



**NEW GENERATION WATERSHED DEVELOPMENT PROJECT
WDC - PMKSY - 2**

**DETAILED PROJECT REPORT
WAYANAD WDC - 1/2021 - 22**



Project Implementing Agency

**SULTAN BATHERY BLOCK PANCHAYAT
WAYANAD**

Technical Support Organisation

**KERALA STATE REMOTE SENSING AND ENVIRONMENT CENTRE
THIRUVANANTHAPURAM**



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Message



Sri. Assainar
President
Block Panchayat
Sulthan Bathery

Watershed development approach has evolved from the initial objectives of soil & water conservation alone to the current integrated approach of managing the biological, physical, and social elements in a landscape within the watershed boundary.

Objectives of the New Generation Watershed Development Projects WDC-PMKSY2.0 is to improve productive potential of the project area through integrated watershed management and to strengthen community based local institutions for promotion of livelihoods & watershed sustainability. The programme gives special emphasis for agriculture engineering measures for Natural Resource Management, effective use of rain water by constructing small water harvesting structures, diligent planning for crop system diversification for risk management, diversification of the watershed economy by adopting IFS- agronomic and horticulture crops, livestock, agro-forestry, fishery etc and most importantly establishing economically vibrant institutions like Farmers Producers Organization (FPO) for innovative sustainable livelihood development of the community.

High level of coordination is necessary between the various stakeholders involved along with forward and backward linkages between the various organizations like the Local Self Government Institutions, Development Departments, Watershed Committees, Neighborhood Groups for achieving the goal.

Kerala State Remote Sensing and Environment Centre (KSREC), the Technical Support Organization has prepared the Detailed Project Report for the New Generation Watershed Development Project Wayanad WDC- 1/ 2021-22 with the close involvement of all stakeholders. The plans included in the DPR reflects the perceptions and priorities of women, farmers and landless and will definitely encourage peoples participation in all stages of project implementation.

I thank State Level Nodal Agency, KSREC, three-tier people's representatives and officials of Development Departments for their active participation and valuable suggestions. I hope the recommendations will help in improving the agricultural, horticultural and livestock productivity, increase the livelihood opportunities for landless and marginal farmers and strengthen microenterprises in the project area.

A handwritten signature in black ink, appearing to read 'Sri. Assainar', written over a horizontal line.

CHAPTER 1

INTRODUCTION

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. 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 sustainable production systems for natural resources management and livelihood options put forward in the New Generation Watershed Development projects (WDC-PMKSY2.0) needs to be seized and provided with socio political impetus in the above line for watershed management to take root in the state.

The New Generation Watershed Development projects (WDC - PMKSY 2.0) is planned with an aim of integrated sustainable eco-friendly development of the rural areas of the country. The objective of the New Generation Watershed Development projects (WDC - PMKSY 2.0) is to promote more agriculture engineering measures rather than mechanical/Engineering treatments with overwhelming focus on trees, cropping systems, soil moisture conservation & management. More emphasis is given on realizing effective use of rain

water by relying more on water productivity along with Diligent planning for crop systems diversification for risk management; enhancing productivity by adopting water use efficient crops and opting for crop alignment as a principle. It also Emphasises on clear risk management plans for adaptation and mitigation of adverse impacts of climate variability and change; diversification of the watershed economy by adopting integrated farming systems – agronomic and horticulture crops, livestock, agro-forestry, fishery, poultry etc.; enlarging livelihood portfolios; building climate change projections into water harvesting designs; precision based use of water for managing drought spells; and timely agro-met farm advisories to deal with climate induced uncertainties. It is also intended to establish economically vibrant institutions, like Farmers Producers Organization (FPO), to promote agri-business services and take up watershed activities for rejuvenation of springs.

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. Climate change issues and its impacts witnessed in the recent past have also adversely impacted ecology in general and agricultural production systems in particular, posing grave challenges to sustainable livelihoods.

1.1 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 Organizations. The Western Ghats 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 the Integrated Watershed Management Programme and now the New Generation Watershed Development projects (WDC - PMKSY 2.0) implemented through the Department of Land Resources, Ministry of Rural Development. Departments like the Agricultural

Department, Land Use Board & Soil Survey Department are also engaged in watershed development activities in the state. 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.

1.2 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 changes 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 non-agricultural 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 9.5lakh 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 requires 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.

1.3 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 localized 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.

1.4 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 (WDC - PMKSY 2.0) 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, homestead plantation etc.

1.5 MAIN OBJECTIVES OF THE WDC - PMKSY 2.0

Objectives of watershed development projects are to improve productive potential of rainfed degraded land through integrated watershed management; to strengthen community based local institutions for promotion of livelihoods & watershed sustainability, and to

improve the efficiency of watershed projects through cross learning and incentive mechanism. At macro - level, the vision of WDC-PMKSY2.0 projects is to accelerate the economic growth rate of agriculture in the less endowed rainfed areas of the country. Moreover, this should be achieved by adopting harmony with ecological principles of development for ensuring sustained transformation of economy and ecology. The guiding principles shall be a better *Economy, Ecology* and *Equity* in the rainfed regions of the country.

At watershed level, the development plan shall be guided by the need to achieve higher incomes for farmers, expanded livelihood options for landless, equity in distribution of benefits, community ownership and management, and ecologically sustainable action plan.

1. Enhancing economic growth of village community dependent on watershed by:
 - a. Securing production and farmers' income against climate variability and its risks of drought spells through diversification of crop systems & animal husbandry, and varied livelihood portfolios; efficient water harvesting and retention of rainwater in soil profile; and entitling all project members to ground and surface water resources for life saving irrigation on equitable basis.
 - b. Improving intensity and productivity of various crops, livestock, fisheries and biomass production systems through optimal, integrated, sustainable and efficient use of natural resources in project areas.
 - c. Recognising the stake of non-land holding project members, and promoting alternate livelihood opportunities.
 - d. Building an ecosystem of enterprises for facilitating efficient scales of operations, access to credit, and market linkages; knowledge sharing; and resource convergence led by vibrant member managed farmers' institutions.
2. Ecological restoration and sustainable management of natural resources across the project area through:
 - a. Sustained community action in management of natural resources/assets such as groundwater, soil, community resources, etc. by way of building community organisations like User Groups (UG), and transferring maintenance responsibilities to them. Further, supporting UGs with regulatory norms, that are

institutionalized through the Gram Panchayats.

- b. Promotion of simple, easy to use and affordable technologies and practices, that builds upon local knowledge and available materials.
3. Improving the economic and social conditions of the resource poor, asset-less, differently-abled and women in particular through:
 - a) Shared and equitable access to the land, water and biomass resources developed.
 - b) Greater access to income generating opportunities.
 - c) Facilitating co-option of members of these categories in various community Institutions i.e. FPO, User Groups etc.

1.6 WATERSHED APPROACH TO WDC - PMKSY 2.0

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' (NWDPPRA) 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 guidelines have been issued by the Government of India to implement the New Generation Watershed Development Projects (WDC-PMKSY 2.0) and agencies have been identified at the State level as well as at the district level to effectively implement and monitor the programme.

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, land levelling, 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.

The contemporary and near future context warrants a paradigm shift in watershed development approach, that is largely describable by “biomass generation, crops- livestock system of production, and livelihood options”. This suggests the need for rejuvenation of life in the watershed landscape, with its multiple dimensions of topography, soils, moisture regimes, water bodies, grasses, trees, diverse crop & livestock systems, and people depending on these resources.

Regeneration of landscapes implies regeneration of all these elements of the landscape and their inter-relationships. It also includes various ecosystem services such as base flow in the streams, increased spring discharge, improved pest- predator complex etc., that contribute to enhanced productivity of all the dependent systems while minimizing the use of external inputs.

1.7 KEY FEATURES OF WDC - PMKSY 2.0

The New Watershed programme (WDC-PMKSY 2.0) is envisaged to effect the following shifts:

- a) A clear transition from the current predominant practice of mechanical/ engineering treatments to more agriculture engineering measures. This implies overwhelming focus on trees, cropping systems, soil moisture conservation & management and soil organic matter.
- b) Emphasis on realizing effective use of rain water by relying more on water productivity. This involves integrated measures to enhance water percolation for storage of rainfall in the soil profile for longer periods; and supplementing of moisture deficits in crops with water that is harvested by constructing small water harvesting structures like field bunds, trench cum bunds, contour trenches, continuous contour trenches, farm ponds, diversion weirs, embankments, percolation tanks, check dams etc.
- c) Diligent planning for crop systems diversification for risk management; enhancing productivity by adopting water use efficient crops (like nutri- cereals, pulses and oil seeds, besides dry land horticulture); and opting for crop alignment as a principle. An important initiative would include aligning crop growth phase with water availability, to provide a protective irrigation at critical stages of crop growth.
- d) Clear risk management plans for adaptation and mitigation of adverse impacts of climate variability and change; diversification of the watershed economy by adopting integrated farming systems – agronomic and horticulture crops, livestock, agro-forestry, fishery, poultry etc.; enlarging livelihood portfolios; building climate change projections into water harvesting designs; precision based use of water for managing drought spells; and timely agro-met farm advisories to deal with climate induced uncertainties. Access to technology suite that forecasts events like pest & disease, price & demand etc. would further help in risk negotiation.
- e) Economically vibrant institutions, like Farmers Producers Organization (FPO), to promote agri-business services and impart efficiency to transactions at both input and output management stages. Such organizations are to be people – owned, people – managed and people-centric approach.

- f) Setting up and nurturing of community groups that will take interventions beyond mere creation of assets and promote responsible ownership and management. Formation of User Groups based on common identities and interests around natural resources and work consciously towards integrating the principle of sharing.
- g) Focus on decentralization, flexibility, community empowerment and greater role for village-level institutions in the planning process with a view to accommodating the local social and traditional strengths.
- h) Rejuvenation of springs by taking up appropriate watershed activities in the watershed development projects.

1.8 GUIDING PRINCIPLES OF WDC - PMKSY 2.0

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) 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 Panchayat 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 Centre (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)

CHAPTER 2

WATERSHED DEVELOPMENT PLAN

The vision of the new generation of watershed development projects is achieved through PWDP prepared by the watershed community with technical guidance from the WDTs.

The following constitute broader components of the watershed development plan:

- i. Ecosystem Regeneration and Production.
- ii. Natural Resources Management and Governance.
- iii. Services & Livelihoods.

These three are organically linked and relate to development, management and governance of natural resources. The plan should focus on effective and efficient use of natural resources to realize better income for the rural people.

2.1 Ecosystem Regeneration and Production Plan

- a. Crops and the land use vary in accordance with the topography. Its characteristics and tenurial relations also determine the land use. The watershed landscape is first zoned into relatively homogenous units based on its physical characteristics, usage (crops, grasses, trees) and tenurial status (such as private/ commons/ forest department owned lands). The types of zonation vary across different agro- ecologies.
- b. In addition to the physical watershed treatment plan covering ridge to valley, the ecosystem regeneration plan should look at the land use crops grown or types of grass lands or vegetation in each of the zones and the status of groundwater/ aquifers etc.
- c. The plan should indicate the measures taken up for improving soil health in terms of soil organic matter, regeneration of vegetation, mitigation of climate risks in crop production, crop diversification including horticulture, approach to improve crop (soil) cover for longer duration in a year, arresting land degradation, harvesting rainfall and protective irrigation.
- d. An important aspect of this plan is integration and strengthening of livestock production systems, integration of livestock feed and fodder into crop systems, promotion of fodder trees and regeneration of grass lands, as the broad components.
- e. The plan for each of the zones must show measurable indicators for assessing the ecosystem regeneration and projected improvement in production of various crop

systems as a result of interventions made. The change can be appreciated only when the baseline index of these indicators is included in the plan.

- f. For comprehensive ridge to valley treatment is the watershed development approach. The forests and common lands on the upper reaches will necessarily constitute the first candidates for watershed activities. Well-treated upper reaches impact the lower reaches including the arable lands positively. The additional benefit of such a treatment would result in improvement in quality of forest, besides augmenting forest produce adding to supplementary income of the community.

2.2 Natural Resources Management and Governance Plans

These plans will have three parts as discussed below:

a) Maintenance of natural resources related assets

Natural resources related physical works need maintenance, and the bio-works such as plantation require strong protection measures and care. The watershed committee responsible for undertaking treatment works and asset creation should maintain a Watershed Assets Register, and the list of completed works recorded and updated continuously. The completed assets should be transferred to the Gram Panchayat for their continued maintenance at the end of each year of implementation.

A system of annual audit of natural resource assets should be taken up by the GP to assess their status and maintenance needs. These can be integrated into the MGNREGS by a resolution of the Gram Panchayats. The WDT should ensure that these processes are institutionalized into the functioning of Gram Panchayat and followed regularly from 2nd year onwards. The activities planned to achieve this should be submitted as a part of the overall Project development plan.

b) Water Budgeting, Management/Regulatory Norms and Governance

It is crucial for the community to establish reference sites of wells/ bore wells, and regularly monitor groundwater along with local rainfall, so as to arrive at regulatory norms on water extraction, type of crops to be grown and area coverage. The groundwater monitoring exercise may be taken up twice a year (April- May & September-October / before the crop season), and results be placed after analysis, before the Gram Sabha. The purpose should be to build a common understanding and

consensus in the project community for sustainable use of groundwater. The community should be brought to agree on potential restrictions on new extraction structures, reducing area under water intensive crops and other such norms that economise on water use. These exercises are to be taken up twice a year and activities proposed should be part of the watershed development plan. A suitable arrangement for carrying out this exercise should be made by PIA in consultation with Watershed Committee and also provide requisite training for the same.

c) Protection and Regulation/Regeneration of Common Lands

Common lands that are typically in the upper reaches of the watershed slopes, including forests, pastures etc. should receive focused attention along with identification of users, their needs and organizing them into user groups. The plan for regeneration and development should also enlist various products, usufructs arising out of the planned regeneration process, and their benefit sharing norms. Protection measures, norms and their enforcement mechanisms need to be arrived at and must have sanction of the Gram Panchayat.

2.3 Services and Livelihood Plan of FPOs

These are essentially economic growth plans of the watershed community building upon the social capital base and investments in natural resources. An FPO is formed from the beginning as a business entity that efficiently provides services, organizes inputs, promotes value added commodities produced by local enterprises, and undertakes aggregation and marketing, protecting the interests of small & marginal farmers, SC/ST members and women.

The FPO shall start with organizing the three regular components:

- **Custom Hiring Centre (CHC)** - renting out implements/ equipment/ small machines for use by small holder farmers, women and agriculture labour
- **Input Shop**- where inputs required for farming, small implements, quality seeds (produced by its farmers or procured from outside) are readily available within close proximity
- **Information Centre**- providing weather forecasts, weather advisories, crops and livestock related information, information on various schemes, hosting knowledge sources like videos, a library etc.

The plan for economic growth and livelihood activities ideally starts with assessment of the potential impact on crop, livestock, fish and other agricultural production system that comes from the investments made on natural resources. From the perspective of monetising the produce, attention is needed on post-production activities, including value addition & marketing. Hence, investments for creating/upgrading infrastructure, building human resources and skills, and working capital are assessed, and included in the watershed development plan.

The FPO should be able to undertake these responsibilities by taking active support of Watershed Committees, Gram Sabha and Gram Panchayats.

2.4 Convergence Planning

Several government schemes can complement the watershed development initiatives. Once the overall project development plans is prepared, the WCDC will need to discuss with the PIA supported by its WDT and prioritise the activities. This should also involve exploration of scope for sourcing funds from various ongoing relevant schemes. The focus should be on supplementing project activities and funds by effecting convergence with relevant ongoing schemes.

2.5 Spring shed Development

Spring shed Development will be taken up as an activity under watershed projects. Any intervention attempting to develop springs as a natural resource must involve assessment of geological controls on springs, recharge potential of springs at micro level, maintenance and protection of springs, and effective monitoring of spring discharge and water quality. Spring conservation and management activities should use integrated landscape management approaches to synergize the positive linkages with livelihood practices, while also preventing practices that have negative impacts (overgrazing, deforestation, creation of artificial gullies, haphazard road construction, over-extraction of springs, etc

CHAPTER 3

PROJECT PERIOD AND PHASING

In view of the expanded scope and expectations under the new generation watershed; development program, the project duration would be three to five years. The phases and duration of each phase is shown in the table given below.

Table: 1

Phase	Name	Duration	
I	Preparatory Phase	upto 1	Year
II	Works Phase	2 to 3	Years
III	Consolidation and Withdrawal Phase	upto 1	Year

3.1 PREPARATORY PHASE

The major objective of this phase is to create people-centric platform by mobilizing the project community and setting up institutions. Towards this, the main activities will include the following:

1. Mobilisation of Community and Promotion of Institutions

- a) Mobilizing the local community, creating awareness, leading them into various User Groups around natural resources with a view to promote their sustainable usage, and initiating opportunities for livelihood activities. This also involves orientation of members belonging to GP, local institutions, various stakeholders, and other VLLs.
- b) Formation of WCs.
- c) Preparing farmers to organise themselves into an FPO, or strengthen the existing ones.
- d) Finalising appointment of the Secretaries of WC and FPO, and taking them through the required orientation & training programs.
- e) Overall orientation of the people, the local PRI members and the officials concerned to be oriented for executing a community-led watershed project.
- f) Day to day functions and activities to ensure progress.

2. Mapping and Creating Watershed Databases

- a) Compilation of basic demographic and spatial data - the data sets accumulating over several planning exercises need to be integrated with the base data/maps, both across households and space.
- b) Building Land Resource Inventory (LRI) assessing soil characteristics of the watershed reaction along with hydrological and meteorological data and Socio-economic status.
- c) Baseline surveys needed for preparation of the project development plan, along with that necessary for assessment of project success and end results to be completed. The data must be disaggregated, such that granular data and information are made available to appreciate the benefits that have accrued to different categories of the project stakeholders including the landless, small & marginal farmers, women and SC/ST members.

3. Participatory Watershed Development Plan (PWDP)

The overall responsibility for preparation of a PWDP for a watershed projects, along with DPR is given to the PIA

- a) Once a watershed has been assigned to a PIA, it becomes its responsibility to constitute project level committees, including the all-important watershed committee, and guide it to prepare a comprehensive development plan, by adopting participatory approach. The comprehensive plan for the project period shall show year-wise actions plan indicating various activities/ works. This shall be placed before the Gram Sabha, and with its approval sent up for consideration and approval of the WCDC..
- b) At the time of submitting the plan for consideration of the WCDC, project level community institutions, namely, FPO, User Groups, SHG etc. must be in place, and the profile must be incorporated into the Plan.
- c) The Plan needs to detail out the potential benefits that will be generated from various interventions in favour of the project community as individuals and as a group, and also the positive impact on the ecology. The time schedules in respect of these varying benefits must also be reflected.

d) In the plan, the project area will need to be clearly delineated by mapping sub watersheds/landscape zones, and their characteristics. It must contain all baseline data in respect of all the parameters.

The Plan must identify the potential climate risks to production activities, through consultations with the farmers, and show the response mechanisms that will be implemented.

e) Hydro-geological assessment of the watershed includes an inventory of both surface and groundwater resources, identified locations of springs and their characteristics, including delineation of recharge and discharge areas.

f) In case of rejuvenation of springs in hilly areas, details of the aquifer profile and its recharge potential need to be studied for identifying both natural and artificial recharge interventions.

g) Groundwater monitoring and local weather monitoring systems needs to be established based on the hydro-geological assessment for use in participatory water budgeting exercise should to be taken up from the second year.

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

i) Common land properties are identified along with their users, the status of the lands is detailed, and the package of activities for regeneration and maintenance of the commons is finalised as a part of the Plan.

j) The WC should take up the responsibility of regular monitoring of groundwater.

k) The plan must also describe the proposed interventions (physical and financial, including the time schedule).

l) Based on the local priorities, the plan may detail the sequence of activities and their budget requirements such that implementation is spaced appropriately for realising the desired quality.

m) The project plan must be in alignment with the District Irrigation Plan. Water budgeting based on available water and the potential quantum that is proposed to be harvested in the project area, will help in determining an optimal crop plan.

- n) Entry point activities are taken up by the WDT to build rapport with the village community and gain their confidence towards people-centric project development. The progress made in respect of the entry point activities like formation of FPO and establishment of custom hiring centre may be included in the plan being submitted. However, a few other activities that the local situation may demand, and the WDT finds it necessary may also be taken up by preferably sourcing funds from ongoing schemes like MGNREGS, RKVY etc.

Formation of FPO with about 300 shareholding members would be an optimal entry point activity for the program. Entry point related budget will be released to the FPO as soon as it has been registered with at least 50 paid shareholders and has a space to open its office. The FPO can then be supported to operationalize a CHC too as its initial activity.

- o) The comprehensive project plan containing all details, forms the basis for the program's MIS. It must therefore be elaborate enough in terms of data, information, technical details, budget etc., so that its MIS can be linked with State and National Data Centres.
- p) The plan must be flexible enough, so that necessary changes can be effected to accommodate emerging experiences/ learning and innovations felt useful. The plan can be reviewed and amended biannually, if necessary, with the approval of the WCDC.
- q) Action plan must show a clearly demarcated project area boundary with specific details of survey numbers, ownership, as also year-wise sites for various works/activities that will be undertaken.

3.2 WATERSHED WORKS PHASE

This phase is the heart of the program during which the planned activities will be implemented. The main challenge of the new approach to watershed development arises from the need for taking up an integral view of multiple expectations and harmonising their realization.

The plan of implementation should parallelly address three streams namely

- (a) Ecosystem regeneration and production enhancement
- (b) Natural resources governance; and

(c) Services & livelihoods.

Some of the following activities are suggested that greatly emphasize agronomic, biological and livelihood activities, while not compromising on the needed mechanical measures for soil and water conservation.

- a) Multi-purpose trees (fodder, nitrogen-fixing, biomass for incorporation into soils) to be promoted. Nursery raising for fodder, fuel, timber and horticultural species should form an important activity. As far as possible, local species may be given priority.
- b) Land development including in-situ soil and moisture conservation, and drainage management measures like field bunds, contour and graded bunds fortified with plantation, terracing in hilly terrains etc.
- c) Water budget-based promotion of Integrated Farming System (IFS) models that promote crops, horticulture, livestock and agro-forestry and facilitate deriving the benefits arising from supplementary and complementary relationships among these enterprises.
- d) Pasture development to support livestock activities.
- e) Exploring the scope for introducing fisheries by assessing the period & availability of water. The tanks/ponds/other water bodies may be designed and executed in accordance with hydro-geological assessment.
- f) Veterinary services for promotion of livestock activities.
- g) Agro-ecology based crop alignment and demonstrations for popularizing new crops/varieties, animal breeds, resource use efficient practices (soil health card-based soil health management, micro-irrigation systems etc.), and various agronomic practices that help in negotiating production risks (pests, diseases, weather variations etc.).
- h) Climate risk management activities like Custom Hiring Centre, portable micro irrigation, drought/flood resistant varieties, protected cultivation, seed bank, fodder bank, tools for dissemination of agro advisories etc.
- i) Thrust on secondary agriculture for increased farm income adding value to primary agriculture activities; taking up alternative enterprises that can utilise the available land and labour particularly the landless to take up activities like mushroom

cultivation, bee keeping, back yard poultry, compost making, rearing of small ruminants & and rabbits etc.

- j) Promotion and propagation of non-conventional energy saving devices, energy conservation measures, bio-fuel plantations etc. This intervention needs careful consideration after examining the local social and cultural milieu, including the critical livelihood options of the household(s) concerned.

3.3 CONSOLIDATION AND WITHDRAWAL PHASE

Around 3rd to 4th year of implementation of the Project, majority of the planned works would have been executed, and FPO shareholders would have risen to substantial numbers. As planned projects get executed, the role of WC diminishes and that of the FPO, User Groups and SHG increases. Sustainability of economic and ecological benefits from watershed investments is predicated upon effective functioning of these institutions. Sustainability after the completion of project work and withdrawal will also depend upon the quality of works executed. Hence, the phase of consolidation and respectful withdrawal from project work assume importance. In this context, the scope of work during this phase is suggested as follows.

3.3.1 Project Implementation Related

- a) Completion and consolidation of all the planned works and activities.
- b) Documented experiences of the farmers and identified champion farmers during the 2nd and 3rd years of work can be used to scale up the practices to larger areas.
- c) With two years of focus on productivity gains, production increase of targeted commodities can be expected. The FPO now needs to work for a robust post- harvest management by operationalizing basic agri-logistics, primary processing, aggregation and marketing. FPOs will need to prepare an integrated action plan and roll it out during the 4th and 5th years of the project. Promoting warehouse-based storage and electronic Negotiable Warehousing Receipts (eNWR) will address concerns of finances and allay distress sale by farmers.

All such post- harvest issues need to be taken into account while planning production strategies itself, and further needed action plan readied simultaneously. This will make it possible to roll out by 3rd - 4th year of the project period, and exhibit stability as exit begins.

- d) Documentation of successful experiences and lessons learnt are useful for course correction and continuous improvement in the quality of implementation. Social media can also be activated to achieve wider dissemination.
- e) Prepare for and undertake terminal evaluation of project to evaluate the extent of expected outcomes realized successfully
- f) Preparing for and operationalization of capacity building programs for all the community-based organizations (CBOs), so that they will be able to take over management of different tasks after the Project Team withdraws.

3.3.2 Consolidating the Strength of FPO

- a) Building capacity of the FPO as a vibrant business organization of farmers is critical to management of the watershed post withdrawal. Annual business plans, linkages with financial institutions, regular updating of books of accounts, legal compliances and functional governance are key responsibilities of a well-functioning FPO.
The outcomes of various capacity building activities and prescribed management processes undertaken as per annual action plans, may be taken stock of, and additional support required to address the gaps provided.
- b) Increasing the capital base of the FPO and linkages with financial agencies for credit are crucial for its healthy growth. The WCDC should now ascertain the status of FPO with respect to its areas of activities and annual turnover, bridge the gaps, if any, by offering support from various initiatives of the government. The importance of coordination and convergence cannot be over emphasized. Facilitating matching grant for the FPO is one such important support.
- c) During the 4th and 5th years, FPO must focus on building various backward and forward linkages and infrastructures that will support practice of agriculture as an integrated value system. Convergence with other ongoing Government schemes should be the norm and guiding principle for the FPOs.

3.3.3 Auditing of Natural Resources

- a) Natural resources developed need to be used in a sustainable manner by reconciling ecology, equity and economic considerations. The use of, and expected outcomes thereof must be viewed through the prism of balance and harmony. Over-emphasis on any one of these three factors to the neglect of other two should be avoided at any cost.

- b) Regularizing the Annual Audit of Natural Resource Assets: All the natural resource assets created (along with the existing ones) should be visited and assessed by the WC. These assets are to be maintained by tapping different sources of funds – MGNREGS, such other infrastructure funds, and WDF for critical investments and even voluntary contributions in cash or kind.
- c) The process of resource audit should also consider, i) implementation of the sharing agreements on usufruct rights; effectiveness of regulatory norms; and health of the natural resource.
- d) During the consolidation phase, the core functions of the WC should be institutionalized. Also, the user groups should be active and stable.

During this phase, local-level institutions are expected to reach maturity, and exit protocols now become operative for the PIA. The WCs may begin to use the WDF for repair and maintenance of structures created in Phase II. However, accessing of the fund should preferably happen after exploring sourcing funds from other ongoing schemes.

3.3.4 FPOs, Farmer’s Income and Value Addition

In contrast to production-centric agriculture, that has largely been practised in the country so far, the Government’s vision of doubling farmer’s income, has shifted the attention to income – centric policy framework. This entails market- based production decisions, and integrating farm-produce with markets, with a view to enabling the farmers to capture optimal value from his farm output.

This calls for mobilising farmers into FPOs, to impart efficiency to operations at both production and post-production stages. It further calls for effective post- harvest management by focussing on agri-logistics (storage and transportation), processing and marketing. The PWDP would do well build a robust FPO system that can take care of important issues as listed below:

- a) The PWDP must incorporate mobilisation of farmers into a healthy FPO, to shoulder the responsibilities. It should become the foremost entry point activity.
- b) The FPO should focus on providing inputs to farmers at reasonable price, and evacuating farmers’ produce to markets by depending on alternate market channels, always preferring for direct sale options. It needs to put in place the needed infrastructure and management systems in place for this purpose.

- c) It should support the farmers to undertake primary processing of the produce, so that it is able to command higher prices when put to price discovery mechanisms, including online trade platforms.
- d) It should establish basic infrastructure that will enable assaying and aggregation of the small lots of the farmers; and further facilitate produce transportation through one or more of the markets now available under new market architecture, comprising Grameen Agricultural Markets (GrAMs), reformed Agriculture Produce Market Committees (APMCs)/ Agriculture Produce and Livestock Market Committees (APLMCs), Export platforms, Futures Trade platforms and the like.
- e) Supporting the farmers to overcome distress sale, which is common after the harvest is critical to capture optimal value on their sales and realise better incomes. The FPO can play a crucial role by hand holding the farmers in adopting warehouse facilities. The farmers will stand to benefit from electronic Negotiable Warehouse Receipt (eNWR) system available in the country.
- f) FPOs can provide/facilitate many other services like input supplies, farm advisories, custom hiring of farm machineries, credit, contract farming etc.

3.3.5 FPO – Subsidiary Institutions and Services Offered

The FPOs can set up several subsidiary activities, create backward & forward linkages, and serve both, farmers and other non – farmer stakeholders of the project. Some of such services that an FPO can manage and deliver are indicated below:

- a) **Custom Hiring Centre (CHC):** Farm machinery and associated services can be rented out to the farmers and landless labourers for achieving higher productivity and reducing cost of cultivation. The FPO can run it on a revenue model by charging reasonable rates of rent. The FPO should try to avail itself of the ongoing CHC scheme.
- b) **Community Seed and Planting Material Centre:** It can take up seed and planting material production of various agronomic, fodder and horticultural crops. The FPO must focus on providing seed and planting materials of varieties recommended for the local area, their timely delivery at reasonable rates. These can become the brand value of such an initiative.
- c) **Integrated Farming System:** FPO can ideally focus on the strength of farmers and facilitate promoting integrated farming system by taking up suitable combination of

sectors like -afforestation (agro-forestry), fishery, goater, apiary, piggery, horticulture plants like moringa, amla, mango, cashew nut, floriculture etc. through convergence with PDMC.

- d) **Promote micro irrigation** like drip, sprinkler and pivot irrigation, and drip cum mulch, small size green house and shade net with foggers through convergence with PDMC.
- e) **Post-harvest management:** FPO can develop facilities and capacity to aggregate the local produce and link to alternate market channels. These include both online and physical transactions, with preference for direct sale. The concomitant logistics for primary processing, aggregation, storage and transport may be set up by the FPO. It should attempt to benefit from several of ongoing relevant schemes.
- f) **Creation of sale outlet and service centre:** FPO can create Centre from where the farmers can purchase various inputs and avail of services such as insurance, credit, vaccination for animals by levying service fee at a single place.
- g) **Promoting secondary agriculture activities** by facilitating skill development, access to institutional credit besides assistance under government scheme.
- h) Managing an information centre for disseminating weather based agro meteorological-advisories, package of practices for cultivation etc.
- i) Any other social / business activity as per the local needs.

CHAPTER 4

WATERSHED DEVELOPMENT FUND (WDF)

4.1 Creation of Fund

Watershed Development Fund (WDF) shall be created at each watershed level in all the Watershed Development Project for ensuring post-project maintenance of so created community assets. One of the mandatory conditions as per the Guidelines for selection of villages for watershed projects is people's contribution towards the Fund.

The Guidelines envisage that a part of contribution of natural resource management (NRM) works shall be contributed by the owners of land, when executed on their land. This norm has been fixed at 10% for general category farmers, and 5% in case of SC/ST farmers. This can serve as the seed money for the Fund (Para 26.1 of the Guidelines).

4.2 Sources of Fund

The following sources may contribute towards this WDF:

- a) Contributions made by the farmers against NRM works taken up on private lands @ 10 % and 5 % in case of general category and SC/ST category farmers respectively
- b) Contributions made by the farmers when receiving benefits from individually livelihood activities (horticulture, animal husbandry, agro-forestry, aquaculture, water bodies and the like) on their privately owned lands

The contributions shall be @ 20 % and 10 % of the estimated cost of the farming system activity

- c) Collections made by the Watershed Committee on account of user charges, sale proceeds and recurring incomes earned from the assets created in the project area (this includes existing ones too) over common properties (land, water, pastures etc.)
- d) Contributions received from philanthropic individuals and institutions.

4.3 Composition of WDF and Joint Bank Account

Composition of the Committee: The WDF will be handled by a Sub-committee approved by the Gram Sabha, comprising of members of the project area. All members of the Watershed Committee including its selected Chairperson and excluding the selected Secretary shall become ex-officio members of this Fund. The Chairperson of the Gram Panchayat, and not the Chairperson of the WC shall serve as the Chairman of the Fund.

Joint bank account: An exclusive joint bank account shall be opened in any of the scheduled commercial bank (public or private), or public sector cooperative bank or Regional Rural Bank (RRB) in the name of the Chairperson of the Gram Panchayat, and the PIA representative on the Fund Committee. In case of the PIA being a Non- Government Organization, the DLNA (District Level Nodal Agency) shall nominate one of the Block level Government officers to hold and operate the joint account. This too shall be placed before the Gram Sabha for its approval. Fund shall be used optimally and in a transparent manner. It may be invested in medium/long term deposits after assessing current and future the requirements.

4.4 Registration of WDF:

The Committee constituted by the Gram Sabha in accordance may either be registered as an Independent society under the provisions of the Societies Registration Act 1860 or be considered as a Sub-committee of the already registered WS, by incorporating a specific provision to this effect. In the alternative, the Gram Sabha may consider recommending to the Gram Panchayat recognise this as one of its Sub-committee.

4.5 Utilisation of the Fund

The money from the Fund can be utilized for post-project activities, when the project implementation team has withdrawn at the end of completion of the developmental activities.

The utilization shall be as follows:

- a) A sum amounting to 50 % of the Fund shall be reserved for maintenance of assets created on community properties (land, water, pastures, etc.) or/and common uses under the project
- b) The remaining 50 % may be used as Revolving Fund for advancing loans.

4.6 Operational Guidelines for WDF

Assets that need maintenance: Various types of engineering structures & biological interventions like water harvesting structures such as check dams, nala bunds, diversion drains, percolation tanks, vented dams, farm ponds, artificial recharge structures, equipment for natural resource governance, specific interventions for spring rejuvenation etc., created in the watershed are prone to damages by stray cattle, rain, sunshine, wind and unexpected natural calamities. Over the period there can also be natural damage or there may be need for its renovation for better results.

There may be need strengthen or rejuvenate biological activities like block plantations pastures etc. IN such cases, if the assets exist on common properties, resources from WDF may be accessed and works taken up. Expenditure can be incurred also on assets built on private land but serve the community, and an agreement to this effect has been created between the WC and the land owner, and this has been shared with the GP.

4.7 Monitoring of the Fund:

The amount available in the WDF account can be spent for post-project maintenance activities in the manner as shown in the Table below:-

Table: 2

Sl. No.	Year	Principal amount	Interest accrued
1.	1 st year	10%	30%
2.	2 nd year	15%	25%
3.	3 rd year	20%	20%
4.	4 th year	25%	15%
5.	5 th year	30%	Remaining interest

CHAPTER 5

DETAILED PROJECT REPORT

A Detailed Project Report (DPR) describe what a Watershed Project will try to achieve over a tenure of watershed project of **3 to 5** 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. **Kabani** watershed project (PMSKY) of SulthanBatheri block of Wayanad district is proposed for **four** years duration (**2021-22 to 2025**).

5.1 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.

5.2 Methodology adopted

In line with the guidelines of WDC-PMKSY 2.0, as suggested by Government of India, the following methodology was adopted for Resource Mapping, NRM planning and preparation of Detailed Project Report.

- Prepared the cadastral maps pertaining to the project area.
- Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification

- Project Fellows were appointed as animators. The animators assisted the People's representatives in the field for primary and secondary data collection. The animators worked as the interface between LSGI and TSO
- Engineers/Overseers were engaged for taking field estimates of the proposed activities.
- Induction training was given for the Project Fellows on concept of maps and Resource Mapping.
- Block level online discussions were conducted for People's representatives of District/Block/Grama Panchayats, line departments, Kudumbasree and other functionaries.
- This was followed by orientation meeting at Grama Panchayats.
- Conducted transect walk with ward members and ADS.
- During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
- A block level online meeting 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.
- Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map.
- Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padasekharam Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, and Veterinary & Soil Conservation Departments.
- The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of ward members.
- Detailed field survey was done for net plan preparation at Grama Panchayat level with the help of ward members & ADS Chairpersons, MGNREGS officials, etc. The information gathered includes 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 in each micro watershed. The list of drains/ponds/wells to be rejuvenated /renovated and the details of group activities/livelihood activities to be taken up were also collected.

- Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
- Panchayat Level online meetings convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
- 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 watershed were also finalised. The livelihood action plan and the activities under production system were also consolidated.
- The suggestions were split for three years and three separate annual plans were also prepared.
- 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.
- Major activities included in the watershed project are.
 - Soil and moisture conservation measures like centripetal and bench terracing, earthen and stone pitched contour bunding, trenching, vegetative barriers, etc.
 - Rain water harvesting activities like farm ponds, percolation tanks, check dams etc.
 - Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
 - Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
 - 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

CHAPTER 6

WAYANAD DISTRICT

6.1 Project Area

Wayanad, the North east District of Kerala came into existence on 1st November, 1980 as the 12th District consisting of Mananthavady, SulthanBatheri and Vythiri Taluks. Being a hilly district in Kerala Wayanad lies between North latitudes 11^o 27' and 11^o 58' 35" and East longitudes 75^o 47' 50" and 76^o 25' 35". The District has an area of 2130 sq km and 40% of its area is covered under forest. The urban area is only 40.74 sq.km. District has no railway line and sea coast. There are two major irrigation projects viz Banasurasagar multipurpose project and Karapuzha irrigation project.

The District has population of 817420 and it ranks first in Scheduled Tribe population (18.5 per cent of its population) among the districts of Kerala. Almost the entire Wayanad district is drained by Kabani and its main tributaries viz Panamaram, Mananthavady and Thirunelly. Kabani river, one of the three east flowing rivers in Kerala is an important tributary of Kavery river. Watershed has become an acceptable unit of planning for optimum use and conservation of soil and water resources.

Land use categories observed in this district are built-up land, forest, water bodies, agriculture land, waste land and wet land. Wayanad offers Panorama of undulating hills. The important mountain peaks which deserve special mention are the Vavumala (highest peak in the district), Vallarimala, Banasuramala, Elampilerimala, Brahmagirimala, Kunelipandimala, Thariotemala and Muthuthala. Edakkal caves, Pakshipathalam (endowed with various birds and wild animals), Pookottu Lake (fresh water) and Banasurasagar dam are located in this district.

6.2 Geography

Wayanad lies between north latitudes 11^o26'28" and 11^o58'22" and east latitudes 75^o46'38 " and 76^o26'11 " and is bounded on the North by the Virajpet Taluk of Kodagu district on the east by Heggadadevankote and Gundal pet Taluk of Mysore district of Karnataka and the Gudalur Taluk of Nilagiri district of Tamil nadu, on the south by the Ernad Taluk of Malappuram district and Kozhikode Taluk of Kozhikode district and on the west by Quilandy and Badagara Taluk of Kozhikode district and Tellichery Taluk of Kannur district. It is situated at a height of 700 to 1200 m above the sea level. Wayanad hills are contiguous to the

Nilgiris in Tamil nadu and Bandhipur in Karnataka, forming a vast land rich in bio diversity. Eco system and environment of the district which is famous for the biodiversity, is greatly endangered today.

6.3 Flora and fauna

The flora of Wayanad is the characteristics of the Western Ghats and the plantain crops grown in the cool climate. A major portion of the district is covered by coffee. Trees of wild types like Rosewood, Anjali (Artocarpus), Mullumurikku (Eythrina), several species of Caussia and many other non-descriptive varieties are still preserved here and there to give shade to the coffee plants. These trees give resemblances of wilderness to the landscape of Waynad. The soil and climate of Wayanad are suitable for horticulture on commercial basis. With the clearing of forests, the diverse and buzzing animal life characteristics of the forests of Western Ghats has vanished from Wayanad. Elephants, Bear and other wild Animals from the neighbouring wild Life sanctuaries of Karnataka and Tamil Nadu, stray into the Begur Forest range and the Forests around Muthanga, which is 20km away from SulthanBatheri.

6.4 Rivers

Kabani River, one of the three east flowing rivers of Kerala, is an important tributary of the river Cauvery. Kabani and its tributaries constitute a powerful river system in the landscape of wayanad. The district is blessed with rich water resources. There are east flowing and west flowing rivers in the region. One of the major rivers in the district is Kabani River, a tributary of River Kaveri. It is also one of the only three east flowing rivers in Kerala. Kabani has many tributaries including Thirunelli River, Panamaram River and Mananthavady River. All these Rivulets help from a rich water resource as well as a distinct landscape for the district

6.5 Rainfall

Wayanad experiences a mean rainfall of 2611.6mm.Lakkidi, Vythiri and Meppady are the high rainfall experiencing area.

6.6 Climate

The district has a salubrious climate. The mean average rainfall in this district is 2322mm. Lakkidi, Vythiri and Meppadi are the high rainfall areas in Wayanad. Annual rain fall in these high rainfall areas ranges from 3000 to 4000 mm. High velocity winds are common during the south-west monsoon and dry winds blow in March-April. High altitude regions experience severe cold.

Generally the year is classified in four seasons, namely, cold weather (December-February), hot weather (March-May), South West monsoon (June-September) and North East monsoon (October-November). The south west and north west monsoon have a direct effect on Wayanad climates. Even without the presence of sea wayanad's elevated area receives a good amount of rain every year.

6.7 Agriculture

Agriculture is the Principal occupation of the people of the district. Hence Wayanad district in the real sense of the term is an agriculture district. The district is suitable for all varieties of cultivation. The most important crops which are cultivated in the district are Pepper and Paddy. The major plantation crops are coffee and tea. The high altitude district is characterized by the cultivation of perennial plantation crops and spices. 11 percent of Pepper, 64 percent of Ginger, 84 percent of coffee, 17 percent of tea and 4.6 percent of cardamom produced in the state are from the district which forms only 5.48 percent of the total area of the state. The major plantation Crops are Coffee, Tea Pepper, Cardamom and Rubber.

6.8 Development Blocks

There are 4 development blocks and one municipality in the district, viz. Kalpetta, Mananthavady, Panamaram and Sultan bathery. The District Rural Development Agency coordinates the works. Several welfare schemes are carried out in the blocks, such as: Swarnajayanthi Gram Swarozgar Yojana (SGSY), Sampoorana Grameen Rozgar Yojana (SGRY), Prime Minister's Gram Sadak Yojana (PMGSY), Indira Awaaz Yojana (IAY) etc.

CHAPTER 7

KABANI WATERSHED

7.1 Location and Extent

The Kabani watershed lies between 11⁰30' to 12⁰00' North latitudes and 75⁰45' to 76⁰30' East longitudes and is spread over the districts of Wayanad and Kozhikkode of Kerala State. It is bounded by Karnataka State in the North and North East, Thalasseri taluk of Kannur District in the North West, Vythiri taluk of Wayanad District in and Kozhikkode taluk of Kozhikkode District in the south, Tamil Nadu in the South east and Vadamakara and Koyilandi taluks of Kozhikkode District in the West. The watershed has a total area of 1934.5sq.km covering 37 villages spread over 26 Panchayaths, 5 blocks and two districts.

7.2 Physiography

Elevation: The Kabani River has its origin in the Western Ghats falling within the Wayanad district of Kerala State. The river is fed by four important tributaries, the Panamaram, the Mannantody, Babali and the Noolpuzha. The Mannantody has its origin in the Tondarmudi Malai of the Western Ghats, at an elevation of about 1801m above MSL. The Panamaram River rises from Lakkidi in the Western Ghats at an altitude of about 944 m above MSL. The Noolpuzha originates from the eastern border of Wayanad district. The watershed lies entirely in the upper region and the general elevation ranges from 135m to 2059m.

Aspect: The Kabani River is one of the three east flowing rivers of the state. The Mannantody river emerges from the South-Western part of the watershed and flows towards East. The Panamaram river which rises from the Southern part of the watershed joins the Mannantody river, 7km North of Panamaram. Near the state's border, the Bavalipuzha joins the Kabani river and from this point the main river follows the state border and then turns north and flows into the Karnataka. The Noolpuzha, another important tributary, originates from the eastern border of Wayanad and flows towards North to join the Kabani River outside the Kerala State boundary.

Landforms: The broad landforms of the watershed are medium hills, high hills and valleys of Wayanad plateau.

7.3 Drainage

The major river draining through the watershed is the Kabani river. The river is east flowing and its tributaries are Noolpuzha, TudukuttiAr, Nugu Hole, Manjatthodu, Manikkadpuzha, KarimbakolliAr, Oda pallam, Kannarampuzha, ChedlethPuzha, Narasipuzha, Kadamanthdu, Gullaka, Vayittiripuzha, Chanumar, Pozhutanapuzha, Cherupuzha, Panamarampuzha, Venniyottupuzha, Mananthavadipuzha, Tirunelli Hole, Nadudanathodu, Kakkerithodu and Periyapuzha. The drainage pattern appears to be dendritic to sub-dendritic.

7.4 Water Resources

Surface Water Resources

The major river of this watershed is the Kabani river and is perennial in nature. The river has 30 tributaries including major and minor ones. The total annual yield and the annual utilizable yield of the river are 4333m³

7.5 Ground water resources

The area falls in the category of white which means that only less than 65% of the ground water is utilized. There is no restriction for further development. The entire area of the watershed is suitable for domestic wells only.

7.6 Watershed Delineation

The Kabani watershed is divided into 42 sub watersheds and 290 micro-watersheds. The details of the area under study and their respective codes are given in (Fig.6) Table3.

Table 3: Area statistics of Watershed

Sl.No	Watershed code and name	Total Area (in Ha)	Treatable Area(in Ha)
1	27k1aa(Mathamangalam)	1015.41	972.00
2	27k1v(Nambikolli)	520.36	509.00
3	27K1w1(Puthenkunnu)	499.52	427.00
4	27K1z(Thelampatta)	98.71	98.00
		2134.00	2006

7.7 Special Problems

1. The area experiences stream bank erosion along the river courses
2. A portion of the forest is of degraded nature.

3. The places Thrissleri, Kanhirangad and Vellamunda of Mananthavady taluk, Padinharathara, Muttill, Kattikulam and Chundel of Vythiri taluk have shown indications of land slips/land slides

7.8 SULTHAN BATHERY BLOCK

SulthanBatheri block located in SulthanBatheri taluk of Wayanad district spreads over an area of 40540.56 ha. Consisting of four Gramapanchayats viz.Ambalavayal, Meenangadi, Nenmeni, Noolpuzha and thirteen block Panchayat divisions bounded by Kabani river and Karnataka State in the north; Kalpetta block in the south; Tamil Nadu border in the east; Mananthavady block in the west. 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.As per Census 2011, Sulthan Bathery's population is 1, 43,440. Out of this, 70,440 are males whereas the females count 73,000.Total literacy rate is recorded as 79.26% with breakup of 82.09% of male and 76.53% of females (Table 4). Nenmeni Panchayth has highest population (46950) and Noolpuzha Panchayath has least population (27833).

The block has a prominent place in the field of agriculture. Major crops cover an area of 19814.55 ha in 2014-15 as against 20121.14 ha in 2013-14. Forest covers an area of 18065.72 ha which is 45% of total geographical area of this block. Land use categories observed in this block are agriculture land, built-up land, paddy land, waste land and forest and water body. Watershed has become an acceptable unit of planning for optimum use and conservation of soil and water resources. Kabani and Chaliyar are the watersheds draining this block

The landform units identified are alluvial plain, flood plain, valley fill, linear ridge, hillcrest, sloppy terrain, rocky slope (scarp face) and hilly terrain. Nedumbala, Muttill and Thekkumkara are the important soil series cover this block.

Groundwater occurs in the weathered, fractured, crystalline and alluvial formations in the district. Phreatic conditions exist in weathered formation and are mostly developed by dug wells for domestic and irrigation purposes. Semi-confined conditions exist in deep fractures and storage and movement of groundwater is mainly controlled by the fracture system. Deep high yielding bore wells are located along fractures / lineaments.

There are a number of government and Private schools offering education. Compared to other districts of Kerala institutions offering higher education are limited in this district.

Sultan Bathery has very good road connectivity with South Indian states. The major Roads is NH 766 connected to Mysore, Bangalore and Kozhikode. SulthanBatheri is the biggest transport hub of Wayanad district.

Table.4 Demographic details of SulthanBatheri

Name of Panchayath/ Block	Area (in Sq. Km)	No. of House Holds	Density of population (Sq. Km.)	Total Population			Scheduled Castes			Scheduled Tribes		
				Person	Male	Female	Person	Male	Female	Person	Male	Female
Noolpuzha	242.97	6510	114.55	27833	13763	14160	862	419	443	11233	5507	5726
Nenmeni	69.38	11330	676.71	46950	22929	24021	1866	910	956	7871	3786	4085
Ambalavayal	60.65	8568	580.49	35207	17214	17993	955	495	460	5867	2813	30545
Meenangadi	53.51	8199	625.12	33450	16624	16826	908	477	431	7775	3843	3932
Total	426.51	34607	1996.87	143440	70440	73000	4591	2301	2200	32746	15949	16797

7.9. Grama Panchayath falling in the project area

Two Panchayats under Sultan bathery block fall in the project area. The details are given in Table5.

Table: 5 List of local bodies in the project area

Watershed code	Panchayath	Area (ha)
27K1aa	Noolpuzha	1015.71
27K1v	Nenmeni	448.06
	Noolpuzha	72.03
27K1w1	Nenmeni	378.76
	Noolpuzha	120.54
27K1z	Noolpuzha	98.71

7.10. 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 (Table 6).

- 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 6: 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)	

Sl. No.	Criteria	Maximum score	Ranges & scores			
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)	
xiii	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)	

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 -WDC-1/2021-22 Watershed project as given in table below:

Table 7. Weightage of the project

Sl. No	Criteria	Weightage
1	Poverty index (% of poor to population)	7.5
2	% of SC/ ST population	5
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	15
8	Drinking water	7.5
9	Degraded land	5
10	Productivity potential of the land	15
11	Contiguity to another watershed that has already been developed/ treated	10
12	Cluster approach in the plains (more than one contiguous micro- watersheds in the project)	0
13	Cluster approach in the hills (more than one contiguous micro- watersheds in the project)	10
	Total	85

Though a predominantly agro based economy, share of workers in this sectors decreasing steeply. Agricultural wage earners, small and marginal farmers, plantation workers and casual workers engaged in non-agricultural activities constitute the bulk of the rural poor. Middle and upper class are employed in government or large private enterprises. For the poor families another major chunk is the income from MNREGS. Lower income people are also involved in animal husbandry with mixed results. Cluster approach was followed taking into consideration 4 micro-watersheds covering a total treatable area of 2006Ha.

7.11 Watershed information

Table: 8
General features of Project Area

Name of Project	Wayanad-WDC-1/2021-22
Name of Program	New Generation Watershed Development
Location	Between 11 ⁰ 30' to 12 ⁰ 00' North latitudes and 75 ⁰ 45' to 76 ⁰ 30' East longitudes
Blocks	Sulthan Bathery
District	Wayanad
Type of project	Hilly
Total Villages	2
Total Gram Panchayats	2
No. of micro watersheds	4
Total Watershed Committees	4
Total Geographical Area	2133.98 Ha
Area available for treatment	2006 Ha
Sanctioned Area	2006 Ha
Total Sanctioned Cost	561.68 Lakhs
Proposed budget on Works	432.49 Lakhs
Proposed budget on NRM	263.99 Lakhs
Proposed budget on Livelihood Enhancement	84.25 Lakhs
Proposed budget on Productivity Enhancement	84.25 Lakhs
Cost per Ha (PMKSY project)	28000/- per ha
From Project Cost	432.49 Lakhs
From Convergence	540.61 Lakhs
Agro climate zone	Wayanad Eastern Plateau and Wayanad Central Plateau
Major crops	Paddy, Coconut, Rubber, Mixed crops
Major slope range	0 to 3 percent
Major streams	First and second order

River Basin	Kabani
Major soil series	Muttill, Thrikkepatta, Madakkimala
Rainfall	1509 mm
Marginal and Small farmers	more than 60%
Major option of livelihoods	Agriculture, Animal husbandry, Wage employment
Water table	3 to 5 meter
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	Sulthan Bathery
Name of PIA	Sultan Bathery Block Panchayath
Coordinating Person in PIA	Secretary, Block Panchayath
Address	Sultan Bathery Block Office, Wayanad, Kerala

7.12 Budget

The distribution of budget for the Kabani watershed for the various components as per PMSKY guidelines is given below:

Table:9

No.	Budget component	% age	Amount in Rs.
1.	Administrative cost	10	5616800
2.	Monitoring & Evaluation	2	1123360
	Preparatory phase		0
3.	Entry point activities	2	1123360
4	Detailed Project Report Institution and capacity building	1	561680
5	Institution and capacity building	3	1685040
	Watershed works phase		
6.	Natural Resource Management	47	26398960
7	Production System	15	8425200
8	Natural Resource Management &	2	1123360

	Governance		
9	Livelihood activities for asset less persons micro enterprises& Business development	15	8425200
	Consolidation phase	3	1685040
		100	56168000

7.13 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 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 dependents.

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 incidence of migration. Several studies have identified that there is a great need of a systematic and scientific approach to deal with watershed development. The common guidelines generate a fresh and flexible framework for the next 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 WDC-PMKSY 2.0 Project consists of four micro-watersheds namely 27K1aa, 27K1v, 27K1w1, 27K1z as their respective codes. The project falls in part of 2 Grama Panchayats coming under SulthanBatheri block.

ii) Transect Walk

Transect walk is a kind of exploratory walk, under taken 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 the understanding of 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:

To access the impact of any watershed development programme a detailed baseline survey has to be conducted. This acts a benchmark for any intervention during and post implementation of any development programme. A detailed baseline survey was undertaken which involved Bio-physical survey and Village level data collection.

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

iv) Secondary data: The secondary data was obtained through Census reports and Panchayats Level Statistics. 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 agencies such as Village Office, Krishi Bhavan, Primary Health Center, District Rural Development Agency initiative - SGSY Programme office, Kudumbasree working on poverty alleviation, Grama Panchayats, 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 Remote Sensing and Environment Centre provides the details of land use/land cover, drains, transport network, assets and other water resources. The Detailed Soil Survey report prepared by Department of Soil Survey and Soil Conservation was used to understand the soil classification, texture, depth, erosion and land capability.

v) 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.

vi) Focus Group Discussion

Kerala State Remote Sensing and Environment Centre 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 all the information collected during field survey and Focus Group Discussions, the main problems identified includes the following:

- 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

vii) 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: Action plan matrix was been 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 10 meter at a scale of 1:25000 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 occurring while calculating the catchment area of a check dam.

Table:10 Details of Scientific Planning and Inputs in WDC-PMKSY projects

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 Remote Sensing and Environment Centre
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	No
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 populace 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

Data was analysed and based on the identified needs and problems in the watershed area, a draft action plan was prepared

CHAPTER 8

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:

8.1 Strengths:

- (1) Strong linkages with line departments for technical guidance.
- (2) Scientific planning with the help of Kerala State Land Use Board & KSREC.
- (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.

8.2 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.

8.3 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) Neighborhoods Groups, User groups and Self Help Groups
- (3) Better financial provision under PMKSY, 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

8.4 Threats:

- (1) Rainfall being unreliable in the project area, the activities planned to be taken up may yield limited impact.
- (2) Poor adaptation to climate change
- (3) Low productivity of land
- (4) Overloaded work may mislead the watershed project or may divert the vision at the time of implementation of the projects of PMSKY
- (5) Agrarian distress is inducing farmers to search for better employment alternatives.
- (6) Options in production system are limited due to the lack of sufficient natural resources and due to limited resource base.
- (7) Irregularities in fund flow can derail the smooth functioning.
- (8) Political interference can dissatisfy the team to work properly.

Sl. No	Area of Intervention	Strengths	Weaknesses	Opportunities	Threats
1	Agriculture	<ul style="list-style-type: none"> • Provides income and employment • Area potential to increase productivity • Availability of natural/man-made resources 	<ul style="list-style-type: none"> • Lack of irrigation facilities • Lack of organic farming practices 	<ul style="list-style-type: none"> • If provided with proper irrigation, considerable increase in agriculture production can be assured. • Minimal migration in search of jobs. • Increasing demand for organic products. 	<ul style="list-style-type: none"> • Rainfall being very unreliable. • Landslide • Wild animal interphase
2	Horticulture	<ul style="list-style-type: none"> • Favorable climate for horticultural activities • Good vegetable and banana production 	<ul style="list-style-type: none"> • Lack of advanced varieties. • Lack of marketing facilities. • Lack of storage facilities 	<ul style="list-style-type: none"> • Availability of Land. • Interest of the villagers to expand horticulture activities. • Increasing price level • Food processing. 	<ul style="list-style-type: none"> • Rapid Climate Change.
3	Animal Husbandry	<ul style="list-style-type: none"> • Favorable environment to raise cow and goats. • Many households engaged in Animal Husbandry activities. • Provides income and employment 	<ul style="list-style-type: none"> • Lack of good quality fodder availability. • Lack of advanced cattle breed. • Low level of Milk production. • Lack of Knowledge base regarding scientific cattle management. 	<ul style="list-style-type: none"> • Providing more advanced cattle breeds can increase the milk production and enhance their subsidiary livelihood option. • Promotion of nursery raising and pasture development will address the lack of fodder availability. • Pasture Development. 	<ul style="list-style-type: none"> • Animal Diseases. • Excessive grazing on degraded and small community lands. • Lack of awareness of Dairy farming as a commercial activity. • Severe climatic conditions.
4	Natural Resources	<ul style="list-style-type: none"> • Extensive natural drainage system 	<ul style="list-style-type: none"> • No direct water distribution mechanisms. 	<ul style="list-style-type: none"> • If used advanced techniques like bench terracing more land can be converted into cultivable 	<ul style="list-style-type: none"> • Rainfall being unreliable.

Sl. No	Area of Intervention	Strengths	Weaknesses	Opportunities	Threats
			<ul style="list-style-type: none"> • Prevalence of soil erosion. • No water storage body present. 	<p>land.</p> <ul style="list-style-type: none"> • Construct water storage tank for irrigation. • Provides income and employment for MGNREGS. 	
5	BPL Household's Livelihoods	<ul style="list-style-type: none"> • Most of them are small and marginal farmers. • Some households are having livestock 	<ul style="list-style-type: none"> • Less income and limited livelihood options. • Lack of knowledge base. 	<ul style="list-style-type: none"> • If provided with livelihood options the income level of the households can be increased and the BPL status can be changed. • Quality of life. • Peoples are interested to take up livelihood activities. 	<ul style="list-style-type: none"> • Due to adverse weather conditions the normal working days are very less.
6	Micro-Enterprises and Production systems.	<ul style="list-style-type: none"> • People having the basic skills. • Organized micro-enterprise activities existing in the area • Availability of natural/man-made resources 	<ul style="list-style-type: none"> • Lack of Management skills. • Lack of technical support. • Lack of organized marketing facilities. 	<ul style="list-style-type: none"> • If provided good technical support and motivation, they can run the units in an organized way • Income level will increase. 	<ul style="list-style-type: none"> • Due to adverse weather conditions the normal working days are very less.

CHAPTER 9

BIO PHYSICAL RESOURCES

9.1 Location of the project

The Kabani watershed lies between 11°30' to 12°00' North latitudes and 75°45' to 76°30' East longitudes and is spread over the districts of Wayanad and Kozhikode of Kerala State. It is bounded by Karnataka State in the North and North East, Thalasseri taluk of Kannur District in the North West, Vythiri taluk of Wayanad District and Kozhikode taluk of Kozhikode District in the south, Tamil Nadu in the South east and Vadakara and Koyilandi taluks of Kozhikode District in the West. The watershed has a total area of 1934.5sq.km covering 37 villages spread over 26 panchayat, 5 blocks and two Districts. The project area under Kabani watershed is located in Sultan bathery Taluk of Wayanad district of Kerala State

The project area is a cluster of four micro watersheds viz 27K1aa, 27k1v, 27K1w1 and 27K1z. The total area of the four micro watersheds is 2134.08 ha and the treatable area is 2006ha. (Fig.1 & Table 12).

Fig.1: Project area

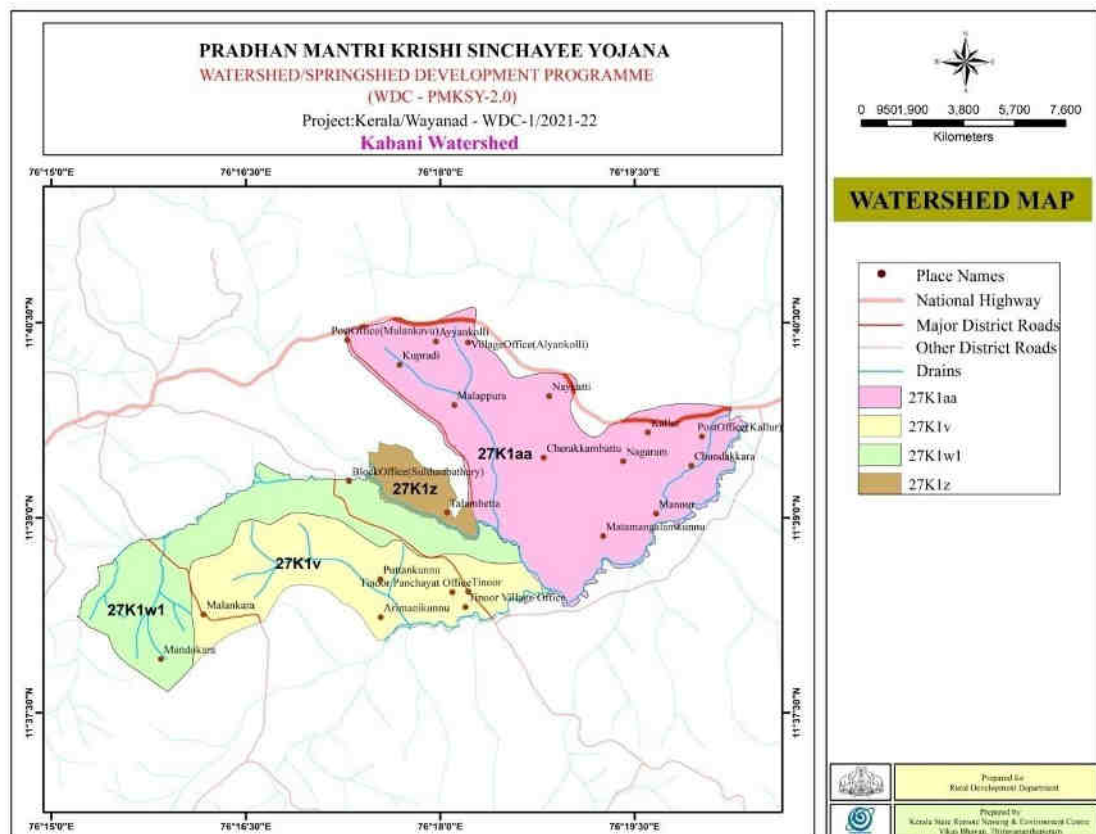


Table12: Details of watershed code and area

Sl.No	Watershed Code	Total Area(ha)	Treatable Area (ha)	Percentage
1	27K1aa	1015.71	972.00	47.60
2	27K1v	520.37	509.00	24.39
3	27K1w1	499.29	427.00	23.40
4	27K1z	98.71	98.00	4.61
	Total	2134.08	2006	100.00

The project area falls in two Grama Panchayath viz. Noolpuzha and Nenmeni coming under SulthanBatheri block. The major town in the Project area is SulthanBatheri. The livelihood of the peoples is primarily based on agriculture

Table 13: Project Area Details

No.	Watershed code	Name of Grama Panchayath	Name of Block Panchayath	Area (ha)
1.	27K1aa	Noolpuzha	Sultan bathery	1015.71
	27K1v	Nenmeni		448.06
		Noolpuzha		72.31
3.	27K1w1	Nenmeni		378.76
		Noolpuzha		120.54
4.	27K1z	Noolpuzha		98.71
Total Project Area				2134.08

9.2 Physiography

Elevation: The Kabani river has its origin in the Western Ghats falling within the Wayanad district of Kerala State. The river is fed by four important tributaries, Panamaram, Mananthavady, Babali and Noolpuzha. The Mannantody has its origin in the Tondarmudi Malai of the Western Ghats, at an elevation of about 1801m above MSL. The Panamram River rises from Lakkidi in the Western Ghats an altitude of about 944 m above MSL. The Noolpuzha originates from the eastern border of Wayanad district (Fig.2). The watershed lies almost entirely in the upper region and the general elevation ranges from 135m to 2059m (Fig.3).

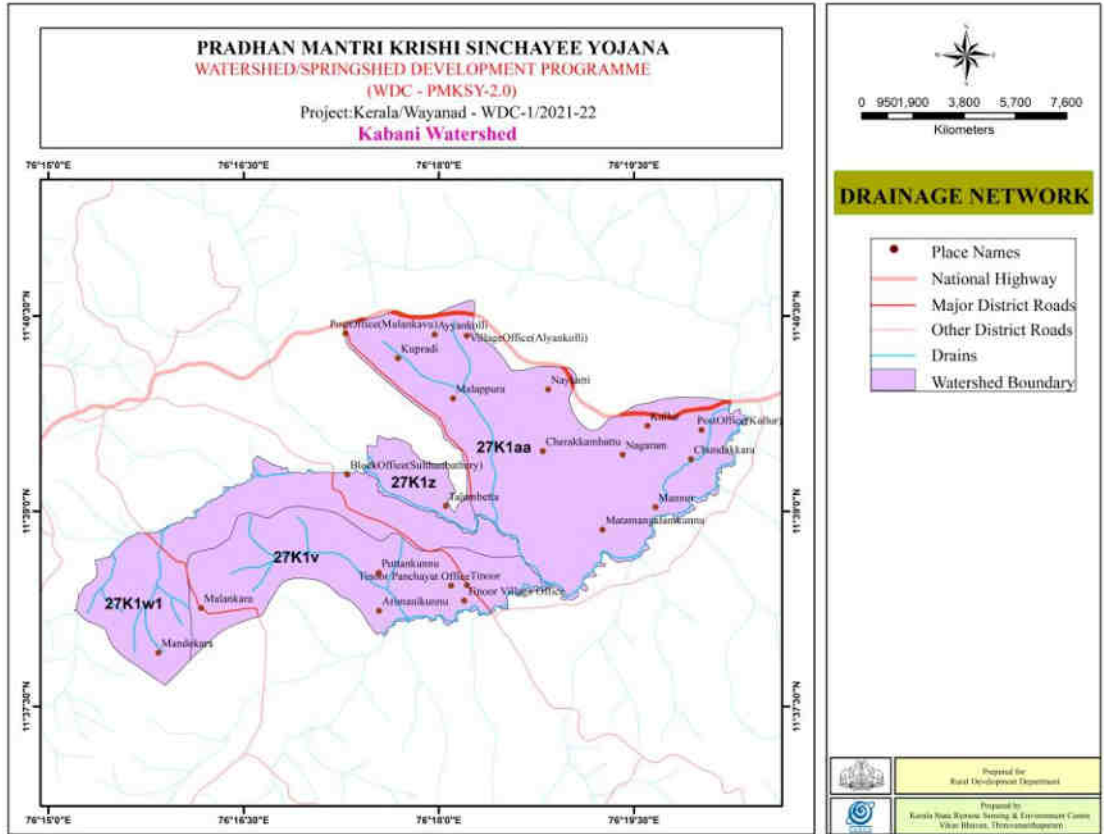


Fig.2: Drainage network

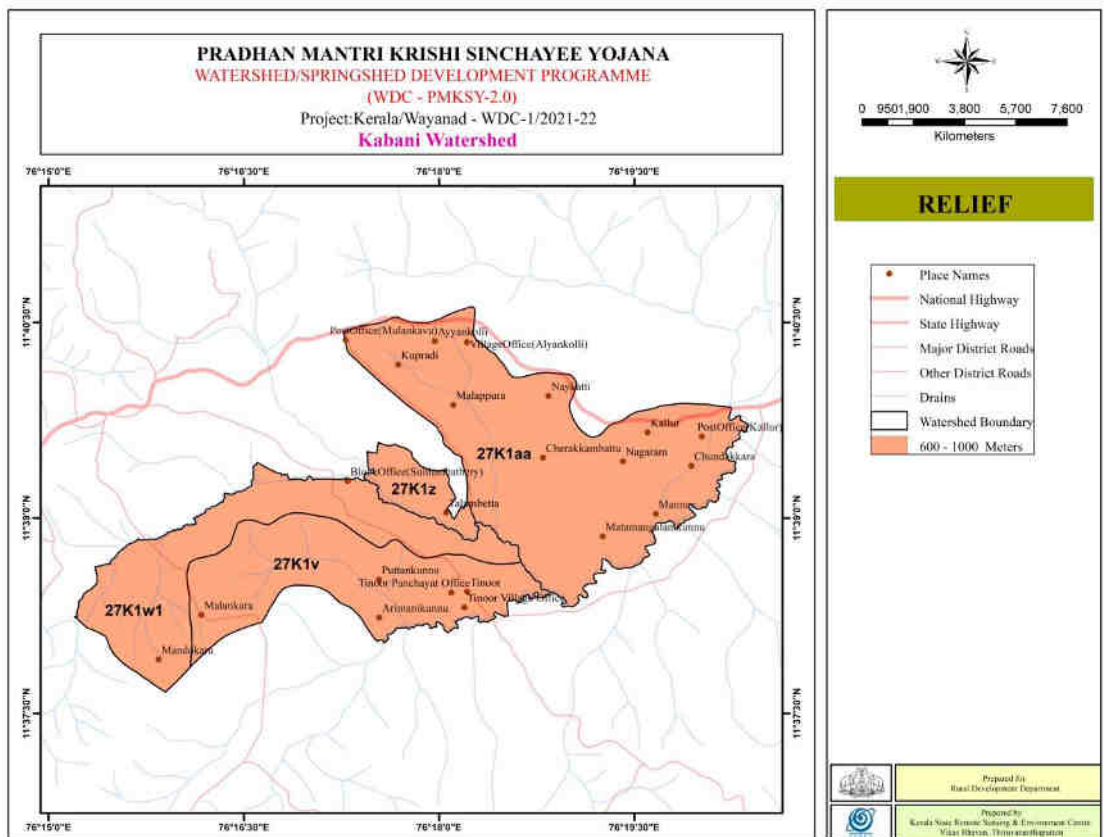


Fig.3: Relief

Aspect: The Kabani River is one of the three east flowing rivers of the state. The Mannantody river emerges from the South-Western part of the watershed and flow towards East. The Panamaram river which rises from the Southern part of the watershed joins the Mannantody river, 7km North of Panamaram. Near the state’s border, the Bavalipuzha joins the Kabani river and from this point the main river follows the state border and then turn north and flows into the Karnataka. The Noolpuzha, another important tributary, originates from the eastern border of Wayanad and flow towards North to join the Kabani River outside the Kerala State boundary.

9.3 Landforms: The broad landforms of the watershed are medium hills, high hills and valleys of Wayanad plateau.

9.4 Climate

The district experiences a typical tropical monsoon climate. The maximum average temperature of the city in the summer season is 34°C while minimum temperature recorded is 29°C. The winter season records a maximum average of 25°C and a minimum average of 15°C.

9.5 Rainfall

Rainfall is the major source of ground water recharge and rainfall pattern plays an important role on the water levels in the aquifer.

Annual Rainfall distribution (2020)

The annual rainfall received for the year 2020 is 2611.6. The district received 2082.4mm of rainfall during the south west monsoon (June to September), and 240 mm of rainfall during north east monsoon (October to December). The monthly annual rainfall distribution during 2020 is given in Table 14.

Table 14 Annual Rainfall (2020)

Month	Rainfall (mm)	Month	Rainfall (mm)
Jan	2.3	July	426.7
Feb	0	Aug	867.7
Mar	17.2	Sep	494.9
Apr	145.4	Oct	125
May	124.3	Nov	84.6
June	293.1	Dec	30.4
Total Annual Rainfall			2029.3

Normal Rainfall Vs Actual Rainfall -2021

Season	Period	Actual	Normal	% Dep
Winter	January- Feb	85.1	13.2	545
Pre-monsoon	March- May	465.1	275.3	68.9
South West Monsoon	June- September	1725.5	2525.5	-32
North East Monsoon	October-December	569.7	335.9	70

Table15: Seasonal variation in Rainfall 2021

Seasonal rainfall Contribution to the total rainfall percentage

The seasonal rainfall contribution to the total rainfall in percentage is given in Table: 16.

Season	Period	Rainfall	Percentage
Winter	January- Feb	85.1	2.99
Premonsoon	March- May	465.1	16.35
South West Monsoon	June- September	1725.5	60.64
North East Monsoon	October- December	569.7	20.02
Total		2845.4	100.0

Table 16. Seasonal Rainfall Contribution to the total rainfall percentage

The South West monsoon received from June to September records the major contribution of the rainfall received during 2021. 60.64 % (1725.5 mm) of the total rainfall is recorded during this season. The north east monsoon contributes 20.02 % and the summer rains contributes 16.35 %. Only 2.99 % of actual rainfall is received during January to February.

Comparison of 2021 seasonal rainfall with previous year (2020) rainfall

The rainfall in the various seasons of 2021 have been compared with previous year rainfall to understand the pattern of rainfall received and to have better assessment of the charge in the ground water region.

Table17. Comparison of Seasonal Rainfall Contribution to the total rainfall percentage

Season	Period	2021	2020	% Dep
Winter	January- March	85.1	19.5	336.41
Summer	April- May	465.1	269.7	72.41
South- West monsoon	June- September	1725.5	2082.4	82.86
North- East monsoon	October- December	569.7	240	237.375
Total		2845.4	2611.6	

During all the four seasons of the year the district recorded different rainfall. During the North- East monsoon season, the district recorded a departure of 237.375% and during South- West monsoon, summer and winter season a departure of 82.86%, 72.41 and 336.41 is noticed respectively.

Month	January		February		March		April		May		June	
Year	RF	% Dep.	RF	% Dep.	RF	% Dep	RF	% Dep.	RF	% Dep.	RF	% Dep
2016	3.3	-31	0	-100	13	-26	20.1	-76	112.8	-35	411.2	-41
2017	14.5	202	0	-100	49.7	184	60.9	-27	182.8	5	343.2	-51
2018	0	-100	11.2	35	78.6	349	105.6	27	267.4	53	814.4	17
2019	0	-100	14.5	116	12.7	-37	156.1	85	100.5	-41	249.3	-63
2020	2.3	-65	0	-100	17.2	-14	145.4	72	124.3	-27	293.1	-56

Month	July		August		September		October		November		December	
Year	RF	% Dep.	RF	% Dep.	RF	% Dep	RF	% Dep.	RF	% Dep.	RF	% Dep
2016	337.7	-70	242.5	-59	82.4	-64	58.6	-72	12.1	-87	34.1	32
2017	419.6	-62	435	-27	454.2	97	118.5	-44	37.5	-60	9.1	-65
2018	1089	-2	1053.5	78	111.4	-52	242.5	14	44.6	-52	13.9	-46
2019	527.6	-50	1190.8	110	409.6	72	343.3	57	74.2	-20	45.9	85
2020	426.7	-60	867.7	53	494.9	108	125	-43	84.6	-8	30.4	23

Table.18. Distribution of Rainfall and Departure from long period Averages (Normal RF) of last five Years

9.6 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 (Fig.4).

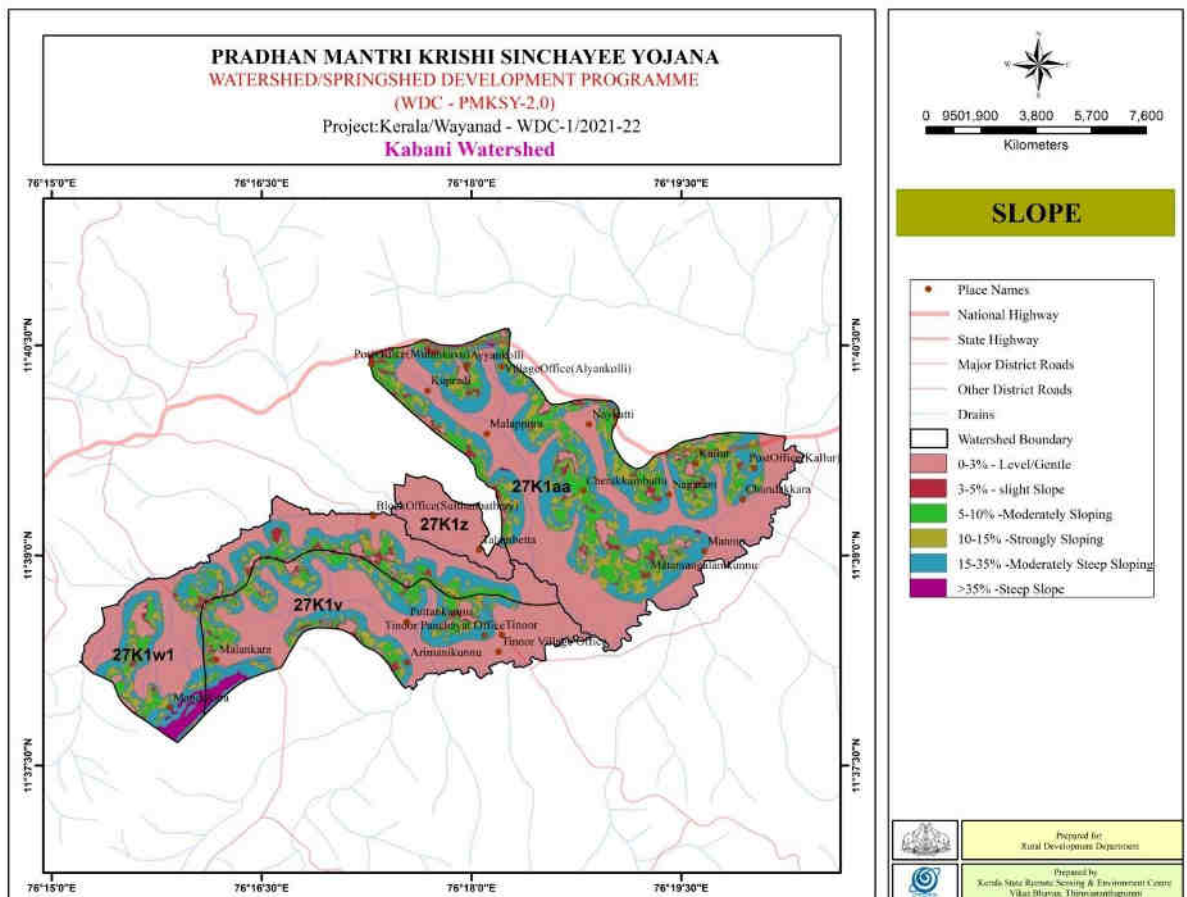


Fig.4: Slope

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:

No.	Slope Class	Description	Area in Ha	Percentage
1	0-3 percent	Very gentle slope	1061.10	49.72
2	3-5 percent	Gentle slope	61.49	2.88
3	5-10 percent	Moderately sloping	252.86	11.85
4	10-15 percent	Strongly sloping	263.41	12.34
5	15-35 percent	Moderately steep to steep	470.17	22.03
6	> 35 percent	Very steep	25.15	1.18
Total area			2134.08	100.00

Table: 19 Slope classes

Majority of the area (1061.1 ha, 49.72% of TGA) comes under the very gentle slope class of 0-3 %. This is major slope class is all micro watersheds. The second major category is moderately steep to steep class with 15-35 % slope. This occurs is 470.17 ha (22.03% of TGA). An area of 25.15 ha 1.18% of TGA is having slope more than 35 %, which requires proper management and conservation measures.

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

<i>Slope Category</i>	<i>27K1aa</i>	<i>27k1v</i>	<i>27k1w1</i>	<i>27k1z</i>
0-3 percent	432.81	282.94	247.73	97.59
3-5 percent	33.41	12.69	15.25	0.11
5-10 percent	149.09	49.13	54.52	0.12
10-15 percent	157.64	55.72	49.73	0.32
15-35 percent	241.81	111.02	116.77	0.57
> 35 percent	0.96	8.88	15.31	----
Total	1015.72	520.38	499.31	98.71

Table 20: Slope classes (micro watershed wise)

9.7 Geology

The district can be broadly divided into four geological domains viz., i) the Peninsula Gneissic Complex in the north and central part, the Migmatite Complex in the south central part, the Charnockite Group in the south and the Wayanad Group in the north.

The project area falls in the geological division viz. peninsular gneiss, is one of the most widespread rock type found in Kerala. This is represented by hornblended-biotite gneiss and pink granite gneiss occupies a major part of the district. Charnockite Group comprises Charnockite forming the hilly terrain in the south and southeast. Pyroxene Granulate and banded Magnetite Quartzite occur as narrow bands within Charnockite. Migmatite Complex is represented by biotite-hornblende gneiss, occurring over a large area in the south-central part. The other member of this group, namely garnetiferous quarto-feldspathic gneiss+sillimanite occur as narrow bands within the older Charnockite. In the east, large bodies of intrusive pink granite occur near Kalpetta and Sultan Bathery. More than 90% of the project area is under Peninsular Gneiss complex. The table showing the distribution of geology in the watersheds is given in Fig.5 & Table21.

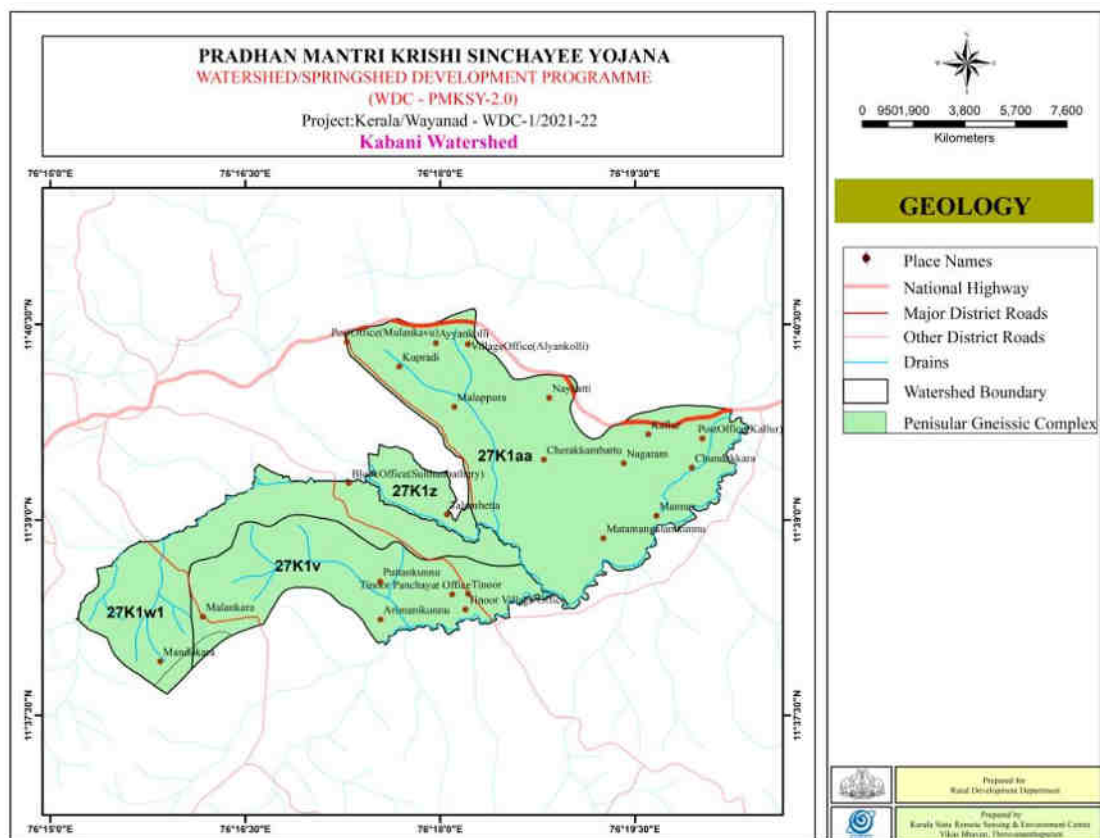


Fig.5 : Geology

Geology	27K1aa	27K1v	27K1w1	27K1z	Area (in Ha)	%
PenisularGneiss complex	1012.61	518.86	497.01	98.04	2126.52	99.65
Waterbody	3.10	1.52	2.28	0.66	7.56	0.35
Total	1722.77	175.59	726.02	440.08	2134.08	100.00

Table: 21.Distribution of geological units in watersheds

9.8 Geomorphology

The thematic map on geomorphology reveals that there are six geomorphological units in the project area. The various geomorphological units identified in the four micro watersheds and their spatial extent is given in Fig.6.

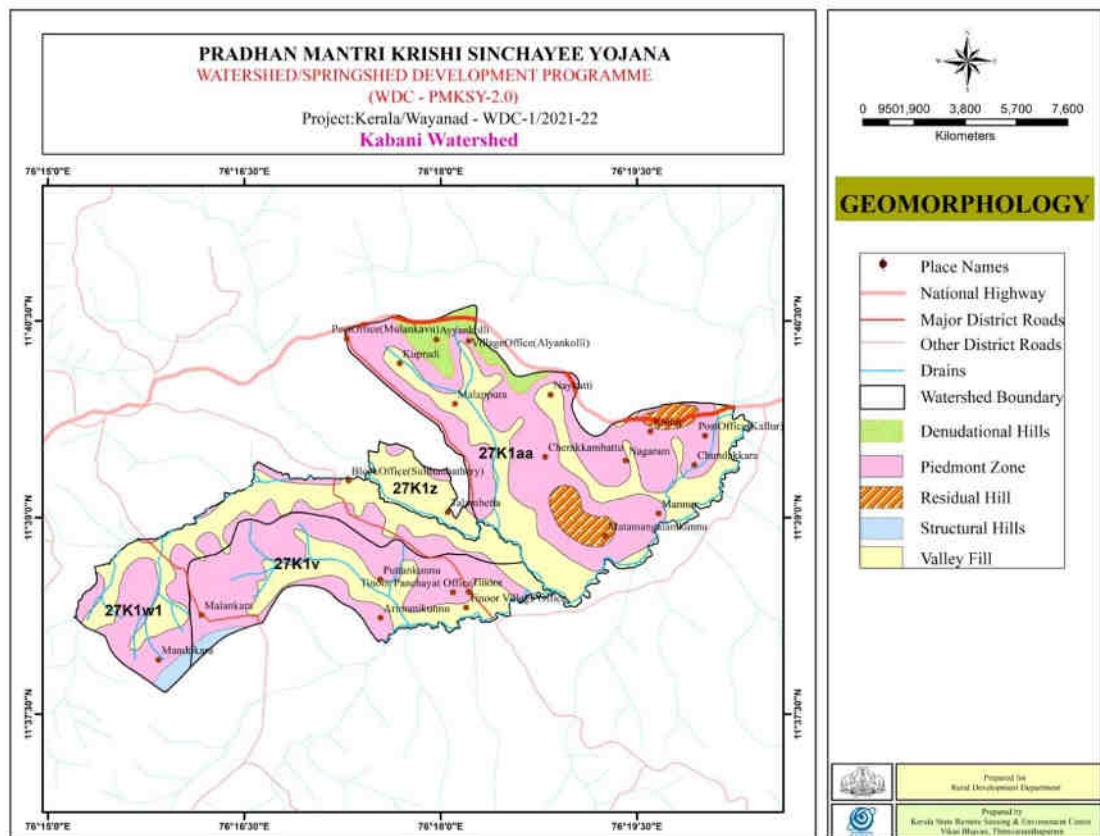


Fig.6: Geomorphology

Sl. No.	Geomorphological unit	Area (in ha)	Percentage (%)
1	Valley fill	889.45	41.68
2	Denudational Hills	48.56	2.28
3	Pediment zone	1082.64	50.73

4	Residual Hill	54.41	2.55
5	Structural Hill	51.45	2.41
6	Water body	7.57	0.35
Total		2134.08	100.00

Table. 22: Geomorphological units description, area and percentage

The major portion of the area is under Pediment Zone and occupies an area of 1082.64 ha (50.73 % of the total geographical area) followed by valley fill with an area of 889.45 ha (41.68 % of total geographical area). The table showing the distribution of geomorphology in the micro watersheds is given below

	27K1aa	27K1v	27K1w1	27K1z
Valley fill	393.42	210.44	188.87	96.72
Denudational Hills	48.56	-	-	-
Pediment zone	516.21	285.26	279.85	1.32
Residual Hill	54.41	--	--	--
Structural Hill	--	23.16	28.29	--
Waterbody	3.10	1.52	2.28	0.66
Total	1015.7	520.38	499.29	98.7

Table 23: Distribution of geomorphological units in watersheds

9.9 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 essential a 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.

9.10 Major Soils

There are four types of soil viz laterite soil, brown hydromorphic soil, forest loam and riverine alluvium (Fig.8). Laterite soil seen in some areas of Wayanad is reddish brown in colour, formed under tropical monsoon climate with alternate wet and dry seasons. Forest soil is found in Mananthavady, Kalpetta and Sultan bathery blocks. Alluvial soils are found along the banks of Kabani, Chaliyar and its tributaries. Soil series of SulthanBatheri block is classified into Nedumbala, Thekkumkara, Muttill etc.

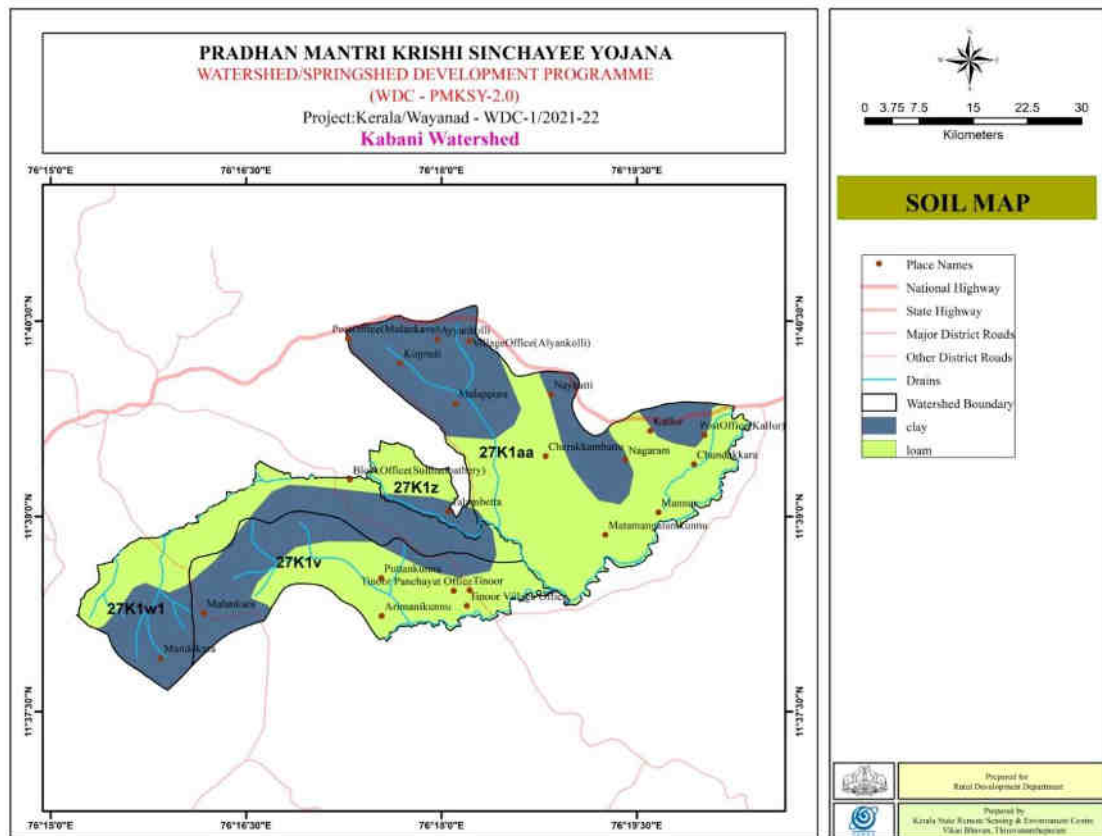


Fig.7: Major Soil

9.11 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(Fig.8). 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

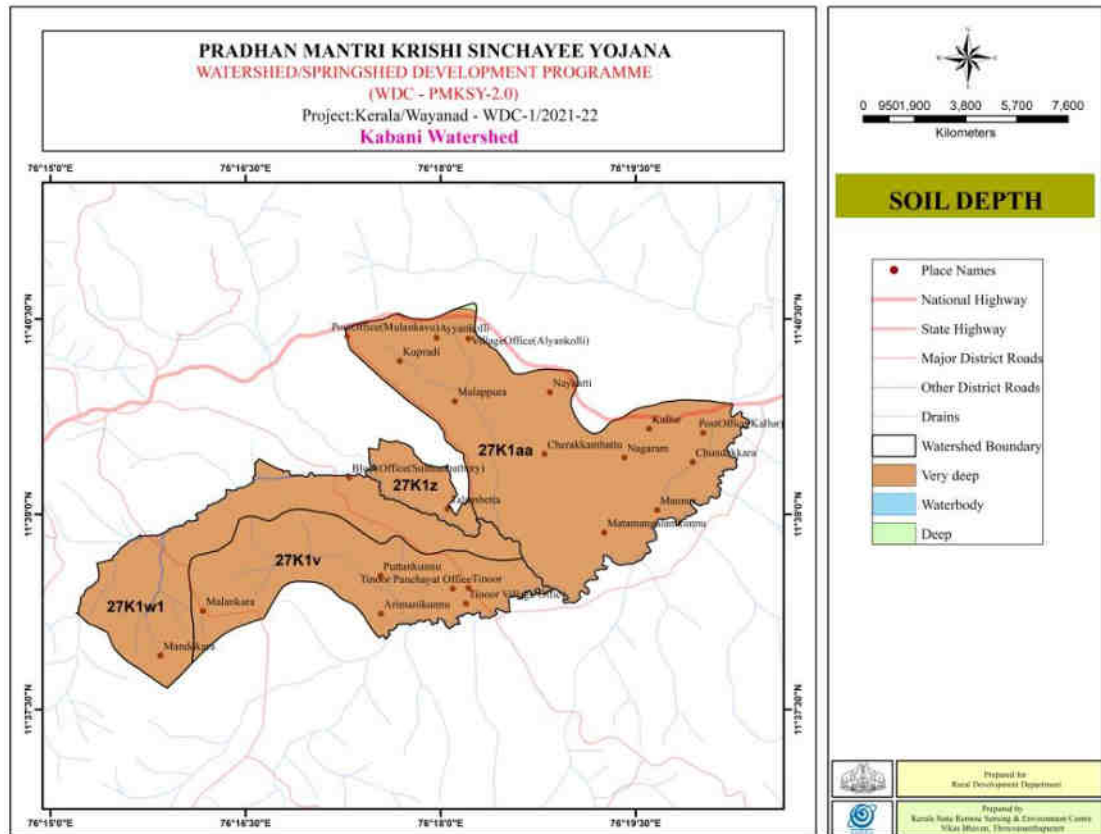


Fig.8: Soil depth

The table showing the distribution of soil depth in the four micro watersheds is given below:

Table 24: Distribution of soil depth in watersheds

Depth	27K1aa	27K1v	27K1w1	27K1z	Area in Ha	%
Deep	1.71	---	---	---	1.71	0.08
Very Deep	1010.90	518.86	497.01	98.04	2124.82	99.57
Water body	3.10	1.52	2.28	0.66	7.56	0.35
	1015.71	520.37	499.29	98.71	2134.08	100.00

Source: Kerala State Land Use Board

Out of the total area, 2124.82 ha (99.57 %) are covered by very deep soils. deep soils having a depth range 100-150 cm is found in 0.08 % of total area.

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 (Fig.10).

The important classification of soil texture is (1) sandy, (2) loamy, (3) clayey. Sandy soils are very permeable and well drained; butt 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.

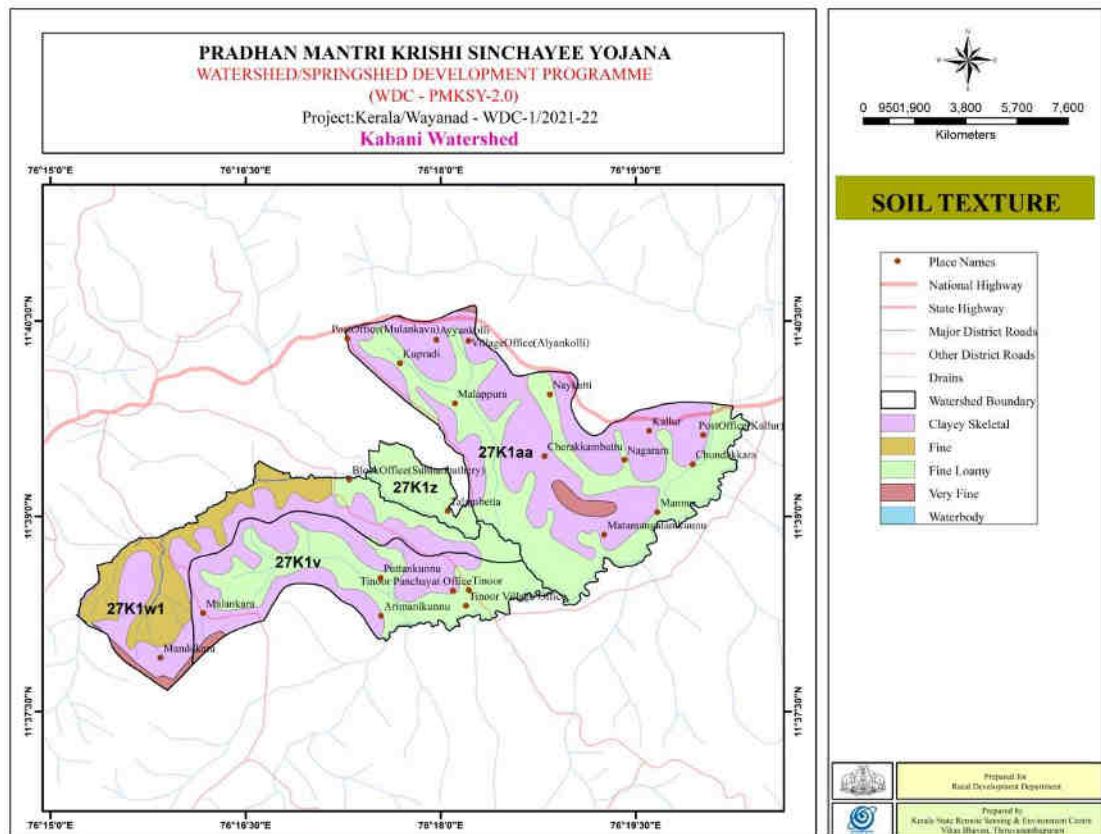


Fig.9 : Soil texture

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

Table 25: Distribution of surface soil texture

No.	Texture	Area in Ha	Percentage
1	Clayey skeletal	1003.73	47.03
2	Fine Loamy	892.84	41.84
3	Very Fine	41.65	1.95
4	Fine	188.3	8.82
5	Water body	7.56	0.35
	Total	2134.08	100

Source: Kerala State Land Use Board

The major soil texture of the project area constitutes of clayey skeletal texture which covers an area of 1003.73 ha (47.03%). Fine loamy soils occur in 892.84 ha (41.84%). Different soil textures are identified and mapped. The table showing the distribution of surface soil texture in the micro watersheds are given below:

Table 26. Distribution of surface soil texture in watersheds

Texture	27K1aa	27K1v	27K1w1	27k1z
Clayey skeletal	538.72	241.03	221.7	2.28
Fine Loamy	451.93	271.27	73.88	95.76
Very Fine	21.97	6.51	13.17	---
Fine	-----	0.04	188.26	----
Waterbody	3.1	1.52	2.28	0.66
Total	1015.72	520.37	499.29	98.7

Source: Kerala State Land Use Board

Soil Erosion

Soil erosion is the process of detachment and displacement of soil particles from land surface. This mainly occurs by natural erosion on the geologic erosion and through 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 (Fig.10).

Three major erosion classes are mapped in the project area

1 -Slight

2 . Moderate

3- Moderate to Severe

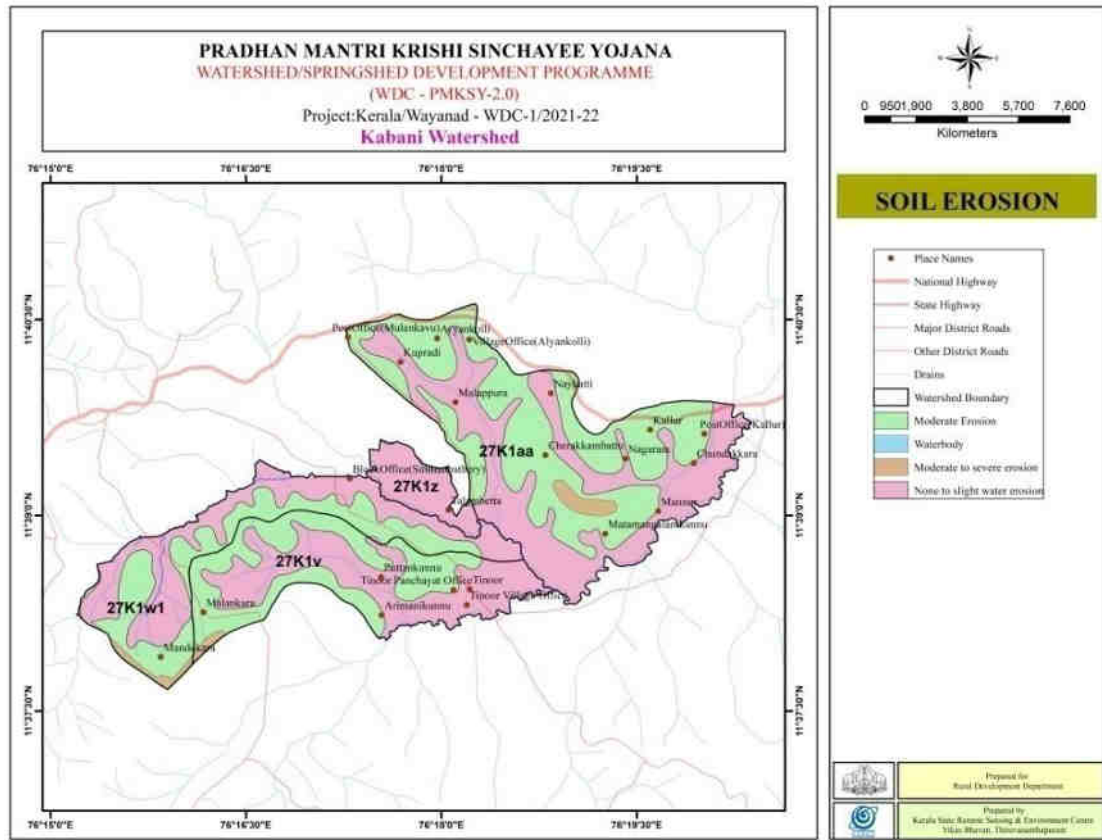


Fig.10: Soil erosion

The majority of the area is under slight erosion class. An area of 1081.24 ha (50.67 % of TGA) is under this class and an area of 1003.73 ha is under moderate erosion class. Nearly 7.56 ha area is having slight erosion, which use the low lying fields in the project area. The table showing the distribution of soil erosion in the four watersheds are given below:

Table 27. Distribution of soil erosion in watersheds

Erosion	27K1aa	27K1v	27K1w1	27K1z	Area (in Ha)	%
None to slight	451.93	271.31	262.24	95.76	1081.24	50.67
Moderate	538.72	241.03	221.7	2.28	1003.73	47.03
Moderate to severe	21.97	6.51	13.07	--	41.55	1.95
River	3.1	1.52	2.28	0.66	7.56	0.35
	1015.72	520.37	499.29	98.7	2134.08	100

Source: Kerala State Land Use Board

9.12 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 (Fig.12). 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.

Class	Description
II	Good cultivable land
III	Moderately good cultivable land
IV	Fairly good cultivable land suites for occasional or limited cultivation
VI	Well suited for forest or grazing. Suited for plantation crops which require minimum tillage
VII	Fairly well suited for grazing or forestry
VIII	Land suited only for wild life

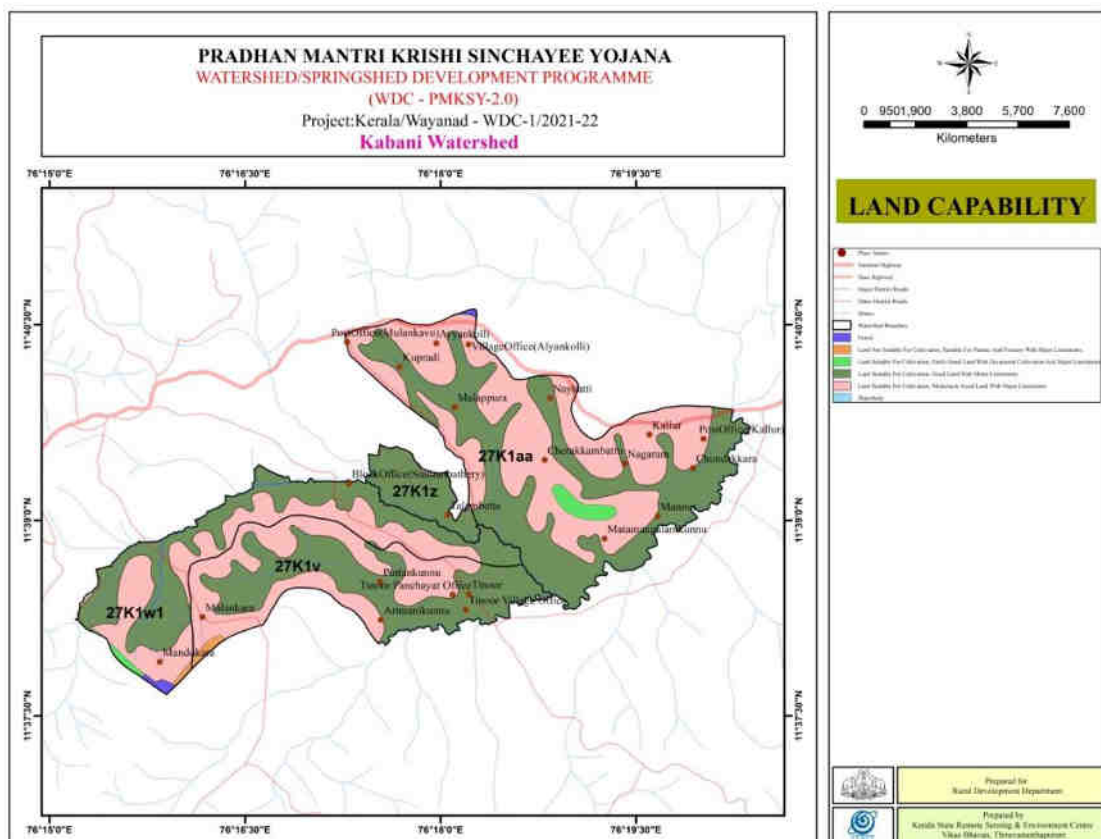


Fig.11: Land Capability

The table showing the distribution of land capability in the four micro watersheds is given below:

Table 28: Distribution of land capability classes in watersheds

Capability class	27K1aa	27K1v	27K1w1	27K1z	Area(in Ha)
II	451.93	271.31	262.24	95.76	1081.24
III	538.72	241.03	221.70	2.28	1003.73
IV	20.26	-----	5.53		25.79
VII	-----	6.51	2.77		9.28
F	1.71	---	4.77	-	6.48
Waterbody	3.10	1.52	2.28	0.66	7.56
Total	1015.72	520.37	499.29	98.7	2134.08

Source: Kerala State Land Use Board

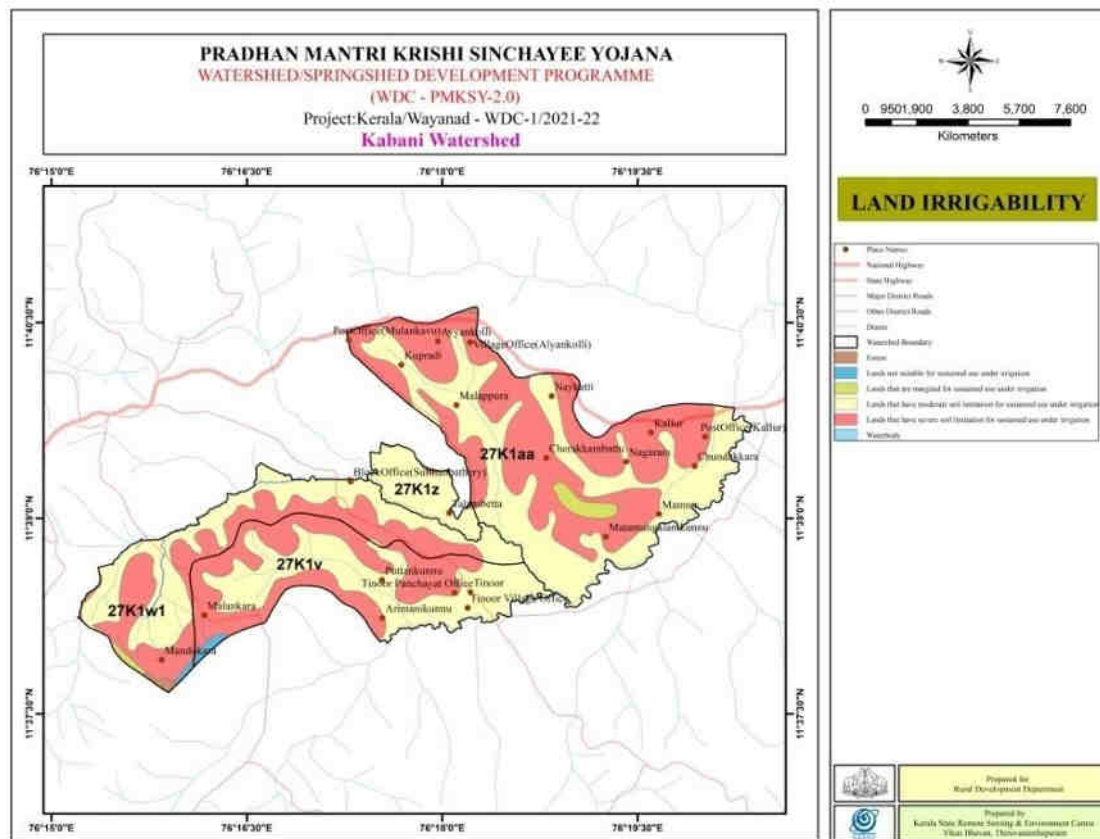


Fig.12: Land Irrigability

9.13 Land use

The land use classification and area statistics of the study area is shown in Fig. 13& Table 29

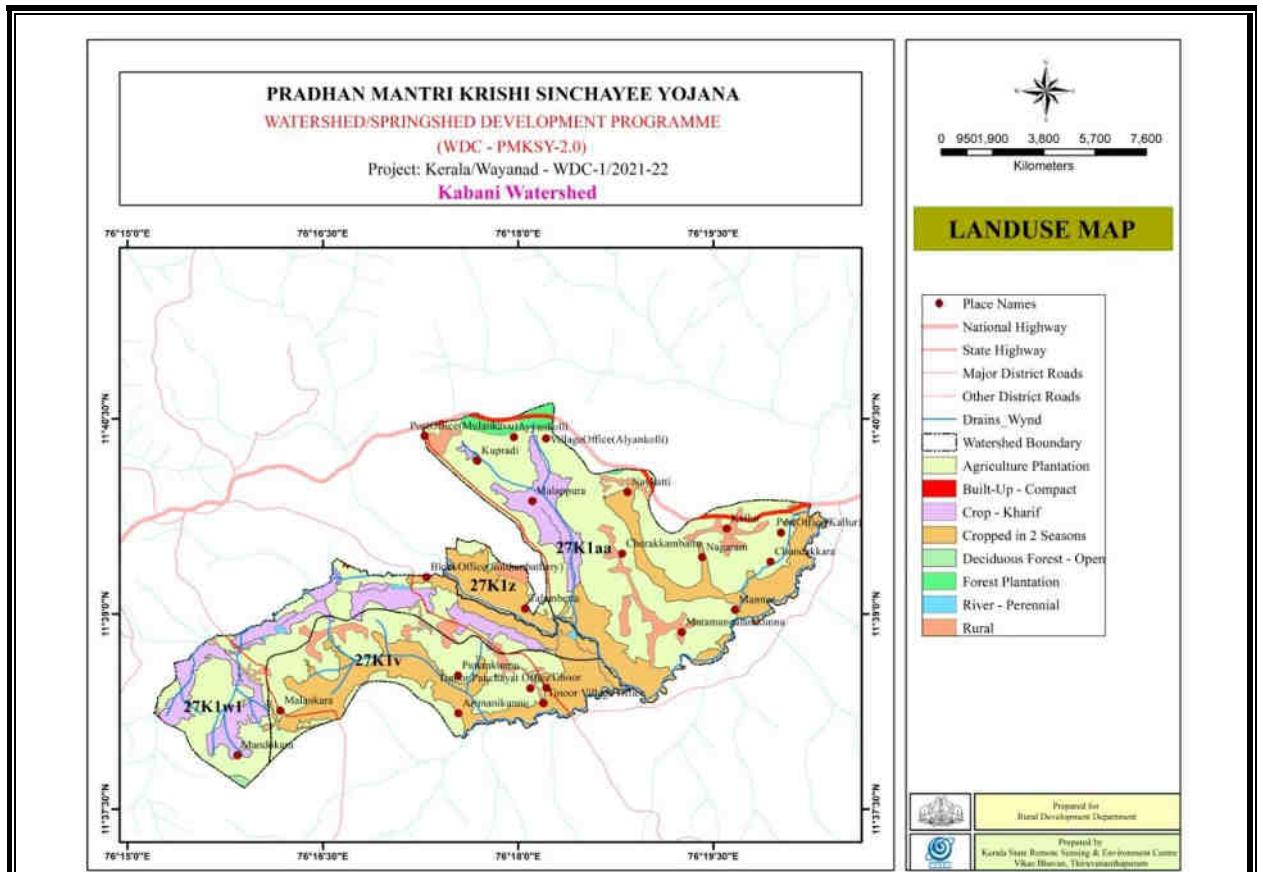


Fig.13: Land use map

Table 29: Land use classes and area statistics

Watershed	Landuse category	Area_Ha
27K1aa	Agricultural Fallow Land - Current Fallow	25.72
	Agricultural Fallow Land - Long Fallow	1.21
	Agricultural Perennial Crop - Coconut dominant Mixed Crops	27.34
	Agricultural Perennial Crop - Mixed Crops	201.56
	Agricultural Perennial Crop - Mixed Crops + Built ups	9.35
	Agricultural Perennial Crop -Arecanut	142.76
	Agricultural Perennial Crop -Coconut	0.59
	Agricultural Perennial Plantation Crop - Coffee	76.01
	Agricultural Perennial Plantation Crop - Rubber	15.26
	Built Up Land - Commercial	8.55
	Built Up Land - Mixed Type	25.35
	Built Up Land - Other Type	2.43
	Built Up Land - Residential	17.35
	Built Up Land - Road	11.33

	Forest - Agricultural Crops (Mixed Crops)	0.06
	Forest - Blanks	0.39
	Forest - Perennial Plantation Crop	0.82
	Forest - Semi Ever Green Dense/Closed	11.06
	Paddy Converted to Built up (Mixed type)	2.10
	Paddy Converted to Commercial Built up	0.60
	Paddy Converted to Long Fallow Land	7.13
	Paddy Converted to Mixed Crops	3.53
	Paddy Converted to Perennial Crops	67.71
	Paddy Converted to Residential Built up	2.20
	Paddy Converted to Seasonal Crops	19.38
	Paddy Cultivating Land (Current Fallow)	5.15
	Paddy Cultivating Land (Nancha)	113.74
	Paddy Cultivating Land (Nancha+Puncha)	187.89
	Waste Land - Degraded Plantation	17.44
	Waste Land - Land with Scrub	5.34
	Waste Land - Land without Scrub	2.40
	Waste Land - Riverine Sand	0.38
	Waterbody - Lakes/Ponds	0.48
	Waterbody - River/Stream	3.10
27K1v	Agricultural Fallow Land - Current Fallow	13.01
	Agricultural Perennial Crop - Coconut dominant Mixed Crops	5.16
	Agricultural Perennial Crop - Mixed Crops	131.87
	Agricultural Perennial Crop - Mixed Crops + Built ups	5.56
	Agricultural Perennial Crop -Arecanut	23.40
	Agricultural Perennial Crop -Coconut	0.98
	Agricultural Perennial Plantation Crop - Coffee	3.13
	Agricultural Perennial Plantation Crop - Rubber	3.05
	Agricultural Perennial Plantation Crop - Tea	0.78
	Built Up Land - Commercial	1.88
	Built Up Land - Mixed Type	23.63
	Built Up Land - Other Type	0.49

	Built up Land - Residential	28.12
	Built up Land - Roads	4.03
	Paddy Converted to Built up (Mixed type)	3.61
	Paddy Converted to Commercial Built up	0.15
	Paddy Converted to Long Fallow Land	0.47
	Paddy Converted to Mixed Crops	4.40
	Paddy Converted to Perennial Crops	37.51
	Paddy Converted to Residential Built up	1.40
	Paddy Converted to Seasonal Crops	22.08
	Paddy Cultivating Land (Current Fallow)	2.85
	Paddy Cultivating Land (Nancha)	198.09
	Waste Land - Degraded Plantation	0.54
	Waste Land - Land with Scrub	2.13
	Water body - Lakes/Ponds	0.55
	Water body - River/Stream	1.52
27K1w1	Agricultural Fallow Land - Current Fallow	17.82
	Agricultural Perennial Crop - Coconut dominant Mixed Crops	11.77
	Agricultural Perennial Crop - Mixed Crops	92.49
	Agricultural Perennial Crop - Mixed Crops + Built ups	4.12
	Agricultural Perennial Crop -Arecanut	36.20
	Agricultural Perennial Crop -Coconut	7.13
	Agricultural Perennial Plantation Crop - Coffee	15.35
	Agricultural Perennial Plantation Crop - Rubber	5.30
	Agricultural Perennial Plantation Crop - Tea	0.24
	Agricultural Seasonal Crop - Banana	1.13
	Agricultural Seasonal Crop - Tuber Crops	0.16
	Built Up Land - Commercial	1.95
	Built Up Land - Mixed Type	23.84
	Built Up Land - Other Type	3.26
	Built Up Land - Residential	37.07
	Built up Land - Roads	4.23
	Paddy Converted to Built up (Mixed type)	19.76

	Paddy Converted to Commercial Built up	2.28
	Paddy Converted to Long Fallow Land	0.34
	Paddy Converted to Mixed Crops	5.57
	Paddy Converted to Perennial Crops	53.72
	Paddy Converted to Residential Built up	1.15
	Paddy Converted to Seasonal Crops	40.64
	Paddy Cultivating Land (Current Fallow)	10.99
	Paddy Cultivating Land (Nancha)	84.13
	Paddy Cultivating Land (Nancha+Puncha)	14.00
	Waste Land - Degraded Plantation	0.38
	Waste Land - Land without Scrub	1.90
	Waterbody - Lakes/Ponds	0.78
	Waterbody - River/Stream	1.59
27K1z	Agricultural Perennial Crop - Coconut dominant Mixed Crops	0.00
	Agricultural Perennial Crop - Mixed Crops	0.48
	Agricultural Perennial Crop -Arecanut	0.04
	Built Up Land - Residential	0.27
	Built Up Land - Road	0.82
	Paddy Converted to Built up (Mixed type)	0.31
	Paddy Converted to Long Fallow Land	0.49
	Paddy Converted to Mixed Crops	0.15
	Paddy Converted to Perennial Crops	9.11
	Paddy Converted to Residential Built up	0.13
	Paddy Converted to Seasonal Crops	9.35
	Paddy Cultivating Land (Current Fallow)	0.10
	Paddy Cultivating Land (Nancha)	0.96
	Paddy Cultivating Land (Nancha+Puncha)	75.67
	Waterbody - Lakes/Ponds	0.15
	Waterbody - River/Stream	0.66

9.14 Ground water

The district is covered by peninsular shield of Western Ghats and form the tri-junction of the Charnockite of the Western Ghats – The Nilgiris range and the southern extension of

the Dharwars of Mysore. Major rock types are Wayanad supra crystals, gneisses and Charnockite of Archaean, basic and acidic intrusive of Proterozoic, laterite of Sub-Recent age and the alluvium of the Recent age. Groundwater occurs in the weathered rocks, fractures of crystalline rocks and the alluvial formations. In weathered formations water occur under phreatic conditions and is mostly developed by dug wells for domestic and irrigation purposes. The Annual Extractable Ground Water Recharge of the district is 231.63 MCM and existing Gross Ground Water Extraction is of the order of 56.78 MCM. The Stage of Ground Water Extraction is 25%. All four blocks in the district are ‘Safe’. The storage in ground water resources of Phreatic zone (unconfined aquifer) is 171.31 MCM, the semi-confined zone is 214.14 MCM and the confined zone is 149.90 MCM. The total ground waterresources of the district are 766.99 MCM. The Ground water Statistics of Sultan Bathery Block is given in the Fig.14 & Table30.

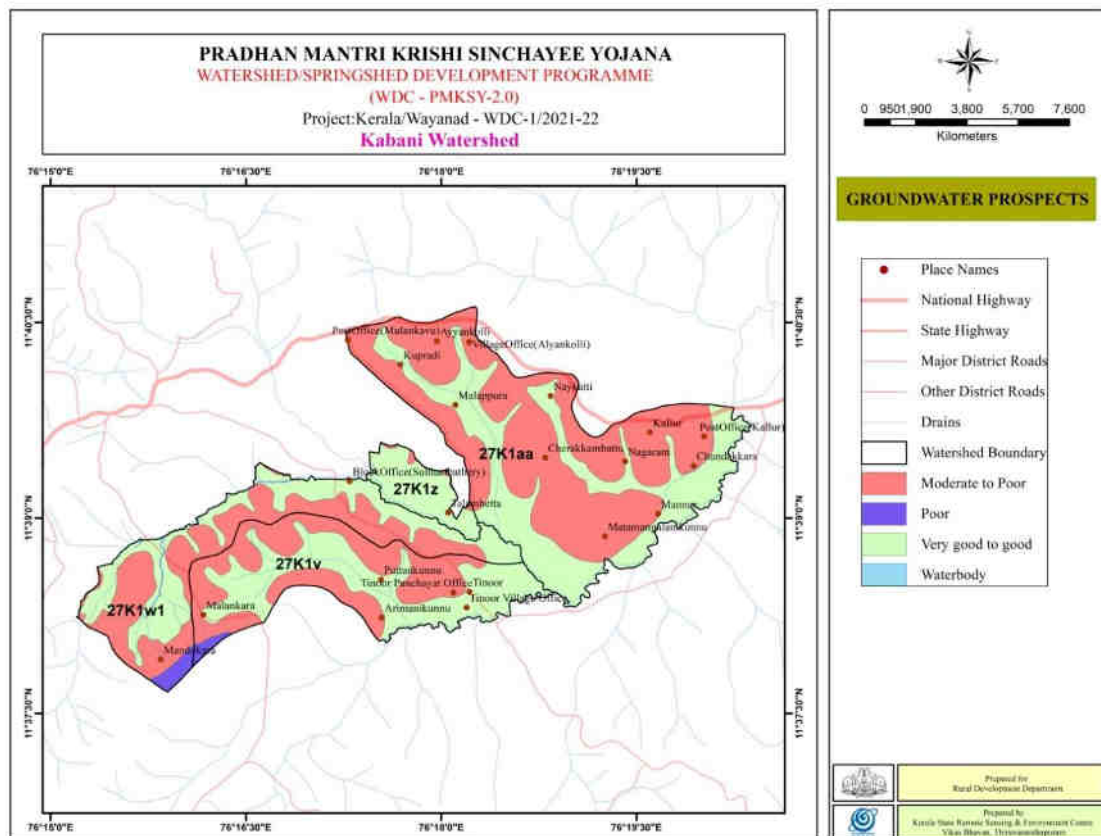


Fig.14: Groundwater prospect

Table 30: Ground water Statistics of Sultan Bathery

1	Assessment Unit	Sultanbathery
2	Command/Non-Command	Non-Command
3	Recharge from rainfall during monsoon season	7917.55

4	Recharge from other sources during monsoon season	6.79
5	Recharge from rainfall during non-monsoon season	0
6	Recharge from other sources during non-monsoon season	71.08
7	Total Annual Ground Water Recharge	7995.42
8	Provision for Natural Discharges	799.54
9	Net Annual Ground Water Availability	7195.88
10	Existing Gross Ground Water Draft for irrigation	191.08
11	Existing Gross Ground Water Draft for domestic and industrial water supply	1003.97
12	Existing Gross Ground Water Draft for all uses	1195.05
13	Provision for domestic and industrial requirement supply in 2025	1104.22
14	Net Ground Water Availability for future irrigation development	5900.58
15	Stage of Ground water Development (%)	16.61

Source: Central Ground Water Department

**Table:31 PRADHAN MANTRI SINCHAYEE YOJANA-WATERSHED/SPRINGSHED DEVELOPMENT PROGRAMME
FUNDING PATTERN**

Watershed	Admin cost (in Lakhs)	Monitoring & Evaluation	Preparatory phase			WS -Workphase				Consolidation & Withdrawal phase	Total (in lakhs)
			Entry Point Activities	DPR	Inst. Capacity building	NRM	Production System	NRM & Governance	Livelihood		
27K1aa	27.216	5.4432	5.4432	2.7216	8.1648	127.9152	40.824	5.4432	40.824	8.1648	272.16
27K1v	14.252	2.8504	2.8504	1.4252	4.2756	66.9844	21.378	2.8504	21.378	4.2756	142.52
27K1w1	11.956	2.3912	2.3912	1.1956	3.5868	56.1932	17.934	2.3912	17.934	3.5868	119.56
27K1z	2.744	0.5488	0.5488	0.2744	0.8232	12.8968	4.116	0.5488	4.116	0.8232	27.44
Total	56.168	11.2336	11.2336	5.6168	16.8504	263.9896	84.252	11.2336	84.252	16.8504	561.68

9.15 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 2 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 WDC-PMKSY 2.0, 2per cent of the total project cost is earmarked for Entry Point Activities. A total amount of Rs. 11.24 lakhs is available for EPA and the details showing the watershed code, name of watershed, area and amount is given below;

Table 32: Watershed wise details of EPA

No	Code of watershed	Name of watershed	Treatable Area in ha	Amount in lakhs
1	27K1aa	Mathamangalam	972.00	5.44
2	27K1v	Nambikolli	509.00	2.85
3	27K1w1	Puthenkunnu	427.00	2.40
4	27K1z	Thelampatta	98.00	0.55
Total			2006.00	11.24

A series of user group discussions were carried out in the project area to finalise the Entry Point Activities to be undertaken. The suggestions derived were discussed in the Panchayath Level Watershed Committees (PLWCC) of each Grama Panchayath 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 establishment of biogas plants, construction of rain water

harvesting structures, mini rural drinking water schemes, renovation of ponds and drains, solar lightings and solar water heaters, planting of avenue trees and crop demonstrations.

Chapter 10

MICRO WATERSHED BASED ACTION PLAN

MATHAMANGALAM MICRO WATERSHED (27K1aa)

Mathamangalam micro watershed is the largest watershed in the PMSKY cluster with an area of 1015.71 ha (47.56 % of total area). This micro watershed is spread over Noolpuzha Panchayats. The Kabani River flows through the south western side of the watershed.

10.1 General Description

Table 33: General Description of Mathamangalam micro watershed (27K1aa)

Name of micro watershed	:	Mathamangalam
Micro watershed code	:	27K1aa
River basin	:	Kabani
District	:	Wayanad
Block Panchayath	:	Sulthan bathery
Grama Panchayath	:	Noolpuzha
Villages	:	Kuppadi, Noolpuzha
Latitude	:	11 ⁰ 30' to 12 ⁰ 00' North
Longitude	:	75 ⁰ 45' to 76 ⁰ 30' East
Wards	:	Noolpuzha Panchayath - 17
Total Area	:	1015.71
% of area in the PMKSY cluster	:	47.56%

10.2 Socio economic profile

As per the information provided in the baseline survey conducted, Mathamangalam micro watershed has a total number of 299 households with a total population of 1278. 188 BPL families reside in the micro watershed area. Out of the total population 516 belongs to scheduled tribe and 40 belongs to Scheduled cast. Agriculture is the major source of livelihood in the micro watershed area. Apart from agriculture/horticultural practices, animal husbandry is also a source of livelihood some families in the watershed area. The socio economic details of the Mathamangalam micro watershed are given in the table.

Table 34. Socio economic details of Mathamangalam micro watershed

1.	Total number of households	299	
2.	Total Population	1278	
3.	No. of BPL families	188	
4.	Population	Scheduled Caste	40
		Scheduled Tribe	516

10.3 Biophysical Resources

10.3.1 Physiography

The relief of the watershed ranges from 600 m above MSL to 1000 m above MSL. All area in the watershed falls in this category.

10.3.2 Slope

The watershed area is divided into six categories of slope classes. The majority of area is under the gentle sloping area having 0-3 % slope. The category spreads over an area of 432.81 ha (42.611 %), 15.52 % of the watershed area is having strongly sloping lands which requires urgent soil and water conservation measures (Fig15).

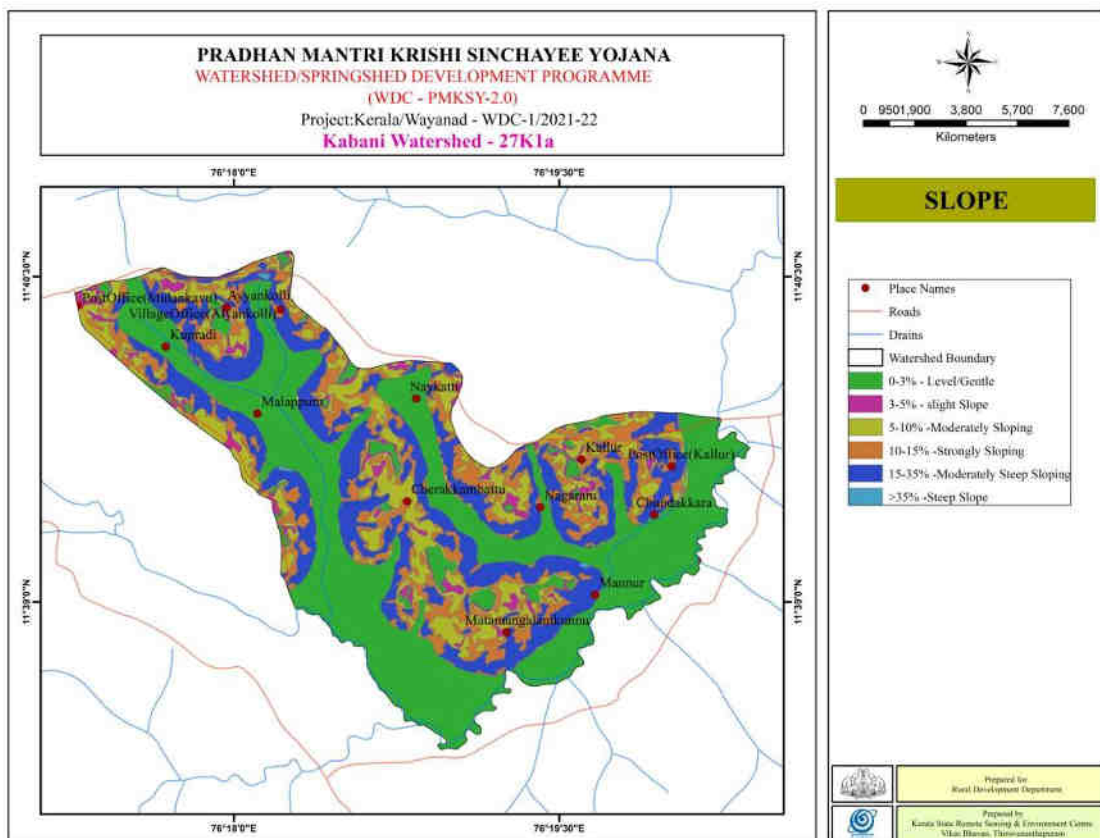


Fig15 : slope

10.3.3 Drains

The Kabani River flowing through the south-west portion of the watershed is the major drain of this watershed. Few small drains are originating from different parts of this watershed which drain to the Kabani River at the south- west boundary of the watershed. The details of the drains and ponds in the watershed area are given in table 35

Table35. Details of Drains in Mathamangalam micro watershed

Grama Panchayat	Drains	Length (m)
Noolpuzha	Aattukollikaithodu	551.36
	Chirakambam	1186.95
	Chundakarakaithodu	895.59
	ChundakaraNagaramchal	850.56
	Chundakarathodu	863.82
	KalloorPuzha	6803.91
	Madhamangalam-ThervayalThodu	2284.99
	Pulimaram Canal	803.65
	PulimaramEralottKaithodu	2514.56
	PulimaramEralott Kaithodu1	1762.07
	PulimaramEralott Kaithodu2	784.82
	PulimaramEralott Kaithodu3	501.51
	ThiruvanoorThodu	344.71
ThoduvettiThodu	1622.84	

10.3.4 Land use

Agriculture is the prime activity in the watershed area. The major land use category mapped in the watershed area is paddy and mixed crop. It occupies an area of 301.63 ha (29.71 %). The second major category is the mixed crops which 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 201.56 ha.

Sl. No.	Land use category	Area in ha	Percentage
1	Agricultural Fallow Land - Current Fallow	25.72	19.52253
2	Agricultural Fallow Land - Long Fallow	1.21	0.12
3	Agricultural Perennial Crop - Mixed Crops	201.56	19.84

4	Agricultural Perennial Crop - Mixed Crops + Built ups	9.35	0.92
5	Agricultural Perennial Crop -Arecanut	142.76	14.06
6	Agricultural Perennial Crop -Coconut	0.59	0.06
7	Agricultural Perennial Plantation Crop - Coffee	76.01	7.48
8	Agricultural Perennial Plantation Crop - Rubber	15.26	1.50
9	Built Up Land - Commercial	8.55	0.84
10	Built Up Land - Mixed Type	25.35	2.50
11	Built Up Land - Other Type	2.43	0.24
12	Built Up Land - Residential	17.35	1.71
13	Built Up Land - Road	11.33	1.12
14	Forest - Agricultural Crops (Mixed Crops)	0.06	0.01
15	Forest - Blanks	0.39	0.04
16	Forest - Perennial Plantation Crop	0.82	0.08
17	Forest - Semi Ever Green Dense/Closed	11.06	1.09
18	Paddy Converted to Built up (Mixed type)	2.10	0.21
19	Paddy Converted to Commercial Built up	0.60	0.06
20	Paddy Converted to Long Fallow Land	7.13	0.70
21	Paddy Converted to Mixed Crops	3.53	0.35
22	Paddy Converted to Perennial Crops	67.71	6.67
23	Paddy Converted to Residential Built up	2.20	0.22
24	Paddy Converted to Seasonal Crops	19.38	1.91
25	Paddy Cultivating Land (Current Fallow	5.15	0.51
26	Paddy Cultivating Land (Nancha)	113.74	11.20
27	Paddy Cultivating Land (Nancha+Puncha	187.89	18.50
28	Waste Land - Degraded Plantation	17.44	1.72
29	Waste Land - Land with Scrub	5.34	0.53
30	Waste Land - Land without Scrub	2.40	0.24
31	Waste Land - Riverine Sand	0.38	0.04
32	Waterbody - Lakes/Ponds	0.48	0.05
33	Waterbody - River/Stream	3.10	0.31
	Total	1015.71	100.00

Table36 land use categories in Mathamangalam micro watershed

10.3.5 Geology

The watershed falls the geological unit of Peninsular Gneissic Complex, has an area of 1012.61 ha (99.69. %). There are four geomorphological units of which more than 50 % (516.21ha) of the area falls under the category Pediment zone (laterite). An area of 393.42 ha is mapped under the category valley fill.

10.3.6 Soils

The major soil series mapped in the watershed area is Trikkepatta series which is. The soil has a surface texture of gravelly sandy clay to gravelly clay. This is distributed in an area of 538.69 ha (53.72 %). Muttill series has mapped under an area of 451.93 ha soils in more than 99% of the watershed area (1010.90 ha) is very deep with a depth of 75- 100 cm. The major surface soil textures in the watershed area constitutes that of clayey skeletal (538.72 ha) and Fine loamy (451.93 ha). Nearly 53 % of the watershed area is prone to moderate soil erosion which calls for proper soil and water conservation measures in the area.

10.3.7 Watershed Committee

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

10.3.8 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 Panchayath. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee. The details of the NHG Committees in Mathamangalam watershed are as follows:

10.3.9 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.

10.3.10 Activities proposed

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

Entry Point Activities	
1	Avenue Plantation
2	Intercropping in coconut Plantations
3	Medicinal plants cultivation
4	Horticulture nursery
5	Fruit trees cultivation
Natural Resource Management Activities	
1	Avenue planting
2	Cultivation of horticultural crops in wastelands
3	Intercropping in coconut plantations
4	Fruit tree planting (Jack fruit, Rambutan, Mango)
5	Pachathuruthu
6	Medicinal plants in public institutions
7	Earthen bunds
8	Centripetal terracing with mulching
9	Stone pitched contour bunds
10	Staggered trenches
11	Strip terracing for rubber/Inward terracing for plantation
12	Moisture Conservation pits
13	Live fencing
14	Gully plugs
15	Brushwood check dams
16	Check dam using blasted rubble
17	Sidewall protection of drains (geotextiles)
18	Desiltation of drains

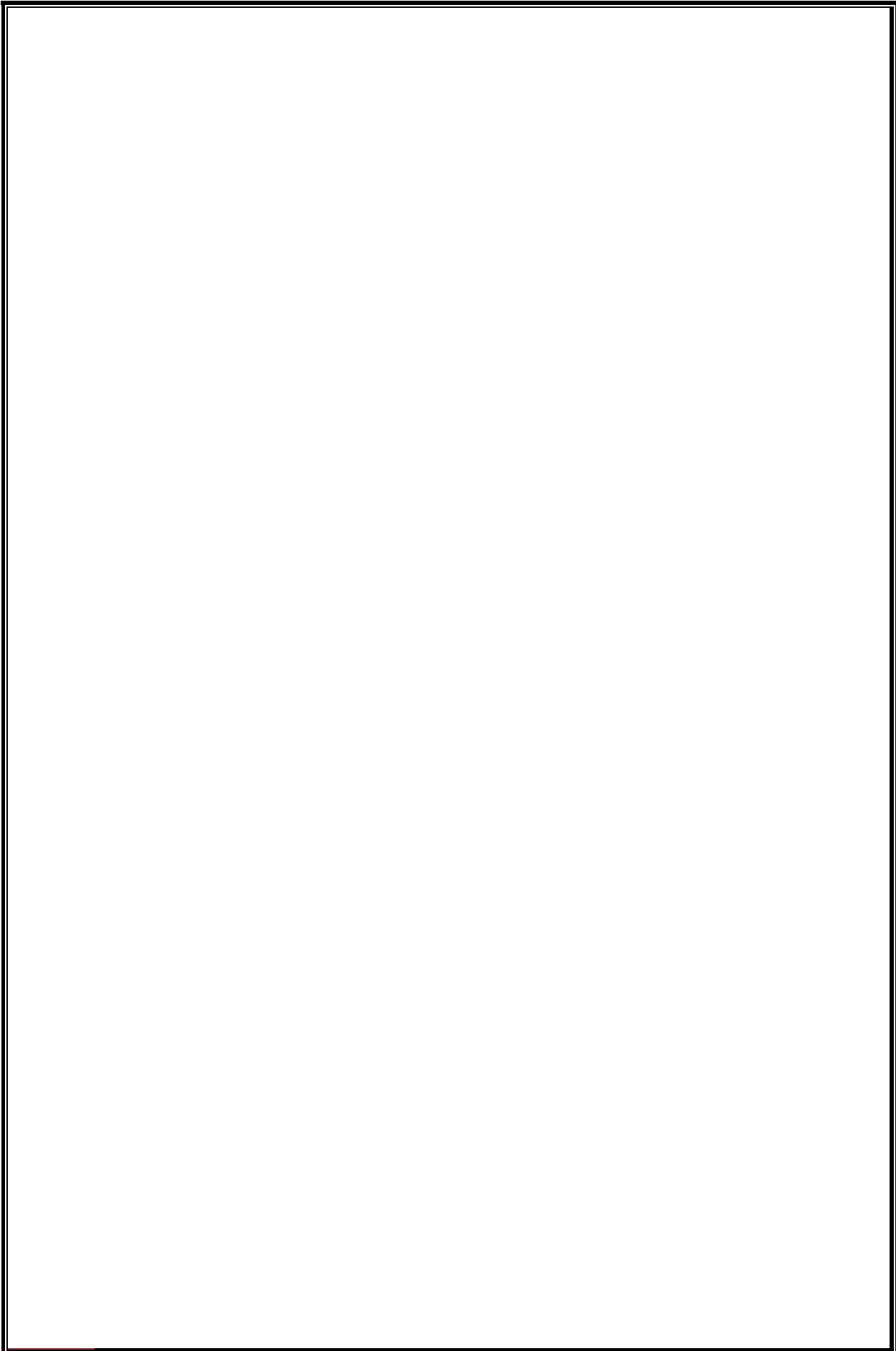
19	Side protection of drains with bamboo planting
20	Construction of farm ponds with geotextiles
21	Well recharging
22	Construction of new well
23	Lift irrigation scheme at Erloypadasekaram from ThankappanKulam
24	Lift irrigation scheme at Bicharam Pond
25	Check dam at convergence of Chitralanagarathodu & Erlokkunnuthodu
26	Two Checkdam construction(up and down stream) in Thervayal thodu and sidewall construction
27	Implementation of lift irrigation schemes for Mannorkunnu upland
28	Channel construction for Mannorkunnu Padasekaram

10.3.11 Budget

The distribution of budget for Mathamangalam micro watershed for the various components as per PMKSY guidelines is given in Table 38.

No.	Budget component	% age	Amount (Rs.)
1.	Administrative cost	10	2721600
2.	Monitoring & Evaluation	2	544320
Preparatory phase			
3.	Entry point activities	2	544320
4.	Detailed Project Report	1	272160
5.	Institution and capacity building	3	816480
Watershed works phase			
6.	Natural Resource Management	47	12791520
7	Production System	15	4082400
8	Natural Resource Management & Governance	2	544320
9	Livelihood activities for asset less persons micro enterprises & Business development	15	4082400
	Consolidation phase	3	816480
		100	27216000

Table. 38 – Budget for Mathamangalam(27K1aa)micro watershed



Mathamangalam Watershed Action Plan

Table 39. Sector-I- Natural Resources Conservation and Management - Ist Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	800		128000	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	3	30000		3000
3	Intercropping in coconut plantations	25 cent	5500	30	165000		16500
4	Fruit tree planting (Jack fruit, Rambutan, mango)	25 cent	10000	10	100000		10000
5	Crop demonstration - vegetable garden	25 cent	15000	4	60000		6000
6	Pachathuruthu	5 cent	50000	4	200000		20000
7	Medicinal plants in public institutions	5 cent	5500	8	41250		
8	Earthen bunds	rm	62	11658		722796	
9	Centripetal terracing with mulching	no.	179	1256		224824	
10	Stone pitched contour bunds	rm	144	6642		956448	
11	Staggered trenches	no.	122	190		23180	
12	Strip terracing for rubber/Inward terracing for plantation	no.	191	67		12797	
13	Moisture Conservation pits	no.	122	223		27206	
14	Live fencing	rm	24.5	2332		57134	
15	Gully plugs	no.	1500	148		222000	
16	Brushwood check dams	rm	316	34		10744	
17	Sidewall protection of drains (geotextiles)	m2	191	1359		259569	
18	Desiltation of drains	10m3	485.85	78		37896.3	
19	Side protection of drains with bamboo planting	no.	34.65	500		17325	

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
20	Construction of farm ponds with geotextiles	no.	130000	8		1040000	
21	Well recharging	no.	8000	360		2880000	
22	Construction of new well	no.	50000	2		100000	
23	Lift irrigation scheme at ErLOT padasekharam from Thankappankulam				1900000	0	
24	Lift irrigation scheme at Bicharam pond				1900000	0	
					4396250	6719919.3	55500

Mathamangalam Watershed Action Plan

Table 40: Sector-I- Natural Resources Conservation and Management –2nd Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	800		128000	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	4	40000		4000
3	Intercropping in coconut plantations	25 cent	5500	30	165000		16500
4	Fruit tree planting (Jack fruit, Rambutan, Mango)	25 cent	10000	15	150000		15000
5	Crop demonstration - vegetable garden	25 cent	15000	6	90000		9000
6	Pachathuruthu	5 cent	50000	4	200000		20000
7	Medicinal plants in public institutions	5 cent	5500	10	55000		
8	Earthen bunds	rm	62	11658		722796	0
9	Centripetal terracing with mulching	no.	179	1675		299825	
10	Stone pitched contour bunds	rm	144	6642		956448	
11	Staggered trenches	no.	122	379		46238	

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
12	Strip terracing for rubber/Inward terracing for plantation	no.	191	134		25594	
13	Moisture Conservation pits	no.	122	447		54534	
14	Live fencing	rm	24.5	3109		76170.5	
15	Gully plugs	no.	1500	148		222000	
16	Brushwood checkdams	rm	316	34		10744	
17	Check dam using blasted rubble	no.	13625	2		27250	
18	Sidewall protection of drains (geotextiles)	m2	191	2719		519329	
19	Desiltation of drains	10m3	485.85	157		76278.45	
20	Side protection of drains with bamboo planting	no.	34.65			0	
21	Construction of farm ponds with geotextiles	no.	130000	12		1560000	
22	Well recharging	no.	8000	480		3840000	
23	Construction of new well	no.	50000	2		100000	
	Check dam at convergence of Chitralangarathodu & ErlotKunnuThodu				1100000	0	
24	Two Check dam construction (up and Down) stream in Thervayalthodu and side wall construction				2100000	0	
	Total				3900000	8665206.95	64500

Mathamangalam Watershed Action Plan

Table 41: Sector-I- Natural Resources Conservation and Management –3rd Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	400		64000	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	3	30000		3000
3	Intercropping in coconut plantations	25 cent	5500	30	165000		16500
4	Fruit tree planting (Jack fruit, Rambutan, mango)	25 cent	10000	10	100000		10000
5	Crop demonstration - vegetable garden	25 cent	15000	4	60000		6000
6	Pachathuruthu	5 cent	50000	4	200000		20000
7	Medicinal plants in public institutions	5 cent	5500	8	41250		
8	Centripetal terracing with mulching	no.	179	1256		224824	
9	Stone pitched contour bunds	rm	144	3321		478224	
10	Staggered trenches	no.	122	190		23180	
11	Strip terracing for rubber/Inward terracing for plantation	no.	191	67		12797	
12	Moisture Conservation pits	no.	122	447		54534	
13	Live fencing	rm	24.5	2332		57134	
14	Sidewall protection of drains (geotextiles)	m2	191	2719		519329	
15	Desiltation of drains	10m3	485.85	157		76278.45	
16	Well recharging	no.	8000	360		2880000	
17	Construction of new well	no.	50000	2		100000	
18	Implementation of lift Irrigation schemes for				2400000	0	

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
	mannorkunnu upland						
19	Channel construction of mannorkunnu padasekharam				1500000	0	
				11308	4496250	4490300.45	55500

Mathamangalam Watershed (27K1aa) - Action Plan

Table 42: Sector-II- Livelihood Support System for Landless/Assetless - 1st Year Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Bee Keeping	2000	31	62000	800	24800	37200
2	Mik Processing Unit	3000000	1	3000000	1200000	1200000	1800000
	Total			3062000		1224800	1837200

Mathamangalam Watershed (27K1aa) - Action Plan

Table 43: Sector-II- Livelihood Support System for Landless/Assetless - 2nd Year Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Mushroom cultivation (80-100 bed)	28125	4	112500	11250	45000	37200
2	Bee Keeping	2000	16	32000	800	12800	1800000

3	Tapioca/Jack Processing Unit	1500000	1	1500000	825000	825000	1837200
4	Retail Market/Outlet Environmentally controlled	1500000	1	1500000	750000	750000	37200
	Total					1632800	1800000

Mathamangalam Watershed (27K1aa) - Action Plan

Table 44: Sector-II- Livelihood Support System for Landless/Assetless - 3rd Year Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Cow rearing (mulching)	65000	5	325000	27500	137500	187500
2	Bee Keeping	2000	15	30000	800	12000	18000
3	Infrastructure development in padasekharam including Block level convergence and establishment of Rice Mills and Par Boiling units	500000	1	500000	250000	250000	250000
4	Spices processing Unit	1500000	1	1500000	825000	825000	675000
5	Total					1224500	1130500

Mathamangalam Watershed (27K1aa) - Action Plan

Table 45: Sector-III- Production Plan- 1stYear Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	5	400000	30000	150000	250000	30000
2	Integrated Farming System (31-40 cents)	100000	5	500000	40000	200000	300000	40000
3	Integrated Farming System (41 cents-2 ha)	120000	5	600000	50000	250000	350000	50000
4	Fallow land cultivation- Paddy	142052	2	284104	40000	80000	204104	16000
5	Fallow land Vegetable Cultivation	149000	2	298000	40000	80000	218000	16000
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passionfruit Cultivation	60000	5	300000	30000	150000	150000	30000
7	Banana cultivation	216000	3	648000	26250	78750	569250	15750
8	Vegetable Cultivation in Growbags	2000	102	204000	1500	153000	51000	30600
9	Distribution of Coconut seedlings (DxT)/Hybrid	250	665	166250	125	83125	83125	16625
				3400354		1224875	2175479	244975

Mathamangalam Watershed (27K1aa) - Action Plan

Table 46: Sector-III- Production Plan - 2ndYear Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	5	400000	30000	150000	250000	30000
2	Integrated Farming System (31-40 cents)	100000	5	500000	40000	200000	300000	40000
3	Integrated Farming System (41 cents-2 ha)	120000	5	600000	50000	250000	350000	50000
4	Fallow land cultivation- Paddy	142052	2	284104	40000	80000	204104	16000
5	Fallow land Vegetable Cultivation	149000	2	298000	40000	80000	218000	16000
6	Small nursery (0.5 acre)	300000	1	300000	150000	150000	150000	30000
7	Rambutan/ Mango/Jack fruit/ Mangosteen/Passionfruit Cultivation	60000	5	300000	30000	150000	150000	30000
8	Banana cultivation	216000	6	1296000	26250	157500	1138500	31500
9	Vegetable Cultivation in Growbags	2000	92	184000	1500	138000	46000	27600
10	Pepper Area Expansion	40000	8	320000	20000	160000	160000	32000
11	Distribution of Coconut seedlings (DxT)/Hybrid	250	939	234750	125	117375	117375	23475
	Total			4716854		1632875	3083979	326575

Mathamangalam Watershed (27K1aa) - Action Plan

Table 47:Sector-III- Production Plan–3rd Year Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	5	400000	30000	150000	250000	30000
2	Integrated Farming System (31-40 cents)	100000	5	500000	40000	200000	300000	40000
3	Integrated Farming System (41 cents-2 ha)	120000	5	600000	50000	250000	350000	50000
4	Fallow land cultivation- Paddy	142052	2	284104	40000	80000	204104	16000
5	Fallow land Vegetable Cultivation	149000	2	298000	40000	80000	218000	16000
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passion fruit Cultivation	60000	5	300000	30000	150000	150000	30000
7	Banana cultivation	216000	3	648000	26250	78750	569250	15750
8	Vegetable Cultivation in Grow bags	2000	102	204000	1500	153000	51000	30600
9	Distribution of Coconut seedlings (DxT)/Hybrid	250	665	166250	125	83125	83125	16625
	Total					1224875	2175479	244975

CHAPTER11
MICRO WATERSHED BASED ACTION PLAN
NAMBIKOLLIMICRO WATERSHED
(27K1v)

Nambikolli micro watershed is the second largest watershed in the PMSKY cluster with an area of 520.37 ha (26 % of total area). This micro watershed is spread over Nenmeni and Noolpuzha Panchayaths. The Kabani River flows through the south western side of the watershed.

11.1 General Description

Table 48: General Description of Nambikolli micro watershed

Name of micro watershed	:	Nambikolli
Micro watershed code	:	27K1v
River basin	:	Kabani
District	:	Wayanad
Block Panchayath	:	Sulthan Bathery
Grama Panchayath	:	Nenmeni and Noolpuzha
Villages	:	Nenmeni and Noolpuzha
Latitude	:	11 ⁰ 39' E
Longitude	:	76 ⁰ 16' E
Wards	:	Nenmeni Panchayath -3,4,5 Noolpuzha Panchayath - 17
Total Area	:	520.37
% of area in the PMKSY cluster	:	26

11.2 Socio economic profile

As per the information provided in the baseline survey conducted, Nambikolli micro watershed has a total number of 752 households with a total population of 3120. 474 BPL families reside in the micro watershed area. Out of the total population 545 belongs to scheduled tribe and 123 belongs to Scheduled cast. Agriculture is the major source of livelihood in the micro watershed area. Apart from agriculture/horticultural practices, animal husbandry is also a source of livelihood some families in the watershed area. The socio economic details of the Nambikolli micro watershed are given in the table 49.

Table 49: Socio economic details of Nambikolli micro watershed

1.	Total number of households	752
2.	Total Population	3120
	Population	
	Scheduled Caste	123
	Scheduled Tribe	545
3.	Land holdings/Family (in Ha)	0.69

11.3 Biophysical Resources

11.3.1 Physiography

The relief of the watershed ranges from 600 m above MSL to 1000 m above MSL. The majority of the area falls in this relief category.

11.3.2 Slope

The watershed area is divided into six categories of slope classes. The majority of area is under the gentle sloping area having 0-3 % slope. The category spreads over an area of 282.94 ha (55.58 %), 21.81 % of the watershed area is having moderately steep sloping lands which requires urgent soil and water conservation measures(Fig.16).

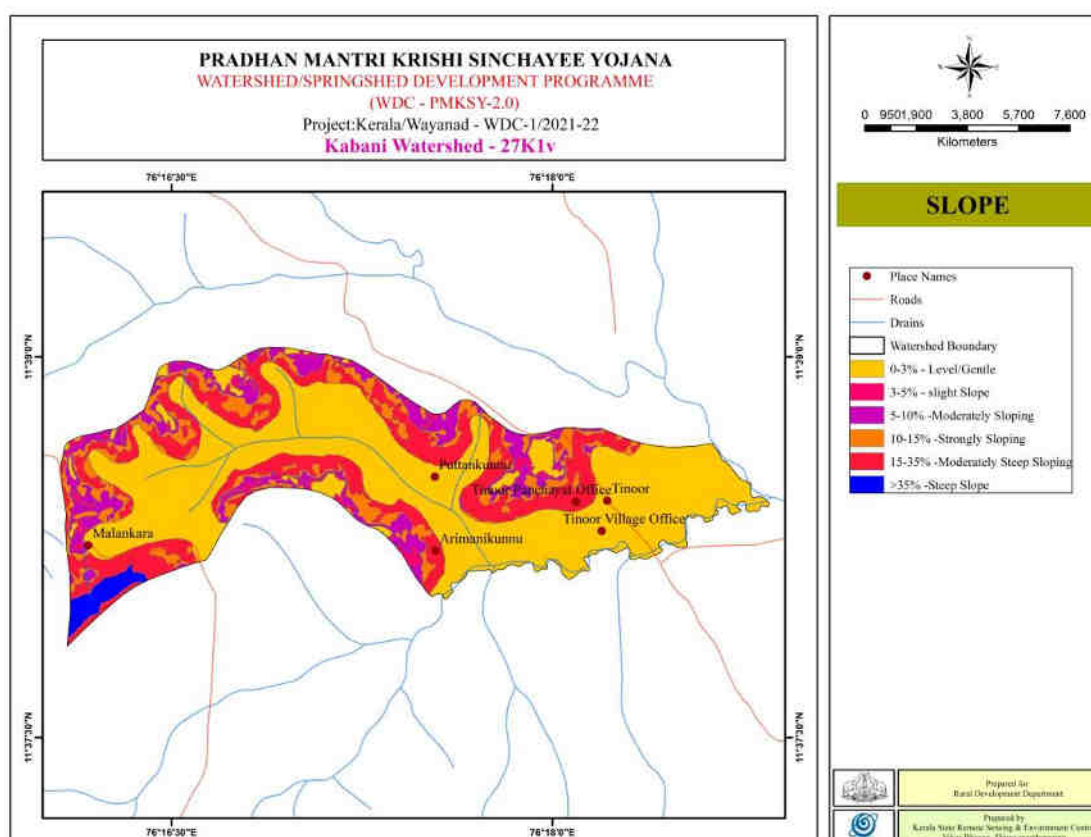


Fig16 : Slope

11.3.3 Drains

The Kabani River flowing through the North-west portion of the watershed is the major drain of this watershed. Few small drains are originating from different parts of this watershed which drains to the Kabani River at the south- west boundary of the watershed. The details of the drains and ponds in the watershed area are given in table 50.

Table 50: Details of Drains in Nambikolli micro watershed

Drains	Length(m)
Amathodu	2668.83
Amathodu Chittoor	2795.62
Amathodu Thazheputhen kunnuThodu	873.89
ArimaniThodu	150.18
Kalloor River	3826.34
Kizhakkemukkam-thodvettiThodu	880.78
NambikolliThodu	498.81
Puchavayal ChiraThodu	289.84
Thampurattichira Kollimoola Thodu	591.01
Thoduvetti Thodu	670.83

11.3.4 Land use

Agriculture is the prime activity in the watershed area. The major land use category mapped in the watershed area is paddy. It occupies an area of 198.09 ha (38.09 %). The second major category is the mixed crops which 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 131.87 ha.

Table51: Land use categories in Nambikolli micro watershed

No.	Land use category	Area in ha	Percentage
1	Agricultural Fallow Land - Current Fallow	13.01	2.50
2	Agricultural Perennial Crop-Coconut dominant Mixed crops	5.16	0.99
3	Agricultural Perennial Crop - Mixed Crops	131.87	25.36
4	Agricultural Perennial Crop - Mixed Crops + Built ups	5.56	1.07

5	Agricultural Perennial Crop -Arecanut	23.40	4.50
6	Agricultural Perennial Crop -Coconut	0.98	0.19
7	Agricultural Perennial Plantation Crop - Coffee	3.13	0.60
8	Agricultural Perennial Plantation Crop - Rubber	3.05	0.59
9	Agricultural Perennial Plantation Crop - Tea	0.78	0.15
10	Built Up Land – Commercial	1.88	0.36
11	Built Up Land - Mixed Type	23.63	4.54
12	Built Up Land - Other Type	0.49	0.09
13	Built Up Land – Residential	28.12	5.41
14	Built Up Land – Road	4.03	0.78
15	Paddy Converted to Built up (Mixed type)	3.61	0.69
16	Paddy Converted to Commercial Built up	0.15	0.03
17	Paddy Converted to Long Fallow Land	0.47	0.09
18	Paddy Converted to Mixed Crops	4.40	0.85
19	Paddy Converted to Perennial Crops	37.51	7.21
20	Paddy Converted to Residential Built up	1.40	0.27
21	Paddy Converted to Seasonal Crops	22.08	4.25
22	Paddy Cultivating Land (Current Fallow)	2.85	0.55
23	Paddy Cultivating Land (Nancha)	198.09	38.09
24	Waste Land - Degraded Plantation	0.54	0.10
25	Waste Land - Land with Scrub	2.13	0.41
26	Water body - Lakes/Ponds	0.55	0.11
27	Water body - River/Stream	1.52	0.29
	Total	520.00	100

11.3.5 Geology

The watershed falls the geological unit of Peninsular Gneissic Complex, has an area of 518.86 ha (99.7 %). There are four geomorphological units of which more than 54 % (285.26ha) of the area falls under the category Pediment zone (laterite). An area of 210.44 ha is mapped under the category valley fill.

11.3.6 Soils

The major soil series mapped in the watershed area is Muttill series which is. The soil has a surface texture of clayey skeletal to fine loamy. This is distributed in an area of 538.69 ha (53.72 %). Muttill series has mapped under an area of 271.27ha and Trikkepatta series has

mapped under 241.03 ha Soils in more than 99% of the watershed area (518.86 ha) is very deep with a depth of 75- 100 cm. The major surface soil textures in the watershed area constitutes that of clayey skeletal (221.7 ha) and Fine loamy (73.88 ha). Nearly 50 % of the watershed area is prone to slight soil erosion.

11.4 Watershed Committee

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

11.5 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 Panchayath. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

11.6 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.

11.7 Activities proposed

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

Table 52: Details of activities proposed

Entry Point Activities	
1	Avenue tree planting
2	Fruit tree planting
3	Vegetable cultivation
4	Medicinal plants gardening
Natural Resource Management Activities	
1	Avenue planting
2	Cultivation of horticultural crops in wastelands
3	Intercropping in coconut plantations
4	Crop demonstration - vegetables
5	Pachathuruthu
6	Medicinal plants in public institutions
7	Earthen bunds
8	Centripetal terracing with mulching
9	Stone pitched contour bunds
10	Staggered trenches
11	Strip terracing for rubber/Inward terracing for plantation
12	Moisture Conservation pits
13	Live fencing
14	Gully plugs
15	Brushwood check dams
16	Check dam using blasted rubble
17	Sidewall protection of drains (geotextiles)
18	Desiltation of drains
19	Side protection of drains with bamboo planting
20	Construction of farm ponds with geotextiles
21	Well recharging
22	Construction of new well
23	Side wall protection of Chittoor puzha
24	Conservation of Mullanchira
25	Check dam construction in Nochanvayal Thodu
26	Lift irrigation in Chitturpuzha for Chitturpadasekharam

11.8 Budget

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

Table 53: Budget for Nambikolli micro watershed

No.	Budget component	% age	Amount (in Rs.)
1.	Administrative cost	10	1425200
2.	Monitoring & Evaluation	2	285040
Preparatory phase			
3.	Entry point activities	2	285040
4	Detailed Project Report Institution and capacity building	1	142520
5	Institution and capacity building	3	427560
Watershed works phase			
6.	Natural Resource Management	47	6698440
7	Production System	15	2137800
8	Natural Resource Management & Governance	2	285040
9	Livelihood activities for asset less persons micro enterprises & Business development	15	2137800
Consolidation phase		3	427560
		100	14252000

Nambikolli Watershed (21K1V) - Action Plan

Table 54: Sector-I- Natural Resources Conservation and Management - Ist Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	800		128000	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	1	10000		1000
3	Intercropping in coconut plantations	25 cent	5500	7	38500		3850
4	Crop demonstration – vegetables	25 cent	15000	3	45000		4500
5	Medicinal plants in public institutions	5 cent	5500	1	5500		
6	Earthen bunds	rm	62	5718		354516	
7	Centripetal terracing with mulching	no.	179	276		49404	
8	Stone pitched contour bunds	rm	144	4931		710064	
9	Staggered trenches	no.	122	28		3416	
10	Strip terracing for rubber/Inward terracing for plantation	no.	191	13		2483	
11	Moisture Conservation pits	no.	122	48		5856	
12	Live fencing	rm	24.5	1144		28028	
13	Gully plugs	no.	1500	96		144000	
14	Brushwood checkdams	rm	316	29		9164	
15	Sidewall protection of drains (geotextiles)	m2	191	1159		221369	
16	Desiltation of drains	10m3	485.85	58		28179.3	
17	Construction of farm ponds with geotextiles	no.	130000	3		390000	
18	Well recharging	no.	8000	240		1920000	

19	Construction of new well	no.	50000	1		50000	
20	Side wall protection of Chittoor puzha				2000000	0	
	Total				2099000	4044479.3	9350

Nambikolli Watershed (21K1v) - Action Plan

Table 55: Sector-I- Natural Resources Conservation and Management –2nd Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	800		128000	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	1	10000		1000
3	Intercropping in coconut plantations	25 cent	5500	10	55000		5500
4	Crop demonstration – vegetables	25 cent	15000	4	60000		6000
5	Pachathuruthu	5 cent	50000	1	50000		5000
6	Medicinal plants in public institutions	5 cent	5500	2	11000		
7	Earthen bunds	rm	62	5718		354516	
8	Centripetal terracing with mulching	no.	179	368		65872	
9	Stone pitched contour bunds	rm	144	4931		710064	
10	Staggered trenches	no.	122	56		6832	
11	Strip terracing for rubber/Inward terracing for plantation	no.	191	27		5157	
12	Moisture Conservation pits	no.	122	96		11712	
13	Live fencing	rm	24.5	1525		37362.5	
14	Gully plugs	no.	1500	96		144000	

15	Brushwood checkdams	rm	316	29		9164	
16	Check dam using blasted rubble	no.	13625	3		40875	
17	Sidewall protection of drains (geotextiles)	m2	191	2318		442738	
18	Desiltation of drains	10m3	485.85	116		56358.6	
19	Construction of farm ponds with geotextiles	no.	130000	4		520000	
20	Well recharging	no.	8000	320		2560000	
21	Construction of new well	no.	50000	2		100000	
23	Conservation of Mullanchira				1903000	0	
24	Check dam construction in Nochanvayal Thodu				1000000	0	
	Total				3089000	5192651.1	17500

Nambikolli Watershed (21K1v) - Action Plan

Table 56:Sector-I- Natural Resources Conservation and Management –3rd Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	400		64000	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	1	10000		1000
3	Intercropping in coconut plantations	25 cent	5500	8	44000		4400
4	Crop demonstration - vegetables	25 cent	15000	3	45000		4500
5	Medicinal plants in public institutions	5 cent	5500	2	11000		
6	Centripetal terracing with mulching	no.	179	276		49404	

7	Stone pitched contour bunds	rm	144	2465		354960	
8	Staggered trenches	no.	122	28		3416	
9	Strip terracing for rubber/Inward terracing for plantation	no.	191	13		2483	
10	Moisture Conservation pits	no.	122	96		11712	
11	Live fencing	rm	24.5	1144		28028	
12	Sidewall protection of drains (geotextiles)	m2	191	2318		442738	
13	Desiltation of drains	10m3	485.85	116		56358.6	
14	Well recharging	no.	8000	240		1920000	
15	Construction of new well	no.	50000	1		50000	
16	Lift irrigation in Chitturpuzha for Chittur padasekaram				1400000	0	
	Total				1510000	2983099.6	9900

Nambikolli Watershed (21K1v) - Action Plan

Table 57: Sector-II- Livelihood Support system for Landless/ Asset less - 1stYear Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Mushroom cultivation (80-100 bed)	28125	8	225000	11250	90000	135000
2	Backyard poultry unit (5 bird+ cage)	2600	195	507000	800	156000	351000
3	Cow rearing (mulching)	65000	10	650000	27500	275000	375000
4	Minimal fruit and vegetable Processing unit	200000	1	200000	100000	100000	100000
5	Trichoderma Enriched cow dung production unit	30000	1	30000	20000	20000	10000
	Total					641000	971000

Nambikolli Watershed (21K1v) - Action Plan

Table 58:Sector-II- Livelihood Support system for Landless/ Asset less - 2ndYear Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Mushroom cultivation (80-100 bed)	28125	8	225000	11250	90000	135000
2	Backyard poultry unit (5 bird+ cage)	2600	192	499200	800	153600	345600

3	Cow rearing (mulching)	65000	10	650000	27500	275000	375000
4	Goat rearing (female 2)	32000	7	224000	16000	112000	112000
5	Distribution Milking Machines (5 cow unit)	75000	5	375000	25000	125000	250000
	Total					755600	1217600

Nambikolli Watershed (21K1v) - Action Plan

Table 59: Sector-II- Livelihood Support system for Landless/ Asset less - 3rdYear Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Mushroom cultivation (80-100 bed)	28125	9	253125	11250	101250	151875
2	Backyard poultry unit (5 bird+ cage)	2600	210	546000	800	168000	378000
3	Cow rearing (mulching)	65000	9	585000	27500	247500	337500
4	Distribution Milking Machines (5 cow unit)	75000	5	375000	25000	125000	250000
	Total					641750	1117375

Nambikolli Watershed (21K1v) - Action Plan

Table 60: Sector-III- Production System- 1stYear Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	2	160000	30000	60000	100000	12000
2	Integrated Farming System (31-40 cents)	100000	2	200000	40000	80000	120000	16000
3	Integrated Farming System (41 cents-2 ha)	120000	2	240000	50000	100000	140000	20000
4	Fallow land cultivation- Paddy	142052	1.5	213078	40000	60000	153078	12000
5	Fallow land Vegetable Cultivation	149000	1	149000	40000	40000	109000	8000
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passion fruit Cultivation	60000	3	180000	30000	90000	90000	18000
7	Banana cultivation	216000	5	1080000	26250	131250	948750	26250
8	Distribution of Coconut seedlings (DxT)/Hybrid	250	340	85000	125	42500	42500	8500
9	Vegetable Cultivation in Growbags (unit of 25 bags)	2000	25	50000	1500	37500	12500	7500
	Total					641250	1715828	128250

Nambikolli Watershed (21K1v) - Action Plan

Table 61: Sector-III- Production System- 2ndYear Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	4	320000	30000	120000	200000	24000
2	Integrated Farming System (31-40 cents)	100000	4	400000	40000	160000	240000	32000
3	Integrated Farming System (41 cents-2 ha)	120000	3	360000	50000	150000	210000	30000
4	Fallow land cultivation- Paddy	142052	2	284104	40000	80000	204104	16000
5	Fallow land Vegetable Cultivation	149000	1	149000	40000	40000	109000	8000
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passionfruit Cultivation	60000	3	180000	30000	90000	90000	18000
7	Banana cultivation	216000	4	864000	26250	105000	759000	21000
8	Distribution of Coconut seedlings (DxT)/Hybrid	250	400	100000	125	50000	50000	10000
9	Pepper Area Expansion	40000	3	120000	20000	60000	60000	12000
	Total					855000	1922104	171000

Nambikolli Watershed (21K1v) - Action Plan

Table 62: Sector-III- Production System- 3rdYear Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	2	160000	30000	60000	100000	12000
2	Integrated Farming System (31-40 cents)	100000	2	200000	40000	80000	120000	16000
3	Integrated Farming System (41 cents-2 ha)	120000	2	240000	50000	100000	140000	20000
4	Fallow land cultivation- Paddy	142052	2	284104	40000	80000	204104	16000
5	Fallow land Vegetable Cultivation	149000	1	149000	40000	40000	109000	8000
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passion fruit Cultivation	60000	3	180000	30000	90000	90000	18000
7	Banana cultivation	216000	5	1080000	26250	131250	948750	26250
8	Distribution of Coconut seedlings (DxT)/Hybrid	250	240	60000	125	30000	30000	6000
9	Vegetable Cultivation in Grow bags (unit of 25 bags)	2000	20	40000	1500	30000	10000	6000
10	Total					641250	1751854	128250

CHAPTER12
MICRO WATERSHED BASED ACTION PLAN
PUTHENKUNNU MICRO WATERSHED
(27K1w1)

Puthenkunnu micro watershed in the PMSKY cluster has an area of 427 ha (21.3 % of total area). This micro watershed is spread over Nenmeni and Noolpuzha Panchayath of Sulthan Bathery block. The Kabani River flows through the south western side of the watershed.

12.1 General Description

Table 63: General Description of Puthenkunnu micro watershed

Name of micro watershed	:	Puthenkunnu
Micro watershed code	:	27K1w1
River basin	:	Kabani
District	:	Wayanad
Block Panchayath	:	SulthanBatheri
Grama Panchayath	:	Nenmeni, Noolpuzha
Villages	:	Nenmeni, SultanBathery, Noolpuzha
Latitude	:	11 ⁰ 39'
Longitude	:	76 ⁰ 15'
Wards	:	Nenmeni- 3,4,5 Noolpuzha Panchayath - 17
Total Area	:	427
% of area in the PMKSY cluster	:	23%

12.2 Socio economic profile

As per the information provided in the baseline survey conducted, Puthenkunnu micro watershed has a total number of 654 households with a total population of 2714. 412 BPL families reside in the micro watershed area. Out of the total population 490 belongs to scheduled tribe and 107 belongs to Scheduled cast. Agriculture is the major source of livelihood in the micro watershed area. Apart from agriculture/horticultural practices, animal

husbandry is also a source of livelihood some families in the watershed area. The socio economic details of the Puthenkunnu micro watershed are given in the table.

Table 64: Socio economic details of Puthenkunnu micro watershed

1.	Total number of households	654
2.	Total Population	2714
	Scheduled Caste	107
	Scheduled Tribe	490
3	No. of BPL families	412
4	Land holdings/Family (in Ha)	0.76

12.3 Biophysical Resources

12.3.1 Physiography

The majority of the area falls in the relief category of 70 to 100 m above MSL which occurs in an area of 48.94 % of the watershed area

12.3.2 Slope

The watershed area is divided into six categories of slope classes. The majority of area is under the gentle sloping area having 0-3 % slope. The category spreads over an area of 432.81 ha (42.611 %), 15.52 % of the watershed area is having strongly sloping lands which requires urgent soil and water conservation measures.

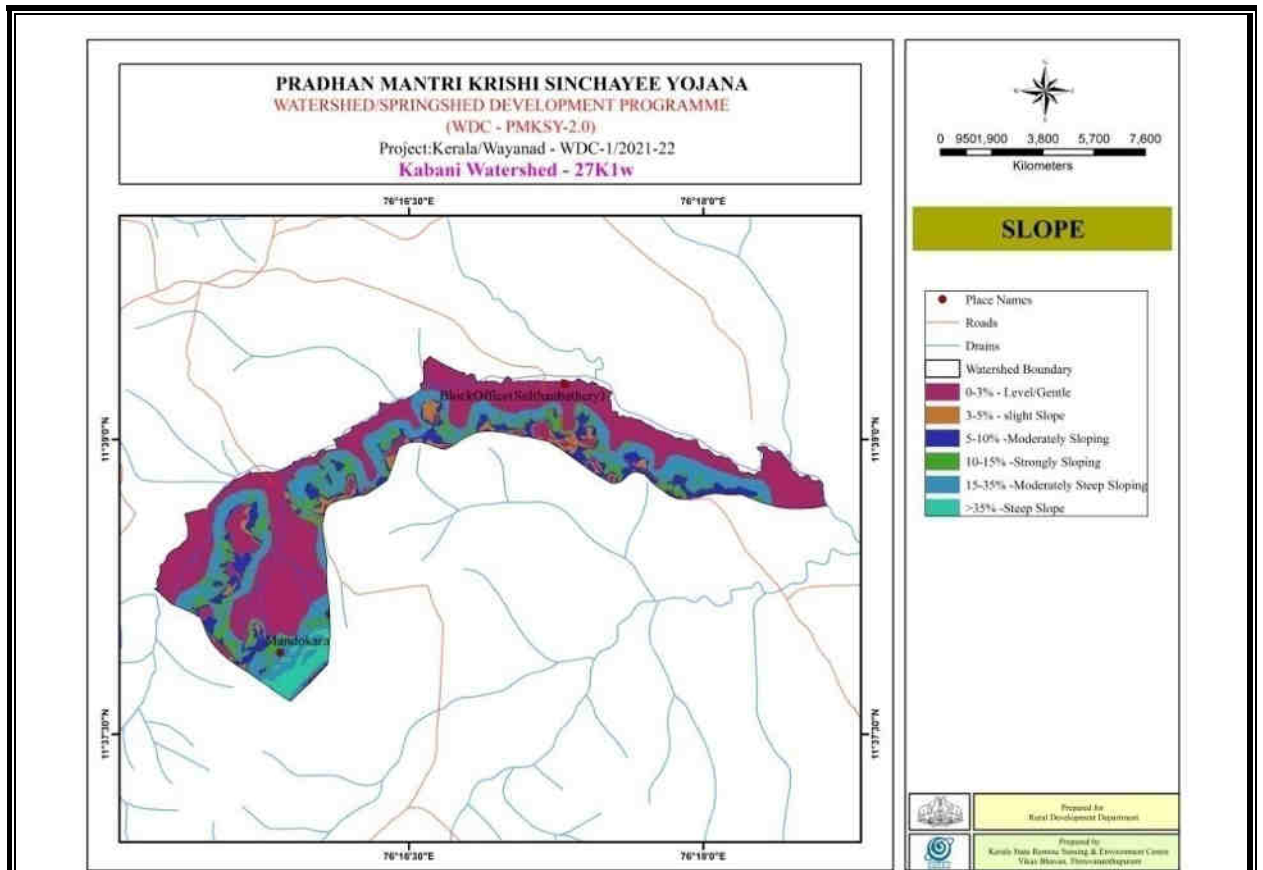


Fig 17: Slope map

12.3.3 Drains

The Kabani River flowing through the south-west portion of the watershed is the major drain of this watershed. Few small drains are originating from different parts of this watershed which drain to the Kabani River at the south- west boundary of the watershed. The details of the drains and ponds in the watershed area are given in table 65.

Table 65: Details of Drains in Puthenkunnu micro watershed

Drains	Length(m)
KunipuraThodu	1332.37
Malankara AmmayipalamThodu	950.11
Malankara vayalThodu	1951.37
ManivayalThodu	897.70
ThankamalThodu	739.14
ThoduvettiThodu	6831.92
ThoduvettiThodu 1	277.75
ThoduvettiThodu 2	465.63
ThoduvettiThodu 3	327.23

ThoduvettiThodu 4	445.40
ThoduvettiThodu 5	429.39
ThoduvettiThodu 7	343.23
ThoduvettiThodu 8	370.88

12.3.4 Land use

Agriculture is the prime activity in the watershed area. The major land use category mapped in the watershed area is mixed crop which are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. It occupies an area of 92.49 ha (18.54 %). The second major category is the paddy (nancha) area which is mapped in an area of 84.13 ha. An area of 14 ha is under double crop.

Table. 66: Table showing land use categories in Puthenkunnu micro watershed

No.	Land use category	Area in ha	Percentage
1	Agricultural Fallow Land - Current Fallow	17.82	3.57
2	Agricultural Perennial Crop - Coconut dominant Mixed Crops	11.77	2.36
3	Agricultural Perennial Crop - Mixed Crops	92.49	18.54
4	Agricultural Perennial Crop - Mixed Crops + Built ups	4.12	0.83
5	Agricultural Perennial Crop -Arecanut	36.20	7.25
6	Agricultural Perennial Crop -Coconut	7.13	1.43
7	Agricultural Perennial Plantation Crop - Coffee	15.35	3.08
8	Agricultural Perennial Plantation Crop - Rubber	5.30	1.06
9	Agricultural Perennial Plantation Crop - Tea	0.24	0.05
10	Agricultural Seasonal Crop - Banana	1.13	0.23
11	Agricultural Seasonal Crop - Tuber Crops	0.16	0.03
12	Built Up Land - Commercial	1.95	0.39
13	Built Up Land - Mixed Type	23.84	4.78
14	Built Up Land - Other Type	3.26	0.65
15	Built Up Land - Residential	37.07	7.43
16	Built Up Land - Road	4.23	0.85
17	Paddy Converted to Commercial Built up(Mixed	19.76	3.96

	type)		
18	Paddy Converted to Commercial Built up	2.28	0.46
19	Paddy Converted to Long Fallow Land	0.34	0.07
20	Paddy Converted to Mixed Crops	5.57	1.12
21	Paddy Converted to Perennial Crops	53.72	10.77
22	Paddy Converted to Residential Built up	1.15	0.23
23	Paddy Converted to Seasonal Crops	40.64	8.14
24	Paddy Cultivating Land (Current Fallow)	10.99	2.20
25	Paddy Cultivating Land (Nancha)	84.13	16.86
26	Paddy Cultivating Land (Nancha+Puncha	14.00	2.81
27	Waste Land - Degraded Plantation	0.38	0.08
28	Waste Land - Land without Scrub	1.90	0.38
29	Waterbody - Lakes/Ponds	0.78	0.16
30	Waterbody - River/Stream	1.59	0.32
	Total	499.00	100.00

12.3.5 Geology

The watershed falls the geological unit of Peninsular Gneissic Complex, has an area of 497.01 ha (99.69.%). There are four geomorphological units of which more than 50 % (279.85ha) of the area falls under the category Pediment zone (laterite). An area of 188.87 ha is mapped under the category valley fill.

12.3.6 Soils

The major soil series mapped in the watershed area is Trikkepatta series which is. The soil has a surface texture of gravelly sandy clay to gravelly clay. This is distributed in an area of 538.69 ha (53.72 %). Mutil series has mapped under an area of 74.08 ha more than 99% of the Soils in watershed area is under very deep with a depth of 75- 100 cm. The major surface soil textures in the watershed area constitutes clayey skeletal (221.7) and fine soil (188.26 ha) Nearly 52 % of the watershed area is prone to moderate soil erosion which calls for proper soil and water conservation measures in the area.

12.4 Watershed Committee

Watershed Committee is constituted by Gram Sabha to implement the watershed project with technical support of WDT in the village. Watershed committees are formed at

village keeping all parameter of watershed committee keeping the gender sensitive issues intact. Watershed committee member are briefed about the project objectives and a workshop is also conducted in this regard at every village. The watershed committee has a pivotal role to play during and after the project implementation period.

12.5 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 Panchayath. The Presidents and Secretaries of the NHG Committees are members of the Watershed Committee.

12.6 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.

12.7 Activities proposed

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

Table 67: Details of activities proposed

Entry Point Activities	
1	Fruit tree planting
2	Horticulture nursery
3	Avenue Planation
4	Vegetable cultivation
Natural Resource Conservation Activities	
1	Avenue planting
2	Cultivation of horticultural crops in wastelands
3	Intercropping in coconut plantations

4	Fruit tree planting (Jack fruit, Rambutan, mango)
5	Pachathuruthu
6	Medicinal plants in public institutions
7	Earthen bunds
8	Centripetal terracing with mulching
9	Stone pitched contour bunds
10	Staggered trenches
11	Strip terracing for rubber/Inward terracing for plantation
12	Moisture Conservation pits
13	Live fencing
14	Gully plugs
15	Brushwood check dams
16	Check dam using blasted rubble
17	Sidewall protection of drains (geotextiles)
18	Desiltation of drains
19	Side protection of drains with bamboo planting
20	Construction of farm ponds with geotextiles
21	Well recharging
22	Construction of new well
23	Side wall construction till 200m Ammayipalam RehmatnagarThodu
24	Maintenance of farm pond and lift irrigation of Ammayipalam Rehmathnagar Thodu
25	Rejuvenation of streams of karyambadipuzha

12.8 Budget

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

Table 68: Budget for Puthenkunnu micro watershed

No.	Budget component	% age	Amount (in Rs.)
1.	Administrative cost	10	1195600
2.	Monitoring & Evaluation	2	239120
Preparatory phase			
3.	Entry point activities	2	239120

4.	Detailed Project Report Institution and capacity building	1	119560
5	Institution and capacity building	3	358680
Watershed works phase			
6.	Natural Resource Management	47	5619320
7	Production System	15	1793400
8	Natural Resource Management & Governance	2	239120
9	Livelihood activities for asset less persons micro enterprises& Business development	15	1793400
10	Consolidation phase	3	358680
		100	11956000

Puthenkunnu Watershed (27K1W1) - Action Plan

Table 69: Sector-I- Natural Resources Conservation and Management - Ist Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	200		32000	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	1	10000		1000
3	Intercropping in coconut plantations	25 cent	5500	3	16500		1650
4	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	10000	4	40000		4000
5	Crop demonstration - vegetables	5 cent	15000	1	15000		1500
6	Medicinal plants in public institutions	5 cent	5500	6	33000		
7	Earthen bunds	rm	62	11658		722796	
8	Centripetal terracing with mulching	no.	179	1256		224824	
9	Stone pitched contour bunds	rm	144	6642		956448	
10	Staggered trenches	no.	122	10236		1248792	
11	Strip terracing for rubber/Inward terracing for plantation	no.	191	190		36290	
12	Moisture Conservation pits	no.	122	223		27206	
13	Live fencing	rm	24.5	2332		57134	
14	Gully plugs	no.	1500	148		222000	
15	Brushwood check dams	rm	316	34		10744	
16	Sidewall protection of drains (geotextiles)	m2	191	1359		259569	
17	Desiltation of drains	10m3	485.85	78		37896.3	
18	Side protection of drains with bamboo planting	no.	34.65	500		17325	
19	Construction of farm ponds with geotextiles	no.	130000	8		1040000	

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
20	Well recharging	no.	8000	360		2880000	
21	Construction of new well	no.	50000	2		100000	
22	Rejuvenation of streams of Karayambadipuzha				2900000	0	
	Total				3014500	7873024.3	8150

Puthenkunnu Watershed (27K1W1) - Action Plan

Table 70:Sector-I- Natural Resources Conservation and Management –2ndYear Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	200		32000	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	1	10000		1000
3	Intercropping in coconut plantations	25 cent	5500	4	22000		2200
4	Fruit tree planting (Jack fruit, Rambutan, mango)	25 cent	10000	4	40000		4000
5	Medicinal plants in public institutions	5 cent	5500	7	38500		
6	Earthen bunds	rm	62	11658		722796	
7	Centripetal terracing with mulching	no.	179	1675		299825	
8	Stone pitched contour bunds	rm	144	6642		956448	
9	Staggered trenches	no.	122	20472		2497584	
10	Strip terracing for rubber/Inward terracing for plantation	no.	191	379		72389	
11	Moisture Conservation pits	no.	122	447		54534	
12	Live fencing	rm	24.5	3109		76170.5	
13	Gully plugs	no.	1500	148		222000	

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
14	Brushwood check dams	rm	316	34		10744	
15	Check dam using blasted rubble	no.	13625	2		27250	
16	Sidewall protection of drains (geotextiles)	m2	191	2719		519329	
17	Desiltation of drains	10m3	485.85	157		76278.45	
18	Construction of farm ponds with geotextiles	no.	130000	12		1560000	
19	Well recharging	no.	8000	480		3840000	
20	Construction of new well	no.	50000	2		100000	
21	Side wall construction till 200m Ammayipalam Rehmatnagar Thodu				1200000	0	
	Total				1310500	11067347.95	7200

Puthenkunnu Watershed (27K1W1) - Action Plan

Table 71: Sector-I- Natural Resources Conservation and Management –3rdYear Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Avenue planting	no.	160	100		16000	
2	Intercropping in coconut plantations	25 cent	5500	3	16500		1650
3	Fruit tree planting (Jack fruit, Rambutan, mango)	25 cent	10000	4	40000		4000
4	Medicinal plants in public institutions	5 cent	5500	7	38500		
5	Centripetal terracing with mulching	no.	179	1256		224824	
6	Stone pitched contour bunds	rm	144	3321		478224	

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
7	Staggered trenches	no.	122	10236		1248792	
8	Strip terracing for rubber/Inward terracing for plantation	no.	191	190		36290	
9	Moisture Conservation pits	no.	122	447		54534	
10	Live fencing	rm	24.5	2332		57134	
11	Sidewall protection of drains (geotextiles)	m2	191	2719		519329	
12	Desiltation of drains	10m3	485.85	157		76278.45	
13	Well recharging	no.	8000	360		2880000	
14	Construction of new well	no.	50000	2		100000	
15	Maintenance of farm pond and lift irrigation of Ammayipalam Rehmatnagr thodu				1200000	0	
	Total			21133	1295000	5691405.45	5650

Puthenkunnu Watershed (27K1w1) - Action Plan

Table 72: Sector-II- Livelihood Support system for landless/ Asset less - 1st Year Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Mushroom cultivation (80-100 bed)	28125	6	168750	11250	67500	101250
2	Cow rearing (mulching)	65000	8	520000	27500	220000	300000
3	Infrastructure development in padasekharam including Block level convergence and establishment of Rice Mills and Par Boiling units	500000	1	500000	250000	250000	250000
	Total					537500	651250

Puthenkunnu Watershed (27K1w1) - Action Plan

Table 73: Sector-II- Livelihood Support system for Landless/ Asset less - 2nd Year Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Backyard poultry unit (5 bird+ cage)	2600	194	504400	800	155200	349200
2	Cow rearing (mulching)	65000	10	650000	27500	275000	375000
3	Goat rearing (female 2)	32000	7	224000	16000	112000	112000

4	Vermicompost unit (30'x8'x2.5')	100000	1	100000	50000	50000	50000
5	Distribution Milking Machines (5 cow unit)	75000	5	375000	25000	125000	250000
	Total					717200	1136200

Puthenkunnu Watershed (27K1w1) - Action Plan

Table 74:Sector-II- Livelihood Support system for Landless/ Asset less - 3rd Year Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Backyard poultry unit (5 bird+ cage)	2600	205	533000	800	164000	369000
2	Cow rearing (mulching)	65000	5	325000	27500	137500	187500
3	Goat rearing (female 2)	32000	7	224000	16000	112000	112000
4	Distribution Milking Machines (5 cow unit)	75000	5	375000	25000	125000	250000
	Total					538500	918500

Puthenkunnu Watershed (27K1w1) - Action Plan

Table 75: Sector-III- Production System- 1st Year Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	2	160000	30000	60000	100000	12000
2	Integrated Farming System (31-40 cents)	100000	2	200000	40000	80000	120000	16000
3	Integrated Farming System (41 cents-2 ha)	120000	2	240000	50000	100000	140000	20000
4	Fallow land cultivation- Paddy	142052	2	284104	40000	80000	204104	16000
5	Fallow land Vegetable Cultivation	149000	1	149000	40000	40000	109000	8000
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passion fruit Cultivation	60000	2	120000	30000	60000	60000	12000
7	Banana cultivation	216000	2	432000	26250	52500	379500	10500
8	Distribution of Coconut seedlings (DxT)/Hybrid	250	284	71000	125	35500	35500	7100
9	Vegetable Cultivation in Grow bags (unit of 25 bags)	2000	20	40000	1500	30000	10000	6000
	Total					538000	1158104	107600

Puthenkunnu Watershed (27K1w1) - Action Plan

Table 76:Sector-III- Production System- 2nd Year Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	3	240000	30000	90000	150000	18000
2	Integrated Farming System (31-40 cents)	100000	3	300000	40000	120000	180000	24000
3	Integrated Farming System (41 cents-2 ha)	120000	2	240000	50000	100000	140000	20000
4	Fallow land cultivation- Paddy	142052	3	426156	40000	120000	306156	24000
5	Fallow land Vegetable Cultivation	149000	1	149000	40000	40000	109000	8000
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passion fruit Cultivation	60000	2	120000	30000	60000	60000	12000
7	Banana cultivation	216000	2	432000	26250	52500	379500	10500
8	Distribution of Coconut seedlings (DxT)/Hybrid	250	280	70000	125	35000	35000	7000
9	Pepper Area expansion	40000	5	200000	20000	100000	100000	20000
	Total					717500	1459656	143500

Puthenkunnu Watershed (27K1w1) - Action Plan

Table 77: Sector-III- Production System- 3rd Year Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Integrated Farming System (5-30 cents)	80000	2	160000	30000	60000	100000	12000
2	Integrated Farming System (31-40 cents)	100000	2	200000	40000	80000	120000	16000
3	Integrated Farming System (41 cents-2 ha)	120000	2	240000	50000	100000	140000	20000
4	Fallow land cultivation- Paddy	142052	2	284104	40000	80000	204104	16000
5	Fallow land Vegetable Cultivation	149000	1	149000	40000	40000	109000	8000
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passion fruit Cultivation	60000	2	120000	30000	60000	60000	12000
7	Banana cultivation	216000	2	432000	26250	52500	379500	10500
8	Distribution of Coconut seedlings (DxT)/Hybrid	250	205	51250	125	25625	25625	5125
9	Pepper Area expansion	40000	2	80000	20000	40000	40000	8000
	Total					538125	1178229	107625

CHAPTER13
MICRO WATERSHED BASED ACTION PLAN
THELAMPATTA MICRO WATERSHED
(27K1z)

Thelampatta micro watershed is the smallest watershed in the PMSKY cluster with an area of 98 ha (4.89 % of total treatable area). This micro watershed is spread over Noolpuzha Panchayath .The Kabani River flows through the center of the watershed.

13.1 General Description

Table 78: General Description of Thelampatta (27K1z) micro watershed

Name of micro watershed	:	Thelampatta
Micro watershed code	:	27k1z
River basin	:	Kabani
District	:	Wayanad
Block Panchayath	:	SulthanBatheri
Grama Panchayath	:	Noolpuzha
Villages	:	Kuppadi, Noolpuzha
Latitude	:	11 ⁰ 39'19.128"N
Longitude	:	76 ⁰ 17'45.733"
Wards	:	Noolpuzha Panchayath - 17
Total Area		98 ha
% of area in the PMKSY cluster	:	4.89

13.2 Socio economic profile

As per the information provided in the baseline survey conducted, Thelampatta micro watershed has a total number of 33 households with a total population of 142. BPL families reside in the micro watershed area. Out of the total population 57 belongs to scheduled tribe and 4 belongs to Scheduled cast. Agriculture is the major source of livelihood in the micro watershed area. Apart from agriculture/horticultural practices, animal husbandry is also a source of livelihood some families in the watershed area. The socio economic details of the Thelampatta micro watershed are given in the table.

Table 79: Socio economic details of Thelampatta micro watershed

1.	Total number of households	33	
2.	Total Population	142	
3.	Population	Scheduled Caste	4
		Scheduled Tribe	57

13.3 Biophysical Resources

13.3.1 Physiography

The majority of the area falls in the relief category of 70 to 100 m above MSL(48.94 %). Other area is located above 150m above MSL.

13.3.2 Slope

The watershed area is divided into five categories of slope classes. The majority of area is under the gentle sloping area having 0-3 % slope. The category spreads over an area of 432.81 ha (42.611 %), 15.52 % of the watershed area is having strongly sloping lands which requires urgent soil and water conservation measures.

13.3.3 Drains

The Kabani River flowing through the south-west portion of the watershed is the major drain of this watershed. Few small drains are originating from different parts of this watershed which drains to Kabani River at the south- west boundary of the watershed. The details of the drains and ponds in the watershed area are given in table 80.

Table 80: Details of Drains in Thelampatta micro watershed

Drains	Length(m)
Thoduvetti thodu	2460.59
Thoduvetti thodu6	796.24
Thoduvettithodu 9	768.91
Thoduvettithodu 10	232.67

13.3.4 Land use

Agriculture is the prime activity in the watershed area. The major land use category mapped in the watershed area is paddy. It occupies an area of 75.67 ha (76.66 %). The second major category is the paddy converted seasonal crops. This is mapped in an area of 9.35 ha. An area of 9.11 ha is under paddy converted to perennial crops.

Table 81: land use categories in Thelampatta micro watershed

Sl. No.	Land use category	Area in ha	Percentage
1	Agricultural Perennial Crop - Mixed Crops	0.48	0.49
2	Agricultural Perennial Crop -Arecanut	0.04	0.04
3	Built Up Land - Residential	0.27	0.27
4	Built Up Land - Road	0.82	0.83
5	Paddy Converted to Built up (Mixed type)	0.31	0.31
6	Paddy Converted to Long Fallow Land	0.49	0.5
7	Paddy Converted to Mixed Crops	0.15	0.15
8	Paddy Converted to Perennial Crops	9.11	9.23
9	Paddy Converted to Residential Built up	0.13	0.14
10	Paddy Converted to Seasonal Crops	9.35	9.47
11	Paddy Cultivating Land (Current Fallow)	0.10	0.11
12	Paddy Cultivating Land (Nancha)	0.96	0.97
13	Paddy Cultivating Land (Nancha+Puncha)	75.67	76.66
14	Waterbody - Lakes/Ponds	0.15	0.15
15	Waterbody - River/Stream	0.66	0.67
	Total	98.71	100.00

13.3.5 Geology

The watershed falls the geological unit of Peninsular Gneissic Complex, has an area of 98.04 ha (99.69.%). There are three geomorphological units in the watershed area. An area of 96.72 ha is mapped under the category valley fill.

13.3.6 Soils

The major soil series mapped in the watershed area is Muttil series .An area of 7.56 ha is under Trikkepatta series. The soil has a surface texture of clayey skeletal to fine loamy. An area of 95.76 ha is under fine loamy. More than 99% of the watershed area (98.04) has very deep soil with a depth of 75- 100 cm. 95.76 ha area of the watershed is prone to slight soil erosion which calls for proper soil and water conservation measures in the area.

13.4 Watershed Committee

Watershed Committee is constituted by Gram Sabha to implement the watershed project with technical support of WDT in the village. Watershed committees are formed at village keeping all parameter of watershed committee keeping the gender sensitive issues

intact. Watershed committee member are briefed about the project objectives and a workshop is also conducted a in this regard at every village. The watershed committee has a pivotal role to play during and after the project implementation period.

13.5 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.

13.6 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.

13.7 Activities proposed

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

Table 82: Details of activities proposed

Entry Point Activities	
1	Fruit tree planting
2	Horticulture nursery
3	Avenue plantation
4	Vegetable cultivation
Natural Resources Management Activities	
1	Paddy cultivation in fallow lands
2	Sidewall protection of drains (geotextiles)
3	Side varambu Earthening of drains
4	Brushwood check dams

5	Check dam using blasted rubble
6	Desiltation of drains
7	Side protection of drains with bamboo planting
8	Rejuvenation of streams of Karayambadi puzha

13.8 Budget

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

Table 83. Budget for Thelampatta micro watershed

No.	Budget component	% age	Amount (in Rs.)
1.	Administrative cost	10	274400
2.	Monitoring & Evaluation	2	54880
Preparatory phase			
3.	Entry point activities	2	54880
4	Detailed Project Report Institution and capacity building	1	27440
5	Institution and capacity building	3	82320
Watershed works phase			
6.	Natural Resource Management	47	1289680
7	Production System	15	411600
8	Natural Resource Management & Governance	2	54880
9	Livelihood activities for asset less persons micro enterprises & Business development	15	411600
10.	Consolidation phase	3	82320
		100	2744000

Thelampatta Watershed (27K1z) - Action Plan

Table 84 Sector-I- Natural Resources Conservation and Management - 1st Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Paddy cultivation in fallow lands	25 cent	15000	1	15000		1500
2	Sidewall protection of drains (geotextiles)	m2	191	87		16617	
3	Side varambu Earthening of drains	m	234	54		12636	
4	Brushwood check dams	rm	316	1		316	
5	Check dam using blasted rubble	no.	13625	1		13625	
6	Desiltation of drains	10m3	485.85	10		4858.5	
7	Side protection of drains with bamboo planting	no.	34.65	50		1732.5	
8	Rejuvenation of streams of Karyambadipuzha				300000	0	
					315000	49785	1500

Thelampatta Watershed (27K1z) - Action Plan

Table 85:Sector-I- Natural Resources Conservation and Management –2nd Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Paddy cultivation in fallow lands	25 cent	15000	2	30000		3000
2	Sidewall protection of drains (geotextiles)	m2	191	174		33234	
3	Side varambu Earthening of drains	M	234	107		25038	
4	Brushwood check dams	Rm	316	2		632	

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
5	Check dam using blasted rubble	no.	13625	1		13625	
6	Desiltation of drains	10m3	485.85	20		9717	
7	Side protection of drains with bamboo planting	no.	34.65	50		1732.5	
8	Rejuvenation of streams of Karyambadipuzha				625000	0	
	Total				655000	83978.5	3000

Thelampatta Watershed (27K1z) - Action Plan

Table 86:Sector-I- Natural Resources Conservation and Management –3rd Year Plan

No.	Activity	Unit	Rate	Volume	PMKSY	Convergence	WDF
1	Paddy cultivation in fallow lands	25 cent	15000	1	15000		1500
2	Sidewall protection of drains (geotextiles)	m2	191	174		33234	
3	Side varambu earthening of drains	M	234	107		25038	
4	Brushwood check dams	Rm	316	2		632	
5	Check dam using blasted rubble	no.	13625	1		13625	
6	Desiltation of drains	10m3	485.85	20		9717	
7	Rejuvenation of streams of Karyambadipuzha				300000		
	Total				315000	82246	1500

Thelampatta Watershed (27K1z) - Action Plan

Table 87:Sector-II- Livelihood Support system for landless/ Asset less - 1st Year Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Mushroom cultivation (80-100 bed)	28125	5	140625	11250	56250	84375
2	Cow rearing (mulching)	65000	2	130000	27500	55000	75000
	Total					111250	159375

Thelampatta Watershed (27K1z) - Action Plan

Table 88:Sector-II- Livelihood Support system for landless/ asset less - 2nd Year Plan

No.	Name of Activity	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Cow rearing (mulching)	65000	2	130000	27500	55000	75000
2	Infrastructure development in Padasekharams including Block level convergence and establishment of Rice Mills and Par Boiling units	500000	1	500000	250000	250000	250000
	Total					305000	325000

Thelampatta Watershed (27K1z) - Action Plan

Table 89: Sector-III- Production System - 3rd Year Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Fallow land cultivation- Paddy	142052	3	426156	40000	120000	306156	24000
2	Distribution of Coconut seedlings (DxT)/Hybrid	250	30	7500	125	3750	3750	750
	Total					123750	309906	24750

Thelampatta Watershed (27K1z) - Action Plan

Table 90:Sector-III- Production System - Year 2 Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Fallow land cultivation- Paddy	142052	4	568208	40000	160000	408208	32000
2	Distribution of Coconut seedlings (DxT)/Hybrid	250	30	7500	125	3750	3750	750
	Total					163750	411958	32750

Thelampatta Watershed (27K1z) - Action Plan

Table 91: Sector-III- Production System - 3rd Year Plan

Sl. No	Project	Unit cost/Nos	Area/ Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	Fallow land cultivation- Paddy	142052	3	426156	40000	120000	306156	24000
2	Distribution of Coconut seedlings (DxT)/Hybrid	250	30	7500	125	3750	3750	750
	Total					123750	309906	24750

CHAPTER 14

WATERSHED WORKPHASE- ACTIVITIES SUGGESTED

Watershed work phase is the core component of the project. Creating permanent structures as required the slope, geology and topography starting from ridge to valley to conserve rain water at point of its incidence with ground. 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 approached towards implementation of watershed development projects. A net budget of 56 percent is allotted for this work.

14.1 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.

This 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, under 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, and bio fuel plantation etc.

14.2 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 to see the geographical 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 in PMKSY-1 watershed. For the ridge area treatment of PMKSY-1 watersheds, following structure are been proposed after interaction between the watershed committee, Neighbour Hood Groups, Grama Panchayats, Block Panchayath and other field staff of line departments and WDT engineer.

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

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 high rainfall areas and regions where the [clay] soil is relatively impervious. 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 with arranging loose boulder perpendicular to the flow of water is called gully plug.



Benefits:

1. Prevents soil erosion of land and reduces the flow of water and further prevents the formation of new streams.
2. Very useful in moisture conservation and reduces the scorching and 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 containing runoff for a longer period of time within the trench. It is also true that if trenches were not to follow a contour, such digging could actually increase the possibility of soil erosion because there would be a rise in the velocity of runoff following an increase in the slope of the land.



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 flatter 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 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 in-creasing 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 containing 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, blinds also collect the rainwater that falls in the ridge area. This way the soil moisture profile in the area adjacent to the blind is improved. Along with the water, eroded fertile topsoil also gets deposited in the blind. It is, therefore, important to combine contour blinding 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

Following structures are been proposed in these areas

- a. Land Leveling
- 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. The processes of soil erosion (detachability and transportability) will continue resulting fluctuating crop fields. 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. increasing the capacity to retain water
- 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.

Farm Bunds: Bunding, also called a bund wall, is the area within a structure designed to prevent inundation or breaches of various types. 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:

These are at field level of farmers where farmers are operating at a very high labour intensive way. These generally field bunding, crop pattern alteration. 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 two 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 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.

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.

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 Neighborhood 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 Kabani River tributaries 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.

14.3 Budget

The distribution of budget under the natural resources management activities for different micro watersheds as per WDC-PMKSY 2.0 guidelines is given below:

Table 92: Budget for Natural Resource Management activities

No.	Name of micro watershed	Treatable Area (ha)	Amount in Rs.
1	27K1aa	972	12791520
2	27K1v	509	6698440
3	27K1w1	427	5619320
4	27K1z	98	1289680
	Total	2006	26398960

14.4 Major interventions suggested

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

Table:93 Major Interventions suggested

1	Avenue planting
2	Cultivation of horticultural crops in wastelands
3	Intercropping in coconut plantations
4	Fruit tree planting (Jack fruit, rambutan, mango)
5	Pachathuruthu
6	Medicinal plants in public institutions
7	Earthen bunds
8	Centripetal terracing with mulching
9	Stone pitched contour bunds
10	Staggered trenches
11	Strip terracing for rubber/Inward terracing for plantation
12	Moisture Conservation pits
13	Live fencing
14	Gully plugs
15	Brushwood check dams
16	Check dam using blasted rubble
17	Sidewall protection of drains (geotextiles)

18	Desiltation of drains
19	Side protection of drains with bamboo planting
20	Construction of farm ponds with geotextiles
21	Well recharging
22	Construction of new well
23	Lift irrigation scheme at Erlot padasekaram from ThankappanKulam
24	Lift irrigation scheme at Bicharam Pond
25	Check dam at convergence of Chitralanagarathodu & Erlotkunnuthodu
26	Two Check dam construction(up and down stream) in Thervayal thodu and sidewall construction
27	Implementation of lift irrigation schemes for Mannorkunnu upland
28	Channel construction for Mannorkunnu Padasekharam
29	Side wall construction till 200m Ammayipalam RehmatnagarThodu
30	Maintenance of farm pond and lift irrigation of Ammayipalam Rehmathnagar Thodu
31	Side wall protection of Chittoor Puzha
32	Conservation of Mullanchira
33	Check dam construction in Nochanvayal Thodu
34	Lift irrigation in Chitturpuzha for Chittur padasekaram
35	Rejuvenation of streams of Karayambadi puzha

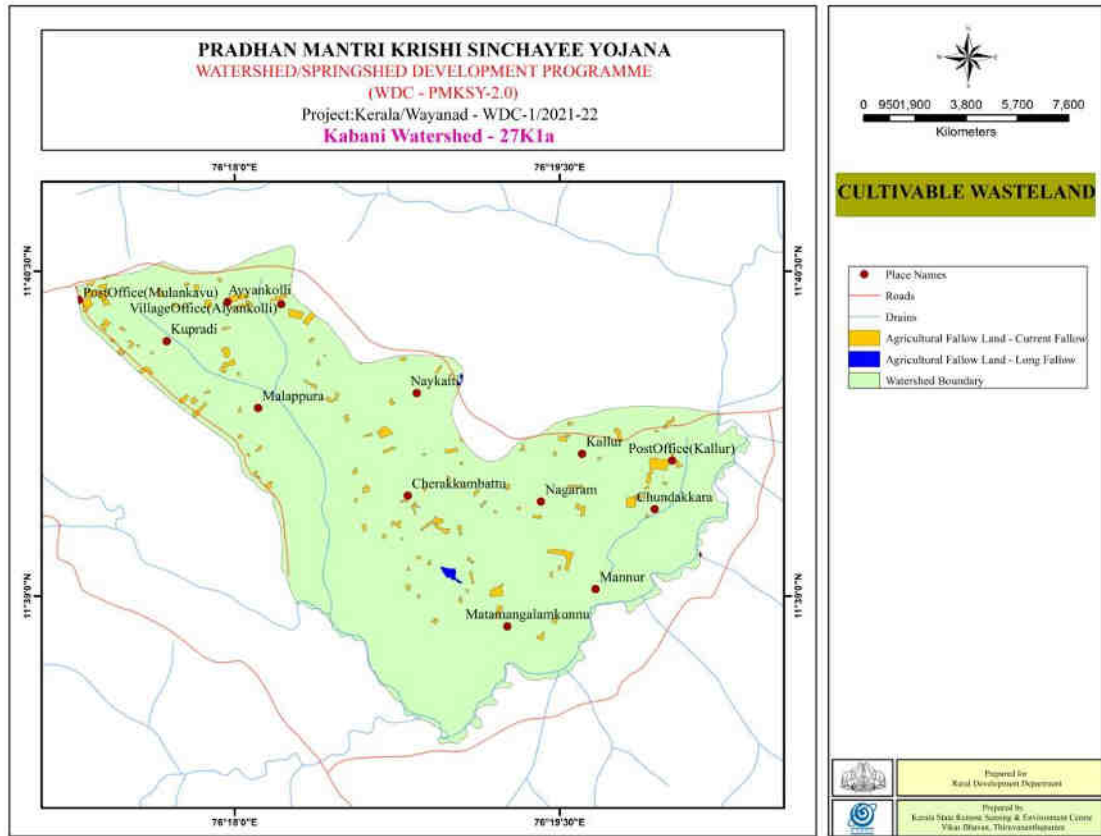


Fig.18 Cultivable wasteland(27K1aa)

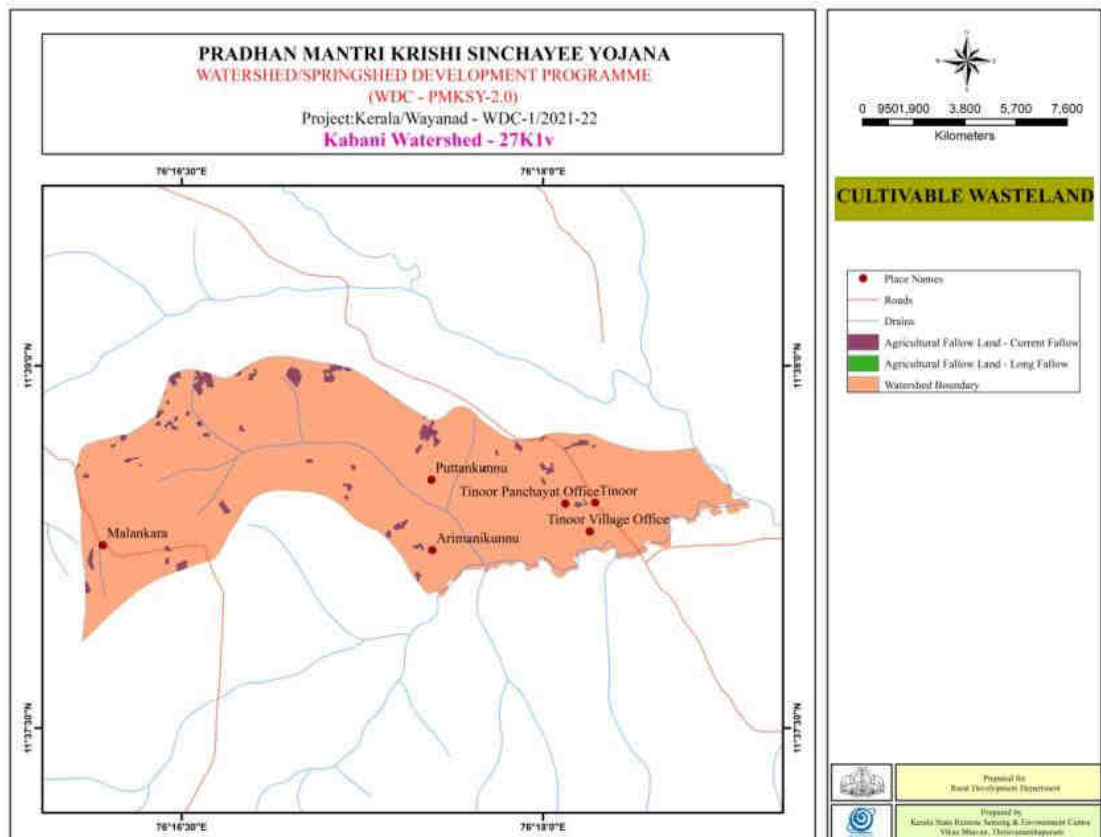


Fig. 19 Cultivable wasteland(27K1v)

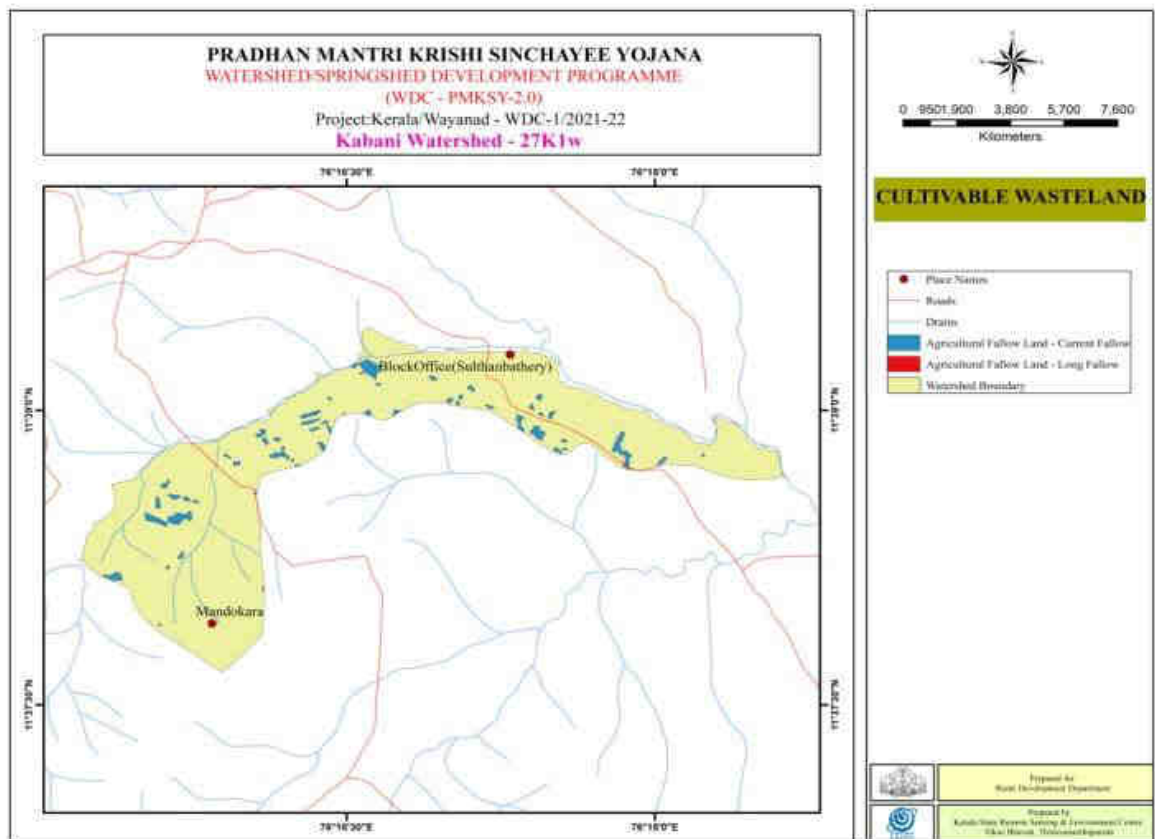


Fig.20 Cultivable wasteland(27K1w1)

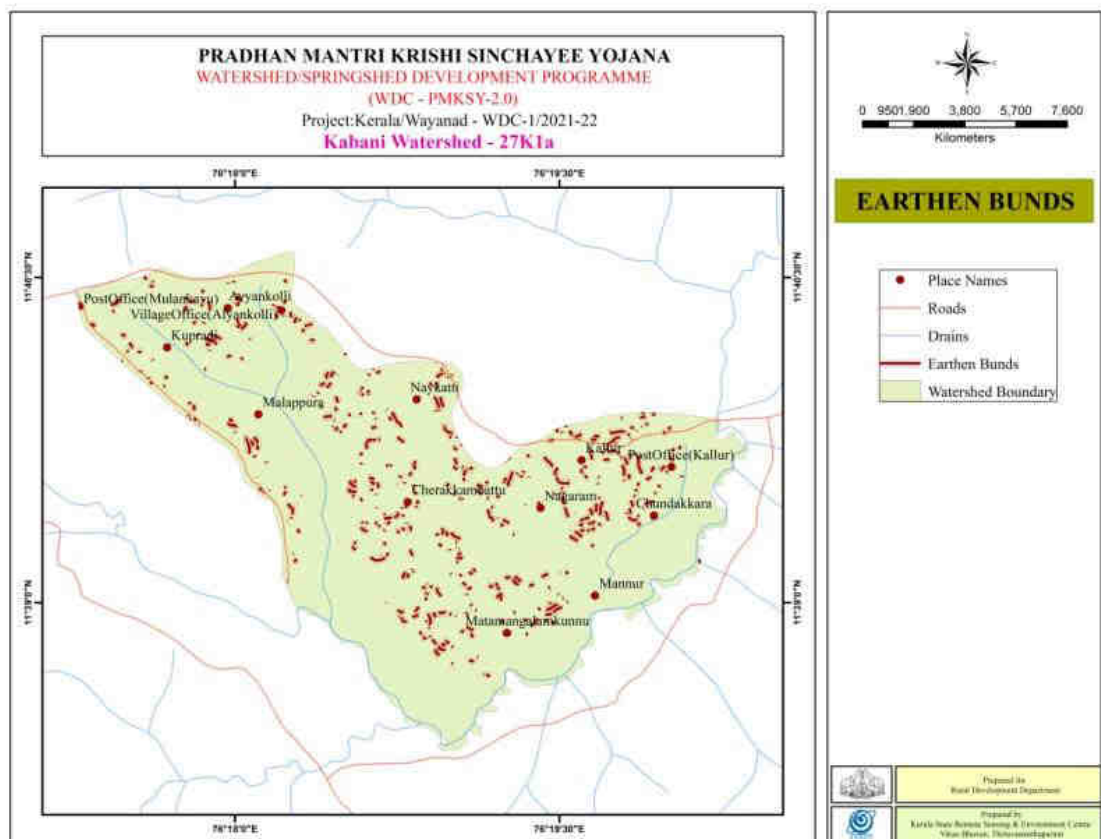


Fig. 21 Earthen bunds(27K1aa)

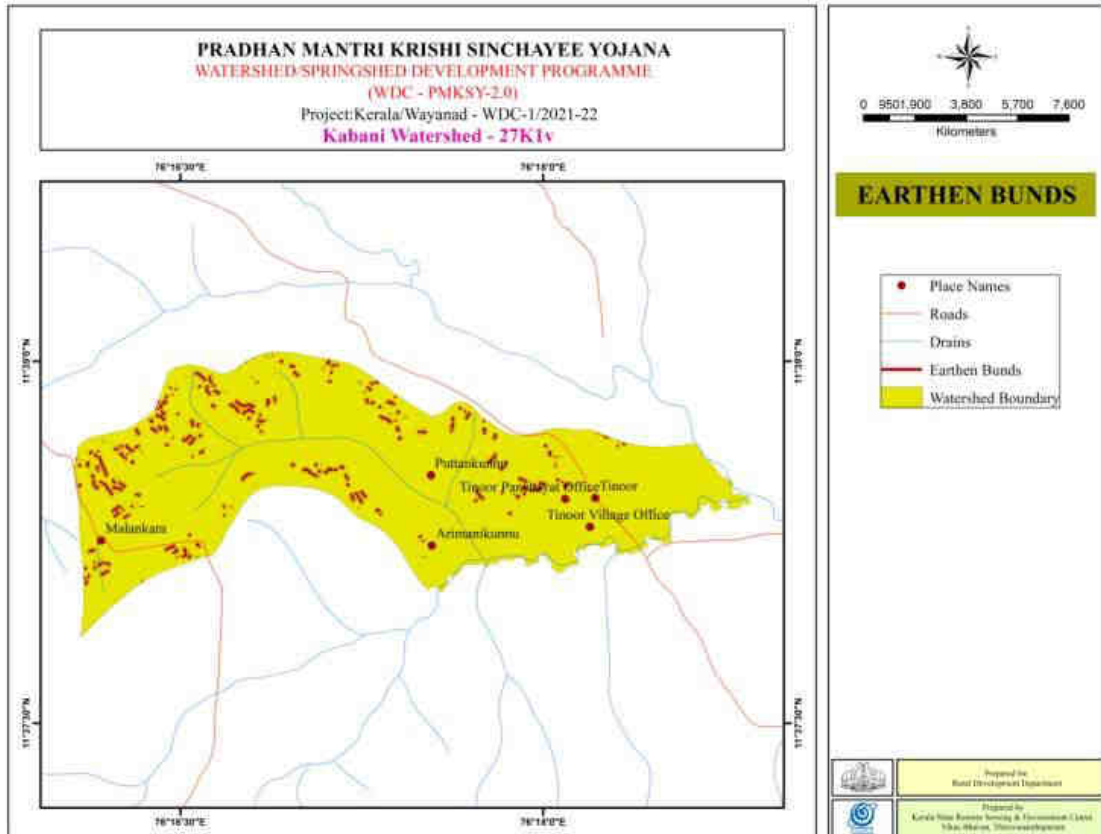


Fig.22 Earthen bunds(27K1v)

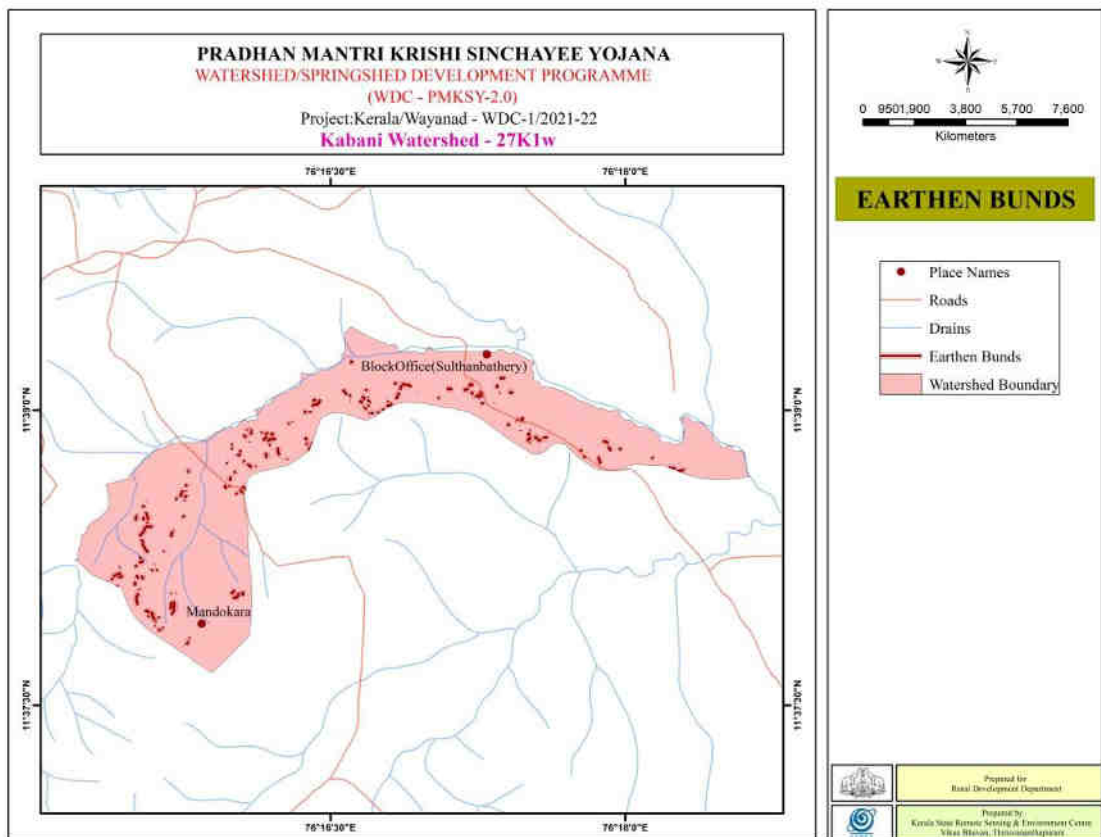


Fig. 23 Earthen bunds(27K1w1)

CHAPTER 15

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. 15% 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.

15.1 Guiding Principles

Livelihood improvement initiative emphasizes on natural resource based activities and conforms to principles of equity, gender sensitivity and transparency. It strive 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/Asset less people, women, etc., to the benefits.
- c. Select the beneficiaries in a transparent manner.

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

15.2 Planning and Implementation

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

15.3 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.

15.4 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 budget component of the project cost earmarked for institution and capacity building.

15.5 Budget

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

Table:94 Budget for livelihood activities

No.	Name of micro watershed	Amount in Rs.
1	27K1aa (Mathamangalam)	4082400
2	27K1v(Nambikolli)	2137800
3	27K1w1(Puthenkunnu)	1793400
4	27K1z (Thelampatta)	411600
	Total	8425200

15.6 Major interventions suggested

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

Table.95 :Major Intervention Suggested

1	Bee Keeping
2	Milk Processing Unit
3	Mushroom cultivation (80-100 bed)
4	Tapioca/Jack Processing Unit
5	Retail Market/Outlet Environmentally controlled
6	Cow rearing (mulching)
7	Infrastructure development in padasekharam including Block level convergence and establishment of Rice Mills and Par Boiling units
8	Spices processing Unit
9	Minimal fruit and vegetable Processing unit
10	Backyard poultry unit (5 bird+ cage)
11	Trichoderma Enriched cow dung production unit
12	Goat rearing (female 2)
13	Distribution Milking Machines (5 cow unit)
14	Infrastructure development in padasekharam including Block level convergence and establishment of Rice Mills and Par Boiling units

CHAPTER 16

PRODUCTION SYSTEM

One of the important components in the watershed development activities under WDC-PMKSY 2.0 includes support to production/farming system based livelihood activities and enterprises. 15% 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.

16.1 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.

16.2 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 organized 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.

16.3 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.

16.4 Budget

The distribution of budget under the production system for different micro watersheds as per PMKSY guidelines is given below:

Table 96: Budget for Production System

No.	Name of micro watershed	Amount in Rs.
1	27K1aa (Mathamangalam)	4082400
2	27K1v(Nambikolli)	2137800

3	27K1w1(Puthenkunnu)	1793400
4	27K1z (Thelampatta)	411600
	Total	8425200

16.5 Major interventions suggested

The major interventions suggested under the Production System are the following:

Table: 97 Major Intervention Suggested

1	Integrated Farming System (5-30 cents)
2	Integrated Farming System (31-40 cents)
3	Integrated Farming System (41 cents-2 ha)
4	Fallow land cultivation- Paddy
5	Fallow land Vegetable Cultivation
6	Rambutan/ Mango/Jack fruit/ Mangosteen/Passion fruit Cultivation
7	Banana cultivation
8	Vegetable Cultivation in Grow bags
9	Distribution of Coconut seedlings (DxT)/Hybrid
10	Small nursery (0.5 acre)
11	Pepper Area Expansion

CHAPTER 17

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

Table 98: Training Plan

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 management • 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 PMKSY
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,
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	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 Panchayath 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 PMKSY
Training Objectives	The need for watershed based development programs, concepts involved in watershed development, PMKSY 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 PMKSY • Projects involved in the programs • Scope of the project. • Role and responsibilities. • 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

	<ul style="list-style-type: none"> • 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 PMKSY
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.
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

	<ul style="list-style-type: none"> 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 PMKSY
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 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 PMKSY
Training Objectives	To orient the participants on operational guidelines for Watershed Committees in PMKSY
Coverage/ topic	<ul style="list-style-type: none"> Leadership

	<ul style="list-style-type: none"> • 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 PMKSY for effective implementation of the project and proper maintenance of records.

Programme No. 12

Title of the Programme	Awareness programme on production system (PS)a, Micro Enterprises (ME) 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 per capita income, attain self sustainability etc.

Programme No. 13

Title of the Programme	Develop action plan for PS, ME 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.
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Programme No. 15

Title of the Programme	Training of Trainers (ToT) in PMKSY
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. Food processing 9. Storage & Marketting 10. Value addition 11. Livelihood 12. Entrepreneurship development
Training Objectives	To provide skills and techniques of various activities
Coverage/ topic	<ul style="list-style-type: none"> • Organic Vegetable cultivation • 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.

Table:99 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- KILA (SIRD-KILA)	Director SIRD-KILA, 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	National Centre for Earth Science Studies (N-CESS)	Director NCESS, 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	Kerala State Remote Sensing & Environment Centre (KSREC)	Director KSREC Vikas Bhavan, Tvpm – 33	Government	Remote Sensing &GIS, Spatial mapping, Information System
8	Tropical Botanical Garden and Research Institute (TBGRI)	Director TBGRI, Palode, Kottayam	Government	Bio diversity Eco restoration
9	Social Conservation	Additional Director of soil	Government	Various soil and water conservation

	Training Institute under the soil conservation dept.	Conservation, Kottayam		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, Thiruvananthapuram	Government	Resource Mapping, Watershed Management, GIS etc.
13	Institute of Management in Government (IMG)	Director IMG Trivandrum	Government	Administration

CHAPTER 18

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 Grama Panchayats of Sulthan Bathery block under the WDC-PMKSY 2.0. 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.

1. 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 activities for self-employed, wage labour and income generating 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.

2. Expected migration

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.

3. Ground water table

In the presence scenario the ground water level of open wells varies from 3 meter to 5 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 1 to 2 meter.

4. 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 Jal Jeevan Mission will increase the ground water table so that the expected status of drinking water will increase.

5. Expected Crops 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.

6. 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 the entire household engaged in the horticulture activities. There will be significant increase in the area covered under horticulture.

7. Livestock

Mulch-animals include cow and buffalo in the project area. Productivity of the cow is 3 liters per day where as 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.

8. 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.

Table 100

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 Rising	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
	Storage centre	Post harvest handling of fruits and vegetables
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

Table 101:Pre-Intervention and Expected Post Interventions 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, especially fruit crops, 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	All the cultivated lands will be

	prevalent in the water shed area at present	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 PMKSY 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.

CHAPTER 19

NATURAL RESOURCES MANAGEMENT AND GOVERNANCE PLANS

a) Maintenance of natural resources related assets

Natural resources related physical works need maintenance, and the bio-works such as plantation require strong protection measures and care. The watershed committee responsible for under taking treatment works and asset creation should maintain a Watershed Assets Register, and the list of completed works recorded and updated continuously. The completed assets should be transferred to the Gram Panchayat for their continued maintenance at the end of each year of implementation. A system of annual audit of natural resource assets should be taken up by the GP to assess their status and maintenance needs. These can be integrated in to the MGNREGS by a resolution of the Gram Panchayats. The WDT should ensure that these processes are institutionalized into the functioning of Gram Panchayat and followed regularly from 2nd year onwards. The activities planned to achieve this should be submitted as a part of the overall Project development plan. Various types of engineering structures & biological interventions like water harvesting structures such as checkdams, *nalabunds*, diversion drains, percolation tanks, vented dams, farms ponds, artificial recharge structures, equipment for natural resource governance, specific interventions for spring rejuvenation etc., created in the watershed are prone to damages by stray cattle, rain, sunshine, wind and unexpected natural calamities. Over the period there can also be natural damage or there may be need for its renovation for better results. There may be need strengthen or rejuvenate biological activities like block plantations pastures etc. In such cases, if the assets exist on common properties, resources from WDF may be accessed. Expenditure can be incurred also on assets built on private land but serve the community, and an agreement to this effect has been created between the WC and the land owner, and this has been shared with the GP.

b) Water Budgeting, Management/Regulatory Norms and Governance

It is crucial for the community to establish reference sites of wells/ bore wells, and regularly monitor groundwater along with local rainfall, so as to arrive at regulatory norms on water extraction, type of crops to be grown and area coverage. The groundwater monitoring exercise may be taken up twice a year (April-May & September-October /before the crop season), and results be placed after analysis, before the Gram Sabha. The purpose should be to build a common understanding and consensus in the project community for sustainable

use of groundwater. The community should be brought to agree on potential restrictions on new extraction structures, reducing area under water intensive crops and other such norms that economies on water use. These exercises are to be taken up twice a year and activities proposed should be part of the watershed development plan. A suitable arrangement for carrying out this exercise should be made by PIA in consultation with Watershed Committee and also provide requisite training for the same.

Protection and Regulation/Regeneration of Common Lands

Common lands that are typically in the upper reaches of the watershed slopes, including forests, pastures etc. should receive focused attention, along with identification of users, their needs and organizing them into user groups. The plan for regeneration and development should also enlist various products, usufructs arising out of the planned regeneration process, and their benefit sharing norms. Protection measures, norms and their enforcement mechanisms need to be arrived at and must have sanction of the Gram Panchayat.

Appropriate Technology Centres (ATCs)

It is proposed to set up **Appropriate Technology Centres (ATCs)** that could function more like dedicated cells (or more like special purpose vehicles – SPVs) within the project area. ATCs would function as the technology arm of the WC and PIA and work under their They could also be a registered institution, thereby functioning as legal entities. This will open up opportunities to integrate appropriate technology with gender sensitivity, convergence, environment friendliness, transparency etc. The functions of ATCs could include (i) awareness building and sensitization about appropriate technologies: their need, scope, benefits, etc., (ii) piloting and demonstration of various appropriate technology options in different areas, (iii) provision of various technology services and implementation of projects on a turnkey basis, (iii) taking up repairs and maintenance and (iv) trainings and handholding of technology applications. In order to improve the efficiency, Each ATC can have about 5-6 members. It is important that the members together should have the capabilities in terms of skill base to perform the above-mentioned functions covering all the areas mentioned above. In short, they should be multi-skilled groups. Capacity building of the members would be very crucial most of the appropriate technology options would be new to them. Since the selected members would already have a bit of technology bent it would be easy for them to absorb the technologies easily. The ATCs need to function in a professional manner and cannot be based on voluntarism. This would require a work station

in the form of a space with adequate infrastructural facilities and instrumentation. The space required to create this facility can be made available by the PIA. If so, then as per very rough estimation, the capital cost required would be about Rs.15 lakh per centre. This would include the cost of the establishing the workshop facility, and basic instrumentation and allied facilities. Each ATC would require about Rs.2 lakh as working capital. An appropriate cost estimate will have to be worked out considering the deployment requirement of ATCs over the years to reach all the GPs and ULBs. The working capital could be raised by the ATCs through different ways including bank especially cooperative bank loans, CSR funds, inviting the public (the members of ATCs who can invest, SHGs and Kudumbashree units from the concerned LSG, and also the wider public), to invest with an assured interest or return on investment that can match and/or 1 or 2% higher than the interest fetched by term deposits. User fees appropriately charged can be another source of revenue for the ATCs. Also, the funds earmarked for technology support for various development programmes and schemes like watershed development, renewable energy programmes, etc., can be also made available to the ATCs. With ATCs in place, it has a potential of creating green jobs or self-employment. The number can increase with more and more activities taken up by the ATCs. The members of the ATCs can be drawn from a large catchment including the Kudumbashree units, landless and agricultural labourers, workers from other informal sectors like construction and also from the Gulf returnees. It is estimated that nearly 8 lakh people have come back from the Gulf after the outbreak of the pandemic. Of this, at least 1 to 2 lakh would stay back in Kerala and would require some employment. These are people with different skill sets and the ATCs should be able to tap into this huge skilled human resource. Probably they can also make investments into the ATCs (as part of the running costs as discussed above) as most of them would have some savings. The experience of Integrated Rural Technology Centre (IRTC) at Mundur, Palakkad and such other institutions at present can provide valuable lessons in the functioning of ATCs. If the ATCs need to succeed then they would require handholding support throughout. For this we propose setting up Support center's (SCs) at block level which will seek expert inputs from nearest engineering/agricultural colleges and such other technical institutions. The functions of the SCs could be (i) dissemination of Information, Education and Communication (IEC) material related to appropriate technologies that could be used for awareness building (ii) assessment of the feasibility and relevance of suggested alternative technologies (iii) capacity building of the ATC members in various appropriate technologies and this would also include identification of other resource persons/institutions who can provide specialised

training in a particular field and lining up the same, (iv) monitoring and periodic evaluations to see that the ATCs function within the agreed upon criteria of alternative technologies, examine quality of work, etc., (v) suggest ways to strengthen the functioning of ATCs including its financial matters (for example suggest sources from where the ATCs can source financial resources for the running cost) and (vi) facilitate bulk purchase of materials, tools and equipment for the ATCs. The SCs can be housed in the block level office of one of the related line departments (agriculture, PWD, Water Resources, etc.) The SC team could include persons from related departments, educational institutions (Industrial Training Institutes, polytechnics, engineering colleges, regular colleges, science teachers), NGOs including Parishad units, etc. The costs would be mainly in the form of running costs – compensation for the time spent, travel, etc. There would not be capital costs as the SCs would be housed in the premises of one of the line departments. There could be various ways to meet the running costs like: small grant by the state government, CSR money, and a portion of the funds earmarked for the technology component of various development programmes and schemes, user fees form the ATCs, etc. The SC and ATC can merge with a conventional institutional arrangement as the PIA or WDT, thereby reducing the institutional complexities to a large extent.

Table 102: Budget

Sl.No	Activity	No	Unitcost	Amount
1	Geospatial Resource Information System	1	500000	500000
2	Automatic weather stations for local predictions	2	100000	200000
3	Establishment of observation wells and data collection using mobile app	1	100000	100000
4	Water Budgeting	2	100000	200000
5	Installation of scales in selected ponds and establishment of observation	1	100000	100000
				1100000

CHAPTER 20

CONSOLIDATION AND WITHDRAWAL

The last one year is 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 wll 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.

Table: 102 Monitoring Activity

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	Goal Oriented	Specified monitoring team

		from second year onwards.		formed by WCDC, External Monitoring team by PIA
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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 Panchayath 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 conduct 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 finalised in the Gram Sabha.
14. The Watershed Committee may collect financial assistance from any other sources to augment the WDF. All donations, interests, fines and fees shall be deposited in the WDF.
15. The WDF shall be jointly operated by the Chairman and Secretary of the watershed committee.
16. All the expenditure shall be authenticated by the Watershed committee.
17. Annual 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 Panchayath.

CHAPTER 21

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 PMKSY-WDC project of Nemom. 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 Panchayath and other existing political or non political 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.

KERALA STATE REMOTE SENSING & ENVIRONMENT CENTRE

Under the aegis of National Natural Resources Management System (NNRMS), Kerala State Remote Sensing & Environment Centre (KSREC) was established in 1995 by Government of Kerala as an autonomous body under Planning and Economic Affairs Department for carrying out research, training and other related activities in the field of Remote Sensing and GIS applications. KSREC is a

- Facility provider in Space Application and GIS
- Technology Developer
- Facilitator for transferring of Technology to Grass root level.
- Support provider to various developmental sectors in developing comprehensive multipurpose geospatial database.

1. KSREC provides services in the field of

- **Remote Sensing Applications:** For inventory mapping, developmental planning and monitoring of natural resources, environmental issues of resources.
- **GIS:** conceptualizing, creating and organizing multipurpose common digital database and for preparing sectoral/need based decision support system.
- **Software Development:** For wider usage of geospatial applications and to provide decision support systems to the administrators and users at low cost.

2. Functions of the Centre

- Build up a firm database on natural resources and other related information for local and regional level utilizing the Remote Sensing Technology as well as the existing data from conventional method.
- Temporal monitoring of Land use/ land cover and waste land mapping – Change detection, damage detection, assessment etc.
- Preparation of optimum Land use plan for the State, District, Region and Urban areas.
- Analysis of landforms, their effect on ground water availability, landform changes and causes, landslips/slides, littoral changes, tectonics and neo-tectonism.
- To carryout environmental impact assessment studies.
- Flood mapping, damage assessment and disaster management studies.

- Conduct studies in industrial development, impact on land use and landscape quality. Location optimization studies in relation to raw material, power and potential land use.
- Conduct training courses to the officers and staff of Government Departments and other agencies in the application of the Remote Sensing in the fields of land, water and environment management
- Development of a Marine Resource Information System.
- Take up analytical and research studies in collaboration with other departments and agencies.
- Establish and maintain a library of books, periodicals and other documents relating to the subjects of interest to the functioning of the centre
- Establish a digital spatial data base on natural resources of the State and develop information systems to help planning and decision making
- To conduct awareness campaign on environmental issues



**KERALA STATE REMOTE SENSING AND ENVIRONMENT CENTRE
PLANNING AND ECONOMIC AFFAIRS DEPARTMENT
VIKAS BHAVAN , THIRUVANANTHAPURAM**

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