.
- c. Sustainable management of (developed) natural resources and
- d. Up-scaling of successful experiences regarding farm production systems/off farm livelihoods.

An indicative list of various activities during this phase is given below:

i. Consolidation of various works

- a. Preparation of project completion report with details about status of each interventions;
- b. Documentation of successful experiences as well as lessons learnt for future use.

ii. Management of developed natural resources

- a. Improving the sustainability of various interventions under the project;
- b. Formal allocation of users right over common property resources (CPRs);
- c. Collection of user charges for CPRs;
- d. Repair, maintenance and protection of CPRs;
- e. Sustainable utilization of developed natural resources;
- f. Involvement of gram panchayat/corresponding institutions (as a governance body) in addressing the above aspects.

iii. Intensification of farm production/systems/off-farm livelihoods

- a. Up scaling of successful experiences related to above aspects through revolving fund under the project as well as credit technical support from external institutions;
- b. Promotion of agro-processing, marketing arrangement of produce and similar off – farm and informal sector enterprises.
- c. Farmers may also be encouraged to develop non pesticidal management, low cost organic inputs, seed farms and links with wider markets to fetch competitive price.

iv. Project Management related aspects

- a. Participatory planning, implementation and monitoring of activities to be carried out during consolidation phase;
- b. Terminal evaluation of project as per the expected outcomes.

DETAILED PROJECT REPORT

A Detailed Project Report (DPR) describe what a Watershed Project will try to achieve over a tenure of watershed project of 4 to 7 years and how it intends to achieve it. DPR is containing the general features of the watershed project, contain an analysis of the current situations of watershed project area and particularly needs of the community with respect to land and water and existing potential in the project area.

Pallom watershed project (Kottayam/IWMP-III/2012-13) of Pallom block of Kottayam district is proposed for four years duration (2013-14 to 2017-18).

Objectives of DPR

PIA decided the following objectives for the DPR.

- To prepare a Simple, Logical, Community Friendly and Comprehensive Detail Project Report following community base participatory approaches involving all segments of communities and stakeholders.
- To develop a livelihood plan through livelihood analysis for optimum utilization of scarce available resources viz. natural, physical, human and financial and analysis of vulnerability in the project.
- To develop a detailed plan for improving agricultural and livestock productivity and to strengthen the micro enterprises in the project area.
- To develop a management grid for convergence with other department and their authorities for pool out the financial resources in the project area.

Methodology adopted

The following methodology adopted for the preparation of DPR.

1. **Rapport building in the project area**– PIA members and TSO devoted sincere efforts in the project area to understand the communities. TSO described about the project to the stakeholders. Through different levels of discussions and field visit, TSO understood the communities, their culture, socio economic status and project area. These efforts helped to establish a rapport in the project area.
2. **Organized Village Meetings** – PIA and TSO organized several meetings at village level and gram Panchayat levels to make aware the communities about the watershed project. Elected representatives and senior officers from the PIA also attended the meetings to motivate the community and develop faith in the project
3. **Base Line Survey** - TSO conducted the household survey in the project area with support of volunteers. The data collected were related to socio-economic status of project area. Secondary data were collected from the records and reports available with line departments.
4. **Participatory Rural Appraisal (PRA)** – This is the second most important tool for primary data collection. TSO carried out PRA in the every project village of the

project area to ensure the participation and develop of ownership of project community with the watershed project.

5. **Develop thematic layers of watershed** - TSO developed the thematic layers of the watershed by using GIS and remote sensing technology. These maps help to understand the basic characteristics of the watershed area. The details are given in the coming chapters.
6. **Desk Research** - A systematic and focused desk research and internet assisted search for relevant documents, reports and appraisals were reviewed during preparation of DPR.
7. **Processing and Analysis of Data** - All the collected information from the primary and secondary sources, desk reviews were analyzed and calibrated. The findings of the analysis data have been used for developing vision document, strategy and action plan of the project
8. **Writing of DPR** - A comprehensive report was prepared by the TSO following the prescribed DPR template issued by State Level Nodal Agency.
9. **Sharing the plan in the Grama Sabha** – PIA share the action plan of the concerned grama panchayat in the respective Gram Sabha.
10. **Approval** – After approval of Grama Sabha, it will be submitted to Block Panchayat, District Panchayat and State Level Nodal Agency for approval at different tiers.

KOTTAYAM DISTRICT

The Kottayam district is popularly known as land of latex and letters. This is one of the leading places in the country for production of rubber and most of the Malayalam dailies and weekly magazines are published from here only. Kottayam is the first town to acquire cent percent literacy in the State and first English school in the State was started here. The district is famous for the largest inland water body in the State ie., Vembanad lake.

The district of Kottayam is situated between the Western Ghats and the Vembanad lake and extends between 9° 15' N to 10° 21' N latitude and 76° 22' to 77° 25' E longitude. The district is bounded by Ernakulam district on the north, Idukki district on the east and north-east, Alapuzha district on the west and south-west, and Kollam on the south. The Muvattupuzha, the Manimala and the Meenachil rivers are the important rivers flowing through this district. The district is bounded on the east by the rugged high hills of Western Ghats and on the west by the Vembanad lake, the largest backwater in the State. This lake is used for fishing, inland navigation and for collecting lime shell. Kottayam is a landlocked district and it has no sea coast. The district has two revenue divisions viz. Kottayam and Pala. Vaikom, Kottayam, Changanassery, Meenachil and Kanjirapally are the taluks in the district. There are four municipalities, 11 development blocks and 73 panchayats.

Geographical description

The district has a tropical humid climate with an oppressive hot season in the plains and plenty of rainfall throughout. The hot season from March to May, is followed by the south-west monsoon from June to September. October and November contribute the post monsoon or retreating monsoon season, when day temperature increases gradually and the heat is nearly as intense as in summer. Rains are early in January. The district has a mean annual temperature of 28° C and an average rainfall of 3175 mm.

Physiography

Based on the physical features, the districts can be divided into three regions. They are the lowland, midland and highland. Kanjirapally taluk and portion of the Meenachil taluk are the highland region, western portion of the Meenachil taluk and the eastern parts of Kottayam, Changanassery and Vaikom taluk falls in the midland region and the western portion of Kottayam, Changanassery and Vaikom taluks falls in the lowland region.

In the mountainous tracts of the highland region close to the high ranges in Idukki district, there are thick evergreen tropical forests. There are several rubber plantations in this region. The land in the midland is highly fertile and rich in luxuriant vegetation. In certain parts of the lowland region in the district paddy fields are located about a meter below the mean sea level

Geology

The main rock type in the district belongs to the charnockites and khondalite group of the pre-cambian metamorphics. The charnockite group predominates in the district, and includes hypersthene-diopside gneisses and granulites, grandiferrous hypersthene hornblende granulites and their migmatite equivalents. The khondalite group includes granite-biotite gneisses and granite sillinite gneisses and granulites. Graphite is seen associated with khondalite group of rock. A few bands of magnetite quartz are also seen associated with the above group. Cordierite gneisses seen developed from both charnockite and khondalite groups of rock along a certain zone passing through Vadavathur trending in a NW-SE direction. The crystalline rocks of this district generally trend in NW-SE direction and have suffered repeated periods of folding and deformation.

A system of dolerite dyke and one major gabbrodyke represent the basic intrusion. They generally trend in NW-SE direction. The sedimentaries are represented by small patches of tertiaries seen towards the eastern fringes of Vembanad lake and the recent alluvium developed along the low lying western portion of the district. Laterisation is prevalent in the western margin of the district.

Mineral resources

Graphite is found in association with the khondalite group of rocks at Aranikunnu, Velavur, Idanad, Kallambakka, Vazhur, Puvarni, Idamala, Chelavu and near Idayar. Limeshell is found near Thanneremukom. Tile clay is seen towards the western portion of the district in the plain fringes of the Vembanad lake.

Rivers, Irrigation and Drainage

The major rivers in the district are the Meenachil river, the Muvathupuzha river and the Manimala river. The Meenachil river flows through Meenachil, Vaikom and Kottayam taluks. The total catchment area of Meenachil river is 1272 sq km and is formed by several streams originating from the Western Ghats in Idukki district. The Poonjar river joins at Erratupetta, the Chittar river joins at Kondur and the Payapparathodu joins at Lalam. Finally the river confluences with Vembanad lake. The Muvattupuzha river originates from Idduki district flowing mostly through Vaikom taluk and joins with Vembanad lake. The Manimala river flows through Kanjirapally and Chanaganacherry taluks. The Chittar joins it on its course further down the west as it flows towards Alappuzha district. There is no major irrigation project in this district, however, the Meenachil medium irrigation project is having a net ayacut of 9960 hectares and a catchment area of 155 sq km. The minor irrigation is by tanks, dug wells and bore wells etc

Vegetative cover

Agriculture forms the livelihood of the majority in the district. It is also the main factor influencing the economy. Food crops as well as cash crops are cultivated here. The district contributes a significant share of the food crops in the State and a large share of the cash crops. Paddy and tapioca are the main food crops, while rubber, coconut and pepper are the main cash crops. Annual crops like banana and pineapple, seasonal crops

like ginger, tubers, vegetables and wide range of perennial crops like jack, mango, etc. are grown.

Soil

The lowland soils are imperfectly drained hydromorphic soils, which are developed from riverine and lacustrine sediments and alluvia-colluvial deposits. The depth varies from 75 cm to more than 150 cm. Soils are very dark grayish brown to black with silty clay loam to clay texture. The midland soils are well drained laterite soils have a depth of less than 100 cm having dark reddish brown to red with gravelly clay loam to gravelly clay texture. The midland soils are well drained with depth more than 75 cm developed from gneissic rock. Soils are yellowish red to reddish brown with gravelly loam to gravelly clay loam texture. Upland soils are well drained with depth less than 75 cm developed from gneissic rock. Soils are black to dark reddish brown with sandy clay loam to clay loam texture. Rock out crops are common feature. The soils in the highland region are well drained with depth more than 150 cm, developed from gneissic rock. Soils are very dark brown to strong brown with gravelly sandy loam to gravelly clay loam texture.

Predominant occupation of the people

It is predominantly an agricultural district and majority of the work force is engaged in agriculture. In this district, the working population constitutes total main workers (557415), cultivators (42074), agricultural laborers (44137), household industry workers (11924) and other workers (459280).

Per capita income

The per capita income at current prices in the district for the year 2010-2011 is Rs. 89583. The district ranks second in the State.

MEENACHIL WATERSHED (12M)

Location and Extent

The Meenachil watershed lies between 9° 25' to 9° 55' North latitudes and 76° 20' to 76° 55' East longitudes and is located in the Alappuzha and Kottayam districts and along the Western boundary of Idukki district of Kerala State. It is bounded by Vaikom and Meenachil taluks of Kottayam district and Thodupuzha taluk of Idukki district in the North, Changanassery and Kanjirapally taluks of Kottayam district and Kuttanad taluk of Alappuzha district in the South, Peerumedu and Thodupuzha taluks of Idukki district in the East and Shertallai taluk of Alappuzha district in the West. The watershed has a total area of 1208.11 sq.km. covering 52 villages spread over 59 panchayats, 18 blocks and three districts.

Physiography

Elevation: The Meenachil River is formed by several streams originating from the Western Ghats. The Kadapuzha Ar originates from Annakunnumudi at an elevation of +922m and Pazhavattikudi at an elevation of +1117m above MSL. Tikovil Ar originates from Kurusu malai at an elevation of 105m and Marmalai at an elevation of 1011m above MSL. The Poonjar river originates from Kolahalamedu at an elevation of +1156m and the Chit Ar originates from Anangampadi at an elevation of +530m above MSL. The river finally flows to the Vembanad lake. The general elevation ranges from 77m to 1156m in the upper region, 8m to 68m in the middle region and less than 2m in the lower region.

Aspect: The main river originates in the North-Eastern part of the watershed. The Kadapuzha river flows in a Southerly direction and is joined by the Konipad thodu to form the Kalathukadavu Ar. The Tikovil Ar also joins it at Cheripad. The Southerly direction of flow is continued till Erattupetta. Here it receives the Poonjar river and flows in a westerly direction. At Erattupetta the main river takes a sharp turn and flows towards West till Kondur. At Kondur it is joined by the Chit Ar. Then the river flows in a westerly direction and reaches Pala. At Pala, another important tributary, the Payyappara thodu joins the main river. Then the river traces a South-Westerly course till it reaches Kottayam. Then the river splits up into numerous inter-connecting water courses and finally join the Vembanad lake through a series of criss-cross channels.

Landforms: The broad landforms include high and medium hills and isolated hillocks at the upper region, narrow valleys, lateritic mounds and mid-land laterites at the middle region and swamps, marshes and reclaimed lands at the lower region of the watershed.

Shape

The watershed is almost square shaped with a length width ratio of 1:1.

Drainage

The major river draining through this watershed is the Meenachil Ar, which has a length of 78km. This river is formed by several streams originating from the Western Ghats. The river takes a westerly direction and joins the Vembanad lake. The tributaries of the river are Konipad thodu, Chit Ar, Poonjar river, Payyappara thodu, Kala Ar,

Vazhikadavu Ar, Muttom thodu, Tikovil Ar, Kollampallil thodu, Vengattu thodu, Kalathukadavu Ar, Kadapuzha, Pacha thodu, Parayil thodu, Kudamurutti thodu, Ponnuzhukum thodu, Mannani thodu, Tenanganai thodu, Pannagam thodu, Elikulam thodu, Kuruttu thodu, Nettalur thodu, Poralu thodu, Valiya thodu, Vettikkal Ar, Koduvan Ar, Kakka thodu, Tanikal thodu, Vellur thodu, Mannurchira thodu, Puttuchira thodu, Kottachira thodu, Minadam Ar, Puttan thodu, Chengalam Ar, Kavan Ar, Pennar thodu and Kaippuzha Ar. The drainage pattern appears to be dendritic.

Soils

Soils of the watershed vary in their depth, texture, internal drainage and degree of erosion.

Water Resources

Surface water resources: The major river of this watershed is the Meenachil Ar which is perennial in nature. The river has a total annual yield of 2349Mm³ and annual utilizable annual yield of 1110Mm³. The river has 38 tributaries including major and minor ones.

Ground water resources: The area falls in the category of 'white' which means that only less than 65 per cent of the ground water is utilized. There is no restriction for further development. In the lower region, the water table is shallow to moderately deep.

The upper region of the watershed is suitable for domestic wells. The middle and lower regions of the watershed are suitable for large diameter dug wells and medium capacity tube wells respectively.

Watershed Delineation

The Meenachil watershed is divided into 47 sub-watershed and 114 micro watersheds. Of these, 8 micro watersheds falling under 2 subwatersheds falls under the project area.

Special Problems

1. Melukavu, Moonilavu, Poonjar, Poonjar Thekkekara, Teekoy and Thelanad villages in Meenachil taluk and Maakara, Peringalam, Kurinji, Koonnar, Kaipally, Adukkom, Adivaram, Vellani, Kallom, Mavadi, Kurinjiplavu and Vellattusery villages of Kanjirapally taluk have shown indications of land slips/landslides.
2. The wasteland in the lower region of the watershed is water-logged.
3. The area is subjected to stream bank erosion along the river courses. The severity of the stream bank erosion is observed in the middle and lower regions.
4. Aryad, Champakulam and Veliyanad blocks of the Alappuzha district, Vaikom, Kaduthuruthy, Ettumanoor and Pallom block of Kottayam district are in the Kuttanad tract of problem area zone. The main problems in this area are ;
 - a) Low productivity from the paddy crop.
 - b) High cost of cultivation due to the necessity of annual maintenance of embankments of paddy plots.
 - c) Salinity problems.
 - d) Inundation of crop in flood waters.

PALLOM BLOCK

Pallom Block Panchayath is situated in Kottayam Taluk and has an area of 121.76 Sq. Km. (5.53% of total area of the district). There are 5 Grama Panchayaths viz. Ayarkunnam, Vijayapuram, Kurichi, Puthupally and Panachikkad and 6 Villages viz. Ayarkunnam, Muttambalam, Vijayapuram, Kurichi, Puthupally and Panachikkad under the jurisdiction of the block. The block panchayat has 13 block divisions. The block has a 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 2011 censuses is 173693 of which 84966 are males and 88727 are females. The population density is 1426 and sex ratio is 1044. The literacy ratio of this block is 89.77 percentages. Kottayam is the nearest major town which is situated 10 km from block headquarters.

The physiography of the block includes low hills with isolated hillocks, laterite mounds and valleys. The eastern part of the block is under reserve forest.

The Kottayam – Kumili road 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 block does not find any place in the railway map.

Agriculture is the primary occupation of the people of the block. Cultivable lands are classified as wet, dry, garden and plantations. Rubber is the major plantation crop in the block. Coconut, Banana, Vegetables are also cultivated. The major river draining through the block is the Meenachil River.

Table.3.1 Demographic details of Pallom Block

Name of Panchayath/Block	Area (in Sq. Km)	No. of House Holds	Density of population (Sq. Km.)	Total Population			Scheduled Castes			Scheduled Tribes		
				Male	Female	Total	Male	Female	Total	Male	Female	Total
Ayarkunnam	30.70	8509	1125	17251	17304	34555	1390	1409	2799	68	46	114
Vijayapuram	29.70	7842	1038	14907	15931	30838	1281	1288	2569	52	58	110
Kurichi	16.22	8812	2208	17502	18313	35815	2236	2392	4628	124	131	255
Puthuppally	22.40	7688	1329	14367	15417	29784	634	669	1303	117	133	250
Panachikkad	22.74	10780	1877	20939	21762	42701	1363	1409	2772	152	153	305
Pallom	121.76	43631	1426	84966	88727	173693	6904	7167	14071	513	521	1034

GRAMA PANCHAYATS FALLING IN THE PROJECT AREA

Parts of seven Grama Panchayats coming under two Block panchayats fall in the project area. The details are given in Table 3.2

Table 3.2 Grama Panchayats falling in the project area

No.	Panchayat	Total Geographical Area (TGA)	IWMP project area	% TGA under IWMP	% Area under IWMP
Pallom Block					
1	Ayarkunnam	2814.87	867.95	30.83	16.22
2	Vijayapuram	1586.09	1243.09	78.37	23.24
3	Puthuppally	2269.02	288.40	12.71	5.39
4	Panachikkad	2332.29	1568.62	67.26	29.32
Pampady Block					
1	Manarcad	1736.55	1089.28	62.73	20.36
2	Pampady	3091.11	208.70	6.75	3.90
3	Kooroppada	2733.20	83.47	3.05	1.56
	Total	16563.13	5349.52	32.30	100.00

CRITERIA FOR SELECTION OF WATERSHED

The Department of Land Resources follows the following criteria as provided in Para 48 and 64 to 66 of the Common Guidelines, 2008 for approving the selection of watersheds under the strategic and perspective plans of the States and allocation of budget amongst the States.

- i. Area of the State
- ii. Population of the State
- iii. The State must have its monitoring system in place and online monitoring must be operable.
- iv. States which formulate larger schemes consisting of contiguous Watersheds upto an area of 25,000 hectares will be given priority.
- v. Percentage of rainfed area to total cultivated area.
- vi. Area of the project should not be covered under assured irrigation.
- vii. Largest number of weaker section groups benefited - SCs/STs, women, landless labourers etc.
- viii. Acuteness of drinking water scarcity
- ix. Extent of over exploitation of ground water resources
- x. Preponderance of wastelands/degraded lands.
- xi. Contiguity to another watershed that has already been developed/treated.
- xii. Willingness of village community to make voluntary contributions, enforce equitable social regulations for sharing of common property resources, make equitable distribution of benefits, create arrangements for the operation and maintenance of the assets created.
- xiii. Proportion of Scheduled Castes/Scheduled Tribes.
- xiv. Productivity potential of the land.
- xv. Unspent balance
- xvi. Outstanding utilization certificates.
- xvii. Percentages of completed projects out of total projects.

Table 4.1 Criteria for selection of watershed

Sl. No.	Criteria	Maximum score	Ranges & scores			
i	Poverty index (% of poor to population)	10	Above 80 % (10)	80 to 50 % (7.5)	50 to 20 % (5)	Below 20 % (2.5)
ii	% of SC/ ST population	10	More than 40 % (10)	20 to 40 % (5)	Less than 20 % (3)	
iii	Actual wages	5	Actual wages are significantly lower than minimum wages (5)	Actual wages are equal to or higher than minimum wages (0)		
iv	% of small and marginal farmers	10	More than 80 % (10)	50 to 80 % (5)	Less than 50 % (3)	
v	Ground water status	5	Over exploited (5)	Critical (3)	Sub critical (2)	Safe (0)
vi	Moisture index/ DPAP/ DDP Block	15	-66.7 & below (15) DDP Block	-33.3 to -66.6 (10) DPAP Block	0 to -33.2 (0) Non DPAP/ DDP Block	
vii	Area under rain-fed agriculture	15	More than 90 % (15)	80 to 90 % (10)	70 to 80% (5)	Above 70 % (Reject)
viii	Drinking water	10	No source (10)	Problematic village (7.5)	Partially covered (5)	Fully covered (0)
ix	Degraded land	15	High – above 20 % (15)	Medium – 10 to 20 % (10)	Low- less than 10 % of TGA (5)	

x	Productivity potential of the land	15	Lands with low production & where productivity can be significantly enhanced with reasonable efforts (15)	Lands with moderate production & where productivity can be enhanced with reasonable efforts (10)	Lands with high production & where productivity can be marginally enhanced with reasonable efforts (5)	
xi	Contiguity to another watershed that has already been developed/ treated	10	Contiguous to previously treated watershed & contiguity within the microwatersheds in the project (10)	Contiguity within the microwatersheds in the project but non contiguous to previously treated watershed (5)	Neither contiguous to previously treated watershed nor contiguity within the microwatersheds in the project (0)	
xii	Cluster approach in the plains (more than one contiguous micro-watersheds in the project)	15	Above 6 micro-watersheds in cluster (15)	4 to 6 microwatersheds in cluster (10)	2 to 4 microwatersheds in cluster (5)	
	Cluster approach in the hills (more than one contiguous micro-watersheds in the project)		Above 5 micro-watersheds in cluster (15)	3 to 5 microwatersheds in cluster (10)	2 to 3 microwatersheds in cluster (5)	

xviii. Initially, the funds will be allocated among the States as per criteria. However, from January onwards the remaining funds will be allocated on first-come-first-serve basis except for the mandatory funds for the North-East.

Watershed Development Programme is prioritized on the basis of thirteen parameters namely Poverty Index, Percentage of SC/ST, Actual wages, Percentage of small and marginal farmers, Ground water status, Moisture Index, Area under rainfed agriculture, Drinking water situation in the area, Percentage of the degraded land, Productivity potential of the land, Continuity of another watershed that has already developed/treated, Cluster approach for plain or for hilly terrain. Based on these thirteen parameters, a composite ranking was given to IWMP-III Watershed project as given in table below.

Weightage of the project

	Criteria	Weightage
1	Poverty index (% of poor to population)	5
2	% of SC/ ST population	3
3	Actual wages	0
4	% of small and marginal farmers	10
5	Ground water status	0
6	Moisture index/ DPAP/ DDP Block	0
7	Area under rain-fed agriculture	10
8	Drinking water	5
9	Degraded land	5
10	Productivity potential of the land	12
11	Contiguity to another watershed that has already been developed/ treated	5
12	Cluster approach in the plains (more than one contiguous micro-watersheds in the project)	10
	Total	65

The area is prone to frequent floods and waterlogging. Drinking water is a major problem in this project area. In a broader view, the soil of this region is suitable for agriculture crops and cash crops. But due to lack of water harvesting structures and proper irrigation and drainage facilities, agriculture itself has become a constraint and the production potential has considerably gone low. The majority of the soil is deep to very deep and hence good for agricultural production. However production of the land can be significantly brought up with the help of better management practices and availability of timely irrigation and use of organic and inorganic fertilizer. Cluster approach was

followed taking into consideration 8 micro-watersheds covering a total treatable area of 5100 Ha.

Watershed information

Table 4.3. General Features of Pallom Watershed Project

Name of Project	Pallom Watershed
Name of Program	IWMP-3
Location	9° 31' 20.6" N - 90° 37' 50.8" North Latitude and 76° 31' 17" E - 76° 38' 9" East Longitude
Type of project	Plain
District	Kottayam
Blocks	Pallom & Pampady
Gram Panchayats	7 – Panachikkad, Vijayapuram, Manarkad, Ayarkunnam, Puthupally, Kooropada and Pampady
Villages	8 – Panachikkad, Muttambalam, Vijayapuram, Manarkad, Ayarkunnam, Puthupally, Kooropada and Pampady
No. of micro watersheds	8 – 12M38a (Thiruvanchoor-Nagambadam), 12M38b (Mannarthodu-Maalam-Areeparambu), 12M38d (Maalam), 12M38f (Nedumtharakavu), 12M39a (Mundakapadam), 12M39n (Kalathil kadavu), 12M39o (Parakkal kadavu) & 12M39p (Ereyil kadav)
Total Watershed Committees	8
Total Project Area	5349.52 Ha
Total Treatable Area	5100.00 Ha
Agro climate zone	Malayoram
Major crops	Paddy, Coconut, Rubber, Banana & Vegetables
Major slope range	3-5 %
Major streams	First and second order
River Basin	Meenachil
Major soil series	Kalimala series which occurs in gentle to moderate slope (3-10%), with a solum thickness of 100 to 150 cm, brown to yellowish red in colour, very strongly acid and having a surface texture of gravelly sandy clay loam to gravelly sandy clay moderately well drained, moderate water erosion, moderately managed soils.

Rainfall	2641.3 mm
Marginal farmers	more than 60%
Major option of livelihoods	Agriculture, Animal husbandry, Wage employment
Water table	2.9 to 10.2 meters
Depth of well	5.0 to 12.8 meters
Source of drinking water	Open well, Bore well, Hand pump
Quality of drinking water	Good
Irrigation source	Open well and surface water bodies
Cattle	Cow, Buffalo and Goat
Nearest town	Kottayam
Financial details	
Sanctioned Area	5100.00 Ha
Total Sanctioned Cost	612.00 Lakhs
Proposed budget on Works	459.00 Lakhs
Proposed budget on NRM	342.72 Lakhs
Proposed budget on Livelihood Enhancement	55.08 Lakhs
Proposed budget on Productivity Enhancement	61.20 Lakhs
Cost per Ha (IWMP project)	12000 per Ha
From Project Cost	612.00 Lakhs
From Convergence	
Project Implementation Agency	
Name of PIA	Pallom Block Panchayath
Coordinating Person in PIA	Secretary, Block Panchayath
Address	Pallom Block Office Vadavathoor, Kottayam

Budget

The distribution of budget for Pallom IWMP -III for the various components as per IWMP guidelines is given below:

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	61,20,000
2.	Monitoring	1	6,12,000
3.	Evaluation	1	6,12,000
Preparatory phase			
4.	Entry point activities	4	24,48,000
5.	Institution and capacity building	5	30,60,000

6.	Detailed Project Report	1	6,12,000
Watershed works phase			
7.	Watershed development works	56	3,42,72,000
8.	Livelihood activities for asset less	9	55,08,000
9.	Production system and micro enterprises	10	61,20,000
10.	Consolidation phase	3	18,36,000
		100	6,12,00,000

METHODOLOGY

Watershed Development Strategy

Watershed is a geo-hydrological and biological unit draining through a common point called outlet. It is a dynamic system of living and non-living things. It is simply described as development of physical and biological elements for sustainable and self-reliant interdependence. It is obvious that watershed development is the development of all the constituents of a watershed. Such a development can be achieved through a complete understanding of a system and sub-system of the watershed. Hence, the exploration of all the elements of a watershed becomes an important component of watershed planning so as to efficiently address the needs of all the dependants.

Soil and water conservation remains the core activity. Soil conservation mainly means conserving and protecting the soil from wind or water erosion. It also means improving the microbial activities in the soil and making it "live". Water conservation will be achieved through both engineering and biological measures. In addition to soil and water conservation, watershed development project ought to address several issues for achieving sustainable development. Adoption of the following strategies can ensure sustainable watershed development. Scientific planning with participatory approach is only and one method to make the programme successful.

Watershed management as a strategy has been adopted by Government of India especially in the rainfed regions of semi-arid tropics. These regions are characterized by low and undependable rain, low soil fertility, poor infrastructure development, low literacy and high rate of migration. Several studies have identified that there is a great need for a systematic and scientific approach to deal with watershed development. The common guidelines generate a fresh and flexible framework for the new generation watershed development.

Scientific Planning

i) Cluster Approach

This envisages a broader vision of Geo-hydrological unit which involves treating a cluster of micro-watershed. The IWMP-3 Project consists of eight micro-watersheds namely 12M38a, 12M38b, 12M38d, 12M38f, 12M39a, 12M39n, 12M39o & 12M39p as their respective codes. The project falls in part of 7 GramaPanchayats under two Block Panchayats.

ii) Transect Walk

Transect walk is a kind of exploratory walk, undertaken by the team with the villagers 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 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 is observed and analyzed by the team during the summer and winter. The transect walk also enables in understanding the plantation crops and vegetables grown in the watershed area. Livestock populations are also accounted. Various pending and unsolved problems are located and are given prior importance as EPA.

iii) Base line Survey/ Household survey:

To scientifically plan and phase a watershed development programme, detailed baseline survey has to be conducted. This acts as a benchmark for any intervention during and post implementation of any development programme. A detailed baseline survey was undertaken which involved household census survey, Bio-physical survey and Village level data collection. Household census survey includes a detailed questionnaire which was been filled by visiting each and every household in the village. To understand the family dynamics of watershed community, household survey often play a key role in the process of planning. Community based information is assessed through PRA, which gives the family based information. Census survey is adopted to collect the data in this project.

Door to Door baseline survey was carried out through the Neighbour Hood Groups using structured questionnaire. The questionnaire covered the following areas.

- Demographic Information
- Socio Economic Information
- Agriculture / Horticulture Activities and its marketing
- Animal Husbandry activities and its marketing
- Fodder production and Availability
- Assets (domestic and agricultural)
- Land ownership,
- Land use
- Irrigation (water availability)
- Crops and productions
- Common Property Resources and Its usage

Bio-physical survey was undertaken to identify various natural resources available in the village. It included the soil typology, wells in the area, crop taken in the field, cropping pattern, fertilizers used and various sources of irrigation in the field.

Secondary data: The secondary data was obtained through Census reports (2011) and Panchayat Level Statistics (2010). Data pertaining to social profile is also collected through Census reports. Secondary data related to different kinds of capital assets were collected from different departments of Government such as Village Office, KrishiBhavan, Primary Health Center, District Rural Development Agency initiative-SGSY Programme office, Kudumbasreeworking on poverty alleviation, GramaPanchayat, other NGO's and development societies etc. Climatic information like annual rainfall

with monthly distribution of five year and temperature is collected from the Indian Meteorological Department. The Resources Maps prepared by Kerala State Land Use Board provides the details of land use/land cover, drains, transport network, assets and other water resources. The Detailed Soil Survey report prepared by Soil and Land Use Survey of India, Bangalore Region, Government of India was used to understand the soil classification, texture, depth, erosion and land capability.

Technical/ Field to field Survey: To know the present land use/land cover and slope, field to field survey was also carried out in the project area with the involvement of the local people. It also includes the numbers of water harvesting structure in the area, crop taken in the field, cropping pattern, fertilizer used and various sources of irrigation in the field. For the ridge –valley planning the field to field survey is carried on to demarcate the terrain in the cadastral map.

While implementing the project it is necessary that the treatments are carried out starting from ridge and progressing towards the valley. This approach is followed with the following objectives

- protect the upper reaches to avoid erosion and reduce runoff
- avoid siltation of structures in the middle and lower catchments
- ensure the cost effectiveness of structures in the valley and
- Improve overall efficacy of the measures.

iv) Participatory Rural Appraisal (PRA)

Watershed Development is a good way to generate more employment, to promote the economic development of the village Community and optimum utilization of the Watershed's natural resources like land, water, vegetation etc., which will mitigate the adverse effects of drought and prevent further ecological degradation.

Participatory approach towards Watershed Development would help in tackling all the problems ecologically, socially and economically on a sustained basis through larger people's participation. PRA not only does ease the implementation of the project, but also helps in bringing an equitable and sustainable development. People's participation in Watershed Development and Management programmes is crucial for their successful and cost effective implementation.

Participatory Rural Appraisal (PRA) is a way of enabling local people to analyze their living conditions, to share the outcomes and to plan their activities under this project.

Need for PRA

- Sustained change and the need for accurate and timely information.
- It advocates that the people themselves are solution agents for their problems
- It cuts down the "Normal Professional Bias" and anti-poverty bias towards people
- Reduces down the normal time consuming long methods of survey, which consumes the much needed resources and that gives results after a long time.
- The method is cost effective accurate and timely.

Objectives of PRA

- To use farmers criteria, choices and understand the local environments with clear local priorities.
- To learn farmer's indigenous technologies.
- To achieve triangulations by using different methods and involving various people
- To check and recheck the findings.
- To develop self-critical analysis and indirect contact with local needs and communities.

Purpose of PRA

- To collect first hand information about the village community.
- To interact with the village community to understand their perspectives, perceptions and priorities.
- To know their needs and unfelt needs.
- To diagnose the important problems and a common understanding of the village community's priorities.
- To find out commonly acceptable and accessible solutions and to arrive at a common outline of an action plan for Watershed Development Programme.

The past experience of watershed has given tremendous input to focus on creating accountability of the stakeholders towards the programme. This has created an emphasis to include all the stakeholder communities and their local and Indigenous Technological Knowledge (ITK) while planning for any activity. Participatory approach provides a new path for planning, implementing, and monitoring and post- withdrawal activities with a complete accountability of the stakeholders. Various PRA techniques like resource mapping, social mapping, and season calendars were used to understand the physical and social orientation of the village in general and watershed in specific. These tools put the villagers in ease than the complicated questionnaires. Various tools like Matrix ranking were used to identify various local vegetations, Fodder crops, various institutions and their significance in the life of the farmers.

v) Focus Group Discussion

Kerala State Land Use Board has carried out the FGD with farmers and women in order to understand various issues related to their day to day life. PRA tools such as time line, daily activity chart, details of SHG's, details of common property resources, seasonal health problems, child education, problems of agriculture and seasonal charts were discussed. In this discussion women were encouraged to speak about their problem. The women who drew these charts described the differences between the rainy and dry season patterns. In the dry season, it took longer to get water from the well and collecting firewood to stockpile for the rainy season. When the rains come, things are much busier and the women's days are much longer because of all the work to be done in the fields.

Problems Identification

After analysis of all the information collected during PRA exercise, field to field survey and Focus Group Discussions, the main problems identified includes the following:

- Heavy occurrence of flood during monsoon
- Problem in drinking water facilities
- Low production due to practices of traditional method of cultivation
- Low milk production due to local/ non-descript breed and less availability of fodder
- Low economic condition due to low production
- Soil erosion from farm land
- Less cultivation of vegetables
- Lack of value addition practices
- Less availability of fodder
- Migration
- Urban sprawling
- Waste disposal

vi) Use of GIS and Remote Sensing for planning

Remote sensing and GIS plays an important role in the study of natural resources and helps in planning water resources development. One of the greatest advantages of using remote sensing data for hydrological investigations and monitoring is its ability to generate information in spatial and temporal domain, which is very crucial for successful analysis, prediction and validation. Use of various high science tools has been promoted at various stages of watershed development.

Prioritization: Geographical Information System (GIS) has been used for prioritization process. Various layer maps were created like Geo-morphological, Soil, BPL Population, SC/ST population, Ground water Status, Drinking water situation and Slope percent. These were all given proper weightage and this helped in prioritization of various watershed areas.

Planning: An action plan matrix was formulated by taking into account various features like the slope percent, soil depth, soil texture, soil erosion in the area for wasteland, forest land and agricultural land. Global Positioning System (GPS) was used to identify each and every water conservation structures available in the project area. This was used to create a map. Contour Map of vertical interval of 20 meter at a scale of 1:50000 was used for identifying various location specific recommendations for soil and water conservation structures.

Hydrological modeling: Hydrology modeling technique was been used for locating drainage, stream length, flow direction, sink, and flow accumulation. This model overlaid over cadastral map help to calculate the catchment area of each structures like the check dam etc. This has helped to remove the human error which generally occurs while calculating the catchment area of a check dam.

Table no. 5.1: Details of Scientific Planning and Inputs in IWMP projects

S. No.	Scientific criteria/ inputs used	Scientific Criteria Used
	(A) Planning	
	Cluster approach	Yes
	Whether technical back-stopping for the project has been arranged? If yes, mention the name of the Institute	Yes Kerala State Land Use Board
	Baseline survey	Yes
	Hydro-geological survey	Yes
	Contour mapping	Yes
	Participatory Net Planning (PNP)	Yes
	Remote sensing data-especially soil/ crop/ run-off cover	Yes
	Ridge to Valley treatment	Yes
	Online IT connectivity between	
	(1) Project and DRDA cell/ZP	Yes
	(2) DRDA and SLNA	Yes
	(3) SLNA and DoLR	Yes
	Availability of GIS layers	
	1. Cadastral map	Yes
	2. Village boundaries	Yes
	3. Drainage	Yes
	4. Soil (Soil nutrient status)	Yes
	5. Land use	Yes
	6. Ground water status	Yes
	7. Watershed boundaries	Yes
	8. Activity	Yes
	Crop simulation models	No
	Integrated coupled analyzer/ near infrared visible spectroscopy/ medium spectroscopy for high speed soil nutrient analysis	No
	Normalized difference vegetation index (NDVI)	No
	Weather Station	
	(B) Inputs	
	1. Bio-pesticides	No
	2. Organic manures	Yes
	3. Vermicompost	Yes
	4. Bio-fertilizer	No
	5. Water saving devices	Yes

6. Mechanized tools/ implements	Yes
7. Bio-fencing	Yes
8. Nutrient budgeting	No
9. Automatic water level recorders & sediment samplers	No

Usage of Data

The data, primary as well as secondary, which was obtained from the various authentic sources, was used in formulation of the local needs of the population and also to plan the interventions required for the optimum utilization of the available resources in the watershed area. The due emphasis was given to plan the activities to fill in the existing gaps and to address the weak indicators.

Preparation of Action Plan and Approval from Watershed Grama Sabha

Data were analysed and based on the identified needs and problems in the watershed area, a draft action plan was prepared and placed before the concerned Grama Sabha for approval. After detailed deliberations and incorporation of relevant suggestions into the plan, the action plan was got approved from the concerned Watershed Grama Sabha.

SWOT ANALYSIS

SWOT analysis is a strategic planning method used to evaluate the Strengths, Weaknesses/Limitations, Opportunities, and Threats involved in the implementation of a project. It involves specifying the objective of the project and identifying the internal and external factors that are favorable and unfavorable to achieve the objectives of the project. Setting the objective should be done after the SWOT analysis has been performed. This would allow achievable goals or objectives to be set for the organization.

- Strengths: characteristics of the project team that give it an advantage over others
- Weaknesses (or Limitations): are characteristics that place the team at a disadvantage relative to others
- Opportunities: external chances to improve performance (e.g. make greater profits) in the environment
- Threats: external elements in the environment that could cause trouble for the project

Identification of SWOTs is essential because subsequent steps in the process of planning for achievement of the selected objective may be derived from the SWOTs.

A SWOT analysis was done for the PIA and the result is as follows:

Strengths:

- (1) Strong linkages with line departments for technical guidance.
- (2) Scientific planning with the help of Kerala State Land Use Board.
- (3) State level and District level committees for monitoring, coordination & Co-operation.
- (4) Previous knowledge of convergence with various line departments
- (5) Prior acquaintance of officers with the villagers of selected project area, hence ease in implementation of project.
- (6) Well informed farmers and general public
- (7) Most of the project area is near to the PIA's office.

Weakness:

- (1) Inadequate infrastructural facilities
- (2) Various schemes are being implemented by the PIA with limited human resources.
- (3) Shortage of reputed training centres for capacity building at village level to ensure the proper implementation of the project.

Opportunities:

- (1) A number of different other development schemes of the government are running; so, there can be horizontal integration and convergence of programmes.
- (2) Neighbourhood Groups, User groups and Self Help Groups
- (3) Better financial provision under IWMP, better quality of work can be expected

- (4) Usage of new ICT tools like GIS, GPS and MIS integration of the project with the State Level Data Cell for online monitoring and evaluation.
- (5) Can easily identify and resolve the problems of the area
- (6) Transparency in Accounting System

Threats:

- (1) As there is heavy rainfall and frequent floods in the project area, the activities planned to be taken up may yield limited impact.
- (2) Overloaded work may mislead the watershed project or may divert the vision at the time of implementation of the projects of IWMP
- (3) Rapid urbanization due to proximity to the town
- (4) Irregularities in fund flow can derail the smooth functioning.
- (5) Political interference can dissatisfy the team to work properly.

In addition to this separate SWOT analysis was carried for the different area of intervention for identifying the internal and external factors that are favorable and unfavorable to achieve the objectives of the project. The details are presented in the micro watershed action plans.

The Pallom project area has low productivity because of the following reasons:

i) Occurance of flood during monsoons

Since majority of the area lies below 20 m above MSL, during the monsoon seasons, the Meenachil River, Meenanthala Ar and Kodoor Ar overflows resulting in frequent floods. The wetlands in the area are submerged in water for most part of the year due to poor drainage facilities. Hence annual and perennial crops cannot be successfully cultivated in these lands. Crop loss due to unseasonal or heavy monsoon appeared to be a recurrent phenomenon. Coupled with poor infrastructure in the padasekharams, lack of sufficient labour force & insufficient mechanization the misery of the farmers worsened day by day.

ii) Full dependence on monsoon:

The project area is dependent on monsoon. Water is an essential input in agriculture. Due to the absence of proper irrigation facility, 90% of the total cultivated area depends on the uncertain monsoon. Therefore, the success or failure of the monsoon determines the success or failure of agriculture production. The rainfall is unreliable due to two factors: untimely and inadequate.

iii) Low use of fertilizer per unit cropped area:

Farmers do not use sufficient fertilizer due to lack of water, scarcity of fertilizer in market and insufficient money for fertilizer. Many a times they don't get fertilizer at the right time.

iv) Traditional farming methods:

This also leads to low productivity. There is a lot of ignorance about the use of new farming methods and technologies such as multiple cropping. They are use of FYM

and other input in a proper way; that is why they don't get 90% output. So these factors contribute to low productivity.

v) Lack of adequate farm machinery:

Even today a large number of farmers in Pallom use wooden ploughs and bullocks. They don't have adequate machinery like seed drill. So, old machineries take more time in tillage practices.

vi) Lack of finances for farmers:

In the project area, most of the farmers are marginal and small. They do not have enough money to buy good quality seeds, machinery and other inputs.

vii) Lack of good quality seeds and fertilizers:

Good quality seed, fertilizer and pesticide are the important factors in agriculture productivity. The use of good quality seeds leading to higher productivity. In the project areathere are two limitations in the use of fertilizer. First these fertilizers are most useful in irrigated condition. But in the project area, 90 per cent of land depends on rainfall. Secondly these fertilizers are not properly used.

viii) Lack of other facilities such as storage and marketing:

4-8% of agriculture products damage after harvesting due to scarcity of proper storage and proper market for sale. So he sells to local traders at the low prices. Farmers mainly have a limitation in obtaining proper means of transportation. And second problem is farmers don't have proper storage facilities.

ix) Urbanisation and problem of waste management:

Rapid urbanisation has posed daunting challenges due to insufficient investment in basic services such as water supply, sanitation, transport and power and civic administration. This has resulted in environmental and social problems. The problem of waste disposal is a major issue and this is becoming a threat to health of people of that area.

x) Uncontrolled mining of sand and clay from paddy fields:

Uncontrolled mining of paddy lands for sand and clay has restricted the cultivation of paddy and the lands are left fallow for many years.

Project Implementation

The Block Panchayat having the major area under the programme is selected as the Project Implementing Agency (PIA) by the State Level Nodal Agency (SLNA) for Integrated Watershed Management Programme (IWMP) in Kerala. The PIAs are responsible for implementation of watershed project. In Kottayam district, for the IWMP – III, the Pallom Block Panchayat is selected as the Project Implementing Agency. The office of PIA is located at Vadavathoor, in Vijayapuram Grama Panchayat.

The Project Implementing Agency (PIA) provides necessary technical guidance to the Grama Panchayat for preparation of development plans for the watershed through Participatory Rural Appraisal (PRA) exercise, undertake community organization and training for the village communities, supervise watershed development activities, inspect

and authenticate project accounts, encourage adoption of low cost technologies and build upon indigenous technical knowledge, monitor and review the overall project implementation and set up institutional arrangements for post-project operation and maintenance and further development of the assets created during the project period.

The PIA, after careful scrutiny, shall submit the Action Plan for Watershed Development Project for approval of the DRDA and SLNA. The PIA shall submit the periodical progress report to WCDC. The PIA shall also arrange physical, financial and social audit of the work undertaken. It will facilitate the mobilization of additional financial resources from other government programmes, such as MGNREGS, State Horticulture Mission, VFPC, Tribal Welfare Schemes, Artificial Ground Water Recharging, Greening India, etc.

Co-ordination

The full responsibility of overseeing the watershed programme within the district will lie with the WCDC which will work in close collaboration with the District Planning Committee (DPC). The DPC will provide full governance support to the programme. The DPC will approve the perspective and annual action plans relating to watersheds projects in the district. DPC will integrate the watershed development plans with over all district plans and also oversee its implementation. DWDU will help the DPC in providing oversight and ensuring regular monitoring and evaluation of the programme. The District Panchayat will have an important role of governance in matters relating to the co-ordination of various sectoral schemes with watershed development projects, review of progress, settling disputes etc.

BIO PHYSICAL RESOURCES

LOCATION OF THE PROJECT

Pallom (IWMP-III) project area is mainly located in Kottayam Taluk of Kottayam district of Kerala State. The project is a cluster of eight micro watersheds viz. 12M38a (Thiruvanchoor-Nagambadam), 12M38b (Mannarthodu-Maalam-Areeparambu), 12M38d (Maalam), 12M38f (Nedumtharakavu), 12M39a (Mundakapadam), 12M39n (Kalathil kadavu), 12M39o (Parakkal kadavu) & 12M39p (Ereyil kadav). The total project area comes to 5349.52 Ha of which an area of 5100 Ha is proposed to be treated under Integrated Watershed Management Programme (IWMP).

Table- 7.1.1 Details of Watershed code, name and area

No	Code of watershed	Name of watershed	Treatable Area in ha	Percentage
1	12M38a	Thiruvanchoor-Nagambadam	903.16	17.71
2	12M38b	Mannarthodu-Maalam-Areeparambu	1056.06	20.71
3	12M38d	Maalam	623.70	12.23
4	12M38f	Nedumtharakavu	343.65	6.74
5	12M39a	Mundakapadam	370.96	7.27
6	12M39n	Kalathil kadavu	1111.87	21.80
7	12M39o	Parakkal kadavu	283.85	5.57
8	12M39p	Ereyil kadav	406.75	7.98
		Total	5100.00	100.00

The project area falls in 7 GramaPanchayats viz. Panachikkad, Vijayapuram, Manarkad, Ayarkunnam, Puthupally, Kooropada and Pampady coming under two Block Panchayats viz. Pallom and Pampady. The Project area is located between 9° 31'20.6"N - 9° 37'50.8"North Latitude and 76° 31' 17"E - 76° 38' 9"East Longitude.

Table-7.1.2 Details of Watersheds, GramaPanchayaths and area

No.	Watershed code	Name of Grama Panchayat	Name of Block Panchayat	Total Area (ha)	Treatable Area (ha)
1	12M38a	Ayarkunnam	Pallom	199.15	174.46
		Manarkad	Pampady	297.42	288.67
		Vijayapuram	Pallom	463.46	440.03
2	12M38b	Ayarkunnam	Pallom	668.80	628.87
		Manarkad	Pampady	268.27	254.64
		Kooropada	Pampady	83.47	79.17
		Pampady	Pampady	94.16	93.38
3	12M38b	Manarkad	Pampady	523.59	519.77
		Pampady	Pampady	114.54	103.93

4	12M38f	Vijayapuram	Pallom	347.23	343.65
5	12M39a	Vijayapuram	Pallom	432.40	370.96
6	12M39n	Panachikkad	Pallom	1124.40	1111.87
7	12M39o	Puthupally	Pallom	288.40	283.85
8	12M39p	Panachikkad	Pallom	444.22	406.75
Total Project Area				5349.52	5100.00

The major town near to the project area is Kottayam which lies in the State Highway and connects with other major towns of the State. The project area lies in the sides of the Meenachil River. The livelihood of the people is primarily based on agriculture, animal husbandry, wage labour, rearing cows and buffaloes for milk production.

PHYSIOGRAPHY

The project area can be divided into two physiographical regions viz, Lowlands and Midlands. The midland region lying between the Western Ghats and the lowland is made up of small and tiny hills and valleys. This is an area of intense agricultural activity. The region is rich in crops like coconut, rubber, tapioca, vegetables, banana, spices etc. The lowlands are the valley fills located in the project area. The uplands are seen towards the east and north eastern parts of the project area and is ideal for the major cash crop plantation viz. rubber. The elevation of the project area ranges from 0 to 120 m above MSL and the highest elevation of 120 m above MSL is located in the Mannarthodu-Maalam-Areeparambu Watershed (12M38b). The lowest elevation is 0-20 m which is located in the paddy fields. The area in general has got a undulating topography and moderate relief features.

CLIMATE

The project area has a humid tropical climate.

Rainfall

Rainfall is the major source of ground water recharge and rainfall pattern plays an important role on the water levels in the phreatic aquifer and also indirectly to the deeper leaky and confined aquifers. The rainfall data for Kottayam district from Indian Meteorological Department, during the year 2012 is analyzed.

Annual rainfall distribution

The annual rainfall received for the year 2012 is 2217.8. The district received 63 percent of the rainfall (1397.7 mm) during the south west monsoon, and 537.1 mm of rainfall during north east monsoon period. The monthly annual rainfall distribution during 2012 is given in table below.

Table No. 7.3.1- Monthly annual rainfall for 2012

Month	Rainfall (mm)	Month	Rainfall (mm)
Jan	30.8	July	352.8

Feb	14.8	Aug	483.7
Mar	66.5	Sep	223.1
Apr	284.3	Oct	262.5
May	80.9	Nov	156.9
June	338.1	Dec	4.3
Total annual rainfall			2217.8

Average Rainfall Vs Actual Rainfall

The actual rainfall during different seasons has been compared with the normal rainfall of the season to find out the variations of the rainfall. The seasonal and their percentage departure from normal rainfall is given in table 7.3.3.

Table No. 7.3.2 Seasonal rainfall and their percentage departure from average rainfall

Season	Period	Seasonal	Average	% Dep
Winter	January- March	112.1	100.5	11
Summer	April- May	329.2	434.5	-24
South West Monsoon	June- September	1397.7	2121.9	-34
North East Monsoon	October-December	423.7	573.6	-26

Winter period:- During the month of January to March 2012, the district receives a surplus of rainfall than the average. The percentage departure from average rainfall was 11 %.

Hot weather period:- During the month of April-May 2012, the departure of pre-monsoon rainfall recorded is -24% ie deficient type of rainfall during the season.

South West Monsoon period:- During the south west monsoon season from June to September 2012, the departure of rainfall recorded in the district is -34%. The district recorded deficient type of rainfall during the season.

North East Monsoon period:- During the north east monsoon period from October to December 2012, the district receives a a deficiet rainfall with a departure of -26%.

Table No. 7.3.3 Distribution of Rainfall and Departure from Long Period Averages (Normal RF) of Last 5 Years

Month	January		February		March		April		May		June	
Year	RF	% Dep.	RF	% Dep.	RF	% Dep.	RF	% Dep.	RF	% Dep.	RF	% Dep.
2008	0.0	-100	49.4	76	253.7	321	202.8	19	50.4	-85	341.6	-47
2009	7.5	-66	1.8	-94	78.6	30	69.9	-59	204.9	-38	460.0	-28
2010	9.6	-56	1.4	-95	96.7	60	201.5	18	354.1	7	664.7	4
2011	35.3	172	63.4	155	59.1	40	177.6	30	266.3	-6	860.0	32
2012	30.8	137	14.8	-41	66.5	57	284.3	109	80.9	-71	338.1	-48

Month	July		August		September		October		November		December	
Year	RF	% Dep.	RF	% Dep.	RF	% Dep.	RF	% Dep.	RF	% Dep.	RF	% Dep.
2008	554.4	-13	268.6	-35	370.5	32	284.0	-18	103.8	-54	53.6	-8
2009	553.1	-13	225.6	-45	280.8	0	188.6	-45	278.7	25	86.4	49
2010	568.9	-11	294.4	-28	366.9	31	559.4	62	456.0	104	97.9	69
2011	563.1	-9	453.6	18	381.5	41	180.2	-43	178.0	0	98.2	139
2012	352.8	-40	483.7	25	223.1	-18	262.5	-17	156.9	-12	4.3	-90

(Source: Indian Meteorological Department)

Temperature

The mean maximum temperature is 34 °C (Feb - April) and the mean minimum temperature is 21 °C (December – January). Humidity is high and rises to about 90 percent during the south west monsoon. The monthly mean daily temperature is given below.

Table No. 7.3.4 Monthly mean maximum and minimum temperature

Month	Mean temperature(°C)	
	Maximum	Minimum
January	32.8	21.1
February	34.1	22.3
March	34.1	24.1
April	34.2	23.8
May	33.3	25.2
June	31.4	23.6
July	30.7	23.4
August	29.9	23.2
September	31.0	23.4
October	32.3	23.4
November	32.3	23.0
December	33.3	22.0

RELIEF

The relief of the project area ranges from mean sea level to 120 m above MSL. The majority of the area falls in the relief category of 0 to 20 m above MSL which occurs in an area of 3740.22 ha (69.92 %). An area of 1183.64 ha is located in the relief category of 20 to 40 m above MSL. A very small area of 0.50 ha in Mannarthodu-Maalam-Areeparambu micro watershed is above 100 m above MSL. The table showing the relief class, area and percentage are given below:

Table No. 7.4.1 Relief class, description, area and percentage

No.	Relief Class	Area in Ha	Percentage
1	0-20 m above MSL	3740.22	69.92
2	20-40 m above MSL	1183.64	22.13
3	40-60 m above MSL	344.79	6.45
4	60-80 m above MSL	64.19	1.20
5	80-100 m above MSL	16.18	0.30
6	100-120 m above MSL	0.50	0.01
	Total area	5349.52	100.00
	Treatable area	5100.00	

SLOPE

Slope has a scale connotation. It 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 45° is a slope of 100%, because the difference in elevation between two points 100 m apart horizontally is 100 m on a 45° 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:

Table No. 7.5.1 Slope class, description, area and percentage

No.	Slope Class	Description	Area in Ha	Percentage
1	0-3 percent	Very gentle slope	1472.72	27.53
2	3-5 percent	Gentle slope	1715.60	32.07
3	5-10 percent	Moderately sloping	549.98	10.28
4	10-15 percent	Strongly sloping	534.66	9.99
5	15-35 percent	Moderately steep to steep	906.31	16.94
6	> 35 percent	Very steep	45.30	0.85
7	Waterbodies	Waterbodies	124.95	2.34
		Total	5349.52	100.00
		Treatable area	5100.00	

Majority of the area (1715.60 ha, 32.07 % of TGA) comes under the gentle slope class of 3-5 %. This is the major slope class in half of the micro watersheds (4 nos.). The second major category is very gentle slope with 0-3 % slope. This occurs is 1472.72 ha (27.53 % of TGA). This is the major slope class in three micro watersheds. An area of 906.31 ha (16.94 % of TGA) is having moderately steep to steep slope with 15-35% slope, which requires proper management and conservation measures.

The table showing distribution of slope in eight micro watersheds is given below:

Table No.7.5.2: Distribution of slope classes in watersheds

No.	Particulars	12M38a	12M38b	12M38d	12M38f	12M39a
1	0-3 percent	245.17	96.75	124.85	1.05	204.97
2	3-5 percent	588.90	405.78	199.30	232.19	103.56
3	5-10 percent	1.71	32.22			
4	10-15 percent		263.88	22.61		
5	15-35 percent	55.70	316.08	289.36	64.11	115.18
6	> 35 percent	9.42			35.88	
7	Waterbodies	59.13		2.01	14.00	8.69
	Total area	960.03	1114.71	638.13	347.23	432.40
	Treatable area	903.16	1056.06	623.70	343.65	370.96

No.	Particulars	12M39n	12M39o	12M39p	Total
1	0-3 percent	446.76	106.73	246.44	1472.72
2	3-5 percent	55.25	130.62		1715.60
3	5-10 percent	404.27	15.80	95.98	549.98
4	10-15 percent	185.14		63.03	534.66
5	15-35 percent	19.37	21.69	24.82	906.31
6	> 35 percent				45.30
7	Waterbodies	13.61	13.56	13.95	124.95
	Total area	1124.40	288.40	444.22	5349.52
	Treatable area	1111.87	283.85	406.75	5100.00

GEOLOGY

The major geological formation of the project area is Archean formation. This comprises of charnockite group of rocks, basic rocks and migmatite complex. Majority of the project area falls under charnockite group of rocks. Charnockite was defined as hyperstene granite; composed of hyperstene, microcline, quartz and accessory iron ores associated with granulites rocks. Migmatite complex are distributed along the northern and north eastern ridge of the project area. Migmatites are intermediate between metamorphic rocks and igneous rocks formed during prograde metamorphism where partial melting occurs in preexisting rocks. This migmatite shows irregular banding much recrystallisation, typical of metamorphic gneisses that have been taken on igneous character through partial melting, contains quartz, feldspar, hornblende and micas. Basic rocks are seen as irregular patches in the eastern side of project area. Basic rocks are igneous rocks that are comparatively low in silica and rich in magnesium and calcium seen as intrusives. The table showing the geology, area and percentage are given below

Charnockite group of rocks comprises 61.14% of total project area i.e. about 3270.95 ha. This is the major category in five micro watersheds. The second major category mapped in the area is sand and silt. This category extends over an area of 953.78 ha (17.83 % of TGA) and is the major category in 12M39a and 12M39o. 643.41 ha of project area are under Migmatitic complex.

Table showing distribution of geological units in the eight micro watersheds are given below:

Table No. 7.6.1 Distribution of geological units in watersheds

Sl. No.	Particulars	12M38a	12M38b	12M38d	12M38f	12M39a
1	Charnockite	606.10	823.85	570.55	131.43	73.79
2	Migmatite	294.80			201.80	146.81
3	Basic rocks		153.76			
4	Khondalite		137.10	65.57		
5	Sand & Silt					203.11
6	Waterbodies	59.13		2.01	14.00	8.69
	Total area	960.03	1114.71	638.13	347.23	432.40
	Treatable area	903.16	1056.06	623.70	343.65	370.96

Sl. No.	Particulars	12M39n	12M39o	12M39p	Total
1	Charnockite	760.48	11.22	293.53	3270.95
2	Migmatite				643.41
3	Basic rocks				153.76
4	Khondalite				202.67
5	Sand & Silt	350.31	263.62	136.74	953.78
6	Waterbodies	13.61	13.56	13.95	124.95
	Total area	1124.40	288.40	444.22	5349.52
	Treatable area	1111.87	283.85	406.75	5100.00

GEOMORPHOLOGY

There are six geomorphological units mapped in the project area. The major geomorphological unit of the project area is lower plateau which is an area of high land usually consisting of relatively flat terrain. An area of 3625.47 ha (67.77 % of TGA) is mapped under this category. The second major category of the project area is valley fill. An area of 1462.75 ha (27.34 % of TGA) comes under this category. Valley fills occupy the lowest reaches in topography with nearly level slope. The valley fill deposits are derived from weathering and deposited by the action of water at the floor of valleys. The various geomorphological units identified in the project area and their spatial extent is given Tables 7.6.1 and 7.6.2

Table No. 7.6.1: Geomorphological units description, area and percentage

Sl. No.	Geomorphological unit	Area (in ha)	Percentage (%)
1	Valley fill	1462.75	27.34
2	Channel bar (Flood Plain)	13.79	0.26
3	Point bar (Flood Plain)	23.00	0.43
4	Lower Plateau	3625.47	67.77
5	Linear ridge	18.95	0.35
6	Residual mount	80.61	1.51
7	Water body	124.95	2.34
	Total area	5349.52	100.00
Treatable area		5100.00	

The table showing the distribution of geomorphology in the eight watersheds are given below:

Table No. 7.6.2: Distribution of geomorphological units in watersheds

No.	Particulars	12M38a	12M38b	12M38d	12M38f	12M39a
1	Valley fill	200.18	132.12	129.77	104.07	159.25
2	Channel bar (Flood Plain)	13.79				
3	Point bar (Flood Plain)	23.00				
4	Lower Plateau	647.96	949.46	466.83	218.22	264.46
5	Linear ridge		18.95			
6	Residual mount	15.97	14.18	39.52	10.94	
7	Water body	59.13		2.01	14.00	8.69
	Total area	960.03	1114.71	638.13	347.23	432.40
	Treatable area	903.16	1056.06	623.70	343.65	370.96

No.	Particulars	12M39n	12M39o	12M39p	Total
1	Valley fill	350.26	156.89	230.21	1462.75
2	Channel bar (Flood Plain)				13.79
3	Point bar (Flood Plain)				23.00

4	Lower Plateau	760.53	117.95	200.06	3625.47
5	Linear ridge				18.95
6	Residual mount				80.61
7	Water body	13.61	13.56	13.95	124.95
	Total area	1124.40	288.40	444.22	5349.52
	Treatable area	1111.87	283.85	406.75	5100.00

LANDUSE

The major land use category mapped in the project area is mixed crops. Mixed crops are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. This is mapped in an area of 2250.46 ha (42.07 % of TGA). The second major land use category in the project area is rubber plantation. It covers an area of 1335.51 ha (24.97 % of TGA). In the valley portion of the watershed 291.47 ha comes under paddy cultivation. An area of 160.09 ha paddy land is converted to garden land to cultivate other horticulture crops. 582.75 ha of paddy lands have been left as cultivable wasteland which can be brought to paddy cultivation by providing necessary labour and irrigation facilities. The table showing the land use and area.

Table No. 7.7.1: Distribution of landuse, area and percentage

Sl. No.	Particulars	Total	Percentage
1	Built up Land	138.45	2.59
2	Paddy - Viruppu	47.77	0.89
3	Paddy - Mundakan	35.49	0.66
4	Paddy - Puncha	191.38	3.58
5	Paddy - Viruppu + Mundakan	4.73	0.09
6	Paddy - Mundakan + Puncha	12.10	0.23
7	Paddy converted to Builtup land	19.72	0.37
8	Paddy converted to Arecanut	4.67	0.09
9	Paddy converted to Coconut	11.18	0.21
10	Paddy converted to Banana	4.24	0.08
11	Paddy converted to Mixed crops	75.22	1.41
12	Paddy converted to Mixed trees	3.15	0.06
13	Paddy converted to Vegetables	3.45	0.06
14	Paddy converted to Tapioca	2.83	0.05
15	Paddy converted to Rubber	35.63	0.67
16	Paddy - Cultivable Waste Land	582.75	10.89
17	Arecanut	29.22	0.55
18	Banana	15.17	0.28
19	Coconut	20.79	0.39
20	Tapioca	1.30	0.02

21	Tubercrops	17.27	0.32
22	Vegetables	6.50	0.12
23	Vanilla	1.30	0.02
24	Mixed crops	2250.46	42.07
25	Mixed trees	242.21	4.53
26	Plantation Rubber	1335.51	24.97
27	Plantation Rubber + Arecanut	11.53	0.22
28	Plantation Cashew	1.53	0.03
29	Plantation Teak	6.57	0.12
30	Play ground	1.83	0.03
31	Railway line	9.09	0.17
32	Road	34.47	0.64
33	Quarry - Rock	5.97	0.11
34	Quarry - Clay	1.40	0.03
35	Quarry - Laterite	3.54	0.07
36	Quarry - Sand	2.25	0.04
37	Quarry - Abandoned	1.43	0.03
38	Cemetery	2.98	0.06
39	Cultivable Waste Land	35.53	0.66
40	Marshy land	8.61	0.16
41	Waste land	5.35	0.10
42	Waterbody	124.95	2.34
	Total area	5349.52	100.00
	Treatable area	5100.00	

SOILS

Soil is the basic natural resource that supports all life on earth's surface. Its thickness varies from a few centimeters to a few meters on earth's surface, but takes millions of years for its formation. Knowledge of soils is fundamental to well being of the present generation and the prosperity to come.

Soil survey is the study and mapping of soil as they occur in nature. This involves the systematic examination, description, identification, classification, correlation and finally mapping the geographic distribution of different soil, in the landscape. Thus soil surveys provide basic information on soils for planning development programmes.

A soil survey describes the characteristics of the soils, classifies them, plots the boundaries of the soils on an appropriate base map and makes predictions about the behavior of the soils. This information collected in a soil survey helps in the development of optimum land use plans and evaluates and predicts the effects of land use on the environment.

Major Soils

As part of the detailed soil survey conducted by Soil and Land Use Survey of India (SLUSI), Government of India, 7 series were identified and mapped in the project area viz. Kollad, Vadavathoor, Meenachil, Thiruvanchoor, Kooroppada, Pannimattom & Kalimala.

Meenachil soils are alluvial, in origin and are found along the banks of rivers and flood plains. Low land series viz. Kollad & Vadavathoor are colluvio - alluvial in origin. The soils seen in the made up paddy fields are classified as Miscellaneous land type as they have no uniform character. The major upland soil series is Kalimala which is distributed in an area of 1485.93 ha (28.72 %) followed by Meenachil (1019.18 ha, 18.76 % of TGA) and Thiruvanchoor series (1143.01 ha, 20.58 % of TGA). The Meenachil soil series are developed from riverine alluvium. It occurs in terraced to nearly level to level (0-1%) and very gently to gently sloping (1-5%) lands. The soils are brown to dark brown, very deep, coarse loamy to sandy textured, well drained with none to slight water erosion. These are well managed soils. These soils have good fertility and moderately slow permeability. Kalimala soils are soils with a solum thickness of 100 to 150cm is brown to yellowish red in colour, very strongly acidic and have a gravelly fine loamy surface texture. These soils are developed in Laterite. Pebbles and stones are found distributed in the sub surface region. These soils are well drained with moderate to moderately slow permeability. These are moderately managed soils with 20 to 30 % gravels on surface. These soils have medium fertility & moderate to good water holding capacity. These soils occur in rolling topography with normal to excessive relief and the soils are generally gravelly. Optimum soil conservation measures and proper soil management with judicious application of fertilizers with irrigation will enhance crop production. Thiruvanchoor series

The lowland soils series identified and mapped are Kollad & Vadavathoor. The upland soil series identified and mapped in the project area are Meenachil, Thiruvanchoor, Kooroppada, Pannimattom & Kalimala.

The occurrence of soil series and their extent are listed below.

Table No. 7.8.1: Distribution of soil series

Sl. No	Name of Soil Series	Characteristics	Area (ha)	%
1	Kollad	Coastal Alluvium, Nearly level to very gentle slope (0-3%), brown to dark brown, very deep, fine loamy textured to claye textured, imperfectly drained, none to slight water erosion, well managed soils	777.09	14.65
2	Vadavathoor	Gneiss, Gently to moderate sloping (0-3%) terraced to nearly level to level,	243.14	4.78

		reddish brown to dark reddish brown, deep to very deep, fine loamy textured, imperfectly drained, none to slight water erosion, well managed soils		
3	Meenachil	Alluvium, nearly level to very gentle slope (0-3%), brown to dark brown, very deep, coarse loamy to sandy textured, well drained, none to slight water erosion, well managed soils.	1019.18	18.76
4	Thiruvanchoor	Alluvium, very gently to gently sloping (1-5%) dark brown to very dark grayish brown, very deep, fine loamy to fine textured, moderately well drained, none to slight water erosion, well managed soils.	1143.01	20.58
5	Kooroppada	Gneiss, Strongly sloping to moderately steep (10-25%) yellowish red to dark reddish brown, deep to very deep, fine loamy to gravelly fine loamy textured, excessively drained, moderate water erosion, moderately managed soils with 5-10% rock out exposure and 5-10 stoniness.	139.84	2.74
6	Pannimattom	Laterite, strongly sloping to moderately steep (10-25%), reddish yellow to yellowish red, deep to very deep, gravelly fine loamy textured, excessively drained, moderate water erosion, moderately managed soils with 20-30% gravels on surface.	381.31	7.38
7	Kalimala	Laterite, Gentle to moderate slope (3-10%), brown to yellowish red, deep to very deep, fine loamy to gravelly fine loamy textured, well drained, moderate water erosion, moderately managed soils.	1485.93	28.72
8	Miscellaneous		35.07	0.69
9	River		124.95	1.71
		Total area	5349.52	100.00
		Treatable area	5100.00	

Source: Soil & Land Use Survey of India, Govt. of India

Note: M stands for Miscellaneous soils that have no uniform character

SOIL CHARACTERISTICS

Soil Depth

The physical properties of the soil largely determine how best it can be made suitable for growing a particular crop, different species or types of crops. Some of the important soil properties are water holding capacity, permeability to water, aeration, plasticity, nutrient supplying ability, etc. they are influenced by the size, proportion, arrangement and mineral composition of the soil particles. The proportion of the four major components of the soil- inorganic or mineral particles, organic material, water and air vary substantially from place to place and with depth. So soil depth is an important parameter for agriculture development and according to the depth, the soils have been classified into:

1. Very Shallow - less than 25 cm
2. Shallow - 25-50 cm
3. Moderately shallow - 50-75 cm
4. Moderately deep - 75-100 cm
5. Deep - 100- 150 cm
6. Very deep - more than 150 cm

The table showing the distribution of soil depth in the eight micro watersheds are given below:

Table No. 7.8.2: Distribution of soil depth in watersheds

No.	Soil Depth	12M38a	12M38b	12M38d	12M38f	12M39a
1	Deep	78.58	523.98	266.39	96.05	115.61
2	Very deep	822.32	573.80	351.58	237.18	308.10
3	Miscellaneous		16.92	18.15		
4	Waterbodies	59.13		2.01	14.00	8.69
	Total area	960.03	1114.70	638.13	347.23	432.40
	Treatable area	903.16	1056.06	623.70	343.65	370.96

No.	Soil Depth	12M39n	12M39o	12M39p	Total
1	Deep	581.21	113.23	204.66	1979.71
2	Very deep	529.59	161.61	225.60	3209.78
3	Miscellaneous				35.07
4	Waterbodies	13.61	13.56	13.95	124.95
	Total area	1124.41	288.40	444.21	5349.52
	Treatable area	1111.87	283.85	406.75	5100.00

Source: Soil & Land Use Survey of India, Govt. of India

Note: M stands for Miscellaneous soils that have no uniform character

Out of the total area, nearly half of the project area is having very deep soils. It occurs in an area of 3209.78 ha (60 % of TGA). An area of 1979.71 ha (37.01 % of TGA) is having deep soils with a depth varying from 100 to 150 cms.

Surface Soil Texture

A number of soil factors, the important of which are soil texture, moisture content and temperature modify delivery of ions to plant root surface by diffusion and mass flow. The finer the texture of the soil, the less rapid will be the movement of the soil texture and diffusion of ions through the water. Also, ions diffusing through soil moisture in clay soil are much more likely to be attracted to adsorption sites than on sandy soil.

The important textural classifications of soil are (1) sandy, (2) loamy, (3) clayey. Sandy soils are very permeable and well drained; but are less water retentive and hence need more frequent irrigation for successful crop growth. The clayey soils can hold more moisture, but they have high wilting percentage. They are also subjected to water logging resulting in poor aeration and drainage. The moderately fine texture soils, the loams are the most suitable soils for crop growth, since they have the advantage of both sand and clay.

The various surface soil textures identified in the project area and their spatial extent is given below:

Table No. 7.8.3: Distribution of surface soil texture

No.	Texture	Area in Ha	Percentage
1	Clay	463.19	8.66
2	Clay loam	2644.95	49.44
3	Gravelly clay loam	381.31	7.13
4	Sandy clay	557.04	10.41
5	Sandy clay loam	1143.01	21.37
6	Miscellaneous	35.07	0.66
7	Waterbodies	124.95	2.34
	Total area	5349.52	100.00
	Treatable area	5100.00	

Source: Soil & Land Use Survey of India, Govt. of India

Note: M stands for Miscellaneous soils that have no uniform character

The major soil texture of the project area constitutes that of clay loam texture which covers an area of 2644.95 ha (49.44 % of TGA). Sandy clay loam soils occur in 1143.01 ha (21.37 % of TGA). These surface soil textures cover the major area in all the eight watersheds. Five different soil textures are identified and mapped.

The table showing the distribution of surface soil texture in the eight watersheds are given below:

Table No. 7.8.3: Distribution of surface soil texture in watersheds

No.	Surface soil texture	12M38a	12M38b	12M38d	12M38f	12M39a
1	Clay	128.01	56.06	59.07	65.47	
2	Clay loam	183.78	964.47	469.79	101.09	169.04
3	Gravelly clay loam	25.36	77.25	89.11		33.74
4	Sandy clay					102.13
5	Sandy clay loam	563.75			166.67	118.80
6	Miscellaneous		16.92	18.15		
7	Waterbodies	59.13		2.01	14.00	8.69
	Total area	960.03	1114.70	638.13	347.23	432.40
	Treatable area	903.16	1056.06	623.70	343.65	370.96

No.	Surface soil texture	12M39n	12M39o	12M39p	Total
1	Clay		154.58		463.19
2	Clay loam	506.40	113.23	137.15	2644.95
3	Gravelly clay loam	88.33		67.52	381.31
4	Sandy clay	259.39		195.52	557.04
5	Sandy clay loam	256.68	7.03	30.08	1143.01
6	Miscellaneous				35.07
7	Waterbodies	13.61	13.56	13.95	124.95
	Total area	1124.41	288.40	444.22	5349.52
	Treatable area	1111.87	283.85	406.75	5100.00

Source: Soil & Land Use Survey of India, Govt. of India

Note: M stands for Miscellaneous soils that have no uniform character

Soil Erosion

Soil erosion is the process of detachment and displacement of soil particles from land surface. This mainly occurs by natural erosion or the geologic erosion and accelerated as soil erosion. The accelerated erosion is caused by the unscientific cultivation practices, heavy grazing and destruction of tree cover. The major factors influencing erosion are the rainfall, wind, type of soil, slope of the land, ground cover/land use pattern and human factors.

Three major erosion classes are mapped in the project area

- 1 – none to slight
- 2 –slight
- 3 –moderate

The majority of the area is under slight erosion class. An area of 3073.04 ha (57.45 % of TGA) is under this class. An area of 1096.22 ha (20.49 % of TGA) is under moderate erosion class. The remaining area of 1020.23 ha is under none to slight erosion class, which is under the low lying fields in the project area.

The table showing the distribution of soil erosion in the eight watersheds are given below:

Table No. 7.8.4: Distribution of soil erosion in watersheds

No.	Soil erosion	12M38a	12M38b	12M38d	12M38f	12M39a
1	None to slight erosion	128.01	56.06	59.07	65.47	102.13
2	Slight erosion	694.31	550.07	423.23	171.71	205.98
3	Moderate erosion	78.58	491.66	135.66	96.05	115.60
4	Miscellaneous		16.92	18.15		
5	Waterbodies	59.13		2.01	14.00	8.69
	Total area	960.03	1114.71	638.12	347.23	432.40
	Treatable area	903.16	1056.06	623.70	343.65	370.96

No.	Soil erosion	12M39n	12M39o	12M39p	Total
1	None to slight erosion	259.39	154.58	195.52	1020.23
2	Slight erosion	682.01	120.26	225.47	3073.04
3	Moderate erosion	169.40		9.27	1096.22
4	Miscellaneous				35.07
5	Waterbodies	13.61	13.56	13.95	124.95
	Total area	1124.41	288.40	444.21	5349.52
	Treatable area	1111.87	283.85	406.75	5100.00

Source: Soil & Land Use Survey of India, Govt. of India

Note: M stands for Miscellaneous soils that have no uniform character

LAND CAPABILITY

Land capability classification is an interpretative grouping of soils mainly based on the inherent soil characteristics, external land features and environment factors that limit the use of land. Information on first two aspects are provided by standard detailed soil survey. The internal characteristics include the nature of parent material, colour, texture, structure of soil, depth, soil erosion, etc. and the external land features includes the slope, erosion, drainage, etc.

The classification of soil units into capability grouping enables one to get a picture of the hazards of the soil to various factors which cause soil damage, deterioration or lowering in fertility and its potential for production. A soil with a capacity to grow a large variety of crops and giving high yields will naturally qualify to be grouped in a better class. Thus the soils are mainly classified into 8 capability class and of which 2 classes and their association falls in the project area.

Class	Description
II	Good cultivable land
III	Moderately good cultivable land
IV	Fairly good cultivable land suited for occasional or limited cultivation

These classes based on their limitations have the following sub-class association

c - climate limitation

e - erosion and run- off

s - soil limitations

w - wetness, high water table, flooding, drainage, etc.

Class I land is the best devoid to any limitation for intensive cultivation of all climatically adopted crops. Class II to VII lands has progressively increasing hazards or limitation. The sub classes provide information about the kind of problem involved. Climatic limitation (uneven rainfall distribution and high temperature) being common to the area has not been indicated along with the land capability class.

The table showing the distribution of land capability in the eight watersheds are given below:

Table No. 7.9.1: Distribution of land capability classes in watersheds

No.	Land capability	12M38a	12M38b	12M38d	12M38f	12M39a
1	IIw	128.01	56.06	59.07	65.47	102.13
2	IIIw		16.92	18.15		
3	IIIe	563.75			166.67	118.80
4	IIIes	183.78	824.63	469.79	101.09	169.04
5	IVes	25.36	217.09	89.11		33.74
6	Waterbodies	59.13		2.01	14.00	8.69
	Total area	960.03	1114.70	638.13	347.23	432.40
	Treatable area	903.16	1056.06	623.70	343.65	370.96

No.	Land capability	12M39n	12M39o	12M39p	Total
1	IIw	259.39	154.58	195.52	1020.23
2	IIIw				35.07
3	IIIe	256.68	7.03	30.08	1143.01
4	IIIes	506.40	113.23	137.15	2505.11
5	IVes	88.33		67.52	521.15
6	Waterbodies	13.61	13.56	13.95	124.95
	Total area	1124.41	288.40	444.22	5349.52
	Treatable area	1111.87	283.85	406.75	5100.00

Source: Soil & Land Use Survey of India, Govt. of India

The major land capability associations are:

IIw: An area 1020.23 ha (19.01 % of TGA) comes under this class. These are good cultivable lands with deep to very deep soils occurring on nearly level to very gently sloping lands subject to drainage problem. Excess water is the major limiting factor which limits the choice of crop. Paddy is most suited for the soil.

IIIe: An area of 1143.01 ha (21.37 % of TGA) comes under the class. These are moderately good cultivable land which are subjected to slight and moderate erosion hazards. The

soils are on moderate slopes subject to water erosion and sandy soils subject to wind erosion. These are problems due to moderate depth and gravelliness. These lands are suited for coconut, arecanut, banana, tapioca, vegetables, etc.

IIIw: An area of 35.07 ha is mapped under this class. The built up paddy lands (miscellaneous land type) is included in this class. These are moderately good cultivable lands with deep to very deep soils occurring on gently sloping lands subject to slight to moderate erosion. Spice trees, arecanut, coconut, betel vine, banana, vegetables etc. are the crops suited to the type of land.

IIIes: An area of 2505.11 ha (46.83 % of TGA) comes under this capability class. These are moderately good cultivable lands having deep to very deep soils. These soils occur on moderately sloping to steep lands subject to moderate erosion hazards and soil limitation. These lands are suitable for the cultivation of coconut, banana, pepper, rubber, pineapple, fruit trees etc.

IVes: An area of 521.15 ha comes under this capability class. These are fairly good cultivable lands having moderately deep gravelly soils. These soils occur on strongly sloping to steep lands subject to moderate erosion hazards and soil limitation. These lands are suitable for the cultivation of coconut, banana, pepper, rubber, pineapple, fruit trees etc.

GROUND WATER

Groundwater has been the mainstay for meeting the domestic needs of more than 80% of rural and 50% of urban population besides, fulfilling the irrigation needs of around 50% of irrigated agriculture. The ease and simplicity of its extraction has played an important role in its development. Recently the problems of decline in water table, contamination of groundwater, seawater intrusion etc. are being reported at many places.

The ground water potential of Kerala is very low as compared to that of many other states in the country. The estimated ground water balance is 5590 Mm³. Dug wells are the major ground water extraction structure in Kerala. The dug wells have a maximum depth of about 10 to 15 meters and have a diameter of about 1 to 2 meters in coastal region and 2 to 6 meters in the midland and high land. The open well density in Kerala is perhaps the highest in the country – 200 wells per sq.km in the coastal region, 150 wells per sq.km in the midland and 70 wells per sq.km in the high land. The ground water withdrawal is estimated as 980 Mm³ and the State Ground Water Department calculate the effective recharge as 8134 sq Mm³. The ground water level is receding drastically during the summer months and drying up of wells are common features of the ground water levels in many parts of Kerala. The ground water replenishment and hence the levels also depends on the geo-morphological, physical and chemical properties of the soil in general, The depth of water level in Kerala state varies from few cm bgl to 56 M bgl and most of the area fall under 0-20 M bgl. The depth of the water level in the weathered crystalline of midland areas in Kerala varies from 3- 16 M bgl. 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 Iph and 1,25,000 Iph. 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.bgl. Lateries form 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. Filter point 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 pre monsoon vary between coastal alluvium, river alluvium and valley fills.

The details of the ground water resource, ground water resource potential and observation wells in the study area are given below:

Table No. 7.10.1 :Ground water resource of Pallom Block
(As per GEC – 1997) on 31st March 2004

1	Domestic 2004	9.46
2	Domestic 2009	11.02
3	Industrial 2004	0.25
4	Industrial 2009	0.61
5	Total Annual GW recharge (MCM)	77.74
6	Natural discharge during non-monsoon season (MCM)	7.77
7	Net annual GW availability (MCM) (5-6)	69.97
8	Existing gross ground water draft for irrigation (MCM)	7.77
9	Existing gross ground water draft for domestic & Industrial water supply (MCM)	9.71
10	Existing gross ground water draft for all uses (MCM) (8+9)	17.48
11	Allocation for domestic and industrial water supply upto next 25 years (MCM)	11.63
12	Requirement for domestic and industrial water supply upto next 25 years (MCM)	13.18
13	Net GW availability for future irrigation development (MCM) (7-8-11)	50.57
14	Stage of GW Development in % (10/7 x 100)	24.98
15	Category	safe

Ground Water Resource Potential of Pallom Block
as on 31st March, 2004 in MCM

1	Command/Non command (NC)	NC
2	Recharge from Rainfall during Monsoon season	42.32

3	Recharge from other sources during monsoon season	Nil
4	Recharge from Rainfall during non-monsoon season	20.42
5	Recharge from other sources during non-monsoon season	15.00
6	Total Annual Ground Water Recharge	77.74
7	Natural Discharge during non-monsoon season	7.77
8	Net Annual Ground Water Availability	69.97

Observation wells

The details regarding the location of observation wells, depth of well and water table are given below:

Table 7.10.2: Distribution of observation wells in the watershed area

No.	Watershed code	Longitude	Latitude	Depth of well (m)	Depth of water table
1	12M38a	76°35'18"	9°37' 21"	6.4	5
2	12M38b	76°36'19"	9°37' 04"	5.8	3.7
3	12M38b	76°36'07"	9°36' 28"	5.0	2.9
4	12M38d	76°35'06"	9°35' 32"	7.6	6.2
5	12M39a	76°33'04"	9°35' 11"	10.3	7.3
6	12M39n	76°33'00"	9°33' 24"	14.9	9.3
7	12M39n	76°32'15"	9°31' 45"	12.0	8.6
8	12M39n	76°33'26"	9°31' 28"	9.0	6.6
9	12M39o	76°33'38"	9°33' 00"	8.4	6.2

Table No. 8.1

INTERGRATED WATERSHED MANAGEMENT PROGRAMME - PALLOM (IWMP-III)
PALLOM BLOCK PANCHAYATH, KOTTAYAM
FUNDING PATTERN - Master Plan for 4 Years

(Amount in Rupees)

Year	Adminiatration	Monito ring	Evalua tion	Entry Point Activity	Institu tion & Capacity Building	DPR Preparation	Natural Resource Management Activities	Livelihood Activities	Production System & Micro Enterprises	Consoli dation Phase	Total IWMP Project Fund
1 st	1224000	122400	61200	2448000	1224000	612000	3393847	550250	687000	0	10322697
%	2	0.2	0.1	4	2	1	5.55	8.99	1.12		16.87
2 nd	1530000	153000	153000	0	1224000	0	12908383	1512000	1710000	0	19190383
%	2.5	0.25	0.25		2		21.09	24.70	2.79		31.36
3 rd	1530000	153000	153000	0	612000	0	12469974	1716000	2240000	0	18873974
%	2.5	0.25	0.25		1		20.38	28.04	3.66		30.84
4 th	1836000	183600	244800	0	0	0	5526308	1647600	1680000	1836000	12954308
%	3	0.3	0.4				9.03	26.92	2.75	3	21.17
Total	6120000	612000	612000	2448000	3060000	612000	34272000	5425850	6120000	1836000	61200000
%	10	1	1	4	5	1	56	9	10	3	100

Table No. 8.2

INTERGRATED WATERSHED MANAGEMENT PROGRAMME - PALLOM (IWMP-III)
PALLOM BLOCK PANCHAYATH, KOTTAYAM
NATURAL RESOURCE MANAGEMENT ACTIVITIES - Master Plan for 4 Years

(Amount in Rupees)

Sl. No	Name of Watershed	Year wise	IWMP Fund	Convergence	WDF	Total
1	12M38a - Thiruvanchoor- Nagambadam	First Year	538689	4284329	53868	4823018
		Second Year	2189645	6821046	218965	9010691
		Third Year	2299122	2928667	229913	5227789
		Fourth Year	1043000	1152000	104300	2195000
2	12M38b - Mannarthodu- Maalam-Areeparambu	First Year	779000	1894825	77900	2673825
		Second Year	2604671	5680992	260467	8285663
		Third Year	2575981	3601742	257598	6177723
		Fourth Year	1146008	820800	114601	1966808
3	12M38d - Maalam	First Year	360000	472175	36000	832175
		Second Year	1588727	2598480	158872	4187207
		Third Year	1430731	2036863	143073	3467594
		Fourth Year	811668	793000	81167	1604668
4	12M38f - Nedumtharakavu	First Year	188855	1319000	18886	1507855
		Second Year	951690	2927495	95169	3879185

		Third Year	838964	2823525	83896	3662489
		Fourth Year	338600	490000	33860	828600
5	12M39a – Mundakapadam	First Year	230700	686175	23070	916875
		Second Year	952015	2611625	95202	3563640
		Third Year	891115	3049242	89112	3940357
		Fourth Year	420000	641000	42000	1061000
6	12M39n – Kalathil kadavu	First Year	728339	3894251	72834	4622590
		Second Year	2821403	21674394	282140	24495797
		Third Year	2819496	18742174	281950	21561670
		Fourth Year	1105790	2799490	110579	3905280
7	12M39o – Parakkal kadavu	First Year	237776	2341909	23778	2579685
		Second Year	708128	8184844	70813	8892972
		Third Year	649591	7921894	64959	8571485
		Fourth Year	312466	1660354	31247	1972820
8	12M39p – Ereyil kadav	First Year	330488	2687287	33049	3017775
		Second Year	1092104	4964061	109210	6056165
		Third Year	964974	3084736	96497	4049710
		Fourth Year	348776	1995134	34878	2343910

Table No. 8.3

INTERGRATED WATERSHED MANAGEMENT PROGRAMME - PALLOM (IWMP-III)**PALLOM BLOCK PANCHAYATH, KOTTAYAM****LIVELIHOODS FOR LANDLESS/ ASSETLESS - Master Plan for 4 Years***(Amount in Rupees)*

No	Name of Watershed	Year wise	IWMP Fund	Beneficiary contributions	Total
1	12M38a - Thiruvanchoor- Nagambadam	First Year	98250	56250	154500
		Second Year	240000	60000	300000
		Third Year	272000	68000	340000
		Fourth Year	285000	285000	570000
2	12M38b - Mannarthodu-Maalam- Areeparambu	First Year	113250	71250	184500
		Second Year	332000	83000	415000
		Third Year	348000	87000	435000
		Fourth Year	328000	528000	856000
3	12M38d - Maalam	First Year	66500	38500	105000
		Second Year	184000	46000	230000
		Third Year	216000	54000	270000
		Fourth Year	191100	191100	346200
4	12M38f - Nedumtharakavu	First Year	38000	20500	58500
		Second Year	96000	24000	120000

		Third Year	128000	32000	160000
		Fourth Year	140000	140000	280000
5	12M39a – Mundakapadam	First Year	40250	22750	63000
		Second Year	108000	27000	135000
		Third Year	128000	32000	160000
		Fourth Year	105000	105000	210000
6	12M39n – Kalathil kadavu	First Year	119500	63500	183000
		Second Year	356000	89000	445000
		Third Year	364000	91000	455000
		Fourth Year	367500	367500	735000
7	12M39o – Parakkal kadavu	First Year	31000	17000	48000
		Second Year	84000	21000	105000
		Third Year	104000	26000	130000
		Fourth Year	94500	94500	189000
8	12M39p – Ereyil kadav	First Year	43500	22500	66000
		Second Year	112000	28000	140000
		Third Year	156000	39000	195000
		Fourth Year	136500	136500	273000

Table No. 8.4

INTERGRATED WATERSHED MANAGEMENT PROGRAMME - PALLOM (IWMP-III)
PALLOM BLOCK PANCHAYATH, KOTTAYAM
PRODUCTION SYSTEM & MICRO ENTERPRISES - Master Plan for 4 Years

(Amount in Rupees)

No.	Name of Watershed	Year wise	IWMP Fund	Convergence	WDF	Total
1	12M38a - Thiruvanchoor- Nagambadam	First Year	138750	138750	24975	225000
		Second Year	365000	465000	65700	830000
		Third Year	430000	639000	77400	1069000
		Fourth Year	160000	276000	28800	436000
2	12M38b - Mannarthodu-Maalam- Areeparambu	First Year	142500	142500	25650	285000
		Second Year	355000	529000	63900	884000
		Third Year	450000	549500	81000	999500
		Fourth Year	415000	433500	74700	848500
3	12M38d - Maalam	First Year	90000	90000	16200	180000
		Second Year	165000	243000	29700	408000
		Third Year	255000	393000	45900	648000
		Fourth Year	220000	208000	39600	428000
4	12M38f - Nedumtharakavu	First Year	56250	56250	10125	112500
		Second Year	160000	204000	28800	364000

		Third Year	150000	200000	27000	350000
		Fourth Year	160000	224000	28800	384000
5	12M39a – Mundakapadam	First Year	48750	48750	8775	97500
		Second Year	125000	165000	22500	290000
		Third Year	135000	180000	24300	315000
		Fourth Year	140000	192000	25200	332000
6	12M39n – Kalathil kadavu	First Year	135000	111000	24300	246000
		Second Year	240000	396000	43200	636000
		Third Year	510000	664000	91800	1174000
		Fourth Year	450000	520000	81000	970000
7	12M39o – Parakkal kadavu	First Year	37500	25500	6750	63000
		Second Year	150000	210000	27000	360000
		Third Year	100000	144000	18000	244000
		Fourth Year	45000	60000	8100	105000
8	12M39p – Ereyil kadav	First Year	38250	38250	6885	76500
		Second Year	150000	180000	27000	330000
		Third Year	210000	280000	37800	490000
		Fourth Year	90000	120000	16200	210000

INSTITUTION BUILDING

The watershed development project has great potential and scope to empower socially disadvantaged sections of the community. Considering the needs and priorities of these sections, special activities were designed to reduce their drudgery. This was involved in a skills upgradation programme. People's organizations hold the key in ensuring the right integration between sustainable development and social equity. Such organizations have representations from socially backward communities and women with separate special interest groups. Within group interactions across group interactions and representation in village level institutions provide a platform for the disadvantaged groups to become a part of mainstream development. It is also important to note that it was properly ensured that these groups obtain equal opportunities to access the resources developed at the community level.

In order to implement effectively, under the umbrella of State Level Nodal Agency (SLNA) various institutional mechanisms are formed. They are:

- viii. Watershed Cell cum Data Center (WCDC)
- ix. Project Implementation Agency (PIA)
- x. Watershed Development Team (WDT)
- xi. Watershed Committee (WC)
- xii. Neighbourhood Groups
- xiii. Self Help Groups (SHGs)
- xiv. User Groups (UGs)

i) State Level Nodal Agency

A dedicated State Level Nodal Agency (SLNA) is constituted by the State Government with Agricultural Production Commissioner as the Chairman and Rural Development Commissioner as the Vice Chairman. SLNA is having an independent bank account. The SLNA sanction watershed projects for the State on the basis of approved state perspective and strategic plan as per procedure in vogue and oversee all watershed projects in the state within the parameters set out in these Guidelines.

ii) Watershed Cell cum Data Center (WCDC)

In district, a separate dedicated unit, called the Watershed Cell cum Data Center (WCDC) is established, which oversees the implementation of watershed programme in the district. WCDC has a separate independent account for this purpose. WCDC function in close co-ordination with the District Planning Committee. WCDC is a separate unit with full time Project Manager and 3 to 4 subject matter specialists on Agriculture/ Water Management / Social Mobilisation/ Management & Accounts appointed on the basis of their qualification and expertise on contract/deputation/transfer etc.

iii) Project Implementing Agency (PIA)

The Block Panchayat having the major area under the programme is selected as the Project Implementing Agency (PIA) by the State Level Nodal Agency (SLNA) for Integrated Watershed Management Programme (IWMP) in Kerala. The PIAs are responsible for implementation of watershed project. In Kottayam district, for the IWMP – III, the Pallom Block Panchayat is being selected as the Project Implementing Agency.

The Project Implementing Agency (PIA) provides necessary technical guidance to the Grama Panchayat for preparation of development plans for the watershed through Participatory Rural Appraisal (PRA) exercise, undertake community organization and training for the village communities, supervise watershed development activities, inspect and authenticate project accounts, encourage adoption of low cost technologies and build upon indigenous technical knowledge, monitor and review the overall project implementation and set up institutional arrangements for post-project operation and maintenance and further development of the assets created during the project period.

The PIA, after careful scrutiny, submits the Action Plan for Watershed Development Project for approval of the DWDU/DRDA and other arrangements. The PIA will also submit the periodical progress report to DWDU. The PIA shall also arrange physical, financial and social audit of the work undertaken. It will facilitate the mobilization of additional financial resources from other government programmes, such as MGNREGS, BRGF, SGRY, National Horticulture Mission, Tribal Welfare Schemes, Artificial Ground Water Recharging, Greening India, etc.

iv) Watershed Development Team (WDT)

Watershed Development Team is an integral part of the PIA and is set up by the PIA as per the directions of SLNA. WDT has seven members, broadly with knowledge and experience in agriculture, soil science, water management, social mobilization and institutional building. WDT functions in close collaboration with the team of experts at the district and state level. The expenses towards the salaries of the WDT members are charged from the administrative support to the PIA. WDT guides the Watershed Committee (WC) in the formulation of the watershed action plan. WDT assists Gram Panchayat / Gram Sabha in constitution of the Watershed Committee and their functioning. WDT also assist in organizing and nurturing User Groups and Self-Help Groups. WDT undertakes engineering surveys, prepare engineering drawings and cost estimates for any structures to be built. Monitoring, checking, assessing, undertaking physical verification and measurements of the work done are also done by WDT.

v) Watershed Committee

It is a committee that is constituted by Grama Sabha to implement the watershed project with technical support of WDT in the micro watershed area. This committee is

registered as a sub group of the Grama Panchayat. The Grama Sabha of the Panchayat selects the chairman of the watershed committee with the secretary who will be an employee nominated by the Grama Panchayat, preferably the Village Extension Officer. The Watershed Committee (WC) will comprise of at least 9 members, half of the members shall be representatives of SHGs and User Groups, SC/ST community, women and landless persons in the village. One member of the WDT shall also be represented in the Watershed Committee (WC). Where the Panchayat covers more than one village, they would constitute a separate subcommittee for each village to manage the watershed development project in the concerned village. Where a watershed project covers more than one Gram Panchayat, separate committees will be constituted for each Gram Panchayat.

The Watershed Committee was formed in all the eight micro watersheds of IWMP-III project area. The IWMP-III is a cluster of 7 Grama Panchayats coming under 2 Block Panchayats. 8 Watershed Committees are formed at Panchayats keeping all parameter of Watershed Committee keeping the gender sensitive issues intact. Watershed Committee members are briefed about the project objectives and a workshop is also conducted in this regard at every Panchayat.

The watershed committee has a pivotal role to play during and after the project implementation period. The Watershed Committee has a separate bank account to receive funds for watershed projects and will utilize the same for undertaking its activities.

vi) Neighbour Hood Groups

Neighbour Hood Groups are formed in every micro watershed combining 40 to 50 households living as clusters. The overall planning, coordination, management and maintenance of the activities pertaining to the area are implemented through this Group. These families are further subdivided into clusters of 7-8 houses and a person is selected to represent this cluster in the Neighbour Hood Committee ensuring the proper representation on different sections. The details of wards, households and NHGs in the project area are given below:

Table No. 9.6.1: Details of Panchayat, wards and NHGs

No.	Name of Panchayat	number of wards in full	number of wards in part	number of NHGs
1	12M38a - Thiruvanchoor-Nagambadam			
a	Ayarkunnam	2	2	24
b	Vijayapuram	5	-	35
c	Manarkad	2	1	26
2	12M38b - Mannarthodu-Maalam-Areparambu			
a	Ayarkunnam	4	2	33
b	Manarkad	1	2	16

c	Kooropada		2	3
d	Pampady		3	20
3	12M38d – Maalam			
a	Manarkad	5	4	39
b	Pampady		2	18
4	12M38f - Nedumtharakavu			
a	Vijayapuram	4	2	39
5	12M39a – Mundakapadam			
a	Vijayapuram	3	5	45
6	12M39n – Kalathil kadavu			
a	Panachikkad	12	4	124
7	12M39o – Parakkal kadavu			
a	Puthupally	2	1	13
8	12M39p – Ereyil kadav			
a	Panachikkad	4	1	38

vii) Self Help Groups

Self Help Groups are self-motivated, small homogenous groups organized together through highly successful of credit and thrift activities. Self Help Group initiative especially for women helps to uplift their livelihood. The Watershed Committee shall constitute SHGs in the watershed area with the help of WDT from amongst poor, small and marginal farmer households, landless/asset less poor agricultural labourers, women, shepherds and SC/ST persons. These Groups shall be homogenous groups having common identity and interest who are dependent on the watershed area for their livelihood. Each Self Help Group will be provided with a revolving fund of an amount to be decided by the Nodal Ministry

SHG initiative in this project was being organized by having a focused group discussion between various homogenous communities of women based on their livelihood separately. Each group discussed their basic problems with their facilitators. The major problems identified are:

- a) Lack of proper credit facilities due to low intervention of formal financial credit institution.
- b) Excessive exploitation of weaker section by money lenders
- c) Lack of attitude for saving among poor people due to complex and rigid conventional financial institution structures.
- d) Lack of small micro-loans without collaterals and high interest rates.
- e) Lack of knowledge on credit, thrift activity and banking.

With a view point of these problems it was planned to organize these women to into a group consisting of 5 to 20 in each groups. It was planned to have some capacity building training regarding SHG activities. It was also proposed to have some livelihood activities which will promote women empowerment. This included Bakery units, Garments making, Mushroom Production, and Vermi compost activities with forward and backward linkage. This will ultimately lead into better human development in the village.

viii) User Groups

User Groups are normally formed to manage an activity or asset created under the programme on a long term basis. The Watershed Committee (WC) shall 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 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 user group collects user charges from their members, oversee the works and manage the benefits

Some of the points which were considered while forming a user group in the villages of the IWMP-III project are:

- a) In case of, Land Leveling, Farm Bundling, Roof Well Recharge, Kitchen Garden, Demonstration Plot, Contour Trench, Ring Bund, Soil Bund, Staggered Trenches, etc. all the beneficiaries of the individual and community activities who are involved are made user group members.
- b) In case of a check dam or Gully Plug, all the beneficiaries of the individual check dam where involved as user group members.

Focused group discussion will be conducted to between the user groups to discuss the above conditions and to select potential members. It was decided that each group would formulate certain internal rules and have a feeling of ownership with community spirit. Membership was on voluntary and democratic.

The following types of User Groups were planned to be formed in the villages of the Pallom IWMP-III watershed

No	Name of User Group	Major Task
1	Animal Husbandry	Bringing of new AH technology

		Management of New Cattle and their improvement
2	Agriculture	Self sufficiency in vegetables Increasing area under cultivation
3	Land Leveling	Equitable sharing of soil management
4	Farm bund	Equitable sharing of natural resources Assuring conduct of proper work
5	Gully Plug	Equitable sharing of soil and water management Development of community land for fodder development
6	Well Recharge	Equitable sharing of Water Management to improve ground water table
7	Check Dam	Equitable sharing of Water Management to improve ground water table and enhance water Storage Capacity
8	Plantation	Develop wasteland area and production of bio fuel.
9	Horticulture	Increase Livelihood
10	Kitchen Garden	Increase Livelihood & poison free vegetables
11	Mushroom	Increase Livelihood
12	Bee keeping	Increase Livelihood
13	Demonstration Plot	Demo to Village People on Modern Agriculture system and High Production
14	Fodder Bank & Cultivation	Bringing of More Fodder available in Village for village animal and their improvement.
15	Floriculture	Improve and purpose of livelihood
16	Vegetable Farming	Improve modern technology and purpose of livelihood
17	Fishery	Improve modern technology and purpose of livelihood

CAPACITY BUILDING

Capacity building is a conceptual approach to development that focuses on understanding the obstacles that inhibit people, Local Self Governments and various stake holds working in the project area. This also aims at realizing their developmental goals while enhancing the abilities that will allow them to achieve measurable and sustainable results. Capacity building was aimed in strengthening the skills, competencies and abilities of people and communities in developing societies in order to overcome the causes of their exclusion and suffering. It was to guide their internal development and activities. A series of trainings, awareness programmes, user group discussions and brain storming sessions were organized at different levels.

The following awareness seminars/trainings were conducted as part of the Capacity Building for the different stakeholders of the project area.

Block Level Co-ordination Committee

Kerala State Land Use Board is entrusted as Technical Support Organisation for Preparing Detailed Project Report for IWMP, Pallom. As part of Capacity Building, multi-level training was given to the people's representatives of the Blocks & Panchayaths included in IWMP (Integrated Watershed Management Programme), Pallom. A meeting of Block Level Co-ordination Committee was organised on 28-05-2013 at Block Panchayath Hall, Pallom by Kerala State Land Use Board in collaboration with Pallom Block Panchayath. The Programme was organised with an inaugural session followed by technical session. Smt. P. Marykutty IAS, Land Use Commissioner, Kerala State Land Use Board inaugurated the meeting. Presidential address was delivered by Smt. Letha Kumari Salimon, Block Panchayath President, Pallom. Participants included officials of line departments and people's representatives of Pallom & Pampady Block Panchayath under this project. A. Nizamudeen, Deputy Director (Soil Survey), Kerala State Land Use Board delivered a talk to create an awareness about the programme Integrated Watershed Development Programme. The topics presented include concepts of Watershed Planning, salient features of IWMP, convergence of IWMP, etc.

Awareness Seminar

To create awareness on Watershed Based Local Planning, a one day seminar on 11-06-2013 was organised at Pallom Block Panchayath Hall by Kerala State Land Use Board in collaboration with Pallam Block Panchayath. The awareness seminar was inaugurated by Pallom Block President Smt. Letha Kumari Salimon. Pallom & Pampady Block Panchayath

members, Grama Panchayath Presidents and Ward members of Panachikad, Puthupalli, Vijayapuram, Manarkad, Pampady, Ayarkunnam, and Koororpada Grama Panchayaths participated in the seminar. The inaugural session was followed by a technical session handled by Shri. A. Nizamudeen, Deputy Director, Kerala State Land Use Board and was attended by the officials of the line departments like Agriculture, LSGD, Fisheries, Animal Husbandry etc from all the above Panchayaths. Topics viz. the concept of Watershed Planning and Development, Integrated Watershed Management Programme, role of different tiers of Local Self Government Institutions and Neighbourhood Groups in watershed planning were included in the seminar which ended with an user interactive discussion.

Block Level training on Drainage Line Treatment

One day training was organised at project area to discuss the various interventions to be undertaken on the drainage line and surface water resources. The training was organised on 05-08-2013 at Block Panchayath Hall and was attended by the people's representatives, office bearers of Neighbourhood groups, Padashekhara Samithis, MGNREGS, etc coming under the IWMP project area. The objective of the training was to identify the different agronomic and engineering interventions needed for the protection and conservation of drains and surface water bodies. The training was organised with an inaugural session followed by technical session and group discussion. The training was inaugurated by Smt. Letha Kumari Salimon, Block Panchayat President, Pallom Block Panchayath. Shri. Baiju Cherukkotiyil, Vijayapuram Grama Panchayath President, Shri. K.C. Mathai, Ayarkunnam Panchayath President, Smt. Girija Thulaseedharan, Acting President, Panachikad Grama Panchayath, Shri. Babu.K. Kora, Mannarkadu Grama Panchayath were also present. Smt. Yasmin.L.Rasheed, Assistant Director, Kerala State Land Use Board explained the concept of watershed Planning and Interventions on Drainage Line. Grama Panchayath President along with the ward members, NHG representatives and Padashekara samithi members discussed about the interventions to be implemented in their area and concerned Grama Panchayath Presidents presented the brief of the group discussion. In the general discussion the participants of the seminar were members of District/Block/Grama Panchayaths, CDS Chairpersons, LSGD Engineers/Overseers, and Officials of development departments in the project area. One hundred and twenty participants attended the meeting.

Orientation Seminars

Panchayth Level Committee was formed in all panchayths and half day orientation seminars were organized in the Grama Panchayats to create awareness on the need of Watershed level planning in local level development and planning. The programme was conducted with an inaugural session followed by technical presentations. The orientation

seminars were formally inaugurated by the concerned Grama Panchayat Presidents. The lectures delivered includes concept of watershed planning, salient features of Integrated Watershed Mngement Programme and possible interventions for watershed conservation, development and management. The participants of the seminar includes people's representatives of Block & Grama Panchayats, officials of line departments, ADS chairpersons, progressive farmers, MGNREGS labour group, NGO's Social Groups etc.

Focus Group Discussions

Focus Group Discussions were organized at Grama Panchayat Level to understand the concepts of development and suggestions from the people's representatives, line departments, progressive farmers and beneficiaries regarding the different types of interventions - soil and water conservation, livelihood, production system and micro enterprises - to be undertaken in this project. One day workshop was conducted with an inaugural session followed by an introductory remark explaining the purpose and elaborated the key list of attributes to be discussed. Groups were formed at ward level and two hours was allotted for the group discussion. The technical officers of Kerala State Land Use Board facilitated the groups to deal tactfully with the outspoken group members, keep the discussion on track and to make sure that every participant was involved in the group discussion. After the group discussion, each ward member or his representative has presented the outcome of the discussion. The participants of the focus group discussion includes the Presidents and Secretaries of the Neighbour Hood Groups, People's representatives, ADS chairpersons and MGNREGS labour groups and progressive farmers.

Suggestions received from Drainage Line Treatment discussions, Focus Group Discussions were codified and this was further discussed with officials and elected representatives of Block and Grama Panchayats. Based on such series of discussions, the Entry Point Activities to be taken up in the project area were finalized

Activities for Coming Years

It is proposed to carry out the following institutional based training and capacity building programmes in the first three years of the project period in order to equip various stakeholders to successfully participate and implement the project:

First Year:

1. Technical Trainings for Entry Point Activities
2. Orientation for Watershed Development Team and Watershed Development Committee Members and Panchayat Officials
3. Orientation course on Fund Management for Watershed Development Teams and Watershed Committees

Second & Third Year:

1. Orientation programme on Group Management and Livelihood Activities with special focus on Nursery Raising, Kitchen Garden, Fisheries, Dairy Development, Mushroom cultivation, Bee Keeping, Vermi compost, Integrated Nutrient Management (INM), etc.
2. Orientation programme on water conservation, water literacy and well recharging.
3. Orientation for members of User Groups (UGs) and Self Help Groups (SHGs)
4. Orientation of Watershed Development Team (WDT) and Watershed Development Committees on Monitoring and Evaluation of the Project with special focus on RTI, Social Audit and Transparency

Capacity Building Plan

One of the key features of the watershed development is the capacity building support. It is a crucial component to achieve the desired results from watershed development projects. Five percent of the total project cost (Rs. 30.60 Lakhs) has been earmarked for institution and capacity building. The funds available for different micro watersheds as per the IWMP guidelines are as follows:

No.	Name of micro watershed	Amount in Rs.
1	Thiruvanchoor-Nagambadam	5,41,896
2	Mannarthodu-Maalam-Areeparambu	6,33,636
3	Maalam	3,74,220
4	Nedumtharakavu	2,06,190
5	Mundakapadam	2,22,576
6	Kalathil kadavu	6,67,122
7	Parakkal kadavu	1,70,310
8	Ereyil kadav	2,44,050
Total		30,60,000

A series of awareness and training programmes were organized as part of the detailed project report preparation and entry point activities.

The remaining activities planned during the first, second, third and fourth year of the implementation area as follows:

Participants	Topics for Training
Watershed Development Team, Watershed Committee and Elected Representatives	Community organization in participatory preparation of DPR Fund management CPR management Participatory M & E Post – project management

	Benefit sharing Coordination and convergence with other allied several development activities
Watershed Committee Members and Neighbour Hood Group Office bearers	Awareness on participatory WDP Organizing groups Conducting meetings Recording the proceedings Office management Accounting procedures Book keeping Assisting SHGs and UGs in identifying proper items for DPR Effective payments, etc.,
Neighbour Hood Groups Self Help Groups	Orientation on IWMP Nursery Management Homestead Vegetable garden Vermi-composting Mushroom cultivation Apiculture Green fodder production Livestock rearing – cow, goat, rabbit Livelihood activities – composting, nursery raising, carpet making, soap making, etc. Skill up gradation in Marketing Benefit sharing
User Groups	Natural Resources Management CPR management Post project management of assets created Fund management Benefit sharing

The training plans suggested for the watershed area are given in the session viz. Training Plan.

ENTRY POINT ACTIVITIES

Entry point activities are necessary to bring the community members towards the project and to bring about a positive air in the project area. Entry Point Activities are part of community mobilization process to get more and more participation of the community in the watershed planning and to meet a part of community needs. Entry Point Activities are those interventions identified by the community as felt needs, during the initial awareness.

EPA activities are taken up under watershed projects to build a rapport with the village community to make them to feel the presence at the beginning of the project; generally, certain important works which are in urgent demand of the local community are taken up. A Group Discussion was conducted with watershed Development Committee regarding the EPA activity. It was conveyed to the WC that a particular amount was allotted for EPA activity for each of their villages, which was 4 per cent of total allocated budget. The villagers discussed various activities which they felt is important but after a brief discussion it was conveyed to them that only those activities can be taken, which revive the common natural resources. It was also taken into priority that there should be an instrument of convergence which will result in sustainability of activities.

According to the Common Guidelines of Integrated Watershed Management Programme (IWMP), 4 per cent of the total project cost is earmarked for Entry Point Activities. A total amount of Rs. 24.48 lakhs is available for EPA and the details showing the watershed code, name of watershed, area and amount is given below:

No	Code of watershed	Name of watershed	Treatable Area in ha	Amount (Rs.)
1	12M38a	Thiruvanchoor-Nagambadam	903.16	4,33,517
2	12M38b	Mannarthodu-Maalam-Areeparambu	1056.06	5,06,909
3	12M38d	Maalam	623.70	2,99,376
4	12M38f	Nedumtharakavu	343.65	1,64,952
5	12M39a	Mundakapadam	370.96	1,78,061
6	12M39n	Kalathil kadavu	1111.87	5,33,698
7	12M39o	Parakkal kadavu	283.85	1,36,248
8	12M39p	Ereyil kadav	406.75	1,95,240
Total			5100.00	24,48,000

A series of workshop, trainings and user group discussion were carried out in the project area to finalise the Entry Point Activities to be undertaken. The Suggestions derived were discussed in the Panchayat Level Watershed Committees (PLWCC) of each Grama Panchayat falling in the project area. With the approval of the PLWCC, it was decided to carry out the following Entry Point Activities in the project area such as strengthening of bunds of paddy fields, establishment of biogas plants, construction of the rain water harvesting structures, mini rural drinking water schemes, renovation of ponds, culvert and drains, medicinal garden, vegetable garden, side wall construction of quarries and pisciculture.

The details of the entry point activities are given below:

Sl. No	Name of Watershed	Watershed Code	Name of Grama Panchayath	Name of Activity	Location
1	Thiruvanchoor-Nagambadem	12M38a	Ayarkunnam	Vegetable cultivation 50 cents	Children's Home, Ayarkunnam Survey No. 408
			Ayarkunnam	Bio-Gas	Children's Home, Ayarkunnam Survey No. 408
			Manarkkad	Widening the Peringhazha thodu for Tourism Development and improve agricultural activity. Construction of bund, motofacility for pumbing water. Combined project of three panchayaths.	Ward No 1&2 Manarkkad, Vijayapuram, Ayarkunnam
			Vijayapuram	Sneha theeram Park- Landscaping and hard scaping	Ward no.1, survey no.111. In the bank of Meenachil river
2	Mannan thodu-Maalam-Aryparambu	12M38b	Manarkkad	Biogas plant-Rajeev Gandhi Laksham Veedu Colony Pipe Compost Rain water pits, vegetables Mount Mary Public School	Ward No 5 Sur.No.440 Ward No 5
			Kooroppada	Grow bags, vegetables	

			Pampady	Grow bags, vegetables	
			Ayarkunnam	Grow bag ,Vegetable cultivation	Ayarkunnam
3	Maalam	12 M38d	Manarkkad	Roof top Rain Water Harvesting, Rain water pits Rock Quarry-Side wall construction, Net covering Length-130 cm Water level- 3m to 4.3m	Ward No.8 Sur.No 393 Ward No.10 Sur.No374 Ward No.2 Sur.No45 Ward No.2 Sur.No.24,25
			Pampady	Side wall construction of Karil padasekharam Length-78 cm, Height-2.20m Two public wells renovation work	
4	Nedumtharakavu	12M38f	Vijayapuram	Renovation of existing Pallikkunnu pond for drinking water project	Ward 17, Survey no. 270/4 Pallikkunnu
				Restoration of abandoned drinking water project	Ward 16, Survey no. 281 ESI hospital
5	Mundakapadam	12M39a	Vijayapuram	Public Well renovation	Ward 12 Survey no.57

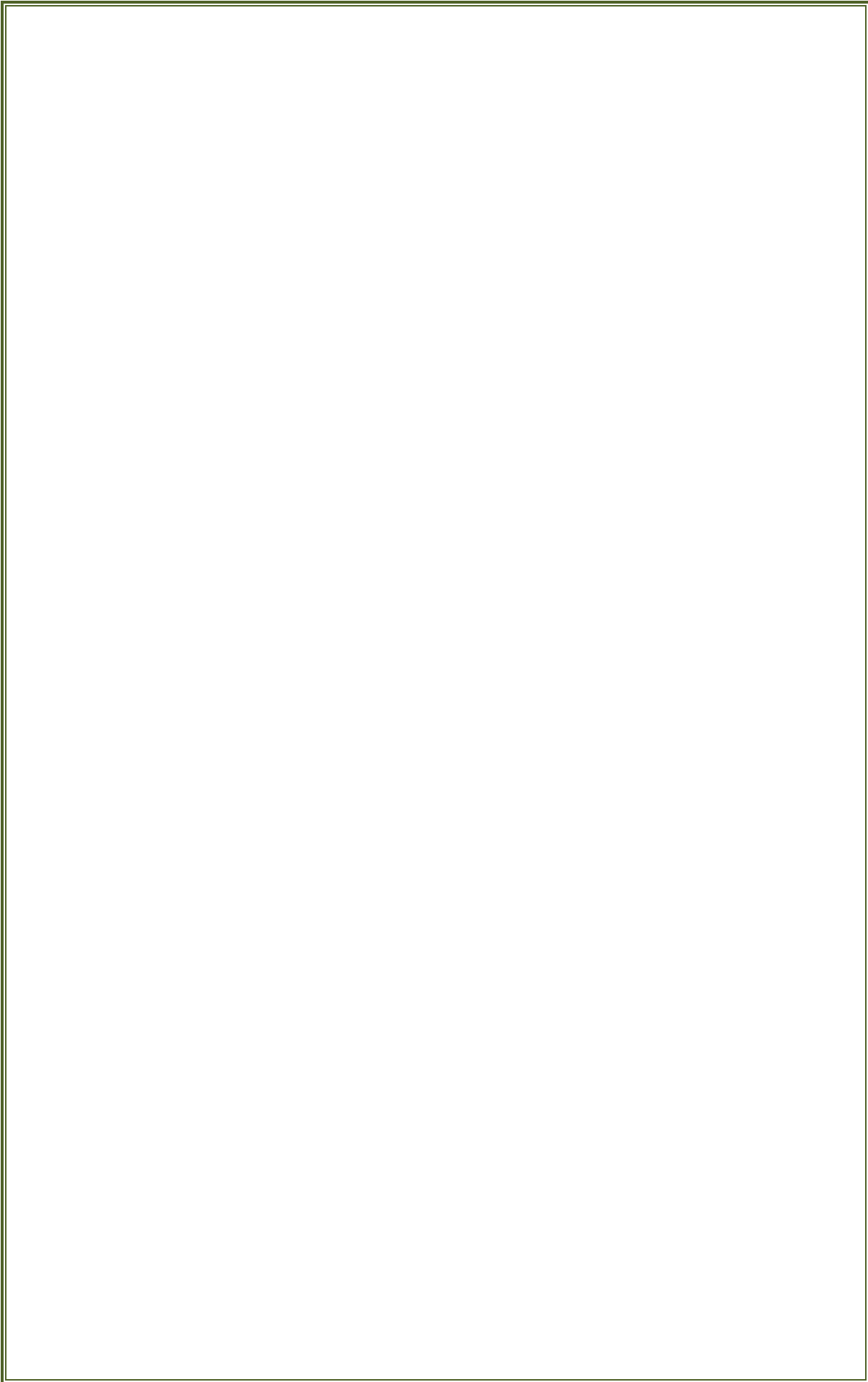
6	Kalathikkadav	12M39n	Panachikkad	Strengthening of outer bunds of paddy area.	Thokalampadam Padasekharam
				Rainwater Harvesting Structure	Survey No. 183, in Ayurveda Hospital
				Strengthening of outer bunds of paddy area. Extension of Paddy Area	Kallunkal Kadavu
7	Parakkalkadavu	12M39o	Puthuppally	Strengthening of outer bunds of paddy area.	Survey No. 255,407,252 to 242
				Cleaning of 3Culverts and smoothening of water course Extension of Paddy Area	Malayakeri Thekkumbagham padasekharam Malayakeri Thekkumbagham padasekharam
				Vegetable cultivation	Erikkatt Padasekharam
				Medicinal Plants Garden/ Vegetable Garden	437,Next to puthuppally Church
8	Ereyilkadavu	12M39p	Panachikkad	Strengthening of outer bunds of paddy area.	Erelkadavu Padasekharam
				Pond Rejuvenation Pisciculture	Kuthirakulam Pond Kuthirakulam Pond
				Drinking Water Scheme.	Kaduvakulam SC Colony, Survey No.321

Pre-Intervention and Expected Post Intervention Status by the Entry Point Activities.

The details of the various entry point activities with the pre intervention status and the expected post intervention status is given below:

No	Activity	Present Status	Post - Intervention Status
1	Rain Water Harvesting structures	Watershed area has been experiencing drinking water scarcity with condition worsening in some regions	Harvested water can be recycled and used for many purposes such as drinking, irrigation, livestock etc.
2	Biogas plant	Watershed area facing many unhygienic issues due to poor waste management system	Benefits of production of energy, transformation of organic waste to high quality facilities, improvement to hygiene conditions
3	Strengthening of bunds	Paddy cultivable waste lands present	Extension of paddy area
4	Well recharging	Water scarcity during summer months	Water available throughout the year
5	Mini Drinking Water Scheme	Shortage of Drinking water	Provide safe potable drinking water to habitation.
6	Renovation of ponds and drains	Ponds and drains remains deposited by wastes and garbage and facing problem of sitting, reduction in depth etc.	Increasing availability of water, productivity can be increased by utilizing water for agricultural purpose.

The location details, technical details and detailed estimates of the various Entry Point Activities suggested were submitted as a separate report to PIA.



WATERSHED DEVELOPMENT WORKS

Watershed work phase is the core component of the project. This includes creating permanent structures as required by the slope, geology and topography, starting from ridge to valley, to conserve rain water at point of its incidence. Tapping the water resources at right place at right time will increase the effectiveness of this project. The objective being reclamation of natural resources and creating sustainability to assets created under this project. A multi-tier ridge to valley sequence approach was adopted towards implementation of watershed development projects. A net budget of 56 percent is allotted for this work.

NATURAL RESOURCES MANAGEMENT

The physical treatments are to be carried on during the watershed development work phase. While implementing the project, it is necessary that the treatments are carried out starting from ridge and progressing towards the valley. This approach is followed with the following objectives:

- a) Protect the upper reaches to avoid erosion and reduce runoff
- b) Avoid siltation of structures in the middle and lower catchments.
- c) Ensure the cost effectiveness of structures in the valley and
- d) Improve overall efficacy of the measures.

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

- a. Ridge Area Treatment : All activities required to restore the health of the catchment area by reducing the volume and velocity of surface runoff, including regeneration of vegetative cover in forest and common land, afforestation, staggered trenching, contour and graded bunding, bench terracing etc.
- b. Drainage line treatment with a combination of vegetative and engineering structures, such as earthen checks, brushwood checks, gully plugs, loose boulder checks, gabion structures, underground dykes etc.
- c. Development of water harvesting structures such as low-cost farm ponds, nalla bunds, check-dams, percolation tanks and ground water recharge through wells, bore wells and other measures.
- d. Nursery raising for fodder, fuel, timber and horticultural species. As far as possible local species may be given priority.
- e. Land development including in-situ soil and moisture conservation and drainage management measures like field bunds, contour and graded bunds fortified with plantation, bench terracing in hilly terrain etc.
- f. Crop demonstrations for popularizing new crops/varieties, water saving technologies such as drip irrigation or innovative management practices. As far as possible varieties based on the local germplasm may be promoted.

- g. Pasture development, sericulture, bee keeping, back yard poultry, small ruminant, other livestock and micro-enterprises.
- h. Veterinary services for livestock and other livestock improvement measures.
- i. Fisheries development in village ponds/tanks, farm ponds etc.
- j. Promotion and propagation of non-conventional energy saving devices, energy conservation measures, bio fuel plantation etc.

Soil and Water Conservation Works

Mainly the watershed development works are divided into three stages such as ridge area treatments, Slope treatment, Plains or flat level (Area treatment) and Drainage line treatments. Different treatments are planned for each micro watershed considering the geographic and socio economic condition of that specific area. The details are briefly described below:

A. Ridge Area Treatment Plans:

It is very important to treat the ridge as this is where the major water resources originate. This involves mainly hilly region. For the ridge area treatment of watersheds, following structures are been proposed after interaction between the watershed committee, Neighbour Hood Groups, GramaPanchayats, Block Panchayat and other field staff of line departments and WDT engineer.

- a) Graded Bunding
- b) Gully Plug
- c) Contour Trenches
- d) Staggered Trenches
- e) Earthen Bunds

a. Graded Bunding:

“Graded bunds or graded terraces or channel terraces are the bunds or terraces laid along a pre-determined longitudinal grade very near the contour but not exactly along contour”.



The graded bunds, commonly used are comparable to the narrow base terraces. They are used for the safe disposal of excess runoff in high rainfall areas and regions where the soil is relatively impervious [clay]. Farming operations are not done on bunds or bund channels.

Function:

1. These terraces act primarily as drainage channel to regulate and conduct runoff at non erosive velocity.
2. To make the runoff water to trickle rather than to rush out.

b. Gully Plug:

The portion where the stream begins, the structure is constructed by arranging loose boulder perpendicular to the flow of water is called gully plug.

Benefits:

1. Prevents soil erosion and reduces the flow of water.
2. Very useful in moisture conservation and reduces the desiltation of the streams.

c. Contour trenching:

It is a simple, and a low-cost method of checking the velocity of runoff in the ridge area of any watershed. A contour trench is a trench dug along a contour line. A contour line is a line which joins together points of the same elevation. Digging a trench along such a line increases the chances of retaining runoff for a longer period of time within the trench. It is also true that if trenches were not along the contour, such digging could actually increase the possibility of soil erosion.

**Objectives:**

- Slowing down the velocity of runoff
- Checking soil erosion, and
- Improving local soil moisture profile

Contour trenches are constructed in the ridge area of a watershed. Rainwater, which falls in this area, flows unchecked carrying with it eroded soil into the level portion of the watershed referred to as the "valley". This eroded soil gets deposited as silt in the reservoirs and ponds, thereby reducing their life. Thus, any water harvesting work undertaken in the valley will become meaningless unless appropriate measures such as contour trenching are undertaken to control runoff and soil erosion on the ridge. Contour trenches serve to collect the rainwater that falls in the ridge area. This way the soil moisture profile in the area adjacent to the trench gets improved. Along with the water, the eroded fertile topsoil also gets deposited in the trench. It is, therefore, necessary to combine trench construction with plantation.

**d. Staggered trenches**

In medium rainfall areas with highly dissected topography, Staggered Contour Trenches (SCT) are adopted. The length of the trenches is kept short around 2-3 m and the



spacing between the rows may vary from 3-5 m. The chances of breaches of SCT are less as compared to Continuous Contour Trenches. Over time, experience of watershed programs has shown that it is better to stagger the digging of contour trenches. This is because it has been found that invariably errors have been made in contouring over

long distances. If the contour trench is not level and by mistake sloped, then water starts to flow from the high point to the low point, cutting a path and increasing soil erosion. Therefore, instead of making trenches continuously, they should be made in a staggered, discontinuous manner.

Objectives:

- Slowing down the velocity of runoff
- Checking soil erosion, and
- Improving local soil moisture profile

e. Contour earthen bunds

Contour bunding is a simple and low-cost method of checking the velocity of runoff in the ridge area of any watershed. A contour bund is a bund constructed along a contour line. A contour line is a line, which joins together points of the same elevation. Making a bund along such a line increases the chances of retaining runoff for a longer period of time within the bund.

Objectives:

- Slowing down the velocity of runoff
- Checking soil erosion
- Improving local soil moisture profile

Contour bunds are constructed on the ridge area of a watershed. Rainwater, which falls in this area, flows unchecked carrying with it eroded soil into the flatter portion of the watershed - the "valley". This silt gets deposited into the reservoirs and ponds, thereby reducing their life. Thus, any water harvesting work undertaken in the valley, will become meaningless unless appropriate measures such as contour trenching and bunding are undertaken to control runoff and soil erosion on "the ridge. Like contour trenches, bunds also collect the rainwater that falls in the ridge area. This way the soil moisture profile in the area adjacent to the bund is improved. Along with the water, eroded fertile topsoil also gets deposited in the bund. It is, therefore, important to combine contour bunding with appropriate vegetative measures.



B. Land Development

The second tier treatment is the slope treatment. This is generally done on agricultural land or waste land. This generally includes water conservation or surface water storage structures. This being highly labour intensive, will involve more of manual labour; so, funds from Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) can be taken. Following structures are been proposed in these areas

- a. Land Leveling/Bench Terracing
- b. Plantation
- c. Earthen Bund

Land leveling: Bench terracing means construction of nearly level steps like fields along contours usually by half cutting and half filling procedure. It is an earthen embankment or a ridge and channel, constructed across the slope at a suitable location to intercept surface runoff water. It may be constructed with an acceptable grade to an outlet or with a level channel and ridge. By adopting bench terracing, both degree and length of slope are reduced which help in soil moisture conservation for enhanced crop production. Bench terracing is recommended for slopes from 10 to 30%.

Plantation: Several agronomical measures are adopted, supplementing the mechanical measures in the treated lands. These measures include: -

- a. Contour Farming - planting on contours.
- b. Mulching using various techniques that will increase the water retention capacity of the soil, for instance mixing straw and breaking clods. Mulching is particularly helpful in vegetable cultivation, where assured soil moisture is a necessity.
- c. Use of dense growing crops/ cover crops, for instance cowpea, pulses, paddy. These will reduce splash erosion.
- d. Mixed cropping
- e. Intercropping or strip cropping, alternating either blocks or strips with different crops.
- f. Use of organic manure or green manuring with legumes, such as cowpea, dhaincha, pulses. This improves water-holding capacity.

Earthen Bunds: Field bunding is one of the important structures which check the runoff of water from the farm level. Often farm area left without proper bunding, water freely flows out of the farm and scope for percolation is almost negligible. Hence farm bunding plays an important role in conservation of moisture at farm level. As the multi-tier approach ridge to valley, drainage line treatment and land development farm bund fall in the third agenda.

C. Plains or Flat Level Treatment:

This is generally done in the fields of the farmers where they are raising very high labour intensive crops. This generally includes field bunding, cropping pattern alteration, etc. The prime aim is to conserve the rain in the field. In this area stone bunding is not feasible due to unavailability of stone in the local area. So in the plain or flat level treatment, the four things are proposed as under.

1. Farm Bund
2. Centripetal terracing
3. Rain water harvesting pits
4. Afforestation/ Plantation

D. Water conservation Structures and activity:

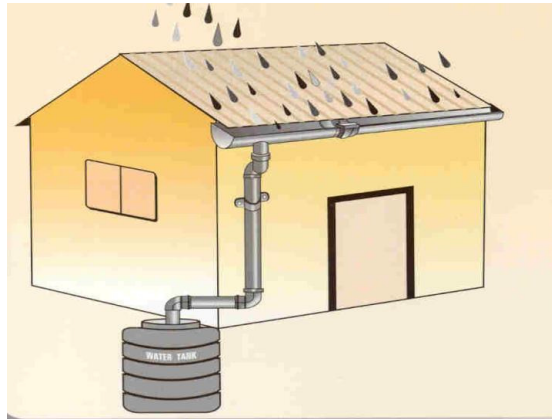
The activities are generally taken in the bottom area/ valley region of the watershed area. The structures will help in the storage of the water which increases the soil moisture and water table of the area. Land can be irrigated through these structures. The proposed structures are as follows:

1. Rain (Roof)Water Harvesting
2. Farm ponds/Irrigation wells
3. Check Dam
4. Well Recharge

Rainwater harvesting from rooftop catchments

Rooftop Rain Water Harvesting is the technique through which rain water is captured from the roof catchments and stored in reservoirs. Harvested rain water can be stored in sub-surface ground water reservoir by adopting artificial recharge techniques to meet the household needs through storage in tanks. The main objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain

water for use is particularly important in dryland, hilly, urban and coastal areas. There are several reasons for harvesting rainwater today including: low-cost irrigation, domestic water supply, water and soil conservation, aquifer recharge, and flood control. It is also desirable to use rain because of the high quality and softness of the water and the relative absence of



contaminates such as disinfection byproducts (chlorinated hydrocarbons), endocrine disrupting compounds (antibiotics and hormones), heavy metals, agricultural chemicals and chlorine resistant microbes that are increasingly appearing in our ground and tap water. Rainwater collection systems are cost effective and easy to maintain by the average homeowner and are easier to install and use than wells or surface ponds.

Well recharge

The broad aim of the programme is to improve the water quantity and quality levels of homestead open dug wells and small homestead ponds. This will contribute to enhanced health and welfare of the community through improved access to drinking water. The reduction of public spending on Tanker Water Distribution to the water stressed regions which is common during summer is also envisaged as a broader goal of the programme.

The specific objectives of the programme are

- (i) recharge ground water
- (ii) improved drinking water availability across the year
- (iii) significantly reduce the impact of drought and consequent public spending on supply of drinking water in tankers to the water stressed regions
- (iv) Improved agricultural production and productivity.



The programme would also envisage strengthening of the decentralization programme and the PRIs, in discharging their basic mandate in water sector through community efforts that are cost effective and sustainable.

Biogas plants

The term 'biogas' is commonly used to refer to a gas which has been produced by the biological breakdown of organic matter in the absence of oxygen. The gases methane,



hydrogen and carbon monoxide can be combusted or oxidized with oxygen and the resultant energy release allows biogas to be used as a fuel. Biogas is a commonly used bio fuel around the world and is generated through the process of anaerobic digestion or the fermentation of biodegradable materials such as biomass, manure, sewage, municipal waste, rubbish dumps, septic tanks, green

waste and energy crops. This type of biogas comprises primarily methane and carbon dioxide.

Biogas has a wide variety of uses and can be used as a relatively low-cost fuel for the generation of energy and heating purposes, such as cooking. For example, basically any facilities which need power are able to use biogas to run engines, or to generate either mechanical or electrical power. Biogas can be compressed, similar to natural gas, and is able to be used to power motor vehicles. It is possible to concentrate the methane within biogas to the same quality standards as fossil fuel derived natural gas to produce biomethane. If concentrated and compressed this biogas can then be used in vehicle transportation.

MINI DRINKING WATER SUPPLY SCHEMES

In spite of heavy annual rainfall, and numerous rivers and ponds, the State of Kerala is paradoxically situated among the country's lowest per capita ground water availing state. Water plays an important role in the welfare of societies through its widespread linkages. Water needs are complexly linked with the daily life and its scarcity can be an obstacle to economic growth. The important aspects in this regard are (i) the availability of water for production and income generation; (ii) water for domestic needs, which have a significant role in maintaining human health; and (iii) sustainable environmental management. Among the water users in different sectors, consumption by households has very specific influence on human well-being. Even though the household consumption constitutes only eight per cent of the total water usage, the value of water for household purposes is reckoned much higher than the value of it for industrial use and farming.

Hence, providing potable water to all sections of the society becomes one of the major concerns of the governments. The problem of financing the water service may be one of the contributing factors for institutional change. In this context, privatization or market based profit dominated approach to water supply service has emerged as a policy suggestion to tackle the problem. However, privatization of an essential service of water is not politically and socially viable. Further market strategies and privatization tend to raise inequalities. Another approach, aiming both economic and environmental sustainability includes decentralized development with co-operation of NGOs and local communities. Community management of drinking water has recently emerged as an alternative.



Declining water table has a consequence on the family managed drinking water supply. In this background, conservation of the existing water resources and its efficient management becomes the priority issue at policy level.

Providing rural drinking water supply is one of important functions of the Panchayat system. Wherever the water supply is lower than the norms laid down by Government, augmentation of water supply is to be taken up. Drinking water has to be provided within 1/2 km of the habitation.

It is proposed to start six numbers of mini rural drinking water supply schemes in the project area, of which two has been started under the EPA.

CROP DEMONSTRATIONS

The agricultural system is characterized by low productivity, shift towards less labour intensive crops and increasing marginalization of agricultural income in the household economies. These deplorable conditions form the backdrop to the local initiative for agricultural rejuvenation.

At present the agricultural activities in the area are mainly aimed to meet the local needs and only small amount of vegetables are sent to outside market for sale. The farmers rely on old techniques and patterns for agricultural production. The area has wider scope for the use of modern techniques and improved tillage practices. As banana and vegetables are the key horticulture produce in the area, it is proposed to bring more area under these crops. To popularize these crops, crop demonstrations were taken under the Entry Point Activities. It is proposed to give 5 banana seedlings to all households and to introduce organic vegetable cultivation in 50 cents per Neighbourhood



Group. As crop diversification is also essential for economic sustainability, it is proposed to introduce water melon, jasmine and floriculture. The plants of money fetching horticulture plants like mango, rambutan, mangosteen, guava, etc. will also be supplied to the households to improve the economic condition of the farmers.

The activities aimed at irrigation will enhance the productivity and will irrigate more area which paves way to bring more area under agriculture/horticulture production. The villagers expressed much enthusiasm towards expanding their horticulture activities. Moreover the watershed area holds good potential for horticulture activities. Hence it is important to promote and expand horticulture activities in the area.

Avenue plantation

Afforestation is the process of establishing a forest on land that is not a forest, or has not been a forest for a long time by planting trees or their seeds. Trees could be planted along the roads, which could check the erosion in the depression of the roadside.

Advantages:

- It helps meet the world's increasing demands for timber and forest products
- Soil erosion is avoided as trees prevent rapid run off after heavy rainfall.
- Jobs are provided.
- Trees provide oxygen
- The beauty of the landscape is preserved
- Trees absorb carbon dioxide and help cut down the danger of global warming
- Trees help prevent heavy storms



Alarmed over the massive degradation of its lush green cover, it is proposed to launch an ambitious social forestry project aimed at instilling a love for nature in the student community, and other inhabitants. The programme will have three elements - 'Our Trees' for school students, 'Puzhayoram' for those who live in the reaches of major drains in the area including the banks of Pallom River and 'Vazhiyoram' (roadside tree shades) for other inhabitants of the area. Under the 'Our Tree' programme, students from Classes 5 will plant fruit trees in their school premises and take good care of it and manage them for five years. Necessary arrangements will be sought to provide grace marks according to how well they take care of the plants. Under 'Puzhayoram' seedlings of bamboo, reeds and other suitable plants will be planted along the sides of the major drains ensuring the side wall protection. Under 'Vazhiyoram', other inhabitants will plant trees along the sides of major roads. The persons who plant trees alongside the road sides will be responsible for taking care of them too. The Project Implementation Agency will be working in tandem with the Public Works Department to implement the project. The Social Forestry division of Kerala Forest Department will provide saplings of around 25 varieties of trees including teak, jackfruit, anjili, bamboo, reeds and gooseberry that would be planted as part of the programme.

It is proposed to bring all the educational institutions in the project area under this scheme.

Budget

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

No.	Name of micro watershed	Amount in Rs.
1	Thiruvanchoor-Nagambadam	60,69,235
2	Mannarthodu-Maalam-Areeparambu	70,96,723
3	Maalam	41,91,264
4	Nedumtharakavu	23,09,328
5	Mundakapadam	24,92,851
6	Kalathil kadavu	74,71,766
7	Parakkal kadavu	19,07,472
8	Ereyil kadav	27,33,360
	Total	3,42,72,000

Major interventions suggested

The major interventions suggested under the watershed development works are the following:

1	Medicinal plants garden in public institutions
2	Vegetable garden in schools
3	Extension of paddy cultivation
4	Cultivation of horticultural crops in wastelands
5	Cultivation of fodder crops
6	Floriculture
7	Avenue tree planting
8	Pineapple cultivation
9	Banana cultivation
10	Fruit tree planting
11	INM in pepper (in mixed cropped area)
12	INM in coconut
13	Crop demonstration - vegetable (pandal type)
14	Crop demonstration - vegetable (non-pandal type)
15	Crop demonstration - horticultural crops
16	Vegetable grow bags
17	Intercropping in coconut gardens
18	Distribution of organic fertilizers
19	Desiltation of drains
20	Desiltation of ponds
21	Centripetal terracing
22	Vetiver planting
23	Earthen bunds/strengthening of existing earthen bunds
24	Strip terracing
25	Chal restoration/vachal clearing
26	Mulching
27	Agrostological measures
28	Cover crops in rubber plantation
29	Bio fencing
30	Brush wood bunding
31	Geo textiles
32	Outer bund strengthening of paddy fields
33	Planting of bamboo seedlings
34	Embankment protection of drains
35	Stone pitched contour bunding
36	Side wall protection of drains (engineering)
37	Side wall protection of ponds (vegetative)

38	Construction of shutters
39	Repair of existing shutters
40	Construction of new ponds
41	Rain water harvesting structures
42	Moisture Collection Pits
43	Renovation of public wells
44	Well recharging
45	Silpaulin tanks
46	Mini drinking water scheme
47	Biogas
48	Pipe compost
49	Vermicompost
50	Solid Waste Management unit

LIVELIHOOD ACTIVITIES FOR THE LANDLESS/ASSET LESS HOUSEHOLDS

One of the key features of the watershed development includes focused priority on livelihood activities for landless/asset less persons. Nine percent of the total project cost has been assigned to support the livelihood activities for landless/asset less households. This component aims to maximize the utilization of potential generated by watershed activities and creation of sustainable livelihoods and enhanced incomes for households within the watershed area. This will facilitate inclusiveness through enhanced livelihood opportunities for the poor through investment into assets, improvements in productivity and income, and access of the poor to common resources and benefits and augment the livelihood strategy at household level.

Guiding Principles

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

- a. Enhance livelihood opportunities for the poor through investment into asset creation and improvement in productivity and income.
- b. Improve access of the marginalized communities, including SC/ST, landless/assetless people, women, etc., to the benefits.
- c. Select the beneficiaries in a transparent manner.

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

Planning and Implementation

The most important aspect is the inclusion of ‘micro level livelihood planning’ as an empowerment tool for the marginalized communities. This planning helps in understanding existing livelihood assets/capitals in a highly participatory manner to augment the existing livelihood platform.

Planning

- i. An awareness drive was undertaken at Panchayat level for communication & sensitization of the target beneficiaries.
- ii. A “Livelihood Action Plan” (LAP) was prepared for availing the funds under the livelihood component.
- iii. The livelihood action plan was prepared by analyzing the socio-economic conditions and existing livelihood capitals of the watershed, during the situation analysis by means of PRA and focus group discussion, in order to facilitate collection of information to feed into the livelihood action planning process.

Livelihood action plan contains schedule of activities, interventions, no. of SHGs to be assisted and expected outcome.

- iv. To promote convergence, the PIA has worked in close association with other employment generating programmes such as MGNREGS, NRLM, Kudumbasree, VFPC, NHM, etc.

Mode of Operation

- i. The livelihood action plan will be implemented through Self Help Groups and/or their federation. However financial support to enterprising individuals was also be considered subject to a maximum of 10% of the funds under the livelihood component.
- ii. 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.
- iii. SHGs selected for implementing livelihood action plan will be homogeneous in-terms of their existing livelihood capitals, common interest and need.
- iv. SHGs can undertake any permissible activity jointly as a group or the group may decide to support individual(s) for the activities under the umbrella of the main SHG. In case of individual support under the SHGs, the individuals will be accountable to the main SHG for finances and performance.
- v. The financial support to enterprising individuals who prepare and submit a viable livelihood proposal, will be considered by Watershed Cell cum Data Centre (WCDC) on the recommendation of the Watershed Committee (WC). The plan has to be approved by the WCDC before extending financial support. However, support to individuals should not exceed a maximum of 10 % of funds under the livelihood component.

Funding pattern

The funding pattern under the livelihood components will be as follows

1	Seed money for Enterprising Individuals	10 percent
2	Seed money for SHGs	60 percent
3	Funding for Major Livelihood activities	30 percent

Capacity Building for Beneficiaries

The capacity building needs of the marginalized communities, including SC/ST, landless/asset less people, women, etc is also be included in the livelihood action plan prepared after the livelihood analysis. The capacity building aims at skill enhancement and not just knowledge and information. The expenditure for the training for livelihood component will be met from 5% of the budget component of the project cost earmarked for institution and capacity building.

Budget

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

No.	Name of micro watershed	Amount in Rs.
1	Thiruvanchoor-Nagambadam	9,75,413
2	Mannarthodu-Maalam-Areeparambu	11,40,545
3	Maalam	6,73,596
4	Nedumtharakavu	3,71,142
5	Mundakapadam	4,00,637
6	Kalathil kadavu	12,00,820
7	Parakkal kadavu	3,06,558
8	Ereyil kadav	4,39,290
	Total	55,08,000

Major interventions suggested

The major interventions suggested under the livelihood activities for the landless/asset less households are the following:

A	Enterprising individuals (10 %)
1	Malabari Goat rearing
2	Backyard Poultry
B	Revolving fund to SHGs (60 %)
1	Vegetable Cultivation
2	Paper carry bag unit
3	Honey bee
4	Mushroom
5	Bush Jasmine
6	Lease land nendran cultivation
7	Ornament making unit
8	Rabbit rearing
9	Paper plate unit
10	Tailoring unit
11	Grow bag units
12	Soap making
13	Handicrafts
C	Major livelihood activities (30 %)
1	Goat farm
2	Rabbit farm
3	Poultry unit

4	Diary farm
5	Live stock support (1 milch cow and 2 goats)
6	Mechanisation support to livestock farmers
7	Pisciculture
8	Nursery making

MICROENTERPRISES AND PRODUCTION SYSTEM

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

The objective is to

- a) Promote diversified production/farming systems based livelihood activities/interventions, and.
- b) Encourage farmers to adopt and up-scale successful experiences of proven technologies, integrated farming systems and improved farming practises for livelihood augmentation.

Planning and Implementation

- a. The status of natural resources potential was analysed to determine the befitting production system and microenterprises based livelihoods conducive to the socio economic situation and existing livelihood capitals of the watershed village(s) in a participatory manner, at village level under each micro-watershed during the group discussions and user interactive workshops organised as part of the DPR preparation of the project.
- b. An action plan was prepared for production system and microenterprises based livelihood activities such as aquaculture, horticulture, agriculture, agro-forestry, animal husbandry, microenterprise, agro- processing, value addition, marketing etc for the project area.
- c. To ensure convergence with other production system and microenterprises schemes, the PIA should work in close association with other schemes such as MGNREGS, NRLM, VFPC, Kudumbasree, NHM, RKVY, NFSM, etc.
- d. Production system and microenterprises action plan contains location/farmer centric schedule of activities and interventions and these are delineated on the map.

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

- a. Individual land holders/owners can avail the benefits of production system on their private land. The small and marginal farming households, women headed farming households, SC & ST farmers will be given preference based on the wealth ranking exercise conducted during PRA. Those households whose land is

in close proximity to the developed natural resources may be preferred to make full use of natural resource potential.

- b. Selection of beneficiaries will be done by PIA, in consultation with WC.
- c. Beneficiaries having common interest will be organised into User Groups to pool and manage their resources as well as manage aggregating their produce for effective disposal and marketing, besides maintaining their natural resource base. This may also provide a means for deciding resource use arrangements based on equity and sustainability.
- d. The funds were earmarked for cost intensive farming system based livelihood activities/interventions such as aquaculture, agriculture, horticulture, agro-forestry, animal husbandry, agro-processing, value addition, etc.
- e. The beneficiary contribution of farmers will be 20 percent for general category and 10 percent for SC/ST.

Capacity Building for Beneficiaries

The capacity building needs of the marginalized communities, including SC/ST, landless/asset less people, women, etc is also be included in the action plan prepared for production systems and micro enterprises. The capacity building aims at skill enhancement and not just knowledge and information. The expenditure for the training for production systems and micro enterprises will be met from 5% of the budget component of the project cost earmarked for institution and capacity building.

Budget

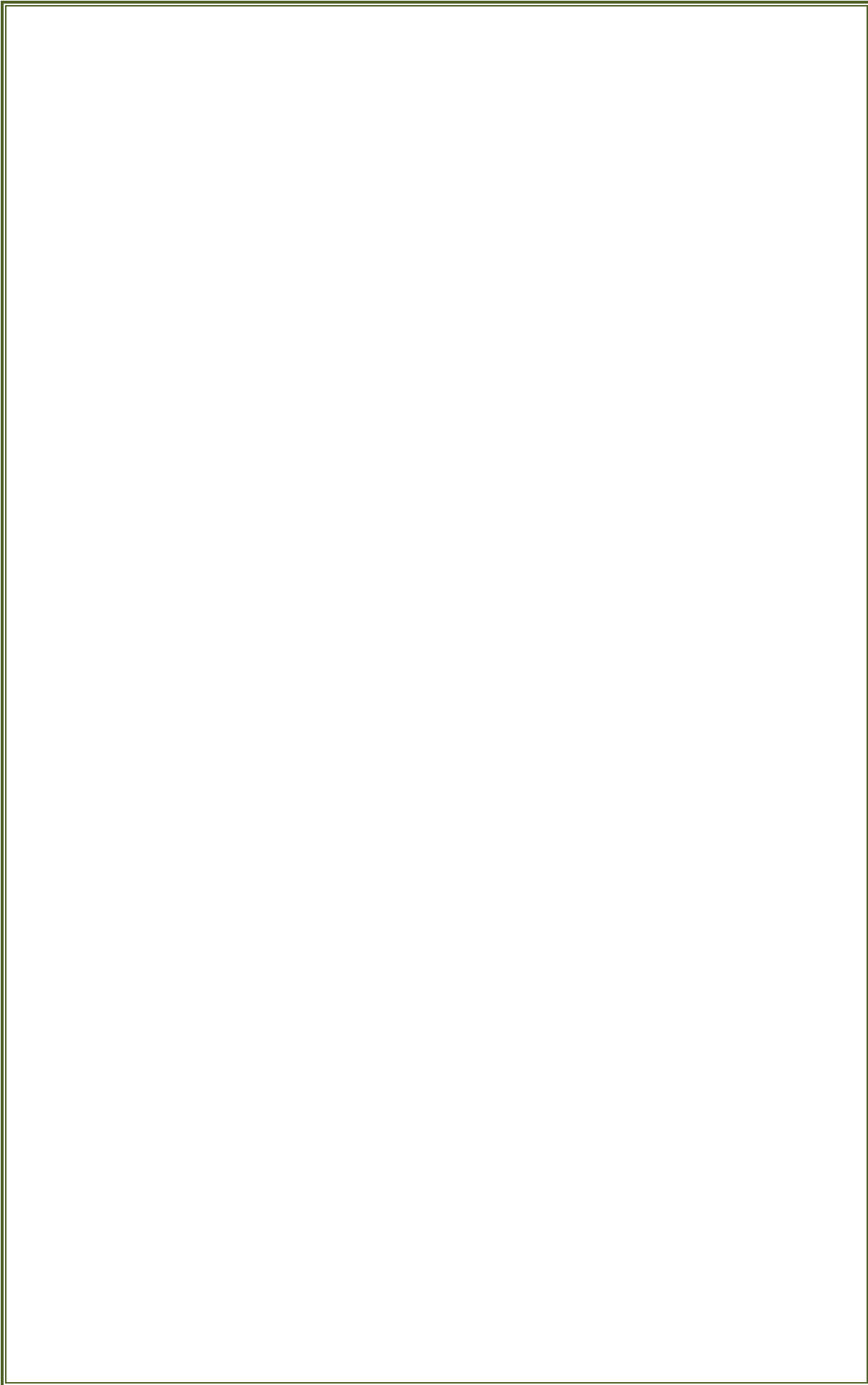
The distribution of budget under the livelihood activities for the landless/asset less households for different micro watersheds as per IWMP guidelines is given below:

No.	Name of micro watershed	Amount in Rs.
1	Thiruvanchoor-Nagambadam	10,83,792
2	Mannarthodu-Maalam-Areeparambu	12,67,272
3	Maalam	7,48,440
4	Nedumtharakavu	4,12,380
5	Mundakapadam	4,45,152
6	Kalathil kadavu	13,34,244
7	Parakkal kadavu	3,40,620
8	Ereyil kadav	4,88,100
	Total	61,20,000

Major interventions suggested

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

	Micro enterprises & Production system
1	Ordinary Compost
2	Nendran Banana Cultivation
3	Backyard Poultry
4	Vermi Compost
5	Cow rearing;providing animals
6	Soap making
7	Candle making unit



MICRO WATERSHED BASED ACTION PLAN

THIRUVANCHOOR - NAGAMBADEM Micro Watershed (12M38a)

Thiruvanchoor - Nagambadem is the third largest microwatershed in this cluster having an area of 903.16 Ha (17.70 percent of the cluster). This micro watershed is spread over in Vijayapuram, Ayarkunnam and Manarkad Grama Panchayats. Majority of the area, ie. 48.72% of total micro watershed area is in Vijayapuram Grama Panchayat. 32% of the micro watershed area falls in Manarkad Grama Panchayat and the remaining 19% of micro watershed area is located in Ayarkunnam Grama Panchayat. The Meenachil River flows through the northern portion of the microwatershed. The total project area is 960.03 ha of which 903.16 ha is the treatable area under the project

General Description

Name of micro watershed	: Thiruvanchoor - Nagambadem
Micro watershed code	: 12M38a
River basin	: Meenachil
District	: Kottayam
Block Panchayath	: Pallom and Pampady
GramaPanchayath	: Vijayapuram, Manarkad, Ayarkunnam
Villages	: Ayarkunnam , Vijayapuram , Manarkad
Latitude	: 9°36' 9.7" to 9°37'47.4" North
Longitude	: 76°32' 37.7" to 76°35' 32.9" East
Wards	: Vijayapuram 1, 2, 3, 4, 19 full Ayarkunnam 14, 15 full, 16,17 part Manarkad 1, 2 full, 3 part
Total project area	: 960.03 Ha
Total treatable area	: 903.16 Ha
% area in the IWMP cluster	: 17.70 %

Methodology

In line with the guidelines of IWMP, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Training Coordinators were engaged at project level for organizing the series of trainings at Block and Grama Panchayat levels.
5. Overseers were engaged for taking field estimates of the proposed activities.

6. Induction training was given for the project staff on PRA techniques, concept of maps and Resource Mapping.
7. Printed posters, banners and notices for providing wide publicity regarding the programme.
8. Two block level seminars were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
9. This was followed by orientation seminars at GramaPanchayats.
10. Conducted transect walk with ward members and ADS.
11. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
12. NHGs were formed at grass root level comprising of 40 to 50 neighbouring households.
13. Panchayat Level Watershed Committees were convened at Grama Panchayats for finalizing the modalities of work.
14. Trainer's training for base line survey were conducted for two facilitators from each Neighbour Hood Group
15. Predefined questionnaire was prepared for data collection from each household.
16. A block level seminar was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented by concerned Grama Panchayat Presidents.
17. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map with the help of the facilitators selected from the NHGs.
18. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
19. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of NHGs and accordingly present land use map is prepared using different notions and symbols.
20. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
21. Panchayat Level Watershed Committees were convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
22. Trainer's training for taking people's estimates and consolidation of project proposals. This was organized at Grama Panchayat and NHG level. Elected

representatives, ADS Chairpersons, Officer bearers of NHGs, MGNREGS officials, etc. attended this training. The information gathered on soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalized. The livelihood action plan and the activities under production system were also consolidated.

23. The suggestions were split for four years and four separate annual plans were also prepared.
24. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
25. Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal terracing, earthen and stone pitched contour bunding, outerbund strengthening, water logging prevention, vegetative barriers etc.
 - Rain water harvesting activities like farm ponds, sil paulin tanks, check dams etc.
 - Enhancement of paddy cultivation through area expansion in cultivable paddy fallows.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Scientific waste management practices like vermi compost, biogas, pipe compost and solid waste management units.
 - Protection of water sources like streams, ponds, drains etc.
 - Crop improvement practices and crop demonstrations.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - Encouragement of self sufficiency in vegetable production through vegetable gardens and grow bags.
 - Encouraging natural regeneration including fodder cultivation.
 - Promotion of agro-forestry and horticulture
 - Capacity building and creation of a greater degree of awareness among the participants.
 - Encouraging people's participation with the involvement of NHGs.
 - Livelihood activities for asset less people
 - Production system and Micro enterprises

SWOT Analysis 12M38a					
Sl.No.	Area	Strengths	Weakness	Opportunities	Threats
1	Agriculture	109.37 hectare under paddy cultivation raising two crops.	7.99 hectare of paddy land converted for banana and other mixed crops. Lack of skilled labour for transplanting, harvesting paddy.	14.23 hectare cultivable fallow paddy land and lease farmers. One skilled labour group for mechanized farming.	Uncultivable submerged fallow after clay mining.
2	Horticulture	446.62 Ha of the total area of watershed under coconut based farming system with intercrops such as arecanut plantain, nutmeg tuber crops ginger turmeric and pepper.	Lack of skilled labour for plant protection, harvesting coconut, arecanut, staking nendran banana, insitu budding of nutmeg, tapping of rubber	Scope for intercropping in nendran banana with chilli, area expansion for plantain varieties, rejuvenation of pepper. Skilled labour group for insitu budding nutmeg, plant protection, tapping, coconut climbing, totray method of raising vegetable seedling.	

3	Animal Husbandry	Cattle rearing as major livelihood by many small and marginal farmers. Backyard poultry taken up as subsistent farming by majority of inhabitants. Accessibility to milk collection centres	Lack of availability of fodder. Lack of sufficient infrastructure for rearing cattle in a scientific manner	Cattle rearing major livelihood by many women. Scope for increasing backyard poultry as part of production system. Scope for cultivation of fodder as intercrop in coconut garden and common lands.	Cattle rearing cannot be taken up as group enterprise due to lack of sufficient space for construction of the shed.
4	Natural Resources	94.18% of area of watershed lie below 20m MSLand belongs to the category of geomorphology lower plateau where the slope is gentle and soil is deep and texture is clayey.	The topography is lowland and slope is gentle. In the valley portion, breach of bunds, flooding	Area treatment with suitable soil and water conservation measures such as contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting measures such as staggered trenches and pits. Embankment protection of river by vegetative measures. As part of drainage line treatment, strengthening of field bunds (VARAMBU) Stream bank protection of thodu, desiltation and restoration of field channels.	Sand mining from river adversely affecting the water table and water quality. Clay mining from fertile paddy field has left paddy field as uncultivable waste land impairing the natural drainage and increasing the chance of flooding.

Biophysical Resources

Relief

The relief of the watershed ranges from MSL up to 60 m above MSL. Majority of the area falls in the relief category of 0–20m above MSL which covers an area of 904.16 ha (94.18%). The details of the relief with spatial extent in the watershed area are given in the table.

Sl.No.	Particulars	Area (Ha)
1	0-20	904.16
2	20-40	42.21
3	40-60	13.66
4	Total	960.03

Slope

The watershed area falls in five slope classes. The majority of area is having gentle slope of 3 to 5 % slope. This category spreads over an area of 588.90 ha (61.34 %). 245.17 ha area of watershed is having nearly level to very gentle slope of 0-3% slope. The details of the slope with spatial extent in the watershed are given in the table below.

Sl.No.	Slope	Description	Area (Ha)
1	0-3 percent	Nearly level to very gentle slope	245.17
2	3-5 percent	Gentle slope	588.90
3	5-10 percent	Moderately sloping	1.71
4	15-35 percent	Moderately steep to steep	55.70
5	> 35 percent	Very steep	9.42
6	Waterbodies	Waterbodies	59.13
		Total	960.03

Drains

The Meenachil River, flowing through the western and south western boundary of the watershed is the major drain of this watershed. Meenanthara Ar flows through the southern portion. The details of the drains and ponds in the watershed area are given in table.

Sl.No.	Name of Drain
1	Purakkad-vallaakuzhi thodu
2	Meenachil Ar
3	Chuliyil thodu
4	Chathanpadam thodu
5	Ikkaramali thodu
6	Chenikuzhi thodu
7	Munduthodu
8	Elavapadam Thodu
10	Velloor thodu

11	Chettithodu
12	Patholthodu
13	Karikkottumoola thodu

Ponds

Sl.No.	Name of Pond
1	Maravathuchira
2	Arimbanachira
3	Thiruvanchoor Kulam
4	Elavapadam Kulam
5	Purakkad Kulam
6	Nagambadam Kulam
7	Nattassery Kulam
8	Naalpamattom Kulam

Landuse

Agriculture is one of the prime activities in the watershed area. The major landuse category mapped in the watershed area is mixed crops which are the typical homestead cultivation of Kerala where in the different horticultural crop species are grown together that cannot be spatially mapped separately. In this watershed mixed crops mainly includes coconut based farming intercropped with arecanut, banana and nutmeg along with other crop species. It occurs in an area of 446.62 ha (46.52 %). The second major category is rubber. This is mapped in an area of 171.46 ha (17.86 %). An area of 109.37 ha is under paddy cultivation and an area of 7.99 ha of paddy lands is converted to garden land and cultivated with other crops. An area of 14.37 ha is mapped as cultivable wasteland which can be brought to paddy cultivation by providing necessary labour and other facilities. An area of 9.56 ha is mapped as cultivable wasteland which can be brought under horticulture. The details of the landuse categories with spatial extent are given in table.

Sl.No.	Particulars	Area (Ha)	Percentage (%)
1	Built up Land	14.69	1.53
2	Paddy - Viruppu	34.23	3.57
3	Paddy - Mundakan	1.01	0.11
4	Paddy - Puncha	74.13	7.72
5	Paddy converted to Arecanut	0.47	0.05
6	Paddy converted to Coconut	2.03	0.21
7	Paddy converted to Mixed crops	2.29	0.24
8	Paddy converted to Tapioca	2.32	0.24
9	Paddy converted to Rubber	0.88	0.09
10	Paddy - Cultivable Waste Land	14.23	1.48
11	Arecanut	2.65	0.28
12	Banana	2.73	0.28

13	Coconut	5.76	0.60
14	Tubercrops	4.17	0.43
15	Vegetables	4.76	0.50
16	Mixed crops	446.62	46.52
17	Mixed trees	75.80	7.90
18	Plantation Rubber	171.46	17.86
19	Plantation Cashew	0.50	0.05
20	Plantation Teak	0.30	0.03
21	Play ground	1.83	0.19
22	Road	15.26	1.59
23	Quarry - Rock	1.07	0.11
24	Quarry - Clay	1.12	0.12
25	Quarry - Laterite	0.22	0.02
26	Quarry - Sand	0.55	0.06
27	Cemetery	0.36	0.04
28	Cultivable Waste Land	9.56	1.00
29	Marshy land	5.35	0.56
30	Waste land	4.55	0.47
31	Waterbody	59.13	6.16
	Total	960.03	100.00

Geology

The major geological unit in the watershed is Charnockite group of rocks extending to an area of 606.10 ha (63.13 %). The remaining area of 294.80 ha comes under the Migmatite complex. The details of geological units with spatial extent in the watershed are given in the table.

Sl.No.	Particulars	Area (Ha)
1	Charnockite	606.10
2	Migmatite	294.80
3	Waterbody	59.13
	Total	960.03

Geomorphology

There are five geomorphological units in the watershed area of which 647.96 ha (67.49 %) area falls under the category lower plateau (lateritic). 200.18 ha (20.85 %) is mapped under valley fill. The details of geomorphology in the watershed area with spatial extent are given in the table.

Sl.No.	Particulars	Area (Ha)
1	Valley fill	200.18
2	Channel bar (Flood Plain)	13.79

3	Point bar (Flood Plain)	23.00
4	Lower Plateau	647.96
5	Residual mount	15.97
6	Water body	59.13
	Total	960.03

Soils

The major soil series mapped in the watershed area is Meenachil series having a solum thickness of 150 cm with very dark brown to pale brown colour. The river bank area is mapped under Meenachil series which is alluvial in origin. The soil is very strongly acid and has a surface texture of sandy clay loam to sandy clay. This is distributed in an area of 563.75 ha (58.72 %). Soils in more than 80 percent of the watershed area is having very deep soils with a depth of more than 150 cm and 8.19 % of the area (78.58 ha) is having deep to very deep soils with a depth of 100-150 cm. The major surface soil textures in the watershed area constitutes that of sandy clay loam (563.75 ha) and clay loam (183.78 ha). Nearly 10 % of the watershed area is prone to severe soil erosion which calls for proper soil and water conservation measures in the area.

Capacity Building/Trainings

Extensive training programmes and user interaction meetings were organized for the stake holders as part of the preparation of detailed project report. The details are given below:

No.	Training	Participants
1.	Block level awareness training	Elected representatives of three tier
2.	Block level orientation training	Elected representatives and ADS chairpersons
3.	Training on Base line survey	Two facilitators from NHG.
4.	Training on Drainage line treatment	Elected representatives and one facilitator from NHG.
5.	Focus Group Discussion	Elected representatives, Presidents and Secretaries of the NHGs, ADS chairpersons and MGNREGS labour groups and progressive farmers
6.	Entry point activity finalization	Elected representatives, Vice Presidents and Joint Secretaries from NHG, ADS chairpersons and MGNREGS labour groups.

Watershed Committee

Watershed Committee is constituted by Grama Sabha to implement the watershed project with technical support of WDT in the panchayat. Watershed committees are formed following the parameters of watershed committee, keeping the gender sensitive issues intact. Watershed committee members are briefed about the project objectives and a workshop is also conducted in this regard at every panchayat. The watershed committee has a pivotal role to play during and after the project implementation period.

The details of the Watershed Committee for Thiruvanchoor - Nagambadem watershed is given below:

Table No. 13.6. Details of the Watershed Committee of Thiruvanchoor - Nagambadem watershed

Sl. No.	Name	Ph. number
1	Sri. Baiju Cherukotayil (Panchayath President)	9495735235
2	Sri. Anoop (VEO)	
3	Smt. Bindhu Jayachandran (member, ward No.1)	9400570231
4	Sri. V.S.Appukkuttan (member,ward No.2)	9447212534
5	Sri. Sunil chacko (member ,ward No.2)	
6	Smt. Girija Thulasidharan (member,wardNo.3)	
7	Sri. Anne Maman (member,ward No.22)	
8	Smt. Mariamma Joy (SHG member, Ward No: 1)	
9	Sri. V.K.Gopinathan (SHG member, Ward No: 2)	
10	Sri. K.C.Gopalan (SHG member, Ward No: 3)	
11	Smt. Gracy Raju (SHG member, Ward No: 1)	
12	Smt. Sushmma Prasad (SHG member, Ward No: 23)	
13	Sri. Arun Raj (SHG member, Ward No: 22)	
14	Smt. Indhu.K.Thomas (WDT member)	
15	Sri. Santhosh (SC Representative, Ward No: 2)	9349430196
16	Sri. Raveendran (ST Representative, Ward No: 3)	
17	Smt. Sarasamma Krishnan (Lady representative, Ward No: 2)	9961746003
18	Sri. Pradeep C.S (Landless Representative, Ward No: 1)	

Neighbour Hood Groups

Neighbour Hood Groups are constituted in the watershed area combining 40 to 50 adjacent households which are living in a cluster. These are further subdivided into seven sub groups and one person from each subgroup is selected to the Neighbour Hood Group Committee. These seven members formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is women. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. These

Committees are registered with the concerned Grama Panchayat. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

The details of the NHG Committees in Thiruvanchoor - Nagambadem watershed is as follows:

Sl. No.	Panchayat	Ward	NHGNo.
1	Ayarkunnam	Ward 14	7
2	Ayarkunnam	Ward 15	8
3	Ayarkunnam	Ward 16	4
4	Ayarkunnam	Ward 17	5
5	Manaracadu	Ward 01	8
6	Manaracadu	Ward 02	9
7	Manaracadu	Ward 03	9
8	Vijayapuram	Ward 01	8
9	Vijayapuram	Ward 02	8
10	Vijayapuram	Ward 03	5
11	Vijayapuram	Ward 04	6
12	Vijayapuram	Ward 19	8

Self Help Groups

In addition to this, the existing Self Help Groups formed under the Kudumbasree Mission and other SHGs which are performing at a satisfactory level will be promoted to take various programmes under the Livelihood activities and Production Systems and Micro enterprises. If required, additional SHGs will also be formed in the watershed area in the coming years.

Activities proposed

Based on the series of discussions held with the different stakeholders the following activities are suggested for the micro watershed.

Vijayapuram Grama Panchayath

Side Wall Protection

No.	Name of Thodu	Survey No.
1	Purakkad-vallaakuzhi thodu	125, 133, 134, 136
2.	Meenachil Ar	3, 2, 23, 24, 25, 36, 37, 38, 40, 41

Side wall Repair

No.	Name of Thodu	Survey No.
1	Ikkaramali thodu	118, 141, 145, 142, 143

Desiltation of Drains

No.	Name of Thodu
1	Purakkad-vallaakuzhi thodu
2	Ikkaramali thodu
3	Chenikuzhi thodu

Side Varambu Earthening of Thodu

No.	Name of Thodu	Survey No.
2	Chenikuzhi thodu	15, 21, 23

Brush Wood Bunding

No.	Name of Thodu	Survey No.
1	Purakkad-vallaakuzhi thodu	125,133, 134, 136
3	Chhenikuzhi thodu	15,21,23

Embankment Protection

No.	Name of Thodu	Survey No.
1	Meenanthala Ar	102,101,77, 98, 181,106

Pond Desiltation

No.	Name of Pond	Survey No.
1	Purakkad	142
2	Nagambadam	136
3	Nattassery	124
4	Naalpamattom	81

Side Varambu Earthening of pond

No.	Name of Pond
1	Purakkad
2	Nagambadam
3	Nattassery
4	Naalpamattom

Other NRM works

No.	Activity	Location
1.	New Pond	Ward 4
2.	New Well	Survey no. 58
3.	Waste treatment plant	Kosamattom colony in ward no.2
4.	Avenue Planting	116,112,113,100,72,63,82,59,43,34,26,19,505,508,510
5.	Rainpits	Survey no.13, 12, 8, 7 ,5, 4, 3, 39, 60 ,20 ,18, 385, 381, 382, 29, 27, 36, 150, 159, 165, 161, 183, 162, 159, 174, 154, 166, 173, 186, 178, 107, 98, 148, 163, 179, 164,122
6.	Earthen bunds	Survey no. 374, 379, 49, 68, 76, 102, 47, 50, 67, 30, 378, 48, 57, 70, 103, 384, 103, 188, 148, 150, 166, 169, 170, 173, 185, 186, 187, 181, 180
7.	Public well Cleaning	4 no.s
8.	Crop demonstration of vegetable	Survey no. 125 , 133, 131, 132, 135, 141, 119
9.	Fodder Cultivation	Survey no. 132, 130, 129, 126, 127, 122, 120, 121, 119, 123, 118, 152, 151, 153, 154, 165, 164, 163, 166,

		170, 162
10.	Centripetal terracing	Survey no. 162, 164 , 165, 374, 375, 378 ,379, 132, 130, 129, 126, 127, 122, 120, 121, 119, 123, 118, 152, 151, 153, 154, 165, 164, 163, 166, 170, 162
11.	Planting Bamboo seedlings	Survey no. 135, 136, 137 , 138, 132, 131, 130, 129, 128, 143, 144, 149, 167, 168, 171, 188, 187, 186, 104, 60, 376, 373, 425, 426
12.	Planting Horticultural crops	184, 81, 82, 71, 67, 68, 66, 58, 57, 52, 45, 46, 47, 379, 380, 381, 384
13.	Strengthening of river side	24, 25, 36, 37, 38, 40, 41, 62, 61, 73, 82, 83, 111, 121, 127, 128, 129
14.	Strip terracing	30, 3, 4, 6, 7, 8, 9, 24, 412, 416 and 417
15.	Live fencing	92, 91, 88, 85, 81, 70, 71, 67, 66, 68, 57, 58, 56, 52, 51, 45, 381, 380, 384, 385, 31, 30
16.	Conservation of Kavu	126, 130
17.	Pond cleaning & renovation	152
18.	Fruits trees planting	131, 132, 135, 133, 125, 140, 124, 123, 141, 119, 142, 152, 165, 164, 169
19.	Brush wood check dam	377

Ayarkunnam Grama Panchayat

Side Wall Protection

No.	Name of Thodu	Survey No.
1	Munduthodu	418, 419, 415, 420
2	Elavapadam Thodu	530, 531, 528, 529, 534, 527, 525, 524, 508, 507, 517
3	Chettithodu	374, 386, 387, 392, 391

Side Varambu Earthening of Pond

No.	Name of Pond
1	Maravathuchira
2	Arimbanachira
3	Thiruvanchoor Kulam
4	Elavapadam Kulam

Desiltation of Ponds

No.	Name of Pond
1	Maravathuchira

Other NRM works

No.	Activity	Location
2	Rainwater harvesting struture	PEM HSS(50 Cents), Govt LPS Thiruvanchiyoor

3	New Well	545, 530, 494, 501, 547, 535, 552, 560, 471
4	Rainpits	Sy No: 532, 593, 534, 563, 547, 593, 545, 593, 491, 494, 552, 530, 500, 560, 495, 491, 414, 486, 487, 474, 478, 472, 413, 411, 511, 512, 514
5	Medicinal Garden	PEM HSS(50 Cents) & Govt LPS Thiruvanchiyoor
6	Vegetable Garden	St Clair's Convent (50Cent)
7	Centripetal terracing for coconut	Sy No:- 535, 486, 503, 529, 502, 512, 537, 534, 493, 535, 506, 561, 537, 530, 547, 493, 494
8	Stone Pitched Bunding&Terracing	Sy No:- 477, 476, 471, 470, 419, 417, 412, 407, 406, 583, 584, 570, 577, 574, 575, 576, 585
9	Composting	Sy No:- 560, 535, 501, 545, 561, 494, 557, 552, 563
10	Earthern bunds	486, 487, 474, 478, 472, 413, 411, 511, 512, 514, 515

Manarkad Grama Panchayat

Side Wall Protection

No.	Name of Thodu	Survey No.
1	Velloor thodu to vadavathoor pump house	478-223
3	Pakkeri thodu	48-215

Desiltation of Drains

No.	Name of Thodu
1	Velloor thodu to vadavathoor pump house
2	Pakkeri thodu

Pond Desiltation

No.	Survey No.
1	453/2
2	455/1
3	216
4	477

Other NRM works

No.	Activity	Location
4	New Well	Survey no. 458, 21, 58, 59, 56, 50, 79, 76, 69, 68, 67, 585, 576, 575
5	Avenue Planting	Survey no. 395, 399, 352, 351, 348, 346
6	Well recharging	Survey no. 217, 205, 20, 204, 206, 344, 346, 350, 355, 349, 353, 386, 397
7	Rainpits	Survey no. 394, 392, 399, 406, 8, 29, 22
8	Paddy cultivation	Survey no. 418, 419, 420, 421, 422, 423, 447, 475, 472, 452, 453, 454, 224, 46, 48, 45, 49, 41, 36, 38, 201, 206, 207, 210, 208, 209, 215, 213, 211, 212, 210, 197, 77, 75, 74, 73. 605, 603, 606, 596, 595, 594, 591, 588, 589

9	Centripetal Teracing	Survey no. 402, 395, 455, 457, 476, 220, 63, 57, 202, 25, 26, 572, 20, 22, 223, 18, 31, 458, 16
10	Vegetable Cultivation	Survey no.403, 395, 409, 397, 412, 413, 450, 462, 4, 3, 2, 24, 25, 22, 20, 18, 11, 14, 218, 219, 220, 224, 225, 226
11	Temporary Shutter System	Near Vadavathur Padashekaram
12	Stone pitched bunding	355, 358, 344, 346, 353, 349, 375, 376, 602, 577, 583, 584, 570, 574, 576, 585, 20, 12, 15
13	Earthen bunds	581, 580, 579, 568, 569, 571, 572, 573, 589, 11, 14, 15, 17, 30, 29, 28, 25, 24

Budget

The distribution of budget for Thiruvanchoor - Nagambadem micro watershed for the various components as per IWMP guidelines is given below:

Table No. 13.9. Budget for Thiruvanchoor - Nagambadem micro watershed

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	10,83,792
2.	Monitoring	1	1,08,379
3.	Evaluation	1	1,08,379
Preparatory phase			
4.	Entry point activities	4	4,33,517
5.	Institution and capacity building	5	5,41,896
6.	Detailed Project Report	1	1,08,379
Watershed works phase			
7.	Natural Resources Conservation works	56	60,69,235
8.	Livelihood activities for asset less	9	9,75,413
9.	Production system and micro enterprises	10	10,83,792
10.	Consolidation phase	3	3,25,138
	Total	100	1,08,37,920

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.10.1 - Sector-I- Natural Resources Conservation and Management - 1st Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Avenue planting	no.	160	1000		160000		160000
2	Banana cultivation	10 cent	16800	7	117600		11760	117600
3	Crop demonstration of vegetables	25 cent	7500	4	30000		3000	30000
4	Cultivation of horticultural crops	25cent	7850	5	39250		3925	39250
5	Intercropping in coconut plantations	10 cent	5500	10	55000		5500	55000
6	Earthern bunds	rm	27	6000		162000		162000
7	Centripetal terracing with mulching	no.	46	2800		128800		128800
8	Live fencing	rm	24.5	6000		147000		147000
9	Sidewall protection of drains (vegetative)	m	548	650		356200		356200
10	Desiltation of drains	10m3	485.85	1000		485850		485850
11	Side varambu earthening of drains	m	234	2000		468000		468000
12	Embankment protection of river	500m	4500	4		18000		18000
13	Planting bamboo seedlings	no.	34.65	2500		86625		86625
14	Desiltation of ponds	10m3	649	500		324500		324500
15	Moisture collection pits	no.	30	100		3000		3000
16	Pipe compost	no.	900	75	10125	57375	1012	67500
					251975	2397350	25197	2649325
No.	Ayarkunnam Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Medicinal plants at school	5 cent	4279	1		4279		4279
2	Crop demonstration of vegetables	25 cent	7500	1	7500		750	7500
3	Banana cultivation	10 cent	16800	2	33600		3360	33600

4	Earthen bunds	rm	27	2000		54000		54000	
5	Live fencing	rm	24.5	1500		36750		36750	
6	Centripetal terracing with mulching	no.	46	200		9200		9200	
7	Side varambu earthening of ponds	10m3	2317	100		231700		231700	
8	Desiltation of ponds	10m3	649	250		162250		162250	
9	Well recharging	no.	5500	10	55000		5500	55000	
10	Moisture collection pits	no.	30	125		3750		3750	
11	Compost pits(3.6x1.5x0.9m)	no.	8000	50		400000		400000	
						96100	901929	9610	998029
No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total	
1	Avenue planting	no.	160	500		80000		80000	
2	Paddy cultivation in fallow lands	ha	63538	3	190614		19061	190614	
3	Earthen bunds	rm	27	4000		108000		108000	
4	Live fencing	rm	24.5	2500		61250		61250	
5	Centripetal terracing with mulching	no.	46	250		11500		11500	
6	Desiltation of drains	10m3	485.85	1000		485850		485850	
7	Side varambu earthening of drains	m	234	300		70200		70200	
8	Desiltation of ponds	10m3	649	250		162250		162250	
9	Moisture collection pits	no.	30	200		6000		6000	
					190614	985050	19061	1175664	

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.10.2 - Sector-I- Natural Resources Conservation and Management –IInd Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Avenue planting	no.	160	1000		160000		160000
2	Banana cultivation	10 cent	16800	7	117600	117600	11760	235200
3	Crop demonstration of vegetables	25 cent	7500	4	30000	30000	3000	60000
4	Cultivation of horticultural crops	25cent	7850	5	39250	39250	3925	78500
5	Intercropping in coconut plantations	10 cent	5500	20	110000	110000	11000	220000
6	Earthen bunds	rm	27	6000		162000		162000
7	Centripetal terracing with mulching	no.	46	2800		128800		128800
8	Live fencing	rm	24.5	6000		147000		147000
9	Sidewall protection of drains (engineering)	m2	2400	300	288000	432000	28800	720000
10	Sidewall protection of drains (vegetative)	m	548	650		356200		356200
11	Sidewall repair of drains (engineering)	m2	1800	150	270000		27000	270000
12	Desiltation of drains	10m3	485.85	1000		485850		485850
13	Side varambu earthening of drains	m	234	3000		702000		702000
14	Embankment protection of river	500m	4500	4		18000		18000
15	Planting bamboo seedlings	no.	34.65	2500		86625		86625
16	Desiltation of ponds	10m3	649	500		324500		324500
17	Construction of new pond	no.	332867	1		332867		332867
18	Well recharging	no.	5500	30	165000		16500	165000
19	Construction of new well	no.	30000	3	90000		9000	90000
20	Renovation of public wells	no.	24000	2	48000		4800	48000
21	Moisture collection pits	no.	30	100		3000		3000

22	Biogas(0.5m3)	no.	8500	8	17000	51000	1700	68000
23	Pipe compost	no.	900	75	10125	57375	1012	67500
					1184975	3744067	118498	4929042
No.	Ayarkunnam Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Medicinal plants at school	5 cent	4279	1		4279		4279
2	Banana cultivation	10 cent	16800	3	50400		5040	50400
3	Earthern bunds	rm	27	3000		81000		81000
4	Live fencing	rm	24.5	3000		73500		73500
5	Centripetal terracing with mulching	no.	46	200		9200		9200
6	Stone pitched contour bunding	m2	143.52	500	71760		7176	71760
7	Side wall protection of drains (engineering)	m2	2400	100	96000	144000	9600	240000
8	Side varambu earthening of ponds	10m3	2317	100		231700		231700
9	Desiltation of ponds	10m3	649	250		162250		162250
10	Well recharging	no.	5500	20	110000		11000	110000
11	Rain water harvesting structure at PEM HSS	no.	330000	1		330000		330000
12	Moisture collection pits	no.	30	125		3750		3750
13	Biogas(0.5m3)	no.	8500	12	25500	76500	2550	102000
14	Compost pits(3.6x1.5x0.9m)	no.	8000	50		400000		400000
					353660	1516179	35366	1869839
No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Avenue planting	no.	160	1000		160000		160000
2	Vegetable cultivation (pandal)	25cents	15000	3	45000		4500	45000
3	Earthern bunds	rm	27	4000		108000		108000

4	Live fencing	rm	24.5	2500		61250		61250
5	Centripetal terracing with mulching	no.	46	250		11500		11500
6	Stone pitched contour bunding	m2	143.52	500	71760		7176	71760
7	Side wall protection of drains (engineering)	m2	2400	300	288000	432000	28800	720000
8	Desiltation of drains	10m3	485.85	1000		485850		485850
9	Side varambu earthening of drains	m	234	300		70200		70200
10	Desiltation of ponds	10m3	649	250		162250		162250
11	Construction of new well	no.	30000	2	60000		6000	60000
12	Well recharging	no.	5500	30	165000		16500	165000
13	Moisture collection pits	no.	30	200		6000		6000
14	Biogas(0.5m3)	no.	8500	10	21250	63750	2125	85000
					651010	1560800	65101	2211810

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.10.3 - Sector-I- Natural Resources Conservation and Management –IIIrdYear Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Banana cultivation	10 cent	16800	7	117600	117600	11760	235200
2	Crop demonstration of vegetables	25 cent	7500	4	30000	30000	3000	60000
3	Cultivation of horticultural crops	25cent	7850	5	39250	39250	3925	78500
4	Intercropping in coconut plantations	10 cent	5500	20	110000	110000	11000	220000
5	Sidewall protection of drains (engineering)	m2	2400	300	288000	432000	28800	720000
6	Sidewall repair of drains (engineering)	m2	1800	150	270000		27000	270000
7	Side varambu earthening of drains	m	234	3000		702000		702000
8	Embankment protection of river	500m	4500	5.6		25200		25200

9	Well recharging	no.	5500	30	165000		16500	165000
10	Renovation of public wells	no.	24000	2	48000		4800	48000
11	Biogas(0.5m3)	no.	8500	7	14875	44625	1487.5	59500
					1082725	1500675	108273	2583400
No.	Ayarkunnam Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Banana cultivation	10 cent	16800	3	50400		5040	50400
2	Earthern bunds	rm	27	3000		81000		81000
3	Live fencing	rm	24.5	3000		73500		73500
4	Stone pitched contour bunding	m2	143.52	500	71760		7176	71760
5	Side wall protection of drains (engineering)	m2	2400	200	192000	288000	19200	480000
6	Well recharging	no.	5500	10	55000		5500	55000
7	RWH structure at Govt. LPS Thiruvanchoor	no.	50000	1	50000		5000	50000
8	Construction of well	no.	25000	3	75000		7500	75000
9	Biogas(0.5m3)	no.	8500	10	21250	63750	2125	85000
					515410	506250	51541	1021660
No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable cultivation (pandal)	25cents	15000	3	45000		4500	45000
2	Live fencing	rm	24.5	2500		61250		61250
3	Stone pitched contour bunding	m2	143.52	600	86112		8611	86112
4	Side wall protection of drains (engineering)	m2	2400	300	288000	432000	28800	720000
5	Construction of new pond	no.	332867	1		332867		332867
6	Construction of new well	no.	30000	2	60000		6000	60000
7	Well recharging	no.	5500	30	165000		16500	165000

8	Biogas(0.5m3)	no.	8500	15	31875	95625	3187	127500
9	Temporary shutter system in Vadavathoor padashekhararam	no.	25000	1	25000		2500	25000
					700987	921742	70099	1622729

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.10.4 - Sector-I- Natural Resources Conservation and Management –IVth Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Sidewall protection of drains (engineering)	m2	2400	300	288000	432000	28800	720000
2	Well recharging	no.	5500	30	165000		16500	165000
					453000	432000	45300	885000
No.	Ayarkunnam Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Side wall protection of drains (engineering)	m2	2400	200	192000	288000	19200	480000
					192000	288000	19200	480000
No	Manarcaud Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Side wall protection of drains (engineering)	m2	2400	300	288000	432000	28800	720000
2	Well recharging	no.	5500	20	110000		11000	110000
					398000	432000	39800	830000

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.11.1 - Sector-II- Livelihood Support system for landless/ assetless - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
A	Enterprising individuals (10 %)						
	Ayarkunnam						
1	Malabari Goat rearing	No.	10500	2	14000	7000	21000
2	Backyard Poultry	No.	1500	6	4500	4500	9000
	Manarkad						
1	Malabari Goat rearing	No.	10500	4	28000	14000	42000
2	Backyard Poultry	No.	1500	6	4500	4500	9000
	Vijayapuram						
1	Malabari Goat rearing	No.	10500	6	42000	21000	63000
2	Backyard Poultry	No.	1500	7	5250	5250	10500
	Total				98250	56250	154500

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.11.2 - Sector-II- Livelihood Support system for landless/ assetless- IInd Year Plan

Sl. No	Name of Activity	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
	Revolving fund to SHGs (60%)					
	Ayarkunnam					
1	Vegetable Cultivation	25000	1	20000	5000	25000
2	Paper carry bag unit	10000	1	8000	2000	10000
3	Honey bee	20000	1	16000	4000	20000

4	Mushroom	15000	1	12000	3000	15000
Manarkad						
1	Vegetable Cultivation	25000	1	20000	5000	25000
2	Paper carry bag unit	10000	1	8000	2000	10000
3	Honey bee	20000	1	16000	4000	20000
4	Mushroom	15000	1	12000	3000	15000
Vijayapuram						
1	Vegetable Cultivation					
2	Bush Jasmine	25000	1	20000	5000	25000
3	Honey bee	20000	2	32000	8000	40000
4	Lease land nendran cultivation	15000	3	36000	9000	45000
5	Mushroom	10000	5	40000	10000	50000
Total				240000	60000	300000

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.11.3 - Sector-II- Livelihood Support system for landless/ assetless- IIIrd Year Plan

Sl. No	Name of Activity	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
	Revolving fund to SHGs (60%)					
Ayarkunnam						
1	Vegetable Cultivation	25000	1	20000	5000	25000
2	Paper carry bag unit	10000	1	8000	2000	10000
3	Honey bee	20000	1	16000	4000	20000
4	Mushroom	15000	1	12000	3000	15000

Manarkad						
1	Vegetable Cultivation	25000	1	20000	5000	25000
2	Paper carry bag unit	10000	1	8000	2000	10000
3	Honey bee	20000	1	16000	4000	20000
4	Mushroom	15000	1	12000	3000	15000
Vijayapuram						
1	Vegetable Cultivation					
2	Bush Jasmine	25000	2	40000	10000	50000
3	Honey bee	20000	2	32000	8000	40000
4	Lease land nendran cultivation	15000	4	48000	12000	60000
5	Mushroom	10000	5	40000	10000	50000
Total				272000	68000	340000

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.11.4 - Sector-II- Livelihood Support system for landless/ assetless- IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
C	Major livelihood activities (30 %)						
	Ayarkunnam						
1	Malabari Goat rearing	No.	105000	1	52500	52500	105000
	Manarkad						
1	Malabari Goat rearing	No.	105000	1	52500	52500	105000
2	Rabbit rearing	No.	8000	10	40000	40000	80000

	Vijayapuram						
1	Poultry	No.	280000	1	140000	140000	280000
	Total				285000	285000	570000

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.12.1 - Sector-III- Production system and Microenterprises - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
	Ayarkunnam							
1	Backyard Poultry	Nos.	1500	50	37500	37500	6750	75000
	Manarkad							
1	Backyard Poultry	Nos.	1500	60	45000	45000	8100	75000
	Vijayapuram							
1	Backyard Poultry	Nos.	1500	75	56250	56250	10125	75000
	Total				138750	138750	24975	225000

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

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.12.2 - Sector-III- Production system and Microenterprises –IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
	Ayarkunam							
1	Ordinary Compost	No.s	8000	6	30000	18000	5400	48000
2	Nendran Banana Cultivation	No.s	34000	4	40000	96000	7200	136000
	Manarkad						0	0
1	Ordinary Compost	No.s	8000	4	30000	18000	5400	48000
2	Vermi Compost	No.s	18000	5	50000	40000	9000	90000
3	Nendran Banana Cultivation	No.s	34000	4	40000	96000	7200	136000

	Vijayapuram						0	0
1	Ordinary Compost	No.s	8000	7	35000	21000	6300	56000
2	Vermi Compost	No.s	18000	10	100000	80000	18000	180000
3	Nendran Banana Cultivation	No.s	34000	4	40000	96000	7200	136000
	Total				365000	465000	65700	830000

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

Thiruvanchoor - Nagambadem Watershed (12M38a) - Action Plan

Table No. 13.12.3 - Sector-III- Production system and Microenterprises –IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
	Ayarkunnam							
1	Ordinary Compost	No.s	8000	6	30000	18000	5400	48000
2	Nendran Banana Cultivation	No.s	34000	4	40000	96000	7200	136000
	Manarkad							
1	Ordinary Compost	No.s	8000	4	20000	12000	3600	32000
2	Nendran Banana Cultivation	No.s	34000	4	40000	96000	7200	136000
3	Cow rearing	No.s	35000	5	75000	100000	13500	175000
	Vijayapuram							
1	Ordinary Compost	No.s	8000	7	35000	21000	6300	56000
2	Nendran Banana Cultivation	No.s	34000	4	40000	96000	7200	136000
3	Cow rearing	No.s	35000	10	150000	200000	27000	350000
	Total				430000	639000	77400	1069000

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

Thiruvanchoor - Nagambadem Watershed (12M38a)-Action Plan
Table No. 13.12.4 - Sector-III- Production system and Microenterprises –IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
Ayarkunnam								
1	Ordinary Compost	No.s	8000	4	20000	12000	3600	32000
2	Nendran Banana Cultivation	No.s	34000	2	20000	48000	3600	68000
Manarkad								
1	Ordinary Compost	No.s	8000	2	10000	6000	1800	16000
2	Nendran Banana Cultivation	No.s	34000	4	40000	96000	7200	136000
Vijayapuram								
1	Ordinary Compost	No.s	8000	6	30000	18000	5400	48000
2	Nendran Banana Cultivation	No.s	34000	4	40000	96000	7200	136000
Total					160000	276000	28800	436000

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

MICRO WATERSHED BASED ACTION PLAN

MANNARTHODU – MAALAM – ARYPARAMBU MICRO WATERSHED (12M38b)

Mannarthodu – Maalam – Aryparambu micro watershed is the second largest micro watershed in the IWMP cluster (IWMP-III) with an area of 1056.06 ha (20.70 % of total geographical area). The major portions of the micro watershed are located in Ayarkunnam Grama Panchayat (59.54 % of micro watershed area) and Manarcad Grama Panchayat (24.11 % of micro watershed area). The remaining areas are spread over Kooropada and Pampady Grama Panchayats. The Meenachil River flows through the boundary of the watershed. The total project area is 1114.71 Ha of which 1056.06 Ha is the total treatable area under the project.

General Description

Name of micro watershed	: Mannarthodu – Maalam – Aryparambu
Micro watershed code	: 12M38b
River basin	: Meenachil
District	: Kottayam
Block Panchayath	: Pallom and Pampady
Grama Panchayath	: Ayarkunnam, Manarcad, Kooropada, Pampady
Villages	: Ayarkunnam, Manarcad, Kooropada, Pampady
Latitude	: 9°35'18.6" to 9°37'50.8" North
Longitude	: 76°35'19.6" to 76°38'9" East
Wards	: Ayarkunnam 12, 11, 9, 10 (full), 8, 7 (part) Manarcad 5 (full), 6, 7 (part) Kooropada 1,17 (Part) Pampady 1,2,3 (Part)
Total project area	: 1114.71 Ha
Total treatable area	: 1056.06 ha
% of area in the IWMP cluster	: 20.70 %

Methodology

In line with the guidelines of IWMP, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Training Coordinators were engaged at project level for organizing the series of trainings at Block and Grama Panchayat levels.

5. Overseers were engaged for taking field estimates of the proposed activities.
6. Induction training was given for the project staff on PRA techniques, concept of maps and Resource Mapping.
7. Printed posters, banners and notices for providing wide publicity regarding the programme.
8. Two block level seminars were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
9. This was followed by orientation seminars at GramaPanchayats.
10. Conducted transect walk with ward members and ADS.
11. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
12. NHGs were formed at grass root level comprising of 40 to 50 neighbouring households.
13. Panchayat Level Watershed Committees were convened at Grama Panchayats for finalizing the modalities of work.
14. Trainer's training for base line survey were conducted for two facilitators from each Neighbour Hood Group
15. Predefined questionnaire was prepared for data collection from each household.
16. A block level seminar was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented by concerned Grama Panchayat Presidents.
17. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map with the help of the facilitators selected from the NHGs.
18. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
19. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of NHGs and accordingly present land use map is prepared using different notions and symbols.
20. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
21. Panchayat Level Watershed Committees were convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.

22. Trainer's training for taking people's estimates and consolidation of project proposals. This was organized at Grama Panchayat and NHG level. Elected representatives, ADS Chairpersons, Officer bearers of NHGs, MGNREGS officials, etc. attended this training. The information gathered on soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalized. The livelihood action plan and the activities under production system were also consolidated.
23. The suggestions were split for four years and four separate annual plans were also prepared.
24. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
26. Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal terracing, earthen and stone pitched contour bunding, outerbund strengthening, water logging prevention, vegetative barriers etc.
 - Rain water harvesting activities like farm ponds, sil paulin tanks, check dams etc.
 - Enhancement of paddy cultivation through area expansion in cultivable paddy fallows.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Scientific waste management practices like vermi compost, biogas, pipe compost and solid waste management units.
 - Protection of water sources like streams, ponds, drains etc.
 - Crop improvement practices and crop demonstrations.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - Encouragement of self sufficiency in vegetable production through vegetable gardens and grow bags.
 - Encouraging natural regeneration including fodder cultivation.
 - Promotion of agro-forestry and horticulture
 - Capacity building and creation of a greater degree of awareness among the participants.
 - Encouraging people's participation with the involvement of NHGs.
 - Livelihood activities for asset less people
 - Production system and Micro enterprises

SWOT Analysis 12M38b					
Sl.No.	Area	Strengths	Weakness	Opportunities	Threats
1	Agriculture	39.92 hectare under paddy cultivation raising two crops.	29.69 hectare of paddy land converted for banana, arecanut, rubber and other mixed crops. Lack of skilled labour for transplanting, harvesting paddy.	1.69 hectare cultivable fallow paddy land and lease farmers. One skilled labour group for mechanized farming.	uncultivable submerged fallow after clay mining occurs.
2	Horticulture	30% of the total area of watershed under coconut based farming system with intercrops such as arecanut plantain, nutmeg tuber crops ginger turmeric and pepper.	Lack of skilled labour for plant protection, harvesting coconut, arecanut, staking nendran banana, insitu budding of nutmeg, tapping of rubber	Scope for intercropping nendran banana, area expansion for plantain varieties, rejuvenation of pepper. Skilled labour group for insitu budding nutmeg, plant protection, tapping, coconut climbing, totray method of raising vegetable seedling.	

3	Animal Husbandry	Cattle rearing as major lively hood by many small and marginal farmers. Backyard poultry taken up as subsistent farming by majority of inhabitants. Accessibility to milk collection centres	Lack of availability of fodder. Lack of sufficient infrastructure for rearing cattle in a scientific manner	Cattle rearing major lively hood by many women. Scope for increasing backyard poultry as part of production system. Scope for cultivation of fodder as intercrop in coconut garden and common lands.	Cattle rearing cannot be taken up as group enterprise due to lack of sufficient space for construction of the shed.
4	Natural Resources	561.66 ha of area of watershed lie below 20m MSL and belongs to the category of geomorphology lower plateau where the slope is gentle and soil is deep and texture is clayey.	30% of area of watershed, the topography is undulating and slope moderate. Subject to erosion hazards. In the valley portion, breach of bunds, flooding	Area treatment with suitable soil and water conservation measures such as contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting measures such as staggered trenches and pits. Embankment protection of river by vegetative measures. As part of drainage line treatment, strengthening of field bunds (VARAMBU) Stream bank protection of thodu, desiltation and restoration of field channels.	Sand mining from river adversely affecting the water table and water quality. Clay mining from fertile paddy field has left paddy field as uncultivable waste land impairing the natural drainage and increasing the chance of flooding.

Biophysical Resources

Relief

The relief of the micro watershed ranges from MSL upto 100 m above msl. Majority of the area falls in the relief category of 0–20m above MSL which covers an area of 561.66 ha (50.39%). An area of 330.17 ha falls in the category of 20 to 40 m above MSL. A small area of 16.68 ha is located above 80 m above MSL. The details of the relief with spatial extent in the watershed area are given in the table.

Sl. No.	Relief	Area (Ha)
1	0-20 above MSL	561.66
2	20-40 above MSL	330.17
3	40-60 above MSL	167.22
4	60-80 above MSL	38.98
5	80-100 above MSL	16.18
6	100-120 above MSL	0.50
	Total	1114.71

Slope

The watershed area is divided into five categories of slope classes. The majority of area is under gentle slope areas having 3-5% slope. This category spreads over an area of 405.78 ha (36.40 %). An area of 316.08 ha (28.36 %) is under moderately steep to steep class having 15 – 35 percent slope. The details of the slope with spatial extent in the watershed are given in the table.

Sl. No.	Slope	Description	Area (Ha)
1	0-3 percent	Very gentle slope	96.75
2	3-5 percent	Gentle slope	405.78
3	5-10 percent	Moderately sloping	32.22
4	10-15 percent	Strongly sloping	263.88
5	15-35 percent	Moderately steep to steep	316.08
		Total	1114.71

Drains

The Meenachil River is flowing through the western and north boundary of the watershed. Meenanthala Ar flows through the south boundary of the watershed. The details of the drains and ponds in the watershed area are given in table.

Sl. No.	Name of Drain
1	Kuttuvettikkal Chirapalam Thodu
2	Kattuvetti Ettupara Chirapalam Thodu
3	Thundiylpadi Orappani Chirapalam Thodu
4	Chirappalam Thodu (Mannuur Thodu)
5	Meenachil –Meenanthala River

6	Velloor thodu
7	Muriyankal
8	Puthukulam-poothiri thodu
9	Poothiri-kannankunnu thodu
10	Kannankunnu-kattuvetti thodu

Ponds

Sl.No	Name of Pond
1	Kuttuvettikkal Kulam
2	Malathu Padasekhara Chira

Landuse

Agriculture is one of the prime activities in the watershed area. The major landuse category in the micro watershed area is under Plantation Rubber. This is mapped in an area of 554.38 Ha (49.73 %). The second major landuse category mapped in the watershed area is mixed crops which are the typical homestead cultivation of Kerala wherein the different horticultural crop species are grown together that cannot be spatially mapped separately. In this watershed mixed crops mainly includes coconut based farming intercropped with arecanut, banana and nutmeg along with other crop species. It occurs in an area of 332.60 Ha (29.84 %). An area of 39.92 ha is under paddy cultivation and an area of 35.30 Ha of paddy lands were converted to garden land to cultivable other horticulture crops. An area of 1.69 Ha is mapped as cultivable wasteland which can be brought to paddy cultivation by providing necessary labour and other facilities. The details of the landuse categories with spatial extent are given in table.

Sl.No.	Particulars	Area (Ha)	Percentage (%)
1	Built up Land	6.14	0.55
2	Paddy - Viruppu	13.25	1.19
3	Paddy - Mundakan	9.58	0.86
4	Paddy - Puncha	0.26	0.02
5	Paddy - Viruppu + Mundakan	4.73	0.42
6	Paddy - Mundakan + Puncha	12.10	1.09
7	Paddy converted to Arecanut	3.85	0.35
8	Paddy converted to Coconut	0.15	0.01
9	Paddy converted to Banana	3.50	0.31
10	Paddy converted to Mixed crops	19.04	1.71
11	Paddy converted to Mixed trees	3.15	0.28
12	Paddy converted to Rubber	5.61	0.50
13	Paddy - Cultivable Waste Land	1.69	0.15
14	Arecanut	18.91	1.70
15	Banana	1.33	0.12
16	Coconut	4.50	0.40

17	Tubercrops	7.36	0.66
18	Mixed crops	332.60	29.84
19	Mixed trees	94.59	8.49
20	Plantation Rubber	554.38	49.73
21	Plantation Rubber + Arecanut	11.53	1.03
22	Road	4.72	0.42
23	Quarry - Rock	0.73	0.07
24	Cemetery	0.66	0.06
25	Cultivable Waste Land	0.08	0.01
26	Marshy land	0.27	0.02
	Total	1114.71	100.00

Geology

The major geological units in the watershed are Charnockite group of rocks extending to an area of 823.85 (73.91 %). Khondalite (137.10 ha) and basic rocks (153.76 ha) also exist in the watershed. The details of geological units with spatial extent in the watershed are given in the table.

Sl. No.	Particulars	Area (Ha)
1	Charnockite	823.85
2	Basic rocks	153.76
3	Khondalite	137.10
	Total	1114.71

Geomorphology

There are four geomorphological units in the watershed area of which 949.46 ha (85.18 %) area falls under the category lower plateau (lateritic). An area of 132.12 ha (11.85 %) is mapped under valley fill. The details of geomorphology in the watershed area with spatial extent are given in the table.

Sl. No.	Particulars	Area (Ha)
1	Valley fill	132.12
2	Lower Plateau	949.46
3	Residual mount	14.18
4	Linear ridges	18.95
	Total	1114.71

Soils

The major soil series mapped in the watershed area is Thiruvanchoor series which occurs in very gently to gently sloping (1-5%) lands with dark brown to very dark grayish brown colour having very deep depth with fine loamy to fine texture. The soils are moderately well drained with none to slight water erosion. These are well managed

soils. The soils of the watershed area have a surface texture of clay to gravelly clay loam. This major textural class of clay loam is distributed in an area of 964.47 ha. Soils in more than 50 % of the watershed area (573.80 ha) is very deep with a depth of more than 150 cm. An area of 523.98 ha is having deep soils with a depth of 100- 150 cm. Nearly 50 % of the watershed area is prone to moderate to severe soil erosion which calls for proper soil and water conservation measures in the area.

Capacity Building/Trainings

Extensive training programmes and user interaction meetings were organized for the stake holders as part of the preparation of detailed project report. The details are given below:

No.	Training	Participants
1.	Block level awareness training	Elected representatives of three tier
2.	Block level orientation training	Elected representatives and ADS chairpersons
3.	Training on Base line survey	Two facilitators from NHG.
4.	Training on Drainage line treatment	Elected representatives and one facilitator from NHG.
5.	Focus Group Discussion	Elected representatives, Presidents and Secretaries of the NHGs, ADS chairpersons and MGNREGS labour groups and progressive farmers
6.	Entry point activity finalization	Elected representatives, Vice Presidents and Joint Secretaries from NHG, ADS chairpersons and MGNREGS labour groups.

Watershed Committee

Watershed Committee is constituted by Grama Sabha to implement the watershed project with technical support of WDT in the panchayat. Watershed committees are formed following the parameters of watershed committee, keeping the gender sensitive issues intact. Watershed committee members are briefed about the project objectives and a workshop is also conducted in this regard at every panchayat. The watershed committee has a pivotal role to play during and after the project implementation period.

The details of the Watershed Committee for Mannarthodu – Maalam – Aryparambu watershed is given below:

Sl. No.	Name	Phone number
1	Sri. Johnykutty Mammen (Panchayath President)	9496044700
2	Sri.Anil (VEO)	9495329510

3	Smt. Mini mol K (member, ward No.12)	
4	Sri.Jonnykutty Mammen (member,ward No.11)	9496044700
5	Smt.Mairamma Georgekutty (member ,ward No.9)	9447156514
6	Sri.K.C.Mathai(member,wardNo.10)	9400702763
7	Smt.Manju Manoj (member,ward No.8)	9961005878
8	Smt.Shani Rejimon(Member, Ward No.13)	9495866055
9	Sri.Issac Thomas (SHG member, Ward No: 8)	
10	Sri.Georgekutty Sacharia (SHG member, Ward No: 9)	0481-2543414
11	Sri.James M.T (SHG member, Ward No: 10)	9496114073
12	Sri.Rajan Ponnus (SHG member, Ward No: 11)	
13	Sri.E.G.Satheeshan (SHG member, Ward No: 12)	
14	Sri.V.C.Scaria (SHG member, Ward No: 13)	9446202575
15	Smt.Moly Rajan (User group Representative,Ward No.10)	9495994908
16	Smt. Indhu.K.Thomas (WDT member)	
17	Smt.Sulochana Rajan (SC Representative, Ward No: 8)	9562198331
18	Sri.Sarala NedumparambilKarottu (ST Representative, Ward No: 9)	
19	Smt.Jaya Paul(Lady representative, Ward No: 12)	9539744409
20	Smt.Jaya Ajikumar(Lady representative, Ward No: 10)	9947660432
21	Sri.Kora Mathew (Landless Representative, Ward No: 1)	8281571599

Neighbour Hood Groups

Neighbour hood Groups are constituted in the watershed area combining 40 to 50 adjacent households which are living in a cluster. These are further subdivided into seven sub groups and one person from each subgroup is selected to the Neighbour hood Group Committee. These seven members formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is women. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. These Committees are registered with the concerned Grama Panchayat. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

The details of the NHG Committees in Mannarthodu – Maalam – Aryparambu watershed is as follows:

Table No. 14.7- NHG Committees in Mannarthodu – Maalam – Aryparambu watershed

Sl. No.	Panchayat	Ward	No. of NHG
1	Ayarkunnam	Ward 09	7
2	Ayarkunnam	Ward 10	10
3	Ayarkunnam	Ward 11	6
4	Ayarkunnam	Ward 12	8

5	Ayarkunnam	Ward 8(part)	2
6	Manarkad	Ward 5	9
7	Manarkad	Ward 6(part)	5
8	Manarkad	Ward 7(part)	2
9	Kooropada	Ward 1(part)	2
10	Kooropada	Ward 17(part)	1
11	Pampady	Ward 1(part)	6
12	Pampady	Ward 2(part)	12
13	Pampady	Ward 3(part)	2

Self Help Groups

In addition to this, the existing Self Help Groups formed under the Kudumbasree Mission and other SHGs which are performing at a satisfactory level will be promoted to take various programmes under the Livelihood activities and Production Systems and Micro enterprises. If required, additional SHGs will also be formed in the watershed area in the coming years.

Activities proposed

Based on the series of discussions held with the different stakeholders the following activities are suggested for the micro watershed.

Table No. 14.8 – Activities suggested

Ayarkunnam Grama Panchayath

Side Wall Protection

Sl. No.	Name of Thodu
1	Kuttuvettikkal Chirapalam Thodu
2.	Kattuvetti Ettupara Chirapalam Thodu
3	Thundiylpadi Orappani Chirapalam Thodu
4.	Chirappalam Thodu (Mannuur Thodu)

Desiltation of drains

Sl. No.	Name of Thodu
1	Chirapalam Thodu

Brush wood bunding

Sl. No.	Name of Thodu	Survey No.
1	Chirapalam Thodu	421, 423

Desiltation of ponds

Sl. No.	Name of Pond
1	Kuttuvettikkal Kulam
2	Malathu Padasekhara Chira

Side Varambu Earthening of pond

Sl. No.	Name of Pond
1	Kuttuvettikkal Kulam

2	Malathu Padasekhara Chira
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VCB Repair

Sl.No.	Name of Thodu	Survey No.
1	Chirapalam Thodu	415

Other NRM works

No.	Activity	Location
1.	Rainpits	Survey no. 442, 439, 438, 432, 437, 430, 429, 428, 447, 426, 422, 448, 449, 276, 419, 433, 290, 291, 283, 284, 315, 309, 296, 298, 300, 410, 391, 382, 409, 401, 402, 404, 380, 386, 390, 381, 379, 375, 305, 304, 306, 308, 309, 139, 192
2.	Vegetable Garden	CMS LPS Amayanuur
3.	Centripetal terracing for coconut	Survey no. 265, 40, 39, 38, 42, 45, 46, 51, 55, 452, 451, 450, 449, 448, 447, 446, 450, 459, 461, 462, 467, 460, 445, 444, 437, 436, 442, 272, 273, 270, 269, 397, 411, 412, 299, 413, 415, 414, 417, 281, 304, 347
4.	Composting	Survey no. 422, 427, 432, 375, 379, 383, 426, 433, 438, 377, 380, 400, 419, 428, 439, 378, 403, 385
5.	Stone pitched contour bund	Survey no. 65, 66, 67, 69, 70, 78, 77, 498, 493, 492, 486, 489, 490, 134, 133, 137, 145, 144, 146, 147, 143, 155, 156, 157, 158, 115, 159, 119, 121, 122, 110, 129, 131, 132, 108, 107, 90, 89, 201, 133, 65, 64
6.	Check Dam	Survey no. 425, 478
7.	River Integration	Meenachil –Meenanthara Sy No:- 357

Manarkad Grama Panchayat**Side Wall Protection of thodu**

Sl.No.	Name of Thodu	Survey No.
1.	Vellur thodu	265-54

Side Varambu Earthening of pond

Sl. No.	Name of Pond	Survey No.
1	Parakulam	463/13

Other NRM works

No.	Activity	Location
1.	New Pond	Survey no.132,440
2.	New Well	Survey no.547, 432, 443, 444, 411, 406, 131, 129, 122, 124, 123, 119, 121, 114, 135, 137, 144, 145, 146, 512, 555, 517, 522, 545, 445, 460, 415, 419, 406, 364, 382
3.	Well recharging	Survey no. 445, 460, 450, 447, 439, 437, 440, 442, 412, 364, 362, 271, 272, 266, 260, 264, 268, 12, 45, 42, 39, 40, 41, 59, 11, 10, 64, 66, 70, 90, 110, 132, 107, 130, 125, 120, 136, 135,

		120, 138, 140, 141, 143, 77, 74, 72, 75, 78, 73, 463, 292, 484, 462, 463, 523, 525, 535, 520, 475, 482, 471, 534, 461, 434, 430, 435, 432, 449, 428, 441,
4.	Seed & Fertilizer support	Survey no. 460, 445, 461, 458, 453, 446, 444, 437, 440, 431, 436, 447, 449, 450, 459, 467, 458, 453, 455
5.	Vegetable grow bag	Survey no. 463, 484, 482, 471, 545, 449, 428, 406, 534, 419, 364, 382
6.	Temporary Shutter System	Near Vadavathur Padashekaram

Pampady Grama Panchayat

Side wall protection of thodu

Sl. No.	Name of Thodu
1	Vellur thodu

Other NRM works

No.	Activity	Location
1.	New Well	Survey no. 269, 268, 271, 286, 256, 289, 45, 260, 11, 259, 257
2.	Well recharging	Survey no. 271, 272, 266, 260, 264, 268, 12, 45, 42, 39, 40,41, 59, 11, 10, 64, 66, 70, 77, 74, 72, 75, 78, 73

Koroopada Grama Panchayat

Side wall protection

Sl.No.	Name of Thodu	Survey No.
1	Arakkal parambu	132, 114
2.	Muriyankal thodu	141, 140

Desilication of thodu

Sl.No.	Name of Thodu
1	Mathacherry thodu
2	Arakkal parambu
3	Muriyankal thodu
4	Puthukulam Poothiri thodu
5	Poothiri Kannan kunnu thodu
6	Kannankunnu kattuketti thodu

Other NRM works

Sl. No.	Activity	Location
1.	Vegetable cultivation	139, 143, 141, 125, 126, 129, 119
2.	New Well	115, 131, 129, 122, 124, 123, 119, 121, 114, 135, 137, 144, 145, 146
3.	Well recharging	90, 110, 132, 107, 130, 125, 120, 136, 135,

		120, 138, 140, 141, 143,
4.	New Pond	132

Budget

The distribution of budget for Mannarthodu – Maalam – Aryparambu micro watershed for the various components as per IWMP guidelines is given below:

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	12,67,272
2.	Monitoring	1	1,26,727
3.	Evaluation	1	1,26,727
Preparatory phase			
4.	Entry point activities	4	506909
5.	Institution and capacity building	5	633636
6.	Detailed Project Report	1	126727
Watershed works phase			
7.	Natural Resources Conservation works	56	7096723
8.	Livelihood activities for asset less	9	1140545
9.	Production system and micro enterprises	10	1267272
10.	Consolidation phase	3	380182
		100	12672720

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.10.1 - Sector-I- Natural Resources Conservation and Management - 1st Year Plan

No.	Ayarkunnam Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Banana cultivation	10 cent	16800	1		16800		16800
2	Vegetable garden in CMS LPS Amayanur	25 cent	7500	1	7500		750	7500
3	Earthern bunds	rm	27	2000		54000		54000
4	Centripetal terracing with mulching	no.	46	200		9200		9200
5	Live fencing	rm	25	1000		24500		24500
6	Vegetable grow bags	no.	1200	400	480000		48000	480000
7	Desiltation of drains	10m3	486	1500		728775		728775
8	Desiltation of ponds	10m3	649	250		162250		162250
9	Compost pits	no.	8000	50		400000		400000
					487500	995525	48750	1483025
No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable grow bags	no.	1200	50	60000		6000	60000
2	Earthern bunds	rm	27	2000		54000		54000
3	Centripetal terracing with mulching	no.	46	200		9200		9200
4	Desiltation of drains	10m3	486	250		121463		121463
5	Desiltation of ponds	10m3	649	250		162250		162250
6	Well recharging	no.	5500	20	110000		11000	110000
					170000	346913	17000	516913
No.	Pampady Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Earthern bunds	rm	27	2000		54000		54000

2	Distribution of organic fertilizers	no.	1800	50	90000		9000	90000
3	Desiltation of drains	10m3	486	500		242925		242925
					90000	296925	9000	386925
No.	Kooroppada Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Crop demonstration of pineapple	20 cent	4000	1	4000		400	4000
2	Avenue tree planting	no.	160	500		80000		80000
3	Earthen bunds	rm	27	2000		54000		54000
4	Desiltation of drains	10m3	486	250		121463		121463
5	Well recharging	no.	5500	5	27500		2750	27500
					31500	255463	3150	286963

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.10.2 -Sector-I- Natural Resources Conservation and Management –IInd Year Plan

No.	Ayarkunnam Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Crop demonstration in vegetables(non-pandal)	25 cent	7500	2	15000		1500	15000
2	Cultivation of horticultural crops	25 cent	7850	2	15700		1570	15700
3	Banana cultivation	10 cent	16800	2		33600		33600
4	Earthen bunds	rm	27	4000		108000		108000
5	Centripetal terracing with mulching	no.	46	200		9200		9200
6	Live fencing	rm	25	2000		49000		49000
7	Stone pitched contour bunding	m2	144	1000	143520		14352	143520
8	Sidewall protection of drains (engineering)	m2	2400	700	672000	1008000	67200	1680000
9	Desiltation of drains	10m3	486	1500		728775		728775
10	Sidewall protection of drains (brushwood bunding)	m	548	1000		548000		548000

11	VCB Repair in chirapalam thodu	no.	183329	1	183329		18333	183329
12	Construction of check dam	no.	100000	1	100000		10000	100000
13	Desiltation of ponds	10m3	649	250		162250		162250
14	Side varambu earthening of ponds	10m3	2317	250		579250		579250
15	Moisture Collection Pits	no.	30	200		6000		6000
16	Well recharging	no.	5500	50	275000		27500	275000
17	Biogas(0.5m3)	no.	8500	50	106250	318750	10625	425000
18	Compost pits	no.	8000	100		800000		800000
					1510799	3550825	151080	5061624
No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Crop demonstration in vegetables(non-pandal)	25 cent	7500	2	15000		1500	15000
2	Earthern bunds	rm	27	2000		54000		54000
3	Centripetal terracing with mulching	no.	46	200		9200		9200
4	Live fencing	rm	25	2000		49000		49000
5	Distribution of organic fertilizers	no.	1800	50	90000		9000	90000
6	Stone pitched contour bunding	m2	144	600	86112		8611	86112
7	Sidewall protection of drains (engineering)	m2	2400	250	240000	360000	24000	600000
8	Desiltation of drains	10m3	486	250		121463		121463
9	Side varambu earthening of ponds	10m3	2317	50		115850		115850
10	Desiltation of ponds	10m3	649	250		162250		162250
11	Construction of new pond	no.	332867	1		332867		332867
12	Construction of new well	no.	30000	4	120000		12000	120000
13	Well recharging	no.	5500	20	110000		11000	110000
					661112	1204630	66111	1865742

No.	Pampady Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Crop demonstration of watermelon	25 cent	7500	1	7500	7500	750	15000
2	Earthen bunds	rm	27	2000		54000		54000
3	Centripetal terracing with mulching	no.	46	200		9200		9200
4	Live fencing	rm	25	1000		24500		24500
5	Stone pitched contour bunding	m2	144	500	71760		7176	71760
6	Desiltation of drains	10m3	486	500		242925		242925
7	Desiltation of ponds	10m3	649	250		162250		162250
8	Construction of new well	no.	30000	2	60000		6000	60000
9	Well recharging	no.	5500	20	110000		11000	110000
					249260	500375	24926	749635
No.	Kooroppada Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable cultivation(pandal)	25 cent	15000	2	30000		3000	30000
2	Earthen bunds	rm	27	3000		81000		81000
3	Centripetal terracing with mulching	no.	46	200		9200		9200
4	Live fencing	rm	25	1000		24500		24500
5	Sidewall protection of drains (engineering)	m2	2400	100	96000	144000	9600	240000
6	Desiltation of drains	10m3	486	250		121463		121463
7	Construction of new well	no.	30000	1	30000		3000	30000
8	Well recharging	no.	5500	5	27500		2750	27500
9	Construction of new pond	no.	45000	1		45000		45000
					183500	425163	18350	608663

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.10.3 -Sector-I- Natural Resources Conservation and Management –IIIrdYear Plan

No.	Ayarkunnam Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Crop demonstration in vegetables(non-pandal)	25 cent	7500	2	15000		1500	15000
2	Banana cultivation	10 cent	16800	2		33600		33600
3	Earthern bunds	rm	27	4000		108000		108000
4	Live fencing	rm	24.5	2000		49000		49000
5	Stone pitched contour bunding	m2	143.52	3000	430560		43056	430560
6	Sidewall protection of drains (engineering)	m2	2400	700	672000	1008000	67200	1680000
7	Sidewall protection of drains (brushwood bunding)	m	548	1000		548000		548000
8	Construction of check dam	no.	100000	1	100000		10000	100000
9	Side varambu earthening of ponds	10m3	2317	250		579250		579250
10	Moisture Collection Pits	no.	30	200		6000		6000
11	Well recharging	no.	5500	50	275000		27500	275000
12	Biogas(0.5m3)	no.	8500	25	53125	159375	5312	212500
13	Compost pits	no.	8000	100		800000		800000
					1545685	2491225	154569	4036910
No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Planting of horticultlural crops	25 cent	7850	2	15700		1570	15700
2	Earthern bunds	rm	27	2000		54000		54000
3	Live fencing	rm	24.5	2000		49000		49000
4	Stone pitched contour bunding	m2	143.52	800	114816		11482	114816
5	Sidewall protection of drains (engineering)	m2	2400	250	240000	360000	24000	600000

6	Side varambu earthening of ponds	10m3	2317	50		115850		115850
7	Construction of new pond	no.	332867	1		332867		332867
8	Construction of new well	no.	30000	5	150000		15000	150000
9	Well recharging	no.	5500	15	82500		8250	82500
					603016	911717	60302	1514733
No.	Pampady Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Crop demonstration of watermelon	25 cent	7500	1	7500		750	7500
2	Live fencing	rm	24.5	2000		49000		49000
3	Stone pitched contour bunding	m2	143.52	250	35880		3588	35880
4	Construction of new well	no.	30000	4	120000		12000	120000
5	Well recharging	no.	5500	12	66000		6600	66000
					229380	49000	22938	278380
No.	Kooroppada Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Planting of hoticultural crops	25 cent	7850	2	15700		1570	15700
2	Live fencing	rm	24.5	2000		49000		49000
3	Sidewall protection of drains (engineering)	m2	2400	70	67200	100800	6720	168000
4	Construction of new well	no.	30000	2	60000		6000	60000
5	Well recharging	no.	5500	10	55000		5500	55000
					197900	149800	19790	347700

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.10.4 -Sector-I- Natural Resources Conservation and Management –IVth Year Plan

No.	Ayarkunnam Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Stone pitched contour bunding	m2	143.52	1000	143520		14352	143520
2	Sidewall protection of drains (engineering)	m2	2400	420	403200	604800	40320	1008000
3	Well recharging	no.	5500	25	137500		13750	137500
					684220	604800	68422	1289020
No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Stone pitched contour bunding	m2	143.52	400	57408		5740.8	57408
2	Sidewall protection of drains (engineering)	m2	2400	150	144000	216000	14400	360000
3	Well recharging	no.	5500	15	82500		8250	82500
					283908	216000	28390.8	499908
No.	Pampady Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Stone pitched contour bunding	m2	143.52	250	35880		3588	35880
2	Construction of new well	no.	30000	2	60000		6000	60000
					95880		9588	95880
No.	Kooroppada Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Construction of new well	no.	30000	2	60000		6000	60000
2	Well recharging	no.	5500	4	22000		2200	22000
					82000		8200	82000

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan
Table No. 14.11.1 -Sector-II- Livelihood Support system for landless/ asset less – 1st Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
A	Enterprising individuals (10 %)						
	Ayarkunnam						
1	Malabari Goat rearing	No.	10500	8	56000	28000	84000
2	Backyard Poultry	No.	1500	15	11250	11250	22500
	Manarkad						
1	Malabari Goat rearing	No.	10500	3	21000	10500	31500
2	Backyard Poultry	No.	1500	8	6000	6000	12000
	Pampady						
1	Malabari Goat rearing	No.	10500	1	7000	3500	10500
2	Backyard Poultry	No.	1500	5	3750	3750	7500
	Kooroppada						
1	Backyard Poultry	No.	1500	11	8250	8250	16500
	Total				113250	71250	184500

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan
Table No. 14.11.2 -Sector-II- Livelihood Support system for landless/ asset less - IInd Year Plan

Sl. No	Name of Activity	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)					
	Ayarkunnam					
1	Vegetable Cultivation	25000	2	40000	10000	50000
2	Ornament making unit	20000	4	64000	16000	80000
3	Rabbit rearing	15000	4	48000	12000	60000
4	Honey bee	10000	5	40000	10000	50000
5	Paper plate unit					
	Manarkad					
1	Vegetable Cultivation	25000	1	20000	5000	25000
2	Bush Jasmine	20000	1	16000	4000	20000
3	Honey bee	15000	3	36000	9000	45000
4	Mushroom					
	Kooroppada					
1	Honey bee	20000	1	16000	4000	20000
2	Mushroom	15000	1	12000	3000	15000
	Pampady					
1	Vegetable Cultivation					
2	Honey bee	20000	1	16000	4000	20000
3	Carry bag unit	15000	2	24000	6000	30000
4	Mushroom					
	Total			332000	83000	415000

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan
Table No. 14.11.3 -Sector-II- Livelihood Support system for landless/ asset less - IIIrd Year Plan

Sl. No	Name of Activity	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)					
	Ayarkunnam					
1	Vegetable Cultivation	25000	3	60000	15000	75000
2	Ornament making unit	20000	4	64000	16000	80000
3	Rabbit rearing	15000	4	48000	12000	60000
4	Honey bee	10000	5	40000	10000	50000
5	Paper plate unit					
	Manarkad					
1	Vegetable Cultivation	25000	1	20000	5000	25000
2	Bush Jasmine	20000	2	32000	8000	40000
3	Honey bee	15000	3	36000	9000	45000
4	Mushroom					
	Kooroppada					
1	Honey bee	15000	2	24000	6000	30000
2	Mushroom					
	Pampady					
1	Honey bee					
2	Mushroom	15000	2	24000	6000	30000
	Total			348000	87000	435000

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.11.4 -Sector-II- Livelihood Support system for landless/ assetless- IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
C Major livelihood activities (30 %)							
Ayarkunnam							
1	Cow rearing		600000	1	200000	400000	600000
Manarkad							
1	Rabbit rearing		8000	5	28000	28000	
2	Live stock support (1 milch cow and 2 goats)		50000	2	50000	50000	
Kooroppada							
1	Mechanisation support to livestock farmers		50000	1	25000	25000	50000
Pampady							
1	Live stock support (1 milch cow and 2 goats)		50000	1	25000	25000	50000
Total					328000	528000	856000

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.12.1 -Sector-III- Production system and Microenterprises - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
Ayarkunnam								
1	Backyard Poultry	Nos.	1500	75	56250	56250	10125	112500

Manarkad								
1	Backyard Poultry	Nos.	1500	60	45000	45000	8100	90000
Kooroppada								
1	Backyard Poultry	Nos.	1500	35	26250	26250	4725	52500
Pampady								
1	Backyard Poultry	Nos.	1500	20	15000	15000	2700	30000
Total				190	142500	142500	25650	285000

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

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.12.2 -Sector-III- Production system and Microenterprises –IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
Ayarkunnam								
1	Ordinary Compost	Nos.	8000	12	60000	36000	10800	96000
2	Nendran Banana Cultivation	Nos.	34000	10	100000	240000	18000	340000
Manarkad								
1	Ordinary Compost	Nos.	8000	10	50000	30000	9000	80000
2	Nendran Banana Cultivation	Nos.	34000	6	60000	144000	10800	204000
Kooroppada								
1	Vermi Compost	Nos.	18000	5	50000	40000	9000	90000
Pampady								
1	Ordinary Compost	Nos.	8000	5	25000	15000	4500	40000
2	Nendran Banana Cultivation	Nos.	34000	1	10000	24000	1800	34000
Total				49	355000	529000	63900	884000

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

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.12.3 -Sector-III- Production system and Microenterprises –IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
Ayarkunnam								
1	Soap making	Nos.	25000	10	150000	100000	27000	250000
2	Candle making unit	Nos.	21300	15	150000	169500	27000	319500
Manarkad								
1	Vermi Compost	Nos.	18000	5	50000	40000	9000	90000
2	Nendran Banana Cultivation	Nos.	34000	6	60000	144000	10800	204000
Kooroppada								
2	Nendran Banana Cultivation	Nos.	34000	1	10000	24000	1800	34000
Pampady								
1	Nendran Banana Cultivation	Nos.	34000	3	30000	72000	5400	102000
Total				40	450000	549500	81000	999500

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

Mannarthodu – Maalam – Aryparambu Watershed (12M38b) - Action Plan

Table No. 14.12.4 -Sector-III- Production system and Microenterprises –IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
Ayarkunnam								
1	Soap making	Nos.	25000	10	150000	100000	27000	250000
2	Candle making unit	Nos.	21300	15	150000	169500	27000	319500
Manarkad								
1	Cow rearing	Nos.	35000	5	75000	100000	13500	175000

	Kooroppada							
1	Nendran Banana Cultivation	Nos.	34000	1	10000	24000	1800	34000
	Pampady							
1	Cow rearing	Nos.	35000	2	30000	40000	5400	70000
	Total			33	415000	433500	74700	848500

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

MICRO WATERSHED BASED ACTION PLAN

MAALAM MICRO WATERSHED (12M38d)

Maalam micro watershed is a micro watershed in the IWMP cluster (IWMP-III) with a total treatable area of 623.71 ha (12.22 % of total geographical area). This micro watershed is located mainly in ward 3, 4, 8, 9, 10 (full) 11,12,16,17 (part) of Manarkkad panchayat, ward 1, 2 (part) of Pampady panchayat respectively. This micro watershed bounded by Velloor thodu and Kuzhakkattuchira thodu and with the tributaries of Meenachil Ar. The total area of the micro watershed comes to 638.13 Ha of which the total treatable area is 623.71 Ha.

General Description

Name of micro watershed	: Maalam
Micro watershed code	: 12M38d
River basin	: Meenachil
District	: Kottayam
Block Panchayath	: Pampady
GramaPanchayaths	: Manarkad, Pampady
Villages	: Manarkad, Pampady
Latitude	: 9°35'15.6" to 9°36'54.6" North
Longitude	: 76°34'21.8" to 76°36' 29" East
Wards	: 3,4,8,9,10 (full), 11,12,16,17 (part) of Manarkkad 1,2 (part) of Pampady
Total area	: 638.13 Ha
Total treatable area	: 623.71 Ha
% of area in the IWMP cluster	: 12.22 %

Methodology

In line with the guidelines of IWMP, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Training Coordinators were engaged at project level for organizing the series of trainings at Block and Grama Panchayat levels.
5. Overseers were engaged for taking field estimates of the proposed activities.

6. Induction training was given for the project staff on PRA techniques, concept of maps and Resource Mapping.
7. Printed posters, banners and notices for providing wide publicity regarding the programme.
8. Two block level seminars were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
9. This was followed by orientation seminars at GramaPanchayats.
10. Conducted transect walk with ward members and ADS.
11. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
12. NHGs were formed at grass root level comprising of 40 to 50 neighbouring households.
13. Panchayat Level Watershed Committees were convened at Grama Panchayats for finalizing the modalities of work.
14. Trainer's training for base line survey were conducted for two facilitators from each Neighbour Hood Group
15. Predefined questionnaire was prepared for data collection from each household.
16. A block level seminar was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented by concerned Grama Panchayat Presidents.
17. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map with the help of the facilitators selected from the NHGs.
18. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
19. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of NHGs and accordingly present land use map is prepared using different notions and symbols.
20. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
21. Panchayat Level Watershed Committees were convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
22. Trainer's training for taking people's estimates and consolidation of project proposals. This was organized at Grama Panchayat and NHG level. Elected

representatives, ADS Chairpersons, Officer bearers of NHGs, MGNREGS officials, etc. attended this training. The information gathered on soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalized. The livelihood action plan and the activities under production system were also consolidated.

23. The suggestions were split for four years and four separate annual plans were also prepared.
24. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
25. Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal terracing, earthen and stone pitched contour bunding, outerbund strengthening, water logging prevention, vegetative barriers etc.
 - Rain water harvesting activities like farm ponds, sil paulin tanks, check dams etc.
 - Enhancement of paddy cultivation through area expansion in cultivable paddy fallows.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Scientific waste management practices like vermi compost, biogas, pipe compost and solid waste management units.
 - Protection of water sources like streams, ponds, drains etc.
 - Crop improvement practices and crop demonstrations.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - Encouragement of self sufficiency in vegetable production through vegetable gardens and grow bags.
 - Encouraging natural regeneration including fodder cultivation.
 - Promotion of agro-forestry and horticulture
 - Capacity building and creation of a greater degree of awareness among the participants.
 - Encouraging people's participation with the involvement of NHGs.
 - Livelihood activities for asset less people
 - Production system and Micro enterprises

SWOT Analysis 12M38d					
Sl. No.	Area	Strengths	Weakness	Opportunities	Threats
1	Agriculture	68.86 hectareis under paddy cultivation.	40.65 hectare of paddy land converted for banana and other mixed crops. Lack of skilled labour for transplanting, harvesting paddy.	8.50 hectare cultivable fallow paddy land and lease farmers. One skilled labour group for mechanized farming.	Submerged fallow after clay mining.
2	Horticulture	39.10% of the total area of watershed under coconut based farming system with intercrops such as arecanut plantain, nutmeg tuber crops ginger turmeric and pepper.	Lack of skilled labour for plant protection, harvesting coconut, arecanut, staking nendran banana, insitu budding of nutmeg, tapping of rubber	Scope for area expansion for plantain varieties, rejuvenation of pepper. Skilled labour group for insitu budding nutmeg, plant protection, tapping, coconut climbing, totray method of raising vegetable seedling.	
3	Animal Husbandry	Cattle rearing as major lively hood by many small and marginal farmers. Backyard poultry taken up as subsistent farming by majority of inhabitants. Accessibility to milk collection centres	Lack of availability of fodder. Lack of sufficient infrastructure for rearing cattle in a scientific manner	Cattle rearing major lively hood by many women. Scope for increasing backyard poultry as part of production system. Scope for cultivation of fodder as intercrop in coconut garden and common lands.	Cattle rearing cannot be taken up as group enterprise due to lack of sufficient space forconstruction of the shed.

4	Natural Resources	56% of area of watershed lie below 20m MSLand belongs to the category of geomorphology lower plateau.	The topography is undulating and slope moderate. Subject to erosion hazards. In the valley portion, breach of bunds, flooding	Area treatment with suitable soil and water conservation measures such as contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting measures such as staggered trenches and pits. Embankment protection of river by vegetative measures. As part of drainage line treatment, strengthening of field bunds (VARAMBU) Stream bank protection of thodu,desiltation and restoration of field channels.	Sand mining from river adversely affecting the water table and water quality. Clay mining from fertile paddy field has left paddy field as uncultivable waste land impairing the natural drainage and increasing the chance of flooding.
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Biophysical Resources

Relief

The relief of the watershed ranges up to 80 m above msl. Majority of the land falls in the relief category of 0–20m above MSL which covers an area of 358.21 ha (56.13%). An area of 174.08 ha is located 20-40m from msl. The details of the relief with spatial extent in the watershed area are given in the table.

Sl.No.	Relief	Area(ha)
1.	0-20 m above MSL	358.21
2.	20-40 m above MSL	174.08
3.	40-60 m above MSL	96.01
4.	60-80 m above MSL	9.83
	Total	638.13

Slope

The watershed area is divided into four categories of slope classes. The majority of area is under moderately steep to steeply sloping having 15-35% slope. This category spreads over an area of 289.36 ha (45.34 %). 199.30 ha area of watershed is having gently sloping area with a slope percentage of 3-5. The details of the slope with spatial extent in the watershed are given in the table

Sl.No.	Slope	Description	Area(ha)
1	0-3 percent	Very gentle slope	124.85
2	3-5 percent	Gentle slope	199.30
3	10-15 percent	Strongly sloping	22.61
4	15-35 percent	Moderately steep to steep	289.36
	Waterbodies	Waterbodies	2.01
	Total		638.13

Drains

The northern boundary of ward 3, 8, 4 adjoins the Velloor thodu having a length of 2500 m and a width of 30 m flowing from Eastern side to west, Kuzhakkettu chira thodu surrounds the wards 16, 17, 11, 12 of Manarkkad panchayat having 1000 m length.

The details of the drains and ponds in the watershed area are given in table.

Sl. No.	Name of Drain
1	Vellor thodu
2	Mannamlodithodu
3	Varupuzha thodu
4	Kavumpady - Vattomalapadi
5	Muthirakunnel Karivannur thodu
6	Kakarivelilthodu
7	Palamuri – Edakottu thodu
8	Thembraval Elamkulathupadi thodu
9	Muthirakunnel padi-karimannoor padi thodu

Ponds

Sl.No.	Name of Pond
1	Shreyam Pond
2	Thuruthipadikulam
3	Parakulam
4	Perumannur kulam

Landuse

Agriculture is one of the prime activities in the watershed area. The major landuse category mapped in the watershed area is mixed crops which are the typical homestead cultivation of Kerala where in the different horticultural crop species are grown together that cannot be spatially mapped separately. In this watershed mixed crops mainly includes coconut based farming intercropped with arecanut, banana and nutmeg along with other crop species. It occurs in an area of 249.51 Ha (39.10 %). The second major category is plantation rubber. This is mapped in an area of 193.70 Ha (30.35 %). An area of 40.65 Ha (6.37 %) paddy land is converted to garden land to cultivable other horticulture crops. An area of 8.50 Ha is mapped as paddy - cultivable wasteland which can be brought to paddy cultivation by providing necessary labour and other facilities. An area of 2.70 Ha is mapped as cultivable wasteland which can be brought under horticulture. The details of the landuse categories with spatial extent are given in table.

Sl.No.	Particulars	Area(ha)	Percentage (%)
1	Built up Land	24.64	3.86
2	Paddy - Viruppu	0.29	0.05
3	Paddy - Mundakan	17.19	2.69
4	Paddy - Puncha	51.38	8.05
5	Paddy converted to Builtup land	1.33	0.21
6	Paddy converted to Coconut	3.15	0.49
7	Paddy converted to Banana	0.32	0.05
8	Paddy converted to Mixed crops	21.69	3.40
9	Paddy converted to Rubber	14.16	2.22
10	Paddy - Cultivable Waste Land	8.50	1.33
11	Arecanut	5.21	0.82
12	Banana	8.99	1.41
13	Coconut	5.77	0.90
14	Tubercrops	3.55	0.56
15	Mixed crops	249.51	39.10
16	Mixed trees	18.14	2.84
17	Plantation Rubber	193.70	30.35
18	Plantation Cashew	0.43	0.07
19	Plantation Teak	1.00	0.16

20	Road	3.68	0.58
21	Quarry - Rock	0.12	0.02
22	Quarry - Abandoned	0.67	0.10
23	Cultivable Waste Land	2.70	0.42
24	Waterbody	2.01	0.31
Total		638.13	100.00

Geology

The major geological unit in the watershed consists of Charnockite group of rocks extending over an area of 570.55 ha (89.41%). Khondalite group of rocks (65.57 ha) also exists in the watershed. The details of geological units with spatial extent in the watershed are given in the table.

Sl. No.	Particulars	Area(ha)
1	Charnockite	570.55
2	Khondalite	65.57
3	Waterbodies	2.10
Total		638.13

Geomorphology

There are three geomorphological units mapped in the watershed area of which 446.83 ha (85.18%) area falls under the category lower plateau (lateritic). An area of 129.77 ha (11.85 %) is mapped under valley fill. The details of geomorphological units in the watershed area with spatial extent are given in the table.

Sl. No.	Particulars	Area(ha)
1.	Valley fill	129.77
2.	Lower Plateau	466.83
3.	Residual mount	39.52
4.	Waterbodies	2.10
Total		638.13

Soils

The major soil series mapped in the watershed area is Thiruvanchoor series having a solum thickness of more than 150 cm with very dark brown to pale brown colour. The soil is very strongly acid and has a surface texture of gravelly sandy clay loam to gravelly sandy clay. This is distributed in an area of 292.51 ha (45.84 %). An area of 177.28 ha is mapped under Kalimala series which is fine textured and acidic in nature. Soils in more than half of the watershed area (355.18 ha, 55.10 % of TGA) is having very deep soils with a depth of more than 150 cm and 41.75 % of the area (266.39 ha) is having deep soils with a depth of 100- 150 cm. The major surface soil textures in the watershed area constitutes that of clay loam (469.79 ha) and gravelly clay loam (89.11 ha). Nearly 50 % of the watershed area is having slight erosion and nearly 25 % is having moderate to

severe soil erosion which calls for proper soil and water conservation measures in the area.

Capacity Building/Trainings

Extensive training programmes and user interaction meetings were organized for the stake holders as part of the preparation of detailed project report. The details are given below:

No.	Training	Participants
1.	Block level awareness training	Elected representatives of three tier
2.	Block level orientation training	Elected representatives and ADS chairpersons
3.	Training on Base line survey	Two facilitators from NHG.
4.	Training on Drainage line treatment	Elected representatives and one facilitator from NHG.
5.	Focus Group Discussion	Elected representatives, Presidents and Secretaries of the NHGs, ADS chairpersons and MGNREGS labour groups and progressive farmers
6.	Entry point activity finalization	Elected representatives, Vice Presidents and Joint Secretaries from NHG, ADS chairpersons and MGNREGS labour groups.

Watershed Committee

Watershed Committee is constituted by Gram Sabha to implement the watershed project with technical support of WDT in the panchayat. Watershed committees are formed following the parameters of watershed committee, keeping the gender sensitive issues intact. Watershed committee members are briefed about the project objectives and a workshop is also conducted in this regard at every panchayat. The watershed committee has a pivotal role to play during and after the project implementation period.

The details of the Watershed Committee for Maalam watershed is given below:

Table No. 15.6 Details of the Watershed Committee for Maalam watershed

Sl. No.	Name	Phone number
1	Sri. Babu.K.Kora (Panchayath President)	9447227489
2	Sri.Bishnu Maya (VEO)	9895239593
3	Sri.T.V.Narayana Sharma (member, ward No.4)	9562356959
4	Smt.Lizy Babichan (member, ward No.9)	9745461160
5	Smt.Giji Manarkad (member ,ward No.8)	9447286735
6	Sri.Sacharia Kurian(member,wardNo.10)	9447082915
7	Sri.Job Kuriyakose (member,ward No.3)	9447785173

8	Smt.Suja Kuriyakose(Member, Ward No.11)	9495234017
9	Smt.Selin.V.Joseph (Member, Ward No: 12)	9495992858
10	Smt.Susi Thomas(Member, Ward No:16)	9495313967
11	Sri.George Thommi(Member, Ward No:17)	9446964843
12	Smt.Saali Kuruvila (SHG member, Ward No: 4)	8182519951
13	Sri.Mathew Mani (SHG member, Ward No: 9)	9447857556
14	Sri.T.J.Nanu (SHG member, Ward No: 10)	0481-2379308
15	Sri.Sabu Maylakadan (SHG member, Ward No: 3)	9447269526
16	Smt.Thankamma Mathew(SHG Member, Ward No:11)	9249226441
17	Sri.Sajimon.K(SHG Member, Ward No:12)	9847560860
18	Sri.SannyThekekuttu(SHG Member, Ward No:16)	
19	Sri.Saju Muppathiyil(SHG Members, Ward No:17)	944124812
20	K.V.Kuriakose (User group Representative,Ward No.)	9747318929
21	Smt. Indhu.K.Thomas (WDT member)	
22	Smt.Rajamma Suresh(SC Representative, Ward No:)	
23	Sri.Usha.S.Nair(Lady representative, Ward No:)	9048419207
24	Smt.Raichal Abraham(Lady representative, Ward No:)	9947357069
25	Smt.Saramma(Landless Representative, Ward No:)	

Neighbour hood Groups

Neighbour hood Groups are constituted in the watershed area combining 40 to 50 adjacent households which are living in a cluster. These are further subdivided into seven sub groups and one person from each subgroup is selected to the Neighbour hood Group Committee. These seven members formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is women. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. These Committees are registered with the concerned Grama Panchayat. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

The details of the NHG Committees in Maalam watershed is as follows:

Table No. 15.7- Details ofNHG Committees in Maalam watershed

Sl. No.	Panchayat	Ward	NHG No.
1	Manarcad	Ward 04	7
2	Manarcad	Ward 08	8
3	Manarcad	Ward 09	7
4	Manarcad	Ward 03	9
5	Manarcad	Ward 11(part)	2
6	Manarcad	Ward 12(part)	1
7	Manarcad	Ward 16(part)	1
8	Manarcad	Ward 17(part)	4

9	Pampady	Ward 01(part)	6
10	Pampady	Ward 02(part)	12

Self Help Groups

In addition to this, the existing Self Help Groups formed under the Kudumbasree Mission and other SHGs which are performing at a satisfactory level will be promoted to take various programmes under the Livelihood activities and Production Systems and Micro enterprises. If required, additional SHGs will also be formed in the watershed area in the coming years.

Activities proposed

Based on the series of discussions held with the different stakeholders the following activities are suggested for the micro watershed.

Manarkad Grama Panchayat

Desiltation of thodu

Sl.No.	Name of Thodu
1	Muthirakunnelpadi
2	Thembraval Elamkulathupadi
3	Palamuri Edakode thodu
4	Kakarivelilthodu
5	Vellur thodu
6	Thuruthipadi Varupuzhathodu
7	Kulathupurathu thodu

Embankment Protection of thodu

Sl.No.	Name of Thodu
1.	Muthirakunnelpadi
2.	Thembraval Elamkulathupadi
3.	Palamuri Edakodethodu
4.	Kizhakedathupadi Kavumpadi thodu
5.	Vellur thodu
6.	Thuruthipadi Varupuzhathodu
7.	Kulathupurathu thodu

Desiltation of Pond

Sl.No.	Name of Pond	Survey No.
1	Perumannor Pond	297
2	Thuruthipadi Pond	106

Public Well Cleaning

Sl.No.	Public Well	Survey No.
1	Public Well	297

Other NRM works

No.	Activity	Location
1.	New Well	Survey no. 169, 179, 175, 397, 403, 402, 396, 397, 398, 388, 363, 392, 148, 147, 166, 164, 158, 162, 157, 149, 137, 288, 286, 374, 293, 373, 336, 291, 333, 332, 331, 337, 349, 350, 354, 352, 563, 573, 570, 257, 244, 233, 241, 262, 258, 380, 487, 489, 482 550
2.	Well recharging	Survey no. 168, 171, 170, 97, 180, 177, 100, , 99, 114, 119, 111, 132, 104, 129, 98, 113, 124, 403, 402, 396, 406, 397, 388, 379, 393, 363, 387, 137, 138, 143, 252, 153, 158, 162, 161, 162, 164, 156, 291, 295, 300, 299, 298, 302, 295, 336, 308, 303, 325, 329, 324, 549, 558, 235, 500, 483, 243, 549, 550, 500, 233, 257, 487
3.	Water tank	Survey no. 308
4.	Earthen bund	Survey no. 550, 549, 558, 557, 257, 267, 291, 295, 300, 286, 287, 289, 277, 372, 371, 377, 376, 378, 381, 382, 383, 386, 392, 391, 393
5.	Stone pitched bunding	140, 165, 164, 163, 161, 160, 159, 141, 137, 138, 139, 166, 98, 199, 171, 172, 398, 395, 397, 405, 379, 380, 362, 363, 335, 373, 334, 353, 352, 350, 351, 338, 339, 303, 308, 328

Pampady Grama Panchayath**Other NRM works**

No.	Activity	Location
1.	Well recharging	Survey no. 59, 58, 51, 56, 45, 42, 46, 55, 36, 33, 32, 39, 33, 37, 24
2.	Rainpits	Survey no.59, 58, 51, 56, 45, 42, 46, 55, 36, 33, 32, 39, 33, 37, 24

Budget

The distribution of budget for Maalam micro watershed for the various components as per IWMP guidelines is given below:

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	7,48,440
2.	Monitoring	1	74,844
3.	Evaluation	1	74,844
Preparatory phase			
4.	Entry point activities	4	2,99,376
5.	Institution and capacity building	5	3,74,220
6.	Detailed Project Report	1	74,844
Watershed works phase			
7.	Natural Resources Conservation	56	41,91,264

	works		
8.	Livelihood activities for asset less	9	6,73,596
9.	Production system and micro enterprises	10	7,48,440
10.	Consolidation phase	3	2,24,532
	Total	100	74,84,400

Maalam Watershed (12M38d) - Action Plan

Table No. 15.10.1 -Sector-I- Natural Resources Conservation and Management - 1st Year Plan

No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable grow bags	no.	1200	75	90000		9000	90000
2	Earthen bunds	rm	27	2000		54000		54000
3	Live fencing	rm	24.5	2500		61250		61250
4	Centripetal terracing with mulching	no.	46	300		13800		13800
5	Desiltation of drains	10m3	485.85	500		242925		242925
6	Cleaning of public well	no.	20000	2	40000		4000	40000
7	Well recharging	no.	5500	20	110000		11000	110000
8	Construction of new well	no.	30000	2	60000		6000	60000
					300000	371975	30000	671975
No.	Pampady Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Strengthening of earthen bunds	rm	27	1500		40500		40500
2	Live fencing	rm	24.5	2000		49000		49000
3	Centripetal terracing with mulching	no.	46	200		9200		9200
4	Construction of new well	no.	30000	2	60000		6000	60000
5	Moisture Collection Pits	no.	30	50		1500		1500
					60000	100200	6000	160200

Maalam Watershed (12M38d) - Action Plan

Table No. 15.10.2 -Sector-I- Natural Resources Conservation and Management –IInd Year Plan

No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Tuber cultivation	10 cent	5500	2	11000		1100	11000
2	Crop demonstration in vegetables	25 cent	7500	3	22500		2250	22500
3	Vegetable grow bags	no.	1200	75	90000		9000	90000
4	INM in coconut	ha	3100	2	6200		620	6200
5	Strip terracing	m	101	500		50500		50500
6	Earthen bunds	rm	27	4000		108000		108000
7	Live fencing	rm	24.5	2500		61250		61250
8	Centripetal terracing with mulching	no.	46	300		13800		13800
9	Stone pitched contour bunding	m2	143.52	950	136344		13634	136344
10	Sidewall protection of drains (engineering)	m2	2400	750	720000	1080000	72000	1800000
11	Desiltation of drains	10m3	485.85	750		364388		364387.5
12	Well recharging	no.	5500	40	220000		22000	220000
13	Construction of new well	no.	30000	6	180000		18000	180000
14	Construction of pond	no.	332867	1		332867		332867
15	Pipe compost	no.	900	50	6750	38250	675	45000
					1392794	2049055	139279	3441849
No.	Pampady Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable cultivation (non-pandal)	25 cent	7500	2	15000		1500	15000
2	Vegetable cultivation (pandal)	25 cent	15000	2	30000		3000	30000
3	Crop demonstration in pineapple	20 cent	4000	1	4000		400	4000
4	Strengthening of earthen bunds	rm	27	1500		40500		40500

5	Live fencing	rm	24.5	2000		49000		49000
6	Centripetal terracing with mulching	no.	46	200		9200		9200
7	Stone pitched contour bunding	m2	143.52	400	57408		5741	57408
8	Brush wood bunding	m	548	500		274000		274000
9	Desiltation of ponds	10m3	649	250		162250		162250
10	Construction of new well	no.	30000	2	60000		6000	60000
11	Well recharging	no.	5500	5	27500		2750	27500
12	Moisture Collection Pits	no.	30	100		3000		3000
13	Pipe compost	no.	900	15	2025	11475	202	13500
					195933	549425	19593	745358

Maalam Watershed (12M38d) - Action Plan

Table No. 15.10.3 -Sector-I- Natural Resources Conservation and Management –IIIrdYear Plan

No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Tuber cultivation	10 cent	5500	3	16500		1650	16500
2	Crop demonstration in vegetables	25 cent	7500	3	22500		2250	22500
3	Strip terracing	m	101	500		50500		50500
4	Earthern bunds	rm	27	4000		108000		108000
5	Live fencing	rm	25	2500		61250		61250
6	Stone pitched contour bunding	m2	144	950	136344		13634	136344
7	Sidewall protection of drains (engineering)	m2	2400	750	720000	1080000	72000	1800000
8	Desiltation of drains	10m3	486	750		364388		364388
9	Well recharging	no.	5500	30	165000		16500	165000
10	Construction of new well	no.	30000	6	180000		18000	180000
11	Pipe compost	no.	900	50	6750	38250	675	45000
					1247094	1702388	124709	2949482

No.	Pampady Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable cultivation (non-pandal)	25 cent	7500	2	15000		1500	15000
2	Vegetable cultivation (pandal)	25 cent	15000	3	45000		4500	45000
3	Crop demonstration in pineapple	20 cent	4000	2	8000		800	8000
4	Live fencing	rm	25	2000		49000		49000
5	Stone pitched contour bunding	m2	144	600	86112		8611	86112
6	Brush wood bunding	m	548	500		274000		274000
7	Well recharging	no.	5500	5	27500		2750	27500
8	Pipe compost	no.	900	15	2025	11475	203	13500
					183637	334475	18364	518112

Maalam Watershed (12M38d) - Action Plan

Table No. 15.10.4 -Sector-I- Natural Resources Conservation and Management –IVth Year Plan

No.	Manarkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Crop demonstration in vegetables	25 cent	7500	3	22500	22500	2250	45000
2	Strip terracing	m	101	500		50500		50500
3	Stone pitched contour bunding	m2	143.52	400	57408		5740.8	57408
4	Sidewall protection of drains (engineering)	m2	2400	500	480000	720000	48000	1200000
5	Construction of new well	no.	30000	6	180000		18000	180000
					739908	793000	73991	1532908
No.	Pampady Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Stone pitched contour bunding	m2	143.52	500	71760		7176	71760
					71760	0	7176	71760

Maalam Watershed (12M38d) - Action Plan

Table No. 15.11.1 -Sector-II- Livelihood Support system for landless/ assetless - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
A							
Enterprising individuals (10 %)							
Manarkad							
1	Malabari Goat rearing	No.	10500	7	49000	24500	73500
2	Backyard Poultry	No.	1500	8	6000	6000	12000
Pampady							
1	Malabari Goat rearing	No.	10500	1	7000	3500	10500
2	Backyard Poultry	No.	1500	6	4500	4500	9000
Total					66500	38500	105000

Maalam Watershed (12M38d) - Action Plan

Table No. 15.11.2 -Sector-II- Livelihood Support system for landless/ assetless- IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B							
Revolving fund to SHGs (60 %)							
Manarkad							
1	Vegetable Cultivation						
2	Bush Jasmine		25000	1	20000	5000	25000
3	Honey bee		20000	3	48000	12000	60000
4	Ornament making		15000	4	48000	12000	60000
5	Paper plate		10000	5	40000	10000	50000
6	Mushroom						

	Pampady						
1	Vegetable Cultivation						
2	Honey bee		20000	1	16000	4000	20000
3	Mushroom		15000	1	12000	3000	15000
	Total				184000	46000	230000

Maalam Watershed (12M38d) - Action Plan

Table No. 15.11.3 -Sector-II- Livelihood Support system for landless/ assetless- IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
	Manarkad						
1	Vegetable Cultivation						
2	Bush Jasmine		25000	2	40000	10000	50000
3	Honey bee		20000	3	48000	12000	60000
4	Ornament making		15000	4	48000	12000	60000
5	Paper plate		10000	5	40000	10000	50000
6	Mushroom						
	Pampady						
1	Vegetable Cultivation						
2	Honey bee		20000	1	16000	4000	20000
3	Mushroom		15000	2	24000	6000	30000
	Total				216000	54000	270000

Maalam Watershed (12M38d) - Action Plan

Table No. 15.11.4 -Sector-II- Livelihood Support system for landless/ assetless- IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
C	Major livelihood activities (30 %)						
	Manarkad						
1	Malabari Goat rearing	Nos.	105000	1	52500	52500	105000
2	Cow rearing	Nos.	22500	4	63000	63000	90000
3	Pisciculture	Nos.	84000	1	42000	42000	84000
	Pampady						
1	Rabbit rearing	Nos.	11200	6	33600	33600	67200
	Total				191100	191100	346200

Maalam Watershed (12M38d) - Action Plan

Table No. 15.12.1 -Sector-III- Production system and Microenterprises - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
	Manarkad							
1	Backyard Poultry	Nos.	1500	100	75000	75000	13500	150000
	Pampady							
1	Backyard Poultry	Nos.	1500	20	15000	15000	2700	30000
	Total			120	90000	90000	16200	180000

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

Maalam Watershed (12M38d) - Action Plan

Table No. 15.12.2 -Sector-III- Production system and Microenterprises –IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
Manarkad								
1	Ordinary Compost	Nos.	8000	15	75000	45000	13500	120000
2	Nendran Banana Cultivation	Nos.	34000	6	60000	144000	10800	204000
Pampady								
1	Ordinary Compost	Nos.	8000	2	10000	6000	1800	16000
2	Nendran Banana Cultivation	Nos.	34000	2	20000	48000	3600	68000
Total				25	165000	243000	29700	408000

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

Maalam Watershed (12M38d) - Action Plan

Table No. 15.12.3 -Sector-III- Production system and Microenterprises –IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
Manarkad								
1	Cow rearing	Nos.	35000	10	150000	200000	27000	350000
2	Nendran Banana Cultivation	Nos.	34000	6	60000	144000	10800	204000
Pampady								
1	Ordinary Compost	Nos.	8000	3	15000	9000	2700	24000
2	Cow rearing	Nos.	35000	2	30000	40000	5400	70000
Total				21	255000	393000	45900	648000

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

Maalam Watershed (12M38d) - Action Plan

Table No. 15.12.4 -Sector-III- Production system and Microenterprises –IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
	Manarkad							
1	Vermi Compost	Nos.	18000	20	200000	160000	36000	360000
	Pampady							
1	Nendran Banana Cultivation	Nos.	34000	2	20000	48000	3600	68000
	Total			22	220000	208000	39600	428000

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

MICRO WATERSHED BASED ACTION PLAN
NEDUMTHARAKKAVU MICRO WATERSHED (12M38f)

Nedumtharakkavu micro watershed is located along the southern banks of Meenthala River with a total treatable area of 343.65 ha (6.70 % of the IWMP cluster) This micro watershed is located in southern portion of the Vijayapuram GramaPanchayath covering parts of six wards. The Meenthala River flows through the northern boundary of the watershed. The total area of the micro watershed is 347.23 ha of which 343.65 ha is the total treatable area.

General Description

Name of micro watershed	: Nedumtharakkavu
Micro watershed code	: 12M38f
River basin	: Meenachil
District	: Kottayam
Block Panchayath	: Pallom
GramaPanchayath	: Vijayapuram
Villages	: Vijayapuram
Latitude	: 9 ^o 35'11.4" to 9 ^o 36'21.8" North
Longitude	: 76 ^o 32'49.8" to 76 ^o 34'11.1" East
Wards	: Vijayapuram Panchayat –15, 16, 17, 18 (full) and 5, 6 (part)
Total area	: 347.23 ha
Total Area	: 343.65 ha
% of area in the IWMP cluster	: 6.70 %

Methodology

In line with the guidelines of IWMP, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Training Coordinators were engaged at project level for organizing the series of trainings at Block and Grama Panchayat levels.
5. Overseers were engaged for taking field estimates of the proposed activities.

6. Induction training was given for the project staff on PRA techniques, concept of maps and Resource Mapping.
7. Printed posters, banners and notices for providing wide publicity regarding the programme.
8. Two block level seminars were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
9. This was followed by orientation seminars at GramaPanchayats.
10. Conducted transect walk with ward members and ADS.
11. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
12. NHGs were formed at grass root level comprising of 40 to 50 neighbouring households.
13. Panchayat Level Watershed Committees were convened at Grama Panchayats for finalizing the modalities of work.
14. Trainer's training for base line survey were conducted for two facilitators from each Neighbour Hood Group
15. Predefined questionnaire was prepared for data collection from each household.
16. A block level seminar was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented by concerned Grama Panchayat Presidents.
17. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map with the help of the facilitators selected from the NHGs.
18. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
19. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of NHGs and accordingly present land use map is prepared using different notions and symbols.
20. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
21. Panchayat Level Watershed Committees were convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
22. Trainer's training for taking people's estimates and consolidation of project proposals. This was organized at Grama Panchayat and NHG level. Elected

representatives, ADS Chairpersons, Officer bearers of NHGs, MGNREGS officials, etc. attended this training. The information gathered on soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalized. The livelihood action plan and the activities under production system were also consolidated.

23. The suggestions were split for four years and four separate annual plans were also prepared.
24. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
25. Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal terracing, earthen and stone pitched contour bunding, outerbund strengthening, water logging prevention, vegetative barriers etc.
 - Rain water harvesting activities like farm ponds, sil paulin tanks, check dams etc.
 - Enhancement of paddy cultivation through area expansion in cultivable paddy fallows.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Scientific waste management practices like vermi compost, biogas, pipe compost and solid waste management units.
 - Protection of water sources like streams, ponds, drains etc.
 - Crop improvement practices and crop demonstrations.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - Encouragement of self sufficiency in vegetable production through vegetable gardens and grow bags.
 - Encouraging natural regeneration including fodder cultivation.
 - Promotion of agro-forestry and horticulture
 - Capacity building and creation of a greater degree of awareness among the participants.
 - Encouraging people's participation with the involvement of NHGs.
 - Livelihood activities for asset less people
 - Production system and Micro enterprises

SWOT Analysis 12M38f					
Sl.No.	Area	Strengths	Weakness	Opportunities	Threats
1	Agriculture		17.8 hectare of paddy land converted for banana and other mixed crops. Lack of skilled labour for transplanting, harvesting paddy.	25.24 hectare cultivable fallow paddy land and lease farmers. One skilled labour group for mechanized farming.	Submerged fallow after clay mining.
2	Horticulture	47% of the total area of watershed under coconut based farming system with intercrops such as arecanut plantain, nutmeg tuber crops ginger turmeric and pepper.	Lack of skilled labour for plant protection, harvesting coconut, arecanut, staking nendran banana, insitu budding of nutmeg, tapping of rubber	Scope for area expansion for plantain varieties, rejuvenation of pepper. Skilled labour group for insitu budding nutmeg, plant protection, tapping, coconut climbing, totray method of raising vegetable seedling.	
3	Animal Husbandry	Cattle rearing as major lively hood by many small and marginal farmers. Backyard poultry taken up as subsistent farming by majority of inhabitants.	Lack of availability of fodder. Lack of sufficient infrastructure for rearing cattle in a scientific manner	Cattle rearing major lively hood by many women. Scope for increasing backyard poultry as part of production system. Scope for cultivation of fodder as	Cattle rearing cannot be taken up as group enterprise due to lack of sufficient space for construction of the shed.

		Accessibility to milk collection centres		intercrop in coconut garden and common lands.	
4	Natural Resources	66% of area of watershed lie below 20m MSL and belongs to the category of geomorphology lower plateau where the slope is gentle and soil is deep and texture is clayey.	30% of area of watershed, the topography is undulating and slope moderate. Subject to erosion hazards. In the valley portion, breach of bunds, flooding	Area treatment with suitable soil and water conservation measures such as contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting measures such as staggered trenches and pits. Embankment protection of river by vegetative measures. As part of drainage line treatment, strengthening of field bunds (VARAMBU). Stream bank protection of thodu, desiltation and restoration of field channels.	Sand mining from river adversely affecting the water table and water quality. Clay mining from fertile paddy field has left paddy field as uncultivable waste land impairing the natural drainage and increasing the chance of flooding.

Biophysical Resources

Relief

The relief of the watershed ranges from MSL up to 80 m above MSL. Majority of the watershed area falls in the relief category of 0 – 20 m above MSL which covers an area of 231.06 ha (66.54 %). An area of 86.92 ha is located 20 - 40 m above MSL. The details of the relief with spatial extent in the micro watershed area are given in the table.

Sl. No.	Relief(m)	Area(ha)
1	0-20 m above MSL	231.06
2	20-40 m above MSL	86.92
3	40-60 m above MSL	17.55
4	60-80 m above MSL	11.70
	Total	347.23

Slope

The watershed area is divided into four categories of slope classes. The majority of area is under gently sloping areas having a slope percentage of 3 – 5. This category is spread over an area of 232.29 ha (66.87 %). The slope category viz. moderately steep to steep, having 15-35% slope spreads over an area of 64.11 ha (18.46 %). 35.88 ha area of watershed is having very steep slope. The details of the slope with spatial extent in the watershed are given in the table.

Sl. No.	Slope	Description	Area(ha)
1	0-3 percent	Very gentle slope	1.05
2	3-5 percent	Gentle slope	232.19
3	15-35 percent	Moderately steep to steep	64.11
4	> 35 percent	Very steep	35.88
5	Waterbodies	Waterbodies	14.00
		Total	347.23

Drains

Meenanthara Ar flows through the northern boundary of the watershed. The details of the drains and ponds in the watershed area are given in table.

Sl. No.	Name of Drain
1.	Njarakkal Karani thodu
2.	Parapuzha Nedumpuncha thodu
3.	Vattaveli poovelithodu
4.	KollakombuThodu
5.	Nedumtharakadavu thodu
6.	Chembola thodu

Ponds

Sl.No.	Name of Ponds
1.	Pallikunnu Pond
2.	Unnikunnukulam
3.	Chembolakulam
4.	Thekkumgal kulam

Landuse

Agriculture is one of the prime activities in the watershed area. The major landuse category mapped in the watershed area is mixed crops which are the typical homestead cultivation of Kerala where in the different horticultural crop species are grown together that cannot be spatially mapped separately. In this watershed mixed crops mainly includes coconut based farming intercropped with arecanut, banana and nutmeg along with other crop species. It occurs in an area of 163.95 Ha (47.22%). The second major category is plantation rubber. This is mapped in an area of 65.63 Ha (18.90%). An area of 17.88 ha of paddyland is converted to garden land to cultivable other horticulture crops. An area of 25.24 Ha is mapped as paddy - cultivable wasteland which can be brought to paddy cultivation by providing necessary labour and irrigation facilities. An area of 3.89 Ha is mapped as cultivable wasteland which can be brought under horticulture. The details of the landuse categories with spatial extent are given in table.

Sl.No.	Particulars	Area (ha)	Percentage
1	Built up Land	40.37	11.63
2	Paddy converted to Builtup land	7.08	2.04
3	Paddy converted to Arecanut	0.35	0.10
4	Paddy converted to Mixed crops	8.58	2.47
5	Paddy converted to Vegetables	1.87	0.54
6	Paddy - Cultivable Waste Land	25.24	7.27
7	Mixed crops	163.95	47.22
8	Mixed trees	9.72	2.80
9	Plantation Rubber	65.63	18.90
10	Road	3.02	0.87
11	Quarry - Sand	1.70	0.49
12	Cemetery	0.12	0.03
13	Cultivable Waste Land	3.89	1.12
14	Marshy land	1.53	0.44
15	Waste land	0.18	0.05
16	Waterbody	14.00	4.03
	Total	347.23	100.00

Geology

The major geological unit in the watershed is the Migmatite complex which spreads over an area of 201.80 ha (58.12 % of TGA). The remaining area is under the Charnockite group of rocks extending to an area of 131.43 ha. (37.85 % of TGA). The details of geology with spatial extent in the watershed are given in the table.

Sl. No.	Particulars	Area (Ha)
1	Charnockite	131.43
2	Migmatite	201.80
3	Water body	14.00
	Total	347.23

Geomorphology

There are three geomorphological units in the watershed area of which 218.22 ha (62.84%) area falls under the category lower plateau (lateritic). An area of 104.07 (29.97%) is mapped under valley fill. The details of geomorphology in the watershed area with spatial extent are given in the table.

Sl. No.	Particulars	Area (Ha)
1.	Valley fill	104.07
2.	Lower Plateau	218.22
3.	Residual mounts	10.94
4.	Water body	14.00
	Total	347.23

Soils

The major soil series mapped in the watershed area is Meenachil series having a solum thickness of more than 150 cm with very dark brown to pale brown colour. The soil is very strongly acid and has a surface texture of sandy clay loam to sandy clay. This is distributed in an area of 166.67 ha (48 %). The river bank area is mapped under this series which is alluvial in origin. Soils in more than half of the watershed area (68%) are very deep soils with a depth of more than 150 cm and 27.66 % of the area (96.05 ha) is having deep soils with a depth of 100-150 cm. The major surface soil textures in the watershed area constitutes that of sandy clay loam (166.67 ha) and clay loam (101.09 ha). Nearly 50 % of the watershed area is having slight erosion and 27.66 % of the micro watershed area is having moderate to severe soil erosion which calls for proper soil and water conservation measures in the area.

Capacity Building/Trainings

Extensive training programmes and user interaction meetings were organized for the stake holders as part of the preparation of detailed project report. The details are given below:

No.	Training	Participants
1.	Block level awareness training	Elected representatives of three tier
2.	Block level orientation training	Elected representatives and ADS chairpersons
3.	Training on Base line survey	Two facilitators from NHG.
4.	Training on Drainage line treatment	Elected representatives and one facilitator from NHG.
5.	Focus Group Discussion	Elected representatives, Presidents and Secretaries of the NHGs, ADS chairpersons and MGNREGS labour groups and progressive farmers
6.	Entry point activity finalization	Elected representatives, Vice Presidents and Joint Secretaries from NHG, ADS chairpersons and MGNREGS labour groups.

Watershed Committee

Watershed Committee is constituted by Grama Sabha to implement the watershed project with technical support of WDT in the panchayat. Watershed committees are formed following the parameters of watershed committee, keeping the gender sensitive issues intact. Watershed committee members are briefed about the project objectives and a workshop is also conducted in this regard at every panchayat. The watershed committee has a pivotal role to play during and after the project implementation period.

The details of the Watershed Committee for Nedumtharakkavu watershed is given below:

No.	Name	Phone number
1	Sri. Baiju Cherukottayil (Panchayath President) - Chairman	9495735235
2	Sri. Anoop (VEO) – Convener	9645316768
3	Sri. Vinod Vattaveli (member, ward No.15)	9995295040
4	Sri. Jacob John (member, ward No.16)	9947274399
5	Smt.Sisi Bobi (member ,ward No.17)	9447409576
6	Sri.Roy John Edayathara (member,wardNo.18)	9447721337
7	Smt. K.K.Padmakumari (member, ward No.5)	9400875297
8	Smt.Jaya Shaji (Member, ward No:6)	9446788691
9	Sri.K.V.Kuriachan (SHG member Ward No: 7)	9349503174
10	Sri.Reji Punnackal (SHG member, Ward No: 17)	9747489554
11	Sri.K.G.Presannan (SHG member , Ward No: 18)	
14	Sri.Somankutty (SHG Member, Ward No: 5)	8281636851

15	Smt.Santhamma Vasu (SHG Member Ward No: 16)	
16	Smt. Saali Joseph (SHG Member, Ward No: 6)	
17	Smt. Reena Jose (User group, Ward No: 15)	8086733775
18	Smt. Indhu.K.Thomas (WDT member)	
19	Smt. Sobhana Sivan (SC Representative)	
20	Smt.Ponnamma Raveendran (SC Representative)	9744170564
21	Smt.Suma Kuzhiyil (ST Representative)	
22	Smt.Bindu Kuzhiyil (ST Representative)	
21	Smt. Pushpavally Lal (Lady Representative, Ward No:)	9387686107
22	Smt.Ivi Iype (Lady Representative, Ward No:)	9605032219
23	Smt. Manju Rajesh (Landless Representative)	
24	Sri.Mani(Landless Representative)	8086733775

Neighbour hood Groups

Neighbour hood Groups are constituted in the watershed area combining 40 to 50 adjacent households which are living in a cluster. These are further subdivided into seven sub groups and one person from each subgroup is selected to the Neighbour hood Group Committee. These seven members formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is lady. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. These Committees are registered with the concerned Grama Panchayat. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

The details of the NHG Committees in Nedumtharakkavu watershed is as follows:

Sl. No.	Panchayat	Ward	NHG No.
1	Vijayapuram	Ward 15	8
2	Vijayapuram	Ward 16	6
3	Vijayapuram	Ward 17	10
4	Vijayapuram	Ward 18	7
5	Vijayapuram	Ward 05(part)	1
6	Vijayapuram	Ward 06(part)	4

Self Help Groups

In addition to this, the existing Self Help Groups formed under the Kudumbasree Mission and other SHGs which are performing at a satisfactory level, will be promoted to take various programmes under the Livelihood activities and Production Systems and

Micro enterprises. If required, additional SHGs will also be formed in the watershed area in the coming years.

Activities proposed

Based on the series of discussions held with the different stakeholders the following activities are suggested for the micro watershed.

Vijayapuram Grama Panchayat

Side Wall Protection

Sl. No.	Name of Thodu
1	Karani – Njarackal thodu
2	Kollakombu thodu

Desiltation of drains

Sl. No.	Name of Thodu
1	Karani – Njarackal thodu
2	Parapuzha Nedumpuncha thodu
3	Vattaveli Pooveli thodu
4	Kollakombu thodu

Desiltation of ponds

Sl. No.	Name of Pond	Survey No.
1	Unnikunnu Kulam	230
2.	Pallikunnu Kulam	264
3	Chembola Kulam	286
4	Thekkumkal Kulam	260

Side Varambu Earthening of pond

Sl.No.	Name of Pond
1	Kuttuvettikkal Kulam
2	Malathu Padasekhara Chira

Other NRM works

No.	Activity	Location
1.	New Pond	Survey no. 225, 249
2.	Rainwater harvesting struture	St. Mary's Njarakkal School
3.	Rainpits	Survey no. 211, 212, 213, 313, 317, 190, 191, 192, 193, 200, 199, 202, 217, 216, 223, 232, 233, 238, 243
4.	Medicinal Garden	ESI hospital
5.	Vegetable Garden	Survey no. 245, 252, 308, 278, 276, 333
6.	Centripetal terracing for coconut	Survey no. 259, 260, 294 , 295, 298, 286,

		287, 288, 205, 204, 203, 199, 198, 200, 193, 192, 191, 190, 217, 216, 223, 224, 232, 233, 237, 243, 238, 240, 241, 243, 250, 249, 248, 231, 267, 290, 268, 275, 273, 271, 282, 364, 280, 319
7.	Brush wood check dam	Survey no. 247
8.	Geo Textiles	sides of Parapuzha Nedumpuncha thodu, Maganam Padasekharam Bund
9.	Crop demonstration for vegetables	Survey no. 225, 226, 295, 230
10.	Outer bund strengthening of paddy field	Chembola kadath kadavu bund, Survey no. 229, 222, 234, 236
11.	Paddy Cultivation Extension	Both sides of Karani Njarakkal thodu, Survey No. 247, 242, 263, 229, 230, 244, 236, 234, 220, 221, 222
12.	Horticultural crops	Survey no. 217, 255, 257, 259, 270
13.	Planting Vetiver	Survey no. 246, 247, 263, 229, 230, 236, 222
14.	Bamboo seedlings	Survey no. 236, 245, 246, 188, 189, 186, 187, 104, 99, 271, 272, 69, 368
15.	Staggered trenches	Survey no. 282, 362, 191, 200, 203, 211, 273, 274, 515, 270, 267, 271, 275, 280
16.	Fodder grass	Survey no. 333, 275, 276, 277, 257, 269, 281, 271, 282, 251, 256, 260, 259, 269, 264, 262, 293, 291, 294, 297, 295, 284, 338
17.	Avenue trees	Survey no. 512, 308, 332, 334, 336, 337
18.	Terracing	Survey no. 294, 295, 297, 296, 293, 289, 281, 286, 298
19.	Pineapple cultivation	Survey no. 273, 255, 257, 269, 259, 268
20.	Renovation of water tank	ESI hospital
21.	Strip terracing	Survey no. 507, 510, 516, 251, 256, 260, 258, 269, 277, 293, 294, 295, 297, 284, 320, 364, 338, 361, 281, 516, 507, 510, 515, 516

Budget

The distribution of budget for Nedumtharakkavu micro watershed for the various components as per IWMP guidelines is given below:

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	4,12,380
2.	Monitoring	1	41,238

3.	Evaluation	1	41,238
Preparatory phase			
4.	Entry point activities	4	1,64,952
5.	Institution and capacity building	5	2,06,190
6.	Detailed Project Report	1	41,238
Watershed works phase			
7.	Natural Resources Conservation works	56	23,09,328
8.	Livelihood activities for asset less	9	3,71,142
9.	Production system and micro enterprises	10	4,12,380
10.	Consolidation phase	3	1,23,714
	Total	100	41,23,800

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.10.1 –Sector-I- Natural Resources Conservation and Management - 1st Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Medicinal garden in ESI hospital	5 cent	4279	1	4279		428	4279
2	Crop demonstration of vegetables	25 cent	7500	2	15000		1500	15000
3	Outer bund strengthening of paddy fields	300 m	437	1000		437000		437000
4	Extension of paddy cultivation	ha	63538	2	127076		12708	127076
5	Avenue tree planting	no.	160	500		80000		80000
6	Fodder cultivation	10 cent	5000	2		10000		10000
7	Centripetal terracing with mulching	no.	46	750		34500		34500
8	Live fencing	rm	24.5	1000		24500		24500
9	Strengthening of earthen bunds	rm	27	2000		54000		54000
10	Terracing	m	101	1500		151500		151500
11	Biogas plant(0.5m3)	no.	8500	20	42500	127500	4250	170000
12	Compost pits(3.6x1.5x0.9m)	no.	8000	50		400000		400000
					188855	1319000	18886	1507855

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.10.2 –Sector-I- Natural Resources Conservation and Management –IInd Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable garden	25 cent	7500	2	15000		1500	15000
2	Crop demonstration of vegetables	25 cent	7500	4	30000		3000	30000
3	Outer bund strengthening of paddy fields	300 m	437	1500		655500		655500
4	Extension of paddy cultivation	ha	63538	5	317690		31769	317690
5	Cultivation of horticultural crops	25 cent	7850	5	39250		3925	39250

6	Avenue tree planting	no.	160	1000		160000		160000
7	Pineapple cultivation	20 cent	4000	2	8000		800	8000
8	Fodder cultivation	10 cent	5000	4		20000		20000
9	Centripetal terracing with mulching	no.	46	750		34500		34500
10	Live fencing	rm	24.5	1000		24500		24500
11	Strengthening of earthen bunds	rm	27	5000		135000		135000
12	Terracing	m	101	2000		202000		202000
13	Sidewall protection of drains (engineering)	m2	2400	175	168000	252000	16800	420000
14	Desiltation of drains	10m3	485.85	1000		485850		485850
15	Brush wood check dam in sy no.226	no.	1645	1		1645		1645
16	Planting of bamboo seedlings	no.	34.65	1000		34650		34650
17	Desiltation of ponds	10m3	649	250		162250		162250
18	Side varambu earthening of ponds	10m3	2317	50		115850		115850
19	Construction of new pond	no.	45000	1		45000		45000
20	Moisture collection pits	no.	30	250		7500		7500
21	Well recharging	no.	5500	20	110000		11000	110000
22	Renovation of water tank in ESI Hospital	no.	200000	1	200000		20000	200000
23	Biogas plant(0.5m3)	no.	8500	30	63750	191250	6375	255000
24	Compost pits(3.6x1.5x0.9m)	no.	8000	50		400000		400000
					951690	2927495	95169	3879185

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.10.3 –Sector-I- Natural Resources Conservation and Management –IIIrdYear Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable garden	25 cent	7500	3	22500		2250	22500

2	Crop demonstration of vegetables	25 cent	7500	4	30000		3000	30000
3	Outer bund strengthening of paddy fields	300 m	437	1500		655500		655500
4	Extension of paddy cultivation	ha	63538	3	190614		19061	190614
5	Cultivation of horticultural crops	25 cent	7850	5	39250		3925	39250
6	Pineapple cultivation	20 cent	4000	3	12000		1200	12000
7	Fodder cultivation	10 cent	5000	4		20000		20000
8	Strengthening of earthen bunds	rm	27	5000		135000		135000
9	Terracing	m	101	2000		202000		202000
10	Sidewall protection of drains (engineering)	m2	2400	300	288000	432000	28800	720000
11	Desiltation of drains	10m3	485.85	1500		728775		728775
12	Geotextile protection	m2	191	100	19100		1910	19100
13	Vetiver planting	rm	35	500	17500		1750	17500
14	Planting of bamboo seedlings	no.	34.65	1000		34650		34650
15	Desiltation of ponds	10m3	649	250		162250		162250
16	Side varambu earthening of ponds	10m3	2317	50		115850		115850
17	Rain water harvesting structure in St.Mary's Njarackal School	no.	330000	1		330000		330000
18	Moisture collection pits	no.	30	250		7500		7500
19	Well recharging	no.	5500	40	220000		22000	220000
					838964	2823525	83896	3662489

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.10.4 –Sector-I- Natural Resources Conservation and Management –IVth Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Terracing	m	101	2000		202000		202000

2	Sidewall protection of drains (engineering)	m2	2400	200	192000	288000	19200	480000
3	Geo textile protection	m2	191	100	19100		1910	19100
4	Vettiver planting	rm	35	500	17500		1750	17500
5	Well recharging	no.	5500	20	110000		11000	110000
					338600	490000	33860	828600

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.11.1 –Sector-II- Livelihood Support system for landless/ assetless - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
A	Enterprising individuals (10 %)						
1	Malabari Goat rearing	No.	10500	5	35000	17500	52500
2	Backyard Poultry	No.	1500	4	3000	3000	6000
	Total				38000	20500	58500

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.11.2 –Sector-II- Livelihood Support system for landless/ assetless- IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation						
2	Bush Jasmine		25000	1	20000	5000	25000
3	Honey bee		20000	2	32000	8000	40000

4	Lease land nendran cultivation		15000	1	12000	3000	15000
5	Mushroom		10000	4	32000	8000	40000
Total					96000	24000	120000

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.11.3 –Sector-II- Livelihood Support system for landless/ assetless- IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation						
2	Bush Jasmine		25000	2	40000	10000	50000
3	Honey bee		20000	2	32000	8000	40000
4	Lease land nendran cultivation		15000	2	24000	6000	30000
5	Mushroom		10000	4	32000	8000	40000
Total					128000	32000	160000

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.11.4 –Sector-II- Livelihood Support system for landless/ assetless- IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
C	Major livelihood activities (30 %)						
1	Poultry farm	Nos.	280000	1	140000	140000	280000
Total					140000	140000	280000

Nedumtharakkavu Watershed (12M38f) - Action Plan**Table No. 16.12.1 –Sector-III- Production system and Microenterprises - Ist Year Plan**

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Backyard Poultry	Nos.	1500	75	56250	56250	10125	112500
	Total			75	56250	56250	10125	112500

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

Nedumtharakkavu Watershed (12M38f) - Action Plan**Table No. 16.12.2 –Sector-III- Production system and Microenterprises –IInd Year Plan**

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Ordinary Compost	Nos.	8000	20	100000	60000	18000	160000
2	Nendran Banana Cultivation	Nos.	34000	6	60000	144000	10800	204000
	Total			26	160000	204000	28800	364000

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

Nedumtharakkavu Watershed (12M38f) - Action Plan**Table No. 16.12.3 –Sector-III- Production system and Microenterprises –IIIrd Year Plan**

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Cow rearing	Nos.	35000	10	150000	200000	27000	350000
	Total			10	150000	200000	27000	350000

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

Nedumtharakkavu Watershed (12M38f) - Action Plan

Table No. 16.12.3 –Sector-III- Production system and Microenterprises –IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Vermi Compost	Nos.	18000	10	100000	80000	18000	180000
2	Nendran Banana Cultivation	Nos.	34000	6	60000	144000	10800	204000
	Total			16	160000	224000	28800	384000

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

MICRO WATERSHED BASED ACTION PLAN
MUNDAKAPADAM MICRO WATERSHED (12M39a)

Mundakapadam micro watershed is located along the eastern banks of Kodoor Ar with a total treatable area of 370.96 ha (7.20 % of the IWMP cluster). This micro watershed is located in western portion of the Vijayapuram GramaPanchayath covering parts of seven wards. The total project area comes to 432.40 ha of which 370.96 ha is the total treatable area.

General Description

Name of micro watershed	: Mundakapadam
Micro watershed code	: 12M39a
River basin	: Meenachil
District	: Kottayam
Block Panchayath	: Pallom
GramaPanchayath	: Vijayapuram
Villages	: Muttambalam , Vijayapuram
Latitude	: 9°33'33.3" to 9°35'28.1" North
Longitude	: 76°32'40.8" to 76°33' 57.2" East
Wards	: Vijayapuram 10,12,14 full 7,8,9,11,13 part
Total area	: 432.40 ha
Total treatable area	: 370.96 ha
% of area in the IWMP cluster	: 7.20 %

Methodology

In line with the guidelines of IWMP, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Training Coordinators were engaged at project level for organizing the series of trainings at Block and Grama Panchayat levels.
5. Overseers were engaged for taking field estimates of the proposed activities.
6. Induction training was given for the project staff on PRA techniques, concept of maps and Resource Mapping.

7. Printed posters, banners and notices for providing wide publicity regarding the programme.
8. Two block level seminars were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
9. This was followed by orientation seminars at GramaPanchayats.
10. Conducted transect walk with ward members and ADS.
11. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
12. NHGs were formed at grass root level comprising of 40 to 50 neighbouring households.
13. Panchayat Level Watershed Committees were convened at Grama Panchayats for finalizing the modalities of work.
14. Trainer's training for base line survey were conducted for two facilitators from each Neighbour Hood Group
15. Predefined questionnaire was prepared for data collection from each household.
16. A block level seminar was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented by concerned Grama Panchayat Presidents.
17. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map with the help of the facilitators selected from the NHGs.
18. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary & Soil Conservation Departments. Followed by technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
19. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of NHGs and accordingly present land use map is prepared using different notions and symbols.
20. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
21. Panchayat Level Watershed Committees were convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
22. Trainer's training for taking people's estimates and consolidation of project proposals. This was organized at Grama Panchayat and NHG level. Elected representatives, ADS Chairpersons, Officer bearers of NHGs, MGNREGS officials, etc. attended this training. The information gathered on soil and water

conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalized. The livelihood action plan and the activities under production system were also consolidated.

23. The suggestions were split for four years and four separate annual plans were also prepared.
24. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
25. Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal terracing, earthen and stone pitched contour bunding, outerbund strengthening, water logging prevention, vegetative barriers etc.
 - Rain water harvesting activities like farm ponds, sil paulin tanks, check dams etc.
 - Enhancement of paddy cultivation through area expansion in cultivable paddy fallows.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Scientific waste management practices like vermi compost, biogas, pipe compost and solid waste management units.
 - Protection of water sources like streams, ponds, drains etc.
 - Crop improvement practices and crop demonstrations.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - Encouragement of self sufficiency in vegetable production through vegetable gardens and grow bags.
 - Encouraging natural regeneration including fodder cultivation.
 - Promotion of agro-forestry and horticulture
 - Capacity building and creation of a greater degree of awareness among the participants.
 - Encouraging people's participation with the involvement of NHGs.
 - Livelihood activities for asset less people
 - Production system and Micro enterprises

SWOT Analysis 12M39a					
Sl.No.	Area	Strengths	Weakness	Opportunities	Threats
1	Agriculture		11.10 hectare of paddy land converted for banana and other mixed crops. Lack of skilled labour for transplanting and harvesting paddy.	80.12 hectare cultivable fallow paddy land and lease farmers. One skilled labour group for mechanized farming.	Uncultivable submerged fallow after clay mining.
2	Horticulture	54.17% of the total area of watershed under coconut based farming system with intercrops such as arecanut plantain, nutmeg tuber crops ginger turmeric and pepper.	Lack of skilled labour for plant protection, harvesting coconut, arecanut, staking nendran banana, insitu budding of nutmeg, tapping of rubber	Scope for area expansion for plantain varieties, rejuvenation of pepper. Skilled labour group for insitu budding nutmeg, plant protection, tapping, coconut climbing, totray method of raising vegetable seedling.	
3	Animal Husbandry	Cattle rearing as major lively hood by many small and marginal farmers. Backyard poultry taken up as subsistent farming by majority of inhabitants. Accessibility to milk	Lack of availability of fodder. Lack of sufficient infrastructure for rearing cattle in a scientific manner	Cattle rearing major lively hood by many women. Scope for increasing backyard poultry as part of production system. Scope for cultivation of fodder as intercrop in coconut garden and common lands.	Cattle rearing cannot be taken up as group enterprise due to lack of sufficient space for construction of the shed.

		collection centres			
4	Natural Resources	76% of area of watershed lie below 20m MSL and belongs to the category of geomorphology lower plateau where the slope is gentle and soil is deep and texture is clayey.	30% of area of watershed, the topography is undulating and slope moderate. Subject to erosion hazards. In the valley portion, breach of bunds, flooding	Area treatment with suitable soil and water conservation measures such as contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting measures such as staggered trenches and pits. Embankment protection of river by vegetative measures. As part of drainage line treatment, strengthening of field bunds (VARAMBU) Stream bank protection of thodu, desiltation and restoration of field channels.	Sand mining from river adversely affecting the water table and water quality. Clay mining from fertile paddy field has left of paddy field as uncultivable waste land impairing the natural drainage and increasing the chance of flooding.

Biophysical Resources

Relief

The relief of the watershed ranges from MSL up to 80 m above MSL. Majority of the watershed area falls in the relief category of 0–20m above MSL which covers an area of 329.99 ha (76.31 %). An area of 72.15 ha is lying in the range of 20 to 40 m above MSL. The details of the relief with spatial extent in the watershed area are given in the table.

Sl. No.	Relief(m)	Area(ha)
1	0-20 m above MSL	329.99
2	20-40 m above MSL	72.15
3	40-60 m above MSL	26.58
4	60-80 m above MSL	3.68
	Total	432.40

Slope

The watershed area is divided into three categories of slope classes. The majority of watershed area falls in nearly level to very gentle slope class of 0-3 percent. This category spreads over an area of 204.97 ha (47.40 %). An area of 115.18 ha (26.64 %) falls in moderately steep to steep slope class of 15 – 35 percent. The details of the slope with spatial extent in the watershed are given in the table below.

Sl. No.	Slope	Description	Area(ha)
1	0-3 percent	Very gentle slope	204.97
2	3-5 percent	Gentle slope	103.56
3	15-35 percent	Moderately steep to steep	115.18
4	Waterbodies	Waterbodies	8.69
	Total		432.40

Drains

Kodoor Ar flows through the western side and south western side of the watershed. The details of the drains and ponds in the watershed area are given in table.

Sl.No.	Name of Drain	Panchayat
1.	Enjikalathuruth palam thodu	Vijayapuram
2.	Kodoraruthodu	Vijayapuram
3.	Puthusserithodu	Vijayapuram
4.	Kanjikuzhi thodu	Vijayapuram
5.	Makroni thodu	Vijayapuram

Ponds

Sl.No.	Name of Ponds	Panchayat
1.	Manganam Bhagavathy temple pond	Vijayapuram
2.	Kolathuparambu kulam	Vijayapuram

Landuse

Agriculture is one of the prime activities in the watershed area. The major landuse category mapped in the watershed area is mixed crops which are the typical homestead cultivation of Kerala where in the different horticultural crop species are grown together that cannot be spatially mapped separately. In this watershed mixed crops mainly includes coconut based farming intercropped with arecanut, banana and nutmeg along with other crop species. It occurs in an area of 234.23Ha (54.17%). An area of 20.63 paddy land is converted to garden land to built up. An area of 80.12 Ha is mapped as cultivable wasteland which can be brought to paddy cultivation by providing necessary labour and other facilities. An area of 3.31 Ha is mapped as cultivable wasteland which can be brought under horticulture. The details of the landuse categories with spatial extent are given in table.

Sl. No.	Particulars	Area (ha)	Percentage (%)
1	Built up Land	27.81	6.43
2	Paddy converted to Builtup land	9.53	2.20
3	Paddy converted to Coconut	4.69	1.08
4	Paddy converted to Banana	0.42	0.10
5	Paddy converted to Mixed crops	5.99	1.39
6	Paddy - Cultivable Waste Land	80.12	18.53
7	Mixed crops	234.23	54.17
8	Mixed trees	0.47	0.11
9	Plantation Rubber	46.55	10.77
10	Plantation Cashew	0.60	0.14
11	Plantation Teak	1.06	0.25
12	Road	6.05	1.40
13	Quarry - Rock	0.25	0.06
14	Quarry - Clay	0.28	0.06
15	Quarry - Abandoned	0.76	0.18
16	Cemetery	0.13	0.03
17	Cultivable Waste Land	3.31	0.77
18	Marshy land	1.46	0.34
19	Waterbody	8.69	2.01
	Total	432.40	100.00

Geology

The major geological unit in the watershed consists of sand and silt extending to an area of 203.11 ha (46.97 %). Migmatite complex exists in an area of 146.81 ha (33.95 %). The remaining area of the micro watershed is under the charnockite group. The details of geology with spatial extent in the watershed are given in the table.

Sl. No.	Particulars	Area(ha)
1	Charnockite	73.79
2	Migmatite	146.81
3	Sand & Silt	203.11
4	Waterbodies	8.69
	Total	432.40

Geomorphology

There are two geomorphological units mapped in the watershed area of which 264.46 ha (61.12 %) area falls under the category lower plateau (lateritic). 159.25 Ha (36.80 %) is mapped under valley fill. The details of geomorphological units in the watershed area with spatial extent are given in the table.

Sl. No.	Particulars	Area(ha)
1	Valley fill	159.25
2	Lower Plateau	264.46
3	Water body	8.69
	Total	432.40

Soils

The major soil series mapped in the watershed area is Meenachil series having a solum thickness of more than 150 cm with very dark brown to pale brown colour. The soil is very strongly acid and has a surface texture of sandy clay loam to sandy clay. This is distributed in an area of 118.80 ha (27.47 %). The river bank area is mapped under this series which is alluvial in origin. An area of 102.13 ha is mapped under Kollad series. Soils in more than half of the watershed area (71.25 %) are very deep soils with a depth of more than 150 cm and 16.74 % of the watershed area (115.61 ha) is having deep soils with a depth of 100-150 cm. The major surface soil textures in the watershed area constitutes that of clay loam (169.04 ha) and sandy clay loam (118.80 ha). Nearly 50 % of the watershed area is having moderate erosion and 26.72 % of the TGA is prone to severe soil erosion which calls for proper soil and water conservation measures in the area.

Capacity Building/Trainings

Extensive training programmes and user interaction meetings were organized for the stake holders as part of the preparation of detailed project report. The details are given below:

No.	Training	Participants
1.	Block level awareness training	Elected representatives of three tier
2.	Block level orientation training	Elected representatives and ADS chairpersons
3.	Training on Base line survey	Two facilitators from NHG.

4.	Training on Drainage line treatment	Elected representatives and one facilitator from NHG.
5.	Focus Group Discussion	Elected representatives, Presidents and Secretaries of the NHGs, ADS chairpersons and MGNREGS labour groups and progressive farmers
6.	Entry point activity finalization	Elected representatives, Vice Presidents and Joint Secretaries from NHG, ADS chairpersons and MGNREGS labour groups.

Watershed Committee

Watershed Committee is constituted by Grama Sabha to implement the watershed project with technical support of WDT in the panchayat. Watershed committees are formed following the parameters of watershed committee, keeping the gender sensitive issues intact. Watershed committee members are briefed about the project objectives and a workshop is also conducted in this regard at every panchayat. The watershed committee has a pivotal role to play during and after the project implementation period.

The details of the Watershed Committee for Mundakapadam watershed is given below:

Sl. No.	Name	Ph. number
1	Sri. Baiju Cherukottayil (Panchayath President) - chairman	9495735235
2	Sri. Anoop (VEO) – Convener	9645316768
3	Smt. Sathi Devi (member, ward No.10)	9961641080
4	Sri. Mathai Thomas (member, ward No.12)	9446320268
5	Sri. Vinod P. Kurian (member ,ward No.14)	9526703706
6	Smt. Saramma Thomas (member,wardNo.7)	9447114713
7	Smt. Jessy John (member, ward No.8)	9495670293
8	Sri. Baiju Cherukottayil (Member, ward No:9)	9495735235
9	Smt. V.R. Somini (Member, Ward No: 11)	9447095415
10	Sri. N. Jeevakumar (Member, Ward No: 13)	9447041764
11	Smt. Jayasree Omanakuttan (SHG member Ward No: 10)	9496801316
12	Smt. Saramma Antony (SHG member, Ward No: 12)	9249222740
13	Smt. Indira Jaichal (SHG member , Ward No: 14)	
14	Smt. Mini Vinod (SHG Member, Ward No: 7)	9497667804
15	Smt. Elsamma Joy (SHG Member Ward No: 8)	7736602880
16	Smt. Shyni Surendran (SHG Member, Ward No: 11)	9961032267
17	Smt. Udayamma Lalu (SHG Member, Ward No: 13)	
18	Smt. Indhu.K.Thomas (WDT member)	

19	Smt. Sheeba (SC Representative)	9526718739
20	Smt. Saramma Kurian (Lady Representative)	9495108146
21	Smt. Rafi Afsal (Lady Representative, Ward No: 7)	
22	Sri. Vijayan (Landless Representative)	9249338282

Neighbour hood Groups

Neighbour hood Groups are constituted in the watershed area combining 40 to 50 adjacent households which are living in a cluster. These are further subdivided into seven sub groups and one person from each subgroup is selected to the Neighbour hood Group Committee. These seven members formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is lady. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. These Committees are registered with the concerned Grama Panchayat. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

The details of the NHG Committees in Mundakapadam watershed is as follows:

Table No. 17.7 -Details of the NHG Committees in Mundakapadam watershed

Sl. No.	Panchayat	Ward	NHG No.
1	Vijayapuram	Ward 10	9
2	Vijayapuram	Ward 12	10
3	Vijayapuram	Ward 14	7
4	Vijayapuram	Ward 07	1
5	Vijayapuram	Ward 08	2
6	Vijayapuram	Ward 09	1
7	Vijayapuram	Ward 11	9
8	Vijayapuram	Ward 13	5

Self Help Groups

In addition to this, the existing Self Help Groups formed under the Kudumbasree Mission and other SHGs which are performing at a satisfactory level, will be promoted to take various programmes under the Livelihood activities and Production Systems and Micro enterprises. If required, additional SHGs will also be formed in the watershed area in the coming years.

Activities proposed

Based on the series of discussions held with the different stakeholders the following activities are suggested for the micro watershed.

Vijayapuram Panchayat**Side Wall Protection**

Sl. No.	Name of Thodu
1	Enchikala thuruth palam - Kodurar thodu
2	Puthussery thodu
3	Kanjikuzhi thodu
4	Macroni thodu
5	Kodurar

Desiltation of drains

Sl. No.	Name of Thodu
1	Enchikala thuruth palam - Kodurar thodu
2	Puthussery thodu
3	Kanjikuzhi thodu
4	Macroni thodu
5	Kodoraru
6	Vadekkenadapalm thodu

Desiltation of ponds

Sl. No.	Name of Pond	Survey No.
1	Ward 10- Manganam Bhagavathi Kavu	110
2	Ward 7 – Kolathu parambu kulam	49

Side Varambu Earthening of pond

Sl. No.	Name of Pond	Survey No.
1	Ward 10 – Manganam Bhagavathi Kavu	110
2	Ward 7 – Kolathu parambu Kulam	49

Other NRM works

No	Activity	Location
2	Rainwater harvesting structure	Churavelikunnu
3	Rainpits	Survey no. 88 ,118., 186, 242, 48, 239, 51, 139, 134, 132, 121, 131, 194, 78, 79, 53, 52, 29, 47, 42, 33, 39
4	Vegetable Garden	Mar Bacelious Public School
5	Centripetal terracing for coconut	Survey no. 132, 121, 134, 186, 58, 205, 193, 4, 10, 9, 14, 15, 16, 17, 20, 29, 30, 33, 42, 47
6	New Well	Ward 10 – Manganam NSS , Ward 14 – Survey no. 11
9	Cleaning of public well	Churavelikunnu
11	Avenue trees	Survey no. 179, 137, 136,135, 133, 120, 119, 86, 85, 84, 2, 5, 36, 37, 38, 43, 44, 45, 245
15	Bamboo seedlings	Survey no. 98, 99, 106, 125, 126, 127, 140, 141, 153, 155, 154

16	Bund strengthening	Survey no. 100, 99, 98, 97, 96, 95, 93, 92, 91, 90, 115, 106, 123, 124, 125, 126, 127
20	Brush wood check dam	Survey no. 201, 71, 23, 75
23	Strip terracing	Survey no. 243, 240, 231, 49, 61, 68, 48, 238, 239, 234, 233, 228, 55, 68, 61, 69, 208, 209, 210, 205, 203, 214, 215, 216

Budget

The distribution of budget for Mundakapadam micro watershed for the various components as per IWMP guidelines is given below:

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	4,45,152
2.	Monitoring	1	44,515
3.	Evaluation	1	44,515
Preparatory phase			
4.	Entry point activities	4	1,78,060
5.	Institution and capacity building	5	2,22,576
6.	Detailed Project Report	1	44,515
Watershed works phase			
7.	Natural Resources Conservation works	56	24,92,851
8.	Livelihood activities for asset less	9	4,00,636
9.	Production system and micro enterprises	10	44,515
10.	Consolidation phase	3	1,33,545
	Total	100	44,51,520

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.10.1 –Sector-I- Natural Resources Conservation and Management - 1st Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Avenue tree planting	no.	160	500		80000		80000
2	Crop demonstration of vegetables	25 cent	7500	2	15000		1500	15000
3	Cultivation of fodder grass	10 cent	5000	2	10000		1000	10000
4	Cultivation of horticultural crops	25 cent	7850	2	15700		1570	15700
5	Centripetal terracing for coconut	no.	46	1000		46000		46000
6	Strip terracing	m	101	1000		101000		101000
7	Strengthening of earthen bunds	rm	27	2000		54000		54000
8	Desiltation of drains	10m3	485.85	500		242925		242925
9	Desiltation of ponds	10m3	649	250		162250		162250
10	Well recharging	no.	5500	20	110000		11000	110000
11	Renovation of public well in Churavelikunnu	no.	20000	1	20000		2000	20000
12	Construction of new well	no.	30000	2	60000		6000	60000
					230700	686175	23070	916875

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.10.2 –Sector-I- Natural Resources Conservation and Management –IInd Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable garden	25 cent	7500	2	15000		1500	15000
2	Avenue tree planting	no.	160	500		80000		80000
3	Crop demonstration of vegetables	25 cent	7500	3	22500		2250	22500
4	Cultivation of fodder grass	10 cent	5000	4	20000		2000	20000

5	Cultivation of horticultural crops	25 cent	7850	4	31400		3140	31400
6	Intercropping in coconut gardens	10 cent	5500	2	11000		1100	11000
7	Centripetal terracing for coconut	no.	46	1500		69000		69000
8	Strip terracing	m	101	2000		202000		202000
9	Strengthening of earthen bunds	rm	27	4000		108000		108000
10	Side wall protection of drains (engineering)	m2	2400	250	240000	360000	24000	600000
11	Desiltation of drains	10m3	485.85	1000		485850		485850
12	Geo textile protection	m2	191	200	38200		3820	38200
13	Planting of bamboo seedlings	no.	34.65	1000		34650		34650
14	Brush wood check dam	no.	1645	2	3290		329	3290
15	Vettiver planting	rm	35	500	17500		1750	17500
16	Desiltation of ponds	10m3	649	500		324500		324500
17	Side varambu earthening of ponds	10m3	2317	250		579250		579250
18	Rain water harvesting structure in Churavilakkunnu	no.	330000	1	330000		33000	330000
19	Moisture Collection Pits	no.	30	300		9000		9000
20	Well recharging	no.	5500	20	110000		11000	110000
21	Construction of new well	no.	30000	2	60000		6000	60000
22	Biogas plant (0.5m3)	m3	8500	25	53125	159375	5313	212500
23	Compost pits (3.6x1.5x0.9m)	no.	8000	25		200000		200000
					952015	2611625	95202	3563640

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.10.3 –Sector-I- Natural Resources Conservation and Management –IIIrdYear Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable garden	25 cent	7500	3	22500		2250	22500
2	Cultivation of fodder grass	10 cent	5000	4	20000		2000	20000
3	Cultivation of horticultural crops	25 cent	7850	4	31400		3140	31400
4	Intercropping in coconut gardens	10 cent	5500	4	22000		2200	22000
5	Strip terracing	m	101	2000		202000		202000
6	Strengthening of earthen bunds	rm	27	4000		108000		108000
7	Side wall protection of drains (engineering)	m2	2400	400	384000	576000	38400	960000
8	Desiltation of drains	10m3	485.85	1000		485850		485850
9	Geo textile protection	m2	191	300	57300		5730	57300
10	Planting of bamboo seedlings	no.	34.65	1000		34650		34650
11	Brush wood check dam	no.	1645	2	3290		329	3290
12	Vettiver planting	rm	35	500	17500		1750	17500
13	Desiltation of ponds	10m3	649	250		162250		162250
14	Side varambu earthening of ponds	10m3	2317	250		579250		579250
15	Construction of new pond	no.	332867	1		332867		332867
16	Moisture Collection Pits	no.	30	300		9000		9000
17	Well recharging	no.	5500	40	220000		22000	220000
18	Construction of new well	no.	30000	2	60000		6000	60000
19	Biogas plant (0.5m3)	m3	8500	25	53125	159375	5313	212500
20	Compost pits (3.6x1.5x0.9m)	no.	8000	50		400000		400000
					891115	3049242	89112	3940357

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.10.4 –Sector-I- Natural Resources Conservation and Management –IVth Year Plan

No.	Vijayapuram Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Intercropping in coconut gardens	10 cent	5500	4	22000		2200	22000
2	Side wall protection of drains (engineering)	m2	2400	300	288000	432000	28800	720000
3	Moisture Collection Pits	no.	30	300		9000		9000
4	Well recharging	no.	5500	20	110000		11000	110000
5	Compost pits (3.6x1.5x0.9m)	no.	8000	25		200000		200000
					420000	641000	42000	1061000

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.11.1 –Sector-II- Livelihood Support system for landless/ assetless - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
A	Enterprising individuals (10 %)						
1	Malabari Goat rearing	No.	10500	5	35000	17500	52500
2	Backyard Poultry	No.	1500	7	5250	5250	10500
	Total				40250	22750	63000

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.11.2 –Sector-II- Livelihood Support system for landless/ assetless- IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation						
2	Bush Jasmine		25000	1	20000	5000	25000
3	Honey bee		20000	2	32000	8000	40000
4	Lease land nendran cultivation		15000	2	24000	6000	30000
5	Mushroom		10000	4	32000	8000	40000
	Total				108000	27000	135000

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.11.3 –Sector-II- Livelihood Support system for landless/ assetless- IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation						
2	Bush Jasmine		25000	2	40000	10000	50000
3	Honey bee		20000	2	32000	8000	40000
4	Lease land nendran cultivation		15000	2	24000	6000	30000
5	Mushroom		10000	4	32000	8000	40000
	Total				128000	32000	160000

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.11.4 –Sector-II- Livelihood Support system for landless/ assetless- IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
C	Major livelihood activities (30 %)						
1	Malabari Goat rearing	No.s	105000	2	105000	105000	210000
	Total				105000	105000	210000

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.12.1 –Sector-III- Production system and Microenterprises - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Backyard Poultry	Nos.	1500	65	48750	48750	8775	97500
	Total			65	48750	48750	8775	97500

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

Mundakapadam Watershed (12M39a) - Action Plan

Table No. 17.12.2 –Sector-III- Production system and Microenterprises –IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Ordinary Compost	Nos.	8000	15	75000	45000	13500	120000
2	Nendran Banana Cultivation	Nos.	34000	5	50000	120000	9000	170000
	Total			20	125000	165000	22500	290000

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

Mundakapadam Watershed (12M39a) - Action Plan**Table No. 17.12.3 –Sector-III- Production system and Microenterprises –IIIrd Year Plan**

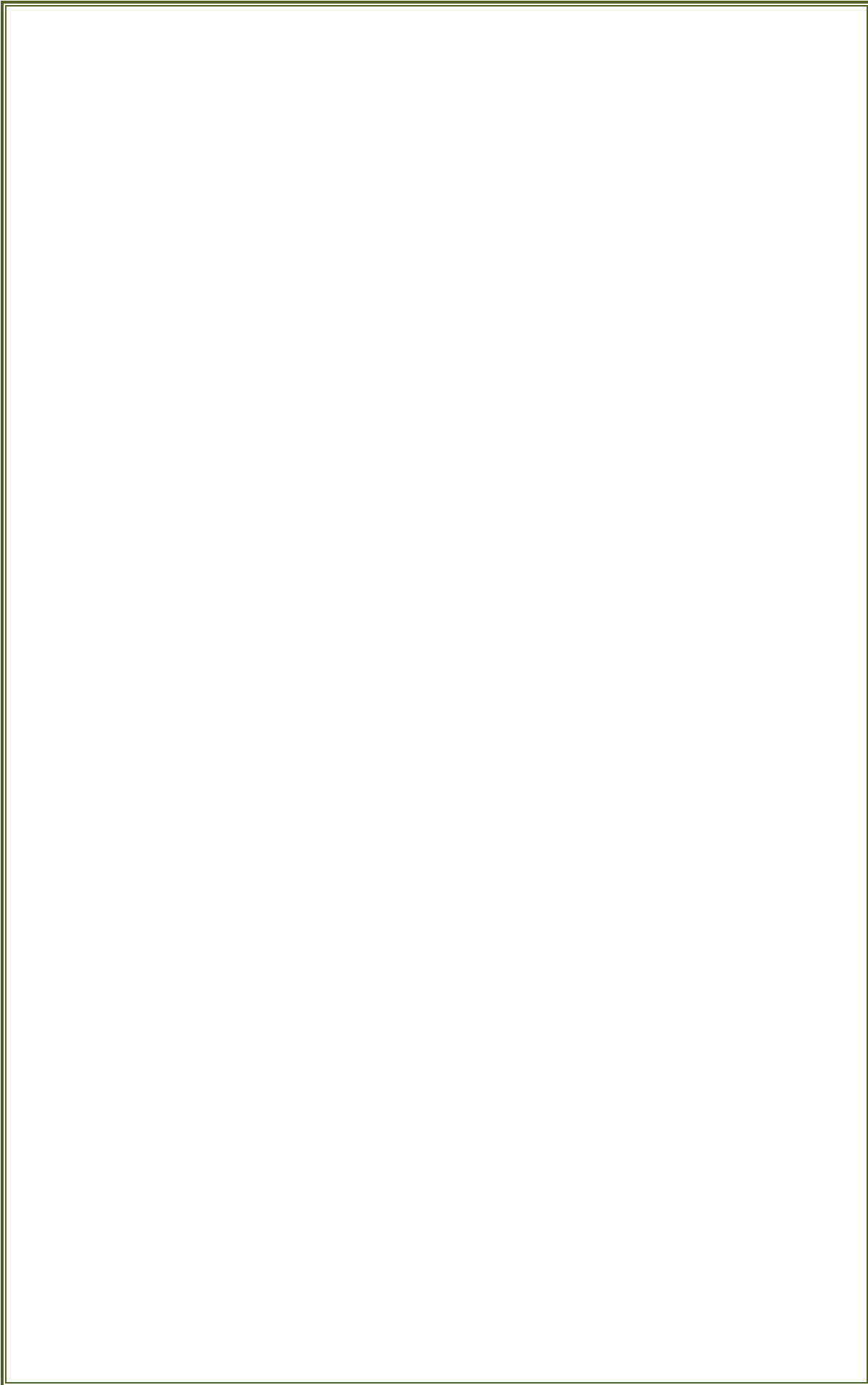
Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Cow rearing	Nos.	35000	9	135000	180000	24300	315000
	Total			9	135000	180000	24300	315000

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

Mundakapadam Watershed (12M39a) - Action Plan**Table No. 17.12.3 –Sector-III- Production system and Microenterprises –IVth Year Plan**

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Vermi Compost	Nos.	18000	9	90000	72000	16200	162000
2	Nendran Banana Cultivation	Nos.	34000	5	50000	120000	9000	170000
	Total			14	140000	192000	25200	332000

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



MICRO WATERSHED BASED ACTION PLAN
KALATHIKADAVU MICRO WATERSHED (12M39n)

Kalathikadavu micro watershed is the largest micro watershed in the IWMP cluster (IWMP-III) with a total treatable area of 1111.87 ha (21.80 % of total geographical area). This micro watershed is spread over 15 wards in Panachikkad Grama Panchayat of Pallom block. The total project area comes to 1124.40 ha of which the total treatable area is 1111.87 ha.

General Description

Name of micro watershed	:	Kalathikadavu
Micro watershed code	:	12M39n
River basin	:	Meenachil
District	:	Kottayam
Block Panchayath	:	Pallom
GramaPanchayath	:	Panachikkad
Villages	:	Nattakam, Panachikkad
Latitude	:	9°31'20.6" to 9°33'40.8" North
Longitude	:	76°31'16.9 to 76°33'45.1 East
Wards	:	Panachikkad Panchayat - 2, 3, 4, 5, 6, 7, 8, 9, 17, 18, 19, 20,(full) and 10, 11 ,21, 22 (part)
Total area	"	1124.40 ha
Total treatable area	:	1111.87 ha
% of area in the IWMP cluster	:	21.80 %

Methodology

In line with the guidelines of IWMP, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Training Coordinators were engaged at project level for organizing the series of trainings at Block and Grama Panchayat levels.
5. Overseers were engaged for taking field estimates of the proposed activities.
6. Induction training was given for the project staff on PRA techniques, concept of maps and Resource Mapping.

7. Printed posters, banners and notices for providing wide publicity regarding the programme.
8. Two block level seminars were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
9. This was followed by orientation seminars at GramaPanchayats.
10. Conducted transect walk with ward members and ADS.
11. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
12. NHGs were formed at grass root level comprising of 40 to 50 neighbouring households.
13. Panchayat Level Watershed Committees were convened at Grama Panchayats for finalizing the modalities of work.
14. Trainer's training for base line survey were conducted for two facilitators from each Neighbour Hood Group
15. Predefined questionnaire was prepared for data collection from each household.
16. A block level seminar was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented by concerned Grama Panchayat Presidents.
17. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map with the help of the facilitators selected from the NHGs.
18. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary & Soil Conservation Departments. Followed by technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
19. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of NHGs and accordingly present land use map is prepared using different notions and symbols.
20. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
21. Panchayat Level Watershed Committees were convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
22. Trainer's training for taking people's estimates and consolidation of project proposals. This was organized at Grama Panchayat and NHG level. Elected representatives, ADS Chairpersons, Officer bearers of NHGs, MGNREGS officials, etc. attended this training. The information gathered on soil and water

conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalized. The livelihood action plan and the activities under production system were also consolidated.

23. The suggestions were split for four years and four separate annual plans were also prepared.
24. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
25. Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal terracing, earthen and stone pitched contour bunding, outerbund strengthening, water logging prevention, vegetative barriers etc.
 - Rain water harvesting activities like farm ponds, sil paulin tanks, check dams etc.
 - Enhancement of paddy cultivation through area expansion in cultivable paddy fallows.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Scientific waste management practices like vermi compost, biogas, pipe compost and solid waste management units.
 - Protection of water sources like streams, ponds, drains etc.
 - Crop improvement practices and crop demonstrations.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - Encouragement of self sufficiency in vegetable production through vegetable gardens and grow bags.
 - Encouraging natural regeneration including fodder cultivation.
 - Promotion of agro-forestry and horticulture
 - Capacity building and creation of a greater degree of awareness among the participants.
 - Encouraging people's participation with the involvement of NHGs.
 - Livelihood activities for asset less people
 - Production system and Micro enterprises

SWOT Analysis 12M39n					
No.	Area	Strengths	Weakness	Opportunities	Threats
1	Agriculture	25.92 hectare under paddy cultivation.	Lack of skilled labour for transplanting, harvesting paddy. Weak outer bunds and non functional field channels	180.24 hectare cultivable fallow paddy land and lease farmers. One skilled labour group for mechanized farming.	Uncultivable submerged fallow after clay mining.
2	Horticulture	52.78% of the total area of watershed under coconut based farming system with intercrops such as arecanut plantain, nutmeg tuber crops ginger turmeric and pepper.	Lack of skilled labour for plant protection, harvesting coconut, arecanut, staking nendran banana, insitu budding of nutmeg, tapping of rubber	Possibility of enhancing vegetable cultivation through Kudumbasree units. Skilled labour group for insitu budding nutmeg, plant protection, tapping, coconut climbing, totray method of raising vegetable seedling.	
3	Animal Husbandry	Cattle rearing as major lively hood by many small and marginal farmers. Backyard poultry taken up as subsistent farming by majority of inhabitants. Accessibility to milk collection centres	Lack of availability of fodder. Lack of sufficient infrastructure for rearing cattle in a scientific manner	Cattle rearing major lively hood. Scope for increasing backyard poultry as part of production system. Scope for cultivation of fodder as intercrop in coconut garden and common lands.	Cattle rearing cannot be taken up as group enterprise due to lack of sufficient space for construction of the shed.
4	Natural	761.04 ha of watershed lie	5 to 10% of area of	Area treatment with suitable	Sand mining from river

	Resources	below 20m MSLand belongs to the category of geomorphology lower plateau where the slope is gentle and soil is deep and texture is clayey.	watershed, the topography is undulating and slope moderate. Subject to erosion hazards. In the valley portion, breach of bunds, flooding	soil and water conservation measures such as contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting measures such as staggered trenches and pits. Embankment protection of river by vegetative measures. As part of drainage line treatment, strengthening of field bunds (VARAMBU) Stream bank protection of thodu, desiltation and restoration of field channels.	adversely affecting the water table and water quality. Clay mining from fertile paddy field has left paddy field as uncultivable waste land impairing the natural drainage and increasing the chance of flooding.
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Biophysical Resources

Relief

The relief of the watershed ranges from MSL upto 60 m above MSL. Majority of the microwatershed area falls in the relief category of 0 – 20 m above MSL which covers an area of 761.04 ha (67.68 %). An area of 350.90 ha is located 20 – 40 m above MSL. The details of the relief with spatial extent in the watershed area are given in the table.

Sl. No.	Relief(m)	Area(ha)
1	0-20 m above MSL	761.04
2	20-40 m above MSL	350.90
3	40-60 m above MSL	12.46
	Total	1124.40

Slope

The watershed area is divided into five categories of slope classes. The majority of area is under nearly level to vvery gentle slope, having 0-3 % slope. This category spreads over an area of 446.76 ha (39.73 %). An area of 404.27 ha (35.95 %) in the micro watershed is having moderately sloping lands having 5 – 10 percent slope. An area of 19.37 ha is having modertately steep to very steep lands which requires proper soil and water conservation. The details of the slope categories with spatial extent in the watershed are given in the table.

Sl. No.	Slope	Description	Area(ha)
1	0-3 percent	Very gentle slope	446.76
2	3-5 percent	Gentle slope	55.25
3	5-10 percent	Moderately sloping	404.27
4	10-15 percent	Strongly sloping	185.14
5	15-35 percent	Moderately steep to steep	19.37
6	Waterbodies	Waterbodies	13.61
		Total	1124.40

Drains

The tributary of the Meenachil River flows through the eastern boundary of the watershed. It is the major drain of this watershed. The details of the drains and ponds in the watershed area are given in table.

Sl.No.	Name of Thodu
1.	Perincherry thodu
2.	Kanjirakkod Sasthavali thodu
3.	Kodurar
4.	Pavanakkulam thodu
5.	Perincherrykunnu thodu
6.	Pannimattom-Kummannur Thodu
7.	Kammannur thodu
8.	Kallumkal Kadavu - Pachira thodu

9.	Kulachankal - vettikkal Ar
10.	Chodhiyar Ar thodu
11.	Murikkumpakkal thodu
12.	Thumpichirathodu
13.	Pachirathodu
14.	Kollattu Vadakkumpuram thodu
15.	Kolachangal Vettikkal Thodu
16.	Arikuthode, Murikkumpokkal thodu
17.	Kaduvakkulam-Channanikkad Thode
18.	Mahvishnu temple thodu
19.	Kallunkal Kadavu Veeppanadi thodu
20.	Kanjakkad njamakkad thodu
21.	Kallumkal Kadavu thodu
22.	Pallathrakadavu thodu
23.	Ambattukadavu thodu

Ponds

SI. No.	Name of Pond
1	Pavanakulam
2	Plaparmpu Kadavu
3	Channanikkad Mulanthanam
5	Perumbthazhakulam
6	Kuthirakulam Pannimattam
7	Chadiyathukulam
8	Puliyathuparakulam
9	Ambattukadavu Parakuzhi

Landuse

Agriculture is one of the prime activities in the watershed area. The major landuse category mapped in the watershed area is mixed crops which are the typical homestead cultivation of Kerala where in the different horticultural crop species are grown together that cannot be spatially mapped separately. In this watershed mixed crops mainly includes coconut based farming intercropped with arecanut, banana and nutmeg along with other crop species. It occurs in an area of 593.42 Ha (52.78 %). The second major category is plantation rubber which is along the valley portions of the watershed. This is mapped in an area of 207.16 Ha (18.42 %). An area of 25.92 ha is under paddy cultivation and an area of 15.67 ha (1.39 %) of paddy land is converted to garden land to cultivable other horticulture crops. An area of 180.24 Ha of paddy land is left as cultivable wasteland which can be brought to paddy cultivation by providing necessary labour and other facilities. An area of 15.42 Ha is mapped as cultivable wasteland which can be brought under horticulture. The details of the landuse categories with spatial extent are given in table.

Sl. No.	Particulars	Area(ha)	Percentage (%)
1	Built up Land	21.74	1.93
2	Paddy - Puncha	25.92	2.31
3	Paddy converted to Builtup land	1.78	0.16
4	Paddy converted to Mixed crops	8.60	0.76
5	Paddy converted to Vegetables	1.58	0.14
6	Paddy converted to Tapioca	0.51	0.05
7	Paddy converted to Rubber	3.20	0.28
8	Paddy - Cultivable Waste Land	180.24	16.03
9	Arecanut	2.45	0.22
10	Banana	2.12	0.19
11	Coconut	1.22	0.11
12	Tapioca	1.30	0.12
13	Tubercrops	2.19	0.19
14	Vegetables	1.74	0.15
15	Vanilla	1.30	0.12
16	Mixed crops	593.42	52.78
17	Mixed trees	22.03	1.96
18	Plantation Rubber	207.16	18.42
19	Plantation Teak	1.04	0.09
20	Railway line	6.50	0.58
21	Road	0.23	0.02
22	Quarry - Rock	3.80	0.34
23	Quarry - Laterite	3.32	0.30
24	Cemetery	1.71	0.15
25	Cultivable Waste Land	15.42	1.37
26	Waste land	0.27	0.02
27	Waterbody	13.61	1.21
	Total	1124.40	100.00

Geology

The major geological unit in the micro watershed area is Charnockite group of rocks extending to an area of 760.48 ha (67.63%). Sand and silt covers an area of 350.31ha also exist in the watershed. The details of geology with spatial extent in the watershed are given in the table.

Sl. No.	Particulars	Area(ha)
1	Charnockite	760.48
2	Sand & Silt	350.31
3	Waterbodies	13.61
	Total	1124.40

Geomorphology

There are two geomorphological units in the watershed area of which 760.53 ha (67.64%) area falls under the category lower plateau (lateritic). An area of 350.26 (31.15%) is mapped under valley fill. The details of geomorphology in the watershed area with spatial extent are given in the table.

Sl. No.	Particulars	Area(ha)
1	Valley fill	350.26
2	Lower Plateau	760.53
3	Water body	13.61
	Total	1124.40

Soils

The major soil series mapped in the watershed area is Kalimala series which occurs in gentle to moderate slope (3-10%), having brown to yellowish red colour. These soils are deep to very deep, fine loamy to gravelly fine loamy textured. These are moderately managed soils which are well drained with moderate water erosion. This is distributed in an area of 492.87 ha (43.83 %). The river bank area is mapped under Meenachil series (256.68 ha) which is alluvial in origin. The major wetland series is Paddy which is mapped in an area of 259.39 ha. Soils in nearly half of the watershed area (581.21 ha) are deep soils with a depth of 100-150 cm and the remaining area (529.59 ha) is having very deep soils with a depth of 100- 150 cm. The major surface soil textures in the watershed area constitutes that of clay loam (506.40 ha, 45.04% of TGA), sandy clay (259.39 ha) and sandy clay loam. Nearly 170 ha of the watershed area is prone to severe soil erosion which calls for proper soil and water conservation measures in the area.

Capacity Building/Trainings

Extensive training programmes and user interaction meetings were organized for the stake holders as part of the preparation of detailed project report. The details are given below:

No.	Training	Participants
1.	Block level awareness training	Elected representatives of three tier
2.	Block level orientation training	Elected representatives and ADS chairpersons
3.	Training on Base line survey	Two facilitators from NHG.
4.	Training on Drainage line treatment	Elected representatives and one facilitator from NHG.
5.	Focus Group Discussion	Elected representatives, Presidents and Secretaries of the NHGs, ADS chairpersons and MGNREGS labour groups and progressive farmers

6.	Entry point activity finalization	Elected representatives, Vice Presidents and Joint Secretaries from NHG, ADS chairpersons and MGNREGS labour groups.
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Watershed Committee

Watershed Committee is constituted by Gram Sabha to implement the watershed project with technical support of WDT in the panchayat. Watershed committees are formed following the parameters of watershed committee, keeping the gender sensitive issues intact. Watershed committee members are briefed about the project objectives and a workshop is also conducted in this regard at every panchayat. The watershed committee has a pivotal role to play during and after the project implementation period.

The details of Watershed Committee for Kalathikadavu watershed is given below:

Table No. 18.6 -Details of Watershed Committee for Kalathikadavu watershed

No.	Name	Ph. number
1	Sri. Jeena Jacob (Panchayath President) - Chairman	
2	Smt.Sanuma Kumari T.S (VEO) – Convener	
3	Smt.P.K.Rajasekharan Nair (member, ward No.5)	9446295984
4	Sri. Binu P.B (member, ward No.6)	9847913253
5	Sri.Boby Scaria (member ,ward No.7)	9497226405
6	Sri.P.K.Mohanan (member,wardNo.8)	9605605161
7	Smt.Suma Mukundan (member, ward No.9)	9544491610
8	Sri.E.R.Sunil Kumar (Member, ward No:10)	9947609607
9	Smt.Jessy Chacko (member Ward No: 11)	9497667600
10	Smt.Shalini Prabhash (member, Ward No: 17)	9495446193
11	Sri.E.K.Vijayumar(member, Ward No: 18)	9447426660
12	Sri.C.M.Sali(member, Ward No: 19)	9446967334
13	Smt.Sheena Lalachan(member, Ward No: 20)	9946206787
14	Smt.Vasanthy Salim(member, Ward No: 21)	8129001191
15	Smt.Annie Mammen(member, Ward No: 22)	9496135364
16	Sri.Sunil Chacko(member, Ward No: 2)	944781363
17	Smt.Girija Thulasidharan(member, Ward No: 3)	9020451400
18	Smt.Jayasree Rajappan (SHG member , Ward No: 8)	9747628843
19	Smt.Salma Sabu (SHG Member, Ward No: 8)	9403591420
20	Smt.Santhamma Kumari Ajith (SHG Member Ward No: 10)	8606331367
21	Sri.Binu Sasikumar (SHG Member, Ward No: 6)	0481-2330396
22	Sri.T.T.Thomas (SHG Member, Ward No: 22)	9446774448
23	Sri.Babu Thomas(SHG Members, Ward No.22)	9048608793
24	Smt. Indhu.K.Thomas (WDT member)	
25	Sri.Raveendran (SC Representative, Ward No.22)	9747491658

26	Smt.Thulasi Bai (ST Representative, Ward 8)	
27	Smt.Sreelekha Anilkumar (Lady Representative, Ward No: 18)	808692722
28	Smt.Anila Sunil (Landless Representative)	

Neighbour hood Groups

Neighbour hood Groups are constituted in the watershed area combining 40 to 50 adjacent households which are living in a cluster. These are further subdivided into seven sub groups and one person from each subgroup is selected to the Neighbour hood Group Committee. These seven members formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is lady. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. These Committees are registered with the concerned Grama Panchayat. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

The details of the NHG Committees in Kalathikadavu watershed is as follows:

Table No. 18.7 -Details of the NHG Committees in Kalathikadavu watershed

Sl. No.	Panchayat	Ward	NHG No.
1	Panachikkad	Ward 02	10
2	Panachikkad	Ward 03	7
3	Panachikkad	Ward 04	7
4	Panachikkad	Ward 05	9
5	Panachikkad	Ward 06	8
6	Panachikkad	Ward 07	8
7	Panachikkad	Ward 08	9
8	Panachikkad	Ward 09	8
9	Panachikkad	Ward 17	9
10	Panachikkad	Ward 18	9
11	Panachikkad	Ward 19	7
12	Panachikkad	Ward 20	8
13	Panachikkad	Ward 10	7
14	Panachikkad	Ward 11	3
15	Panachikkad	Ward 21	7
16	Panachikkad	Ward 22	8

Self Help Groups

In addition to this, the existing Self Help Groups formed under the Kudumbasree Mission and other SHGs which are performing at a satisfactory level will be promoted to take various programmes under the Livelihood activities and Production Systems and Micro enterprises. If required, additional SHGs will also be formed in the watershed area in the coming years.

Activities proposed

Based on the series of discussions held with the different stakeholders the following activities are suggested for the micro watershed.

Table No. 18.8 -Details of activities proposed

Panachikkad Grama Panchayat**Desiltation of drains**

No.	Name of Thodu
1.	Kanjirakkod Sasthaveli
2.	Kodurar
3.	Perincherrykunnu
4.	Pannimattom-Kummannur Thodu
5.	Kallumkal Kadavu-Pachira thodu
6.	Kulachankal - vettikkal Aru drain
7.	Chodhiyara thodu
8.	Murikkumpakkal thodu
9.	Thumpichirathodu
10.	Pachirathodu
11.	Kolachangal Vettikkal Thode
12.	Arikuthode, Murikkumpokkal thode
13.	Kaduvakkulam-Channanikkad Thode
14.	Kallunkal Kadavu Veeppanadi drain
15.	Kanjakkad njamakkad thodu
16.	Sasthamveli
17.	Ambattukadavu thodu

Vegetative Protection of drains

Sl. No.	Location
1	Survey no. 454, 453, 442, 431, 427, 425, 403, 405, 401
2	Survey no. 618, 617, 614, 612, 129, 105
3	Survey no. 570, 565, 600, 618, 612
4	Survey no. 235, 234, 267, 233, 222
5	Survey no. 29, 68, 69, 44, 56, 55, 39, 3, 40, 37, 61
6	Survey no. 563, 564, 571

Side Wall Protection of drains

Sl. No.	Location
1.	Pachira thode – Survey no. 618, 617, 614, 612, 129, 105
2.	Kammannur thode – Survey no. 31, 33, 32, 21, 50
3.	Vayanasala Junction
4.	Kaniyamala – Survey no. 553
5.	Kallumkal Kadavu - Pachira moola

Chal Restoration (Vaachal Clearing)

Sl. No.	Location
1.	Ambattukadavu – Survey no. 213, 215, 230, 231, 232, 233, 234, 235
2.	Kolladu Padasekharam (15000km/2)
3.	Ennasserri Velluvakkal Padasekharam – Survey no. 276, 278, 279, 280, 281, 289, 292, 293, 294, 296
4.	Pachirathode – Survey no. 606
5.	Arikuthode, Murikkumpokkal thode
6.	Ambattukadavu-Karothukadavu road

Earthen Bunds

Sl. No.	Location
1	Ayurveda Hospital – Survey no. 183
2	Perincherrickunnu – Survey no. 178, 179
3	Laksham Veed Colony – Survey no. 139, 140
4	Thenpurakkal – Survey no. 650, 649
5	Karimattam – Survey no. 644, 645
6	Survey no. 664, 669, 670, 632, 635, 626, 634, 643, 637
7	Malamel Kavuvu – Survey no. 424, 425, 427
8	Kallunkal Kavuvu – Survey no. 404, 403, 425, 427, 431, 406
9	Survey no. 606, 97, 107, 610, 607, 557, 103
10	Panachikkad temple, Veluthururthi – Survey no. 216, 207, 229, 212, 211, 210
11	Ambattukadavu – Survey no. 213, 215, 230, 231, 232, 233, 234, 235
12	Velluthuruthi – Survey no. 387, 289, 295
13	Survey no. 552, 553, 118, 111
14	Channanikkad – Survey no. 563, 565, 571, 559
15	Survey no. 15, 544, 543, 546, 1, 535

Outer Bunds of paddy fields

Sl. No.	Location
1	Kallumkal Kadavu Padasekharam – Survey no. 624, 412, 411, 410, 415, 117, 420, 418
2	kulachankal - vettikkal Aru drain
3	Ward - 9
4	Tholampadam - Ambattukadavu – Survey no. 231, 232, 233
5	Kollattu Vadakkumpuram, Kizhakkumpuram, Malippadam
6	Survey no. 302, 303, 296
7	Survey no. 180, 235, 234, 233, 232, 681, 675, 672, 673, 213, 215, 230, 231
8	Survey no. 521, 520, 517, 575, 581, 584, 587, 590, 593, 596, 418
9	Survey no. 441, 437, 432, 433, 421, 420
10	Survey no. 272, 271, 20, 11, 33, 31, 549, 529, 559
11	Survey no. 192, 221, 222, 223, 224

12	Thokalampadam Padasekharam Survey no. 630, 671, 673, 672, 675, 681 –
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Side Varambu Earthening

Sl. No.	Location
1	Survey no. 189/7-2
2	Pachira thode – Survey no. 618, 617, 614, 612, 129, 105
3	Kammannur thode - Survey no. 31, 33, 32, 21, 50
6	Kallumkal Kadavu - Pachira moola

Stream Bank Protection – banmbboo planting

Sl. No.	Location
1	Survey no. 192,221,222,223,224,225,385,386,387,388,408,409,410
2	Survey no. 625,628,629,630,675,681,213,215,230,231,232,276
3	urvey no. 154, 183171, 172, 173, 154, 176, 183
4	Survey no. 293,292,291,629,628,627, 596
5	Survey no. 278,279,280,290,305,306

Brushwood Bunding

Sl. No.	Location
1	Pavanakkulam – Survey no. 189/7-2
2	Thumbichira thode – Survey no. 415,420,421,433,432,437,441

Gully Plugging

Sl. No.	Location
1	Kammannur thode - Survey no.115
2	Kallumkal Kadavu - Pachira thode - Survey no. 563,564,565,571
3	Survey no. 532,528

Geo textiles

Sl. No.	Location
1	Survey no. 202
2	Kodurar – Survey no. 621,622,623,625,628,629,630,671,672
3	Pachira thode – Survey no. 618,617,614,612,129,105
4	Kallumkal Kadavu - Pachira thode – Survey no. 563,564,565,571
5	Channanikkad-Survey no. 70,73,79,77,41,40,39, 112,38
6	Survey no. 15,544,543,546,1, 535
7	Pachirathode - 606 - SC Colony

Pond Desiltation

Sl. No.	Name of Pond
1	Pavanakulam
2	Plaparmpu Kadavu
3	Channanikkad Mulanthanam
4	Channanikkad
5	Perumbthazhakulam

6	Kuthirakulam Pannimattam
7	Chadiyathukulam
8	Puliyathuparakulam
9	Ambattukadavu Parakuzhi

Earthen bunds

Sl. No.	Location
1	Survey no. 136, 162,163,204,187,202,197,198,196,125,148,140, 154,161,
2	Survey no. 602, 557, 606, 613, 610, 611, 128, 127, 108, 101, 97, 556, 606, 558
3	Survey no. 3, 7-6, 5-3, 8-3, 8-4, 8, 7-4-3, 5-1, 6, 1-10, 7-4, 7-2,
4	Survey no. 2-1, 2,9,5, 79/5-2,5-4,5-1-2,5-2-1,5-1, 80/14, 23, 15, 24, 23, 15, 5, 81/19, 1-2-3,3,1,1-3,
5	Survey no. 111/18-2,3-3,21,24,22,16-23,3-5, 112/5-4, 6-3, 7-2-3, 113/7,4, 116/4-11-1, 118/1, 119/7-1, 1-1,
6	Survey no. 9,10,551/10,17,1-3,550/5,4,552/11-4,15-4-1,18-1,1-3,551/1-3,17,10, 553/6, 562/18-1
7	Survey no. 546, 535, 543, 5, 4, 9, 347, 1, 169

Rain Water Harvesting

Sl. No.	Location
1	Survey no. 168-2,169-3,197-1,161-2,143-2,336-3, 327-3,323-2
2	Survey no. 25
3	Panachikkad NSS UP School – Survey no. 205
4	Survey no. 269-4,270-3,299-5,325-4,320-11,327-12,319-5,313-12,287-10
5	Survey no. 544/20-2,1/5-1,1/13,3/19,543/16,5/5
6	Survey no. 256- Govt. LPS Velluthuruthi(Ward – 9)
7	Survey no. 505-Pachira LP School
8	Govt. LPS Channanikkad
9	Govt. HS, Kollad

Rain Pits

Sl. No.	Location
1	Survey no. 323-3, 326-6, 324-2, 341-5, 329-4, 336-2, 125-4, 148-5, 197-8, 169-5
2	Survey no. 241-10, 239, 218, 220, 242, 244, 253, 230, 224, 221, 243, 237, 219, 209, 250
3	Survey no. 627-3, 626, 676, 249, 261, 247
4	Velluruthi temple – Survey no. 286, 287, 298, 322, 316, 317, 313, 265, 270, 284
5	Survey no. 48, 27, 29, 39, 22, 3, 53, 36, 41
6	Survey no. 20, 30, 40, 39, 44, 57, 61, 67, 68, 65, 27, 3, 29, 54
7	Survey no. 81-13, 80-15, 85-14, 116-16, 552-18, 113-14, 79-17, 120-20, 553-8, 83-10, 117-2
8	Survey no. 539-10, 535-5, 544-4,1-8,2-9,4-10, 546-12, 9-7, 531-9

Crop Intensification

Sl. No.	Location
1	Survey no. 179/5, 206, 146, 140, 305
2	Survey no. 180, 181, 162
3	Pachiramoola - Survey no. 620, 621, 622, 623, 625, 629, 628, 630, 671, 672, 673, 663
4	Survey no. 422, 425, 408, 438, 454
5	Survey no. 613, 125, 108, 107, 101, 97
6	Kollattu Vadakkumpuram, Kizhakkumpuram, Malippadam

Centripetal terrace

Sl. No.	Location
1	Survey no. 147-6, 148, 143-10, 165, 201-7, 203-8, 197-10, 168-12, 357-10, 341-15, 327-10, 334-16
2	Survey no. 176-10, 172-8, 189-5, 186-10, 159-15, 160-20, 175-10, 162-30, 171-5, 197-20, 179-10, 165-10, 164-10
3	Survey no. 647/9-11, 646/10, 135
4	Survey no. 602, 616, 557, 615, 610, 125, 127, 107, 97
5	Survey no. 559-10, 552-12, 116-20, 61-25, 566-25, 110-30, 111-23, 117-20, 551-10, 117-10
6	Survey no. 4-10, 260-15, 546-20, 548-25, 539-22, 5-10, 4-25, 9-35, 1-30, 540-25, 535-28

Public Land – Horticulture

Sl.No.	Location
1	Boat Jetty Kavala – Survey no. 159
2	Kollanvala - Survey no. 163
3	Kaduvakkulam Junction - Survey no. 330
4	Chulakkavala Junction - Survey no. 322
5	Nalkkavala Junction
6	Nellikkal Junction - Survey no. 164
7	Ayurveda Hospital Junction - Survey no. 169
8	Survey no. 658
9	Survey no. 639, 630, 624
10	Panachikkad - Survey no. 216
11	Parakkulam - Survey no. 254
12	Ottakkanjiram
13	Kaniyamala Junction - Survey no. 553, Mahavishnu Temple- Survey no. 61, Vayanasala Junction, Saippu Junction- Survey no. 545
14	Pannimattam-Paruthumpara - Survey no. 261, 268

15	Ellimoodu-Kaniyamala - Survey no. 168,1, 5
Vegetable Cultivation	
Sl. No.	Location
1	Survey no. 167, 166, 205, 206, 148, 140, 143 149, 160, 335, 337, 322, 327, 326
2	Survey no. 181,180,236
3	Survey no. 630, 632, 622, 629, 671
4	Survey no. 613, 125, 108, 107, 101, 97
5	Survey no. 567, 127, 616, 107, 97, 125, 607
6	Survey no. 212, 216, 231, 233, 234, 220, 242, 239, 249, 261, 230, 241, 252
7	Survey no. Parakkulam LP School - Survey no. 254
8	Survey no. 283, 295, 319, 270, 321, 326
9	Survey no. 29, 68, 69, 44, 56, 55, 39, 3, 40, 61
10	hannanikkadavu - Survey no. 114, 115, 563, 565, 571, 79, 553, 559, 85, 88, 73, 90, 113
11	Survey no. 534, 532, 529, 549, 20
12	Survey no. 5, 3, 4, 543, 1, 546, 9, 547, 531, 12
13	Poovanthuruth Govt. School - Survey no. 225, 385, 224
Paddy Rejuvenation	
Sl. No.	Location
1	Survey no. 181-180
2	Survey no. 134, 132, 130, 547, 546
3	Pachiramoola - Survey no. 570, 601, 600, 599, 618, 617, 614, 612, 100
4	Ambattukadavu - Survey no. 213, 215, 230, 231, 232, 233, 234, 235
5	Vella Vathukkal - Survey no. 280, 290, 291, 279, 278, 289, 294, 292, 282, 281, 293, 276, 191
8	Channanikkad - Survey no. 563, 550, 115, 565, 571
9	Kallumkal Kadavu - Pachira thode - Survey no. 532
10	Pannimattom - Survey no. 20, 11, 549, 529, 520, 532
11	Kallumkal Kadavu Padasekharam - Survey no. 624, 412, 411, 410, 415420, 418
12	Tholampadam Padasekharam
13	Etticharamoola
14	Kolladu Vadakke
15	Malipadam
16	Chamakkari - Purathekkari
17	Alambekkari
18	Ambattukadavu-Thokalambalam Padasekharam - Survey no. 231, 232, 233
19	Ennasserri Velluvakkal Padasekharam - Survey no. 276, 278, 279, 280, 281, 289, 292, 293, 294, 296
20	Pachiramoola-Kalumkukadavu Padasekharam

21	Survey no. 179, 180, 183
22	Survey no. 181-180
23	Kallunkal Kavu - Survey no. 453, 441, 437, 432, 433, 421, 420, 415, 412, 418, 596, 593
24	Survey no. 193, 192, 221, 222, 223, 224, 225

Crop Demonstration

Sl. No.	Crops
1	Curry Leaf cultivation
2	Betel vine
3	Coleus rotundifolius
4	Rambutan
5	Garcinia Seedings
6	Pineapple Cultivation
7	Bush Jasmine Cultivation

Stone Pitched Contour Bunds

Sl. No.	Location
1	Survey no. 448, 447, 444, 446, 449, 443, 441, 329, 330, 335
2	Survey no. 336, 340, 322, 321, 317, 316, 314, 311
3	Survey no. 327, 323, 258, 328, 442, 445, 452, 270
4	Survey no. 271, 263, 264, 218, 219, 217, 204, 205
5	Survey no. 220, 224, 209, 208, 223, 242

Other NRM projects

No.	Activity	Location (Survey Nos)
1	Public Well Cleaning	Survey no. 626, 217, 255
		Survey no. 295-1, 323-2, 328, 258, 270
		Survey no. 68/6
		Survey no. 77/7-5, 78/3, 80/24, 551/15-4-1, 562/10, 119/1-1, 11/21, 22
2	Well Digging	Survey no. 422, 404, 427
		Survey no. 602, 556, 615, 125
		Survey no. 260-1
		Survey no. 80/14
3	New Pond Digging	675-1
		551/1
		150
		406-5, 422-3, 434-2, 595-3
		25, 15
		112-1, 79-2, 88-4, 120-3, 559-2, 561-3, 566-4, 122-5
5	Drinking Water	468, 466, 490, 500, 501, 495, 506, 509
		Kaduvakkulam area

6	Agrostological Measures	169
		15, 544, 543, 546, 1,535
7	Banana Cultivation	168/100, 250-50, 147/30, 162-25, 196-20, 140-40, 125-10, 337-10, 335-25, 327-30, 329-30
		181, 192, 198, 176, 174, 160
		198, 193, 159, 162
		175/8-300, 650/2-100, 644/3-1, 6, 1-100,646/11-125, 650/15, 16-100, 645/4-1, 4-2, 150, 650/11-50, 151/7-125
		639-6, 633-100, 630-80, 659-30, 669-65
		554, 609
		299, 283, 270
		110-50, 55-30560-100, 81-80, 119-40, 110-120, 116-80, 559-30
8	Solid waste management	Kaduvakkulam Factory
		Chozhiyakkad - 634
9	Recharge of Wells	Panachikkad NSS UP School - 205
		Chingamanam Paruthapara road - 68/6
		77, 551, 562, 73, 88, 89,77, 79, 116, 112, 81, 100, 85, 82, 553, 559, 561, 82
10	Coconut – Crop Improvement	634-10, 670-20, 641-30, 643-25, 664-20, 631-15, 658-20, 662-25
		119/9-25
		4-10,260-15, 546-20, 548-25, 539-22, 5-10, 4-25, 9-35, 1-30, 540-25, 535-28
11	Pepper Crop Improvement	191/1-1, 189, 179, 197
		639, 664, 635, 640, 643
		425, 406, 592, 442
		73, 88, 116, 112, 562, 553, 117
		654, 651, 657, 144, 155, 156
13	Pineapple cultivation	Survey no. 444 – Cultivation of Pineapple in the cultivable wasteland.
14	Tuber crops	Survey no. 556 – CWL to tuber crops Survey no. 70, , 73, 88, 89, 90 – Utilization of interspace using tuber crops like tapiaco, yam, colacassia.
15	Medicinal plants	Ayurveda Hospital - 183
		Family verifiyer Centre – 183
		Panachikkad - 60 Students
		Panachikkad NSS UP School - 205
		Survey no. 490-organic medicinal plants garden

		Plapprambu Colony - 168
		139
		605
		Pachirathode - 606
17	Ground Water Recharging	Survey no. 79, ,116,112, 100,85,82,553
18	Avenue Trees	Kanikkamandapam Kallumkadavu Palam Road
		Paruthumpara Kallumkadavu Road
		Ellukali L.P. School Road
		Shap Kavala Thumba Colony Road –
		Survey no. 55, 59, 58
		Njamakkattu Kadavu Road
		Kollad Panachikkad Road
		Survey no. 125, 123, 101, 82, 120
19	Check Dam	Pannimattom-Kummannur Thodu - 31,33,32,21,50
		Kammannur Thodu -553
20	Terracing	Kodurar - 621,622,623,625,628,629,630,671,672
		Pachira thode - 618,617,614,612,129,105
		Kallumkal Kadavu - Pachira thode - 563,564,565,571
		Channanikkad-70,73,79,77,41,40,39,80,112,38
21	Mulching	36,31,30,29,22,3,48,51,53,58, 55, 56,54,44,77,39,40,89
22	Fodder	20,11,549,529,532, 9,512,535
23	Intercropping	82,83, 85,100,77,40,41,39,37,113,120, 552,559 spice crops like pepper nutmeg and clove
		Survey no. 536, 539, 535, 540, 543, 544, 251, 247, 12, 9, 546, 547, 531
		Survey no. 506, 576, 577, 578, 579, 497, 461, 451, 457, 463, 465
		Survey No. 377, 380, 379 – Cultivation of fruit crops Survey No.450 .567, 568 – Vegetable Cultivation Survey No. 123, 124, 108, 107, 127 interspace can be utilized banana cultivation using varieties like Palaynkoden and Njalipoooven .
		Survey No. 48, 51, 53, 58, 64 –vegetables. Survey No. 54, 55, 47, 44, 67, 66, 65 – Banana Cultivation
		Survey No.444, 329, 441, 327, 328, 258 - Near nellikkal extension of are under vegetables. Survey No.211, 212, 216, 219, 229, 218 – Crop intensification – banana, tuber, vegetables in the

		interspaces. Survey No.258, 328, 326, 327, 323 – banana.
24	Side Varambu Earthening	Channanikkad
		Perumbthazhakulam
		Kuthirakulam Pannimattam
		Chadiyathukulam
26	Social Forestry	S. No. 546, 544, 74, 12 in railway area

Budget

The distribution of budget for Kalathikadavu micro watershed for the various components as per IWMP guidelines is given below:

Table No. 18.9 - Budget for Kalathikadavu micro watershed

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	13,34,244
2.	Monitoring	1	1,33,424
3.	Evaluation	1	1,33,424
Preparatory phase			
4.	Entry point activities	4	5,33,697
5.	Institution and capacity building	5	6,67,122
6.	Detailed Project Report	1	1,33,424
Watershed works phase			
7.	Natural Resources Conservation works	56	74,71,766
8.	Livelihood activities for asset less	9	12,00,819
9.	Production system and micro enterprises	10	13,34,244
10.	Consolidation phase	3	4,00,273
	Total	100	1,33,42,440

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.10.1 -Sector-I- Natural Resources Conservation and Management - 1st Year Plan

No.	Panachikkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable garden in schools	25 cent	7500	4	30000		3000	30000
2	Extension of paddy cultivation	ha	63538	10	190614	444766	19061	635380
3	Avenue tree planting	no.	160	2000		320000		320000
4	Vegetable grow bags (15 nos/unit)	no.	1200	100	60000	60000	6000	120000
5	Desiltation of drains	10m3	485.85	1000		485850		485850
6	Desiltation of ponds	10m3	649	500		324500		324500
7	Centripetal terracing	no.	46	1000		46000		46000
8	Earthen bunds	rm	27	3000		81000		81000
9	Strip terracing	m	101	2000		202000		202000
10	Chal restoration/vachal clearing	10m3	898	500	224500	224500	22450	449000
11	Mulching	no.	28	1000		28000		28000
12	Geo textiles	m2	191	100	19100		1910	19100
13	Outer bund strengthening of paddy fields	300 m	437	1500		655500		655500
14	Side wall protection of ponds	10m3	2317	250		579250		579250
15	Moisture Collection Pits	no.	30	250		7500		7500
16	Well recharging	no.	5500	50	137500	137500	13750	275000
17	Biogas (0.5m3)	m3	8500	25	53125	159375	5313	212500
18	Pipe compost	no.	900	100	13500	76500	1350	90000
19	Vermi compost		6201	10		62010		62010
	Total			13399	728339	3894251	72834	4622590

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.10.2 -Sector-I- Natural Resources Conservation and Management –IInd Year Plan

No.	Panachikkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Medicinal garden in public institutions	5 cent	4279	3	12837		1284	12837
2	Extension of paddy cultivation	ha	63538	40	762456	1779064	76246	2541520
3	Cultivation of horticultural crops in wastelands	25 cent	7850	4	31400		3140	31400
4	Cultivation of fodder crops	10 cent	5000	4	20000		2000	20000
5	Floriculture	5 cent	5500	5	27500		2750	27500
6	Avenue tree planting	no.	160	3000		480000		480000
7	Pineapple cultivation	20 cent	4000	3	12000		1200	12000
8	Banana cultivation	10 cent	16800	5	42000	42000	4200	84000
9	Fruit tree planting	25 cent	7850	4		31400		31400
10	INM in pepper(in mixed cropped area)	ha	6200	15	93000		9300	93000
11	INM in coconut	ha	3100	1	3100		310	3100
12	Crop demonstration - vegetable (pandal type)	25 cent	15000	4	30000	30000	3000	60000
13	Crop demonstration - vegetable (non-pandal type)	25 cent	7500	4	30000		3000	30000
14	Crop demonstration - horticultural crops	no.	10000	4	40000		4000	40000
15	Vegetable grow bags (15 nos/unit)	no.	1200	100	60000	60000	6000	120000
16	Intercropping in coconut gardens	10 cent	5500	50		275000		275000
17	Desiltation of drains	10m3	485.85	2000		971700		971700
18	Desiltation of ponds	10m3	649	500		324500		324500
19	Centripetal terracing	no.	46	3000		138000		138000
20	Vetiver planting	rm	35	250	8750		875	8750

21	Earthen bunds	rm	27	3000		81000		81000
22	Strip terracing	m	101	2000		202000		202000
23	Chal restoration/vachal clearing	10m3	898	500	224500	224500	22450	449000
24	Mulching	no.	28	3000		84000		84000
25	Agrostological measures	100m	710	2000		1420000		1420000
26	Bio fencing	rm	24.5	400		9800		9800
27	Brush wood bunding	m	548	250		137000		137000
28	Geo textiles	m2	191	100	19100		1910	19100
29	Outer bund strengthening of paddy fields	300 m	437	1000		437000		437000
30	Planting of bamboo seedlings	no.	34.65	1000		34650		34650
31	Embankment protection of drains	500 m	4500	2000		9000000		9000000
32	Stone pitched contour bunding	m2	143.52	1000	71760	71760	7176	143520
33	Side wall protection of drains (engineering)	m2	2400	750	720000	1080000	72000	1800000
34	Side wall protection of ponds	10m3	2317	500		1158500		1158500
35	Construction of shutters	no.	45000	4	90000	90000	9000	180000
36	Repair of existing shutters	no.	25000	2	50000		5000	50000
37	Construction of new ponds	no.	45000	1		45000		45000
38	Rain water harvesting structure	no.	330000	1		330000		330000
39	Moisture Collection Pits	no.	30	250		7500		7500
40	Renovation of public wells	no.	24000	4	96000		9600	96000
41	Well recharging	no.	5500	50	137500	137500	13750	275000
42	Silpaulin tanks	no.	3120	25		78000		78000
43	Biogas (0.5m3)	m3	8500	100	212500	637500	21250	850000
44	Pipe compost	no.	900	200	27000	153000	2700	180000
45	Vermi compost		6201	20		124020		124020

46	Solid Waste Management unit		2000000	1		2000000		2000000	
Total						2821403	21674394	282140	24495797

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.10.3 -Sector-I- Natural Resources Conservation and Management –IIIrdYear Plan

No.	Panachikkadd Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Extension of paddy cultivation	ha	63538	40	762456	1779064	76246	2541520
2	Cultivation of horticultural crops in wastelands	25 cent	7850	4	31400		3140	31400
3	Cultivation of fodder crops	10 cent	5000	4	20000		2000	20000
4	Floriculture	5 cent	5500	5	27500		2750	27500
5	Avenue tree planting	no.	160	3000		480000		480000
6	Pineapple cultivation	20 cent	4000	4	16000		1600	16000
7	Banana cultivation	10 cent	16800	5	42000	42000	4200	84000
8	Fruit tree planting	25 cent	7850	4		31400		31400
9	INM in pepper(in mixed cropped area)	ha	6200	10	62000		6200	62000
10	Crop demonstration - vegetable (pandal type)	25 cent	15000	8	60000	60000	6000	120000
11	Crop demonstration - vegetable (non-pandal type)	25 cent	7500	8	60000		6000	60000
12	Crop demonstration - horticultural crops	no.	10000	4	40000		4000	40000
13	Intercropping in coconut gardens	10 cent	5500	50		275000		275000
14	Desiltation of drains	10m3	485.85	2000		971700		971700
15	Desiltation of ponds	10m3	649	500		324500		324500
16	Centripetal terracing	no.	46	3000		138000		138000
17	Vetiver planting	rm	35	500	17500		1750	17500

18	Earthen bunds	rm	27	3000		81000		81000
19	Mulching	no.	28	3000		84000		84000
20	Agrostological measures	100m	710	2000		1420000		1420000
21	Bio fencing	rm	24.5	400		9800		9800
22	Brush wood bunding	m	548	300		164400		164400
23	Outer bund strengthening of paddy fields	300 m	437	1000		437000		437000
24	Planting of bamboo seedlings	no.	34.65	1000		34650		34650
25	Embankment protection of drains	500 m	4500	2000		9000000		9000000
26	Stone pitched contour bunding	m2	143.52	1500	107640	107640	10764	215280
27	Side wall protection of drains (engineering)	m2	2400	1000	960000	1440000	96000	2400000
28	Construction of shutters	no.	45000	4	90000	90000	9000	180000
29	Repair of existing shutters	no.	25000	2	50000		5000	50000
30	Construction of new ponds	no.	45000	1		45000		45000
31	Rain water harvesting structure	no.	330000	1		330000		330000
32	Renovation of public wells	no.	24000	4	96000		9600	96000
33	Well recharging	no.	5500	50	137500	137500	13750	275000
34	Silpaulin tanks	no.	3120	25		78000		78000
35	Mini drinking water scheme	no.	267000	1		267000		267000
36	Biogas (0.5m3)	m3	8500	100	212500	637500	21250	850000
37	Pipe compost	no.	900	200	27000	153000	2700	180000
38	Vermi compost		6201	20		124020		124020
	Total				2819496	18742174	281950	21561670

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.10.4 -Sector-I- Natural Resources Conservation and Management –IVth Year Plan

No.	Panachikkadd Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Cultivation of horticultural crops in wastelands	25 cent	7850	4	31400		3140	31400
2	Cultivation of fodder crops	10 cent	5000	2	10000		1000	10000
3	Avenue tree planting	no.	160	2000		320000		320000
4	Pineapple cultivation	20 cent	4000	3	12000		1200	12000
5	Crop demonstration - vegetable (pandal type)	25 cent	15000	8	60000	60000	6000	120000
6	Crop demonstration - vegetable (non-pandal type)	25 cent	7500	8	60000		6000	60000
7	Centripetal terracing	no.	46	3000		138000		138000
8	Vettiver planting	rm	35	250	8750		875	8750
9	Earthen bunds	rm	27	3000		81000		81000
10	Mulching	no.	28	3000		84000		84000
11	Bio fencing	rm	24.5	400		9800		9800
12	Brush wood bunding	m	548	300		164400		164400
13	Planting of bamboo seedlings	no.	34.65	1000		34650		34650
14	Stone pitched contour bunding	m2	143.52	1500	107640	107640	10764	215280
15	Side wall protection of drains (engineering)	m2	2400	750	720000	1080000	72000	1800000
16	Construction of new ponds	no.	45000	1		45000		45000
17	Rain water harvesting structure	no.	330000	1		330000		330000
18	Renovation of public wells	no.	24000	4	96000		9600	96000
19	Silpaulin tanks	no.	3120	25		78000		78000
20	Mini drinking water scheme	no.	267000	1		267000		267000
	Total				1105790	2799490	110579	3905280

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.11.1 -Sector-II- Livelihood Support system for landless/ assetless - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
A	Enterprising individuals (10 %)						
1	Malabari Goat rearing	No.	10500	16	112000	56000	168000
2	Backyard Poultry	No.	1500	10	7500	7500	15000
	Total				119500	63500	183000

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.11.2 -Sector-II- Livelihood Support system for landless/ assetless- IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation						
2	Bush Jasmine		25000	4	80000	20000	100000
3	Honey bee		20000	5	80000	20000	100000
4	Lease land nendran cultivation		15000	5	60000	15000	75000
5	Soap making		10000	17	136000	34000	170000
6	Mushroom						
	Total				356000	89000	445000

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.11.3 -Sector-II- Livelihood Support system for landless/ assetless- IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation						
2	Bush Jasmine		25000	4	80000	20000	100000
3	Honey bee		20000	5	80000	20000	100000
4	Lease land nendran cultivation		15000	5	60000	15000	75000
5	Soap making		10000	18	144000	36000	180000
6	Mushroom						
	Total				364000	91000	455000

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.11.4 -Sector-II- Livelihood Support system for landless/ assetless- IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
C	Major livelihood activities (30 %)						
1	Malabari Goat rearing	15no.s	105000	3	157500	157500	315000
2	Pisciculture	3500no.s	84000	5	210000	210000	420000
	Total				367500	367500	735000

Kalathikadavu Watershed (12M39n) - Action Plan**Table No. 18.12.1 -Sector-III- Production system and Microenterprises - Ist Year Plan**

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Backyard Poultry	Nos.	1500	100	75000	75000	13500	150000
2	Ordinary Compost	Nos.	8000	12	60000	36000	10800	96000
	Total			112	135000	111000	24300	246000

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

Kalathikadavu Watershed (12M39n) - Action Plan**Table No. 18.11.2 -Sector-III- Production system and Microenterprises –IInd Year Plan**

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Ordinary Compost	Nos.	8000	20	100000	60000	18000	160000
2	Nendran Banana Cultivation	Nos.	34000	14	140000	336000	25200	476000
	Total			34	240000	396000	43200	636000

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

Kalathikadavu Watershed (12M39n) - Action Plan**Table No. 18.12.3 -Sector-III- Production system and Microenterprises –IIIrd Year Plan**

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Vermi Compost	Nos.	18000	15	150000	120000	27000	270000
2	Cow rearing	Nos.	35000	20	300000	400000	54000	700000
3	Nendran Banana Cultivation	Nos.	34000	6	60000	144000	10800	204000
	Total			41	510000	664000	91800	1174000

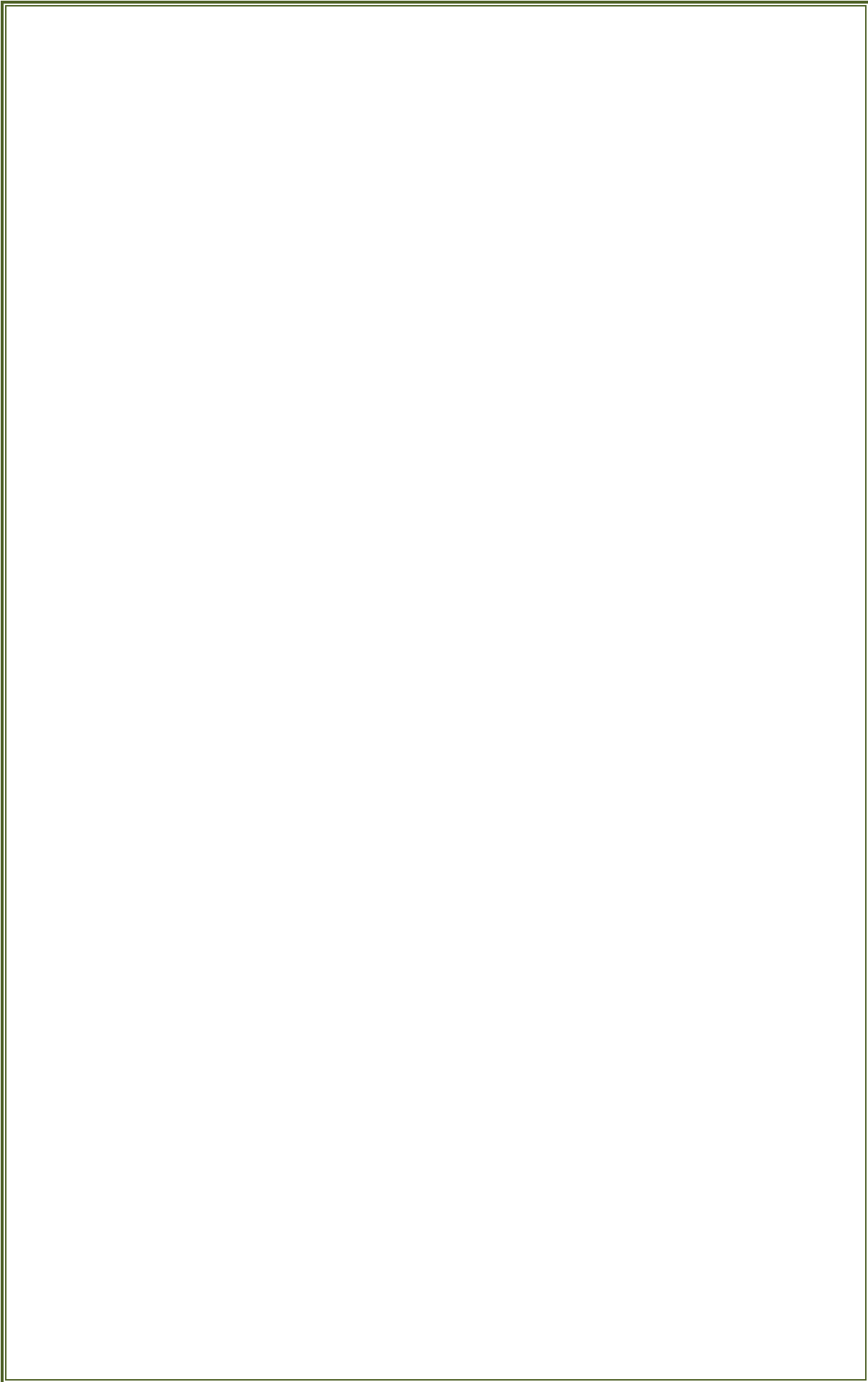
Note: 20 percent of the beneficiaries will be SC/ST. Contribution to WDF is 20 % for General and 10 % for SC/ST

Kalathikadavu Watershed (12M39n) - Action Plan

Table No. 18.12.4 -Sector-III- Production system and Microenterprises –IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Vermi Compost	Nos.	18000	15	150000	120000	27000	270000
2	Cow rearing	Nos.	35000	20	300000	400000	54000	700000
	Total			35	450000	520000	81000	970000

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



MICRO WATERSHED BASED ACTION PLAN
PARAKKALKADAVU MICRO WATERSHED (12M39o)

Parakkalkadavu micro watershed is the smallest micro watershed in the IWMP cluster (IWMP-III) with a total treatable area of 283.85 ha (5.56 % of total geographical area). This micro watershed is spread over three wards in Puthupally Grama Panchayat of Pallom block. The total project area comes to 288.40 ha of which the total treatable area is 283.85 ha.

General Description

Name of micro watershed	:	Parakkalkadavu
Micro watershed code	:	12M39o
River basin	:	Meenachil
District	:	Kottayam
Block Panchayath	:	Pallom
GramaPanchayath	:	Puthupally
Villages	:	Puthupally
Latitude	:	9°32'20.9" to 9°33'32.9" North
Longitude	:	76°32'54" to 76°34' 12.8" East
Wards	:	Puthupally Panchayat –14,15 (full) and 16 (part)
Total area	:	288.40 ha
Total treatable area	:	283.85 ha
% of area in the IWMP cluster	:	5.56%

Methodology

In line with the guidelines of IWMP, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Training Coordinators were engaged at project level for organizing the series of trainings at Block and Grama Panchayat levels.
5. Overseers were engaged for taking field estimates of the proposed activities.
6. Induction training was given for the project staff on PRA techniques, concept of maps and Resource Mapping.

7. Printed posters, banners and notices for providing wide publicity regarding the programme.
8. Two block level seminars were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
9. This was followed by orientation seminars at GramaPanchayats.
10. Conducted transect walk with ward members and ADS.
11. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
12. NHGs were formed at grass root level comprising of 40 to 50 neighbouring households.
13. Panchayat Level Watershed Committees were convened at Grama Panchayats for finalizing the modalities of work.
14. Trainer's training for base line survey were conducted for two facilitators from each Neighbour Hood Group
15. Predefined questionnaire was prepared for data collection from each household.
16. A block level seminar was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented by concerned Grama Panchayat Presidents.
17. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map with the help of the facilitators selected from the NHGs.
18. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
19. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of NHGs and accordingly present land use map is prepared using different notions and symbols.
20. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
21. Panchayat Level Watershed Committees were convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
22. Trainer's training for taking people's estimates and consolidation of project proposals. This was organized at Grama Panchayat and NHG level. Elected representatives, ADS Chairpersons, Officer bearers of NHGs, MGNREGS officials, etc. attended this training. The information gathered on soil and water

conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalized. The livelihood action plan and the activities under production system were also consolidated.

23. The suggestions were split for four years and four separate annual plans were also prepared.
24. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
25. Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal terracing, earthen and stone pitched contour bunding, outerbund strengthening, water logging prevention, vegetative barriers etc.
 - Rain water harvesting activities like farm ponds, sil paulin tanks, check dams etc.
 - Enhancement of paddy cultivation through area expansion in cultivable paddy fallows.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Scientific waste management practices like vermi compost, biogas, pipe compost and solid waste management units.
 - Protection of water sources like streams, ponds, drains etc.
 - Crop improvement practices and crop demonstrations.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - Encouragement of self sufficiency in vegetable production through vegetable gardens and grow bags.
 - Encouraging natural regeneration including fodder cultivation.
 - Promotion of agro-forestry and horticulture
 - Capacity building and creation of a greater degree of awareness among the participants.
 - Encouraging people's participation with the involvement of NHGs.
 - Livelihood activities for asset less people
 - Production system and Micro enterprises

SWOT Analysis 12M39o					
Sl.No.	Area	Strength	Weakness	Opportunities	Threat
1	Agriculture	39.69 hectare under paddy – puncha cultivation .	Paddy land converted for banana and other mixed crops. Lack of skilled labour for transplanting, harvesting paddy.	80.74 hectare cultivable fallow paddy land and lease farmers. Well organized pada sekhara samidees.	Water logging due to non functional vaachals
2	Horticulture	The major area of watershed under coconut based farming system with intercrops such as arecanut plantain, nutmeg tuber crops ginger turmeric and pepper. Already a vegetable growing tract.	Lack of skilled labour for plant protection, harvesting coconut, arecanut, staking nendran banana, insitu budding of nutmeg, tapping of rubber	Scope for intercropping with vegetables, expansion for plantain varieties, rejuvenation of pepper. Skilled labour group for insitu budding nutmeg, plant protection, tapping, coconut climbing, totray method of raising vegetable seedling.	
3	Animal Husbandry.	Cattle rearing as major livelihood by many small and marginal farmers. Backyard poultry taken up as subsistent farming by majority of inhabitants.	Lack of availability of fodder. Lack of sufficient infrastructure for rearing cattle in a scientific manner.	Cattle rearing major livelihood. Scope for increasing backyard poultry as part of production system. Scope for cultivation of fodder as intercrop in coconut garden	Cattle rearing cannot be taken up as group enterprise due to lack of sufficient space for construction of the

		Accessibility to milk collection centres.		and common lands.	shed.
4	Natural Resources	87.50% of area of watershed lie below 20m MSL and belongs to the category of geomorphology vallyfill where the slope is gentle and soil is deep and texture is clayey.	In the valley portion, breach of bunds, flooding	Area treatment with suitable soil and water conservation measures such as contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting measures such as staggered trenches and pits. Embankment protection of river by vegetative measures. As part of drainage line treatment, strengthening of field bunds (VARAMBU) Stream bank protection of thodu, desiltation and restoration of field channels.	Water logging due to non functional vaachals.

Biophysical Resources

Relief

The relief of the watershed ranges from MSL upto 60 m above MSL. Majority of the microwatershed area falls in the relief category of 0–20m above MSL which covers an area of 255.01 ha (88.42 %). An area of 29.85 ha is located 20- 40 m above MSL. The details of the relief with spatial extent in the watershed area are given in the table.

Sl.No.	Relief (m)	Area (ha)
1	0-20 m above MSL	255.01
2	20-40 m above MSL	29.85
3	40-60 m above MSL	3.54
	Total	288.40

Slope

The micro watershed area is divided into four categories of slope classes. The majority of area is under gentle slope having 3-5% slope. This category spreads over an area of 130.62 ha (45.29%). 106.73 ha (37.01 %) area of this micro watershed is having nearly level to very gentle slope. The details of the slope with spatial extent in the watershed are given in the table.

Sl. No.	Particulars	Description	Area(ha)
1	0-3 percent	Very gentle slope	106.73
2	3-5 percent	Gentle slope	130.62
3	5-10 percent	Moderately sloping	15.80
4	15-35 percent	Moderately steep to steep	21.69
5	Water bodies	Water bodies	13.56
		Total	288.40

Drains

Vadasseri Poyka Neerchal (850m), Ambattukadavu Neerchal (1800m), Kannakulangara Neerchal (1425m) and Pullithode-Pattukulam Neerchal (800m) are the major drains flowing through the watershed. The details of the drains and ponds in the watershed area are given in table.

Sl. No.	Name of Thodu
1.	Vadasseri Poyka Neerchal(850m)
2.	Ambattukadavu Neerchal (1800m)
3.	Kannakulangara Neerchal(1425m)
4.	Pullithode-Pattukulam Neerchal(800m)
5.	Venmalil Neerchal(1250m)
6.	Poozhikolil chal (800m)
7.	Kodurar(1250m) 288-294,321-294,309-295,297-301,290-91
8.	335 - Kannankulangara - Eravinelloor
9.	Parakkalkadavuthode -
10.	Ottathekkil - Eramallur thode - 437

11.	Vettuvallikadavu Manalumbhagam Chira thode -
12.	Nallakkulam Padam Thode
13.	Kottarathilkadavu-Eramalloor
14.	Kotturam-Ottathaikkal
15.	Eravinalloor Kalunk
16.	Kaithod Vaypukara Chira

Ponds

Sl. No.	Name of Pond
1	Parakkulam
2	Kothakulangara Kshethra Kulam
3	Theeruthi pond
4	Paykkal pond
5	Pothukulam
9	Thamarasseri Parambu
10	Mecheril Raman Nair Pond
11	Mattathil Madhu Pond

Landuse

Agriculture is one of the prime activities in the watershed area. The major land use category mapped in the watershed area is mixed crops. Mixed crops are the typical homestead cultivation of Kerala where in the different horticultural crop species are grown together that cannot be spatially mapped separately. In this watershed mixed crops mainly includes coconut based farming intercropped with arecanut, banana and nutmeg along with other crop species. It occurs in an area of 65.93 Ha (22.86%). An area of 80.74 ha of paddy lands are left as cultivable waste land which is along the valley portions of the watershed. This is mapped in an area of 80.74 Ha(28 %). An area of 45.70 ha is under paddy lands and an area of 19.19 ha paddy lands are converted to garden land to cultivable other horticulture crops. An area of 108.51 Ha mapped as cultivable wasteland can be brought to paddy cultivation by providing necessary labour and irrigation facilities. The details of the landuse categories with spatial extent are given in table.

Sl. No.	Particulars	Area(ha)	Percentage (%)
1	Paddy - Mundakan	7.71	2.67
2	Paddy - Puncha	39.69	13.76
3	Paddy converted to Mixed crops	7.41	2.57
4	Paddy converted to Rubber	11.78	4.08
5	Paddy - Cultivable Waste Land	80.74	28.00
6	Coconut	3.54	1.23
7	Mixed crops	65.93	22.86
8	Mixed trees	17.75	6.15

9	Plantation Rubber	36.77	12.75
10	Plantation Teak	3.17	1.10
11	Waste land	0.35	0.12
12	Waterbody	13.56	4.70
	Total	288.40	100.00

Geology

The major geological unit in the micor watershed is Sand & Silt extending to an area of 263.62 ha (91.41 % of TGA). Charnockite also exist in the watershed and it is seen in an area od 11.22 ha. The details of geological units with spatial extent in the micor watershed are given in the table.

Sl. No.	Particulars	Area (Ha)
1	Charnockite	11.22
2	Sand & Silt	263.62
3	Waterbody	13.56
	Total	283.85

Geomorphology

There are three geomorphological units in the watershed area of which 117.94 ha (41.55 %) area falls under the category lower plateau (lateritic). An area of 156.34(55.07%) is mapped under valley fill. The details of geomorphology in the watershed area with spatial extent are given in the table.

Sl. No.	Particulars	Area (Ha)
1	Valley fill	156.89
2	Lower Plateau	117.95
3	Water body	13.56
	Total	283.85

Soils

The major soil series mapped in the watershed area is Paddy series having a solum thickness of more than 150 cm. These soils are developed from coastal alluvium and occur in nearly level to very gentle slope (0-3%) having brown to dark brown colour. The soils are very deep, fine loamy textured to clay textured, imperfectly drained, none to slight water erosion, well managed soils. This is distributed in an area of 154.58 ha (53.60 %). The major upland series is Kalimala which is mapped in an area of 113.23 ha. Soils in more than half of the watershed area (56.04 %) are very deep soils with a depth of moe than 150 cm and 39.26 % of the area (113.23 ha) is having deep soils with a depth of 100 - 150 cm. The major surface soil textures in the watershed area constitutes that of clay loam (113.23 ha) and clay (154.58 ha). Nearly 40 % of the watershed area is prone to

severe soil erosion which calls for proper soil and water conservation measures in the area.

Capacity Building/Trainings

Extensive training programmes and user interaction meetings were organized for the stake holders as part of the preparation of detailed project report. The details are given below:

No.	Training	Participants
1.	Block level awareness training	Elected representatives of three tier
2.	Block level orientation training	Elected representatives and ADS chairpersons
3.	Training on Base line survey	Two facilitators from NHG.
4.	Training on Drainage line treatment	Elected representatives and one facilitator from NHG.
5.	Focus Group Discussion	Elected representatives, Presidents and Secretaries of the NHGs, ADS chairpersons and MGNREGS labour groups and progressive farmers
6.	Entry point activity finalization	Elected representatives, Vice Presidents and Joint Secretaries from NHG, ADS chairpersons and MGNREGS labour groups.

Watershed Committee

Watershed Committee is constituted by Gram Sabha to implement the watershed project with technical support of WDT in the panchayat. Watershed committees are formed following the parameters of watershed committee, keeping the gender sensitive issues intact. Watershed committee members are briefed about the project objectives and a workshop is also conducted in this regard at every panchayat. The watershed committee has a pivotal role to play during and after the project implementation period.

The details of Watershed Committee for Parakkalkadavu watershed is given below:

Table No. 17.6 -Details of Watershed Committee for Parakkalkadavu watershed

Sl. No:	Name	Phone No:
1.	Smt. Sasikala Devi (Puthupally Panchayath President)	9496044700
2.	Sri. Arun (VEO)	9946669859
3.	Sri.P. Sunil kumar (Member ward 15)	9447827183
4.	Sri. Abraham Chacko (Member ward 14)	9846816971
5.	Smt. Valsamma Mani (Member ward 16)	9605841609
6.	Sri. Mathew P.V. (SHG Member) Ward 15	8089180724

7.	Sri. K. A. Gopalakrishnan (SHG Member) Ward 15	9495 111667
8.	Sri. Prasannan N.R. (SHG Member) Ward 14	9446757801
9.	Sri. Scariakutty (SHG Member) Ward 14	9447847208
10.	Smt. Alice John (SHG Member) Ward 16	9526889124
11.	Smt. Ponnamma Nandan (SHG Member) Ward 16	
12.	Smt. Indhu K. Thomas (WDT Member)	
13.	Sri. Suresh Babu (SC Representative) Ward 15	9747981358
14.	Sri. Rahul M.R. (ST Representative)Ward 15	
15.	Smt. Kunjumol(Lady Representative)	9656770438
16.	Sri. Biju John (Landless Representative)	9526889124

Neighbour hood Groups

Neighbour hood Groups are constituted in the watershed area combining 40 to 50 adjacent households which are living in a cluster. These are further subdivided into seven sub groups and one person from each subgroup is selected to the Neighbour hood Group Committee. These seven members formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is lady. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. These Committees are registered with the concerned Grama Panchayat. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

The details of the NHG Committees in Parakkalkadavu watershed is as follows:

Table No. 17.7 -Details of the NHG Committees in Parakkalkadavu watershed

Sl. No.	Panchayat	Ward	NHG No.
1	Puthupally	Ward 14	3
2	Puthupally	Ward 15	7
3	Puthupally	Ward 16	3

Self Help Groups

In addition to this, the existing Self Help Groups formed under the Kudumbasree Mission and other SHGs which are performing at a satisfactory level will be promoted to take various programmes under the Livelihood activities and Production Systems and Micro enterprises. If required, additional SHGs will also be formed in the watershed area in the coming years.

Activities proposed

Based on the series of discussions held with the different stakeholders the following activities are suggested for the micro watershed.

Table No. 19.8 -Details of activities proposed

Puthupally Grama Panchayat**Desiltation of Drains**

Sl.No.	Name of Thodu
1	Vadasseri Poyka Neerchal(850m)
2	Ambattukadavu Neerchal (1800m)
3	Kannakulangara Neerchal(1425m)
3	Pullithode-Pattukulam Neerchal(800m)
4	Venmalil Neerchal(1250m)
5	Poozhikolil chal (800m)
6	Kodurar
7	335 - Kannankulangara - Eravinelloor
8	Parakkalkadavuthode -
9	Ottathekkil - Eramallur thode - 437
10	Vettuvallikadavu Manalumbhagam Chira thode -
11	Nallakkulam Padam Thode
12	Kottarathilkadavu-Eramalloor
13	Kotturam-Ottathaikkal
14	Eravinalloor Kalunk
15	Kaithod Vaypukara Chira

Vegetive Protection

Sl. No.	Location
1	Parakkalkadavuthode -
2	Ottathekkil - Eramallur thode - 437
3	Vettuvallikadavu Manalumbhagam Chira thode -
4	Nallakkulam Padam Thode
5	Kottarathilkadavu-Eramalloor
6	Eravinalloor Kalunk-Kaithod Vaypukara Chira
7	Kannamkulangara - Eravinelloor
8	Kotturam-Ottathaikkal
9	Eravinalloor Kalunk-Kaithod Vaypukara Chira
10	Parakkalkadavuthode -
11	Ottathekkil - Eramallur thode - 437
12	Vettuvallikadavu Manalumbhagam Chira thode -

Side Wall Protection

Sl. No.	Location
1	Vettuvallikadavu Manalumbhagam Chira thode -
2	Nallakkulam Padam Thode
3	Kottarathilkadavu-Eramalloor
4	Eravinalloor Kalunk-Kaithod Vaypukara Chira
5	Thevarkkara-Puthuvally

6	Kannamkulangara - Eravinelloor
7	Kotturam-Ottathaikkal
8	Eravinalloor Kalunk-Kaithod Vaypukara Chira
9	Ozhikkattukadavu-Thevarkari

Chal Restoration (Vaachal Clearing)

Sl. No.	Location
1	Kottarathil Kadavu- Survey no. 419, 418, 416
2	Malayakeri Thekkumbhagam Padam – Survey no. 443, 442, 440, 439, 436, 431, 429, 432, 433, 434
3	Paddy field near Kodurar - Erikkattu Padasekharam - Survey no. 418, 419, 416
4	Eravinelloor - Kannankulangara vaachal
5	Moolakonam Padasekharam (200m) - Survey no. 285, 289, 290
6	Parakkalkadvau near bridge (3m)
7	Survey no. 269
8	Eramalloor - Parakkal kadavu vaachal near transformer - Survey no. 269, 281
9	Survey no. 437-50m length, Survey no. 438-30 m length
10	Survey no. 241/26, 27, 13, 7, 26
11	Kuzhithadam Padasekharam vaachal - between Survey no. 245 &- 246 & 250, 247&248, 250&250, 254&253
12	Kottarathilkadavu - Chemmarapally road - vaachal clearing near Puthupally Eramalloor culvert
13	Survey no. 438 - Vaachal clearing and culvert repair
14	Parakkal Kadavu Kaithode
15	Kannamkulangara - Eravinelloor
16	Thekkadath region
17	Kottarathilkadavu-Ervinelloor
18	Thevarkkara-Puthuvally
19	VettuvalaAlikkadavu-Malekkari Vachal
20	Thaikkodathi Kadavi-Abi Kalunk

Earthen bunds

Sl. No.	Location
1	Puthpally padasekharam
2	Eravinelloor Padasekaram
3	Mulakonam Padasekharam
4	Kuzhithadam Padaasekharam
5	Thekkumbhagam pad asekharam
	Survey no. 309, 339, 321, 322, 323
	Survey no. 350, 304

	Survey no. 235, 239, 245, 246, 247, 24,8
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Paddy Rejuvenation

Sl. No.	Location
1	Malayakeri Thekkumbhagam Padam – Sy. nos 443, 442, 440, 439, 436, 431, 429, 432, 433, 434
2	Thevarkari Padam – Sy. nos 410, 413, 414, 407, 406, 404, 401 Single crop to Double crop
3	Moolakonam Padam – Sy. nos 285, 286, 289, 290, 291, 321
4	Kuzhithadam Padama – Survey no. 242, 243, 244, 246, 247, 245, 252, 250, 249, 248
5	Survey no. 304, 305, 339, 309
6	Survey no. 236, 235, 233
7	Eravinelloor Mulasekharam (Mulakonam) Padasekharam
8	Puthupally Padasekharam

Outer Bunds

Sl. No.	Location
1.	Survey no. 269,255,254
2.	Survey no. 252,245,244,243,241 – Kuzhithadam Padam
3.	Survey no. 297, 296, 293, 292, 291,300, 301-Moolakkonam
4.	Survey no. 290, 289, 285, 84 Moolakkonam –Upper stretch
5.	Eramallor kizhakkum bhagam
6.	Survey no. 443, 437, 436, 419,
7.	Survey no. 233, 23,5 236

Stream Bank Protection

Sl. No.	Location
1	Survey no. 236,235,233,443,437,436, 416,412
2	Survey no. 410, 413, 407, 404, 401, 400, 398,397, 394, 306, 30,5 304, 303
3	Survey no. 30,0 301, 297, 296, 293, 292, 291, 290, 289, 285
4	Survey no. 284, 283, 282, 254, 252, 244, 243, 242, 241, 240

Brushwood Bunding

Sl. No.	Location
1	Moolakonam Padasekharam (200m) - 285,289,290
2	Parakkalkadvau near bridge (3m)
3	Survey no. 292, 293
4	Survey no. 404, 407
5	Survey no. 411, 412
6	Survey no., 436

Gully Plugging

Sl. No.	Location
1	Ottathekkil - Eramallur thode - 437
2	Vettuvallikadavu Manalumbhagam Chira thode -
3	Nallakkulam Padam Thode
4	Kottarathilkadavu-Eramalloor

Geo textiles

Sl. No.	Location
1	Kampakamthattu
2	Parakkal kadavu
3	Kalluvarikunnu
4	Kalimala kunnu
5	Laksham veed
6	St.Thomas School
7	Kannamkulangara - Eravinelloor

Pond Desiltation

Sl.No.	Name of Pond
1	Parakkulam
2	Kothakulangara Kshethra Kulam
3	Theeruthi
4	Paykkal
5	Pothukulam
9	Thamarasseri Parambu

Edachal Reneration

Sl. No.	Location
1	Puthpally padasekharam
2	Eravinelloor Pada
3	Mulakonam Pad
4	Kuzhithadam Pada
5	Thekkumbhagam
6	Thekkadath
7	Survey no. 443, 442, 440, 430, 431, 429
8	Survey no. 439, 436, 437, 439, 443
9	Survey no. 418, 419, 416, 417
10	Survey no. 254, 269

Stone Pitched Bunds

Sl. No.	Location
1	Survey no. 328, 329, 330, 331,332
2	Survey no. 339, 272, 264, 265

Rain Water Harvesting

Sl. No.	Location
1	Parakkal Kadavu
2	Kallurikunnu
3	Kalimala kunnu

Rain Pits

Sl. No.	Location
1	Pulimoottil Parambu
2	Thamarasseri Parambu
3	Survey no. 233
4	Survey no. 340 316 313
6	Survey no. 303,319,321,322
7	Survey no. 233 ,234
8	Survey no. 284,283

Minor Fruit Tree Planting

Sl. No.	Location
1	Survey no. 322,276,270,268
2	Survey no. 258,250, 234, 230
3	Survey no. 312,311, 336,337,342
4	Survey no. 340,341,342, 290,283,321
5	Survey no. 322,276,270,268
7	Survey no. 312,311, 336,337,342
8	Survey no. 340,341,342,290,283,321
9	Survey no. 322,276,270,268

Centripetal terrace

Sl. No.	Location
1	Survey no. 340, 34,1 34, 2, 313, 374, 283
2	Survey no. 350, 304
3	Survey no. 303, 321, 322
4	Survey no. 323, 324, 284, 283
5	Survey no. 282
6	Survey no. 312, 316, 313
7	Survey no. 339, 340, 341, 342
10	Survey no. 235, 239, 245, 246, 247, 248

Crop demonstration

Sl. No.	Crop
1	Garcinia Seedings
2	Betel Vine
3	Nelli, Njavel, -
4	Clove, nutmeg

5	Rambutan
6	Agathi cultivation
7	Anthurium
8	Orchid
9	Heliconia

Other NRM works

No.	Activity	Location
1	Public Well Cleaning	Laksham veedu colony
2	New Pond Digging	Thamarasseri Parambu Pond Karothukadav
4	Drinking Water	Kampakamthattu Parakkal kadavu Kalluvarikunnu Kalimala kunnu Laksham veed St.Thomas School Thamarasseri Parambu, Pulimoottil Parambu Kannamkulangara - Eravinelloor
5	Agrostological measures	Kannamkulangara - Eravinelloor - Vetiver
6	Banana cultivation	Survey no.304, 303, 319, 321,
		Survey no. 322 ,323, 324, 329, 284, 283,
		Survey no. 282, 312, 314, 316
		Survey no. 239, 245, 246, 247, 248
7	Pipe compost	Survey no. 272, 324, 339, 276, 423, 238, 271, 426
8	Recharge of wells	Thamarasseri Parambu, Pulimoottil Parambu
9	Coconut - crop improvement	Survey no. 316. 315. 313. 312. 310. 311
		Survey no. 241, 240, 239, 237, 238, 234, 250, 258, 267, 263, 239, 245, 246, 247, 248
10	Pepper crop improvement	Survey no. 425, 424, 423, 422, 339, 238
11	Vegetable cultivation	Survey no. 496, 495, 499, 494, 418, 419, 420, 416, 322, 323, 324, 326, 329, 284, 283, 282, 368, 367, 364, 312 to 316
		Sy. Nos. 239, 235, 250, 230, 229, 263, 266, 267, 265, 271
12	Pineapple Cultivation	Survey no. 264, 322, 320, 575, 329, 274, 339, 272, 227, 228, 225, 224, 422
14	Intercropping	Laksham veed Colony (ward 15) 20 households Kuzhithadam

15	Waste land development	Survey no. 263, 264, 265
16	Flori culture	Survey no. 440, 441, 439, 436
17	Shutters	Survey no. 337, 311
18	Medicinal plants	3 nos in Laksham veedu colony
19	Public well	Thuruthi colony
21	Avenue Tree Planting	Survey no. 258, 250, 234, 325, 312, 311, 336, 337, 342, 340, 341, 342, 290, 283, 321
		Parakkalkadvau near bridge (3m) 269, 280, 279, 281, 278 Eramalloor - Parakkal kadavu vaachal near transformer - 269, 281, 277
22	Check Dam	Survey no. 416 ,419, 418
23	Vegetable Cultivation	Survey no. 339. 316. 315. 313. 312. 310. 311, 241, 240, 239, 237, 238, 234, 250, 258, 267, 266, 263, 239, 245, 246, 247, 248 425, 424, 423, 422, 339, 238
24	Mulching	Survey no. 316. 315. 314. 313. 312. 310. 311,
25	Fodder	All upland survey numbers
26	Grow bags	All upland survey numbers

Budget

The distribution of budget for Parakkalkadavu micro watershed for the various components as per IWMP guidelines is given below:

Table No. 17.9 - Budget for Parakkalkadavu micro watershed

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	3,40,620
2.	Monitoring	1	34,062
3.	Evaluation	1	34,062
Preparatory phase			
4.	Entry point activities	4	1,36,248
5.	Institution and capacity building	5	1,70,310
6.	Detailed Project Report	1	34,062
Watershed works phase			
7.	Natural Resources Conservation works	56	19,07,472
8.	Livelihood activities for asset less	9	3,06,558
9.	Production system and micro enterprises	10	3,40,620
10.	Consolidation phase	3	1,02,186
	Total	100	34,06,200

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.10.1 -Sector-I- Natural Resources Conservation and Management - Ist Year Plan

	Puthupally Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Extension of paddy cultivation	ha	63538	10	127076	508304	12708	635380
2	Avenue tree planting	no	160	500		80000		80000
3	Banana cultivation	10cent	16800	5		84000		84000
4	Vegetable grow bags	no	1200	150	45000	135000	4500	180000
5	Desiltation of drains	10m3	485.85	1300		631605		631605
6	Desiltation of ponds	10 m3	649	250		162250		162250
7	Centripetal terracing	no	46	1000		46000		46000
8	Earthen bunds	rm	27	1000		27000		27000
9	Geotextiles	m2	191	200	38200		3820	38200
10	Side wall protection of ponds	10m3	2317	250		579250		579250
11	Moisture Collection Pits	no	30	200		6000		6000
12	Well recharging	no	5500	20	27500	82500	2750	110000
					237776	2341909	23778	2579685

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.10.2 -Sector-I- Natural Resources Conservation and Management –IInd Year Plan

No.	Puthupally Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Medicinal garden in public institutions	5 cent	4279	3	12837		12834	12837
2	Vegetable garden in schools	25 cent	7500	1	7500		750	7500
3	Extension of paddy cultivation	ha	63538	10	127076	508304	12708	635380
4	Cultivation of fodder crops	10 cent	5000	5		25000		25000
5	Avenue tree planting	no	160	500		80000		80000

6	Tuber crop cultivation	10 cent	5500	10		55000		55000
7	Banana cultivation	10cent	16800	10		168000		168000
8	Fruit tree planting	25 cent	7850	2		15700		15700
9	Crop demonstration - vegetable (pandal type)	25 cent	15000	5	37500	37500	3750	75000
10	Crop demonstration - vegetable (non-pandal type)	25 cent	7500	5	18750	18750	1875	37500
11	Crop demonstration - horticultural crops	no	10000	25		250000		250000
12	Vegetable grow bags	no	1200	300	90000	270000	9000	360000
13	Intercropping in coconut gardens	10 cent	5500	25		137500		137500
14	Desiltation of drains	10m3	485.85	1500		728775		728775
15	Desiltation of ponds	10 m3	649	250		162250		162250
16	Centripetal terracing	no	46	1500		69000		69000
17	Vetiver planting	rm	35	1500		52500		52500
18	Earthen bunds	rm	27	1000		27000		27000
19	Chal restoration/vachal clearing	10m3	898	750	168375	505125	16838	673500
20	Mulching	no	28	1000		28000		28000
21	Agrostological measures	10m	710	1000		710000		710000
22	Cover crops in rubber plantation	50 cent	450	10		4500		4500
23	Construction of edachal	100m	1093	500		546500		546500
24	Brush wood bunding	m	548	500		274000		274000
25	Geotextiles	m2	191	200	38200		3820	38200
26	Outer bund strengthening of paddy fields	300m	437	900		393300		393300
27	Planting of bamboo seedlings	no	34.65	600		20790		20790
28	Embankment protection of drains	500m	4500	250		1125000		1125000
29	Side wall protection of drains (engineering)	m2	2400	200		480000		480000

30	Construction of shutters	no	45000	4	45000	135000	4500	180000
31	Repair of existing shutters	no	25000	6	37500	112500	3750	150000
32	Construction of new ponds	no	45000	1	22500	22500	2250	45000
33	Rain water harvesting structure	no	330000	1		330000		330000
34	Moisture Collection Pits	no	30	200		6000		6000
35	Renovation of public wells	no	24000	2		48000		48000
36	Well recharging	no	5500	20	27500	82500	2750	110000
37	Silpaulin tanks	no	3120	2	6240		624	6240
38	Mini drinking water scheme	no	267000	2		534000		534000
39	Biogas (0.5 m3)	no	8500	30	63750	191250	6375	255000
40	Pipe compost	no	900	40	5400	30600	540	36000
					708128	8184844	70813	8892972

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.10.3 -Sector-I- Natural Resources Conservation and Management –IIIrdYear Plan

No.	Puthupally Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Extension of paddy cultivation	ha	63538	10	127076	508304	12708	635380
2	Cultivation of fodder crops	10 cent	5000	5		25000		25000
3	Avenue tree planting	no	160	500		80000		80000
4	Tuber crop cultivation	10 cent	5500	10		55000		55000
5	Banana cultivation	10cent	16800	5		84000		84000
6	Fruit tree planting	25 cent	7850	2		15700		15700
7	Crop demonstration - vegetable (pandal type)	25 cent	15000	5	37500	37500	3750	75000
8	Crop demonstration - vegetable (non-pandal)	25 cent	7500	5	18750	18750	1875	37500
9	Crop demonstration - horticultural crops	no	10000	25		250000		250000

10	Vegetable grow bags	no	1200	300	90000	270000	9000	360000
11	Intercropping in coconut gardens	10 cent	5500	25		137500		137500
12	Desiltation of drains	10m3	485.85	1500		728775		728775
13	Vetiver planting	rm	35	1000		35000		35000
14	Chal restoration/vachal clearing	10m3	898	750	168375	505125	16838	673500
15	Mulching	no	28	1000		28000		28000
16	Agrostological measures	10m	710	1000		710000		710000
17	Cover crops in rubber plantation	50 cent	450	10		4500		4500
18	Construction of edachal	100m	1093	500		546500		546500
19	Brush wood bunding	m	548	600		328800		328800
20	Outer bund strengthening of paddy fields	300m	437	900		393300		393300
21	Planting of bamboo seedlings	no	34.65	600		20790		20790
22	Embankment protection of drains	500m	4500	250		1125000		1125000
23	Side wall protection of drains (engineering)	m2	2400	200		480000		480000
24	Construction of shutters	no	45000	4	45000	135000	4500	180000
25	Repair of existing shutters	no	25000	6	37500	112500	3750	150000
26	Construction of new ponds	no	45000	1	22500	22500	2250	45000
27	Rain water harvesting structure	no	330000	1		330000		330000
28	Renovation of public wells	no	24000	4		96000		96000
29	Well recharging	no	5500	20	27500	82500	2750	110000
30	Silpaulin tanks	no	3120	2	6240		624	6240
31	Mini drinking water scheme	no	267000	2		534000		534000
32	Biogas (0.5 m3)	no	8500	30	63750	191250	6375	255000
33	Pipe compost	no	900	40	5400	30600	540	36000
					649591	7921894	64959	8571485

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.10.4 -Sector-I- Natural Resources Conservation and Management –IVth Year Plan

No.	Puthupally Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Extension of paddy cultivation	ha	63538	10	127076	508304	12708	635380
2	Tuber crop cultivation	10 cent	5500	20		110000	0	110000
3	Banana cultivation	10cent	16800	5		84000	0	84000
4	Fruit tree planting	25 cent	7850	2		15700	0	15700
5	Crop demonstration - vegetable (pandal type)	25 cent	15000	5	37500	37500	3750	75000
6	Crop demonstration - vegetable (non-pandal type)	25 cent	7500	5	18750	18750	1875	37500
7	Crop demonstration - horticultural crops	no	10000	25		250000	0	250000
8	Vegetable grow bags	no	1200	300	90000	270000	9000	360000
9	Intercropping in coconut gardens	10 cent	5500	25		137500	0	137500
10	Vettiver planting	rm	35	1000		35000	0	35000
11	Mulching	no	28	1000	0	28000	0	28000
12	Cover crops in rubber plantation	50 cent	450	10	0	4500	0	4500
13	Renovation of public wells	no	24000	2		48000	0	48000
14	Well recharging	no	5500	20	27500	82500	2750	110000
15	Silpaulin tanks	no	3120	2	6240		624	6240
16	Pipe compost	no	900	40	5400	30600	540	36000
					312466	1660354	31247	1972820

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.11.1 -Sector-II- Livelihood Support system for landless/ assetless - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
A	Enterprising individuals (10 %)						
1	Malabari Goat rearing	No.	10500	4	28000	14000	42000
2	Backyard Poultry	No.	1500	4	3000	3000	6000
	Total				31000	17000	48000

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.11.2 -Sector-II- Livelihood Support system for landless/ assetless- IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation		25000	2	40000	10000	50000
2	Bush Jasmine		20000	1	16000	4000	20000
3	Lease land nendran cultivation		15000	1	12000	3000	15000
4	Mushroom		10000	2	16000	4000	20000
	Total				84000	21000	105000

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.11.3 -Sector-II- Livelihood Support system for landless/ assetless- IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation		25000	2	40000	10000	50000
2	Bush Jasmine		20000	1	16000	4000	20000
3	Lease land nendran cultivation		15000	2	24000	6000	30000
4	Mushroom		10000	3	24000	6000	30000
	Total				104000	26000	130000

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.11.4 -Sector-II- Livelihood Support system for landless/ assetless- IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
C	Major livelihood activities (30 %)						
1	Malabari Goat rearing	Nos.	105000	1	52500	52500	105000
2	Pisciculture	Nos.	84000	1	42000	42000	84000
	Total				94500	94500	189000

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.12.1 -Sector-III- Production system and Microenterprises - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Backyard Poultry	Nos.	1500	10	7500	7500	1350	15000
2	Ordinary Compost	Nos.	8000	6	30000	18000	5400	48000
	Total			16	37500	25500	6750	63000

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

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.11.2 -Sector-III- Production system and Microenterprises –IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Ordinary Compost	Nos.	8000	6	30000	18000	5400	48000
2	Nendran Banana Cultivation	Nos.	34000	6	60000	144000	10800	204000
3	Vermi Compost	Nos.	18000	6	60000	48000	10800	108000
	Total			18	150000	210000	27000	360000

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

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.12.3 -Sector-III- Production system and Microenterprises –IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Nendran Banana Cultivation	No.s	34000	3	30000	72000	5400	102000
2	Vermi Compost	No.s	18000	4	40000	32000	7200	72000
3	Cow rearing	No.s	35000	2	30000	40000	5400	70000
	Total			9	100000	144000	18000	244000

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

Parakkalkadavu Watershed (12M39o) - Action Plan

Table No. 19.12.4 -Sector-III- Production system and Microenterprises –IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
5	Cow rearing	No.s	35000	3	45000	60000	8100	105000
	Total			3	45000	60000	8100	105000

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

MICRO WATERSHED BASED ACTION PLAN

ERAYILKADAVU MICRO WATERSHED (12M39p)

Erayilkadavumicro watershed is fifth largest micro watershed in the IWMP cluster (IWMP-III) with a total treatable area of 406.75 ha (7.97% of total geographical area). This micro watershed is spread over five wards in Panachikkad Grama Panchayath of Pallom Block Panchayath. The total project area comes to 444.22 ha of which the total treatable area is 406.75 ha

General Description

Name of micro watershed	: Erayilkadavu
Micro watershed code	: 12M39p
River basin	: Meenachil
District	: Kottayam
Block Panchayath	: Pallom
GramaPanchayath	: Panachikad
Villages	: Nattakom, Panachikad
Latitude	: 9°33'9.7" to 9°34'11" North
Longitude	: 76°31'45.5" to 76°33' 25.5" East
Wards	: Panachikkad Panchayat – 1, 2, 3, 23 (full) and 22 (part)
Total area	: 444.22 ha
Total treatable area	: 406.75 ha
% of area in the IWMP cluster	: 7.97 %

Methodology

In line with the guidelines of IWMP, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Training Coordinators were engaged at project level for organizing the series of trainings at Block and Grama Panchayat levels.
5. Overseers were engaged for taking field estimates of the proposed activities.
6. Induction training was given for the project staff on PRA techniques, concept of maps and Resource Mapping.

7. Printed posters, banners and notices for providing wide publicity regarding the programme.
8. Two block level seminars were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
9. This was followed by orientation seminars at GramaPanchayats.
10. Conducted transect walk with ward members and ADS.
11. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
12. NHGs were formed at grass root level comprising of 40 to 50 neighbouring households.
13. Panchayat Level Watershed Committees were convened at Grama Panchayats for finalizing the modalities of work.
14. Trainer's training for base line survey were conducted for two facilitators from each Neighbour Hood Group
15. Predefined questionnaire was prepared for data collection from each household.
16. A block level seminar was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented by concerned Grama Panchayat Presidents.
17. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map with the help of the facilitators selected from the NHGs.
18. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
19. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of NHGs and accordingly present land use map is prepared using different notions and symbols.
20. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
21. Panchayat Level Watershed Committees were convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
22. Trainer's training for taking people's estimates and consolidation of project proposals. This was organized at Grama Panchayat and NHG level. Elected representatives, ADS Chairpersons, Officer bearers of NHGs, MGNREGS officials, etc. attended this training. The information gathered on soil and water

conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activities to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalized. The livelihood action plan and the activities under production system were also consolidated.

23. The suggestions were split for four years and four separate annual plans were also prepared.
24. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
25. Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal terracing, earthen and stone pitched contour bunding, outerbund strengthening, water logging prevention, vegetative barriers etc.
 - Rain water harvesting activities like farm ponds, sil paulin tanks, check dams etc.
 - Enhancement of paddy cultivation through area expansion in cultivable paddy fallows.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Scientific waste management practices like vermi compost, biogas, pipe compost and solid waste management units.
 - Protection of water sources like streams, ponds, drains etc.
 - Crop improvement practices and crop demonstrations.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - Encouragement of self sufficiency in vegetable production through vegetable gardens and grow bags.
 - Encouraging natural regeneration including fodder cultivation.
 - Promotion of agro-forestry and horticulture
 - Capacity building and creation of a greater degree of awareness among the participants.
 - Encouraging people's participation with the involvement of NHGs.
 - Livelihood activities for asset less people
 - Production system and Micro enterprises

SWOT Analysis 12M39p					
No.	Area	Strengths	Weakness	Opportunities	Threats
1	Agriculture	191.99 ha of paddy cultivable waste lands poses the scope of increasing paddy cultivation in the watershed area	2.64 hectare of paddy land converted for banana and other mixed crops. Lack of skilled labour for transplanting, harvesting paddy.	Active padasekhara samithees interested in taking up paddy cultivation in the cultivable fallows.	Water intrusion due to weak outer bunds
2	Horticulture	40% of the total area of watershed under coconut based farming system with intercrops such as arecanut plantain, nutmeg tuber crops ginger turmeric and pepper.	Lack of skilled labour for plant protection, harvesting coconut, arecanut, staking nendran banana, insitu budding of nutmeg, tapping of rubber	Area expansion for plantain varieties and rejuvenation of pepper. Skilled labour group for insitu budding nutmeg, plant protection, tapping, coconut climbing.	More horti culture lands under the pressure of conversion to human dwellings
3	Animal Husbandry	Cattle rearing as major lively hood by many small and marginal farmers. Backyard poultry taken up as subsistent farming by majority of inhabitants. Accessibility to milk collection centres	Lack of availability of fodder. Lack of sufficient infrastructure for rearing cattle in a scientific manner.	Cattle rearing major lively hood by many women. Scope for increasing backyard poultry as part of production system. Scope for cultivation of fodder as intercrop in coconut garden and common lands.	Cattle rearing cannot be taken up as group enterprise due to lack of sufficient space for construction of the shed.

4	Natural Resources	70% of area of watershed lie below 20m MSLand belongs to the category of geomorphology valleyfill where the slope is gentle and soil is deep and texture is clayey.	30% of area of watershed, the topography is undulating and slope moderate. Subject to erosion hazards. In the valley portion, breach of bunds, flooding	Area treatment with suitable soil and water conservation measures such as contour bunding and terracing in medium slopes, mulching, cover cropping, water harvesting measures such as staggered trenches and pits. Embankment protection of river by vegetative measures. As part of drainage line treatment, strengthening of field bunds (VARAMBU) Stream bank protection of thodu, desiltation and restoration of field channels.	Sand mining from river adversely affecting the water table and water quality.
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Biophysical Resources

Relief

The relief of the watershed ranges from MSL up to 60 m above MSL. Majority of the land falls in the relief category of 0 – 20 m above MSL which covers an area of 339.09 ha (76.33 %). An area of 97.36 ha is located in the range of 20 - 40 m above MSL. The details of the relief with spatial extent in the watershed area are given in the table.

Sl. No.	Relief (M)	Area (Ha)
1	0-20 m above MSL	339.09
2	20-40 m above MSL	97.36
3	40-60 m above MSL	7.77
	Total	444.22

Slope

The watershed area is divided into four categories of slope classes. The majority of area is having nearly level to very gentle slope with 0-3 % slope. This category spreads over an area of 246.44 ha (55.48%). 95.98 Ha area of this microwatershed is having moderately sloping lands with 5 to 10 percent slope. The details of the slope with spatial extent in the watershed are given in the table.

Sl. No.	Slope	Description	Area (Ha)
1	0-3 percent	Very gentle slope	246.44
2	5-10 percent	Moderately sloping	95.98
3	10-15 percent	Strongly sloping	63.03
4	15-35 percent	Moderately steep to steep	24.82
5	Waterbodies	Waterbodies	13.95
	Total		444.22

Drains

The Meenachil River, flowing through the northern boundary of the watershed, is the major drain of this watershed. The details of the drains and ponds in the watershed area are given in table.

Sl. No.	Name of Thodu
1	Idungadi Thodu
2	Pudukkulamchira Thodu
3	Kaithakkadu parakkulam Thodu
4	Kadanchira Thodu
5	Ereyil kadavu thodu
6	Kuruvikkadu Thodu
10	Kallunkal kadav - Pachira thode
11	Punnakkal Thodu
12	Pathil Thodu

13	Kaithakade Thodu
14	Kulachankal thodu
19	Pakkilchira thode -

Ponds

Sl. No.	Name of Pond
1	Kadanchira parakkulam
2	Kaithakkadu parakkulam
3	Idungadi parakkulam
4	Keedankutti parakkulam
5	Kochakkara parakkulam
6	Plappara parakkulam

Landuse

Agriculture is one of the prime activities in the watershed area. The major landuse category mapped in the watershed area is mixed crops which are the typical homestead cultivation of Kerala where in the different horticultural crop species are grown together that cannot be spatially mapped separately. In this watershed, mixed crops mainly includes coconut based farming intercropped with arecanut, banana and nutmeg along with other crop species. It occurs in an area of 164.20 Ha (43.22%). The second major category is under rubber which occurs in an area of 59.86 ha. An area of 191.99 ha of paddy land is left as cultivable wasteland due to the problems of labour and drainage issues. This can be brought under cultivation with the convergence of activities. Very small area of paddy land is converted to garden land to cultivable other horticulture crops.. An area of 0.57 Ha is mapped as cultivable wasteland which can be brought under horticulture. The details of the landuse categories with spatial extent are given in table.

Sl. No.	Particulars	Area (Ha)	Percentage (%)
1	Built up Land	3.06	0.69
2	Paddy converted to Coconut	1.16	0.26
3	Paddy converted to Mixed crops	1.62	0.36
4	Paddy - Cultivable Waste Land	191.99	43.22
5	Mixed crops	164.20	36.96
6	Mixed trees	3.71	0.84
7	Plantation Rubber	59.86	13.48
8	Railway line	2.59	0.58
9	Road	1.51	0.34
10	Cultivable Waste Land	0.57	0.13
11	Waterbody	13.95	3.14
	Total	444.22	100.00

Geology

The major geological unit in the micro watershed area is Charnockite group of rocks extending to an area of 293.53 ha (66.08%). Sand & Silt also exist in the watershed. An area of 136.74 ha (30.78 %) is mapped under this unit. The details of geological with spatial extent in the watershed are given in the table.

Sl. No.	Particulars	Area (Ha)
1	Charnockite	293.53
2	Sand & Silt	136.74
3	Waterbodies	13.95
	Total	444.22

Geomorphology

There are two geomorphological units in the watershed area of which 200.06 ha (45.04 %) area falls under the category lower plateau (lateritic). An area of 230.21 (51.82 %) is mapped under valley fill. The details of geomorphology in the watershed area with spatial extent are given in the table.

Sl. No.	Particulars	Area (Ha)
1	Valley fill	230.21
2	Lower Plateau	200.06
3	Water bodies	13.95
	Total	444.22

Soils

The major soil series mapped in the watershed area is Paddy series. It is a wetland series which is alluvial in origin having very deep soils with medium textured and imperfectly drained soils. The soils are acidic in nature having dark reddish brown colour with sandy clay loam texture. This occurs in an area of 195.52 ha. This is followed by Kalimala series having a solum thickness of 150 cm with very dark brown to pale brown colour. The soil is very strongly acid and has a surface texture of sandy clay loam to gravelly sandy clay. This is distributed in an area of 137.15 ha (30.87 %). Soils in nearly half of the watershed area (225.60 ha) are very deep soils with a depth of more than 150 cm and 46.07 % of the area (204.66 ha) is having deep soils with a depth of 100- 150 cm. The major surface soil textures in the watershed area constitutes that of sandy clay (195.52 ha) and gravelly loam (542.78 ha) and clay loam (137.15 ha). Nearly 50 % of the watershed area is prone to slight soil erosion and nearly 10 ha of the watershed area is affected by moderate to severe erosion which calls for proper soil and water conservation measures in the area.

Capacity Building/Trainings

Extensive training programmes and user interaction meetings were organized for the stake holders as part of the preparation of detailed project report. The details are given below:

No.	Training	Participants
1.	Block level awareness training	Elected representatives of three tier
2.	Block level orientation training	Elected representatives and ADS chairpersons
3.	Training on Base line survey	Two facilitators from NHG.
4.	Training on Drainage line treatment	Elected representatives and one facilitator from NHG.
5.	Focus Group Discussion	Elected representatives, Presidents and Secretaries of the NHGs, ADS chairpersons and MGNREGS labour groups and progressive farmers
6.	Entry point activity finalization	Elected representatives, Vice Presidents and Joint Secretaries from NHG, ADS chairpersons and MGNREGS labour groups.

Watershed Committee

Watershed Committee is constituted by Gram Sabha to implement the watershed project with technical support of WDT in the panchayat. Watershed committees are formed following the parameters of watershed committee, keeping the gender sensitive issues intact. Watershed committee members are briefed about the project objectives and a workshop is also conducted in this regard at every panchayat. The watershed committee has a pivotal role to play during and after the project implementation period.

The details of the Watershed Committee for Erayilkadavu watershed is given below:

Table No. 20.6 – Details of the Watershed Committee

Sl. No.	Name	Ph.number
1	Smt. Jeena Jacob (Panchayath President)	9526330034
2	Smt. Rema (VEO)	9447236955
3	Smt. Mini Ittikunju (member, ward No.1)	9400740741
4	Sri. E. T. Abraham (member, ward No.23)	9744399479
5	Sri. Sunil chacko (member ,ward No.2)	9447781363
6	Smt. Girija Thulasidharan (member, ward No.3)	9020451400
7	Sri. Anne Maman (member, ward No.22)	9496135364
8	Smt. Mariamma Joy (SHG member, Ward No: 1)	2340790
9	Sri. V.K.Gopinathan (SHG member, Ward No: 2)	9447719340
10	Sri. K.C.Gopalan (SHG member, Ward No: 3)	9400841139
11	Smt. Gracy Raju (SHG member, Ward No: 1)	2342773
12	Smt. Sushmma Prasad (SHG member, Ward No: 23)	9744996043
13	Sri. Arun Raj (SHG member, Ward No: 22)	

14	Smt. Indhu.K.Thomas (WDT member)	
15	Sri. Santhosh (SC Representative, Ward No: 2)	9349430196
16	Sri. Raveendran (ST Representative, Ward No: 3)	
17	Smt. Sarasamma Krishnan (Lady representative, Ward No: 2)	9961746003

Neighbour hood Groups

Neighbour hood Groups are constituted in the watershed area combining 40 to 50 adjacent households which are living in a cluster. These are further subdivided into seven sub groups and one person from each subgroup is selected to the Neighbour hood Group Committee. These seven members formed a Neighbour hood Group Committee with a President, Vice President, Secretary, Joint Secretary and Treasurer. Of these Treasurer and one Committee member is lady. The ward members and ADS Chairpersons of the wards are Ex-officio members in all the NHG Committees. These Committees are registered with the concerned Grama Panchayat. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

The details of the NHG Committees in Erayilkadavu watershed is as follows:

Table No. 20.7 –Details of the NHG Committees

Sl. No.	Panchayat	Ward	NHG No.
1	Panachikkad	Ward 01	8
2	Panachikkad	Ward 02	10
3	Panachikkad	Ward 03	7
4	Panachikkad	Ward 23	5
5	Panachikkad	Ward 22 (Part)	8

Self Help Groups

In addition to this, the existing Self Help Groups formed under the Kudumbasree Mission and other SHGs which are performing at a satisfactory level will be promoted to take various programmes under the Livelihood activities and Production Systems and Micro enterprises. If required, additional SHGs will also be formed in the watershed area in the coming years.

Activities proposed

Based on the series of discussions held with the different stakeholders the following activities are suggested for the micro watershed.

Table No. 20.8 – Details of activities suggested

Panachikkad Grama Panchayat

Desiltation of drains

Sl. No.	Name of Thodu
1	Idungadi Thodu
2	Pudukkulamchira Thodu

3	Kaithakkadu parakkulam Thodu
4	Kadanchira Thodu
5	Ereyil kadavu thodu
6	Kuruvikkadu Thodu
7	Kulachankal thodu
11	Punnakkal Thodu
12	Pathil Thodu
13	Kaithakade Thodu
19	Pakkilchira thode -

Vegetative Protection

SI. No.	Location
1	Kuruvikkadu thodu- Sy. Nos. 87, 94, 93
2	Sy. Nos. 101, 104, 253, 246, 254, 255
3	Parambil thodu - Sy. Nos. 244, 250, 120, 103, 239, 238, 354
4	Punnakkal thode
8	Edungadi thode
9	Kallunkal kadave
10	Kodurar - Sy. Nos. 225, 224, 223, 222, 221, 192, 191, 190, 184
11	Meenachil river - Sy. Nos. 1, 18, 20, 21, 22, 23, 24, 40, 41, 42, 53, 54, 55, 56, 82, 97, 99, 100, 101, adjacent to Eriyilkadavu
12	Sy. Nos. 11, 12,13, 14,15, 16, 17, 18,19,54, 53, 52, 44
13	Sy. Nos. 82, 84, 85, 87, 88, 91, 90, 89, 92, 93, 94, 97, 99, 104, 118, 258, 257, 256, 283, 284

Side Wall Protection

SI. No.	Location
1	Kuruvikkadu thodu- Sy. Nos. 87, 94, 93
2	Kadanchira thode - Sy. Nos. 104, 118, 253, 254, 283, 348, 339 - 196m.
3	Punnakkal thode – Sy. Nos. 275 to 97
4	Kodurar – Sy. Nos. 225, 224, 223, 222, 221,192, 191, 190, 184

Chal Restoration (Vaachal Clearing)

SI. No.	Location
1	Pathil thodu- Sy. Nos. 91, 89, 86, 92, 94, 38 ,22, 16, 15, 12, 24
2	Near Poovanthuruthu SNDP School

Earthen Bunds

SI. No.	Location
1	Sy. Nos. 106/5-5-1, 6-2, 111/8, 112/1, 274/3,7, 273/2,8, 272/6-7, 109/5, 110/4, 11/5,4, 107/3,2-4, 106/1, 95/5 - Kunnampally
2	Sy. Nos. 338, 339, 348, 283, 256, 255, 257, 258, 117, 118
3	Sy. Nos. 90,91,87,85,84,82 on both sides of Punnakkal Thodu
4	Survey no. 123, 120, 217, 125, 142, 143, 140, 146

5	Survey no. 152, 153, 154, 149, 252, 251, 249, 248
6	Survey no. 151, 152, 156, 157, 36, 46, 49, 47, 48, 50, 60, 63
7	Survey no. 62, 74, 75, 76, 78, 80, 71, 79, 72, 73, 57, 58, 56, 55, 51

Outer Bunds

No.	Location
1	Survey no. 43/3,3-1, 53/4-1.76 Ha, 39/1,3,, 40/2,3-2 - 1.64 Ha, 38/5-1, 41/5 - 1.2 Ha, 40/5, 42/2,4 - 1.52 Ha
2	Survey no. 41/5, 5-1, 45/2-1 - 1.64 Ha, 42/2, 44/4, 44/2 - 1.62 Ha, 42/4, 40/5, 39/11, 42/2 - 1.6 Ha
5	Between Survey no. 20,21,22,23,24,12 and 11,13,15,16,19
6	Survey no. 18,17,14,3
7	Survey no. 54,53,52,44
8	Survey no. 82,84,85,87,88,91,90,89,92,93,94,97,99,104,118,258,257,256,283,284
9	Survey no. 138,139,145,167,170

Side Varambu Earthening of Thodu

No	Location
	Earthening- 82,84,85 -Kaithod near Kodurar—deepening upto 1.50 cm

Stream Bank Protection

No.	Location
1	Survey no. 1,18,19,20,21,22,23,24,40,41,42,53,54,56,82,97,99
2	Survey no. 100,101,132,134,135,136,137,138,170,171,172,173,174,175,176,179
3	Survey no. 182,183,184,18,187,189,190,191

Brushwood Bunding

No.	Location
1.	Kadanchira Thodu – Survey no. 297, 27
2.	Ereyil kadavu thod- Survey no. 18,16
3.	Punnakkal thodu Survey no. 82, 84, 85, 87, 90, 91

Gully Plugging

No.	Location
1	Punnakkal Thodu - Survey no. 275 to 97
2	Pathil Thodu – Survey no. 89
3	Kaithakode Thodu - Survey no. 86

Geo textiles

No.	Location
1	Survey no. 290/19,51/5,59/8-4,7,3-1,5&111,114-geo textiles
2	Survey no. 47, 8,48, 51,81
3	Punnakal-moothedem
4	71, 77, 78, 282, 283, 89,284,90,287,8,48,51,36, 55,107,95,81,57,74,86, 12,60,62,82,58,59,51

5	Shappupadi - Mulayidem Road - S. Nos. 103,119,104,105,107,95,79,74,73
6	Thrikkayil temple – Survey no. 262, 265, 266, 261, 259
7	Kunnampally area – Survey no. 269, 270, 281
8	Velluruthi Ambala region –Survey no. 287

Pond Desiltation

Sl. No.	Name of Pond
2	Kaithakkadu parakkulam Thodu
3	Idungadi parakkulam
4	Keedankutti parakkulam-
5	Kochakkara parakkulam -
6	Plappara parakkulam

Edachal Clearing

Sl. No.	Location
1	Kulachankal thodu –Survey no. 19,20,16,21,22,23,24,13,12,11,38,45,44,53
2	pathil thodu-Survey no. 91,89,86,92,94,38,22,16,15,12,24
3	Kochukara region
4	Kallunkal kavu-Pachira thode
5	Savakkotta Padam

Stone Pitched Bunds

Sl. No.	Location
1	Stone pitched bunds - near punnakal-moothedem
2	Survey no.197, 202, 198, 209, 162, 235, 236, 237, 356, 288, 289, 279, 290, 292, 293, 294

Rain Water Harvesting

Sl. No.	Location
1	Survey no. 290/19,51/5,59/8-4,7, 3-1,5&111,114 - Punnakkal Chungam, Muledam, Kunnampally
2	Survey no. 47,50,60,,8,48,60,51,81
4	Nanniyad CMS LPS - 350 Students
5	Survey no. 183- Ayurveda Hospital

Rain Pits

Sl. No.	Location
1	Survey no. 47, 60, 48,60,51,81
2	Survey no. 106/5,5-1,107/4-3,3, 2-4, 274/7,3, 273/8, 272/6-7, 109/5, 110/4, 114/4,5, 91/3
3	Survey no. 288-10, 295-15, 287-10, 270-20, 280-25, 286-15, 266-10, 261-12, 287-5, 114-15
4	Punnakkal Chungam region

5	Survey no. 280, 281, 261, 270
6	Ward 11

Fruit crop planting

Sl. No.	Location
1	Survey no. 262,265,266,261,259
2	Shappupadi - Mulayidem Road - S. Nos. 103,119,104,105,107,95,79,74,73
3	Punnakkal Chunkam Junction - S. Nso. 61
4	Punnakkal Chunkam Kadath - S. Nos. 55
6	Kaduvakkulam Junction
9	Nellikkal Kavala - Parakkulam Road

Centripetal terrace

SI. No.	Location
1	Survey no. 260/1-6, 10-2, 269/10-1, 5-1, 11-2, 285/11, 268, 284, 287

Other NRM projects

No.	Activity	Location
1	Public Well Cleaning	73/9, 73, 183, 52, 52
2	Well Digging	57/7,112/6,107/1&5,95/12,71/7,282/25,90/6,290/10-12&3/18
3	New Pond Digging	49/3 and 52/2
4	Biogas	290/2,63/2-1
5	Drinking Water	Survey no. 47, 60,48,60,51,81 SC Colony Kaduvakkulam
6	Agrostological measures	71,77,78,282,452,283,89,284,90,287, 48,51,36, 55,107,95,81,57,74,86,12,60,62,082,058,059,51 Ward 11
7	Banana cultivation	288-50, 294-30, 320-25, 285-25, 260-40, 259-50, 114-40
		237, 122
		209
8	Pipe compost	11,12
9	Recharge of wells	Survey no. 294 - CSI Church Areas- Ward 23 Survey no. 500
	INM in Coconut	102-10, 103-15, 120-22, 121-16, 252-30, 249-25
11	INM in Pepper	108, 106, 63, 79, 80, 76, 71, 72, 273, 277
12	Vegetable cultivation	Pannimattam Padam and 137,138,144,139
13	Strip terracing	Survey no. 280,281,261,270
		45,52,54,86,82,92,93,94
		Kadanchira thode S. No. 253, 283, 104, 348 -

14	Waste land development	adjacent paddy field Kollad Vadakkupuram - 225,224,221,222,194
15	Flori culture	Survey no. 80,63,72,106,274
		Survey no. 253, 118, 104, 101, 254
		59, 106, 113
		Survey no. 71/2,5, 6-1, 7-2, 7, 77/6-10, 2-9, 282/24, 14-4, 284,6, 89/4-1, 90/6 - Toilet
16	Kadathu development	Survey no. 55
17	Medicinal plants	St. Andrews LPS - 244
		Survey no. 209 and Kollad Govt. LP School
18	Public well	268 - Near Kunnampally Ration Shop
19	Avenue trees	Punnakkal Chunkam Junction - S. No. 61
		Punnakkal Chunkam Kadath - S. No. 55
		Velluruthi Ambala road
		Kollam Kavala - 215
		Pallikkunnu - 216
		Kollad-Puthupallu road - 298-96 Shappum padi-Mooledam Road
20	Check dam	Kadanchira thode
21	Terracing	Thrikkayil temple - 262, 265, 266, 261, 259
		Kunnampally area - 269, 270, 281
22	Mulching	Survey no. 260/1-6, 10-2, 269/10-1, 5-1, 11-2, 285/11, 268, 284, 287
23	Waste disposal and management	Survey no. 128
24	Side Varambu Earthening	Survey no. 82, 83, 84, 85
25	Fruit Tree Planting	Ward 22 Kollad Road Survey no. 312 to 345 459, 451,458,455 – Along roads
		Ward 22 Moolamattom Thikkayil road Survey no. 303 to 286
		Divan Kavala Kallayil Kadavu road
		Puliyil Kadavu Puliyil Roads
		Kollad Puthupally Road – Ward 1

Budget

The distribution of budget for Erayilkadavu micro watershed for the various components as per IWMP guidelines is given below:

Table No. 20.9 – Budget for Erayilkadavu micro watershed

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	4,88,100
2.	Monitoring	1	48,810
3.	Evaluation	1	48,810
Preparatory phase			
4.	Entry point activities	4	1,95,240
5.	Institution and capacity building	5	2,44,050
6.	Detailed Project Report	1	48,810
Watershed works phase			
7.	Natural Resources Conservation works	56	27,33,360
8.	Livelihood activities for asset less	9	4,39,290
9.	Production system and micro enterprises	10	4,88,100
10.	Consolidation phase	3	1,46,430
		100	48,81,000

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.10.1 –Sector-I- Natural Resources Conservation and Management - 1st Year Plan

	Panachikkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Vegetable garden in schools	25 cent	7500	1	7500		750	7500
2	Extension of paddy cultivation	ha	63538	5	63538	254152	6354	317690
3	Cultivation of fodder crops	10 cent	5000	1	5000		500	5000
4	Banana cultivation	10 cent	16800	2		33600		33600
5	Vegetable grow bags	no.	1200	100	60000	60000	6000	120000
6	Desiltation of drains	10m3	485.85	500		242925		242925
7	Centripetal terracing	no.	46	1000		46000		46000
8	Earthen bunds	rm	27	2500		67500		67500
9	Chal restoration/vachal clearing	10m3	898	100	44900	44900	4490	89800
10	Mulching	no.	28	500		14000		14000
11	Embankment protection of drains	500m	4500	250		1125000		1125000
12	Side wall protection of ponds	10m3	2317	250		579250		579250
13	Moisture Collection Pits	no.	30	250		7500		7500
14	Renovation of public wells	no.	24000	2	48000		4800	48000
15	Well recharging	no.	5500	10	55000		5500	55000
16	Biogas	m3	8500	20	42500	127500	4250	170000
17	Pipe compost	no.	900	30	4050	22950	405	27000
18	Vermi compost (3.6*1*.75)m	no.	6201	10		62010		62010
					330488	2687287	33049	3017775

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.10.2 –Sector-I- Natural Resources Conservation and Management –IInd Year Plan

No.	Panachikkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Medicinal garden in public institutions	5cent	4279	2	8558		856	8558
2	Vegetable garden in schools	25 cent	7500	2	15000		1500	15000
3	Extension of paddy cultivation	ha	63538	15	190614	762456	19061	953070
4	Cultivation of horticultural crops in wastelands	25 cent	7850	1	7850		785	7850
5	Cultivation of fodder crops	10 cent	5000	1	5000		500	5000
6	Floriculture	5 cent	5500	2	11000		1100	11000
7	Banana cultivation	10 cent	16800	2		33600		33600
8	Fruit tree planting	no.	160	500		80000		80000
9	INM in pepper	ha	6200	5		31000		31000
10	INM in coconut	ha	3100	5		15500		15500
11	Crop demonstration - vegetable (pandal type)	25 cent	15000	2	15000	15000	1500	30000
12	Crop demonstration - vegetable (non-pandal)	25 cent	7500	2	15000		1500	15000
13	Crop demonstration - horticultural crops	no.	10000	3		30000		30000
14	Vegetable grow bags	no.	1200	150	90000	90000	9000	180000
15	Intercropping in coconut gardens	10 cent	5500	10		55000		55000
16	Desiltation of drains	10m3	485.85	1000		485850		485850
17	Desiltation of ponds	10 m3	649	250		162250		162250
18	Centripetal terracing	no.	46	1000		46000		46000
19	Vettiver planting	rm	35	400	14000		1400	14000
20	Earthen bunds	rm	27	2000		54000		54000
21	Chal restoration/vachal clearing	10m3	898	200	89800	89800	8980	179600

22	Mulching	no.	28	1500		42000		42000
23	Gully plugs	no.	4411	2	8822		882	8822
24	Agrostological measures	100m	710	100		71000		71000
25	Bio fencing	rm	24.5	100		2450		2450
26	Kadav Development	no.	50000	1		50000		50000
27	Brush wood bunding	m	548	300		164400		164400
28	Geo textiles	m2	191	200	38200		3820	38200
29	Outer bund strengthening of paddy fields	300m	437	400		174800		174800
30	Planting of bamboo seedlings	no.	34.65	500		17325		17325
31	Embankment protection of drains	500m	4500	250		1125000		1125000
32	Stone pitched contour bunding	m2	143.52	500	71760		7176	71760
33	Side wall protection of drains (engineering)	m2	2400	150	144000	216000	14400	360000
34	Repair of existing shutters	no.	25000	2	25000	25000	2500	50000
35	Construction of new ponds	no.	45000	2		90000		90000
36	Rain water harvesting structure	no.	330000	1		330000		330000
37	Moisture Collection Pits	no.	30	250		7500		7500
38	Renovation of public wells	no.	24000	3	72000		7200	72000
39	Construction of wells	no.	30000	3	90000		9000	90000
40	Well recharging	no.	5500	20	110000		11000	110000
41	Silpaulin tanks	no.	3120	5		15600		15600
42	Mini drinking water scheme	no.	267000	1		267000		267000
43	Biogas	m3	8500	30	63750	191250	6375	255000
44	Pipe compost	no.	900	50	6750	38250	675	45000
45	Vermi compost (3.6*1*.75)m	no.	6201	30		186030		186030
					1092104	4964061	109210	6056165

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.10.3 –Sector-I- Natural Resources Conservation and Management –IIIrdYear Plan

No.	Panachikkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Extension of paddy cultivation	ha	63538	20	254152	1016608	25415	1270760
2	Cultivation of fodder crops	10 cent	5000	1	5000		500	5000
3	Floriculture	5 cent	5500	2	11000		1100	11000
4	Banana cultivation	10 cent	16800	2		33600		33600
5	Fruit tree planting	no.	160	500		80000		80000
6	INM in pepper	ha	6200	5		31000		31000
7	INM in coconut	ha	3100	10		31000		31000
8	Crop demonstration - vegetable (pandal type)	25 cent	15000	3	22500	22500	2250	45000
9	Crop demonstration - vegetable (non-pandal)	25 cent	7500	3	22500		2250	22500
10	Crop demonstration - horticultural crops	no.	10000	4		40000		40000
11	Intercropping in coconut gardens	10 cent	5500	10		55000		55000
12	Desiltation of drains	10m3	485.85	600		291510		291510
13	Centripetal terracing	no.	46	2000		92000		92000
14	Vettiver planting	rm	35	400	14000		1400	14000
15	Earthen bunds	rm	27	2000		54000		54000
16	Chal restoration/vachal clearing	10m3	898	200	89800	89800	8980	179600
17	Gully plugs	no.	4411	2	8822		882	8822
18	Agrostological measures	100m	710	100		71000		71000
19	Bio fencing	rm	24.5	125		3063		3063
20	Kadav Development	no.	50000	1		50000		50000
21	Brush wood bunding	m	548	300		164400		164400
22	Geo textiles	m2	191	200	38200		3820	38200

23	Outer bund strengthening of paddy fields	300m	437	400		174800		174800
24	Planting of bamboo seedlings	no.	34.65	500		17325		17325
25	Side wall protection of drains (engineering)	m2	2400	150	144000	216000	14400	360000
26	Repair of existing shutters	no.	25000	6	75000	75000	7500	150000
27	Construction of new ponds	no.	45000	1		45000		45000
28	Renovation of public wells	no.	24000	3	72000		7200	72000
29	Well recharging	no.	5500	25	137500		13750	137500
30	Silpaulin tanks	no.	3120	5		15600		15600
31	Biogas	m3	8500	30	63750	191250	6375	255000
32	Pipe compost	no.	900	50	6750	38250	675	45000
33	Vermi compost (3.6*1*.75)m	no.	6201	30		186030		186030
					964974	3084736	96497	4049710

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.10.4 –Sector-I- Natural Resources Conservation and Management –IVth Year Plan

No.	Panachikkad Grama Panchayat	Unit	Rate	Volume	IWMP	Convergence	WDF	Total
1	Extension of paddy cultivation	ha	63538	10	127076	508304	12708	635380
2	Banana cultivation	10 cent	16800	2		33600		33600
3	Fruit tree planting	no.	160	500		80000		80000
4	INM in coconut	ha	3100	10		31000		31000
5	Crop demonstration - horticultural crops	no.	10000	3		30000		30000
6	Intercropping in coconut gardens	10 cent	5500	10		55000		55000
7	Vetiver planting	rm	35	400	14000		1400	14000
8	Agrostological measures	100m	710	100		71000		71000
9	Outer bund strengthening of paddy fields	300m	437	400		174800		174800

10	Repair of existing shutters	no.	25000	2	25000	25000	2500	50000
11	Construction of new ponds	no.	45000	1		45000		45000
12	Rain water harvesting structure	no.	330000	1		330000		330000
13	Well recharging	no.	5500	25	137500		13750	137500
14	Silpaulin tanks	no.	3120	5		15600		15600
15	Mini drinking water scheme	no.	267000	1		267000		267000
16	Biogas	m3	8500	20	42500	127500	4250	170000
17	Pipe compost	no.	900	20	2700	15300	270	18000
18	Vermi compost (3.6*1*.75)m	no.	6201	30		186030		186030
					348776	1995134	34878	2343910

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.11.1 –Sector-II- Livelihood Support system for landless/ assetless - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
A	Enterprising individuals (10 %)						
1	Malabari Goat rearing	No.	10500	6	42000	21000	63000
2	Backyard Poultry	No.	1500	2	1500	1500	3000
	Total				43500	22500	66000

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.11.2 –Sector-II- Livelihood Support system for landless/ assetless- IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation						
2	Honey bee		25000	1	20000	5000	25000
3	Lease land nendran cultivation		20000	2	32000	8000	40000
4	Tailoring		15000	3	36000	9000	45000
5	Handicraft		10000	3	24000	6000	30000
	Total				112000	28000	140000

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.11.3 –Sector-II- Livelihood Support system for landless/ assetless- IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
B	Revolving fund to SHGs (60 %)						
1	Vegetable Cultivation						
2	Honey bee		25000	2	40000	10000	50000
3	Lease land nendran cultivation		20000	3	48000	12000	60000
4	Tailoring		15000	3	36000	9000	45000
5	Handicraft		10000	4	32000	8000	40000
	Total				156000	39000	195000

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.11.4 –Sector-II- Livelihood Support system for landless/ assetless- IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Beneficiary Contribution	Total
C	Major livelihood activities (30 %)						
1	Malabari Goat rearing	No.s	105000	1	52500	52500	105000
2	Pisciculture	No.s	84000	2	84000	84000	168000
					136500	136500	273000

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.12.1 –Sector-III- Production system and Microenterprises - Ist Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Backyard Poultry	Nos.	1500	51	38250	38250	6885	76500
	Total			51	38250	38250	6885	76500

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

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.12.2 –Sector-III- Production system and Microenterprises –IInd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Ordinary Compost	Nos.	8000	20	100000	60000	18000	160000
2	Nendran Banana Cultivation	Nos.	34000	5	50000	120000	9000	170000
	Total			25	150000	180000	27000	330000

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

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.12.3 –Sector-III- Production system and Microenterprises –IIIrd Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Vermi Compost	Nos.	18000	10	100000	80000	18000	180000
2	Nendran Banana Cultivation	Nos.	34000	5	50000	120000	9000	170000
3	Cow rearing	Nos.	35000	4	60000	80000	10800	140000
	Total			19	210000	280000	37800	490000

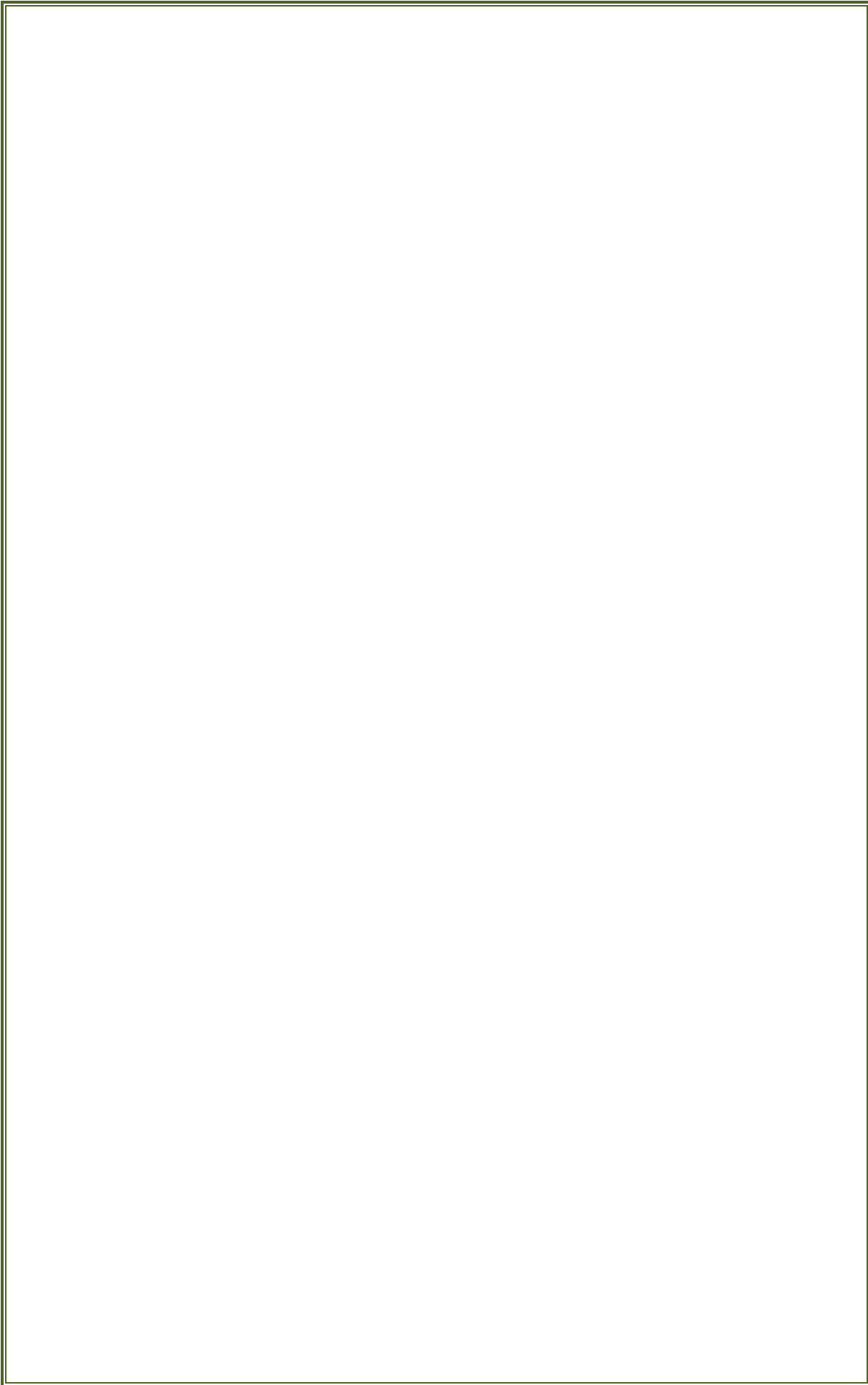
Note: 20 percent of the beneficiaries will be SC/ST. Contribution to WDF is 20 % for General and 10 % for SC/ST

Erayilkadavu Watershed (12M39p) - Action Plan

Table No. 20.12.4 –Sector-III- Production system and Microenterprises –IVth Year Plan

Sl. No	Name of Activity	Unit	Unit Cost	Target	IWMP Fund	Convergence	WDF	Total
1	Cow rearing	Nos.	35000	6	90000	120000	16200	210000
	Total			6	90000	120000	16200	210000

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



Watershedworks is the important component of the Integrated Watershed Management Programme. 56 % of the total project cost is allocated for the execution of these works. This is the core component of the IWMP watershed project. Now, watershed project is looked as holistic approach for development of village, so all component is covered in the watershed project. Two types of soil and water conservation works are covered under this component. It can be classified into

1. Physical measures
2. Vegetative/Agronomic measures

In addition to this, several energy conservation measures such as tapping solar energy, biogas, etc. are also included in this component.

Soil and water conservation workscomponents are again divided into three sub components viz.

- A. **Arable land development-** The proposed works for treatment of private cultivable land is covered under arable land treatment. Centripetal terracing, rain water harvesting pits, roof water harvesting, recharging of wells, renovation of existing ponds and construction of new ponds/dug wells, check dams, earthen bunds, strip terracing and stone pitched contour bunding are taken up under this.
- B. **Non arable land development** – the proposed works for treatment of non-arable land or common waste land or non-cultivable area is covered under this component. Pasture land development through fodder cultivation and staggered trenches are taken up under this component.
- C. **Drainage line treatment-** The works proposed in the drainage line (streams) of the project area is called drainage line treatment. Stream bank protection, Geo textiles, Gully plugging and masonry check dams are taken up under this.

The key purposes of the various measures are

- a. To check the erosive velocity of water to reduce the soil erosion in project area
- b. To conserve the water for more time in the project area to promote the recharge phenomena (to increase the time of concentration).
- c. To cover the area by vegetation, agro forestry and plantation to develop ecofriendly environment
- d. To reduce the erosion and conserve insitu moisture in the field

Arable Land Treatment- Ten types of measures have been identified through following participatory approaches and discussion with community for arable land development.

CENTRIPETAL TERRACING

1	Earth work excavation in ordinary soil and depositing on bank with in initial lead and lift for forming the circular trench including neat banking etc. complete.	
	$3.14 \times (1.5^2 - 0.50^2) \times 0.15 = 0.942$	
	Say 0.942m³ @ Rs. 485.85/10m³	46/No



Centripetal Terracing



Rain water Harvesting Pit

RAIN WATER HARVESTING PITS

Rainwater may be charged into the groundwater aquifers through any suitable structures like dug wells, bore wells, recharge trenches and recharge pits. Various recharge structures are possible - some which promote the percolation of water through soil strata at shallower depth (e.g., recharge trenches, permeable pavements) whereas others conduct water to greater depths from where it joins the groundwater (e.g. recharge wells). At many locations, existing structures like wells, pits and tanks can be modified as recharge structures, eliminating the need to construct any structures afresh. Here are a few commonly used recharging methods

Rain water harvesting pits may be of any shape and size. They are generally constructed 1 to 2 m. in length, 0.65 - 0.75 m wide and 0.5 - 0.75 m deep.

DETAILED ESTIMATE OF BIT TRENCHES

Sl. No	Description of Work	No	L (m)	B (m)	H (m)	Qty (m ³)	Amount (Rs.)
1	Earth work Excavation in mix soil and depositing on bank with initial lead for foundation of Bit trenches 0.43 m ³ @ 692/10m ³ Say @ Rs. 30 / E	1	1.2	0.6	0.6	0.43m ³	30

RECHARGING OF OPEN WELLS

The State Water Policy published in 2008 highlights the following issues in the water sector seeking a quantum jump in the water management scenario of the state focusing on open dug wells.

1. Protecting open wells and ground water sources from chemical and bacteriological contamination.
2. Lack of perspective planning in water resources sector at the local level.
3. Inadequate technical support for integrated water resources planning at the local level.
4. Increasing tendency to replace traditional water sources and systems with piped water supply in Kerala.
5. Poor efficiency of water user and management regimes.

6. Decreasing summer flow in the rivers and increasing salinity intrusion.

Considering the problems mentioned above, various agencies in Kerala have experimented the techniques suggested by Central Ground Water Board, New Delhi such as open well recharging through roof water harvesting and in situ rain water harvesting by way of percolation pits, trenches etc. The roof water is diverted to homestead dug wells using rain gutters and pipes (PVC) with filtration. This benefited the households in two ways. Homestead wells near the coastal belts which were facing saline intrusion, started availing fresh water in all seasons soon after the injection of roof rain water to their wells. Wells became perennials in the plain and high lands after roof rain water recharging programme.



It is evinced from the successful experiments from various Districts and odd attempts of NGOs, World Bank Aided Jalanidhi Schemes in various locations in the State, that open well recharging through roof water harvesting is a powerful tool for combating drought in the State. And therefore, the Programme Implementation Agency wish to popularize the well recharge programme throughout the project area to reach the water security for all by reviving their traditional water resources i.e., homestead open dug wells.

Where to be implemented: Areas where the ground water is over exploited will be given top preference. The experience from various projects shows that 'where there is demand for open well recharging and preference for open well water' it is the suitable sites of identification for implementing the scheme. If the beneficiaries are indifferent to well recharge scheme on wrong conception, it is less likely to be successful. And therefore, awareness building is highly required for the programme. Places where the availability of piped drinking water supply exists, it is quite often seen that beneficiary tend to give less priority for roof harvested open well water.

Aims and Objectives

The broad aim of the programme is to improve the water quantity and quality levels of homestead open dug wells and small homestead ponds. This will contribute to enhanced health and welfare of the community through improved access to drinking water. The reduction of public spending on Tanker Water Distribution to the water stressed regions which is common during summer is also envisaged as a broader goal of the programme.

The specific objectives of the programme are

- (v) recharge ground water
- (vi) improved drinking water availability across the year
- (vii) significantly reduce the impact of drought and consequent public spending on supply of drinking water in tankers to the water stressed regions
- (viii) Improved agricultural production and productivity.

The programme would also envisage strengthening of the decentralization programme and the PRIs, in discharging their basic mandate in water sector through community efforts that are cost effective and sustainable.

To narrow down the prime objective, the well recharge programme intends to recharge 2000 numbers of seasonal and quality affected wells across the project area within 4 years (2012-2016). This will benefit not only these 2000 numbers of wells in the area but also the nearby wells of each well aquifer which will get recharged since the ground water table is common to all.

Approach and strategy

The strategy of implementation of the programme is as follows.

Community Driven: The Programme is tailored to trigger the community strengths, social capital, traditional wisdom and focus on “Investing in Common Future”

Participatory Approach: As water is everybody’s business, the programme envisages partnership, collaboration and synergy of all stakeholders, private, public and NGOs.

Demand Driven: The programme is bottom up and demand driven. There exists tremendous pent up demand in service level (quantity), quality and such demand is converted into willingness to make cost effective and minor investments to reap rich dividends.

LSGI Centric: Water is a mandate of the Local Self Government Institutions. The programme supports them effectively discharge their mandate by harnessing community initiatives and leveraging investments at their disposal for common benefit. Ground water is our common pool resource and investments made are undoubtedly for public welfare. This also entails vital responsibility on the LSGIs, in participatory planning/management and effective regulation of ground water usage.

Process Oriented: The programme encourages innovation and diversity. Grama Panchayaths will have the freedom to follow their own implementation arrangements. Critical to the programme is the thrust on the menu of technical choices open to the households and regions according to their capacity and need. Informed choice of the household is facilitated by trained technical task teams/resource teams at Grama Panchayat level.

Cost Effective: Considering the overall impact on quantity of water harvested in volume, these would be the most cost effective way, possible by employing local material and labour available.

Campaign Mode: As the basic approach is participatory and demand driven, the success of the programme is possible only through the campaign mode in generating awareness, demand and sustained enthusiasm. This is expected through a Panchayat level campaign comprising direct contact programme and media.

The Cost of a Unit

As per the experiences of Open Well Recharging scheme in the state, it is estimated that Rs. 5000/- is the minimum cost of an individual homestead open dug wells. Accordingly it will cost Rs. 1 crore to recharge 2000 wells in the project area.

Estimate for One Well Recharging Structure

No	Description	Nos.	Length	Rate	Amount
1.	160 mm PVC Gutter Pipe		15 m	100	1500
2.	160 mm PVC Dropper	1		60	60
3.	160 mm PVC Stopper	1		56	56
4.	160 mm GI Clamp	15		36	540
5.	63 mm 4 KG PVC Pipe		15 m	80	1200
6.	63 mm PVC Bend	5		25	125
7.	63 mm PVC Tee	4		30	120
8.	63 mm Elbow	2		25	50
9.	63 mm PVC MTA	2		35	70
10.	63 mm PVC Tread Endcap	1		25	25
11.	63 mm PVC Air Cowl	1		15	15
12.	63 mm PVC FTA	1		30	30
13.	63 mm x 50 mm PVC Reducer	2		25	50
14.	63 mm Steel Clamp	6		4	24
15.	Plumbing Labour Charge & Supervision charge	3 Man days		325	975
16.	Miscellaneous Items				150
17.	Beneficiary Contribution (Well & Roof Cleaning)				500
	Total				5500

(Rupees five thousand and five hundred only)

The programme also offers an array of cost effective choices for the community, mainly based on traditional methods and proven choices as follows:

No	Technology choice	Specification	Indicative Cost in Rs.
1.	Roof top harvest with Sand filter	PVC Gutters are fixed to collect water from roof and water is diverted to the filter using a PVC pipe. The filter consists of sand, metal and charcoal	5500.00
2.	Roof top harvest with ordinary Nylon filter for Tiled and Asbestos sheet houses	Water is harvested from the roof and is diverted to the well through a Nylon or cloth filter using a PVC pipe.	3500.00
3	Rooftop harvesting without filter for concrete roofed houses	Water harvested from the roof top is directly fed into the well	2000.00
4	Surface run off catch	Using a bund, trench or pit	500.00

	through pits and trenches		
(*) Additional Rs. 1000 may have to be added for polyethylene sheets for thatched roofs			

Recharge pits may be of any shape and size. They are generally constructed 1 to 2 m. wide and 2 - 3 m deep. The pits are filled with boulders (5-20 cm), gravels (5-10mm) and coarse sand (1.5- 2mm) in graded form. Boulders at the bottom, gravels in between and coarse sand at the top so that the silt content that will come with runoff water will be deposited on the top of the coarse sand layer and can easily be removed.

The programme is well and household centric and therefore, the onus and responsibility for maintenance will remain with the owners themselves. Bulk of the investment can be leveraged through own contributions of the households. The semiskilled work of plumbing and diverting rainwater into the wells can be taken up under the MGNREGS, by training women in the rural areas to undertake this work. The utilization under MGNREGS can be tremendously improved by including Open well recharge under this watershed scheme.

RENOVATION OF PONDS

FARM POND

This structure is constructed where topography of the project area does not lend itself to embankment construction, dugout or excavated pond can be constructed. This is relatively flat area. Since dugout pond can be constructed to expose a minimum water surface area in proportion to volume so they are advantageous where evaporation losses are high and water is scarce. However in context to project area, the farm pond is proposed in the flat land to conserve the rainwater as much as possible in the field. Sites proposed for farm pond are the place which is at highest natural depression of the field. If site is demanding, then diversion ditch would construct to divert the flow of water towards farm pond. The shape of the farm pond is rectangular and size of the pond depend on the land holding of the farmer, demand of water of farmer, soil type, rainfall



pattern and catchment area for proposed farm pond.

For many years, farmers have been building ponds for irrigation and livestock. More will be needed in the future. The demand for water has increased tremendously in recent years, and ponds are one of the most reliable and economical sources of water. Ponds are now serving a variety of purposes, including water for livestock, irrigation, fish production, orchard spraying, wildlife habitat, recreation, and landscape improvement. Harvesting of the water in pond, lakes,

wells, tanks and reservoirs helps to preserve this water so that it can be put to varied uses later on. One of the most effective ways of water management is through pond.

The required storage capacity of a pond used for irrigation depends on these interrelated factors:

1. water requirements of the crops to be irrigated,
2. effective rainfall expected during the growing season,
3. application efficiency of the irrigation method,
4. losses due to evaporation and seepage, and
5. The expected inflow to the pond.

Types of Ponds

Depending on the source of water and their location with respect to the land surface, farm ponds are grouped into four types. These are

- (1) Dugout ponds
- (2) Surface ponds
- (3) Spring or Creek fed ponds and
- (4) Off-stream storage ponds.

Dugout Ponds: are excavated at the site and the soil obtained by excavation is formed as embankment around the pond. The pond could either be fed by surface runoff or groundwater wherever aquifers are available. In case of dugout ponds, if the stored water is to be used for irrigation, the water has to be pumped out. Pond is made by digging a pit or dugout in a nearly level area. Because the water capacity is obtained almost entirely by digging, excavated ponds are used where only a small supply of water is needed. Some ponds are built in gently to moderately sloping areas and the capacity is obtained both by excavating and by building Adam. Excavated ponds are the simplest to build in relatively flat terrain. Because their capacity is obtained almost solely by excavation, their practical size is limited. The ease with which they can be constructed, their compactness, their relative safety from flood flow damage, and their low maintenance requirements make them popular in the State.

Surface water ponds: Is the most common type of farm ponds. These are partly excavated and an embankment is constructed to retain the water. Generally it is made by building an embankment or dam across a stream or watercourse where the stream valley is depressed enough to permit storing 6 feet or more of water. The land slope may range from gentle to steep.

Spring or creek fed ponds: are those where a spring or a creek is the source of water supply to the pond. Construction of these ponds, therefore, depends upon the availability of natural springs or creeks.

Off-stream storage ponds: are constructed by the side of streams which flow only seasonally. The idea is to store the water obtained from the seasonal flow in the streams. Suitable arrangements need to be made for conveying the water from the stream to the storage ponds. If an excavated pond is to be fed by surface runoff, enough impervious soil at the site is essential to avoid excess seepage losses. The most desirable sites are

where fine textured clay and silty clay extend well below the proposed pond depth. Although excavated ponds can be built to almost any shape desired, a rectangle is commonly used in relatively flat terrain.

Traits of a Good Pond Site

A good pond site should possess the following traits

- (1) It should be a narrow gorge with a fan shaped valley above: so that a small amount of earthwork gives a large capacity
- (2) The capacity catchment area ratio should be such that the pond can fill up in about 2-3 months of rainfall. The capacity should not be too small to be choked up with sediments very soon.
- (3) The main factors in deciding the location of a farm pond are soil type, natural flow of water (runoff water), possibilities of siltation and the topography. It must be ensured that all the water from field and also water from catchment area can be diverted into the pond (i.e. point in depression). It is necessary to make a test pit to understand the strata.
- (4) It can be undertaken in any field (individual or common land) from where farmer can easily provide water to crops, nursery, animals, and vegetable crop or fishery.
- (5) Junction of two tributary, depressions and other sites of easily available fill material and favorable geology should be preferred.
- (6) The site should not have excessive seepage losses.
- (7) The catchment area should be put under conservation practices.

Sl. No.	Items	No.	L	B	H	Qty	Amount
1	Earth work excavation in ordinary soil for foundation and depositing on banks with initial lead and left etc complete for foundation.	1	4.6	4.6	1	21.16	
	Say 21.16m³ @ 940/10m³						1989.00
2	Earth work excavation in hard soil for foundation and depositing on banks with initial lead and lift etc complete	2	4.6	0.8	0.5	3.68	
		2	3	0.8	0.5	2.40	
						6.08	
	Say 6.08m³ @ 1737/10m³						1056.00
3	Dry rubble masonry using hard granite blasted rubble including cost and conveyance of all materials and all labour charges etc for foundation						

	and super structure.						
	For Foundation	2	4.6	0.8	0.5	3.68	
		2	3	0.8	0.5	2.40	
	For Super Structure	2	4.6	0.625	1.5	8.625	
		2	3	0.625	1.5	5.625	
						20.33	
	<i>Say 20.33 m³ @ 1359/m³</i>						27628.00
4	Radom rubble masonry in cement mortar 1:8 for superstructure including cost and conveyance of all materials and all labour charges etc complete	2	4.6	0.525	0.5	2.42	
		2	3	0.525	0.5	1.58	
						4.00	
	<i>Say 4.00m³ @ 2573/m³</i>						10292.00
5	Plastering with cement mortar 1:4, 15 mm thick one coat for top of the sidewall	2	4.6	0.55	0	5.06	
		2	3	0.55	0	3.30	
						8.36	
	<i>Say 8.36m² @ 1753/10m²</i>						1466.00
6	Filling with contractors own earth suitable for filling including all charges etc complete	2	4.6	3	0.5	13.80	
		2	3	3	0.5	9.00	
						22.80	
	Deduct cut earth					20.52	
	Net					2.28	
	<i>Say 2.28 m³ @ 2363/10m³</i>						539.00
8	Taxes and Unforeseen items						2030.00
	Total						45,000.00

EARTHEN BUND

This is the most popular soil conservation structure in the country and it is practiced at large scale all over India. Farm bunds are constructed on agricultural land with the aim of arresting soil erosion and improving the soil moisture profile. Ideally, bunds on farms should be made on the contour line. It would lie along the boundary of the field. Land holding in the project area is very small and it is not possible or feasible to construct contour bund or graded bund in the field. The earthen bund is divided into three types on the basis of the slope of the land and size of field. It would help to

conserve the water in the field and maintain insitu moisture in the field. The erosion of the field is reduced. The waste weir in the field helps to safely disposal of the excess water from the field.

Control Soil Erosion

After falling on the ground, rainwater carries off with it precious top soil. Due to this action of rainwater, rills are formed in fields, which soon become small drains. It must be remembered that every year in our country 6.6 billion tonnes of top soil and 5-8



million tonnes of nutrients are lost due to soil erosion. India is losing soil 30 to 40 times faster than the natural replenishment rate. We should also keep in mind that it takes over ten thousand years to form a cm thick layer of fertile soil. It is estimated that if these soil losses are prevented the productivity of agricultural can rise by 30-40%. By dividing the field into several units, bunds control the volume and velocity of runoff in each such unit. The water in the field and the soil it is carrying are stopped at each bund. Thus, by not allowing water a long stretch of free flow, bunds break the momentum of water.

Planning

A plan for farm bunding can never be made for one field alone. Because, in a field water flows from the fields above it and flows out to the fields below it. Thus, it is important to plan for the entire stretch between the up lying fields to the drainage line as a single unit. Therefore, it is crucial to involve all farmers in the village in the planning process. They must be informed about the proposed plan and its objectives. Only with their complete participation bunding should be finalized. Even so, it may happen that farmers in the up lying fields may not agree to get their fields bunded. In such a case, if bunding has to be done on low lying fields, a diversion channel will have to be dug for the exit of water coming in from the fields above.

Spacing

The distance between bunds must be 30-80 m. This decision depends on the slope of the field. That is, the greater the slope, the lesser the distance. The lesser the slope, the greater will be the distance. In highly sloping land, water will run off very fast. Thus it will have to stop more frequently.

DETAILED ESTIMATE OF EARTHEN BUND

Description of Work	Amount
100 Rm earthwork excavations for earthen bund with 20cm, width 100 m, height 2:1 slopes dug from the top uphill side of land forming graded channel with 75 cm from top of the bund etc. or complete. Man days required for 100 Rm One man complete 6.096 Rm /day	15.40 man days for 100 Rm

Amount required for completing 100 Rm earthen bund @ Rs. 180/ day	15.40 x 180 = 2772 Say Rs. 2700/ 100 Rm
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STRIP TERRACING/BENCH TERRACING

Bench terracing means construction of nearly level steps like fields along contours usually by half cutting and half filling procedure. It is an earthen embankment or a ridge and channel, constructed across the slope at a suitable location to intercept surface runoff water. It may be constructed with an acceptable grade to an outlet or with a level channel and ridge. By adopting bench terracing, both degree and length of slope are reduced which help in soil moisture conservation for enhanced crop production. Bench terracing is recommended for slopes from 10 to 30%.

Functions of Terracing in the Conservation Programme

1. One of the best mechanical measures
2. Properly located, constructed and maintained terraces
3. Reduce runoff and soil losses.
4. Prevent the formation of rills and gullies
5. Assist in reclaiming badly eroded gullied fields by intercepting the runoff before it becomes concentrated and attains an eroding velocity
6. To be effective, they must be used in combination with other practices, such as stubble mulching, contouring and strip cropping.
7. Over a period of years, better crops may be expected on terraced land because of the soil and moisture they conserve.



Limitations

Terraces can be constructed on practically all soils except those are too stony, sandy or shallow to permit practical and economical construction and maintenance. It is not advisable to terrace some lands where the slope of the land is either too slight or excessive, or the topography is extremely irregular. The steepness of the land is one of the factors that determine the practicability of terraces. As the slope increases, soil loss from erosion increases. However, the cost of construction and maintenance of terraces and the difficulty of farming them also increase with the degree of slope to the point that these factors may eventually outweigh the benefits derived.

Types of Bench Terraces

Of the different types of bench terraces, the most suitable to the project area is Bench Terraces Sloping Outward. Such terraces are adopted in low rainfall areas with permeable soil. For these terraces a shoulder bund is essential to provide the stability to the outer edge of terrace. Bench terraces sloping outward are also known as orchard type bench terrace.

Design of Bench Terraces

The following factors have direct bearing on design of bench terraces

1. Soil depth and uniform spreading of top soil
2. Slope of land
3. Rainfall amount
4. Farming practices and proposed crops to be grown
5. Basic design parameters
6. Terrace spacing
7. Terrace grade along the width & length
8. Terrace cross section

Terrace spacing

Terrace spacing is the vertical distance between two successive bench terraces. It is equal to the double the depth of cut. It depends on the soil depth and land slope. The width of terrace should be such that it enables convenient and economic agriculture operations.

DETAILED ESTIMATE OF STRIP TERRACING FOR RUBBER

Sl. No	Description of Work	No	L (m)	B (m)	D (m)	Qty. (m ³)	Amount
1	Earth work Excavation in ordinary soil of cutting the earth for making strip terrace for rubber 1.125 m ³ @ 898/ 10 m ³	1	0.5	1.5	1.5	1.125m ³	101
Say@ Rs. 61.27/ No							

STONE PITCHED CONTOUR BUND

This measure involves construction of horizontal lines of stone pitched contour bunds across the sloping land surface. Contour bunding is practiced to intercept the runoff flowing down the slope by an embankment with either open or closed ends to conserve moisture as well as to reduce erosion. The land treatment in between the bunds is desirable for uniform conservation of moisture. The practice of contour bunding is found to increase crop



yield by about 15-20 per cent.

Objectives

1. To increase the time of concentration of rainwater where it falls and thereby allowing rainwater to percolate into the soil
2. Converting a long slope into several ones so as to minimize velocity and thereby reducing the erosion by runoff water
3. To divert runoff for water harvesting purposes

The term contour bunding used in India is same as “level terraces” and “ridge type terraces”. The bund acts as barrier to the flow of water and at the same time impound water to build up soil moisture storage. The spacing of bunds is so arranged that the flowing water is intercepted before it attains the erosive velocity. The vertical interval between the two bunds is determined by the following formula:

Ramser’s formula

V.I. = $0.3 (S/3 + 2)$ Where, S = Degree of slope in percent V.I. = Vertical interval between two bunds,

The spacing is increased by 25% in highly permeable soils and decreased by 15 percent in poorly permeable soils. It is always desirable to remove local ridges and depressions before building contour bunds.

Contour Bunds: DO’s and DONT’S

- i. Always provide a berm (distance from excavated portion to bund) of minimum 30 cm.
- ii. Always provide a settlement allowance of 10-15% depending on soil type.
- iii. Exit must be provided in sloping land and in impermeable soils, depending on site conditions.
- iv. In impermeable soils increase the cross section area of bunds.
- v. Do not start the lay-out of bunds from the shorter section. Always begin from the longest section within the largest area of uniform slope.
- vi. Do not make bunds on slopes higher than 10%. On relatively high slopes do not make bunds closer than 30 m.
- vii. On low slopes do not make bunds farther than 60 m.
- viii. Do not construct bunds where there is already dense vegetation.
- ix. Do not excavate if roots of a tree are encountered
- x. Do not excavate soil continuously in permeable soils.

DETAILED ESTIMATE FOR STONE PITCHED CONTOUR BUND

Description of Work	Rate	Amount
Contour bunding with dry rubble, granite, or jungle stone laying and filling the uphill portion with uniform slope earth packing etc. complete pitching the stone with a slope of 1:3 to 1:5, 1 m height and top width 50 cm. (using 15 cm, 20cm thick quarried stone) Man days required for 100 m ² 1man complete 1.67225 m ² /day	$\frac{1 \text{ man} \times 140 \text{ m}^2}{1.67225 \text{ m}^2}$	59.799 man days for 100 m ²
Amount required for completing 100 m ² contour bund @ Rs. 240/ day	$59.799 \times 240 = 14351.76$ Say Rs. 143.52/ m ²	

LIVE FENCING

The farmer's fields often face the threat of wild animals and grazing. To overcome these problems temporary or permanent fences are made using different plants. Plant grown as live bio fences have strong soil binding capacity and are efficient enough to strengthen the boundaries of crop fields. These fences not only protect the fields but also play an important role in the conservation of some plants. The



The presence of thorns, spines, prickles, stinging hairs and profuse branching makes the bio fences strong and highly effective. The plants with thick foliage cause obstruction to sight of cattle, thereby preventing grazing. *Adhadoda zeylanica*, *Duranta erecta*, *Euphorbia tirucalli*, *Hibiscus* spp., *Jatropha* spp., *Justicia gendarussa*, *Pedilanthus tithymaloides* are preferred due to their unpalatability to cattle. *Acacia caesia*, *A.torta*, *Caesalpinia mimosoides*, *Lantana camara*, *Mucuna pruriens*, *Pandanus* spp. make their presence as they form impenetrable thickets. Bamboos, Cacti, *Jatropha* spp. and *Pandanus* spp. prevent soil erosion. *Bambusa arundinace*, *Bombax ceiba*, *Pandanus* spp., *Terminalia travancorensis* and *Vitex* spp. act as wind breakers and also increase the firmness of the fences. Ornamental plants are often planted along these fences to impart attraction to eyes while in some areas these were supplemented with many fruit yielding climbers to make them economically important.

Sl. No.	Description	Qty.	Rate	Amount	
1	3 No's of Green cutting of glyricedia, muringa or any other Easily available vegetative cutting 1 m length having approximate 3 to 5 cm dia. required to plant at a spacing of 20 cm between to two cutting including conveyance from source to side.				
	Green cutting	LS	5 Nos	3.00/E	15.00
2	Reapers required for cross fencing Stabilization of plants				
	Cutting	LS	2 Nos	1.50/Rm	3.00
3	Coring yarn for tying reapers and planted cuttings				
	Cuttings	LS	0.05 kg	30/Kg	1.50
4	Labour charges for planting the cuttings at a depth of 20 cm and filling the holes with earth completing and cross typing the green cutting etc. complete.				
			0.04	125/Rm	5.00
Total					5.00
Rs. 24.50/Rm					24.50

Drainage Line Treatment – This is the most important component of the works. However, in project area, deep drainage lines are found only in few villages due to comparatively gentle slope. WDT carried out the technical survey L section of the important drainage line and identified the important sites for the side wall protection and masonry check dams.

Details for every individual site has been carried out and design and estimate prepared accordingly.

No.	Item	Dimension	Quantity	Rate	Amount
1	Desiltation thodu	100 x 3 x 0.30	90 m ³	485.85 /10 m ³	43.7265/Rm
2	Side varambu earthening both sides	100 x 1.5 x1.5	101 m ³	2317/10 m ³	234.60/Rm
3	Smoothering of weeds	2 x 100 x 2	400 m ²	328/100 m ²	13.12/Rm
4	Embankment protection (River vegetation)	500 m (250 No)	250 No	18/No	4500
5	Embankment protection (Thodu vegetation)	100 m (2 x 50 No)	100 No	18/No	1800
6	BrushWood Bunding using sand bags	1 m length	-	-	547.99
7	Thodu widening	100 x 2 x 1.50	300 m ³	898/10 m ³	269.40/Rm
8	New thodu	100 x 1 x 1	100 m ³	898/10 m ³	89.80/Rm
9	Thodu Restoration	100 x 1 x 1	100 m ³	692/10 m ³	69.20/Rm
10	Thodu deepening	100 x 2 x 1	200 m ³	898/10 m ³	179.60/Rm
11	Geo textils (Thodu)	2 x100 x 2	400 m ²	191 /m ²	764.00/Rm
12	Brush wood dam	3 x 1.5 x .75	-	-	1643.97
13	Temporary Check Dam using sand bag	3 m length	900 bags	25/bag	22500
14	Desiltation of Pond (in between 150 - 300)	50 x50 x 1	2500 m ³	649/10 m ³	162250
15	Smoothering of weeds (pond)	50 x50	2500 m ²	328/m ²	8200
16	Bio fencing	50 + 50	100 m	24.50/Rm	2450
17	Geo textiles (pond)	2 (50 + 50)x2.50	500 m ²	191/m ²	95500
18	Edachal (Renovation)	1 x 1 x 1	1m ³	898/10 m ³	89.8/Rm
19	Irrigation chanel(Desiltation)	1 x.60 x .60	. 36 m ³	485.85 /10 m ³	17.49/Rm

STREAM BANK PROTECTION

Stream channel erosion consists of both stream bed and stream bank erosion. Stream bed erosion occurs as flows cut into the bottom of the channel, making it deeper.



This erosion process will continue until the channel reaches a stable slope. The resulting slope is dependent on the channel materials and flow properties. As the stream bed erodes, and the channel deepens, the sides of the channel become unstable and slough off, resulting in stream bank erosion.

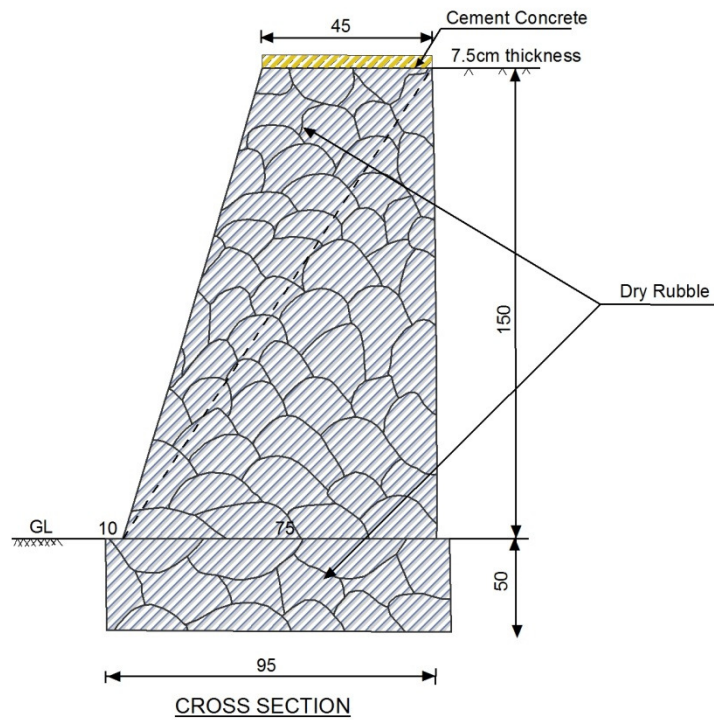
Stream bank erosion can also occur as soft materials are eroded from the stream bank or at bends in the channel. This type of stream bank erosion results meandering waterways. One significant cause of both stream bed and stream bank erosion is due to the increased frequency and duration of runoff events that are a result of urban development.

It is often necessary in areas where development has occurred in the upstream watershed and full channel flow occurs several times a year. Stream bank protection can be vegetative, structural or a combined method where live plant material is incorporated into a structure (bioengineering). Vegetative protection is least costly and the most compatible with natural stream characteristics. Additional protection is required when hydrologic conditions have been greatly altered. Because each reach of channel is unique, measures for stream bank protection should be installed according to a plan developed for the specific site and watershed.

Structural Protection

Structural protection should be provided in locations where velocities exceed 6 feet per second, along bends, in highly erodible soils and in steep channel slopes. Common materials include riprap, gabions, fabric formed revetments and reinforced concrete. The upstream and downstream ends of the structural protection should begin and end along stable reaches of the stream.

Reinforced concrete may be used to stabilize the stream bed or the stream bank. Reinforced concrete retaining walls provide good erosion protection for stream banks. Anchor the foundation for these structures to a stable, non-erodible base material such as bedrock. Place filter fabric or a granular filter between stream bank material and the retaining wall or bulkhead. Construct water stops at all joints in concrete retaining walls. Construct the top of the retaining wall or bulkhead up to the design water surface elevation plus freeboard, and vegetate the rest of the stream bank



DETAILED ESTIMATE FOR RETAINING WALL TYPE A						1.5M HEIGHT		NEW	
No	Description	Measurements			Quantity	Rate	unit	Amount	
		No	Length	breadth					height
1	Earth cutting in ordinary soil for retaining wall average breadth. $85 + \frac{10}{2}$	1	1.0	0.475	1.5	0.71			
					m3	0.71	940.30	10m3	67.00
2	Earthwork excavation in ordinary soil and depositing on bank with initial lead up to 50m and lift up to 1.50m including breaking clods watering ramming and sectioning of spoil bank etc. complete.in or under water	1	1.0	0.95	0.5	0.48			
					m3	0.48	1922.06	10m3	101.30
3	Dry Rubble masonry for retaining walls	1	1.0	0.95	0.5	0.48			
	average breadth. $75 + \frac{45}{2}$	1	1.0	0.6	1.5	0.90			
						1.38	1358.93	M3	1968.53
4	CC 1:4:8 over DRM, 75mm thick plastered with CM, 1:3, 12mm with flush coat over the retaining wall	1	1.0	0.5		0.5			
					M2	0.5	5270.00	10M2	263.50
	total								2400.32
	say	Rs	2400	/m					2400

Biological measures

It is also important to adopt biological measures for stream bank protection so

that it facilitates recharge, in-stream habitat restoration and enriches the overall ecosystem.

Riparian Habitat

Riparian vegetation should be allowed to grow and regenerate on both the banks, throughout the stretch of the stream. Indigenous grasses and plants may be selected for creating vegetation cover along the banks. Depending upon whether plantation is below or above the line of submergence, appropriate aquatic and non-aquatic species may be selected. The vegetation created will absorb floods, protect agriculture, build up hypochthonic zone to increase soil moisture holding capacity and provide habitat to invertebrates and higher animals.

Live Hedge

A barrier created by planting grass, shrubs and trees across the rills to stop soil erosion is called live hedges. It is done at a location where the gully/rill originates. Following points should be kept in mind while designing and constructing live hedges.

Construction

Clean the site first. Excavation up to 0.15 to 0.23m depth needed. Then plant two lines of grasses like vetiver or any other local soil binding grass. On the downstream of the grass line, plant one line of shrubs such as pandanus or agave.

Functions

1. To check soil erosion.
2. To reduce runoff velocity
3. To control further deepening of gullies

GEOTEXTILE PROTECTION

Coir is a 100% organic naturally occurring fiber, from a renewable source obtained from coconut [*Cocosnucifera*] husk. Naturally resistant to rot, moulds and moisture, it is not treated with any chemicals during its spinning process for converting it into a yarn. Hard and strongest among all natural fibers, it can be spun and woven into different types of matting and mats. Geotextiles made out of coir are ideally suited for low cost applications because coir is available in abundance. Only 36% of available coconut husks



in India are used for extraction of coir. Therefore there is enough scope to enhance its application. Coir fibers resemble the wood fibres in terms of physical properties and chemical composition.

Coir geotextiles are found to provide protection against soil erosion to the various types of slopes that has been demonstrated and documented by the Coir Board. The ability of coir fibres to absorb water and to

degrade with time is its prime properties, which give it an edge over synthetic geotextiles for erosion control purposes

It was reported that when natural coir was exposed to water continuously for 167 days, in order to simulate the traction effect while flooding, it had almost no damage. Studies were carried out on change in tensile strength of woven coir geotextiles by immersion in water and embedding in saturated kaolinite clay. It was found that even after 6 months, the strength of woven coir geotextiles was not affected in both the cases except increase in elongation at failure, which was due to water absorption by coir yarn resulting in increased elasticity.

Considering the above difficulties, it was considered to utilize the coir geotextiles to provide protection to the stream banks and allow vegetation to become established for providing sustainable protection against soil erosion.

DETAILED ESTIMATE FOR GEOTEXTILE PROTECTION

1	Leveling of ground to fixed slope lay removing plants and shrubs on both sides of the streams	
	1.00 Male/Female/day @ Rs. 164	164.00
2	0.25 mm x 0.025 m fixing geotex on both sides of the stream making of Bamboo nails	
	4 nos per square meter for 10 m ² 4 x 10 = 40 x 0.25 = 10.00 weight age = <u>2.00</u> 12.00 Cost of Bamboo = <u>12 x 95</u> 4 x 7.50	38.00
3	Labour cost of making Bamboo nails @ 4 nails per 1m ² or 10m ² /40nails @ Rs. 164/day for 1.2 Male/Female	197.00
4	Planting of Locally Available grass on geotex and watering for 30 days. Rs. 164/per days/person for 1.6 male/female	262.40
5	Cost of trench construction 0.45 x 0.30 m of the upper and lower portion of both sides of the stream to fix geotex. 4 x 0.45 x 0.30 = 0.54m ³ @ 485.85/10m ³	26.23
6	Fixing of geotex (740 GSM) on the side walls of the stream using Bamboo Nails Cost of 10 m ² geotex = 10 x 50/m ² Labour charge for 0.66/male/female @ Rs. 164	500.00 108.24
7	Watering replacing charges for about 30 days till the grass takes roots on the geotex it is estimated that 10 m ² shall for watered/hour therefore the cost @ 164/ day for 30 days = 164/8 x 30 = 615	615.00
	Grand Total	1910.97/10m²
	Say @ Rs. 191/m²	

CHECK DAM

It is an impermeable structure constructed across the drainage line having gentle slope and is feasible both in hard rock as well as alluvial formations for storage of water. The side of the dam where water is stored is called the upstream side and other side and other side of the dam is called downstream side. The water stored in these structures is mostly confined to



stream course and the height is normally less than 3 m for watershed projects. These are designed based on stream width and excess water is allowed to flow over the wall. In order to avoid scouring from excess run off, water cushions are provided at downstream side. To harness the maximum run off in the stream, series of such check dams can be constructed to have recharge on regional scale. While constructing a series of check dams on along stream course, the spacing between two check dams should be beyond their water spread. The height of the check dam should be such that even during the highest flood, water does not spill over the banks. During the site selection for water harvesting structures under the watershed programmes, the cement masonry structures are usually preferred over the earthen structures. Watershed projects also focus on aspects that provide employment to the rural community but the construction of the cement masonry structure involves a very small component of un-skilled labour cost. The proportion of wage cost and non-wage cost for the construction of the masonry structure is in the proportion of 40:60. Hence, these structures should be planned only on such sites that are not favorable for the construction of earthen structures.

Uses of check dam:

The stored water may be used may be used for a variety of purposes that may be irrigation, drinking, electricity generation, and flood control etc.

Site Characteristic and Design Guidelines for Check Dams

Site of a dam is selected on the basis of its catchment area and the total amount of runoff generated from the catchment.

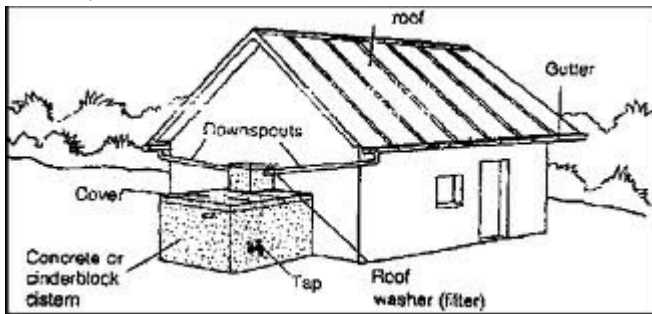
1. The total catchment of the stream is between 500 to 1000
2. The width of drain bed should be at least 5 meters and the depth should not be less than 1 metre
3. The banks of the drain should be high and firm
4. Width of the drain at the site should be narrow and the slope of the drain bed should be gentle.
5. The site should be approachable for an easy transportation of construction materials.

DETAILED ESTIMATE FOR CHECKDAM (BLASTED RUBBLE)

Sl. No.	Items	No.	L	B	H	Qty	Amount
1	Earth work excavation in ordinary soil for foundation and depositing on banks with initial lead and left etc.						
	Sidewall	2	40	0.7	0.5	28.00	
		1	2.3	0.5	0.5	0.57	
						28.57	
	<i>Say 28.57m³ @ 940/10m³</i>						2686.00
2	Cement Concrete 1:4:8 using 40 mm broken stone for bed concrete including cost and conveyance etc complete	1	2.3	0.5	0.2	0.23	
	<i>Say 0.23@ 4244/m³</i>						976.00
3	Graded cement concrete 1:3:6 using 60% of 40 mm and 40% of 20 mm broken stone for	1	2.3	0.4	0.8	0.74	
	<i>Say 0.74m³ @ 5072/m³</i>						3753
4	Dry rubble masonry using hard granite blasted rubble including cost and conveyance of all material and all labour charges etc for side wall.	$2 \times 40.00 \times \frac{0.60 + 0.55}{2} \times 0.50 = 23$					
	<i>Say 23.00m³ @ 1359/10m³</i>						31257
5	Radom rubble masonry 1:8 using hard granite blasted rubble including cost and conveyance for side wall	$2 \times 40.00 \times \frac{0.55 + 0.50}{2} \times 0.50 = 21$					
	<i>Say 21.00m³ @ 2573/m³</i>						54033
6	Plastering with cement mortar 1:4, 15 mm thick one coat for side wall and Thadayana	$1 \times 2.30 \times 0.40 = .92$					
		$2 \times 40.00 \times 0.50 = 40$					
						40.92	
	<i>Say 41.00m² @ 1753/m²</i>						7187.00
8	Taxes and Unforeseen items						108.00
	Total						100000.00

ROOF WATER HARVESTING

Rain water harvesting is the accumulating and storing of rainwater for reuse before it reaches the aquifer. It has been used to provide drinking water, water for livestock, water for irrigation, as well as other typical uses. The method of rain water harvesting has been into practice since ancient times. It is as far the best possible way to conserve water and awaken the society towards the importance of water. The method is simple and cost effective too. It is especially beneficial in the areas, which faces the scarcity of water.



During the monsoons, lots of water goes waste into the gutters. And this is when Rain water Harvesting proves to be the most effective way to conserve water. We can collect the rain water into the tanks and prevent it from flowing into drains and being

wasted. It is practiced on a large scale in metropolitan cities. Rain water harvesting comprises of storage of water and water recharging through the technical process. Communities in the face of adversity have revived or created new water harvesting systems. They have made check dams, johads, and other structures to harvest every drop of drain. Some of them have even harvested rooftop runoffs. In many places these efforts have withstood the effects of recurring drought.

Rainwater harvesting from rooftop catchments

Rooftop Rain Water Harvesting is the technique through which rain water is captured from the roof catchments and stored in reservoirs. Harvested rain water can be stored in sub-surface ground water reservoir by adopting artificial recharge techniques to meet the household needs through storage in tanks. The main objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain water for use is particularly important in dry land, hilly, urban and coastal areas. Rainwater harvesting usually involves collecting water from cleaner surfaces, such as roofs. There are several reasons for harvesting rainwater today including: low-cost irrigation, domestic water supply, water and soil conservation, aquifer recharge, and flood control. It is also desirable to use rain because of the high quality and softness of the water and the relative absence of contaminants such as disinfection byproducts (chlorinated hydrocarbons), endocrine disrupting compounds (antibiotics and hormones), heavy metals, agricultural chemicals and chlorine resistant microbes that are increasingly appearing in our ground and tap water. Rainwater collection systems are cost effective and easy to maintain by the average homeowner and are easier to install and use than wells or surface ponds.

Technical Description

A rainwater harvesting system consists of three basic elements: a collection area, a conveyance system, and storage facilities. The collection area in most cases is the roof of a

house or a building. The effective roof area and the material used in constructing the roof influence the efficiency of collection and the water quality.

A conveyance system usually consists of gutters or pipes that deliver rainwater falling on the rooftop to cisterns or other storage vessels. Both drainpipes and roof surfaces should be constructed of chemically inert materials such as wood, plastic, aluminum, or fiberglass, in order to avoid adverse effects on water quality.

The water ultimately is stored in a storage tank or cistern, which should also be constructed of an inert material. Reinforced concrete, fiberglass, or stainless steel are suitable materials. Storage tanks may be constructed as part of the building, or may be built as a separate unit located some distance away from the building.

A rainwater harvesting system comprises components of various stages - transporting rainwater through pipes or drains, filtration, and storage in tanks for reuse or recharge. The common components of a rainwater harvesting system involved in these stages are illustrated here.

1. **Catchments:** The catchment of a water harvesting system is the surface which directly receives the rainfall and provides water to the system. It can be a paved area like a terrace or courtyard of a building, or an unpaved area like a lawn or open ground. A roof made of reinforced cement concrete (RCC), galvanised iron or corrugated sheets can also be used for water harvesting.
2. **Coarse mesh** at the roof to prevent the passage of debris
3. **Gutters:** Channels all around the edge of a sloping roof to collect and transport rainwater to the storage tank. Gutters can be semi-circular or rectangular and could be made using:
 - Locally available material such as plain galvanised iron sheet (20 to 22 gauge), folded to required shapes.
 - Semi-circular gutters of PVC material can be readily prepared by cutting those pipes into two equal semi-circular channels.
 - Bamboo or betel trunks cut vertically in half.

The size of the gutter should be according to the flow during the highest intensity rain. It is advisable to make them 10 to 15 per cent oversize.

Gutters need to be supported so they do not sag or fall off when loaded with water. The way in which gutters are fixed depends on the construction of the house; it is possible to fix iron or timber brackets into the walls, but for houses having wider eaves, some method of attachment to the rafters is necessary.

4. **Conduits:** Conduits are pipelines or drains that carry rainwater from the catchment or rooftop area to the harvesting system. Conduits can be of any material like polyvinyl chloride (PVC) or galvanized iron (GI), materials that are commonly available.
5. **First-flushing:** A first flush device is a valve that ensures that runoff from the first spell of rain is flushed out and does not enter the system. This needs to be done

since the first spell of rain carries a relatively larger amount of pollutants from the air and catchment surface

6. **Filter:** The filter is used to remove suspended pollutants from rainwater collected over roof. A filter unit is a chamber filled with filtering media such as fibre, coarse sand and gravel layers to remove debris and dirt from water before it enters the storage tank or recharge structure. Charcoal can be added for additional filtration.
- i) **Charcoal water filter:** A simple charcoal filter can be made in a drum or an earthen pot. The filter is made of gravel, sand and charcoal, all of which are easily available.
 - ii) **Sand filters:** Sand filters have commonly available sand as filter media. Sand filters are easy and inexpensive to construct. These filters can be employed for treatment of water to effectively remove turbidity (suspended particles like silt and clay), colour and microorganisms.

In a simple sand filter that can be constructed domestically, the top layer comprises coarse sand followed by a 5-10 mm layer of gravel followed by another 5-25 cm layer of gravel and boulders.

7. **Storage facility:** There are various options available for the construction of these tanks with respect to the shape, size and the material of construction.
Shape: Cylindrical, rectangular and square.

Material of construction: Reinforced cement concrete, (RCC), ferrocement, masonry, plastic (polyethylene) or metal (galvanised iron) sheets are commonly used.

Position of tank: Depending on space availability these tanks could be constructed above ground, partly underground or fully underground. Some maintenance measures like cleaning and disinfection are required to ensure the quality of water stored in the container.

8. **Maintenance**

- Before collecting water the roof, gutters and tank should be cleaned
- Let the first 2-3 rains flow out through the first flush system
- Remember to clean the tank once in a year
- Replace the filtering agents every year
- Keep the tank and surroundings clean and hygienic
- Apply white cement on the tank every year
- Make sure that sunlight does not pass through the manhole to prevent algae growth
- Remember to preserve water and use it judiciously

Advantages

- Rainwater harvesting provides a source of water at the point where it is needed. It is owner operated and managed.
- It provides an essential reserve in times of emergency and/or breakdown of public water supply systems, particularly during natural disasters.

- The construction of a rooftop rainwater catchment system is simple, and local people can easily be trained to build one, minimizing its cost.
- The technology is flexible. The systems can be built to meet almost any requirements. Poor households can start with a single small tank and add more when they can afford them.
- It can improve the engineering of building foundations when cisterns are built as part of the substructure of the buildings, as in the case of mandatory cisterns.
- The physical and chemical properties of rainwater may be superior to those of groundwater or surface waters that may have been subjected to pollution, sometimes from unknown sources.
- Running costs are low.
- Construction, operation, and maintenance are not labor-intensive.

ESTIMATE FOR FERRO CEMENT WATER TANK, Capacity – 1,00,000 Litres

No.	Description of Works	Qty	Unit	Rate	Amount
1	Clearing the Tank Site	93.2449	C.um	2.25	209.80
2	Excavation in hard soil for foundation	55.4711	C.um	211.50	11732.14
3	RCC 1:4:8 using 20 mm broken stone below base slab	3.6725	C.um	5007.68	18390.90
4	Steel reinforcement for floor concrete and pillar	4.4877	Qtl	6057.48	27183.90
5	Floor concreting in R.C.C. 1:11/2:3 using 20 mm broken stone including form work and excluding reinforcement	6.5948	C.um	6783.64	44737.08
6	R.C.C. 1:11/2:3 using 20 mm broken stone for central pillar with formwork but excluding reinforcement	0.1052	C.um	12179.63	1281.83
7	Making steel cage for wall dome and filter chamber with 8 mm & 6 mm bars including supply of material and labour	4.1535	Qtl	9357.48	38866.35
8	Supply and winding with 1 layer of 10 gauge, 50 mm x 50 mm welded mesh over the steel cage including material and labour	60.3087	Sq.m	246.55	14869.12
9	Supplying and winding with three layers of 24 guage, 12.5 x 12.5 mm Gl chicken mesh around the cylindrical steel cage, including material and labour	63.2535	Sq.m	173.10	10949.17
10	Supplying and winding with two layers of 24 guage, 12.5 x 12.5 mm Gl chicken mesh for dome and filer	53.1674	Sq.m	150.60	8007.01

	chamber including material and labour				
11	Plastering with C M 1:2.5, 24 mm thick each on both sides of tankwall applied in layers and finished smooth with cement flushing coat including material and labour	106.017	Sq.m	398.61	42260.21
12	Plastering with CM 1:3, 15 mm thick each on both sides of dome and filter chamber applied in layers and finished smooth with cement flushing coast including material and labour	105.047	Sq.m	230.11	24172.71
13	Plastering tank floor by applying one coat of neat cement slurry and then with CM 1:3, 15 mm thick, mixed with water proofing compound and finished with cement flushing coat.	50.1729	Sq.m	246.08	12346.55
14	Cement washing 2 coats	105.532	Sq.m	44.40	1171.11
15	Providing roof water collection and conveyance system, filter, material, first flush and drainage system including material and labour	LS			15000.00
16	Supplying and erecting of 1 HP Pump, OH tank and pumping main including materials, electrification and labour	LS			20000.00
17	Scaffolding, Water, Cleaning, Writing etc.	LS			4983.00
	Sub Total				296161
	Design Estimate and implementation charges @2.5%				7404
	Total				303565
	Service tax @ 12.36% of labour part				11256
	KVAT @ 4%				12143
	KWWE @ 4%				3036
	Total				330000

Note : Quantities have been rounded off to four digits. Amount is arrived by computer by multiplying the actual quantity (without rounding of) with rate and hence a slight difference may be observed if the rounded of quality is used for multiplication

HOUSEHOLD LEVEL BIOGAS PLANT

The term 'biogas' is commonly used to refer to a gas which has been produced by the biological breakdown of organic matter in the absence of oxygen. The gases methane, hydrogen and carbon monoxide can be combusted or oxidized with oxygen and the resultant energy release allows biogas to be used as a fuel. Biogas is a commonly used bio

fuel around the world and is generated through the process of anaerobic digestion or the fermentation of biodegradable materials such as biomass, manure, sewage, municipal waste, rubbish dumps, septic tanks, green waste and energy crops. This type of biogas comprises primarily methane and carbon dioxide. The actual composition of biogas will vary depending upon the origin of the anaerobic digestion process – i.e. the feedstock.

An air-tight tank transforms the biomass waste into methane producing renewable energy which can then be used for heating, electricity, and many other operations that use any variation of an internal combustion engine. One particular type of biogas is known as 'landfill gas' (LFG) or 'digester gas'. LFG is produced by wet organic waste decomposing under anaerobic conditions in a landfill. In the same way that a compost heap works, the waste is covered and then compressed by the weight of the new material that is deposited on top. This material prevents the oxygen from escaping and encourages the anaerobic microbes to thrive. The gas slowly builds up and is released into the atmosphere if the landfill site has not been engineered to capture the gas.



Use of biogas.

Biogas has a wide variety of uses and can be used as a relatively low-cost fuel for the generation of energy and heating purposes, such as cooking. For example, basically any facilities which need power are able to use biogas to run engines, or to generate either mechanical or electrical power. Biogas can be compressed, similar to natural gas, and is able to be used to power motor vehicles. Biogas is a renewable fuel, so it qualifies for renewable energy subsidies in some parts of the world. It is possible to concentrate the methane within biogas to the same quality standards as fossil fuel derived natural gas to produce bio methane. If concentrated and compressed this biogas can then be used in vehicle transportation.

Benefits

When biogas is used, many advantages arise.

- Generate enough electricity
- Reduce global climate change.

Advantages of biogas

- Use as a renewable fuel
- No additional greenhouse gas emissions (it removes and then releases the same amount of carbon dioxide)
- Waste is disposed of at the same time and in the same operation

- Consumes methane that might otherwise leak into the atmosphere and increase the greenhouse effect

It is proposed to install a bio gas plant in Public Market, Kallara of Kallara Grama Panchayat with the technical and financial assistance of Clean Kerala Mission, Government of Kerala and Agency for Non-Conventional Energy and Rural Technology (ANERT), Government of Kerala.

A. Household level (Prefabricated – Low Cost Type) Biogas Plant

Infrastructure & Specifications

1. Treatment capacity – 2.5 kg of solid waste per day
2. Volume of digester including gas holder – 0.50 m³
3. PVC tank with circular shape as digester and gas holder
4. Inlet device with PVC pipe of diameter 110 mm
5. Inlet chamber with a plastic mug having circular shape and with a lid.
6. Outlet device with PVC pipe of 63 mm
7. A plastic can of 10 liter capacity to be used for collecting slurry/effluent for safe disposal. If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in septic tank soak arrangement.
8. Rubber hose of 25 mm (3/4 inch) diameter for conveyance of biogas for use with maximum length of 10 m.
9. Stove with single burner.
10. Control valve for regulating gas.

Standards

1. Minimum waste retention time of 40 days
2. All PVC pipe of class 4 kg/cm²
3. Rubber hose, stove and control valve with ISI mark.
4. Particle size of waste not to exceed 20 mm

Unit Cost

Rs. 8,500/-

O & M Protocols

1. Start up by adding 25 kg of cow dung with equal quantity of water
2. Waste feeding after chopping and mixed with water in the ratio 1:1
3. Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water (rice water or other kitchen waste water used for washing of rice, vegetables, meat etc. is preferable) Clean the inlet chamber after each feed and keep.
4. Limit the maximum quantity of daily feeding of waste.
5. Daily removal of slurry in plastic cans and disposal as manure/disposal in to septic tank and soak pit arrangement.
6. Prohibited to feed the wastes of slow degrading nature like straw, soil egg shells, fibrous materials like banana leaves, coconut shells, coconut coir, pseudo stem etc. disinfectants like phenyl, Dettol etc. are also prohibited.

7. Mix the substrate or rotate the drum at least weekly for preventing scum formation.

B. Household level floating dome type biogas plant 1m³ capacity

Infrastructure & Specifications

1. Treatment capacity – 7.5 kg of solid waste per day
2. Volume of digester (including gas holder) – 1 m³
3. Digester – PVC tank circular shape.
4. Gas holder dome PVC/Fiber Reinforced Plastic (FRP).
5. Central support of GI pipe of 40 mm (medium class), fixed to a steel frame work to act as guide for the dome to move up and down.
6. Inlet device with PVC pipe of diameter 110 mm.
7. Inlet chamber with plastic container, having circular shape of 30 cm diameter and with a lid.
8. Outlet devise with PVC pipe of 63 mm diameter.
9. A plastic can of 10 liter capacity to be used for collecting slurry/effluent for safe disposal. It toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in septic tank soak arrangement.
10. Rubber hose of 25 mm (3/4 inch) diameter for conveyance of biogas for use with maximum length of 10 m.
11. Stove with single burner.
12. Control valve for regulating gas.

Standards

1. Minimum waste retention time of 40 days
2. All PVC pipe of class 4 kg/cm²
3. Medium class GI pipe for central support
4. Rubber hose, stove and control valve with ISI mark.
5. Particle size of waste not to exceed 20 mm

Unit Cost

Rs. 10,000/- (without septic tank and soak pit)

O & M Protocols

1. Start up by adding 50 kg of cow dung with equal quantity of water
2. Waste feeding after chopping and mixed with water or part of waste water in the ratio of 1:1.
3. Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water. Rice water, other waste water used washing of rice, vegetables or meat in the kitchen be used in place of water.
4. Limit the maximum quantity of daily feeding of waste to 7.5 kg/day. A plastic can to be used for collecting slurry/effluent for safe disposal. It toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement.

5. Clean the inlet chamber after each feed and keep it closed.
6. Prohibited to feed the wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir, pseudo stem etc. Feeding toxic substances like fungicides, insecticides, pesticides, detergents and disinfectant like phenyl, Dettol etc. are also prohibited.
7. Mix the substrate or rotate the drum at least weekly for preventing scum formation.

Maintenance Cost

Rs. 500/- annum per unit.

ORDINARY COMPOST [NADEP Composting]

Methodology:

Quantity of agricultural waste required = 1100 – 1200 Kg

Quantity of cowdung required = 150 Kg

Process involves digging a pit of above dimension and a series of layers of agricultural waste, cowdung and soil are successively heaped upon each other within it. About 100 Kg waste is placed at the bottom of the dugout pit in a layer about 6 inches high. 4 Kg of cowdung mixed in 120 litres of water is applied on top of this layer. (Quantity of water is adjusted to keep the waste below sufficiently moist). Above this a second layer of cleaned and silted soil (roughly half the weight of agricultural waste used, about 50Kg) is spread, on which a little water is sprinkled. In this manner successive layers are heaped until the waste is approximately 45 cm above the pit. The layering can be broken up to allow time for the freshly heaped waste to settle down. After the waste has settled down the top of the pit is sealed with a thick layer of cowdung and a plastering of about 3 inches thick with soil and cowdung. The pit should be protected from rain by providing a temporary roofing and ridges all around to pit to prevent rain water from percolating directly in to the pit. The compost will be ready to use after 4 – 5 months.

Expense for laying a pit of dimension [3.6 x 1.5 x 0.9m]

Sl. No.	Item	Quantity	Rate	Amount
1	Procuring/ Transportation of agricultural waste	1 MT		1000
2	Cowdung	150Kg	2.50/Kg	375
3	Clearing of site for taking pit [5 x 5m]	25m ²	377/Man	94.25 Say 100
4	Earth work excavation in hard soil for pit	4.86m ³	2064.07/10 m ³	1003 Say 1000
5	Processing of waste, cowdung for layering	4 Women	300/Women	1200
6	Collecting and preparing top	½ Man &	300/Woman	500

	soil for layering	1 Woman	400/Man	
7	Layering, sealing of pit	4 men, 6 women	400/Man 300/Women	3400
8	Temporary roofing			500
Grand Total				8075
Say Rs. 8000/-				

SACRED GROVES: A Platform for Biodiversity Conservation

One of the critical issues on the national and global agenda is the need to preserve biodiversity for future generations while trying to understand and document the indigenous knowledge of resource management practices. Some prominent live examples of traditional and cultural forms of biodiversity conservation still exist and are in practice, which include sacred groves, sacred species and sacred landscapes. Sacred groves are the religious practice of conserving biodiversity with strong beliefs, customs and taboos and are treasure house of rare and endemic species. Everything within these groves is under the protection of the reigning deity of the grove and the removal of any material, even dead wood or twig is a taboo. Such groves still exist in many parts of the world and represent relict vegetation of the locality, preserved in its original form with minimal disturbance.



The concept of sacred groves is still relevant and exists today. India has the highest concentration of sacred groves in the world. Estimates suggest that there might be between 1,00,000 and 1,50,000 sacred groves around the country and named differently in different parts of India such as *Kovil kadu* in Kanyakumari, *Dev bhumi* in Uttarakhand, *Kavu* in Kerala, *Ummanglai* in Manipur, etc. The existence of such undisturbed pockets is mostly due to certain taboos, strong beliefs, supplemented by mystic folklores.

Services of sacred groves

Biodiversity in sacred groves: The sacred grove is kept in a comparatively undisturbed condition, due to faith and regard of local people and the belief that the sylvan deities would be offended, if trees are cut, flowers and fruits are plucked. The vegetation composing the sacred groves is very different from that of the surrounding areas of the region.

Rare and endemics plant species from sacred groves: A number of studies have emphasized that many sacred groves are repositories of rare species. *Kunsteria keralensis*, a climbing legume, reported from a sacred grove in southern Kerala, is confined to that sacred grove.

Belpharistermma membranifolia, *Buchanania lanceolata* and *Syzygium travuncorium* are rare species found only in some sacred groves of Kerala which are not found elsewhere.

Micro-climatic habitats: Several group exhibit remarkable microhabitat-specific nature which can be attributed to the local environmental conditions and sacred groves provide excellent micro-climatic conditions for the luxuriant growth of those plant species which are not present in the surrounding areas at the same altitude.

Conservation of water resources: Larger sacred groves also have their own micro-climate which increases nutrient recycling, recharge of aquifers and act as a primary source of perennial streams.

Providing livelihood: Most of the sacred groves besides maintaining biodiversity provide a livelihood to the community they belong to. The local communities and the care takers of the groves have developed a rotation system of getting forest products by which all the families receive benefits during different time. Tree cutting is prohibited and only felled trees are taken away by the natives.

Threats to sacred groves

There are several key threats that have led to the degradation of groves in India, these are:

Developmental projects: Some of the sacred groves that fell under government-vested lands, were destroyed when townships grew. Rails, roads and highways have also taken their toll of many sacred groves. Others disappeared under mining and industrial operations. Still others were flooded by big dam projects. Such developmental projects have contributed greatly to the diminishing of the flora and fauna of these sacred groves.

Collection of biomass and medicinal plants: Collection of biomass like fodder, fuel and other edible plants are frequently done by local communities for their survival and daily needs and grazing of animals is major concern to the biodiversity of sacred groves. Ruthless destruction and overexploitation of medicinal plants which are abundantly found in the sacred groves is another factor for degradation of biodiversity within the grove.

Shift in belief system: Shift of beliefs systems have also led to a weakening of the conservation of sacred groves. In some cases, Hinduism has subsumed the sacred groves that were established for older folk deities. Moreover, in many countries local traditions are being challenged by westernized culture, which results in the loss of sacred groves and their cultural importance for future generations of local people. Diminishing traditional beliefs due to modernization is another factor which affects their conservation.

Conservation measures:

Sacred groves are managed by local communities since ancient time and protection through religious norms and taboo is excellent approach to protect these patches of virgin forests, however, in the absence of effective conservation management these sacred groves are facing challenges to hold the original plant diversity they have. Sacred groves serve as repositories of genetic diversity and are provided with comprehensive and rich ecological niche. Creating awareness among the inhabitants about the importance of invaluable genetic diversity and sustainable use of resources can

lead to a secure future of these conserved patches. Government and international conservation agencies should support traditional institutions of sacred grove management, whether at family, community or even regional level. For effective conservation, it is important to respect community values behind such impressive conservation.

PADDY CULTIVATION

Paddy cultivation [1 Ha]

A. Machinery hire charges				
Sl.No.	Description	Rate	Amount	
1	For land preparation, 2 rounds of tractor (20 hrs)	Rs. 400/hr	8000	
2	For transplanting, use of transplanter	Rs. 3000/acre	7500	
Sub Total			15500	
B. Material Cost				
Sl.No.	Item	Rate	Quantity	Amount
1	Paddy seed	Rs. 25/Kg	80Kg	2000
2	Lime	Rs. 9/ Kg	350Kg	3150
<u>Organic manures</u>				
3	a) Cow dung	Rs. 2/Kg	2000Kg	4000
	b) Neem cake	Rs. 18/Kg	200Kg	3600
				} 7600
<u>Fertilizers</u>				
4	a) Urea	Rs. 5.90/Kg	150Kg	885
	b) Rajphos	Rs. 7.40/Kg	175Kg	1295
	c) Muriate of potash	Rs. 16.80/Kg	60Kg	1008
				} 3188
5	Cost of plant protection chemicals			600
Sub Total			16538	
C. Labour cost				
Sl.No.	Description	Labour required	Rate	Amount
1	Formation of field bunds (Varamb)	2.5 men	Rs. 400/Man	900
2	Pulling over of weeds	5 Women	Rs. 300/ Women	1500
3	Application of lime, organic manure	1 man and 2 women		1000

4	Application of fertilizer	1 man and 1 woman		700
5	Weeding	20 Women		6000
6	Application of plant protection chemicals	2 men and 2 women		1400
7	Harvesting, threshing and winnowing	2 men and 40 women		20000
Sub Total				31500
Grand Total (A+B+C)				63538
Say Rs. 63500/- (25 cents = 6353.8 Say Rs. 6400/-)				

VEGETABLE CULTIVATION

The vegetable crops have been well advocated in solving the problem of food security. They are rich source of minerals, vitamins, fibre and contain a fair amount of protein as well as carbohydrates. In addition to local market demand vegetables have the potential for both domestic and export market. Although India is the second largest producer of vegetables next only to China in World, the productivity of different vegetables in our country is comparatively lower than the World's average productivity. Again the per capita availability of vegetable (210g/head/day) is still behind the recommended quantity (285g /head /day). Our demand by 2020 will be around 250 million tonnes. Thus due to the rapid growth of the population with reduction in land, in order to feed the population, the only solution is the vertical expansion or by increasing the productivity per unit area per unit time as the potential available land and water resources and of technology still remain unexploited. Our strategy should be to produce more vegetables from less land, less water with less pesticides and with less detrimental to soil and environment as well. Organic vegetable cultivation offers one of the most sustainable farming systems with recurring benefits to only long-term soil health but provides a lasting stability in production by importing better resistance against various biotic and a biotic stresses.



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Latent needs of Organic Farming of Vegetable crops in India

1. Most of the vegetable crops are eaten fresh or used for health care; hence any contamination (chemical residue) may lead to various kinds of health hazards
2. In India majority of the vegetable growers are poor, small and marginal farmers
3. Decrease in land productivity due to ever increasing use of chemical fertilizers

4. There are not many scientific breakthroughs in improving quality and production of vegetable crops
5. The ever-increasing cost of production in chemical farming including investments in manufacturing fertilizers, pesticides, irrigation etc. despite massive government subsidies is a major cause of concern, which is very low in organic farming.
6. High environment pollution
7. Due to globalization which affects every industry, there is a need to compete with the best in the World. This urges us to give adequate weightages to Organic farming of vegetable crops
8. Organic Farming of vegetable crops generates income through International exports or by saving production costs.
9. Organic Farming also enables to secure a place for India in International markets by producing high value vegetable crops.
10. Excessive use of chemical fertilizers as well as pesticides not only increases the cost of production but also poses threat to the environment quality, ecological stability and sustainability of production. We have gained quantity but at expense of quality.
11. In developing countries like India, especially in low input traditional system, properly managed organic farming system can increase the crop productivity and restore the natural base.
12. The decision to go for Organic Farming seems partly financial, partly out of concern for the environment and partly because it made sense to threat the land and animal as well without chemicals.

Objectives of Organic Farming in Vegetable crops

1. To produce food of high nutritional quality in sufficient quantity
2. To encourage biological cycles within farming systems by involving the use of microorganisms, soil flora & fauna, plants and animals
3. To maintain and increase the long term fertility of soil and biodiversity
4. To use renewable resources in locally organized production systems
5. To work with a close system with regard to organic matter and nutrient elements
6. To avoid all forms of pollution that may results from Agricultural techniques

With the above objectives and for meeting the vegetable requirements of the households, two types of activities are proposed under promotion of vegetable production, viz.

1. Terrace vegetable gardening
2. Homestead vegetable kitchen gardens
3. Commercial vegetable cultivation

GROW BAGS

An urban homestead farming venture in the project area aims at promoting organic vegetable cultivation so as to produce farm fresh vegetables in terraces to make

each household self-sufficient in vegetable production. This also helps to utilize the recycled household waste efficiently for cultivation of crop through vermi- composting

Advantages:

The advantages are as follows.

1. We can produce all the vegetables required for the home and need not depend on the market vegetables. Self-sufficiency in vegetables means not only the saving of the money but also endurance of proper health which again means saving of the hard earned money.



2. We can have fresh vegetables. From the nutritional point of view fresh vegetables are necessary for maintaining proper health. Many a time the vegetables sold in the market are not fresh as they have to be transported over long distances from one part of the country to the other.
3. There is less danger of consuming pesticides and other agrochemicals through the vegetables bought from the market. Most of the vegetables sold in the market are containing the poisonous substances from the pesticides whereas homemade vegetables will be free from such chemicals.
4. We can have the leafy, root and fruit vegetables in a balanced and required proportion as per requirement of the ICMR recommendation. When we depend on the market at times we do not get all these three kinds of vegetables throughout the year anyone of them may be too costly.
5. We can have a useful and a profitable hobby in cultivating the vegetables. After the usual work in the offices and institutions etc. doing some work in the terrace garden is very helpful to get the mind refreshed and the body exercised.
6. We can easily recycle all the household and kitchen waste into manure and use them for growing vegetables. Normally these wastes are thrown around the house or on the road polluting very badly the environment and encouraging breeding of mosquitoes and flies.
7. We can also use all the liquid waste from the house such as bath room and scullery water for growing the vegetables, provided too much soap or detergents is not used.
8. A good roof garden enhances the beauty of the house. Vegetables grown in an orderly manner, standing in each bed at various stages of growth is as beautiful as any ornamental garden.
9. It gives a chance for all the family members to get involved in a common household engagement.

10. In summer the roof vegetable garden helps in keeping the house cool and comfortable. Growing vegetables on the roof will drastically reduce the chance of the terrace getting heated up.
11. This is one of the best ways of converting otherwise wasted human labour and time into economically useful items.

Homestead Vegetable Kitchen Gardens

Our State is depending heavily on its neighboring states like Tamil Nadu, Karnataka, Andhra Pradesh for meeting the vegetable requirement. The annual vegetable production of our State is only 7 Lakhs MT, (i.e.) 40% of the total requirement of 18 lakhs MT. Efforts are to be made for increasing Vegetable production in the State through massive social movement by starting Kitchen garden in all the households. As part of improving production system, it is decided to distribute vegetable seed kits to all households of the project area to promote & popularize vegetable cultivation in homesteads, with a view to increase vegetable production and to make available pesticide free, good quality vegetable to the people of the project area.



Objectives

1. To increase production of vegetable in the project area.
2. Promote cultivation of vegetable in homesteads to attain self sufficiency
3. Increase the availability of good quality, non – toxic vegetables
4. Awareness creation among public regarding the importance of organic vegetable cultivation.
5. Participation of the society as a whole like Kudumbasree, Janasree, Resident Association, School Students and NGOs in vegetable cultivation.

Programme

As part of the programme, 20,000 vegetable seed kits will be distributed to homesteads. PIA/WC will procure vegetable seeds of good quality from the departmental farms & VFPCCK and prepare vegetable seed kits containing seeds of 4-5 types of vegetable commonly cultivated like Bhindi, Amaranthus, Cowpea, Chilly, Bitter gourd, Snake gourd etc. in homesteads, costing Rs. 10/- including packing. The seed packets should be super scribed "IWMP Pallom - Homestead Vegetable Gardens". The Agricultural Officer of the Krishi Bhavans will select, finalize the beneficiary list in consultation with the NHGs and distribute the seed kits, free of cost. Training programmes will to be conducted as part of comprehensive vegetable development

programme and ATMA Programmes for creating awareness and vegetable production skill among the people. Necessary technical Support for setting up homestead vegetable gardens should be given by Krishi Bhavan officials. Filed visits are to be conducted by Krishi Bhavan staff to address field problems. The launching of the programme should be arranged in a campaign mode involving local leadership.

Commercial vegetable cultivation

Area = 0.50 ha (125 cents)

Details of crops and area

No.	Crop	Area
1	Bitter guard	0.05 ha
2	Snake guard	0.05 ha
3	Pumpkin	0.05 ha
4	Ash guard	0.05 ha
5	Cowpea	0.05 ha
6	Amaranthus	0.05 ha
7	Chilly	0.05 ha
8	Lady's finger	0.05 ha
9	Tomato	0.05 ha
10	Brinjal	0.05 ha
	Total	0.50 ha

Estimated cost of cultivation

1	Land preparation and planting – 10 man days	1640.00
2	Pot watering – 14 man days	2296.00
3	Application of plant protection chemicals, other inputs, intercultural applications upto harvesting – 20 man days	3280.00
	Total cost of unskilled labour (MGNREGS)	7216.00

Material cost

4	Seed	1500.00
5	Green manure	1000.00
6	Cowdung (1 ton)	1500.00
7	Fertilizer	
	Urea – 75 kg	600.00
	Muriate of Potash – 150 kg	900.00
	Rajphos – 150 kg	750.00
		2250.00
8	Trichoderma – 2 kg	200.00
9	Neem cake – 25 kg	2500.00
10	Ground nut cake – 150 kg	4000.00
11	Pseudomonas – 3 kg	300.00
12	Other plant protection materials	1000.00

13	Pandal materials (0.10 ha)		
	Poles (125 nos.)	3125.00	
	Iron rope – 12.5 kg	625.00	
	Coir/plastic rope – 3 kg	600.00	
	Skilled labour – 3 nos. @ Rs. 350	1050.00	5400.00
	Total material cost		19650.00
	Total cost of cultivation		26866.00

BANANA CULTIVATION

Banana prefers tropical humid lowlands and is grown from the sea level to 1000 m above MSL. It can also be grown at elevations up to 1200 m, but at higher elevations growth is poor. Optimum temperature is 27°C. Soils with good fertility and assured supply of moisture are best suited.

Season

Rain fed crop: April-May

Irrigated crop: August-September

Adjust planting season depending upon local conditions. Avoid periods of heavy monsoon and severe summer for planting. Adjust the time of planting so as to avoid high temperature and drought at the time of emergence of bunches (7-8 months after planting).

Climate & Soil: Tropical humid climate, Well-drained soils with good fertility

Seed rate:

Seed Treatment: Remove the roots and outer skin of the rhizomes. Dip them in a solution of Chlorpyrifos @ 2.5 ml/l for 20mts. Drain the solution. The rhizomes are to be smeared with cowdung solution and ash and dried in the sun for about 3-4 days and stored in shade up to 15 days protecting from rain before planting.



Spacing: Pit size 50 x 50 x 50 cm

Variety	Spacing, m	Suckers/ha
Poovan	2.1 x 2.1	2260
Chenkadali	2.1 x 2.1	2260
Palayankodan	2.1 x 2.1	2260
Monthan	2.1 x 2.1	2260
Nendran	2.0 x 2.0	2500
Grosmichael	2.4 x 2.4	1730
Robusta, Monsmarie, Dwarf Cavandish	2.4 x 1.8	2310

Tissue culture banana	2.0 x 2.0	2500
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Nutrient management: In order to adjust the acidity in the soil, apply lime at the rate of 500g to 1 kg. Apply Organic manure @10 kg/plant, NPK - 190:115:300g/plant

Tissue culture Nendran banana: Apply Organic manure @20 kg/plant NPK- 300:115:450 g/plant in 6 splits.

Crop Management:

- During summer months, irrigate once in three days.
- Ensure good drainage and prevent water logging.
- Mulching the basin with crop waste or waste quality paddy straw, especially for the rain fed crop will reduce the moisture loss through evaporation. It will have an additional benefit of reducing the weed growth as well as improving the organic matter content, and thereby considerably improving bunch yield.
- Sow the seeds of green manure crops at the time of planting, cut and incorporate just before flowering.
- Remove male inflorescence and small fingers in lower hands
- Wrap bunch one month after the emergence
- Provide propping after bunch emergence.
- Remove all suckers that are formed before the bunch emergence

Harvesting: Cut gently with a sharp knife, the bunches should not be kept on sand.

Grade and pack.

Yield: 20- 35 t/ha

Unit cost: In the present model, the unit cost for production for 240 plants works out to Rs. 16,800/-. The details of the project cost are presented below:

Sl. No.	Item of investment	Amount (Rs.)
1	Seed cost	10.00
2	Pit	10.00
3	Organic Manure	13.00
4	Pesticide	8.00
5	Support	5.00
6	Labour Charge	24.00
	Total	70.00/ plant
	@ Rs. 70 x 240 plants/unit	16,800

VERMICOMPOSTING

Vermi-technology is a process by which all types of biodegradable wastes such as farm wastes, kitchen wastes, market wastes, bio wastes of agro-based industries, livestock wastes etc. are converted to nutrient rich vermin compost by using earthworms as biological agents. Vermicompost contains major and minor nutrients in plant-available forms, enzymes, vitamins and plant growth hormones.

Species suitable: *Eudrillus eugineae* has been identified as the best species of earthworm for vermi-technology under Kerala conditions.

Vermi composting of farm wastes

Pits of size 2.5 m length, 1 m breadth and 0.3 m depth are taken in thatched sheds with sides left open. The bottom and sides of the pit are made hard by compacting with a wooden mallet. At the bottom of the pit, a layer of coconut husk is spread with the concave side upward to ensure drainage of excess water and for proper aeration. The husk is moistened and above this, bio waste mixed with cowdung in the ratio of 8:1 is spread up to a height of 30 cm above the ground level and water is sprinkled daily. After the partial decomposition of wastes for 7 to 10 days, the worms are introduced @ 500 to 1000 numbers per pit. The pit is covered with coconut fronds. Moisture is maintained at 40 to 50 per cent. When the compost is ready, it is removed from the pit along with the worms and heaped in shade with ample light. The worms will move to bottom of the heap. After one or two days the compost from the top of the heap is removed. Put back the un-decomposed residues and worms to the pit for further composting as described above. The vermicompost produced has an average nutrient status of 1.5%, N, 0.4% P₂O₅ and 1.8% K₂O with pH ranging from 7.0 to 8.0. The nutrient level will vary with the type of material used for composting.



Precautions

1. The composting area should be provided with sufficient shade to protect from direct sunlight.
2. Adequate moisture level should be maintained by sprinkling water whenever necessary.
3. Take preventive measures to ward off predatory birds, ants or rats.

Depending on the extent of weathering of leaves used for composting, 70 per cent of the material will be composted within a period of 60-75 days. At this stage, watering should be stopped to facilitate separation of worms from the compost. Compost can be collected from the top layers, which can be sieved and dried under shade. Earthworms aggregated at the bottom layers can be collected and used for further vermicomposting.

Vermicomposting from coconut leaves

Weathered coconut leaves can be converted into good quality vermicompost in a period of three months with help of earthworm, *Eudrillus* sp. On an average, 6-8 tonnes of leaves will be available from a well-managed coconut garden, which will yield 4-5 tonnes of vermi compost with about 1.2, 0.1 and 0.5% N, P₂O₅, K₂O respectively.

Vermicomposting of household wastes

A wooden box of 45 x 30 x 45 cm or an earthen/plastic container with broad base and drainage holes should be taken. Keep a plastic sheet with small holes at the bottom of the box. Add a layer of soil of 3 cm depth and a layer of coconut fibre of 5 cm depth

above it for draining of excess moisture. Add a thin layer of compost and worms above it. About 250 worms are sufficient for the box. Spread daily vegetable wastes in layers. Cover the top of the box with a piece of sac to provide dim light inside the box. When the box is full, keep the box without disturbance for a week. When the compost is ready, keep the box outside in the open for 2-3 hours so that the worms come down to the lower fibre layer. Remove compost from the top, dry and sieve. The vermi compost produced has an average nutrient status of 1.8 % N, 1.9 % P₂O₅ and 1.6 % K₂O, but composition will vary with the substrate used.

Project Cost

The project cost for vermi composting works out to Rs. 18000/-. The details are given below:

For one tank

Sl. No.	Description	Amount
1	Earth work excavation in ordinary soil for foundation 1 x 9.40 x 1.45 x 0.30 = 1.26m ³ Say 1.26 m³@ Rs. 370/10 m³	46.62
2	R.R. Masonry in CM 1:6 for foundation and basement Foundation – 1 x 9.40 x 0.65 x 0.30 = 1.26 m ³ Basement – 1 x 10.30 x 0.45 x 0.15 = 0.69 Say 1.95 m³@ Rs. 688/m³	1341.60
3	Hollow brick in CM 1:6 with best quality of concrete block 1 x 9.40 x 0.10 x 0.80 = 0.77m ³ Say 0.77 m³@ Rs. 1642/m³	1264.34
4	Plastering with CM 1:4, 12 mm tank one coat floated hand and toweled smooth Wall – 2 x 9.70 x 1.00 = 19.40 m ³ Floor – 1.40 x 3.60 = 0.69 Say 34.44 m³@ Rs. 800/10m³	1955.20
5	Construction of drain channel 1 x 9.80 x 0.10 = 0.98 Say 0.98 m² @ Rs. 208/10 m²	203.84
6	Cost for 1 kg Earthworm - 500/kg	500.00
7	Flooring with CM 1:4:8, 75 mm thick over plastering 1 x 3.8 x 1.4 x 0.05 = 0.26 m ³ Say 0.26 m³@ Rs. 2089/m³	543.14
8	Pointing the basement 1 x 9.40 x 0.15 = 1.41m ³ Say 1.41 m³@ Rs. 800/10m³	46.67
9	Cost for Roof	300.00
Total		6201.41

MUSHROOM CULTIVATION

Mushrooms, also called 'white vegetables' or 'boneless vegetarian meat' contain ample amounts of proteins, vitamins and fibre apart from having certain medicinal

properties. Mushroom contains 20-35% protein (dry weight) which is higher than those of vegetables and fruits and is of superior quality. Mushrooms are now getting significant importance due to their nutritional and medicinal value and today their cultivation is being done in about 100 countries. At present world production is estimated to be around 5 million tonnes and is ever increasing. Though 20 mushroom varieties are domesticated about half a dozen varieties viz; button, shitake, oyster, wood ear and paddy straw mushrooms contribute major share of the total world production.

Mushroom offers prospects for converting lignocellulosic residues from agricultural fields, forests, etc. into protein rich biomass. Such processing of agro waste not only reduces environmental pollution but the byproduct of mushroom cultivation is also a good source of manure, animal feed and soil conditioner.

Cultivation of paddy-straw mushroom (*Volvariella volvacea*)

The paddy straw mushroom can be successfully cultivated in the plains of Kerala throughout the year where the temperature ranges between 28-32°C. The straw beds can be laid out in sheds, veranda of buildings and during summer under shades of trees. Beds should not be kept under direct sunlight. Prepare a raised platform of 1 m long and 0.5 m broad with wooden planks or bricks. Ten to fifteen kg of well-dried and hand-threshed straw is required to raise a single standard bed. For spawning this bed, two bottles of spawn and about 100 to 150 g of red gram powder are



needed. First the straw is made into twists of about 5 to 8 m long and 20-25 cm diameter. The twists are tied into small bundles and are kept immersed in clean water in tanks for about 6 to 12 hours. After this, the bundles are taken out and kept aside for some time to drain the excess water. The bundles are untied and the straightened twists are placed length-wise over the platform in a zigzag fashion. The twists are placed as close as possible. Keep another layer over the first layer crosswise. These two layers form the first layer to be spawned. Break open the spawn bottles and carefully divide the spawn into small bits of 2-2.5 cm thick. Place these bits of spawn all along the periphery of the bed, about 5-8 cm away from the edge and 10 cm apart. Sprinkle a teaspoon full of coarsely powdered red gram powder before and after spawning the first layer. Build the next layer with one row of twist as done before and spawn it. Make successive layers until the straw twists are finished. After placing the last of twists, press the bed thoroughly from the top in order to drain excess water. Make the bed as compact as possible and cover with a transparent polythene sheet to maintain the temperature and relative humidity within the bed. Place another wooden plank over the bed and keep 4-5 bricks above the plank to get more compactness. Keep the bed undisturbed for 6-7 days. Slowly remove the sheet and observe the moisture level of the straw. If the moisture is excess remove the sheets for half an hour and then cover it again as before. Small white round pinheads

appear all along the sides of the bed after 7 days and mature into button and egg stage on 9th day. Harvest the mature sporocarps in eggs stage. About 2-3 kg of mushrooms can be harvested from 10 kg of straw. Cropping lasts for 2-3 days. After the harvest, the spent straw can be sun-dried and used as cattle feed.

Instead of twists, the beds can be laid out using small bundles of straw each weighing about one kg. Place four such bundles of straw side by side over the platform with loose ends towards the same direction. Over this, place another four bundles, the loose ends towards the opposite direction. These eight bundles form one layer, which is to be spawned as in the case of twists.

Cropping and yield: Matured and fully opened sporocarps are harvested by placing the thumb and forefinger near the base of the fruiting body and twisted in clockwise direction to get detached from the mycelium. An average yield of 500-700 g can be harvested from 1 kg of straw. The spent straw can be used as enriched cattle feed.

Yield ranges from about 100-200% of the dry weight of the substrate and depends on the substrate combination as well as the way in which the substrate has been managed during the fruiting season. The richer the combination and the whiter and denser the mycelium, the greater will be the mushroom yield.

To increase yield, the most common supplement used is urea or organic fertilizer dissolved in water (100 gm in 100 liters water). Using a plastic mist sprayer, the solution is sprayed on the surface immediately before fruiting.

Marketing: Mushroom has a good overseas market in which the present contribution of India is negligible. In the domestic market the availability of mushroom is limited to cities and big towns only. Mushrooms can be marketed either fresh or after dehydration. There is huge international demand for dried mushroom and the farmers can get better returns by tapping these sources.

Unit cost: In the present model, the unit cost for production of 100 kg of oyster mushroom per cycle works out to Rs.3700/-. The details of the project cost and techno economic parameters are presented below:

Under production sector, a unit of ten beds will be given to a beneficiary at an unit cost of Rs. 350.00

BEEKEEPING (APICULTURE)

True honeybees belong to the family Apidae subfamily Apinae and genus Apis. They are social insects living in colonies. A colony consists of a queen, several thousand workers and a few hundred drones. There is division of labour and specialization in the performance of various functions. They build nests (combs) with wax, which is secreted from the wax glands of worker bees. The bees use their cells to rear their brood and store food. Honey is stored in the upper part of the comb; beneath it are rows



of pollen storage cells, worker brood cells and drone brood cells in that order. Some Apis species build single comb in open, while others build multiple combs on dark cavities.

Species of honeybees

There are four species of honeybees in India. They are rock bee, little bee, Indian bee and European bee. In addition to the above, another species is also present in Kerala known as stingless bees. They are not truly stingless, but sting is poorly developed. They make nests in the ground, hollows of trees, bamboo, rocks or cracks of walls. Honey and brood cells are separate in the nest. They are efficient pollinators.

Indian bee (*Apis cerana indica*)

This is the domesticated hive bee in Kerala. A colony consists of a queen, 20,000 to 30,000 workers and a few drones. This species is with gentle temperament and responds to smoking. Lack of flora leads to absconding and also has a strong tendency for swarming. It yields 8-10 kg of honey per colony per year.

Bee-box: ISI Type-A box is recommended for the state of Kerala. A division board may be added to the bee box for adjusting the internal space depending on the strength of the colony. It can also be procured from beekeepers. Wild feral colonies can be hived. Beekeepers in different regions use local hives made of low cost wood. The wood should not have a strong smell. Kail (*Pinus excelsa*), teak (*Tectona grandis*), toon (*Toona ciliata*) anjili (*Artocarpus hirsutus*), punna (*Calophyllum inophyllum*) are some of the suitable woods. The hives should be preferably painted white on outside to protect the timber from weathering.

Hiving wild colony: It is done during evening hours. Smoke the colony slightly, cut out the combs one by one and tie to the brood frames with plantain fibre. Arrange them in the box.

Location of beehives: The apiary must be located in well-drained open area, preferably near orchards, with profuse source of nectar, pollen and water. Windbreaks may be provided by planting shrubs, flowering plants and also creepers like antigonon. Shade must also be provided. Ant wells are fixed around the hive stand. The colonies must be directed towards east, with slight changes in the directions of the bee box as a protection from rain and sun. Keep the colonies away from the reach of cattle, other animal, busy roads and streetlights.

Management of colonies: Inspect the beehives at least once in a week during brood rearing / honey-flow seasons preferably during the morning hours. Bright, warm and calm days are suitable. If sunrays fall directly on the beehive spread cloth or a towel over the same. Look for freshly laid eggs to ensure that the colonies are healthy. Clean the hive in the following sequence, the roof, super/supers, brood chambers and floorboard. Observe the colonies regularly for the presence of healthy queen, brood development, storage of honey and pollen, presence of queen cells, bee strength and growth of drones. Look for the infestation by any of the following bee enemies.

Wax moth (*Galleria mellonella*): Remove all the larvae and silken webbings from the combs, corners and crevices of bee box.

Wax beetles (*Platybolium* sp.): Collect and destroy the adult beetles.

Mites: Clean the frame and floorboard with cotton swabs moistened with freshly made potassium permanganate solution. Repeat until no mites are seen on the floorboard.

Diseases: The dead larvae due to Thai sac brood virus (TSBV) in the comb cells may be removed and destroyed.

Management during lean season: Remove the supers and arrange the available healthy broods compactly in the brood chamber. Provide division board, if necessary. Destroy queen cells and drone cells, if noted. Provide sugar syrup (1:1) @ 200 g sugar per colony per week for Indian bees. Feed all the colonies in the apiary at the same time to avoid robbing.

Management during honey flow season: Keep the colony in sufficient strength before honey-flow season. Congestion in the hive must be avoided and surplus honeybees are drawn to supers. Provide maximum space between the first super and the brood chamber and not above the first super. Place queen excluder sheets in between brood and super chamber to confine the queen to brood chamber. Examine the colony once in a week and frames full of honey should be removed to the sides of the super and such frames can be raised from brood to super chamber. The frames, which are three-fourth filled with honey or pollen and one-fourth with sealed brood should be taken out of brood chamber and in its place empty combs or frames with foundation is added. The frame with comb foundation should be placed next to the brood nest. The combs, which are completely sealed, or two-third capped may be taken out for extraction of honey and returned to supers after honey extraction. This helps the colonies to activate the bees to collect and store more honey. Two or three such extractions are possible during a surplus flow. Extraction of uncapped honey will result in fermentation. Honey extraction, after the flow is over, should be avoided to save the bee colonies from robbing. Care should be taken to retain sufficient combs with honey in the brood chamber or reduce the lean period.

Migratory bee keeping: The moving of bee colonies from one place to another to capture increased nectar flow of a particular flora is called migratory beekeeping. Copious flow of extra floral nectar available on rubber trees during January-April is exploited by shifting bee colonies to these plantations during this period.

Similar practice is done in cashew plantations and in other orchards too. Maintaining bee colonies in orchards will increase the yield, since pollination is more efficient in such orchards.

Shifting of colonies is done after sun set. Colonies should be prepared as follows. Extract available honey and fasten all the weak combs to frames with plantain fibres. Secure the frames to the chamber with packing. Close the bee entrance with cotton. Then secure the bee-box (floorboard, brood chamber, supers and roof) firmly with strong threads. Do not tilt or topple beehives while stacking them in the conveyance or during transit. Avoid strong jerks and shocks while transporting.

Set up the beehives as described above at the new site. Inspect the condition of combs and tighten loose threads, if any. This inspection should be done only in dim light. Next morning remove the cotton plug at bee entrance. Later provide comb foundation sheets, if necessary and provide sufficient space for storage of honey.

Extraction of honey: Honey is extracted only from super combs using honey extractor. The sealing of cells on combs is removed with sharp knife before placing in the extractor. Extractor should be worked slowly at the beginning and at about 150 rpm at the end for about 1 to 2 minutes. Then the sides of the frames are reversed and the extractor is again worked. Extracted honey is filtered through muslin cloth. Providing a bee escape between the brood and super on the day prior to honey extraction keeps the bees away from the super. Remove the escape soon after honey extraction.

Processing of honey: Heat the honey to 45°C by keeping it in a water bath. Sieve it to remove wax particles, debris, dust and pollen. Again heat it to a temperature of 65°C in water bath and maintain it for 10 minutes. Then cool and filter it in 80-mesh muslin and store in glass, porcelain, earthenware, enamelware or stainless steel containers. Bulk storing can be made in mild steel containers lined with bee wax.

Unit cost: In the present model, the unit cost for installing 3 boxes of bee colony works out to Rs. 7,000/-. The details of the project cost are presented below:

Expenditure for 3 boxes per family				
Sl.No.	Item	Nos	Rate	Amount
1	ISI bee boxes with bees and hive stand [5 frames]	3	Rs. 1600/One	4800
2	Honey extractor	1	Rs. 1500/One	1500
3	Smoker	1	Rs. 200/One	200
4	Bee knife	1	Rs. 100/One	100
5	Queen cage	1	Rs. 50/One	50
6	Queen gate	1	Rs. 200/One	200
7	Bee veil	1	Rs. 100/One	100
8	Bee capturing nest	1	Rs. 100/One	100
Grand Total				7050
Say Rs. 7000/-				

Expenditure for a group of 5 families - @ Rs. 7000/family - Rs. 35000/-

IWMP assistance as revolving fund - Rs. 25000/group

Beneficiary contribution - Rs. 10000/group ie, Rs. 2000/family

CULTIVATION OF TUBER CROPS

Under production sector, a unit of ten cents will be given to a group at a unit cost of Rs. 5,500.00

Sl. No.	Item	Amount (Rs.)
1	Planting materials	500

2	Fertilizers	200
3	Land preparation	4,000
4	Other expenses	800
Grant Total		5,500

INTEGRATED NUTRIENT MANAGEMENT (INM)

This involves judicious blend of organic, inorganic fertilizers and biofertilisers in providing all the vital nutrients required for plant growth.

INM in coconut

a.1). Application of green manure

No	Components	Qty	Rate	Amount/Ha
1	Green manure crops (even cowpea)	200 No	100g per palm @ Rs.65/kg	1300
			Total cost	1300
			IWMP assistance (80% of cost)	1040
			Beneficiary contribution	260
Minimum plot size : 25 cents/plant population of 20 palms				

a.2). Application of lime

No	Components	Qty	Rate	Amount/Ha
1	Lime	200 No	1kg per palm @ Rs.9/kg	1800
			Total cost	1800
			IWMP assistance (80% of cost)	1440
			Beneficiary contribution	360
Minimum plot size : 25 cents/plant population of 20 palms				

Total cost for INM Coconut = Rs.3100/ha

IWMP assistance (80% of cost) = Rs.2500/ha

Beneficiary contribution = Rs.600/ha

Rehabilitation of pepper gardens

a.) Pepper cuttings

No	Components	Qty	Description	Amount/Ha
1	Pepper cuttings	600 nos	15 additional for a plot of 25 standards, 600 nos /ha @ Rs. 2/one	1200
			Total cost	1200
			IWMP assistance (80% of cost)	1000
			Beneficiary contribution	200
Minimum plot size : for plots with at least 25 standards				

b). Application of Trichoderma mix

Sl. No	Components	Qty	Description	Amount/Ha
1	Trichoderma Mix	1000 standards	For 100 kg mixture (1kg Trichoderma, 90 kg dried cow dung, 10 kg Neemcake). Dose:- 2.5 kg mixture per standards. Trichoderma 25 kg /ha @ Rs.70/kg with Rs.1750 . Cost of cowdung and neemcake rounded to Rs. 3250	1750 + 3250 = 5000
			Total cost	5000
			IWMP assistance (80% of cost)	4000
			Beneficiary contribution	1000
Minimum plot size : for plots with at least 25 standards				

Total cost for Pepper Rejuvenation (1+2) = Rs.6200/ha

IWMP assistance (80% of cost) = Rs.5000/ha

Beneficiary contribution = Rs.1200/ha

COW REARING

Dairy farming is a profitable business. It provides an excellent opportunity for self-employment of unemployed youth. Dairying is an important source of subsidiary income to small/marginal farmers and agricultural labourers. There is immense scope of dairy farming in our country. The increasing cost of feed ingredients and its seasonal variability can be reduced by undertaking fodder cultivation. The manure from animals provides a good source of organic matter for improving soil fertility and crop yields. The gobar gas from the dung is used as fuel for domestic purposes as also for running engines for drawing water from well. The surplus fodder and agricultural by-products are gainfully utilized for feeding the animals. Almost all draught power for farm operations and transportation is supplied by bullocks. Since agriculture is mostly seasonal, there is a possibility of finding employment throughout the year for many persons through dairy farming. Thus, dairy also provides employment throughout the year. The main beneficiaries of dairy programmes are small/marginal farmers and landless labourers

Before starting a dairy farm, the entrepreneurs/ farmers are advised to undergo training on dairy farming. They can contact Local Animal Husbandry Department staffs/Veterinary College/Agriculture University etc. for the purpose. They should also visit progressive



dairy farmers and government/ agricultural university dairy farm in the locality. They must check the following points before starting a dairy farm.

1. Availability of good quality dairy breed cows in nearby livestock market
2. Nearness of the Farm to Veterinary Hospital, Artificial Insemination Center/livestock Aid Centers, MPCS
3. Marketing facility of milk and milk product in non MPCS area
4. Availability of concentrates, fodder & medicine in that locality.

This project is based on following assumption:-

- Freshly calved crossbred/indigenous descriptive (dairy Breed) cows in 1st or 2nd lactation will be purchased.
- Availability of 0.75 to one acre of irrigated land is prerequisite for the project, in absence of irrigated land provision of well and pump set has to be included in the project report.
- Cost of labour has not been taken into consideration since full time labour is not required for the small unit. Family labour will be utilized for maintenance of the dairy farm.
- Cow dung produced will be utilized as Manure for fodder cultivation.
- Cost of rearing calves not considered as it will be repealed by their sale
- In case of death of cow, new cow will be purchased from insurance claim money.

The scheme will be successful on the above guidelines if run by the dairy farmer on scientific lines.

Housing for cows

Floor – it should be Pucca, smooth strong concrete cemented, impervious to moisture, and have slope 1 in 60 towards gutter. Plinth should be 2ft. higher than ground.

Walls-3ft. high lengthwise brick or wall on sides, End wall should be solid made of bricks.

Roof– it should be 14-16ft. high at the center and 8-9 ft. high on the side wall .there should be hang over 3ft beyond wall to prevent rain water entering cow shade. Roof may be of asbestos, or tile. Thatched roof can replace asbestos in low cost housing.

Programme

The aim is to provide one cow to the breeding stock for cow rearing. The scheme aims to provide one cow to the beneficiaries already rearing cow/ new ones. An assistance of Rs.15,750/- will be given for the procurement of one cow.

Selection of beneficiaries will be by constituting of a selection committee and 10 % from SC/ST Beneficiaries. Interested farmers will be trained and their track records maintained. The beneficiaries will be selected by a selection committee with President of that local body, Chairman standing committee and local Veterinary surgeon as members.

Applications will be invited by giving wide publicity. BPL families will be considered for selection and in their absence beneficiaries from APL will also be considered. 30% will be allotted to women beneficiaries and 10 % beneficiaries will be from SC/ST families.

Component	Beneficiary Contribution	Assistance	Total
Cost of two calves (2 x 7500)		15000.00	15000.00
Construction of temporary shed	6750.00		6750.00
Transportation cost		750.00	750.00
Feeding cost	Will be met by the beneficiary		
Total	6750.00 + feeding cost	15750.00	22,500.00

Major livelihood activities

The scheme aims to provide a unit of six cows to the beneficiaries consisting of 3 – 5 members. An assistance of Rs.2,00,000/- will be given.

NATURE FRESH MINI DIARY UNIT

Sl.No.	Item	Amount (Rs.)
1	Shed construction with automatic chamber	1,50,000
2	Cost of cow @ Rs. 30000 x 6 Nos	1,80,000
3	Feed (7 kg per cow per day)	1,80,000
4	Rubber mat, dung scrapper, wheel barrow	24,000
5	Drinking water facility with syntax tank	10,000
6	Milking machine	45,000
7	Insurance	7,800
8	Treat spray, Mastistik kit, bucket, cup etc.	3500.00
Grant Total		6,00,000.00

GOAT REARING

Goat is a multi-functional animal and plays a significant role in the economy and nutrition of landless, small and marginal farmers in the country. Goat rearing is an enterprise which has been practiced by a large section of population in rural areas. Goats can efficiently survive on available shrubs and trees in adverse harsh environment in low fertility lands where no other crop can be grown. In pastoral and agricultural subsistence societies in India, goats are kept as a source of additional income and as an insurance against disaster. Goats are also used in ceremonial feastings and for the payment of social dues. In addition to this, goat has religious and ritualistic importance in many societies. The advantages of goat rearing are :



- i) The initial investment needed for Goat farming is low.
- ii) Due to small body size and docile nature, housing requirements and management problems with goats are less.
- iii) Goats are friendly animals and enjoy being with the people.

- iv) Goats are prolific breeders and achieve sexual maturity at the age of 10-12 months. Gestation period in goats is short and at the age of 16-17 months it starts giving milk. Twinning is very common and triplets and quadruplets are rare.
- v) In drought prone areas risk of goat farming is very much less as compared to other livestock species.
- vi) Unlike large animals in commercial farm conditions both male and female goats have equal value.
- vii) Goats are ideal for mixed species grazing. The animal can thrive well on wide variety of thorny bushes, weeds, crop residues, agricultural by-products unsuitable for human consumption.
- viii) Under proper management, goats can improve and maintain grazing land and reduce bush encroachment (biological control) without causing harm to the environment.
- ix) No religious taboo against goat slaughter and meat consumption prevalent in the country.
- x) Slaughter and dressing operation and meat disposal can be carried without much environmental problems.
- xi) The goat meat is more lean (low cholesterol) and relatively good for people who prefer low energy diet especially in summer and sometimes goat meat (chevon) is preferred over mutton because of its "chewability"
- xii) Goat milk is easy to digest than cow milk because of small fat globules and is naturally homogenized. Goat milk is said to play a role in improving appetite and digestive efficiency. Goat milk is non-allergic as compared to cow milk and it has anti-fungal and anti-bacterial properties and can be used for treating urogenital diseases of fungal origin.
- xiii) Goats are 2.5 times more economical than sheep on free range grazing under semi-arid conditions.
- xiv) Goat creates employment to the rural poor besides effectively utilizing unpaid family labour. There is ample scope for establishing cottage industries based on goat meat and milk products and value addition to skin and fibre.
- xv) Goat is termed as walking refrigerator for the storage of milk and can be milked number of times in a day.

Package of Common Management Practices Recommended for Goat rearing

Modern and well established scientific principles, practices and skills should be used to obtain maximum economic benefits from goat rearing. Some of the recommended practices are given here under:

Housing management:

- a. Construct shed on dry and properly raised ground.
- b. Avoid water-logging, marshy areas.

- c. In low lying and heavy rainfall areas the floors should be preferably elevated.
- d. The floor may be made of wood.
- e. The shed should be 10 ft. high and should have good ventilation.
- f. Bucks should be housed in individual pens.
- g. Does can be housed in group's upto 60 per pen.
- h. Provide proper shade and cool drinking water in summer.
- i. Dispose of dung and urine properly.
- j. Give adequate space for the animals.
- k. Avoid over stocking or crowding

Selection of breeding stock and its management:

1. Purchase the stock from a reliable breeders or from nearest livestock market.
2. Animals in good health and having good physical features must be purchased in consultation with Veterinarian/ Bank's technical officer.
3. Purchase animals which are ready to breed and in prime stage of production.
4. Identify the newly purchased animals by suitable identification mark.
5. Vaccinate the newly purchased animals against the diseases
6. Keep the newly purchased animals under observation for about 15 days and then mix with the general flock.
7. Unproductive animals should be culled promptly and should be replaced by the newly purchased animals or farm born one
8. Animals are to be bred at the interval of 8-9 months for maximum productivity.
9. Cull the old animals at the age of 6 years and above.
10. Avoid the kidding during peak periods of summer and winter.

Feeding management:

1. Ensure Bushes/shrubs for browsing of animals
2. As an alternative to above, supply of cultivated fodder from own farm or from surrounding farms may be ensured.
3. Offer roughages. As a thumb rule 2/3rds of the energy requirements should be met through roughages. Half of the roughages should be leguminous green fodders and rest half should be grasses/tender tree leaves.
4. In the absence of good quality green fodders, concentrates must be considered to replace them.
5. Kids should be fed colostrum upto 5 days of age. Later on they can be put on Kid starter rations.
6. Green leguminous fodders should be offered adlib to kids from 15 days onwards.
7. Provide salt and water to kids at all times
8. Additional concentrates should be given to bucks and does during breeding season.
9. Care should be taken to meet the nutrient requirements as recommended

Marketing:

The marketable products of goat farming includes the fattened kids, manure, culled animals. Marketing avenues for the above products are slaughter houses and individual meat consuming customers and agriculture farms. Therefore availability of either slaughtering facilities or traders who will purchase live animals should be ensured to convert the fatteners into wholesome meat and meat products. Further, demand for manure from nearby agriculture farms must also be ensured.

Propagation of Malabari Goat

The aim is to support small breeding units in selected areas so as to propagate Malabari breeds among farmers. Propagation of Malabari goat by adding 2 does to the breeding stock for backyard goat rearing. The scheme aims to provide 2 does to the beneficiaries already rearing goats/ new ones. An assistance of Rs.7,350/- will be given for the procurement of 2 does.

Selection of beneficiaries will be by constituting of a selection committee and 10 % from SC/ST Beneficiaries. Interested farmers will be trained and their track records maintained. The beneficiaries will be selected by organizing a selection committee will President of that local body, Chairman standing committee and local Veterinary surgeon as members.

Applications will be invited by giving wide publicity. BPL families will be considered for selection and in their absence beneficiaries from APL will also be considered. 30% will be allotted to women beneficiaries and 10 % beneficiaries will be from SC/ST families.

No.	Cost	Beneficiary	Assistance given
1	Cost of animals (3500 x 2=7,000)		3,500x 2 = 7,000/-
2	Construction of temporary shed @ Rs 60 per sq.ft x 40 sq.ft	Rs 3150	
3	Transportation cost	Rs. 350/-	
4	Feeding cost	Will be met by the beneficiary	
	Total	Rs 3450 + feeding cost	Rs 7000/-

Major livelihood activities

The scheme aims to provide a unit of 15 goats to the beneficiaries consisting of 3 – 5 members. An assistance of Rs. 52,500/- will be given.

No.	Particulars	Amount
1	Cost of animal(3500 x 15)	52,500
2	Construction of shed	45,000
3	Transportation cost	2,500
4	Feeding cost	Will be met by the beneficiary
5	Insurance (200 x 25)	5,000
	Total	1,05,000

Mode of implementation

The scheme will be implemented through veterinary institutions of the concerned local body. The subsidy can be either loan linked one or without bank loan.

RABBIT REARING

The aim is to propagate and increase production of fat free meat under livestock. Ten females and two males will be supplied to each beneficiary at 70 % cost. 12 animals of 3-4 months old will be supplied free of cost. The beneficiary has to fabricate hutches for the rabbit (cages) with locally available wood/ bamboo to house the 12 number of rabbits and its progenies.



Component	Beneficiary Contribution	Assistance	Total
1.Rabbits of 3-4months old Rs 250 x 10 nos		2500.00	2500.00
2.Cost of hutches locally made of wood, wire mesh etc. 2ft x 2 ft x2ft – 10 nos +2 colony cages @ Rs 400 per cage	3300.00	1500.00	4800.00
3. Feeders and waterers	600.00		600.00
4. Miscellaneous, transportation etc.	100.00		100.00
	4000.00	4000.00	8000.00

In addition to this the farmer has to meet the feeding cost.

BACKYARD POULTRY

Poultry are one of the most popular types of livestock, particularly among poorer families. They can also be a route out of poverty for farmers who are ready to expand their production and adopt improved systems for feeding and protecting the health of their birds. Though poultry development in the State has taken a quantum leap in the last three decades, the growth has been mainly restricted to commercial poultry. Rural backyard poultry, though still contributing nearly 30% to the national egg production, is the most neglected one. This is in spite of the fact that their poultry eggs and meat fetch a much higher price than that from commercial poultry. 70% of the poultry products and eggs are consumed in urban and semi urban areas and the rural consumption is quite



low. The major limiting factor in the way of increasing consumption of egg and poultry meat in rural area is poor availability.

Backyard poultry requiring hardly any infrastructure set-up is a potent tool for upliftment of the poorest of the poor. Besides income generation, rural backyard poultry provides nutrition supplementation in the form of valuable animal protein and empowers women. Thus there is a need to take up specific rural poultry production programs, to meet the requirements of the rural consumers while constituting a source of subsistence income as a subsidiary occupation by taking up colored bird units ranging from 5 to 10 birds per family in their backyards. Such units require very little hand feeding and can give a fairly handsome return with bare minimum night shelter.

Component	Total	Assistance
1. Birds of 60-70 days old. Rs 75 x 10 nos	750.00	IWMP
2. Construction of shed/cage	750.00	MGNREG S
	1500.00	

Major livelihood activities

The scheme aims to provide a unit of 500 birds to the beneficiaries consisting of 3 – 5 members. An assistance of Rs. 1,40,000/- will be given.

Sl. No.	Item of investment and unit size	Amount (Rs.)
1	Cost of birds @ Rs. 80 x 600	48,000.00
2	Shed 600 sq. ft	1,80,000.00
3	Equipment (Feeding instruments) @ Rs. 40 x 500 birds	20,000.00
5	Feed cost @ Rs. 60 x 500 birds	30,000.00
6	Medicine	2000.00
Total		2,80,000.00

SUPPORT TO WOMEN SELF GROUPS ON FOOD SECURITY INITIATIVES

OBJECTIVES

- Supply 1 milch cow and 2 goats to each beneficiary of a SHG (formed for this purpose)
- Cluster 5 members as a SHG/ unit to promote cluster farming
- Enhance milk and meat production.
- Ensure income and employment generation among women

BENEFICIARIES

- 5 Women will function as a SHG for this purpose
- This will be considered as a basic activity group/unit within a Panchayat.
- Trainings and all other technical assistances will be given to these SHG groups
- Beneficiaries who can raise beneficiary contribution themselves need not avail bank loan

ASSISTANCE / SUBSIDY

- 50% of the project cost

ACTIVITIES

- The NHGs shall invite application after wide publicity.
- WC will select beneficiaries from the applicants.
- Beneficiaries will form group/unit of 5 each for the purpose of this project
- Each beneficiary will be supplied with the one milch cow and 2 goats.
- The NHG will arrange loan(if required) to beneficiaries
- Purchase of cows by a committee constituted by WC for the purpose
- The purchase committee will consist of
 - Veterinary Surgeon
 - Representative of LSG
 - One beneficiary
- All the cows and goats should be insured under existing scheme
- The selected beneficiaries may be trained in the latest trends of dairying and goat rearing by the Veterinarian of the Panchayat.
- The beneficiary should be provided with a milch cow in not more than second lactation and 2 milch goats
- The cows purchased should have good dairy characters and the minimum milk yield in early lactation should not be less than 15 litres.
- The beneficiary should rear the calves as replacement stock for his farm for future expansion programmes.

Financial summary

No.	Item	Assistance (Rs)	Beneficiary /Bank Loan(Rs)	Total Cost(Rs)
1	Cost of milch cow	15000	15000	30000
2	Transportation cost	1000	1000	2000
3	Cost of 2 she goats	3500	3500	7000
4	Insurance cost	Under existing scheme		
5	Renovation of cattle shed	5500	5500	11000
	Total	25000	25000	50000

MECHANIZATION SUPPORT TO LIVESTOCK FARMERS

Objectives

- Optimize milk production through mechanization.
- Minimize environmental pollution through effective waste disposal.
- Reduce cost of production through better labor management.

Beneficiaries

- Farmers having five or more milch animals.

Assistance

- Limited to Rs 25000.

Methodology:

- Farmers having five or more milch cows
- Beneficiaries will be selected by a committee consisting of President of the Watershed Committee, Veterinary Surgeon and a member of LSG
- Selected beneficiary will be given orientation training on dairy farming.
- Veterinary Surgeon will ensure that adequate machinery was purchased by the beneficiary.
- The farmers may purchase and install any of the items listed in this project based on his need.

Activities

Mechanization of various farm activities – Providing rubber mat, automatic drinker, chaff cutter, wheel barrow, hand shower with pump, skin scrapper, hand shower with pump, fan, milking pails, milking machine, pump sets, building up of irrigation facilities, bio-gas plant, slurry pump, etc.

Outcome

- Mechanization and modernization of the existing dairy farms will improve labour efficiency
- Increase in milk production through better scientific management practices
- Reduction in environment pollution through ensuring proper waste disposal.

Economics

The beneficiary shall ensure that modern equipment's are installed in his farm. The assistance is limited to Rs 25,000 per beneficiary.

LIVELIHOOD ACTIVITIES AND MICRO ENTERPRISES

SOAP MAKING (2500 Piece)

Sl. No.	Item	Quantity	Amount (Rs.)
1	Raw Materials like Caustic Soda, Talcum oil, perfume, colour etc.		19,000.00
2	Mould, tray, Plastic, Bucket etc.	1	6,000.00
	Total		25,000.00

CANDLE MAKING UNIT (100 Piece)

Sl. No.	Item	Quantity	Amount (Rs.)
1	Paraffin Wax	1 kg	107
2	Thread	1 Bundle	450
3	Citric Acid	1 kg	50
4	Steric Acid	1 kg	100
5	Colour	1 liter	100
6	Coconut Oil	1	70
7	Mould	1	2500
8	Aluminum Vessel	1	300

9	Ratta	1	6
10	Knife	1	20
11	Plastic tank	1	500
12	Aluminum Cup	1	15
13	Packet	100	50
Total			4268
@ Rs. 4268/100 packets x 5 units			21340
Rounded off to :			21300

CONVERGENCE

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), notified on September 7, 2005, marked a paradigm shift from the previous wage employment programme with its rights-based approach that makes the Government legally accountable for providing employment to those who demand it. The act aims at enhancing livelihood security households in rural areas of the country by providing at least one hundred days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.

Such inter sectorial convergence becomes instrumental towards.

- Establishing synergy among different government programme in planning and implementation to optimize use of public investments.
- Enhancing economic opportunities.
- Strengthening democratic processes.
- Mitigating the effects of Climate change
- Creating conditions for sustainable development.

One of the significant areas for convergence is the watershed management programme of the Development of Land Resource (DoLR) in the Ministry of Rural Development (MoRD).

Convergence is an evolving process and while broad principles can be laid out at the centre, the actual contours of convergence will be determined by the resources at the Central, State, District and the project level. Also, to identify the possibilities of convergence, it may be necessary to make a beginning with select programmes, so that the experience of implementation may further inform and refine strategies for convergence.

Convergence between MGNREGS and Watershed Programmes

Under MGNREGA almost all the activities required for watershed development are permitted. Convergence between NREGA and watershed Programme of DoLR will be mutually beneficial for rainfed areas.

Non-Negotiable for works executed under MGNREGS:

- Only Job Card holders to be employed for MGNREGS component.
- Muster rolls will be maintained on work site, with copies in the Gram Panchayat and to be electronically maintained on nrega.nic.in
- Wage payments will be through no-frills accounts in banks/post offices.

Need for convergence:

Since more than 50% of activities related to Watershed development are conversed under MGNREGA, there is need for convergence to meet gap in funds requirements under IWMP. Detailed survey had been conducted in Watershed villages and it has emerged that there is need for more funds to augment and strengthen the activities under IWMP. Out of 6 sub watersheds, all sub watersheds need more funds to meet the gap. Therefore, some of the works have been converged with MGNREGA. The

labour component would be met out of funds made available under MGNREGA. The details of such fund requirements from MGNREGA are given in the lists for estimates for each sub watershed. However for ready reference, the summary is given in following table:

GAPS IN FUNDS REQUIREMENT –WATERSHED WISE

Sl. No.	Name of micro watershed	Total Cost requirement for works	Total Funds available under IWMP for works	Gap in Funds requirement for works	Convergence with MGNREGA
1	Thiruvanchoor Nagambadem	21256498	6070456	15186042	4401660
2	Mannarthodu – Maalam – Aryparambu	19104019	7105660	11998359	5331033
3	Maalam	10091644	4191126	5900518	1941690
4	Nedumtharakavu	9878129	2318109	7560020	3580970
5	Mundakapadam	9481872	2493830	6988042	1951585
6	Kalathil kadavu	54585337	7475028	47110309	32059250
7	Parakkal kadavu	22016962	1907961	20109001	11006015
8	Erayilkadavu	15467560	2736342	12731218	13383773
	Total	161882021	34298512	127583509	73655976

In addition to the convergence with MGNREGS, the following activities are also included in this DPR through convergence with other departments.

Sl. No.	Activity	Convergence
1	Extension of paddy cultivation	20 % from IWMP & 80% from Agriculture Department
2	INM in pepper	Agriculture Department
3	Crop demonstration - vegetable (pandal type)	50 % from IWMP & 50% from VFPCCK
4	Vegetable grow bags	50 % from IWMP & 50% from SHM
5	Kadav Development	PWD/Irrigation Department
6	Side wall protection of drains (engineering)	40 % from IWMP & 60% from Irrigation/Soil Conservation
7	Stone pitched contour bunding	50 % from IWMP & 50% from Soil Conservation
8	Construction/Repair of existing shutters	50 % from IWMP & 50 % from Soil Conservation & Minor Irrigation
9	Rain water harvesting structure	IWMP & Jananidhi

10	Mini drinking water scheme	IWMP & Jalanidhi
11	Biogas	Clean Kerala Mission
12	Pipe compost	Clean Kerala Mission
13	Vermicompost	Clean Kerala Mission

TRAINING PLAN

The proposed training plan aims in strengthening the skills, competencies and abilities of people and communities in developing societies in order to overcome the causes of their exclusion and suffering. This will help to guide their internal development and activities. It is proposed to carry out the following institutional based training and capacity building programmes during the project period in order to equip various stakeholders for successful participation and implementation of the project

Programme No. 1

Title of the Programme	Orientation Programme on Participatory Watershed Development
Training Objectives	To orient the participants on different dimensions of participatory watershed management
Coverage/ topic	<ul style="list-style-type: none"> • Features and process of watershed programme • Institutional and financial arrangements • Managerial skills • Coordination and linkages with Line-department and LSGIs • Convergence of programmes • Implementation process
Training Methodology	<ul style="list-style-type: none"> • Interactive sessions • Group exercises • Task Analysis • Panel discussions
Target Groups	Members of District Level Coordination Committee
Duration	2 days
No. of expected participants	15 participants
Implementing Agency	SLNA
Expected Outcome	Ensure smooth implementation of the project with full participation and coordination of line departments and LSGIs

Programme No. 2

Title of the Programme	Orientation & Capacity building on conceptual, technical and Managerial aspects
Training Objectives	To familiarize the participants about various dimensions of participatory watershed development
Coverage/ topic	<ul style="list-style-type: none"> • Fundamentals of watershed • Participatory approach in watershed

	<p>management</p> <ul style="list-style-type: none"> • Roles and responsibilities • Institutional and financial arrangements • Coordination and linkages Convergence of programmes • GIS, MIS training
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions • Field visit
Target Groups	Members of WCDC
Duration	4 days
No. of expected participants	3 persons
Implementing Agency	SLNA
Expected outcome	Ensure smooth implementation of the project

Programme No. 3

Title of the Programme	Orientation & capacity building on IWMP
Training Objectives	To orient the participants on different dimensions of participatory watershed management
Coverage/ topic	<ul style="list-style-type: none"> • Fundamentals of watershed • Participatory approach in watershed management • Roles and responsibilities • Institutional and financial arrangements • Coordination, linkages Convergence of programmes
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	District, Block and Grama Panchayat level department officials
Duration	1 day
No. of expected participants	120 persons (40 x 3 batch)
Implementing Agency	PAU
Expected outcome	Ensure smooth implementation of the project with full participation and coordination of line departments and LSGIs

Programme No. 4

Title of the Programme	Orientation & capacity building on conceptual, technical and Managerial aspects
Training Objectives	To familiarize the participants about various dimensions of participatory watershed development
Coverage/ topic	<ul style="list-style-type: none"> • Fundamentals of watershed • Participatory approach in watershed management • Roles and responsibilities • Institutional and financial arrangements • Coordination, linkages Convergence of programmes • Documentation • Community organization
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	Block presidents, GP Presidents, Block and Grama Panchayat members, BLWC, PLWC
Duration	1 day
No. of expected participants	120 persons (40 x 3 batch)
Implementing Agency	PAU
Expected outcome	Ensure smooth implementation of the project with full participation and coordination

Programme No. 5

Title of the Programme	Empowering people's representatives for IWMP
Training Objectives	The need for watershed based development programs, concepts involved in watershed development, IWMP its objectives, steps involved in the implementation of the program, financial management etc.
Coverage/topic	<ul style="list-style-type: none"> • To create awareness among the peoples representatives regarding the need for watershed based development programs. • Concepts of IWMP • Projects involved in the programs • Scope of the project. • Role and responsibilities.

	<ul style="list-style-type: none"> • Financial management.
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises
Target Groups	District, Block and Grama Panchayath members
Duration	2 days
No. of participants	100
Implementing Agency	PIA
Expected outcome	Ensure smooth implementation of the projects, interfere with issues if any while implementation, financial transparency, and ensure peoples participation.

Programme No. 6

Title of the Programme	Orientation & Capacity building on conceptual, technical, non-technical and Managerial aspects
Training Objectives	To empower the technical knowledge regarding watershed development
Coverage/ topic	<ul style="list-style-type: none"> • Measurement and valuation • Fundamentals of watershed • Roles and responsibilities • GIS & MIS • Documentation • Community organization
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions • Field visit
Target Groups	WDT members , Watershed Committee members
Duration	3 days
No. of expected participants	90 persons (30 x 3 batch)
Implementing Agency	SLNA
Expected outcome	Ensure smooth implementation of the project by empowering on technical knowhow.

Programme No. 7

Title of the Programme	Orientation & capacity building on conceptual and Managerial aspects
Training Objectives	To familiarize the participants about various dimensions of participatory watershed development

Coverage/ topic	<ul style="list-style-type: none"> • Participatory approach in watershed management • Fundamentals of watershed • Roles and responsibilities • Institutional and financial arrangements • Coordination and linkages Convergence of programmes
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	BDO/J.BDO, HSC, UDC
Duration	2 days
No. of expected participants	30 persons
Implementing Agency	SLNA
Expected outcome	Ensure smooth implementation of the project

Programme No. 8

Title of the Programme	Participatory approach in Planning and implementation of IWMP
Training Objectives	To orient the participants on different dimensions of participatory watershed management
Coverage/ topic	<ul style="list-style-type: none"> • Fundamentals of watershed • Participatory approach in watershed management • Roles and responsibilities • Institutional and financial arrangements • Coordination, linkages Convergence of programmes
Training Methodology	Lecture - cum – interactive sessions
Target Groups	NHGs
Duration	1 day
No. of expected participants	20,000 participants (50x 400 batch)
Implementing Agency	PIA
Expected outcome	Ensure full participation of users for the smooth implementation of the project

Programme No. 9

Title of the Programme	Concept of watershed management, roles and responsibilities.
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Rationale	Impart awareness among the watershed committees regarding the concept of watershed management, roles and responsibilities, operational guidelines, financial management etc.
Training Objectives	<ul style="list-style-type: none"> • To create awareness among the WCs regarding the concept of watershed management. • To define the roles and responsibilities of WC. • Financial management of the project. • Management of WDF.
Training Methodology	<ul style="list-style-type: none"> • Interactive sessions • Group exercises • Task Analysis • Panel discussions
Target Groups	WCs
Duration	2 days
No. of participants	90 participants (30 x 3 batch)
Implementing Agency	PIA
Expected outcome	Empowerment of WCs for effective implementation of the project and proper maintenance of commonly created asset.

Programme No. 10

Title of the Programme	Operational Strategies and financial management of implementation of watershed projects in IWMP
Training Objectives	To orient the participants on operational strategies and financial management in participatory watershed management
Coverage/ topic	<ul style="list-style-type: none"> • Leadership • Implementation • Management • Roles and responsibilities • Fundamentals of watershed • Participatory approach in watershed management • Institutional and financial arrangements • Coordination, linkages Convergence of programmes
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises • Case Analysis

	<ul style="list-style-type: none"> • Group discussions
Target Groups	Watershed Committee Members
Duration	3 days
No. of expected participants	90 participants (30 x 3 batch)
Implementing Agency	PIA
Expected outcome	Empowerment of WCs on operational Strategies and financial management for effective implementation of the project and proper maintenance of records.

Programme No. 11

Title of the Programme	Operational guidelines for Watershed Committees in IWMP
Training Objectives	To orient the participants on operational guidelines for Watershed Committees in IWMP
Coverage/ topic	<ul style="list-style-type: none"> • Leadership • Institutional and financial arrangements • Conducting meetings • Recording the proceedings • Office management • Accounting procedures • Book keeping
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	Watershed Committee Members
Duration	1 day
No. of expected participants	90 participants (30 x 3 batch)
Implementing Agency	PIA
Expected outcome	Empowerment of WCs on operational guidelines in IWMP for effective implementation of the project and proper maintenance of records.

Programme No. 12

Title of the Programme	Awareness programme on production system and Micro Enterprises (PS & M) and livelihood support system (LSS)
Training Objectives	The watershed community must be made aware of the various PS & M and LSS programmes envisaged in the project, group formation, credit support

	through banks, Accounting procedures etc.
Coverage/topic	<ul style="list-style-type: none"> • Various PS & M. • Generating additional income from such activities. • Self sustainability. • Women empowerment.
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	SHGs : rearing cattle, fodder cultivation, Pisciculture, Apiculture, Horticulture, Mushroom cultivation, Food processing etc.
Duration	1 day
No. of participants	10000 participants (50 x 200 batches)
Implementing Agency	PIA
Expected outcome	Increase the standard of living through increase in percapita income, attain self sustainability etc.

Programme No. 13

Title of the Programme	Develop action plan for PS&M and LSS
Training Objectives	More than 50% of the communities are often land less agri labourers. For attain self sustainability LSS is the main option.
Coverage/topic	<ul style="list-style-type: none"> • Various LSS activities envisaged in the project. • Operational guidelines • Action plan for each watershed depending upon their suitability.
Training Methodology	<ul style="list-style-type: none"> • Interactive sessions • Group exercises • Task Analysis • Panel discussions
Target Groups	Members of District, Block and Grama Panchayat members, Watershed Committees
Duration	1 day
No. of participants	10
Implementing Agency	PIA
Expected outcome	A need based location specific, economically feasible and communally acceptable action plan.

Programme No. 14

Title of the Programme	Planning and implementation of projects related to creation of common assets.
Training Objectives	To create awareness among UGs regarding the mode of creation of common assets.
Coverage/topic	<ul style="list-style-type: none"> • Responsibility of UGs • Establishing common assets. • Mode of operation in establishing common assets. • Financial procedures involved.
Training Methodology	<ul style="list-style-type: none"> • Interactive sessions • Group exercises • Task Analysis • Panel discussions
Target Groups	UGs
Duration	1 day
No. of participants	1-2 persons from each UG
Implementing Agency	PIA
Expected outcome	Empower the UGs to take up the responsibility of creating common assets as well as their future maintenance.

Programme No. 15

Title of the Programme	Training of Trainers (ToT) in IWMP
Training Objectives	To build a team of faculties for imparting training, monitoring and evaluation
Coverage/topic	<ul style="list-style-type: none"> • Fundamentals of watershed • Leadership • Managerial skills • Effective communication • Implementation • Management • Roles and responsibilities • Monitoring and evaluation.
Training Methodology	<ul style="list-style-type: none"> • Lecture – cum - discussions • Interactive sessions • Group exercises • Task Analysis • Role play • Panel discussions

Target Groups	Officials from various departments and extension faculty members, One facilitator from each NHG.
Duration	2 day
No. of participants	400 (20 x 20 batch)
Implementing Agency	PIA
Expected outcome	A well trained faculty team who are capable of disseminating the concept of watershed and other activities related to watershed management.

Programme No. 16

Title of the Programme	Exposure visit
Training Objectives	To visit other states to understand different methodology used in watershed management
Coverage/ topic	<ul style="list-style-type: none"> • Methodology • Techniques • People participation • Implementation • Documentation
Training Methodology	<ul style="list-style-type: none"> • Field visit
Target Groups	Block presidents, GP Presidents, Block and Grama Panchayat members, Watershed Committee
Duration	3 days
No. of expected participants	150 participants (50 x 3 batch)
Implementing Agency	PIA
Expected outcome	Understanding various innovative and cost effective techniques adopted in watershed management

Skill Development Training Programmes

Title of the Programme	<ol style="list-style-type: none"> 1. Agriculture 2. Horticulture 3. Animal Husbandry 4. Pisci Culture 5. Rain water harvesting 6. Well recharging 7. Soil and Water conservation methods 8. Livelihood 9. Entrepreneurship development
Training Objectives	To provide skills and techniques of various activities
Coverage/ topic	<ul style="list-style-type: none"> • Organic Vegetable cultivation

	<ul style="list-style-type: none"> • Organic Banana cultivation • Post-harvest technologies • Cow rearing • Goat rearing • Fodder cultivation • Pisci culture • Different types of rain water harvesting • Recharging of open wells • Mushroom cultivation • Beekeeping • Biogas • Cottage industries • Trading of products • Value addition
Training Methodology	<ul style="list-style-type: none"> • Lecture - cum - discussion • Demonstration • Video Film show
Duration	1 – 2 days
Target Groups	Selected Beneficiaries
No. of expected participants	10,000 (200 trainings x 50 persons in each batch)
Implementing Agency	PIA
Expected outcome	Acquire necessary skills. A need based location specific, economically feasible and communally acceptable action plan.

LIST OF TRAINING INSTITUTES FOR CAPACITY BUILDING

Sl. No.	Name of Institute/Organization	Full Address	Type of Institute/Organization	Area of Specialization
1	State Institute of Rural Development (SIRD)	Director SIRD, ETC. P.O. Kottarakkara Kollam District, Pin 691531	Government	Rural Development
2	Kerala Institute of Local Administration (KILA)	Director, KILA, Mulankunnathukavu P.O., Thrissur District. Pin 680581	Government	Decentralized Administration
3	Centre for Earth Science Studies (CESS)	Director CESS, Akkulam, Kottayam	Government	Resource Mapping and planning
4	Centre of Water Resources Development and Management (CWRDM)	Director, CWRDM, Kunnamangalam Kozhikode	Government	Water resources management watershed management
5	Kerala Agricultural University (KAU) and its various research station.	Vice Chancellor KAU Vellanikkara, Thrissur	Government	Crop management, improved varieties, innovative technologies, Economic planning etc.
6	NARP Research Stations of various Zones	Director Regional Agronomic Research Station (RARS) Vellayani, Kayamkulam	Government	Location specific crop management, Adoption of improved and innovative technologies for crop improvement suited to each locality.
7	Mahatma Gandhi University (M G University)	Vice Chancellor MG University Kottayam	Government	GIS Environmental impacts, Eco preservation.

Sl. No.	Name of Institute/Organization	Full Address	Type of Institute/Organization	Area of Specialization
8	Tropical Botanical Garden and Research Institute (TBGRI)	Director TBGRI, Palode, Kottayam	Government	Bio diversity Eco restoration
9	Social Conservation Training Institute under the soil conservation dept.	Additional Director of soil Conservation, Kottayam	Government	Various soil and water conservation techniques, watershed management etc.
10	Krihi Vijnan Kendras (KVK)	Director KVK All Districts	Government	Modern Agricultural practices.
11	Extension Training Centre (ETC)	Principal ETC, Kottarakkara, Kollam	Government	Participatory Planning, Extension techniques, PRA, RRA, Poverty alleviation, Watershed management etc.
12	Land Use Board (LUB)	Commissioner LUB, Vikas Bhavan, Kottayam	Government	Resource Mapping, Watershed Management, GIS etc.
13	Institute of Management in Government (IMG)	Director IMG Trivandrum	Government	Administration
14	Socio Economic Unit Foundation (SEUF)	Director SEUF Kottayam	NGO	Sanitation and Gender Development.

EXPECTED OUTCOMES

This project is a need based project which aims to increase the individual income, to generate self-employment and to increase the agricultural productivity in the villages of Pallom, Nedumangad, Chirayinkeezhu and Pothencode blocks under the IWMP. This project will be focused on multi approach activities which create an employment opportunity in their native villages for sustaining their income and check the migration, which became a key to defeat the present problems. Project will not only focus on create employment opportunity but also focus on the sustainable use of natural resources by using latest appropriate technology and strengthening the local leaders through capacity building and training, which ultimately ensure the sustainable livelihood of the people of the project area. The details of expected outcomes are given below.

Employment

One of the prominent features of watershed program is to create self sustenance to stake holder in terms of livelihood and increase in employment opportunities is one of the benchmark that can unravel the effect of watershed. Watershed 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 have a direct impact on agriculture and natural resource development. Livelihood for self-employed, wage labour and income generating activities have ample scope for employment generation. As the net employment increases, the per capita income of agriculture, animal husbandry and other allied activities will also increase.

Expected Migration Checked

Watershed development works can generate new opportunities in local area through the physical treatments of the watershed activities and increase the production of agriculture produces through adopting updated/ new techniques. The number of seasons under cultivation will increase as sufficient ground water level is available to the farmers in the winter and summer season. The farmers will be able to take second and third crop in their agriculture land. Hence the watershed development increased demands for labour. This will lead to decrease in the number of seasonal migration from the area.

Ground water table

In the presence scenario the ground water level of open wells varies from 10 meter to 16 meter, from village to village. The groundwater has gone down due to rapid urbanization and maximum ground water harvesting without any sustainable measure. The watershed activities like roof water harvesting, well recharging, rain water harvesting pits, staggered trenches, etc. will help in ground water recharging under this project and it is expected that the ground water level will come up and reach at 8 to 12 meter.

Drinking water

The villages in the project area totally depend upon hand pump and open well for drinking and other domestic activities. The availability of water is only for 10 months at maximum. The activities of watershed and the linkage with the Jalanidhi will increase the ground water table so that the expected status of drinking water will increase. Comparative status of drinking water between pre-project and expected post project are furnished as under.

Expected Crop Yield.

Due to additional availability of water, farmers of the project area will be able to take more crops in their available land. Even after taking rainy season and post-rainy season crops into consideration, they will get a good price for vegetables in summer also. The productivity will also increase due to the use of updated techniques.

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 in the hands of the farmers which will add to the other allied economic activities. It is also proposed to diversify horticulture activity by bringing more area under money fetching horticulture plants like Rambutan, etc. The expansion of horticulture in the area will directly increase the income levels of all the household engaged in the horticulture activities. There will be significant increase in the area covered under horticulture.

Livestock

Milch-animals include cow and buffalo in the project area. Productivity of the cow is 3 liters per day whereas the buffalo give 4 liters of milk per day. Advanced breeds like Jersey and other improved species will be promoted in the watershed area in order to enhance the milk production. The introduction of the nature fresh model is expected to increase the quality and quantity of milk production. Due to the various interventions, the productivity will be increased to 5 and 6 liters respectively.

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 throughout the year encouraging the farmers to take up animal husbandry activities on a broader scale to improve their living conditions. .

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 vermi 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	Increment in income of women and their institutions (SHGs)
	Nursery Raising	Physical existence of new nurseries
	Honey and fruit processing and 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
	DTP centres	Physical existence of DTP centres
Development of BPL families	Improvement in economic status of BPL HHs	Increment in the income of BPL families.
	Improvement in social status	BPL families will have ownership over the generated resources.

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	Sharp 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 contour bunds 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 farming 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.

CONSOLIDATION AND WITHDRAWAL PHASE

The last two years are the Consolidation and Withdrawal Phase of the Watershed development programme. This is the crucial phase of the project as the local institutions will be trained to manage the project independently after withdrawal of the Government Institutions from the project area.

The main purpose of this phase is to create innovative nature based, sustainable livelihoods and raise productivity levels of the augmented resources and local economic development plans developed during the watershed works phase.

The activities those will be under taken during this phase are:

1. Completion of various works under taken during work phase.
 2. Consensus among the villagers to take up any new works out of any unspent amount.
 3. Preparation of Project completion report with details about status of each asset.
 4. Documentation of successful experiences as well as lessons learnt for future use.
 5. Evolving mechanisms to improve the sustainability of various interventions made in the project area.
 6. Formulation of mechanisms for allocation of user right over common property resources.
 7. Formulation of mechanisms to collect user charges for common property resources.
 8. Creation of awareness and building capacity of the community to repair, maintain and protection of common property resources.
 9. Training the user groups for optimum utilization of the developed natural resources.
 10. Up scaling of successful experiences related to farm production system and off-farm livelihood activities undertaken through revolving fund under the project as well as credit and technical support from external institutions.
 11. Evolving marketing arrangements of the farm produce as well as the off-farm and other micro enterprises.
 12. Formation of Farmers' Federation for credit, input procurement, sale of local produce etc.
 13. Forward and backward linkage of the SHGs and User groups for sustainable livelihoods.
 14. Formulating mechanisms for empowering Watershed Committee and its smooth management in a long run.
 15. Formulating mechanism for utilizing the Watershed Development Fund
- The subsequent activities are planned to be carried out during this stage.
1. **Documentation** : It is proposed to document the activities carried out during the watershed implementation period. It will help to maintain the records and identify and propagate the successful activities carried out under the project.

2. **Up-Scaling of successful experiments** : It is proposed to identify the best practices carried out during the project period and up-scaling the same as per feasibility and propagate the same among others members of the watershed area.
3. **Evaluation:** Evaluation is a very important activity to assess the success of implementation of the project. It is proposed to carry out evaluation at the following levels.
 - a. *Social Audit* : It is proposed to conduct the social audit of the programme at the watershed level where the Gram Sabha will evaluate the programme where the beneficiaries should explain their benefits and current status of the activity. The watershed committee should place the books of accounts of watershed programmes for approval.
 - b. *Evaluation by external agency* : An external agency with experience in implementation and monitoring and evaluation of watershed projects should be assigned for the evaluation of the watershed programme

The proper and regular monitoring and evaluation of the project can trim down the improper implementation of activities so that the quality can be controlled at the right time. The chapter extends with the appropriate post-project techniques for project sustainability and research and documentation for maintaining the records, locate the loop falls in implementing and follow up the project with a new and suitable adaptation for the area development.

Plans for Monitoring

To control the activities at the stage of implementing, proper plans was formed for monitoring and Evaluation. Project monitoring is one of the important components in watershed development programmes. The broad objectives of a watershed project demand good monitoring framework. A monitoring framework is suggested within the capacity of watershed development teams and watershed committees. No great deal of training, human resources or instruments are expected to be employed. The monitoring should actually assist the project team to provide a guideline for improvement in the activities and output the project. Selection of an appropriate measure for the given area and ensuring the quality of project measures are to be given great attention at the time of monitoring.

Three Tiers of Monitoring:

The following three tiers of monitoring are planned:

First Tier (Monitoring of activities):

This will be carried out by PIA along with WDT and WC to monitor the implementation of all activities as per the action plan. The monitoring also aims at ensuring that the quality of work is as per the guidelines prescribed for each activity.

Second Tier (Monitoring of outputs):

To check the outputs of the activities, PIA along with WDT monitors as per the logical frame work. The indicators are selected considering the broad objectives of the project. One can adopt or modify these as per requirement at the time of implementation. The output level indicators needs to be devised by the project team based on the outcome level indicators on. Outputs need to be monitored frequently, may be once in a quarter/ six months.

Third Tier (Monitoring of Outcomes):

Project Implementation Agency along with the WC will monitor the overall outcomes of the objectives as per the logical frame. The outcomes level monitoring will start in the second year and continue on an annual basis. Most of the information can be available from the sets of output level indicators. Participatory methods will be used at the time of monitoring the activities.

The methods of collecting sample data for the monitoring activities will be clearly documented in the monitoring report. The detail of the monitoring system is presented in the table as under.

Tiers of Monitoring	Basis of monitoring	Frequency of monitoring	Orientation of the Indicator	Monitoring by
First tier	Immediate result basis	Regular Monthly Monitoring	Activity oriented	Local People organizations
Second Tier	Monitoring of Outputs	Regular monitoring (Quarterly, half yearly and annually)	Objective oriented	Internal project team (WDT, PIA & Experts)
Third Tier	Monitoring of Outcomes	Annually but monitoring start from second year onwards.	Goal Oriented	<ul style="list-style-type: none"> • Specified monitoring team formed by WCDC, • External Monitoring team by PIA

Vigilance and Monitoring Committees

1. For every work sanctioned under the Scheme, there should be a local vigilance and monitoring committee, composed of members of the locality or village where the work is undertaken, to monitor the progress and quality of work while it is in progress. The Gram Sabha will elect the members of this committee and ensure that SC/STs and women are represented on it.
2. The Implementing Agency should apprise this committee of estimates regarding the work, time frame and quality parameters. The final report of the committee should be attached along with the Completion Certificate of the work, and should

also be placed at the next meeting of the Gram Sabha in the Panchayat where work has been executed.

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

Research support in watershed management:

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

Farmer organization and empowerment:

The management of natural resources requires strong and effective farmer organizations. Such organizations empower farmers and create a good foundation for the transfer, adoption and use of information on new technologies. They also help in negotiating for inputs at favorable prices. Strong farmers' organizations can be a conduit for services that meet felt needs. These needs include information to improve production and marketing, credit, and demand driven approaches that ensure ownership and sustainability of interventions. Farmers' organization allows the use of participatory approaches that recognize local capacity and indigenous knowledge. It incorporates the aspirations and perceptions that influence decision-making, while giving farmers an important role in planning and implementation of watershed management activities. Such participation is important for the success, continuity and sustainability of the resource management programmes. Often a successful watershed knits together many aspects of the people's lives apart from purely technical issues. Many conservation and basic group production initiatives have widened into a social movement dealing with matters such as weddings, funerals, care for the elderly and the disadvantaged, and other issues in the community. The initial natural resources focus also widens into a set of integrated activities such as the improvement of houses, provision of water and electricity, acquisition of improved tools, seeds and livestock, all in the name of watershed management. Empowerment of farmers therefore allows farmers to demand services and to ensure the continued role of the state in supporting watershed development.

Use of traditional institutions and indigenous knowledge:

Experience has shown that to effectively reach the farmers and to create viable watershed management options, it is important to respect indigenous knowledge and

combine it with the formal modern science and technology. Local traditional institutions should be part and parcel of the process. For instance, there is a lot of under-used indigenous knowledge about climate, soils, biodiversity and other production conditions that confront farmers. A lot of research findings are abstract to extension providers and farmers alike. Such findings need to be married with indigenous knowledge and disseminated in a language that farmers and members of traditional institutions can understand.

Withdrawal Mechanism:

1. At the end of the project, The Watershed Committee is to take the responsibility for post project management .For which the Memorandum of Agreement is to be formulated between the PIA and Watershed Committee basing on the following terms and conditions.
2. The list of assets created under EPA, NRM, Farm production system and Livelihood support system is to be prepared with joint signature of the Chairman, Secretary of the Watershed committee and PIA. The Watershed Committee will retain one copy of the list for future reference.
3. The amount lying unspent as on closing date will be transferred to the Watershed Development Fund.
4. Watershed Committee will be authorized to use only one Bank account i.e. WDF account.
5. Yearly auditing of the accounts by the Chartered Accountant will be mandatory and to be adhered strictly.
6. The office bearer of the Watershed Committee shall involve all the community irrespective of caste, creed and religion.
7. The Gram Sabha shall have the right to decide the user charges to be collected from the beneficiaries which shall be deposited under the watershed development fund.
8. The cost of repair and maintenance of the assets created out of NRM component shall be borne out of Watershed development fund by using maximum 50% of the amount collected in a year.
9. The WDF account will primarily run as revolving fund.
10. No individual beneficiary should be granted any sort of grant or financial assistance in any form.
11. The SHGs and UGs shall have the eligibility to take loan from the WDF with marginal interest as decided by Gram Sabha.
12. The Watershed Committee is also at their liberty to start new profit making ventures by utilizing WDF as security deposit and the profit earned should go to the WDF.
13. The remuneration for the Watershed secretary will be finalized in the Gram Sabha.

14. The Watershed Committee may collect financial assistance from any other sources to augment the WDF. All donations, interests, fines and fees shall be deposited in the WDF.
15. The WDF shall be jointly operated by the Chairman and Secretary of the watershed committee.
16. All the expenditure shall be authenticated by the Watershed committee.
17. Annual meeting of the Gram Sabha is mandatory. However it may meet at any time if required.
18. The Watershed Committee should meet in every quarter to review the income and expenditure.
19. Any change in the Watershed Committee or its office bearer shall be made once it is resolved in the Gram Sabha. The Gram Sabha should believe in rotational leadership.
20. All the group representatives, at least one from each group shall be ensured in the Watershed Committee.
21. The decision approved and resolved in the Gram Sabha will only be implemented by the Watershed Committee.
22. In case of any embezzlement of fund, the Administrative system shall proceed according to Rules and Laws.
23. In the event of Gram Sabha and watershed Committee become defunct, the assets created under the project and WDF will be transferred to the Panchayat.

PLANS FOR POST-PROJECT MANAGEMENT/SUSTAINABILITY APPROACH

The Project management of any watershed programme is very important. It mainly depends upon the community organization and the village level institutes. In all villages, watershed committee and various self-help & user groups have been formulated for post project operation and maintenance of assets created during project period. Major emphasis will be on equity and sustainable benefit of the project even after implementation stage. A proper link-up will be built during project period with various institutes and capacity building organization. They will act as a major kingpin during post implementation for scaling up the successful experience during project.

Watershed development project can be rendered sustainable through an appropriate combination of environmental balance, community participation and institutionalization of process. So the detail plans for the post project management are described as under:

Adopting Environment friendly conservation measures

The measures taken up will be long lasting. Along with engineering measures, efforts will also be made to establish tree cover in the upper catchment areas and on the slopes. The downstream area will have prolonged stream flows. The stream banks will be vegetated to create a buffer between land and water bodies. Such vegetation helps in stabilizing streams, enhancing recharge and improving the riparian habitat.

Appropriate species of trees and grasses will be selected for developing a vegetative cover at the time of implementation of IWMP-III project of Pallom. The diversity of vegetative measures is the key to sustainability. Combination of shallow and deep-rooted plants, fast and slow growing plants, productive and medical plants and herbs will be encouraged. The vegetation created will ultimately help to recharge the rainwater, use the soil moisture optimally and provide direct and indirect benefits to the community and environment as a whole.

Land use pattern will go hand in hand with carrying capacity of the watershed. Optimum use of water and increased use of organic fertilizers is the key to conserve the precious land source. Water overuse and excessive fertilization leads to permanent damage of lands and groundwater. It is important to maintain soil quality through crop management. Crop diversity and crop rotation helps in improving the micro flora and fauna present in the soil and maintaining the healthy symbiotic subsystems relationship.

Participation of local community in development and management

During the planning phase, the local people's participation were involved and it is planned that the involvement during implementation and post project maintenance will enhance the impact of project and maintain the structures. However, participation without empowerment does not help in achieving sustainable development. So people will be made aware of different concepts and options for their livelihood and natural resource management. Local wisdom is important in understanding rural dynamics that

includes the interface between human behavior and its economic / ecological implications. The interests of a community will be created and maintained by adopting the measures in such a manner that they provide immediate, medium term and long term benefits to the community.

Institutionalization for post project management

A dynamic institutional arrangement is necessary for project management, facilitation of benefit sharing and maintenance of the resources. This usually includes small user groups for different resources / assets as well as village level organizations. In-built system and mechanisms will be developed for qualitative growth and dynamisms of the organizations. The community organizations will be linked to other Government and Non-Government institutes of interest. The potential people's organizations formed in the project area include Watershed Committees, Neighbour Hood Groups and Users Groups.

Watershed Committee

Watershed level organization is established right from the beginning of the project. The overall planning, coordination, management and maintenance are possible through this representative body. This clearly implies representation from different sections of the community – landholders and landless, upper reach and lower reach, men and women, lower and upper castes, Gram Panchayat and other existing political or nonpolitical organizations.

Neighbour Hood Groups

Neighbour Hood Groups are established in every micro watershed combining 40 to 50 households living as clusters. The overall planning, coordination, management and maintenance of the activities pertaining to the area are done through this Group with people's participation. These families are further subdivided into clusters of 7-8 houses and a person is selected to represent this cluster in the Neighbour Hood Committee ensuring proper representation on different sections.

User Groups

The other categories of institutions are formed of various groups with common areas of interest in the project area named user groups. These include, depending upon necessity, Self Help Groups of women and men, User Groups for common assets, Natural Clubs, etc. The capacities of different groups will be developed time to time for effective functioning of these groups. A mechanism will be developed to ensure continuity, both in learning, functioning and actions that from responsibilities of such groups during the implementation project activities.

Watershed Development Fund:

Such contributions will promote feeling of "ownership" of the programme among stakeholders. This will contribute to sustainable outcomes in the long-term. The voluntary contributions are saved in the Watershed Development Fund (WDF) that is to be used for repair, maintenance and use of assets created on common land. The contribution of it will come mainly from the following:

Sl. No.	Financial Details	Minimum contribution
1.	Natural Resource management	
	General	10 percent
	SC/ST	5 percent
2.	Production system and Micro enterprises	
	General	20 percent
	SC/ST	10 percent

It is planned that for SC/ST, BPL population the contribution will be taken in form of voluntary labour and the fund for labour will be diverted to the WDF.

User Charges:

Various user groups will be formed in village. These user groups will collect user charges according to the designated rules formed during the formation of user group. These funds will be transferred to the WDF funds as per these formulated rules. The secretary of watershed committee (WC) will maintain the records of all activities.

KERALA STATE LAND USE BOARD – TECHNICAL SUPPORT ORGANISATION

Kerala State Land Use Board was established in 1975 under Department of Planning and Economic Affairs, Government of Kerala and is functioning as a full-fledged department. The Department is functioning as an agency to assist the State Government to frame policies for optimum land use and natural resource management in the State, with the basic objective of providing necessary advisory support on matters related to the optimum use of land and land resources viz; soil, water, plant, animal system. The Department also uses the technology of remote sensing and GIS to cater its requirement.

- The major **objectives** of Land Use Board are review of existing land uses in the State and exploring possibilities of effective land use in a sustainable manner. The objectives includes, taking effective measures to protect good agricultural lands against (i) depletion on account of soil erosion due to wind, water, sea. (ii) water logging and salinity (iii) loss of fertility (iv) urbanization and industrialization. The department advises the government regarding land use policy in general with particular references to the problems relating to conservation, development and management of lands.
- The main **functions** of the department are (i) to collect and collate data on land resources and land use (ii) to undertake surveys on current land resources and land use (iii) to initiate studies on appropriate land use and related aspects (iv) recommend appropriate policy framework to help the Government to arrive at correct decisions on land and (v) to administer and co-ordinate the implementation of the decisions of the Govt. related to land use without displacing the existing agencies.
- State Land Use Board has a niche of natural **database** on land resources and many organizations are making use of these facilities available in the department. The department organizes awareness among students, youths, farmers, planners and men of all walks of life on need for conservation, development and management of our most precious land resources. The available database includes (i)land use, geomorphology, structural geological map, proposed land use and soil conservation map of Idukki district, (ii) land use, geomorphology, transport network, drainage network, settlements, watersheds of Kerala in 1:50,000 and 1:12,500 scale, (iii) wasteland map of Kerala in 1:50,000 scale, (iv) soil series, depth, erosion, drainage, AWC, texture, land capability and irrigability in 1:250,000 scale, (v) PRM maps (hardcopy & softcopy) in cadastral scale, (vi) agro ecological zonation map of ten districts in1:50,000 scale and (vii) wetland (Paddy land) map of Kerala in 1:12,500 scale.
- The important **services** provided by the department includes (i) preparation of land and water related thematic resource maps, (ii) delineation of watersheds, (iii)

agro-ecological zonation, (vi) recommendation of suitable land use, (v) preparation of watershed based master plans for LSGIs, (vi) studies on land resources, (vii) awareness on land resource conservation and management (viii) consultancy service on land use planning & GIS for various line departments, LSGIs, etc.

Organisational Set Up & Infrastructure

The department has its State office (Headquarters) at Vikas Bhavan Complex, Kottayam. There is a Regional Office for the department functioning at the Municipal Shopping Complex, 2nd Floor, D- Block, Patturaickal, Thrissur – 680 022. The department is presently working with the following sections for carrying out the administrative and technical responsibilities entrusted with it. Land Use Commissioner is the Head of the Department.

Technical Wing

Technical Officers in the cadre of Joint Directors, Deputy Directors, Assistant Directors and Agricultural Officers from disciplines of Agriculture, Soil Conservation, Soil Survey & Statistics is entrusted with the planning and implementation of the technical programme as per the mandate of the department and also for the implementation of the different plan schemes as envisaged in the plan document of Government. The Regional Office at Thrissur is set up for the implementation of the Plan Scheme “Resource Survey at Panchayat Level” i.e. Panchayat Resource Mapping Programme (PRM). The Regional Office is headed by an Assistant Director with supporting technical & administrative staff, created as temporary plan posts and project mode staff for carrying out the PRM programme.

Cartography, RS &GIS

Toposheets, cadastral maps, aerial photographs, satellite data, land resources data at macro and micro level generated through the projects are maintained by this wing. The Cartographic wing of the department is headed by a Cartographer with Draftsman, Planning Surveyors, Laboratory Assistants and Cartographic Assistant as supportive staff.

Administrative Section

Headed by the Senior Superintendent with supporting ministerial staff in various cadre.

Geoinformatics laboratory

It is equipped with computers and softwares capable of analyzing remote sensing data and resource maps for land resource management and planning. The Geoinformatics lab provides a new environment in natural resources planning by meeting the challenges of implementing the new IT paradigm in all aspects of land resource planning. The lab's hardware's include high end workstations, server, scanner and other packages for digital data analysis and for interpretation of digital imageries. The customization packages are developed for preparing user friendly information

systems for different users. The service of this lab is provided to all line departments and LSGIs. The Lab also imparts on-going program of training staff on GIS technology required to the operation of the lab.

Major Projects

- One of the major plan schemes implemented by the Department is generation of resource maps at cadastral level through the Panchayat Resource Mapping Programme (PRM). Comprehensive data base on land and water resources required for local level planning has been generated. The State Planning Board (SPB) has recommended for digital updation of the data base already created through PRM and for creating awareness and training in utilizing these data base at LSGI level for meaningful planning, as a follow up action. The SPB has also recommended that the State Land Use Board should initiate action programmes for formation of data base.
- One of the major consultancy projects implemented by the Department is the preparation of watershed based action plans for the Local Self Governments. Many line departments are demanding for the digital output of the already created the data base under this project. There is also great demand from LSGIs for creating awareness and training in utilizing these data base at LSGI level for meaningful planning, as a follow up action.
- Presently the department is functioning as the Technical Support Organization for preparing the Detailed Project Report for Block Panchayats under the Integrated Watershed Management Programme. The State Level Nodal Agency of IWMP has entrusted the department with the preparation of Preliminary Project Reports for Kottayam and Kollam districts. Airport Authority of India, Town Planning Department, Local Self Governments and several other agencies has awarded consultative GIS projects.

Project Team

Project Director	P. Marykutty IAS <i>Land Use Commissioner</i>
Project Leader	S. Edison <i>Joint Director</i>
Project Team	Nizamudeen. A <i>Deputy Director (Soil Survey)</i> Yasmin. L. Rasheed <i>Assistant Director (Soil Survey)</i> Tina Bhaskaran <i>Assistant Director (Agriculture)</i> Justila Fernandez <i>Specialist (Soil Science)</i> Fathima Paul <i>Agronomist</i> V. Njanaprakash <i>Cartographer</i> Shyamkumar. S. L <i>Soil Survey Officer</i> Kumaresan. S <i>Assistant Geologist</i> Subramanian. S <i>Geological Assistant</i> Althaf Haidary <i>Geological Assistant</i> Balu Jacob <i>Geological Assistant</i>
GIS Support	Jayakumari. G Riyas. M. M Shibu. S. Babu
Data Entry	NishaRani Susmitha
Logistic Support	Asokan Assari. K Sreekandan Nair.K Harikrishnan Maniyan. R
KERALA STATE LAND USE BOARD <i>Vikas Bhavan, Kottayam – 33</i> Phone: 0471-2307830, 2302231: Fax: 0471 – 2307838 www.kslub.kerala.gov.in e-mail: landuseboard@yahoo.com	