Study Team

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## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF TABLES</td>
<td>iv</td>
</tr>
<tr>
<td>ABBREVIATIONS</td>
<td>vi</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>THE PROJECT AREA</td>
<td>6</td>
</tr>
<tr>
<td>INSTITUTION BUILDING AND PROJECT MANAGEMENT</td>
<td>36</td>
</tr>
<tr>
<td>MICRO WATERSHEDS IN THE PROJECT AREA</td>
<td>38</td>
</tr>
<tr>
<td>PROBLEMS TO BE ADDRESSED</td>
<td>46</td>
</tr>
<tr>
<td>WATERSHED INTERVENTIONS</td>
<td>49</td>
</tr>
<tr>
<td>DETAILED ACTION PLAN</td>
<td>60</td>
</tr>
<tr>
<td>EXPECTED OUTCOME</td>
<td>66</td>
</tr>
<tr>
<td>WATERSHED DEVELOPMENT FUND &amp; EXIT PROTOCOL</td>
<td>68</td>
</tr>
</tbody>
</table>

**APPENDIX**

I - DETAILED ESTIMATE

II - MAP
LIST OF TABLES

Table 1.1 Project Background of IWMP II/2012-13
Table 1.2 Financial Allocation
Table 2.1 Basic project information
Table 2.2 Details of the selected watersheds in the project area
Table 2.3 Criteria and Weightage for the Selection of Watershed
Table 2.4 Weightage under different criteria
Table 2.5 Physiography, Relief and Drainage of the Project Area
Table 2.6 Annual Rainfall from 1997 to 2010
Table 2.7 Monthly Mean Temperature during 2002 - 2011(°C)
Table 2.8 Wind Speed
Table 2.9 Genesis of Geo-morphology
Table 2.10 Ground Water Resource of Pulikeezhu Block as on 31st December 2004
Table 2.11 Depth of Ground Water Level Range in Meters Below Ground Level(mbgl)
Table 2.12 Number of Water Sources in the Project Area
Table 2.13 Water availability in private wells
Table 2.14 Agro-ecological situation of the project area
Table 2.15 Details of the population in the project area
Table 2.16 Age distribution of population in the project area
Table 2.17 Number of households in the project area
Table 2.18 Social Classification of Households in the Project Area and Literacy Rate
Table 2.19 Poverty status of households
Table 2.20 Main source of income of households in the project area
Table 2.21 Details about the landless households in the project area
Table 2.22 Details of Land Owned by Farmers in the Microwatersheds in the Project Area
Table 2.23 Proportion of households with electric connection
Table 2.24 Main fuel for cooking in the households
Table 2.25 Toilet facility in the households in the project area
Table 2.26 Membership in Self Help Groups
Table 2.27 Main source of drinking water in the households in the project area
Table 2.28  Quality of water from Pulikeezhu tube well  26
Table 2.29  Drainages in the Project Area  26
Table 2.30  Number of Perennial and Seasonal Drainages in the Project Area  27
Table: 2.31  Number of Ponds and Water Storage Capacity in Cubic Metres  28
Table: 2.32  Length of Roads (in Km)  28
Table: 2.33  Details of Cultivable Wasteland in the Project Area  29
Table 2.34  Details of livestock and poultry in the project area  29
Table 2.35  Educational Institutions in the Project Area  29
Table 2.36  Medical Facilities in the Project Area  30
Table 2.37  Infrastructure in the project area  30
Table 2.38  Present land use pattern in micro watershed  31
Table 2.39  Major ongoing and completed schemes in the project area  31
Table 2.40  SWOT Analysis  34
Table 3.1  Details of Project Implementation Agency (PIA)  36
Table 3.2  Details of Watershed Development Team (WDT)  37
Table 3.3  Dates of Neerthada Gramasabha  37
Table 3.4  Implementation phases of IWMP  38
Table 4.1  Location and extent of Watersheds  41
Table 4.2  Characteristics of Micro Watersheds coming under IWMP II / 2012-13  42
Table 4.3  Area of Land under various Crops in Micro Watersheds (ha)  42
Table 4.4  Plant species in micro watersheds  43
Table 4.5  Medicinal plants in micro watersheds  45
Table 6.1  Entry Point Activities – Location and Estimate  51
Table 7.1  Annual Action Plan – Institution and Capacity Building  60
Table 7.2  Annual Action Plan – Natural Resource Management  61
Table 7.3  Annual Action Plan – Production System & Micro-enterprises  62
Table 7.4  Financial Plan for Livelihood Activities  63
Table 7.5  Action Plan for Major Livelihood Activities  64
Table 7.6  Annual Action Plan – Livelihood (Seed Money)  64
Table 8.1  Expected Outcomes  66
Table 9.1  Project at a glance  72

ABBREVIATIONS

V
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APL</td>
<td>Above Poverty Line</td>
</tr>
<tr>
<td>AAP</td>
<td>Annual Action Plan</td>
</tr>
<tr>
<td>BLCC</td>
<td>Block Level Co-ordination Committee</td>
</tr>
<tr>
<td>BPL</td>
<td>Below Poverty Line</td>
</tr>
<tr>
<td>BRGF</td>
<td>Backward Regions Grant Fund</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CSES</td>
<td>Centre for Socio-economic and Environmental Studies</td>
</tr>
<tr>
<td>DLCC</td>
<td>District Level Co-ordination Committee</td>
</tr>
<tr>
<td>DPC</td>
<td>District Planning Committee</td>
</tr>
<tr>
<td>DPR</td>
<td>Detailed Project Report</td>
</tr>
<tr>
<td>EPA</td>
<td>Entry Point Activities</td>
</tr>
<tr>
<td>FGD</td>
<td>Focus Group Discussion</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GP</td>
<td>Grama Panchayat</td>
</tr>
<tr>
<td>GW</td>
<td>Ground Water</td>
</tr>
<tr>
<td>IEC</td>
<td>Information, Education and Communication</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>IWMP</td>
<td>Integrated Watershed Management Programme</td>
</tr>
<tr>
<td>LFA</td>
<td>Logical Framework Analysis</td>
</tr>
<tr>
<td>LSGD</td>
<td>Local Self Government Department</td>
</tr>
<tr>
<td>LSGI</td>
<td>Local Self Government Institutions</td>
</tr>
<tr>
<td>LSS</td>
<td>Livelihood Support System</td>
</tr>
<tr>
<td>MCM</td>
<td>Million Cubic Meters</td>
</tr>
<tr>
<td>MGNREGA</td>
<td>Mahatma Gandhi National Rural Employment Guarantee Act</td>
</tr>
<tr>
<td>MLA LAD</td>
<td>Member of Legislative Assembly Local Area Development scheme</td>
</tr>
<tr>
<td>MoU</td>
<td>Memorandum of Understanding</td>
</tr>
</tbody>
</table>

vi
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPLAD</td>
<td>Member of Parliament Local Area Development</td>
</tr>
<tr>
<td>MSL</td>
<td>Mean Sea Level</td>
</tr>
<tr>
<td>NABARD</td>
<td>National Bank for Agriculture and Rural Development</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>NRAA</td>
<td>National Rainfed Areas Authority</td>
</tr>
<tr>
<td>NRHM</td>
<td>National Rural Health Mission</td>
</tr>
<tr>
<td>NRM</td>
<td>Natural Resource Management</td>
</tr>
<tr>
<td>OBC</td>
<td>Other Backward Caste</td>
</tr>
<tr>
<td>PIA</td>
<td>Project Implementing Agency</td>
</tr>
<tr>
<td>PRA</td>
<td>Participatory Rural Appraisal</td>
</tr>
<tr>
<td>PRIs</td>
<td>Panchayati Raj Institutions</td>
</tr>
<tr>
<td>PS&amp;M</td>
<td>Production System and Microenterprises</td>
</tr>
<tr>
<td>SC</td>
<td>Scheduled Caste</td>
</tr>
<tr>
<td>SHG</td>
<td>Self Help Group</td>
</tr>
<tr>
<td>SLNA</td>
<td>State Level Nodal Agency</td>
</tr>
<tr>
<td>SPSP</td>
<td>State Perspective and Strategic Plan</td>
</tr>
<tr>
<td>ST</td>
<td>Scheduled Tribe</td>
</tr>
<tr>
<td>TSO</td>
<td>Technical Support Organisation</td>
</tr>
<tr>
<td>UG</td>
<td>User Group</td>
</tr>
<tr>
<td>VEO</td>
<td>Village Extension Officer</td>
</tr>
<tr>
<td>WC</td>
<td>Watershed Committee</td>
</tr>
<tr>
<td>WCC</td>
<td>Watershed Co-ordination Committee</td>
</tr>
<tr>
<td>WCDC</td>
<td>Watershed Cell cum Data Centre</td>
</tr>
<tr>
<td>WDT</td>
<td>Watershed Development Team</td>
</tr>
<tr>
<td>WW</td>
<td>Women Welfare</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

The Integrated Watershed Management Programme (IWMP), initiated by the Ministry of Rural Development (MoRD), Government of India, is a unique watershed programme calling for multidisciplinary approach to natural resource management for ensuring continuous benefit on a sustainable basis. Watershed Management brings about the best possible balance between natural resources on the one side and human beings on the other. IWMP not only helps in land, water and biomass management of degraded areas but also in the conservation of the protected areas so that biodiversity and genetic resources are available for future generations. The programme is implemented through Panchayati Raj Institutions thereby ensuring people’s participation in different stages such as planning, implementation, monitoring, evaluation and post project activities.

1.1 Project Background

IWMP II/2012-13 Pulikeezhu watershed project is located in Pulikeezhu Block Panchayat of Pathanamthitta district. The project comprises of five micro-watersheds namely Ayyankonari (10P8a), Parumala (10P9a), Keecherivalkadavu (10P10a), Chathenkery Kadavu (11M19a) and Podiyadi Puthanthodu (11M20a). The project, with an area of 4838 hectares has been selected for treatment under the Integrated Watershed Management Programme (IWMP). The project area covers the grama panchayats of Kadapra, Niranam, Peringara, Nedumbram and Kuttoor. The project area comes under upper Kuttanad division and have tributaries of Pampa and Manimala rivers.

Table: 1.1: Project Background of IWMP II/2012-13

<table>
<thead>
<tr>
<th>Location</th>
<th>Micro Watersheds</th>
<th>GP</th>
<th>Wards</th>
<th>Total Area (in ha)</th>
<th>Treatable Area (in ha)</th>
<th>Project Amount (in Lakh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State: Kerala District-Pathanamthitta Taluk: Thiruvalla Block: Pulikeezhu</td>
<td>Ayyankonari 10P8a</td>
<td>Kadapra</td>
<td>1,2,3,10,11,12,13,14,15</td>
<td>2366</td>
<td>2366</td>
<td>283.92</td>
</tr>
<tr>
<td></td>
<td>Parumala 10P9a</td>
<td>Kadapra</td>
<td>5,6,7,8,9</td>
<td>418</td>
<td>418</td>
<td>50.16</td>
</tr>
<tr>
<td></td>
<td>Keecherival kadav 10P10a</td>
<td>Kadapra</td>
<td>4</td>
<td>84</td>
<td>84</td>
<td>10.08</td>
</tr>
<tr>
<td></td>
<td>Chathenkeri-kadav 11M 19a</td>
<td>Peringara</td>
<td>13,14,15</td>
<td>839</td>
<td>839</td>
<td>100.68</td>
</tr>
<tr>
<td></td>
<td>Nedumbram</td>
<td>1,2,3,12,13</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Podiyadi Puthenthodu 11M 20a</td>
<td>Peringara</td>
<td>2,9,10,11,12</td>
<td>1131</td>
<td>1131</td>
<td>135.72</td>
</tr>
<tr>
<td></td>
<td>Nedumbram</td>
<td>4,5,6,7,8,9,10,11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Kuttoor</td>
<td>1,2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>4838</td>
<td>4838</td>
<td>580.56</td>
</tr>
</tbody>
</table>
Table 1.2: Financial Allocation

<table>
<thead>
<tr>
<th>No.</th>
<th>Head</th>
<th>Amount (Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Administrative (10%)</td>
<td>580.560</td>
</tr>
<tr>
<td>2</td>
<td>Capacity Building (5%)</td>
<td>29.028</td>
</tr>
<tr>
<td>3</td>
<td>Monitoring (1%)</td>
<td>5.806</td>
</tr>
<tr>
<td>4</td>
<td>Preparation of DPR (1%)</td>
<td>5.806</td>
</tr>
<tr>
<td>5</td>
<td>EPA (4%)</td>
<td>23.222</td>
</tr>
<tr>
<td>6</td>
<td>Evaluation (1%)</td>
<td>5.806</td>
</tr>
<tr>
<td>7</td>
<td>Watershed Development Works (56%)</td>
<td>325.114</td>
</tr>
<tr>
<td>8</td>
<td>Production System and Micro-enterprises (10%)</td>
<td>58.056</td>
</tr>
<tr>
<td>9</td>
<td>Livelihood Activities for assetless Persons (9%)</td>
<td>52.250</td>
</tr>
<tr>
<td>10</td>
<td>Consolidation (3%)</td>
<td>17.417</td>
</tr>
</tbody>
</table>

1.2 Need and Scope for Watershed Development

The Integrated Watershed Management Programme (IWMP) aims to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The need for integrated watershed management arises because of the water scarcity, rapid depletion of ground water table, fragile ecosystems and the incidence of poverty in the area. Land degradation due to soil erosion, low rainwater use efficiency, high population pressure, low livestock productivity, underinvestment in water use efficiency are also observed. The scope of IWMP in the project area, therefore, includes identifying activities that will help to improve the livelihoods of the population in a sustainable manner through participatory watershed development. The expected outcomes are controlled and effective reduction in sediment production, reduction in damaging runoff, reduction in floods in the downstream areas, runoff utilization for useful purposes, enhanced groundwater storage, regeneration of natural vegetation and fodder resources. This enables multi cropping and the introduction of diverse agro-based activities, which will help to provide sustainable livelihoods to the people residing in the watershed area.

1.3 Objectives of the Project

Following are the specific objectives of the project:

- To restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water.
• To maximise rain water harvesting and recharging of the ground water to improve water availability in the project area.
• To prevent degeneration of the biodiversity in the project area and regeneration of natural vegetation.
• To undertake water and soil conservation activities in a scientific manner so as to increase the production and productivity of agricultural crops.
• To undertake activities to prevent soil run-off, increase the fertility of the soil and water storage capacity of the land.
• To undertake activities for the revival and protection of dying water sources.
• To enhance livelihood opportunities of the people dependent on natural resources.
• To improve the natural resource base and employment opportunities of the project area.
• To minimise the impact of natural disasters such as flood and drought.
• To undertake activities to convert wasteland into cultivable land.

1.4 Organizational set-up of IWMP

The organizational set-up of IWMP at different levels is given below:

**Figure 1.1: Institutional set up of IWMP**

<table>
<thead>
<tr>
<th>National</th>
<th>GOI, MoRD, DoLR,</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOV. OF KERALA</td>
<td>SLNA</td>
</tr>
<tr>
<td>DPC</td>
<td>DLCC</td>
</tr>
<tr>
<td>BLOCK PANCHAYATH (PIA)</td>
<td>BLCC</td>
</tr>
<tr>
<td>WC</td>
<td>WCC</td>
</tr>
<tr>
<td>GRAM SARBA</td>
<td>UG/SHGs</td>
</tr>
<tr>
<td>TECH. SUPPORT</td>
<td>EXECUTIVE</td>
</tr>
<tr>
<td>TSU</td>
<td>BLCC</td>
</tr>
<tr>
<td>WCDC</td>
<td>WDT</td>
</tr>
<tr>
<td>WATERED</td>
<td>WPCC</td>
</tr>
<tr>
<td>WATERED</td>
<td>WPCC</td>
</tr>
<tr>
<td>WATERED</td>
<td>WPCC</td>
</tr>
</tbody>
</table>

BLCC- Block Level Coordination Committee
DLCC- District Level Coordination Committee
DoLR- Department of Land Resources
DPC- District Planning Committee
GOI- Government of India
MoRD- Ministry of Rural Development
PIA- Project Implementing Agency
SHGs- Self Help Groups
SLNA- State Level Nodal Agency
TSU- Technical Support Unit
UG- User Groups
WC- Watershed Committee
WCC- Watershed Coordination Committee
WCDC- Watershed Cell cum Data Centre
WDT- Watershed Development Team
1.5 Funding Pattern

<table>
<thead>
<tr>
<th>District</th>
<th>Name of Project</th>
<th>Name of PIA</th>
<th>No. Of Microwatersheds</th>
<th>Project Area (Ha)</th>
<th>Project Cos (Crores)</th>
<th>Central Share (90%)</th>
<th>State Share (10%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathanamthitta</td>
<td>IWMP II/ 2011-12</td>
<td>Pulikeezhu Block Panchayath</td>
<td>5</td>
<td>4838</td>
<td>5.8056</td>
<td>5.225</td>
<td>0.5806</td>
</tr>
</tbody>
</table>

1.6 Approach and Methodology of Preparing the Detailed Project Report (DPR)

The project area lies in Pulikeezhu Block Panchayat of Pathanamthitta district. The common guidelines provide a flexible framework for the preparation of the Detailed Project Report of the projects under IWMP. The methodology for the preparation of the Detailed Project Report of IWMP – II/2011-12 of Pathanamthitta District is outlined below:

- The project comprises of five micro watersheds. A cluster approach has been followed in the preparation of DPR.
- Review of the official documents on MGNREGS at the national and state levels was done prior to the field level activities.
- Preliminary discussions with elected representatives and officials at the block and district level were conducted.
- Secondary Data: The DPR has to be based on a situation analysis of secondary data and information available from various sources. Basic information about the watershed such as rainfall, temperature, location, topography, hydrology, hydrogeology, soils, geology and geomorphology, demographic and socio-economic characteristics of the population, land-use pattern, major crops and productivity, soil and water conservation practices adopted, irrigation, livestock and microenterprisers were collected from different sources such as Census of India, development reports, publications of government departments etc.
- Baseline Survey: A detailed baseline survey was conducted covering all households in the project area. The database thus created is expected to facilitate the assessment of the impact of the watershed development programme on the project area during and after the implementation of the project.
- Participatory Rural Appraisal (PRA): The participation of stakeholders is essential in identifying the problems and needs of the people in the project area and in identifying suitable watershed...
development activities. A Logical Framework Analysis was done at the project level for identifying the important problems (through problem tree analysis) as well as for the purpose of assessing the present situation. Other PRA techniques like transect walk, social mapping, resource mapping, seasonal calendar, etc., were employed in each micro watershed area.

- Use of GIS and Remote Sensing for Planning: GIS and remote sensing devices have made use in the preparation of DPR. Quantum GIS Software was used for preparation of maps. Google Earth images of the project area were also used for the planning. 1: 4000 scale cadastral maps of each village were the base map for planning.

- Indepth interviews, Focused Group Discussions with officials, farmers, entrepreneurs of micro-enterprises etc. were undertaken.

- An assessment of the resources likely to be available from other sources and schemes was done in the initial stages of the plan preparation.

- Field level verification of the identified interventions was undertaken by the DPR preparation team which includes the Technical Support Organisation, Watershed Development Team and Watershed Cell come Data Centre.

- Prioritisation: Prioritisation of the interventions was done taking into account the scientific and technical inputs.

- Identification of Entry Point Activities: The entry point activities were identified taking into account its potential as a model for replication.

- IEC and Capacity Building: IEC and capacity building plan has been formulated to achieve the desired results from watershed management programmes.
CHAPTER II
THE PROJECT AREA

2.1 Introduction
The project IWMP II/2012-13 Pulikeezhu watershed is a cluster of five micro-watersheds namely Ayyankonari (10P8a), Parumala (10P9a), Keecherivalkadavu (10P10a), Chathenkery Kadavu (11M19a) and Podiyadi Puthanthodu (11M20a). The total project area of the watershed 4838 Ha has been selected for treatment under Integrated Watershed Management Programme (IWMP). The project area is located in Pulikeezhu Block of Pathanamthitta district.

Table 2.1: Basic Project Information

<table>
<thead>
<tr>
<th>Name of the project</th>
<th>IWMP II/2012-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>Pathanamthitta</td>
</tr>
<tr>
<td>PIA &amp; Block Panchayat</td>
<td>Pulikeezhu</td>
</tr>
<tr>
<td>No. of micro-watersheds</td>
<td>5</td>
</tr>
<tr>
<td>Total area (ha)</td>
<td>4838</td>
</tr>
<tr>
<td>Proposed area to be treated (ha)</td>
<td>4838</td>
</tr>
<tr>
<td>Geographical coordinates</td>
<td>Longitudes: 76°28' 22.98&quot; to 76°34'37.884&quot; °E Latitudes: 9° 25' 7.896&quot; to 9° 24'1.7274&quot; °N</td>
</tr>
<tr>
<td>Gramapanchayats covered</td>
<td>Niranam,Kadapra,Kuttoor,Nedumbram,Peringara</td>
</tr>
<tr>
<td>Estimated cost (Rs. in crores)</td>
<td>5.80566</td>
</tr>
</tbody>
</table>

2.2 Details of the Micro Watersheds in the Project Area

The details of the selected watersheds in the project area are presented in Table 2.2.

Table 2.2: Details of the Selected Watersheds in the Project Area

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Area (in Ha)</th>
<th>GPs covered</th>
<th>Wards covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayyankonari</td>
<td>10P8a</td>
<td>2366</td>
<td>Kadhapa</td>
<td>1,2,3,10 to 15</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Niranam</td>
<td>1 – 13</td>
</tr>
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<td>Parumala</td>
<td>10P9a</td>
<td>418</td>
<td>Kadhapa</td>
<td>5,6,7,8,9</td>
</tr>
<tr>
<td>Keecherivalkadavu</td>
<td>10P10a</td>
<td>84</td>
<td>Kadhapa</td>
<td>4</td>
</tr>
<tr>
<td>Chathenkery Kadavu</td>
<td>11M19a</td>
<td>839</td>
<td>Peringara</td>
<td>13,14,15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nedumbram</td>
<td>1,2,3,12,13</td>
</tr>
<tr>
<td>Podiyadi Puthanthodu</td>
<td>11M20a</td>
<td>1131</td>
<td>Peringara</td>
<td>2,9,10,11,12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nedumbram</td>
<td>4,5,6,7,8,9,10,11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kuttoor</td>
<td>1,2</td>
</tr>
</tbody>
</table>
2.3 Brief History

From 9th to 12th century A.D., Thiruvalla taluk of the then Alleppey district was part of Nantuzhainad and later it was merged to Odanad and subsequently with Thekkumkur. Pliny, the famous traveller of the 1st century A.D. had described in his famous book ‘Pereplus’ about Niranam (Neleynda), the river Pamba (Baris) and about exporting pepper from Thiruvalla. The famous Niranam Poets - Madhava Panikkar, Sankara Panikkar and Rama Panikkar of the Kannassa family are well known for their great contribution to Malayalam literature. They lived between AD 1350 and 1450. It is believed that in A.D. 52, St.Thomas, one of the twelve Apostles of Jesus Christ, landed at Malankara and founded seven churches in Malabar coast, one of which is located at Niranam. Pulikeezhu block was formed on December 23rd 1955 as the part of the Community Project Approach Programme.

2.4 Location

The project area is located in Pulikeezhu Block, Panchayat Pathanamthitta District and lies between longitudes 76.47304° E to 76.57719° E and latitudes 9.32202° N to 9.40048° N. Among the eight blocks of Pathanamthitta district, Pulikeezhu block is the smallest. The project area is spread over five Grama Panchayats namely, Kadapra, Niranam, Peringara, Nedumbram and Kuttoor. The total geographical area of the block is 68.66 sq.km. Pulikeezhu block is bounded on the Northern side by Madappally block (Kottayam District) and on the Southern side by Mavelikkara block (Alappuzha District). On the Eastern side it is bounded by Koyipram block and Thiruvalla Municipality (both in Pathanamthitta district) and on the Western side by Champakulam block (Alappuzha District).
Figure 2.1: Location & Administrative Map
2.5 Criteria for Selection of the Project

The weightage and criteria for selection of the watershed management programme is given in Table 2.3. The weightage under different criteria for IWMP II/2012-13 Pulikeezhu watershed is given in Table 2.4.

Table 2.3: Criteria and Weightage for the Selection of Watershed

<table>
<thead>
<tr>
<th>No</th>
<th>Criteria</th>
<th>Maximum Score</th>
<th>Ranges &amp; scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Poverty index (% of poor to population)</td>
<td>10</td>
<td>Above 80 % (10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>80 to 50 % (7.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 to 20 % (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Below 20 % (2.5)</td>
</tr>
<tr>
<td>ii</td>
<td>% of SC/ ST population</td>
<td>10</td>
<td>More than 40 % (10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20 to 40 % (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Less than 20 % (3)</td>
</tr>
<tr>
<td>iii</td>
<td>Actual wages</td>
<td>5</td>
<td>Actual wages are significantly lower than minimum wages (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Actual wages are equal to or higher than minimum wages (0)</td>
</tr>
<tr>
<td>iv</td>
<td>% of small and marginal farmers</td>
<td>10</td>
<td>More than 80 % (10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 to 80 % (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Less than 50 % (3)</td>
</tr>
<tr>
<td>v</td>
<td>Ground water status</td>
<td>5</td>
<td>Over exploited (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Critical (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sub critical (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Safe (0)</td>
</tr>
<tr>
<td>vi</td>
<td>Moisture index</td>
<td>15</td>
<td>-66.7 &amp; below (15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-33.3 to -66.6 (10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0 to -33.2 (0)</td>
</tr>
<tr>
<td></td>
<td>DPAP/ DDP Block</td>
<td>DDP Block</td>
<td>DPAP Block</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Non DPAP/ DDP Block</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Above 70 %</td>
</tr>
<tr>
<td></td>
<td>Area under rain-fed agriculture</td>
<td>Drinking water</td>
<td>Degraded land</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------</td>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>vii</td>
<td>15</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>More than 90 % (15)</td>
<td>No source (10)</td>
<td>High – above 20 % (15)</td>
</tr>
<tr>
<td></td>
<td>80 to 90 % (10)</td>
<td>Problematic village (7.5)</td>
<td>Medium – 10 to 20 % (10)</td>
</tr>
<tr>
<td></td>
<td>70 to 80 % (5)</td>
<td>Partially covered (5)</td>
<td>Low-less than10% of TGA(5)</td>
</tr>
<tr>
<td></td>
<td>Fully covered (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster</td>
<td>Approach in the plains (more than one contiguous micro-watersheds in the project)</td>
<td>Micro-watersheds in cluster (15)</td>
<td>Micro-watersheds in cluster (10)</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>xii</td>
<td>Cluster approach in the plains (more than one contiguous micro-watersheds in the project)</td>
<td>15</td>
<td>4 to 6 micro-watersheds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 micro-watersheds in cluster (15)</td>
<td>4 micro-watersheds in cluster (10)</td>
</tr>
<tr>
<td>xiii</td>
<td>Cluster approach in the hills (more than one contiguous micro-watersheds in the project)</td>
<td>Above 5 micro-watersheds in cluster (15)</td>
<td>3 to 5 micro-watersheds in cluster (10)</td>
</tr>
</tbody>
</table>

Table 2.4: Weightage under Different Criteria

<table>
<thead>
<tr>
<th>District</th>
<th>Pathanamthitta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the project</td>
<td>IWMP II/ 2011-12 Pulikeezhu Watershed</td>
</tr>
<tr>
<td>No. of micro-watersheds proposed to be covered</td>
<td>5</td>
</tr>
<tr>
<td>Proposed project area (ha)</td>
<td>4838</td>
</tr>
<tr>
<td>Type of project (Hilly/ Desert/ Others)</td>
<td>Plains</td>
</tr>
<tr>
<td>Proposed cost (Rs. in lakh)</td>
<td>580.56</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>i</th>
<th>ii</th>
<th>iii</th>
<th>iv</th>
<th>v</th>
<th>vi</th>
<th>vii</th>
<th>viii</th>
<th>ix</th>
<th>x</th>
<th>xi</th>
<th>xii</th>
<th>xiii</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>7.5</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>85</td>
</tr>
</tbody>
</table>

2.6 Major Reasons for Selection of Watershed

The major reasons for the selection of the micro watersheds as per PPR of IWMP are:

- Dilapidated traditional irrigation systems
- Low productivity of land
- Strong presence of SC/ST, BPL families and marginal farmers
- Poor adaptation to climate change

2.7 Physiography, Relief and Drainage

The major physiographic units identified in Pathanamthitta district are lowland (areas below 7.5 m from MSL), midland (areas between 7.5 m and 75 m above MSL) and highland (areas more than 75 m above MSL). The project area lies in mid land division and belongs to upper Kuttanad. The project area is characterized by the distribution of two main river networks namely Pampa, the third longest river of Kerala and Manimalayar. These rivers and various networks of streams and channels enriched the project area. The drainage pattern of the project area is dendritic (looks like the branching pattern of tree roots)

Table 2.5: Physiography, Relief and Drainage of the Project Area
<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Physiography</th>
<th>Maximum Relief (M)</th>
<th>Maximum Base in Relief (M)</th>
<th>Slope Range (%)</th>
<th>Major Drainage</th>
</tr>
</thead>
<tbody>
<tr>
<td>IWMP II/2012-13 Pulikeezhu Watershed</td>
<td>Midland</td>
<td>4 to 13</td>
<td>1 to 17</td>
<td>0 to 1</td>
<td>Pamba and Manimala rivers</td>
</tr>
</tbody>
</table>

2.8 Climate

2.8.1 Rainfall

The project area experiences humid tropical climate with a bountiful rainy season through the northeast and southwest monsoons and severe summer. The hot season is from March to May and it is followed by South West monsoon season from June to September. South west monsoon contributes the major part of the annual rainfall\(^3\). Average annual rainfall is 2920mm. There is no drought or dry spells, but Niranam and Peringara panchayats which come under Chathenkerykadavu (11M19a) and Podyadi Puthenthodu (11M20a) experiences mild flood during rainy season. The South-West monsoon contributes nearly 59% of annual rainfall followed by 21% of North-East monsoon. Summer showers contribute remaining 19%.

Table 2.6: Annual Rainfall from 1997 to 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>0</td>
<td>2.2</td>
<td>79.2</td>
<td>169.7</td>
<td>49</td>
<td>473.5</td>
<td>845</td>
<td>460</td>
<td>554</td>
<td>359</td>
<td>179</td>
<td>198</td>
<td>3368.6</td>
</tr>
<tr>
<td>1998</td>
<td>28</td>
<td>0</td>
<td>7.4</td>
<td>123</td>
<td>195.2</td>
<td>795.5</td>
<td>386</td>
<td>608.1</td>
<td>699.9</td>
<td>466.9</td>
<td>55.4</td>
<td>150.4</td>
<td>3515.8</td>
</tr>
<tr>
<td>1999</td>
<td>0</td>
<td>0</td>
<td>36</td>
<td>335.8</td>
<td>507.3</td>
<td>759.9</td>
<td>445.4</td>
<td>266.5</td>
<td>130.9</td>
<td>690.5</td>
<td>161.7</td>
<td>0</td>
<td>3334</td>
</tr>
<tr>
<td>2000</td>
<td>20</td>
<td>176.4</td>
<td>72</td>
<td>90.4</td>
<td>128.4</td>
<td>608.2</td>
<td>234.5</td>
<td>549.7</td>
<td>301</td>
<td>243.8</td>
<td>121</td>
<td>41</td>
<td>2586.4</td>
</tr>
<tr>
<td>2001</td>
<td>81.7</td>
<td>63.6</td>
<td>13</td>
<td>177.6</td>
<td>368.6</td>
<td>627.6</td>
<td>248</td>
<td>542.2</td>
<td>340.8</td>
<td>93.8</td>
<td>95.4</td>
<td>14.2</td>
<td>3301.5</td>
</tr>
<tr>
<td>2002</td>
<td>0</td>
<td>3</td>
<td>22.2</td>
<td>96.2</td>
<td>445.7</td>
<td>568.6</td>
<td>220.2</td>
<td>375.6</td>
<td>85</td>
<td>448.5</td>
<td>302</td>
<td>0</td>
<td>2567</td>
</tr>
<tr>
<td>2003</td>
<td>0</td>
<td>59</td>
<td>60</td>
<td>161.7</td>
<td>110.4</td>
<td>504.2</td>
<td>430.2</td>
<td>345.2</td>
<td>93.8</td>
<td>496.9</td>
<td>95.4</td>
<td>0</td>
<td>2356.8</td>
</tr>
</tbody>
</table>

\(^{3}\) Ground Water Information Booklet of Pathanamthitta District, Central Ground Water Board, Ministry of Water Resources, Government of India.
### Table 2.7: Monthly Mean Temperature during 2002 - 2011\(^{\circ}\) C

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>Min</td>
<td>22.6</td>
<td>23.2</td>
<td>24.1</td>
<td>25.1</td>
<td>24.2</td>
<td>23.2</td>
<td>22.9</td>
<td>22.6</td>
<td>23.3</td>
<td>22.9</td>
<td>23.1</td>
</tr>
</tbody>
</table>

\(^{4}\) Ibid
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>22.0</td>
<td>32.6</td>
<td>32.0</td>
<td>33.5</td>
<td>32.6</td>
<td>34.0</td>
<td>32.9</td>
<td>34.1</td>
<td>30.8</td>
<td>29.5</td>
<td>31.3</td>
<td>30.8</td>
<td>29.0</td>
<td>31.9</td>
<td>31.9</td>
<td>29.0</td>
<td>31.9</td>
<td>32.2</td>
<td></td>
</tr>
</tbody>
</table>

Source: Indian Meteorological Department, for Alappuzha, Thiruvananthapuram.

### 2.8.3 Wind
The table below shows that the project area experiences very low velocity wind. The highest velocity of wind is experienced during southwest monsoon and northeast monsoon.

**Table 2.8: Wind Speed**

<table>
<thead>
<tr>
<th>Month</th>
<th>Wind Speed (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2009</td>
</tr>
<tr>
<td>January</td>
<td>0.4</td>
</tr>
<tr>
<td>February</td>
<td>0.7</td>
</tr>
<tr>
<td>March</td>
<td>0.5</td>
</tr>
<tr>
<td>April</td>
<td>0.5</td>
</tr>
<tr>
<td>May</td>
<td>NA</td>
</tr>
<tr>
<td>June</td>
<td>NA</td>
</tr>
<tr>
<td>July</td>
<td>0.5</td>
</tr>
<tr>
<td>August</td>
<td>0.6</td>
</tr>
<tr>
<td>September</td>
<td>0.7</td>
</tr>
<tr>
<td>October</td>
<td>NA</td>
</tr>
<tr>
<td>November</td>
<td>NA</td>
</tr>
<tr>
<td>December</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: Agrometerological Observatory, Agricultural Research Station, Thiruvalla

2.9 Geology

The whole project area has sedimentary rocks consisting of a series of variegated clay and sandstones with lenticular seams of lignite known as Warkalli Formation. The most characteristic feature of the Warkalli Formation is the impersistent nature of the constituent beds, suggestive of shallow basin margin deposits. Sand and clay are the major mineral resources of the project area.

2.10 Geomorphology

**Table 2.9: Genesis of Geo-morphology**

### Genesis of Geo-morphology

<table>
<thead>
<tr>
<th>Genesis of Geo-morphology</th>
<th>Area in Sq. ha</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluvial Origin-Active Flood Plain</td>
<td>3737.58</td>
<td>77.25</td>
</tr>
<tr>
<td>Coastal Origin-Younger Deltaic Plain</td>
<td>831.57</td>
<td>17.19</td>
</tr>
<tr>
<td>Denudational Origin-Pediment-PediPlain Complex</td>
<td>224.21</td>
<td>4.63</td>
</tr>
<tr>
<td>Waterbodies</td>
<td>44.64</td>
<td>0.92</td>
</tr>
<tr>
<td>Total</td>
<td>4838</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Nrscl / ISRO, Bhuvan

### 2.11 Ground Water

**Table 2.10: Ground Water Resource of Pulikeezhu Block as on 31st December 2004**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Pulikeezhu block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net annual ground water availability</td>
<td>26.23</td>
</tr>
<tr>
<td>Existing gross groundwater draft for all uses</td>
<td>8.07</td>
</tr>
<tr>
<td>Allocation for domestic and industrial requirement supply up to next 25 years</td>
<td>3.94</td>
</tr>
<tr>
<td>Net groundwater availability for future irrigation development</td>
<td>17.61</td>
</tr>
<tr>
<td>Net groundwater available in (MCM)</td>
<td>26.23</td>
</tr>
<tr>
<td>Total gross draft in 2004 (MCM)</td>
<td>8.07</td>
</tr>
<tr>
<td>Stage of GW development in 2004</td>
<td>30.77</td>
</tr>
<tr>
<td>Category</td>
<td>Safe</td>
</tr>
</tbody>
</table>


**Table 2.11: Depth of Ground Water Level Range in Meters Below Ground Level (mbgl)**

50
<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Microwatersheds</th>
<th>Geographical Coordinates of Wells Observed</th>
<th>Post Monsoon (November)</th>
<th>Pre Monsoon (April)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10P9a</td>
<td>76.54302°E,9.33266°N</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>10P9a</td>
<td>76.54789°E,9.33168°N</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>11M20a</td>
<td>76.55386°E,9.36657°N</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>11M20a</td>
<td>76.55451°E,9.35646°N</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>10P8a</td>
<td>76.53788°E,9.35643°N</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>11M20a</td>
<td>76.53788°E,9.35643°N</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>11M19a</td>
<td>76.52507°E,9.37914°N</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>11M19a</td>
<td>76.52114°E,9.37675°N</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>10P8a</td>
<td>76.54386°E,9.34514°N</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>10P8a</td>
<td>76.54035°E,9.34568°N</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Average depth of ground water: 2.1 m (post-monsoon) and 4.2 m (pre-monsoon).

As shown in the Table above, the average depth of ground water below ground level during post-monsoon is 2.1 meters and in pre-monsoon is 4.2 meters.

### Table 2.12: Number of Water Sources in the Project Area

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Open Well</th>
<th>Bore Well</th>
<th>Pond</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>5303</td>
<td>58</td>
<td>59</td>
</tr>
<tr>
<td>10P9a</td>
<td>1406</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>10P10a</td>
<td>275</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>11M19a</td>
<td>1853</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>11M20a</td>
<td>3849</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12686</strong></td>
<td><strong>102</strong></td>
<td><strong>96</strong></td>
</tr>
</tbody>
</table>

Source: Primary Survey
Table 2.13: Water availability in private wells

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Less than 6 months</th>
<th>6-11 months</th>
<th>Throughout the year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>212</td>
<td>1222</td>
<td>3846</td>
<td>5280</td>
</tr>
<tr>
<td>10P9a</td>
<td>83</td>
<td>234</td>
<td>1074</td>
<td>1391</td>
</tr>
<tr>
<td>10P10a</td>
<td>4</td>
<td>10</td>
<td>261</td>
<td>275</td>
</tr>
<tr>
<td>11M19a</td>
<td>134</td>
<td>54</td>
<td>1659</td>
<td>1847</td>
</tr>
<tr>
<td>11M20a</td>
<td>33</td>
<td>356</td>
<td>3455</td>
<td>3844</td>
</tr>
<tr>
<td>Total</td>
<td>466</td>
<td>1876</td>
<td>10295</td>
<td>12637</td>
</tr>
</tbody>
</table>

Source: Primary Survey

The table above shows that some of the wells are being either dried up or the water in them became unfit to drink. So a regular mechanism to monitor the water level of some of the wells in the project area should be there under this scheme.

2.12 Soil

The Soil Survey Organisation of the agriculture department has categorized the soil in the project area Ayroor series. Ayroor series is a member of fine, mixed, isohyperthermic, Typic Ustifluvents. Ayroor soils have dark yellowish brown to brown colours, extremely too strongly acid, sandy clay loam to clay C horizons. These soils are formed on riverine alluvium on gently sloping to level fluvial terraces of Pathanamthitta district, at an elevation of 20 to 100 m above MSL. This soil series belong to land capability sub class IIIe (moderately good cultivable land subject to erosion and runoff) and land irrigability sub class 2t (irrigable land with moderate limitation subject to topography)⁶.

2.13 Agro-Climatic Condition

⁶ Bench Mark Soils of Kerala, Soil Survey Organization, Department of Agriculture (S.C.Unit), Government of Kerala
The State is divided into five agro-climate zones (South Zone, Central Zone, North Zone, Special Zone on Problem Areas, High Altitude Zone) as per State Land Use Board records. The project area comes under the South Zone. Based on altitude, rainfall, soil and topography, the state has been delineated into thirteen agro-ecological zones. Block Panchayath has been taken as the unit for the purpose of delineation. The Pulikeezhu block comes under Kuttanad zone. The details of the zones are presented in Table 2.14.

Table 2.14: Agro-ecological Situation of the Project Area

<table>
<thead>
<tr>
<th>Zone</th>
<th>Altitude type</th>
<th>Rainfall pattern</th>
<th>Topography model</th>
<th>Soil type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuttanad</td>
<td>Type I: Up to 500 m above MSL (Low altitude zone)</td>
<td>Pattern I: Both the southwest and northeast monsoons are active and moderately distributed. Southwest monsoon give more rain with maximum rain in June</td>
<td>Model I: Extensive valleys with level but raised garden lands</td>
<td>Peat (Kari)</td>
</tr>
</tbody>
</table>

Source: Kerala Agricultural University

2.14 Socio-economic and Demographic Characteristics of the Population

The socio-economic characteristics of the population in the project area have been obtained by conducting a census survey of the households in the project area. As may be seen from Table 2.17, there are 15203 households in the project area. The sex ratio in project area is 1046 females per 1000 males (See Table 2.15).

Table 2.15: Details of the Population in the Project Area

<table>
<thead>
<tr>
<th>Micro</th>
<th>Sex</th>
<th>Total</th>
<th>Sex</th>
</tr>
</thead>
</table>
Age wise classification of population in the project area is shown in Table 2.16.

Table 2.16: Age Distribution of Population in the Project Area

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>12988</td>
<td>13577</td>
<td>26565</td>
</tr>
<tr>
<td>10P9a</td>
<td>3481</td>
<td>3647</td>
<td>7128</td>
</tr>
<tr>
<td>10P10a</td>
<td>632</td>
<td>648</td>
<td>1280</td>
</tr>
<tr>
<td>11M19a</td>
<td>5150</td>
<td>5450</td>
<td>10600</td>
</tr>
<tr>
<td>11M20a</td>
<td>9042</td>
<td>9418</td>
<td>18460</td>
</tr>
<tr>
<td>Total</td>
<td>31293</td>
<td>32740</td>
<td>64033</td>
</tr>
</tbody>
</table>

Source: Primary Survey

Table 2.17: Number of Households in the Project Area

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Grama Panchayat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kadapra</td>
<td>Niranam</td>
</tr>
<tr>
<td>10P8a</td>
<td>2837</td>
<td>3472</td>
</tr>
<tr>
<td>10P9a</td>
<td>1613</td>
<td>0</td>
</tr>
<tr>
<td>10P10a</td>
<td>308</td>
<td>0</td>
</tr>
<tr>
<td>11M19a</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Primary Survey
<table>
<thead>
<tr>
<th>Watershed</th>
<th>SC</th>
<th>ST</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>695</td>
<td>6</td>
<td>5608</td>
</tr>
<tr>
<td>10P9a</td>
<td>209</td>
<td>0</td>
<td>1404</td>
</tr>
<tr>
<td>10P10a</td>
<td>33</td>
<td>0</td>
<td>275</td>
</tr>
<tr>
<td>11M19a</td>
<td>177</td>
<td>8</td>
<td>2321</td>
</tr>
<tr>
<td>11M20a</td>
<td>290</td>
<td>11</td>
<td>4166</td>
</tr>
<tr>
<td>Total</td>
<td>1404</td>
<td>25</td>
<td>13774</td>
</tr>
</tbody>
</table>

Source: Primary Survey

Table 2.18: Social Classification of Households in the Project Area and Literacy Rate

Literacy rate of the population in the project area is in the chart given below.
Table 2.19 presents the details about the number and proportion of families living below poverty line (BPL) and those living above poverty line (APL). About 37 per cent of the families in the project area live below poverty line.

Table 2.19: Poverty status of households

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>BPL</th>
<th>APL</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>10P8a</td>
<td>2289</td>
<td>36.28</td>
<td>4020</td>
</tr>
<tr>
<td>10P9a</td>
<td>696</td>
<td>43.15</td>
<td>917</td>
</tr>
<tr>
<td>10P10a</td>
<td>137</td>
<td>44.48</td>
<td>171</td>
</tr>
<tr>
<td>11M19a</td>
<td>1007</td>
<td>40.18</td>
<td>1499</td>
</tr>
<tr>
<td>11M20a</td>
<td>1535</td>
<td>34.36</td>
<td>2932</td>
</tr>
<tr>
<td>Total</td>
<td>5664</td>
<td>37.26</td>
<td>9539</td>
</tr>
</tbody>
</table>

Source: Primary Survey
The distribution of households according to the main source of income of the household is presented in Table 2.20.

**Table 2.20: Main Source of Income of Households in the Project Area**

<table>
<thead>
<tr>
<th>Main source of income</th>
<th>Micro Watershed</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10P8a</td>
<td>10P9a</td>
<td>10P10a</td>
<td>11M19a</td>
<td>11M20a</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Agriculture</td>
<td>552</td>
<td>110</td>
<td>6.82</td>
<td>36</td>
<td>11.69</td>
<td>206</td>
</tr>
<tr>
<td>Fishing</td>
<td>64</td>
<td>26</td>
<td>1.61</td>
<td>-</td>
<td>-</td>
<td>33</td>
</tr>
<tr>
<td>Daily labour</td>
<td>2743</td>
<td>48.67</td>
<td>148</td>
<td>48.05</td>
<td>1196</td>
<td>47.73</td>
</tr>
<tr>
<td>Agriculture labour</td>
<td>58</td>
<td>24</td>
<td>1.49</td>
<td>2</td>
<td>0.65</td>
<td>19</td>
</tr>
<tr>
<td>Salary -Government</td>
<td>246</td>
<td>4.46</td>
<td>17</td>
<td>5.52</td>
<td>111</td>
<td>4.43</td>
</tr>
<tr>
<td>Salary – Private</td>
<td>467</td>
<td>7.40</td>
<td>114</td>
<td>7.07</td>
<td>23</td>
<td>7.47</td>
</tr>
<tr>
<td>Self employed/Business</td>
<td>359</td>
<td>5.69</td>
<td>118</td>
<td>7.32</td>
<td>6</td>
<td>1.95</td>
</tr>
<tr>
<td>Income from abroad</td>
<td>898</td>
<td>12.09</td>
<td>20</td>
<td>6.49</td>
<td>303</td>
<td>12.09</td>
</tr>
<tr>
<td>Pension</td>
<td>711</td>
<td>11.27</td>
<td>144</td>
<td>8.93</td>
<td>40</td>
<td>12.99</td>
</tr>
<tr>
<td>Others</td>
<td>211</td>
<td>3.34</td>
<td>25</td>
<td>1.55</td>
<td>16</td>
<td>5.19</td>
</tr>
<tr>
<td>Total</td>
<td>6309</td>
<td>100.00</td>
<td>1613</td>
<td>100.00</td>
<td>308</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary Survey

The decline in agricultural employment is an emerging issue in the project area. There has also been an alienation of the younger generation from the agriculture sector. The details about the landless households in the project area are presented in Table 2.21. Landless households constitute about two per cent of the total number of households in the project area.

**Table 2.21: Details about the Landless Households in the Project Area**

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Landless Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>% to total</td>
</tr>
</tbody>
</table>

57
Table 2.22 presents the details of land owned by farmers in the watershed area. Majority of the households in the project area have a land holding of less than 50 cents.

Table 2.22: Details of Land Owned by Farmers in the Microwatersheds in the Project Area

<table>
<thead>
<tr>
<th>Land Holding Size (cents)</th>
<th>10P8a</th>
<th>10P9a</th>
<th>10P10a</th>
<th>11M19a</th>
<th>11M20a</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>1581</td>
<td>545</td>
<td>76</td>
<td>589</td>
<td>1069</td>
<td>3860</td>
</tr>
<tr>
<td>5.1-50</td>
<td>3807</td>
<td>916</td>
<td>186</td>
<td>1437</td>
<td>2830</td>
<td>9176</td>
</tr>
<tr>
<td>51-250</td>
<td>782</td>
<td>140</td>
<td>36</td>
<td>406</td>
<td>463</td>
<td>1827</td>
</tr>
<tr>
<td>251-500 and above</td>
<td>25</td>
<td>7</td>
<td>0</td>
<td>44</td>
<td>13</td>
<td>89</td>
</tr>
<tr>
<td>Landless</td>
<td>114</td>
<td>5</td>
<td>10</td>
<td>30</td>
<td>92</td>
<td>251</td>
</tr>
<tr>
<td>Total HH</td>
<td>6309</td>
<td>1613</td>
<td>308</td>
<td>2506</td>
<td>4467</td>
<td>15203</td>
</tr>
</tbody>
</table>

Source: Primary Survey

Proportion of households with electric connection in the project area is shown in Table 2.23. Only one per cent of the households in the project area do not have access to electricity.

Table 2.23: Proportion of Households with Electric Connection

58
<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>10P8a</td>
<td>6214</td>
<td>98.49</td>
<td>95</td>
</tr>
<tr>
<td>10P9a</td>
<td>1582</td>
<td>98.08</td>
<td>31</td>
</tr>
<tr>
<td>10P10a</td>
<td>307</td>
<td>99.68</td>
<td>1</td>
</tr>
<tr>
<td>11M19a</td>
<td>2457</td>
<td>98.04</td>
<td>49</td>
</tr>
<tr>
<td>11M20a</td>
<td>4418</td>
<td>98.90</td>
<td>49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14978</td>
<td>98.52</td>
<td>225</td>
</tr>
</tbody>
</table>

Table 2.24: Main Fuel for Cooking in the Households

Source: Primary Survey

Table 2.24. presents main fuel used for cooking by households in the project area. More than half of the population use wood as main fuel for cooking.

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Main Fuel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LPG</td>
<td>Wood</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>10P8a</td>
<td>2230</td>
<td>35.35</td>
</tr>
<tr>
<td>10P9a</td>
<td>876</td>
<td>54.31</td>
</tr>
<tr>
<td>10P10a</td>
<td>289</td>
<td>93.83</td>
</tr>
<tr>
<td>11M19a</td>
<td>692</td>
<td>27.61</td>
</tr>
<tr>
<td>11M20a</td>
<td>1890</td>
<td>42.31</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5977</td>
<td>39.31</td>
</tr>
</tbody>
</table>

Source: Primary Survey

The distribution of households according to the type of toilet facility available in the households is presented in Table 2.25. Toilet facility is not available in three per cent of the households in the project area.

Table 2.25: Toilet Facility of the Households in the Project Area

59
### Micro Watershed

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Septic Tank</th>
<th>Pit</th>
<th>Public Toilet</th>
<th>No toilet</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>10P8a</td>
<td>3419</td>
<td>54.19</td>
<td>2636</td>
<td>41.78</td>
<td>19</td>
</tr>
<tr>
<td>10P9a</td>
<td>982</td>
<td>60.88</td>
<td>578</td>
<td>35.83</td>
<td>7</td>
</tr>
<tr>
<td>10P10a</td>
<td>301</td>
<td>97.73</td>
<td>4</td>
<td>1.30</td>
<td>0</td>
</tr>
<tr>
<td>11M19a</td>
<td>1589</td>
<td>63.41</td>
<td>776</td>
<td>30.97</td>
<td>16</td>
</tr>
<tr>
<td>11M20a</td>
<td>2222</td>
<td>49.74</td>
<td>2180</td>
<td>48.80</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>8513</td>
<td>56.00</td>
<td>6174</td>
<td>40.61</td>
<td>49</td>
</tr>
</tbody>
</table>

Source: Primary Survey

Table 2.26 presents participation of households in Self Help Groups. About half of the population have membership in SHGs of which large majority have membership in Kudumbasree SHGs.

### Table 2.26: Membership in Self Help Groups

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Kudumbashree</th>
<th>Block SHG</th>
<th>Others</th>
<th>No membership</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>10P8a</td>
<td>3243</td>
<td>51.40</td>
<td>7</td>
<td>0.11</td>
<td>172</td>
</tr>
<tr>
<td>10P9a</td>
<td>865</td>
<td>53.63</td>
<td>47</td>
<td>2.91</td>
<td>10</td>
</tr>
<tr>
<td>10P10a</td>
<td>171</td>
<td>55.52</td>
<td>2</td>
<td>0.65</td>
<td>0</td>
</tr>
<tr>
<td>11M19a</td>
<td>1217</td>
<td>48.56</td>
<td>5</td>
<td>0.20</td>
<td>44</td>
</tr>
<tr>
<td>11M20a</td>
<td>1819</td>
<td>40.72</td>
<td>14</td>
<td>0.31</td>
<td>140</td>
</tr>
<tr>
<td>Total</td>
<td>7315</td>
<td>48.12</td>
<td>75</td>
<td>0.49</td>
<td>366</td>
</tr>
</tbody>
</table>

Source: Primary Survey
2.15 Drinking and Irrigation

The details about the source of drinking water in the households in the project area are presented in Table 2.27. About 58 per cent of households depend on private wells for drinking water purposes. Rainwater is not tapped effectively in the project area. Wells and ponds are also used for domestic consumption.

Table 2.27: Main Source of Drinking Water in the Households in the Project Area

<table>
<thead>
<tr>
<th>Main Source of Drinking Water</th>
<th>Micro Watersheds</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10P9a</td>
<td>10P10a</td>
</tr>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Private Water connection</td>
<td>618</td>
<td>9.80</td>
</tr>
<tr>
<td>Public Tap</td>
<td>1029</td>
<td>16.31</td>
</tr>
<tr>
<td>Well</td>
<td>4154</td>
<td>65.84</td>
</tr>
<tr>
<td>Public well</td>
<td>106</td>
<td>1.68</td>
</tr>
<tr>
<td>Bore Well</td>
<td>11</td>
<td>0.17</td>
</tr>
<tr>
<td>Tanker</td>
<td>2</td>
<td>0.03</td>
</tr>
<tr>
<td>Buying water</td>
<td>7</td>
<td>0.11</td>
</tr>
<tr>
<td>Rain water Harvesting</td>
<td>4</td>
<td>0.06</td>
</tr>
<tr>
<td>Water bodies (Pond/Stream)</td>
<td>48</td>
<td>0.76</td>
</tr>
<tr>
<td>Others</td>
<td>330</td>
<td>5.23</td>
</tr>
<tr>
<td>Total</td>
<td>6309</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary Survey

Project area experiences water scarcity especially during summer season as the existing water resources are either dried up or become unfit for drinking due to high presence of iron and turbidity. Main source of drinking water in the project area are given in Table 2.27. Water availability in private wells is shown in Table 2.13. Open wells are usually dug up to 4 to 8 metres. Some of the households mainly depend on bore well for drinking and domestic purposes. Ponds were one
of the major sources of irrigation in the past but presently most of them are either converted to land by filling or using as a waste dumping place. Ponds are dug at a depth of 1.5 to 3 metres.

Table 2.28: Quality of water from Pulikeezhu Tube Well

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5.89</td>
</tr>
<tr>
<td>TH</td>
<td>1040</td>
</tr>
<tr>
<td>Calcium mg/l</td>
<td>184</td>
</tr>
<tr>
<td>Mg mg/l</td>
<td>141</td>
</tr>
<tr>
<td>CO$_3$</td>
<td>0</td>
</tr>
<tr>
<td>HCO$_3$</td>
<td>29</td>
</tr>
<tr>
<td>Cl</td>
<td>2244</td>
</tr>
<tr>
<td>F</td>
<td>0.21</td>
</tr>
<tr>
<td>Na</td>
<td>960</td>
</tr>
<tr>
<td>K</td>
<td>31</td>
</tr>
<tr>
<td>EC µs/cm at 25° C</td>
<td>6300</td>
</tr>
</tbody>
</table>

Source: Ground Water Information Booklet of Pathanamthitta District

The chemical analysis of water samples from a tube well at Pulikeezhu is summarized in Table 2.28. The data indicates that the water is brackish with the electrical conductivity value of 6300 µs/cm at 25°C. Thus the water is unfit for domestic and irrigation purposes.

There are large number of canals and vachals in the project area which are used for watering the crops and dewatering. Majority of streams are perennial and some are drying up due to sediment deposition. List of drainages and its status are given below.

Table 2.29: Drainages in the Project Area

<table>
<thead>
<tr>
<th>Watershed code</th>
<th>Grama Panchayath</th>
<th>Name of the drains/streams/ rivers</th>
<th>Perennial/Seasonal</th>
</tr>
</thead>
</table>

---

7 Ground Water Information Booklet of Pathanamthitta District, Central Ground Water Board, Ministry of Water Resources, Government of India.
Table 2.30: Number of Perennial and Seasonal Drainages in the Project Area

<table>
<thead>
<tr>
<th>Watershed</th>
<th>No of Perennial Streams</th>
<th>No. Of Seasonal Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>10P9a</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>10P10a</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>11M19a</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>11M20a</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>15</td>
</tr>
</tbody>
</table>

Figure 2.2: Flow of Water by Season, Site and River Basin (MCM) – Pamba from 1998-99 to 2008-09
Figure 2.3: Flow of Water by Season, Site and River Basin (MCM) – Manimala from 1998-99 to 2008-09
Table: 2.31: Number of Ponds and Water Storage Capacity in Cubic Metres

<table>
<thead>
<tr>
<th>Watershed Code</th>
<th>Total no. of Water Storage Structures</th>
<th>Total storage capacity of water storage structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>59</td>
<td>20320</td>
</tr>
<tr>
<td>10P9a</td>
<td>3</td>
<td>2400</td>
</tr>
<tr>
<td>10P10a</td>
<td>4</td>
<td>2560</td>
</tr>
<tr>
<td>11M19a</td>
<td>9</td>
<td>2880</td>
</tr>
<tr>
<td>11M20a</td>
<td>21</td>
<td>8400</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>36560</strong></td>
</tr>
</tbody>
</table>

Source: Primary Survey

2.16 Transport and Communication Facilities

All the microwatersheds in the project area are well connected with road transport. But unscientific construction of these roads without considering the flow of water leads to destruction of these roads during rainy season. Almost of all the households in the project area have access to telephone connection. A telephone exchange is also functioning in the project area.

Table: 2.32: Length of Roads (in Km)

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Length of Roads</th>
<th>Tarred Roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>209</td>
<td>94.1</td>
</tr>
<tr>
<td>10P9a</td>
<td>18.75</td>
<td>8.4</td>
</tr>
<tr>
<td>10P10a</td>
<td>6.25</td>
<td>2.8</td>
</tr>
<tr>
<td>11M19a</td>
<td>86.17</td>
<td>38.8</td>
</tr>
<tr>
<td>11M20a</td>
<td>86.17</td>
<td>38.8</td>
</tr>
</tbody>
</table>
2.17 Agriculture and Land Use Pattern

Paddy is the main crop cultivated in the project area. Farmers here mostly use Uma variety of paddy for the 3rd Puncha season (October to March). 1st and 2nd crops are not popular in the area due to flood in the rainy season and lack of labourers. Some of the paddy fields are used for vegetable cultivation. Cow dung, organic manures, chemicals, pesticides etc are used for farming. Agriculture depends mainly on rainfall. Other crops like turmeric, mango, coconut, arecanut, banana, tapioca, pulses and vegetables like cucumber, snake gourd, bitter gourd, ivy gourd etc are also cultivated in the project area. The main problems faced by the agriculture sector are labour shortage, high labour cost, unutilization of fallow/wasteland, lack of interest among youngsters, climatic conditions, improper soil and water management, lack of repair/maintenance of ponds, extensive use of chemicals and pesticides, increased prices of fertilizers and chemicals etc.

<table>
<thead>
<tr>
<th>Name of Micro Watershed</th>
<th>Area of Waste Land Cultivable (ha)</th>
<th>Problems</th>
<th>Suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>47.33</td>
<td>Land is owned by the people who are not interested in farming and reluctant to lease it to others for farming. These families do not consider agriculture as a major source of income.</td>
<td>People's representatives could encourage the owners to lease the land to SHGs</td>
</tr>
<tr>
<td>10P9a</td>
<td>3.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10P10a</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11M19a</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11M20a</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Preliminary Project Report for IWMP II/2012-13
2.18 Animal Husbandry, Dairying and Poultry

Livestock and poultry are important subsidiary activities in the project area. Rearing livestock in homestead is a source of income and employment. Cattle breeds like Holstein Friesian, Jerky etc are reared. Farmers have recently started raising buffalo for meat considering the increased demand of beef. The major problems in dairy sector identified through PRA are high cost of feed, lack of maintenance of shed, low selling cost of milk, etc. The livestock population in the project area is shown in Table 2.36.

Table 2.34: Details of Livestock and Poultry in the Project Area

<table>
<thead>
<tr>
<th>Micro Watershed</th>
<th>Cow</th>
<th>Buffalo</th>
<th>Duck</th>
<th>Hen</th>
<th>Goat</th>
</tr>
</thead>
<tbody>
<tr>
<td>10P8a</td>
<td>946</td>
<td>56</td>
<td>2574</td>
<td>6461</td>
<td>725</td>
</tr>
<tr>
<td>10P9a</td>
<td>221</td>
<td>8</td>
<td>72</td>
<td>531</td>
<td>47</td>
</tr>
<tr>
<td>10P10a</td>
<td>93</td>
<td>4</td>
<td>44</td>
<td>38</td>
<td>35</td>
</tr>
<tr>
<td>11M19a</td>
<td>331</td>
<td>35</td>
<td>929</td>
<td>7073</td>
<td>254</td>
</tr>
<tr>
<td>11M20a</td>
<td>544</td>
<td>47</td>
<td>514</td>
<td>3176</td>
<td>289</td>
</tr>
<tr>
<td>Total</td>
<td>2135</td>
<td>150</td>
<td>4133</td>
<td>17279</td>
<td>1350</td>
</tr>
</tbody>
</table>

Source: Primary Survey

2.19 Educational and Health Infrastructure in the Project Area

The details of the educational infrastructure in the project area collected through PRA techniques are presented in Table 2.37, 2.40 and 2.41. Health institutions in the project area are shown in Table 2.38

Table 2.35: Educational Institutions in the Project Area

<table>
<thead>
<tr>
<th>Educational Institution</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Primary School</td>
<td>33</td>
</tr>
<tr>
<td>Upper Primary School</td>
<td>11</td>
</tr>
<tr>
<td>High School</td>
<td>12</td>
</tr>
<tr>
<td>Higher Secondary School</td>
<td>1</td>
</tr>
<tr>
<td>Technical institution</td>
<td>2</td>
</tr>
</tbody>
</table>
2.20 Recreation Facilities

Major recreation facilities in the project area are Arts and Sports clubs. There are 7 clubs functioning at various locations. Lack of public place is a limitation to the younger generation to engage in pass time activities. Six libraries are also functioning in the project area.

2.21 Other Infrastructure in the Project Area

Other infrastructure in the project area other than mentioned above are shown below

<table>
<thead>
<tr>
<th>Facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anganwady</td>
<td>14</td>
</tr>
<tr>
<td>Commercial bank</td>
<td>8</td>
</tr>
<tr>
<td>Co-operative society/bank</td>
<td>4</td>
</tr>
<tr>
<td>Day Care Centre/Play School/Children home</td>
<td>3</td>
</tr>
<tr>
<td>Ration shop</td>
<td>9</td>
</tr>
<tr>
<td>Maveli store</td>
<td>4</td>
</tr>
<tr>
<td>Neethi store</td>
<td>4</td>
</tr>
<tr>
<td>Public market</td>
<td>6</td>
</tr>
<tr>
<td>Margin free market</td>
<td>2</td>
</tr>
<tr>
<td>Arts/ Sports club</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 2.37: Infrastructure in the Project Area
2.22 Land Use Pattern of the Project Area

<table>
<thead>
<tr>
<th>Land used for</th>
<th>Project area</th>
<th>10P8a</th>
<th>10P9a</th>
<th>10P10a</th>
<th>11M19a</th>
<th>11M20a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area</td>
<td>Area</td>
<td>Area</td>
<td>Area</td>
<td>Area</td>
<td>Area</td>
</tr>
</tbody>
</table>

Source: Primary Survey

Table 2.38: Present Land Use Pattern in Micro Watershed
<table>
<thead>
<tr>
<th></th>
<th>(Ha.)</th>
<th>(Ha.)</th>
<th>(Ha.)</th>
<th>(Ha.)</th>
<th>(Ha.)</th>
<th>(Ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy Fields</td>
<td>2157.17</td>
<td>1304.25</td>
<td>88.02</td>
<td>21.77</td>
<td>403.98</td>
<td>339.15</td>
</tr>
<tr>
<td>Mixed Crop</td>
<td>2533.76</td>
<td>1008.66</td>
<td>296.64</td>
<td>57.74</td>
<td>406.41</td>
<td>764.31</td>
</tr>
<tr>
<td>Paddy land converted to Annuals</td>
<td>102.42</td>
<td>31.75</td>
<td>32.25</td>
<td>2.7</td>
<td>21.18</td>
<td>14.54</td>
</tr>
<tr>
<td>Water body</td>
<td>44.64</td>
<td>21.34</td>
<td>1.09</td>
<td>1.79</td>
<td>7.43</td>
<td>12.992</td>
</tr>
<tr>
<td>Total cropped area</td>
<td>4919.48</td>
<td>2410.1</td>
<td>442.6</td>
<td>98.4</td>
<td>836.3</td>
<td>1131.5</td>
</tr>
<tr>
<td>Net Area</td>
<td>4838</td>
<td>2366</td>
<td>418</td>
<td>84</td>
<td>839</td>
<td>1131</td>
</tr>
</tbody>
</table>

Source: Calculated using GIS Maps & PRA

Present land use of the project area is given above. Major portion of the area is coconut dominated mixed crop. Inter cropping with vegetables, arecanut, spices, fruit trees and hard wood trees like teak, mahogany etc. Paddy is cultivated in one season depending on rainy season.

2.23 Major Ongoing and Completed Schemes in the Project Area

The major ongoing and completed schemes in the project area are presented in Table 2.43.

Table 2.39: Major Ongoing and Completed Schemes in the Project Area

<table>
<thead>
<tr>
<th>Schemes/Programme</th>
<th>Brief description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrally sponsored schemes</td>
<td></td>
</tr>
<tr>
<td>Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)</td>
<td>Aims to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.</td>
</tr>
<tr>
<td>Sarva Shiksha Abhiyan (SSA)</td>
<td>Flagship programme run by the Government of India to provide universal access to elementary education for children 6-14 years old.</td>
</tr>
<tr>
<td>Scheme Name</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Indira Awas Yojana (IAY)</td>
<td>To help in construction/upgradation of dwelling units of rural BPL SC/ST households and other vulnerable sections by providing lump sum financial assistance.</td>
</tr>
<tr>
<td>Swarnjayanti Gram Swarozgar Yojana (SGSY)</td>
<td>To bring the assisted poor families above the Poverty Line by ensuring appreciable sustained level of income over a period of time. This objective is to be achieved by organising the rural poor into Self Help Groups (SHGs) through the process of social mobilization, their training and capacity building and provision of income generating assets.</td>
</tr>
<tr>
<td>Integrated Child Development Services (ICDS)</td>
<td>This scheme represents one of the world’s largest and most unique programmes for early childhood development. ICDS is the foremost symbol of India’s commitment to her children – India’s response to the challenge of providing pre-school education on one hand and breaking the vicious cycle of malnutrition, morbidity, reduced learning capacity and mortality, on the other.</td>
</tr>
<tr>
<td>Support to State Extension Programmes for Extension Reforms</td>
<td>This is the main scheme to revamp agricultural extension across the country and aims at providing a decentralized and demand driven extension system by way of new institutional arrangements for technology dissemination in the form of an Agricultural Technology Management Agency (ATMA) at district level. Important farmer oriented activities under ATMA includes: (a) training of farmers (b) demonstrations on agriculture and allied sector (c) exposure visit of farmers (d) farmer-scientist interactions (d) farm schools.</td>
</tr>
<tr>
<td>Scheme</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Rashtriya Krishi Vikas Yojana (RKVY)</strong></td>
<td>Aims at achieving annual growth in agriculture sector by a holistic development of Agriculture and allied sectors.</td>
</tr>
<tr>
<td><strong>Kuttanad Package</strong></td>
<td>To develop the six agronomic zones of Kuttanad, namely Kayal Lands, Lower Kuttanad, Upper Kuttaanad, North Kuttanad, Purakkadu Kari and Vaikom Kari, in an integrated manner based on principles of ecology, economics, gender equity and employment generation.</td>
</tr>
<tr>
<td><strong>State sponsored schemes</strong></td>
<td></td>
</tr>
<tr>
<td>Sustainable Development of Rice-Based Farming System</td>
<td>Aims to sustain rice cultivation and to increase its productivity. It includes group farming, distribution of fertilizer, organic manure and weedicides at subsidized rate.</td>
</tr>
<tr>
<td>Restoration of Agro Ecosystems of Kuttanad through Sustainable Aquaculture</td>
<td>It’s a 13th Finance Commission grant in aid project for the process of implementation of aquaculture in 1200 hectares on the period of three years. It aims to increase fish production, prawn production, income generation, employment generation etc.</td>
</tr>
<tr>
<td>State Horticulture Mission (SHM)</td>
<td>Area expansion and subsidy for rising banana, pineapple, cocoa, nutmeg, pepper &amp; cut flowers.</td>
</tr>
<tr>
<td>Small Farm Mechanisation</td>
<td>The objective of the scheme is to provide credit for the purchase of new tractor/new tractor for 2nd time/tractor renovation/repair/replacement of spares/small tractors scheme/power tiller/thresher/power sprayer.</td>
</tr>
<tr>
<td>Matsya Samrudhi</td>
<td>Aims at increased production of fishes to 2.5 lakh tones in three years and increasing fish production by extending aquaculture to 15,000 hectares of inland water bodies.</td>
</tr>
<tr>
<td>Schemes for Integrated Pest Management System</td>
<td>The agriculture department of Government of Kerala proposed a scheme to establish a full-fledged system of pest surveillance in a</td>
</tr>
</tbody>
</table>
phased manner, to cover major crops of the State. The thrust of the scheme will be on biocontrol measures from a long-term perspective. The main objectives of the scheme are: (a) To keep pests and diseases of crops below Economic Threshold level by adopting an integrated pest management practice. (b) Constant pest surveillance and monitoring to ascertain pest population (c) Creating awareness among farmers on the prominent pests and diseases, which cause severe damage to crops and suggest measures to prevent them.

| Integrated Nutrient Management System | The scheme intends to promote usage of organic manures so as to maintain and to enhance the fertility level of soil. Objectives: (a) To establish soil nutrient balance (b) To increase organic matter content of the soil and make it productive (c) To create awareness among farmers about the sustainability aspects of soil fertility (d) To chalk out soil fertility map of the panchayats (e) Strengthening of Soil/Fertiliser/Bio-fertiliser/Pesticide laboratories. |

<table>
<thead>
<tr>
<th>Schemes implemented by Government agency / departments in the project area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of Aquaculture</td>
</tr>
<tr>
<td>Fishermen welfare activities</td>
</tr>
<tr>
<td>Dairy farmers welfare activities</td>
</tr>
<tr>
<td>Measures and schemes for cattle</td>
</tr>
</tbody>
</table>
livestock, cattle artificial insemination centre, preventive measures for communicable diseases, provide cattle insurance facility to farmers for their livestock, prevention and control of cattle borne diseases with the support of institutions and groups, conduct infertility camps, provide technical support for self employed farmers.

2.24 SWOT analysis

The SWOT analysis presents the strengths, weakness, opportunities and threats of Integrated Watershed Management Programme in the project area. It identifies the internal and external factors, which are favourable and unfavourable to achieve the objectives of the project. SWOT analysis of the project area is presented in Table 2.44.

<table>
<thead>
<tr>
<th>Strength</th>
<th>(1) Interest of the people in watershed activities.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(2) A well developed Panchayati Raj System.</td>
</tr>
<tr>
<td></td>
<td>(3) Availability of water from Pampa and Manimalayar river networks for irrigation purposes.</td>
</tr>
<tr>
<td>Weaknesses</td>
<td>(1) Declining profit from paddy cultivation.</td>
</tr>
<tr>
<td></td>
<td>(2) Water resources are dried up in summer season.</td>
</tr>
<tr>
<td></td>
<td>(3) Shortage of agricultural labourers.</td>
</tr>
<tr>
<td></td>
<td>(4) Non adoption of rainwater conservation methods.</td>
</tr>
<tr>
<td></td>
<td>(5) Fodder grass shortage.</td>
</tr>
<tr>
<td></td>
<td>(6) Improper management of land and water bodies</td>
</tr>
<tr>
<td>Opportunities</td>
<td>Threats</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Improper waste management practices</td>
<td>Change in climatic conditions.</td>
</tr>
<tr>
<td>(1) Scope for improving productivity of agricultural crops by adopting modern techniques of farming.</td>
<td>(2) Rise in cost of agriculture machines, pesticides, chemicals etc.</td>
</tr>
<tr>
<td>(2) Possibilities of cooperative farming and organic farming practices.</td>
<td>(3) Lack of interest among new generation towards agriculture activities.</td>
</tr>
<tr>
<td>(3) Scope for improving land area under horticulture crops.</td>
<td>(4) Excessive use of chemicals and pesticides.</td>
</tr>
<tr>
<td>(4) Scope for breed improvement, pisciculture, duck farming etc.</td>
<td>(5) Increase in cost of seeds, fertilizers, pesticides etc.</td>
</tr>
<tr>
<td>(5) Scope for using fallow/wastelands for cultivation.</td>
<td>(6) Spread of diseases (foot and mouth disease) among cattle.</td>
</tr>
<tr>
<td>(6) Scope for convergence with other schemes</td>
<td>(7) Delay in implementation of renovation activities of water bodies.</td>
</tr>
<tr>
<td>(7) Possibilities to adopt water conservation/harvesting and recharging structures</td>
<td>(8) Over grazing of land.</td>
</tr>
<tr>
<td>(8) Scope for management programmes to control flood/water logging and sediment removal</td>
<td>(9) Delay in timely interventions by the authorities.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>(10)</td>
<td>Contamination of drinking water because of seepage from latrines during flood.</td>
</tr>
<tr>
<td>(11)</td>
<td>Uncontrolled sand mining from Pamba and Manimala resulting in ground water level depletion.</td>
</tr>
</tbody>
</table>
CHAPTER III
INSTITUTION BUILDING AND PROJECT MANAGEMENT

3.1 Institutional Arrangements of IWMP
By adopting the principles and guidelines of Integrated Watershed Management Programme (IWMP), appropriate institutional arrangements are made at various levels in order to have an effective and professional management of watershed projects.

3.2 Institution Building at State and District Level
Department of Rural Development is the nodal department for the implementation of IWMP at the state level. State Level Nodal Agency (SLNA) is coordinating and providing guidelines for the effective planning and implementation of the individual IWMP projects. District Planning Committee (DPC) is responsible for the planning and implementation of the projects at the district level. To help the DPC and to coordinate the project level activities Watershed Cell Cum Data Centre (WCDC) is working at the District level. District Level Coordination Committee has been set up under the chairmanship of District Panchayath President, Pathanamthitta. District Collector is functioning as Member Secretary and Principal Agriculture Officer as Member Convener. All the district level officers of the line departments are functioning as members.

3.3 Institution Building at Block Level
Pulikeezhu Block Panchayat is the Project Implementation Agency (PIA) for this IWMP project. They are responsible for all the activities under the project starting from the preparation of Detailed Project Report (DPR) till the completion of project. A Block Level Coordination Committee (BLCC) has been formed for the timely implementation of the project and to provide help to the PIA in technical and administrative matters related to the project. Watershed Development Team (WDT) has been formed and started working under the PIA. Details of PIA are given below.

Table 3.1: Details of Project Implementation Agency (PIA)

<table>
<thead>
<tr>
<th>Name of the Project</th>
<th>IWMP II/ 2011-12</th>
</tr>
</thead>
</table>

77
### Programme Implementation Agency

<table>
<thead>
<tr>
<th>Programme Implementation Agency</th>
<th>Pulikeezhu Block Panchayat</th>
</tr>
</thead>
</table>

| Implementation Officer          | Block Development Officer,  |
|                                 | Pulikeezhu Block Panchayat  |

| Address of PIA                  | Pulikeezhu Block Panchayat, |
|                                 | Valanjavattom PO,           |
|                                 | Thiruvalla,                |
|                                 | Pathanamthitta.             |

| Telephone                       | 04692610708                 |
| Email                           | rddblplk@gmail.com          |

<table>
<thead>
<tr>
<th>Table 3.2: Details of Watershed Development Team (WDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

### 3.4 Institution Building at Grama Panchayat (GP) Level

Watershed management works are implemented at Grama Panchayat level. The GPs supervise, support and advise Watershed Committee. The different institutions formed as part of IWMP are given below.

### 3.5 Watershed Committee (WC)

Watershed Committee has a pivotal role to play during and after the project implementation period. The dates of Neerthada Gramasabha convened in each watershed are given below. These Grama Sabhas constitutes the WCs for each watershed. These WCs will work as the subcommittees of GPs. In the case of Watersheds spread over more than one GP, separate subcommittees are formed in each GP to manage the watershed development project in the GP.

<table>
<thead>
<tr>
<th>Table 3.3: Dates of Neerthada Gramasabha</th>
</tr>
</thead>
</table>

78
3.6 Self Help Groups (SHGs)

There are 246 SHGs working in the project area already. Under IWMP II/ 2011-12 project, until now 172 SHGs have been registered and the registration process is going on. These groups are organized through credit and thrift activities. Some of the groups are also engaged in micro-enterprises. Both women and men SHGs are active in the project area. Details of the SHGs in the project area are given below.

3.7 User Groups (UGs)

User groups are proposed to be formed to manage the different activities or assets created under the programme on a long term basis. The user groups are expected to collect user charges from their members, oversee the works and manage the benefits. At present, user groups to implement Entry Point Activities have been formed. Later on, it will be formed for each work.

3.8 IWMP Project Management

Table 3.4: Implementation phases of IWMP

<table>
<thead>
<tr>
<th>Phase</th>
<th>Name</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Preparatory Phase</td>
<td>1-2 years</td>
</tr>
<tr>
<td>II</td>
<td>Watershed Works Phase</td>
<td>2-3 years</td>
</tr>
<tr>
<td>III</td>
<td>Consolidation and Withdrawal Phase</td>
<td>1-2 years</td>
</tr>
</tbody>
</table>

Activities under each phase are mentioned below.
3.9 Preparatory Phase:

- Institution building, training and empowerment of institutions like watershed committee (WC), user groups (UGs) and self help groups (SHGs) through Capacity Building and IEC activities.
- Preparation of Detailed Project Report with detailed action plans through participatory exercises Entry Point Activity shall be taken up during this phase to establish credibility of the Watershed Development Team (WDT) and create a rapport with the village community.

3.10 Watershed Works Phase:

- This phase is the heart of the programme in which the DPR will be implemented.
- Execution of yearly action plans (NRM works, Production System and Micro-enterprises and Livelihood activities will be implemented)

3.11 Consolidation and Withdrawal Phase:

- In this phase the resources augmented and economic plans developed in watershed work phase becomes the foundation to create new nature-based, sustainable livelihoods and raise productivity levels.
- Bridging the gaps for post project sustainability.
- Building the capacity of the community based organizations to carry out the new agenda items during post project period.
- Preparation of project completion report with details about status of each intervention.
- Documentation of successful experiences as well as lessons learnt for future use.
CHAPTER IV
MICRO WATERSHEDS IN THE PROJECT AREA

4.1 Introduction

The project IWMP II/2012-13 is a cluster of five micro-watersheds namely Ayyankonari (10P8a), Parumala (10P9a), Keecherivalkadavu (10P10a), Chathenkery Kadavu (11M19a) and Podiyadi Puthanthodu (11M20a). The details of each micro watershed in the project area are presented in this chapter.

4.2 Location and Extent of Micro Watersheds

The location and extent of the selected watersheds in the project area are presented in Table 4.1.
### Table 4.1: Location and extent of Watersheds

<table>
<thead>
<tr>
<th>Name of the watershed</th>
<th>Code</th>
<th>Coordinates of Watershed</th>
<th>Boundaries of Watershed</th>
<th>Geographical Area (in Ha)</th>
<th>Gram Panchayats covered</th>
<th>Wards covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayyankonari</td>
<td>10P8a</td>
<td>NW 9°20'42.72N 76°28'57.65E</td>
<td>N Manimala River</td>
<td>2366</td>
<td>Kadapra</td>
<td>1,2,10 to 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NE 9°21'39.45N 76°32'58.49E</td>
<td>S Pampa River</td>
<td>418</td>
<td>Niranam</td>
<td>1 to 13</td>
</tr>
<tr>
<td>Parumala</td>
<td>10P9a</td>
<td>SE 9°19'34.74N 76°31'32.24E</td>
<td>E Nakkada</td>
<td>84</td>
<td>Kadapra</td>
<td>5,6,7,8,9</td>
</tr>
<tr>
<td>Keecherivalkadavu</td>
<td>10P10a</td>
<td>SW 9°19'45.37N 76°28'27.38E</td>
<td>W Puthanar</td>
<td>839</td>
<td>Kupadra</td>
<td>13,14,15</td>
</tr>
<tr>
<td>Chathekery Kadavi</td>
<td>11M19a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Podiyadi Puthanthodu</td>
<td>11M20a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N: North, S: South, E: East, W: West
4.3 Physiography, Relief and Drainage of Micro Watersheds

Physiographically the project area lies between 7.5 m and 75 m above MSL. The five micro watersheds coming under Pulikeezhu IWMP - 2 project falls under mid land division. The geographical area of these micro watersheds ranges from 80 – 2400 hectares. Maximum relief (elevation difference between highest and lowest point) of these micro watersheds ranges from 4 m to 13 m. Table 4.2 represents some characteristics of micro watersheds.

Table 4.2: Characteristics of Micro Watersheds coming under IWMP II / 2011-12

<table>
<thead>
<tr>
<th>Watershed character</th>
<th>Project Area</th>
<th>10P8a</th>
<th>10P9a</th>
<th>10P10a</th>
<th>11M19a</th>
<th>11M20a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compactness Index</td>
<td>2.95</td>
<td>1.45</td>
<td>1.25</td>
<td>1.59</td>
<td>1.61</td>
<td>1.43</td>
</tr>
<tr>
<td>(C = P/2√π A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of Main stream (KM)</td>
<td>71.4</td>
<td>24.96</td>
<td>9.09</td>
<td>3.87</td>
<td>16.49</td>
<td>16.99</td>
</tr>
<tr>
<td>Drainage Density (KM/Sq.KM)</td>
<td>1.5</td>
<td>1.1</td>
<td>2.2</td>
<td>4.6</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Average Slope (%)</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>0 to 1</td>
</tr>
<tr>
<td>Relief (M)</td>
<td>4 to 13</td>
<td>11</td>
<td>13</td>
<td>4</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Elevation (M)</td>
<td>1 to 17</td>
<td>1 to 12</td>
<td>3 to 17</td>
<td>6 to 10</td>
<td>2 to 11</td>
<td>5 to 13</td>
</tr>
<tr>
<td>Perimeter (KM)</td>
<td>72.70</td>
<td>24.96</td>
<td>9.09</td>
<td>5.17</td>
<td>16.49</td>
<td>19.99</td>
</tr>
<tr>
<td>Area (KM²)</td>
<td>48.38</td>
<td>23.67</td>
<td>4.18</td>
<td>0.84</td>
<td>8.39</td>
<td>11.30</td>
</tr>
<tr>
<td>Drainage inside the WS (KM)</td>
<td>51.1</td>
<td>29.7</td>
<td>3</td>
<td>2.4</td>
<td>6.7</td>
<td>9.3</td>
</tr>
</tbody>
</table>

Source: Calculated using GIS Maps

4.4 Agriculture and Present Land Use in Micro Watersheds

The details of the land use pattern in the micro watersheds are presented in this section
The details of area of land under various crops in the micro watersheds are shown in Table 4.3.

**Table 4.3: Area of Land under Various Crops in Micro Watersheds (ha)**

<table>
<thead>
<tr>
<th>Name of the crop</th>
<th>Micro Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10P8a</td>
</tr>
<tr>
<td>Paddy</td>
<td>968.0</td>
</tr>
<tr>
<td>Tapioca</td>
<td>58.8</td>
</tr>
<tr>
<td>Drumstick</td>
<td>13.9</td>
</tr>
<tr>
<td>Amaranthus</td>
<td>1.7</td>
</tr>
<tr>
<td>Brinjal</td>
<td>1.1</td>
</tr>
<tr>
<td>Bitter gourd</td>
<td>1.9</td>
</tr>
<tr>
<td>Snake Gourd</td>
<td>1.6</td>
</tr>
<tr>
<td>Little gourd</td>
<td>2.6</td>
</tr>
<tr>
<td>Ash Gourd</td>
<td>0.3</td>
</tr>
<tr>
<td>Long bean</td>
<td>3.7</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>0.0</td>
</tr>
<tr>
<td>Cucumber</td>
<td>0.4</td>
</tr>
<tr>
<td>Green chili</td>
<td>0.1</td>
</tr>
<tr>
<td>Other Vegetables</td>
<td>3.7</td>
</tr>
<tr>
<td>Elephant Foot Yam</td>
<td>17.2</td>
</tr>
<tr>
<td>Cocolassia</td>
<td>21.7</td>
</tr>
<tr>
<td>Yam</td>
<td>3.9</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>0.0</td>
</tr>
<tr>
<td>Ginger</td>
<td>1.8</td>
</tr>
<tr>
<td>Turmeric</td>
<td>0.8</td>
</tr>
<tr>
<td>Coconut</td>
<td>794.5</td>
</tr>
<tr>
<td>Arecanut</td>
<td>24.1</td>
</tr>
<tr>
<td>Cashew</td>
<td>21.7</td>
</tr>
</tbody>
</table>
4.5 Plant Species in Micro Watersheds

The plants like fruit plants, oil crops, pulses etc seen in the micro watersheds in the project area are shown in Table 4.4.

Table 4.4: Plant Species in Micro Watersheds

<table>
<thead>
<tr>
<th>Crop type</th>
<th>Vernacular name</th>
<th>Common name</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuber Crops</td>
<td>Kappa/Maracheeni</td>
<td>Tapioca</td>
<td>Manihot esculenta</td>
</tr>
<tr>
<td></td>
<td>Chena</td>
<td>Elephant yam</td>
<td>Amorphophallus complanatus</td>
</tr>
<tr>
<td></td>
<td>Kachil</td>
<td>Yam</td>
<td>Dioscorea alata</td>
</tr>
<tr>
<td>Vegetable</td>
<td>Padavalanga</td>
<td>Snake gourd</td>
<td>Trichosanthes</td>
</tr>
<tr>
<td>Crops</td>
<td>Fruit Crops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vellarikka</td>
<td>Cucumber melon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kumbalanga</td>
<td>Cucumis sativus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vazhuthananga</td>
<td>Brinjal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solanum melongena</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thakkali</td>
<td>Tomato</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solanum lycopersicum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pachamulaku</td>
<td>Chilli</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheera</td>
<td>Amaranthus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achinga</td>
<td>Long bean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pavakka</td>
<td>Bitter gourd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kovakka</td>
<td>Little gourd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathanga</td>
<td>Pumpkin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Churakka</td>
<td>Bottle gourd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendakka</td>
<td>Okra/Lady’s finger</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abelmoschus esculentus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kudampuli</td>
<td>Garacenia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Garcinia gummi-gutta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valanpuli</td>
<td>Tamarind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kariveppila</td>
<td>Curry leaf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irumbampuli</td>
<td>Bilimbi</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Musa paradisiacal. M.sapiendum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mangifera indica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chakka</td>
<td>Jack fruit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Artocarpus heterophyllus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anjilichakka</td>
<td>Anjili</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Omakka</td>
<td>Papaya</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaithachakka</td>
<td>Pineapple</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ananas comosus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The different medicinal plants seen in the micro watersheds in the project area are shown in Table 4.5.

<table>
<thead>
<tr>
<th>Vernacular name</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karuka</td>
<td><em>Cynodon dactylon</em></td>
</tr>
<tr>
<td>Kudumpuli</td>
<td><em>Garcinia gummi gutta</em></td>
</tr>
</tbody>
</table>

Table 4.5: Medicinal Plants in Micro Watersheds
<table>
<thead>
<tr>
<th>Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mylanchi</td>
<td><em>Lawsonia inermis</em></td>
</tr>
<tr>
<td>Karivepu</td>
<td><em>Murraya koenigii</em></td>
</tr>
<tr>
<td>Thulasi</td>
<td><em>Ocimum sanctum</em></td>
</tr>
<tr>
<td>Keezharnelli</td>
<td><em>Phyllanthus</em></td>
</tr>
<tr>
<td>Cheroola</td>
<td><em>Aerva lanata</em></td>
</tr>
<tr>
<td>Shankupushpam</td>
<td><em>Clitoria ternatea</em></td>
</tr>
<tr>
<td>Iruveli</td>
<td><em>Coleus amboinicus</em></td>
</tr>
<tr>
<td>Panikoorkka</td>
<td><em>Coleus zeylanicus Benth</em></td>
</tr>
<tr>
<td>Nilappana</td>
<td><em>Curculigo orchiodes Gaertn</em></td>
</tr>
<tr>
<td>Manjal</td>
<td><em>Curcuma longa</em></td>
</tr>
<tr>
<td>Muthanga</td>
<td><em>Cyperus rotundus.</em></td>
</tr>
<tr>
<td>Asokam</td>
<td><em>Saraca asoca</em></td>
</tr>
<tr>
<td>Kallurukki</td>
<td><em>Scoparia dulsis</em></td>
</tr>
<tr>
<td>Kurumthotti</td>
<td><em>Sida rhombifolia</em></td>
</tr>
<tr>
<td>Adakkamaniyan</td>
<td><em>Sphaarathus indicus</em></td>
</tr>
<tr>
<td>Kanjiram</td>
<td><em>Strychnos nux-vumica</em></td>
</tr>
<tr>
<td>Valanpuli</td>
<td><em>Tamaridus indica</em></td>
</tr>
</tbody>
</table>
CHAPTER V
PROBLEMS TO BE ADDRESSED

The treatment in a watershed depends on the specific problems faced by the area. The five micro watersheds in the project area face many common problems because of the similarities existing among the micro watersheds. In order to ensure that the benefits of the project reaches different sections of the population, particularly the vulnerable, the involvement of the community is essential right from the planning the project. The participation of the community, particularly the vulnerable sections of the society such as those living below poverty line, small and marginal farmers, women, landless families, SC/ST communities have been ensured in the identification of the problems. The major problems identified through PRA techniques in the IWMP II/2012-13 project are given below:

1. Acute drinking water shortage.
2. Vachals/Thodu filled with silt resulting in water logging.
3. Flood damage due to improper drainage.
4. Waste dumping into the water bodies.
5. Acidity of the soil and lack of reclamation practices.
6. Water bodies filled with water hyacinth.
9. Insufficient milk production.
10. Lack of livelihood opportunities.
11. Other environmental issues
Recalling the ship wrecked sailors, water as far as up to the horizon, but not a single drop to drink. Inspite of having a large number of water bodies, many households of Nedumbram, Peringara, Kadapra, Nirana and Kutoor faces difficulties to fetch a pot of drinking water. The yellow coloured water from open wells in summer, contaminated water due to flood in rainy season, irregular supply of drinking water of water authority are the major problems related to the availability of drinking water.

The main drinking water sources of the project area are open wells and piped water. The households mainly depend on open wells for drinking and domestic purposes. The project area is prone to flooding except the Parumala watershed. During flood, many of the latrines in the project area overflow due to the rise in water table, which in turn results in the contamination of open wells and water bodies. Immediately after the rainy season, the water table goes down up to 8 meters below ground level. In 2013, despite good rainfall, acute drinking water scarcity was a problem for the region due to unscientific infrastructure projects that block canals and flood-escape routes.

During summer season, the water in many wells is seen to be yellow in color due to the presence of silt and iron. Uncontrolled sand mining from Pamba and Manimala rivers resulted in drastic reduction of water table in the five micro watersheds. It compels the people to dig wells deeper. They still get turbid water.

The situation is worsened due to unhealthy practices of the watershed community such as depositing plastic wastes in water bodies. It necessitates a strong campaign for preserving precious water. To ensure availability of safe drinking water, the following interventions are suggested;

1. Providing roof top rain water harvesting ferrocement tanks to the community. The excess water from the harvesting tank can be diverted to nearby well.
2. Renovation of public wells.
3. Open well recharging from roof top.
4. Installation of Reverse Osmosis Plant in highly polluted areas.
5. Providing Terrafil water filters to individual households.
The micro watersheds in the project area are endowed with several canals and channels. The canals have become dumping grounds for garbage in certain areas. In some places, the waste from the sewage pipes is dumped into the water bodies. Water logging due to poor drainage is another major problem reported in all the micro watersheds. Water logged areas becomes a habitation ground of mosquitoes. Silting, due to inadequate protection of the side walls, of the canals also adds to the gravity of the problem. Improper drainage affects environment and agriculture in the area. Desilting and increasing depth of canals and vachals will help to hold more rain water. Vachal is a suitable ecosystem for fish. While the removal of waste can be undertaken under MGNREGS, the activities related to side protection such as constructing side walls, planting vettiver, mangroves etc can be undertaken under the IWMP. Water flow can be improved by renovating the existing drainages which will ensure connectivity between channels and canals. Some of the canals and channels are blocked by the unscientific construction of roads and foot paths without culverts. It leads to water logging and flood. So construction of culverts has been suggested as an activity under the project.

One of the major agricultural crops in all the micro watersheds is paddy. The livelihood of a good number of households depends on the income from paddy farming. The low productivity and profitability of paddy farming has been a major problem faced by the area. Due to low profitability, many households have shifted to other jobs. We have also noticed that some of the paddy fields are being converted or kept uncultivated.

For paddy farming, water is to be pumped out of the fields prior to sowing. So strong outer bunds, around the field are inevitable to reduce the expenses for maintenance. These bunds can also be used as footpaths. Construction and strengthening of outer bunds for the paddy fields will improve the productivity and profitability of paddy cultivation in the project area. Hence, this activity has been proposed under the project. The dewatering of paddy fields necessitates the availability of motor, motor sheds, petti and para and electricity. Another aspect that leads to low profitability of paddy farming is the shortage of agriculture labourers. Soil of paddy fields have high acidity. So application of lime is essential to improve productivity.

Soil erosion from the homestead (ridges) to low lying areas is another problem noticed in the project area. Erosion decreases the productivity of the soil. So biofencing by local vegetation is proposed.
People having more than one cattle can be provided with biogas plants to make sure that the waste is not drained to the water bodies.

Proliferation of water hyacinth in the water bodies is another major problem in the project area. Ponds and canals are filled with these weeds. Removal of this can be converged with MGNREGA.

Lack of livelihood opportunities for the poor is another problem. In order to improve the livelihood opportunities of the population, the following interventions are proposed:

- Fisheries, duck farming, back yard poultry, cow/buffalo/goat rearing etc are suggested. Individuals and groups can be involved in this activity. Convergence is possible with the projects of the Department of Fisheries and animal husbandry.
- Land scarcity is a major barrier for horticulture development in the project area. So plants can be grown in plastic bags by filling soil and organic manure. These can be placed both in homestead and on the terrace of houses. The programme can be converged with the schemes of Vegetable and Fruit Promotional Council and the Department of Agriculture or RKVY.
- Other livelihood improvement options include floriculture, fodder cultivation, construction of cattle shed, production of different eco-friendly products, ornamental fish farming and lease farming.
CHAPTER VI

WATERSHED INTERVENTIONS

6.1 Introduction

The major objective of Integrated Watershed Management Programme (IWMP) is to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The watershed approach would result in improving the productivity of not only agriculture but also the overall production of bio-mass for enhancement of self-employment opportunities and thus the overall income of the rural households. Based on the problems identified through participatory methods and the inputs from several rounds of discussions with stakeholders including experts, suitable interventions for watershed development of the project area have been identified. The specific interventions under IWMP are broadly classified into Information, Education & Communication (IEC) Activities, Entry Point Activities (EPA), Natural Resource Management (NRM), Production System and Microenterprises (PSM) and Livelihood Activities.

6.2 Information, Education & Communication (IEC) Activities

Information, Education and Communication (IEC) is an important component and it has a vital role in creating awareness, mobilizing people and lays the basis for successful implementation of IWMP.

6.3 Entry Point Activities (EPA)

Entry point activities aim to mobilize the community in support of the subsequent interventions under the project. EPA helps to create rapport with the watershed community. Entry point activities are identified with a view to showcase them as model interventions which, in turn, would generate the interest of the community in watershed development activities. Community participation is essential to maximize the impact of the project and to ensure the sustainability of the project outcomes. Entry point activities identified in the project area are presented below:

(a). Portable Biogas plant of capacity 3m³
Biogas/Biomethanation technology refers to the production of a combustible gas (biogas) and value added fertiliser (slurry) by the anaerobic fermentation of organic materials under certain controlled conditions of temperature, pH, C/N ratio. In the context of global warming the conversion of methane gas to CO₂ is important. The manure produced through a biogas unit has a comparative advantage over ordinary manure in terms of both quantity and quality. It is rich in plant nutrients. The slurry improves soil fertility and therefore, increases crop yield.

Two plants are proposed, one in St. Mary’s High School, Niranam and another in Devaswom Board High School, Kadapra.

Maintenance is proposed to be entrusted with the user group. The gas and slurry produced by the biogas plant can be used by the UGs.

(b). Construction of Roof top Rainwater Harvesting Ferrocement Tanks

Availability of safe drinking water is a major problem in the project area. To improve the availability of safe drinking water, roof water harvesting proposed. Here the water from the roof top is made to flow through a natural filter media and is then collected in ferrocement tanks for domestic use.

(c). Reverse Osmosis Plant

Reverse Osmosis (RO) is a proven technology that is used to remove large majority of contaminants from water by pushing the water under pressure through a semi-permeable membrane. It is capable of removing more than 99% of the dissolved salts (ions), particles, colloids, organics, bacteria and pyrogens from the feed water. Reverse Osmosis is very effective in treating brackish, surface and ground water.

RO membranes requires cleaning atleast once in every year. If the normalized pressure drop or the normalized salt passage increases by 15% indicates the time for cleaning the membrane. The cleaning work can be entrusted to reputed service providers. The annual cleaning of membranes costs Rs. 5000 to 15000. Primary Health Centre located on western part of the Niranam Grama Panchayat faces acute drinking water shortage. This PHC is visited, on an average, by 100 patients everyday. But safe drinking water is not provided here even though it has an open well. The households near the PHC also face water shortage. A reverse osmosis plant in the PHC is proposed. Maintenance is to be entrusted with the local people and the hospital authority. An amount of Rs. 0.50 per litre
can be collected from the beneficiaries and the same can be used for annual maintenance (cleaning of membrane). A collection point has to be provided at the entrance of the hospital with a time frame of supply.

(d). Rain Water Harvesting Syringe for Sub Surface Ground Water Recharge

It’s a recharge or injection technique, directly to discharge water into water bearing zones. The roof water is stored in a tank is directed to the bore well. The water column exerts pressure and water will be spread in to the soil, pushing silt and other impurities backwards. The water is retained in the underground water column and this harvested water can be subsequently collected by simple piston pump or motor by constructing a tube well in the vicinity. 500 to 2500 litres of water can be drawn daily. The water thus harvested can be used for both drinking and minor irrigation.

(e). Renovation and Desiltation of dug out pond at Peringara

Renovation of dug out pond in Peringara High School is suggested to ensure continuous supply of safe drinking water in the school. Presently the pond is a dumping place of plastic wastes and bottles.

(f). Organic Vegetable Garden

Vegetable production in the project area is declining due to unscientific and unsustainable practices of vegetable cultivation such as uncontrolled usage of fertilisers, pesticides and weedicides. Hence a model vegetable garden is proposed at the Government High School Peringara.

To summarize, the entry point activities identified in the project area are presented in Table 6.2.

### Table 6.1: Entry Point Activities – Location and Estimate

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Location</th>
<th>Panchayat Ward No.</th>
<th>Amount</th>
<th>Persons/ Families Benefitted</th>
<th>Area Benefited</th>
<th>Total Amount (in lakhs)</th>
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</thead>
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<tr>
<td></td>
<td>Rain Water Harvesting Tank (Capacity 50000 L)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project Description</td>
<td>Location</td>
<td>Area (Acres)</td>
<td>Cost (Rs)</td>
<td>Income (Rs)</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------------------</td>
<td>----------------</td>
<td>--------------</td>
<td>-------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Kannasa Smarak School (9° 20' 53.66&quot;E, 9° 20' 53.66&quot;N)</td>
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<td>14,41,800.00</td>
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<td>2</td>
<td>Puthiyakavu School (76° 32' 1.28&quot;E, 9° 22' 2.495&quot;N)</td>
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<td>2,40,300.00</td>
<td>300</td>
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</tr>
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<td>3</td>
<td>SNPD School Chathenkery (76° 31' 17.54&quot;E, 9° 22' 43.28&quot;N)</td>
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<td>4</td>
<td>Govt:UP School, Mukaladi (76° 30' 38.01&quot;E, 76° 30' 38.01&quot;N)</td>
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<td>5</td>
<td>Govt:GHS, Peringara (76° 32' 50.96&quot;E, 9° 23' 4.01&quot;N)</td>
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<td>6</td>
<td>Prince Marthanda Varma HSS, Peringara (76° 32' 34.58&quot;E, 9° 22' 46.45&quot;N)</td>
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<td></td>
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**Portable Bio Gas Plant of Capacity 3m³ (2 No)**

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<th>Project Description</th>
<th>Location</th>
<th>Area (Acres)</th>
<th>Cost (Rs)</th>
<th>Income (Rs)</th>
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<tbody>
<tr>
<td>1</td>
<td>Devaswom Board High School, Parumala (76° 33' 0.21&quot;E, 9° 19' 55.99&quot;N)</td>
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**Reverse Osmosis Plant (1 No)**

<table>
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<th>Income (Rs)</th>
</tr>
</thead>
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<td>Primary Health Centre (76° 30' 6.0474&quot;E, 9° 20' 16.368&quot;)</td>
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</table>

**Rain Water Harvesting Syringe for Sub Surface Ground Water Recharge**

<table>
<thead>
<tr>
<th></th>
<th>Project Description</th>
<th>Location</th>
<th>Area (Acres)</th>
<th>Cost (Rs)</th>
<th>Income (Rs)</th>
</tr>
</thead>
<tbody>
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</table>

**Renovation and Desiltation of dug out pond at Peringara (76° 32' 50.9634"E, 9° 23' 4.0194"N)**

<table>
<thead>
<tr>
<th></th>
<th>Project Description</th>
<th>Location</th>
<th>Area (Acres)</th>
<th>Cost (Rs)</th>
<th>Income (Rs)</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>Renovation and Desiltation of dug out pond at Peringara</td>
<td>Peringara</td>
<td>10</td>
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**Organic Vegetable Garden**

<table>
<thead>
<tr>
<th></th>
<th>Project Description</th>
<th>Location</th>
<th>Area (Acres)</th>
<th>Cost (Rs)</th>
<th>Income (Rs)</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>Organic Vegetable Garden</td>
<td>Peringara</td>
<td>10</td>
<td>97000.00</td>
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</tbody>
</table>
The major activities in this phase are

i. Watershed Development Works or Natural Resource Management (NRM)

ii. Livelihood Activities for the poor people

iii. Production System and Microenterprises

The main watershed development interventions are as follows,

6.4.1 Watershed Development Works/Natural Resource Management (NRM) Activities

Natural resource management aims to maintain and improve natural resource base. People in the project area depend upon agriculture and allied activities. Management of natural resources helps to enhance livelihood of the local community on a sustainable basis. The main NRM activities identified for the project area are as follows:

(a). Renovation of Outer Bund/Strengthening/Construction of Outer Bunds for Conservation Measures of Agricultural Land

Strong outer bunds are prerequisite for successful cultivation of paddy in the Padasekharams. Paddy fields in the project area are lying below or equal to the water level of canals. So to avoid water intrusion, renovation/strengthening/construction of outer bund is proposed. The works undertaken are listed in the annual action plan. Some of the padasekharams in the project area are willing to start “Orunellum Orumeenum” programme expecting more profitability from the farm. This could be encouraged by providing financial support to raise the field bund to hold sufficient water. Tharkolil, Valavanari, Niranathuthadam, Vanjippuzhappallam Paddy field, and Manakeri Padasekharams are identified for this intervention. This could be converged with Kuttanad Package.

(b). Vettiver/Fodder Grass Planting to Prevent Soil Erosion
Soil erosion from bund and raised land is occurring due to high amount of precipitation during monsoon. The bunds bordering canals and paddy fields are having gentle slope. During precipitation, soil on bund will erode to the water bodies and to paddy fields. This erosion causes degradation of soil fertility. It can be prevented by suitable soil conservation interventions like planting vettiver or fodder grass along the bunds and slope.

(c). Desilting/Deepening/Formation/Interlinking of Channels (Vachals)

Vachals are drainage channels in the padasekharams. These are used for irrigation as well as drainage of the padashekarams. In some padasekharams, vachals are being silted partially or completely, making the process of dewatering and irrigation insufficient. The proper management of vachals is required for water conservation irrigation and drainage. So desilting/deepening/formation/interlinking of drainage channels (Vachals) are suggested. This can be integrated with MGNREGA.

(d). Removal of Water Hyacinth from Canals

The canals are being filled with water hyacinth due to high eutrification. Low level of salinity, increased discharge of organic waste and fertilizer residues in water bodies are the main reasons for this. Aggressive growth of weeds is preventing the movement of ducks and is also affecting reproduction of fish. So removal of water hyacinth is suggested. It can be fully undertaken in MGNREGS.

(e). Desilting, Widening and Deepening of Canals for Conservation of Irrigation and Drainage

The project area has a number of canals around the padasekarams. Long back, they were used to transport agricultural produce to distant markets. Presently, most of the canals are filled with water hyacinth, waste and silt. Removal of silt will increase the water storage capacity of the canal and will, therefore, help to hold more water during flood. It will also help to improve the quality of water in wells and ponds.

(f). Box Culverts and Shutter for the Management of Flood

Project area has a number of criss crossing water channels and these are being blocked due to unscientific construction of roads and foot paths without culverts. It leads to water logging and flood. So sufficient box culverts have to be constructed to avoid water logging. Regulation of water flow from the canals
and paddy fields are controlled by shutters. There is shortage of shutters in some of the paddy fields in the project area. So shutters are suggested in these padasekharams.

(g). Agro forestry at Home Stead/Bund Sides

The garden land (home stead) and raised bunds of paddy fields are occupied by a variety of plants adn trees. Even though the vegetative cover in the area is thick, further enhancement can be done by providing demand based supply of seedlings without compromising the natural habitat. So, seeds of fruit trees, cash crops, and other varieties of plants can be distributed among households free of cost.

(h). Strengthening of inner bunds of paddy fields

Inner bunds of paddy fields help in reducing soil erosion. At present, some of the inner bunds in Padasekharams are not maintained properly. Strengthening of inner bunds can be undertaken in MGNREGS.

(i). Renovation/Desilting of Dugout Ponds (Embankment & Side Wall Protection)

Ponds are considered as one of the important freshwater habitats and are useful for surface runoff harvesting and ground water recharging. It has an important role in maintaining the biodiversity of the area. Ponds in the project area are not maintained well. In the past, there were ponds in many homesteads. But later it got filled. Most of the public ponds are also facing degradation due to lack of proper maintenance. Silting and over growth of water hyacinth are the major problems. So removal of water hyacinth, desiltation and side wall protection is proposed. Removal of water hyacinth can be converged with MGNREGS.

(j). Rooftop Rainwater Harvesting Ferrocement Tanks

Project area faces acute drinking water shortage. Most people use traditional water harvesting technique by using a clean cloth or clean plastic sheet for collection of water. At present, they can store water only for a few days. Large storage facility is essential to conserve water. One option to improve drinking water availability is to make use of water harvesting technique. The process involves collecting rainwater from roof catchments, passing it through the natural filter media and storing it in ferrocement tanks for drinking and other domestic purposes. So it is suggested that ferrocement tank may be allotted to households and installed in public places.
(k). Open Well Recharging from Roof tops for Ground Water Recharge

Drinking water shortage due to turbidity of the water can be sorted to some extent through recharging from roof top. The process involves collection of rain water from the roof top and diverting directly to the well through a filter medium. Entry of rain water into the well results in a rise in water column. It will exert pressure and infiltrate into ground water.

(l). Floating Drum Portable Biogas Plant

Improper waste management practices such as dumping waste in the water bodies and public places is an important problem identified through PRA. To solve this problem, it is suggested that floating drum portable biogas plants may be provided to households in the project area. The portable biogas technology has the following advantages.

- Requires only kitchen waste and other biodegradable wastes from surroundings.
- Requires less space
- Portable nature.
- High gas production.
- Cheap and economical.
- Solution to biodegradable waste management.
- Ecofriendly approach.

A 1m³ litre plant will provide approximately 2.5 hours of cooking gas and the slurry coming out of the plant is a good bio-manure.

(m). Terrafil Water Filter
Project area is experiencing acute drinking water shortage due to high presence of iron and turbidity. So a low cost device, ‘Household Terrafil Water Filter’ (30 litre capacity), developed by CIPET Bhuvaneswar is suggested. TERAFIL is a low cost burnt red clay porous media (disc/candle), used for filtration & treatment of turbid raw water into clean drinking water for domestic/ community applications. Suspended particles, sediment, iron & many heavy metals, micro-organism, are separated from raw water effectively during filtration, without clogging the core of the TERAFIL. It can be fixed with any container for purification of water. Quality of product water is within BIS limits, especially for turbidity, iron & micro-organisms. Cost of purification is within Rs.2/- per ton of product water, considering total cost of plant. It operates without electricity. Average life of TERAFIL media is five years.

(n) Construction of Ramp for Land Management
Mechanised agriculture is common in the project area due to shortage of agriculture labourers. Presently, farmers are spending large amounts of money and man power to bring these machines to the fields. To avoid this burden, construction of ramp is proposed in suitable places.

(o) Well Renovation
There are a large number of public wells in the project area and most of them are being utilised by the people. But due to improper maintenance a number of them are unhygienic. It is suggested that some of the public wells are renovate to make them usable.

(p) Construction of New Well
Western end of the Niranam gram panchayat is facing acute drinking water shortage due to water contamination. Households in the area are located in very small land holdings from 3 cents to 5 cents. Every household in the area is having own toilet and they have no space for digging a new well at a safe distance from the toilet pit. About 50 families in the area and a health centre located in the area are fetching water from distant places. So digging a new well at the health centre is proposed. A reverse osmosis plant is also necessary to improve availability of safe drinking water. User group can collect Rs. 0.50 per litre for future maintenance.

6.6 Production System and Microenterprises
According to the Common Guidelines for Watershed Development Projects (2008), 10 per cent of the total project cost is to be assigned to support the production system and micro enterprises. This component aims to: (a). promote diversified production/farming system based livelihood activities/ interventions (b). encourage farmers to adopt and upscale successful experiences of proven technologies, integrated farming systems and improved farming practices for livelihood augmentation.

The activities / interventions planned under this component are:

**Fodder Cultivation:**
Promotion of fodder cultivation is important to reduce the production cost of milk and making cattle rearing profitable. Financial assistance of Rs. 550/Unit (10 cents) to farmers can be given through diary co-operative societies/ SHGs for grass cultivation.

**Liming for Reclamation of the Acidity of Soil**
Due to acidity in soil, farmers spend a large amount to stabilize the pH value. Application of lime in soil helps to improve the soil quality. 700 – 1400 Kg of quick lime is recommended per hectare per year depending on the pH of the soil.

**Lease Farming:**
Labours shortage has been a major problem faced by the farmers and it has led many farmers to keep the land fallow. By providing financial and technical support, the SHG members could start agriculture meaningfully.

**Cage Fish Farming**
Cage culture of fish is an innovative method to grow fish in a limited space. Fishes are raised commercially in cages. This method is easier for fish stock monitoring and harvesting. It can be converged with schemes of the Fisheries department.
Horticulture - Vegetable Cultivation:

Project area is located very near to Thiruvalla Municipality, which is a thickly populated town. Most of the people in the town and in the project area are depending on the supplies from Tamil Nadu for vegetable. At the same time, a large extent of land, which are suitable for agriculture production are being kept fallow. The situation can be changed by providing financial and technical support to interested farmers or to a group of farmers to bring their land under vegetable cultivation.

Nursery Formation of Fruit and Spices Plants:

Formation of a nursery is suggested to produce seedlings of various plants like coconut, spices, mango, jack, medicinal plants etc. It directly helps to improve the vegetative cover of the project area.

Paddy Straw Mushroom cultivation:

Due to good demand for mushroom and because of the abundant availability of the base material (Paddy straw) mushroom cultivation by farmers can be encouraged in the project area.

Distribution of 6 month old buffalo Calveby farmers: Since the project area has a large extent of paddy fields, animal husbandary has good scope.

6.7 Livelihood Support

The Common Guidelines for Watershed Development Projects (2008) gives priority to livelihood support for landless/asset less persons. Nine per cent of the total project cost is assigned to support the livelihood activities of landless/asset less households. This aims to maximize the utilization of potential generated by watershed activities and in creating sustainable livelihoods for households within the watershed area.
The guiding principles for livelihood improvement initiatives are:

1. Livelihood improvement initiatives emphasize on natural resource based activities and conform to principles of equity, gender sensitivity and transparency. It strives to:-
   a) Enhance livelihood opportunities for the poor through investment into asset creation and improvement in productivity and income.
   b) Improve access of the marginalized communities including SC/ST, landless/asset less people, women etc to the benefits.
   c) Select the beneficiaries in a transparent manner.

2. Livelihood initiatives for landless/asset less households should aim at improved household income, participation and division of labour, access to information, knowledge, appropriate technologies and resources.

The activities/interventions related to livelihood improvement suggested for the project area are as follows:

- **Ornamental fish farming**: Can be promoted among Kudumbasree groups and individuals. Rearing of ornamental fishes can be taken up in fresh water ponds, agrifilm ponds, canals, etc with the help of enterprises which are ready to buy the products.

- **Vegetable Retail Shop**: Vegetable retail shops along the state highways or main junctions are proposed.

- **Goat/Poultry/Duckery Rearing**: Groups of landless and poor households can be assisted to start purchase Goat/Poultry/Duckery.

- **Units for food processing**: There is some potential for starting food processing units on a small scale. Locally available rice can be powdered and dry roasted to make it suitable for cooking appam, puttu, dosa etc. If powdered in the traditional way, it can add value to the product.

- **Book binding units**: Project area is very close to Thiruvalla municipality and a number of government offices and educational institutions are there. Binding of books and project reports have a good scope from these offices. SHG Federations can start such units.
- **Garment Unit**: Spending on clothing by Malayalees have changed significantly over the years. There is an increase in demand for ready made clothing. To capitalise on this demand, garment making units suggested in the project area. Apart from making ready made garment, the units can also cater to the local demand for stitching clothes.

### 6.8 Sustainable Management Practices for Watershed Area

Micro watershed management involves integrating people, land and water. Management practices aims at long term well being of the local community. Following are some of the micro watershed management practices suggested for the project area:

- a. Regular maintenance of ponds, wells and drainages
- b. Prevent dumping of waste into water bodies.
- c. Keep the drainages waste free.
- d. Manage waste in home by using compost pits, bio gas plants etc.
- e. Reuse the plastic items.
- f. Install and maintain rain water harvesting structures and harvest maximum rain water using filtered tanks.
- g. Regularly clean the rain water harvesting structures to ensure purity of drinking water. Also ensure that stored rain water is not contaminated.
- h. Undertake vegetable cultivation/horticulture in yard or terrace using sacks and polythene covers.
- i. Plant trees and preserve existing trees and shrubs to prevent soil erosion.
- j. Do not spray pesticides indiscriminately.
- k. Prevent over grazing by domestic animals (like goats, cows etc).
# Chapter VII
## Detailed Action Plan

### 7.1 Annual Action Plan

| I | Institution building | 1.25 |
| II | Information, Education & Communication (IEC) Activities in the Project Area | 9.338 |
| III | Capacity Building Programme | Year 1 | Year 2 | Year 3 | Year 4 | Total |
| | | Physical | Financial | Physical | Financial | Physical | Financial | Physical | Financial | Physical | Financial |
| 1 | Empowering Elected Representatives for IWMP | 2 | 0.144 | 2 | 0.144 | 1 | 0.072 | 5 | 0.360 |
| 2 | Training Programme on IWMP | 8 | 1.20 | 8 | 1.20 | 8 | 1.20 | 0 | 24 | 3.60 |
| 3 | Training Programme for Watershed Committee Members | 14 | 0.84 | 14 | 0.84 | 7 | 0.42 | 42 | 2.52 |
| 4 | Training Programme for User Groups | 10 | 0.60 | 10 | 0.60 | 10 | 0.60 | 4 | 0.22 | 34 | 2.02 |
### Table No. 7.2: Annual Action Plan - Natural Resource Management

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<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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**Total**         | 6604926  | 9440854 | 12703122 | 3762458 | 32511360 |
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**Livelihood Action Plan**

The activities proposed under the livelihood action plan are meant for improving livelihood of the poor and marginalized people in the project area. It is proposed to earmark 9 percent of the total allotted amount for the activities under this plan. Major portion of this component is suggested to give to the SHGs working in the project area as revolving funds for improving their livelihood improvement/income generation activities. The beneficiary SHGs will be selected
mainly on the basis of criteria currently used to rate the SHGs. If any change in the criteria is required with regard to the selection of beneficiary SHGs, same will be decided at the time of selection considering the suitable factors and according to State level policies. The funding pattern under livelihood support will be as follows

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Table 7.4: Financial Plan for Livelihood Activities

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CHAPTER VIII
EXPECTED OUTCOMES

8.1 Expected Outcomes

The expected outcomes of the IWMP project are detailed below:

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<th>Pre project period status</th>
<th>Post project period Status</th>
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<td>1</td>
<td>Renovation of irrigation canals/Ponds</td>
<td>Farmers</td>
<td>• Irrigation canals filled with sediment deposit</td>
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<td>• Smoothen water flow</td>
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<td>• Expansion of area irrigated(1197 Ha)</td>
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<td>• Production enhancement(5%)</td>
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<td>Construction of Culvert/Shutter/Ramp</td>
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<td>• Lack of adequate flood control measures</td>
<td>• 23 Nos of the Culvert/ Ramp/ Shutter will bring the following benefit:</td>
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<td>• Difficulty in movement of agricultural implements and machines</td>
<td>• Flood control (in 540 Ha)</td>
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<td></td>
<td>• Sufficient water availability (in 540 Ha)</td>
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<td>• Easy movement of agricultural implements and machines</td>
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<td>Management of water resources</td>
<td>Watershed community</td>
<td>• Inadequate water</td>
<td>• Recharging of 1658 open wells, desiltation of Pond (7184m³), Rainwater Harvesting Ferrocement Tank (30 Nos), and distribution of 2147 purification devices will ensure the following results:</td>
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<td>• Water resources are polluted</td>
<td>• Water availability in summer season (12</td>
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</table>

113
| 4 | Strengthening/Construction of bunds | Watershed community | • Weak/Insufficient height of bunds | • Construction of bund around the padasekharams (252253m³) will bring the following results  
• Stronger bunds |
| 5 | Livelihood activities | Poor people (landless or asset less) | • 37 per cent of families live below poverty line. | • Atleast 125 SHGs will get aid for strengthening their livelihood activities every year.  
• Generate employment opportunities (At least for 1250 Households)  
• Empowerment of landless, asset less poor people especially women who are home makers without having any monetary benefit. Through the seed money they can earn Rs.2000 Per month) |
| 6 | Production system | Small and marginal farmers, asset less households | • Shortage of labour | • Rise in production of paddy, milk, fish catch, eggs, vegetables etc. (Fodder cultivation in 42 acre will help to yield 5% more milk from milching animal, 53 Ha more vegetable cultivation will ensure more availability, 71 cage units will give atleast 9000 Kg of fish per year, buffalo calves will increase beef and milk availability) |
The main source of financial assistance for the post implementation period is Watershed Development Fund (WDF). One of the mandatory conditions for the selection of villages for watershed projects is people’s contribution towards WDF. The Contribution to WDF shall be a minimum 10% of the cost of NRM works executed on private land only. However, in case of SC/ST, small and marginal farmers, the minimum contribution shall be 5% of cost of NRM works executed on their land. These contributions would be acceptable either in cash at the time of execution of works or voluntary labour. A sum equivalent to the monetary value of the voluntary labour would be transferred from the watershed project account to the WDF bank account that will be distinct from the Watershed Committee (WC) bank account. User charges, sales proceeds and other contributions, disposal amounts of intermediate usufruct rights shall also be deposited in the WDF bank account. Income earned from assets created under the project on common property resources shall also be credited to WDF.

For other cost intensive farming system based livelihood activities/interventions such as Aquaculture, Horticulture, Agro-Forestry, Animal Husbandry etc. on private land directly benefiting the individual farmers, the contribution of farmers will be 20 percent for general category and 10 percent for SC/ST beneficiaries and the project funds will meet the cost of farming system activity to a maximum limit of an amount equal to double of the unit cost of the project for watershed development (i.e. Rs 12,000/15,000 per ha, as the case may be). Farmers’ contribution i.e. 20 percent for general category and 10 percent for SC/ST of this amount (i.e. a maximum of Rs 4800/6000 and Rs 2400/3000 as the case may be, respectively for general category and SC/ST beneficiaries) will go to WDF.

The Secretary, Watershed Committee (WC) shall maintain a completely separate account of the income and expenditure of the WDF. Rules for operation of the fund should be prepared by the Watershed Committee (WC) and ratified by the Gram Sabha. The WDF bank account should be operated by the President of the Gram Panchayat and any member from the SHG nominated by the Gram Sabha. Alternatively, the guidelines for the management and utilization of the WDF may be evolved by the concerned Nodal Ministry.
After completion of Phase II, at least 50% of the WDF funds shall be reserved for maintenance of assets created on community land or for common use under the project. Works taken up on private land shall not be eligible for repairing/maintenance out of this Fund. The remaining money may be used as a revolving fund to advance loans to the villagers of the project area who have contributed to the fund. Individuals as well as charitable institutions should be encouraged to contribute generously to this Fund.
SUMMARY AND CONCLUSION

Pulikeezhu (IWMP 2) project is located in Pulikeezhu block in Thiruvalla Taluk of Pathanamthitta District. The project comprises of five micro-watersheds namely Ayyankonari (10P8a), Parumala (10P9a), Keecherivalkadavu (10P10a), Chathenkery Kadavu (11M19a) and Podyadi Puthanthodu (11M20a). The project area is spread over five grama Panchayats of Pulikeezhu block namely Kadapra, Niranam, Peringara, Nedumbram and Kuttoor. There are 15203 households in the project area and the total population is 64033. The total project cost of the Pulikeezhu IWMP 2 project is Rs.580.53 lakhs.

Department of Local Self Government is the nodal department for the implementation of IWMP at the state level. State Level Nodal Agency (SLNA) is coordinating and providing guidelines for the effective planning and implementation of the individual IWMP projects. District Planning Committee (DPC) is responsible for the planning and implementation of the projects at the district level. To help the DPC and to coordinate the project level activities, Watershed Cell Cum Data Centre (WCDC) is working at the district level. The Pulikeezhu Block Panchayat is the Programme Implementing Agency (PIA) of the Pulikeezhu IWMP 2 project. A Block Level Coordination Committee (BLCC) has been formed for the timely implementation of the project and to provide help to the PIA in technical and administrative matters related to the project. Watershed Development Team (WDT) has been formed under the PIA. Centre for Socio-economic & Environmental Studies (CSES) is the Technical Support Organisation (TSO).

A cluster approach was followed in the preparation of DPR. The preparation of the DPR involved several rounds of discussions with elected representatives, officials and other stakeholders. A situational analysis was undertaken using secondary data and information collected from different sources. A baseline survey covering all the households in the project area was also conducted. A Logical Framework Analysis was done at the project level for identifying the important problems (through problem tree analysis) as well as for the purpose of assessing the present situation. Other PRA techniques like transect walk, social mapping, resource mapping, seasonal calendar, etc., were employed in each micro watershed area. GIS and remote sensing devices have been made use of in the preparation of DPR. Quantum GIS Software was used for the preparation of maps. 1:4000 scaled cadastral maps of each village formed the base map for planning. Depth interviews with officials,
farmers, fisher folk, entrepreneurs of micro-enterprises etc. were also undertaken. Field level verification of the identified interventions was undertaken by the DPR preparation team.

The five micro watersheds in the project area face many common problems because of the similarities existing among the micro watersheds. The major problems identified through PRA techniques which have led to the identification of the interventions to be undertaken under the IWMP project are drinking water shortage, canals filled with silt, waste dumping into the water bodies, flood during rainy season, water logging, weak bunds, acidity of the soil, water bodies filled with water hyacinth, fields reclaimed or kept uncultivated, shortage of agricultural labourers, unscientific construction of roads and foot paths, uncultivated paddy fields etc. The suggested interventions for the above mentioned problems are: (a) construction of ferrocement rain water harvesting tanks (b) maintenance of wells and ponds for the availability of fresh water (c) install reverse osmosis plant (d) installation of a water quality testing lab (e) de silting and increasing depth of canals and vachals to hold more water (f) planting vettiver, fodder grass etc for side protection (g) construction of culverts to prevent water logging and flood (h) construction and strengthening of outer bunds for the paddy fields to improve the productivity and profitability of paddy cultivation (i) install biogas plants (j) removing water hyacinth (k) improve livelihood opportunities by promoting pisciculture, horticulture, cage fishing, floriculture, fodder cultivation, supply of cow, goat, duck, chicks etc, training on production of different eco-friendly products etc. The scope for convergence with other schemes and programmes have been examined in identifying interventions under IWMP. The interventions under IWMP is expected to help in restoring the ecological balance of the project area, conserving the natural resources and in improving the livelihood opportunities of the people.
Table 9.1: Project at a glance

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
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<tr>
<td>Total Geographical Area of Project (Lakh Hectares)</td>
<td>0.04838</td>
</tr>
<tr>
<td>Treatable Area</td>
<td>0.04838</td>
</tr>
<tr>
<td>Wasteland (Lakh Hectares)</td>
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</tr>
<tr>
<td>Rainfed Agricultural Land (Lakh Hectares)</td>
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</tr>
<tr>
<td>Total Cropped Area (Lakh Hectares)</td>
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</tr>
<tr>
<td>Net Sown Area (Lakh Hectares)</td>
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</tr>
<tr>
<td>Total no. of Water Storage Structures</td>
<td>96</td>
</tr>
<tr>
<td>Total no. of Water Extracting Units</td>
<td>12788</td>
</tr>
<tr>
<td>Total storage capacity of water storage structures (cubic meters)</td>
<td>36560</td>
</tr>
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**No. of Household**

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<th>Category</th>
<th>Value</th>
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<td>SC</td>
<td>1404</td>
</tr>
<tr>
<td>ST</td>
<td>25</td>
</tr>
<tr>
<td>Others</td>
<td>13774</td>
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<tr>
<td>Total HHs</td>
<td>15203</td>
</tr>
<tr>
<td>Total Population in the project Area</td>
<td>64033</td>
</tr>
<tr>
<td>No. of Household of Landless people</td>
<td>251</td>
</tr>
<tr>
<td>Total no. of BPL Household</td>
<td>5664</td>
</tr>
<tr>
<td>No. of Small Farmer’s Household</td>
<td>77</td>
</tr>
<tr>
<td>No. of Marginal Farmer’s Household</td>
<td>14286</td>
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</table>

**Depth of Ground Water (meters) below Ground Level**

<table>
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<th>Season</th>
<th>Depth</th>
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</thead>
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<td>Pre-monsoon</td>
<td>4.2</td>
</tr>
<tr>
<td>Post-monsoon</td>
<td>2.1</td>
</tr>
</tbody>
</table>

| No. of person-days of Seasonal Migration | 45198 |

**Name of the Project**

IWMP II/2012-13 Pulikeezhu Watershed

**District**

Pathanamthitta

**Blocks Covered**

Pulikeezhu

**Name & Code of micro-watersheds**

- Ayyankonari - 10P8a, Parumala - 10P9a, Keecherivalkadavu - 10P10a, Chathenkery Kadavu - 11M19a, Podiyadi Puthanthodu - 11M20a.

**Gram Panchayats covered**

Kadapra, Niranam, Peringara, Nedumbram, Kuttoor
APPENDIX -I
## Detailed Estimate

<table>
<thead>
<tr>
<th>SL NO</th>
<th>DESCRIPTION</th>
<th>NO</th>
<th>Lenght</th>
<th>Breadth</th>
<th>Depth</th>
<th>Quantity</th>
<th>Rate/Unit</th>
<th>Amount</th>
<th>Labour</th>
<th>Tax (6%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>1. RAMP CONSTRUCTION (2 sides)</strong></td>
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</tr>
<tr>
<td>1</td>
<td>Earth work excavation in or under water and depositing cutsoil on the side of paddy field</td>
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<td>5</td>
<td>1.2</td>
<td>1</td>
<td>24</td>
<td>1515.6</td>
<td>3801.1</td>
<td>2</td>
<td>380.12</td>
<td>3801.12</td>
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<td>1.8</td>
<td>0.6</td>
<td>0.5</td>
<td>1.08</td>
<td>1524.8</td>
<td>18297.60</td>
<td>60</td>
<td>10609.2</td>
<td>7688.4</td>
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</tr>
<tr>
<td>2</td>
<td>Dry rubble masonry for foundation including all charges conveyance, labour charges etc. Complete</td>
<td>4</td>
<td>5</td>
<td>1.2</td>
<td>0.5</td>
<td>12</td>
<td>1524.8</td>
<td>18297.60</td>
<td>60</td>
<td>10609.2</td>
<td>7688.4</td>
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<td>18297.60</td>
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<td></td>
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</tr>
<tr>
<td>3</td>
<td>Random rubble masonry for superstructure including all charges conveyance, labour charges etc. Complete</td>
<td>4</td>
<td>5</td>
<td>0.6</td>
<td>(1.5+.50)/2</td>
<td>12.6</td>
<td>1524.8</td>
<td>18297.60</td>
<td>60</td>
<td>10609.2</td>
<td>9664.32</td>
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<tr>
<td></td>
<td>For side walls</td>
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<td>0.72</td>
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<td>38394.7</td>
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<td>13.32</td>
<td>2882.49</td>
<td>77</td>
<td>28730.4408</td>
<td>9664.32</td>
</tr>
<tr>
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<td></td>
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<td></td>
<td>13.32</td>
<td>2882.49</td>
<td>77</td>
<td>28730.4408</td>
<td>9664.32</td>
</tr>
</tbody>
</table>
Cement concrete 1:2:4 using 20mm (nominal size) hard granite broken stone for reinforced cement concrete work including all form work watering curing etc. complete.

<table>
<thead>
<tr>
<th>For slab</th>
<th>1</th>
<th>1.5</th>
<th>3</th>
<th>0.2</th>
<th>0.9</th>
<th>2.22</th>
<th>6511</th>
<th>14454</th>
<th>42</th>
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<tr>
<td>For top (coping concrete)</td>
<td>4</td>
<td>5.5</td>
<td>0.6</td>
<td>0.1</td>
<td>1.32</td>
<td>6511</td>
<td>15858.94</td>
<td>94</td>
<td>9548.3</td>
<td>6310.7</td>
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<td>Total</td>
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<td>2.22</td>
<td>6511</td>
<td>15858.94</td>
<td>94</td>
<td>9548.3</td>
<td>6310.7</td>
</tr>
<tr>
<td>Rough stone dry packing for forming road surface</td>
<td>2</td>
<td>5</td>
<td>1.8</td>
<td>0.6</td>
<td>10.8</td>
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<td>1468.42</td>
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<td></td>
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<td>4839.41</td>
<td>4839.41</td>
<td>967.88</td>
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<td>2.22</td>
<td>6511</td>
<td>15858.94</td>
<td>94</td>
<td>9548.3</td>
<td>6310.7</td>
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Rough stone dry packing for forming road surface

Providing reinforcement

Total

122
### 2. VAACHAAL NIRMAMAN

<table>
<thead>
<tr>
<th></th>
<th>Clearing grass and other overgrowths of vegetation and small trees of girth up to 30 cm</th>
<th>1</th>
<th>500</th>
<th>2.1</th>
<th>1050 m²</th>
<th>188.5 /100 m²</th>
<th>1979.2 /5</th>
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<td>500</td>
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<td>270 m³</td>
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### 3. CONSTRUCTION OF RAMP(SLOPE)

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<th>5</th>
<th>1.2</th>
<th>1</th>
<th>12.54 m³</th>
<th>1515.6</th>
<th>1900.5</th>
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<th>1900.56</th>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>For blocks</td>
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<td>0.54</td>
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<td>1900.5</td>
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</tr>
<tr>
<td></td>
<td>Dry rubble masonary for foundation including all charges conveyance, labour charges etc. Complete</td>
<td>2</td>
<td>5</td>
<td>1.2</td>
<td>0.5</td>
<td>6 m³</td>
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<tr>
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<td>Random rubble masonary for superstructure including all charges conveyance, labour charges etc. Complete</td>
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<td>3</td>
<td>For side walls</td>
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<tr>
<td>For bed block</td>
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<td>36</td>
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<td></td>
<td></td>
<td>6.66 m³</td>
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<tr>
<td>Cement concrete 1:2:4 using 20mm (nominal size) hard granite broken stone for reinforced cement concrete work including all form work watering curing etc. complete.</td>
<td>4</td>
<td>5.5</td>
<td>0.8</td>
<td>0.1</td>
<td>0.66</td>
<td>6511</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For top (coping concrete)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>0.66 m³</td>
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<td>1182.06</td>
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<td>1.8</td>
<td>0.6</td>
<td>5.4</td>
<td>1468.42</td>
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<td>4. POND RENNOVATION</td>
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<td>45278.3</td>
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<tr>
<td>Bailing out water with (5 H P) engine and pump set</td>
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<td>1</td>
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<td>Bailing out water with (5 H P) engine and pump</td>
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124
## 6. CANAL CONSTRUCTION

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<tr>
<td>1</td>
<td>Clearing grass and other overgrowths of vegetation and small trees of girth up to 30 cm</td>
<td>1 350</td>
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<td>770</td>
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<td>2</td>
<td>Earth work excavation in or under water and depositing cutsoil on the side of paddy field for channel (vaachaal)</td>
<td>1 350</td>
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<td>3</td>
<td>Cement concrete 1:4:8 for bed</td>
<td>1 350</td>
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### Notes:
- **Total**: 15474.33 12145.84 4584 928.46 16402.7
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<th>Description</th>
<th>No.</th>
<th>L</th>
<th>B</th>
<th>D</th>
<th>Qty</th>
<th>Rate</th>
<th>Unit</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Earth work excavation in hard soil for digging well with initial lift up to 1.50m</td>
<td>3.14</td>
<td>1.175</td>
<td>1.175</td>
<td>1.50</td>
<td>6.5</td>
<td>2710</td>
<td>m³</td>
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<td>3.14</td>
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<td>1.175</td>
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<td>6.5</td>
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<td>m³</td>
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<td>3.14</td>
<td>1.175</td>
<td>1.175</td>
<td>1.50</td>
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<td>m³</td>
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</tr>
<tr>
<td>4</td>
<td>Earth work excavation in ordinary rock for digging well with 4th depth up to 6.00m including all charges</td>
<td>3.14</td>
<td>1.175</td>
<td>1.175</td>
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<td>4682</td>
<td>m³</td>
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<tr>
<td>5</td>
<td>Earth work excavation in ordinary rock for digging well with 5th depth up to 7.50m including all charges</td>
<td>3.14</td>
<td>1.175</td>
<td>1.175</td>
<td>1.20</td>
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<td>5619</td>
<td>m³</td>
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<tr>
<td>6</td>
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<td>0.4239</td>
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<td>6900</td>
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<td>m³</td>
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7. CONSTRUCTION OF WELL

<table>
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<th>L</th>
<th>B</th>
<th>D</th>
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<td>6.5</td>
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<td>m³</td>
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<td>Earth work excavation in ordinary rock for digging well with 4th depth up to 6.00m including all charges</td>
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<td>1.175</td>
<td>1.175</td>
<td>1.50</td>
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<td>m³</td>
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<td>6.5</td>
<td>3902</td>
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<td>6.5</td>
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<td>m³</td>
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<td>Earth work excavation in ordinary rock for digging well with 5th depth up to 7.50m including all charges</td>
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<td>7</td>
<td>Form work</td>
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<td>m³</td>
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<td>8</td>
<td>Reinforcement</td>
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<td>12.717</td>
<td>152.604</td>
<td>100</td>
<td>kg</td>
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<td>9</td>
<td>Cement concrete 1:2:4 using 20mm (nominal size) hard granite broken stone including watering curing etc. complete.</td>
<td>1.00</td>
<td>0.3251</td>
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<td>m³</td>
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<td>10</td>
<td>Pointing with cement mortar</td>
<td>12.00</td>
<td>(2X3.14X1.075)</td>
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<td>m</td>
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8. RENNOVATION OF WELL OF DIA 3M (PLATFORM & SIDE WALL)

<table>
<thead>
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<th>B</th>
<th>D</th>
<th>Qty</th>
<th>Rate</th>
<th>Unit</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dismantling clearing away and carefully stacking materials useful for reuse for any thickness of walls of brick, laterite or rubble in mud, including disposal of debris within a distance of 150m</td>
<td>3.14</td>
<td>3.08</td>
<td>0.50</td>
<td>1.60</td>
<td>7.74</td>
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<td></td>
<td>Protection wall</td>
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<tr>
<td></td>
<td>Platform</td>
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<td>3.75</td>
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<td>0.40</td>
<td>1.88</td>
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<td>Pillar</td>
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<td>0.23</td>
<td>0.90</td>
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</tbody>
</table>

127
Earth work excavation in ordinary soil and depositing on bank with initial lead up to 50m and lift upto 1.5m including breaking clods, watering, ramming and sectioning of spoil bank, etc. complete.

| Platform | 3.14 | 4.95 | 0.40 | 0.40 | 2.49 | 1263 | 10 | m³ | 314.09 |

Dry stone masonry for retaining walls.

| Platform | 3.14 | 4.95 | 0.40 | 0.40 | 2.49 | 1525 | 1 | m³ | 3792.4 |

Rough stone dry packing for aprons and revetments.

| Platform | 3.14 | 4.35 | 1.00 | 0.25 | 3.41 | 1577 | 1 | m³ | 5385.0 |

Brick work in mud mortar with country burnt bricks (nominal size 22.9cm X 11.2cm X 7.0cm) for well lining.

| Platform | 3.14 | 3.08 | 0.23 | 0.80 | 1.78 | 3187 | 1 | m³ | 5671.2 |

Brick work in cement mortar 1:6 using country burnt bricks nominal size 22.9x11.2x7cm. For well lining as per standard specification.

| Platform | 3.14 | 3.08 | 0.23 | 0.90 | 2.00 | 4155 | 1 | m³ | 8318.0 |

Brick work in cement mortar 1:6 using country burnt bricks nominal size 22.9x11.2x7cm. For super structure in ground floor upto 5m height.

| Platform | 3.00 | 0.35 | 0.23 | 0.90 | 0.22 | 3881 | 1 | m³ | 843.54 |

Cement concrete 1:2:4 using 20mm (nominal size) hard granite broken stone including watering curing etc. complete.

| Platform | 3.14 | 4.35 | 1.00 | 0.075 | 1.02 | 65 | 10 | dm³ | 6658.7 |

Plastering with cement mortar 1:4, 12mm thick one coat using 54kg of cement /10m² plastering, floated hard and trowelled smooth including cost and conveyance of all materials labour charges etc. complete as directed by dept. Officers at site.

<p>| Platform | 3.14 | 3.35 | 0.90 | 9.47 |</p>
<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner side of parapet wall</td>
<td>3.14</td>
<td>2.85</td>
<td>8.05</td>
</tr>
<tr>
<td>Top portion of parapet wall</td>
<td>3.14</td>
<td>3.10</td>
<td>2.24</td>
</tr>
<tr>
<td>Pillar</td>
<td>3.00</td>
<td>1.16</td>
<td>3.13</td>
</tr>
<tr>
<td>10 Conveying and laying GI 50mm dia pipes</td>
<td>1</td>
<td>2.90</td>
<td>121.80</td>
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<tr>
<td>11 Supplying and fixing Iron pulley including all charges.</td>
<td>1</td>
<td>1</td>
<td>66.00</td>
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<tr>
<td>12 Bailing out water with (5 H P) engine and pump set</td>
<td>1.00</td>
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<td>9. SHUTTERS</td>
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<tr>
<td>VENGAI WOOD ROUGHT &amp; PUT-UP</td>
<td>1</td>
<td>3.5</td>
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<tr>
<td>11. Rain Water Harvesting Syringe</td>
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</tr>
<tr>
<td>1 Shallow tank(pvc) 1000 litres</td>
<td></td>
<td>Rs 5500</td>
<td></td>
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<tr>
<td>2 Syringe/Suction line work(Rs-1750) per meter-7 meter</td>
<td></td>
<td>Rs 13250</td>
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</tr>
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<td>3 Rain water filter</td>
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<tr>
<td>4 Rain water pressure line 2pvc, 1pvc pipes-7 meter</td>
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<td>Rs 1750</td>
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</tr>
<tr>
<td>5 Plumbing charges</td>
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<td>11. Rain Water Harvesting Syringe</td>
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</tr>
<tr>
<td>6</td>
<td>PVC fittings, foot valve, valves, elbows</td>
<td>Rs 2500</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.5 HP self priming pump, fittings</td>
<td>Rs 2500</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Transporting charges</td>
<td>Rs 2000</td>
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</tr>
<tr>
<td>9</td>
<td>Design, Consultancy, and supervision</td>
<td>Rs 5000</td>
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</tr>
<tr>
<td>10</td>
<td>Other unseen expense</td>
<td>Rs 1000</td>
<td></td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
<td>Rs 39000</td>
<td></td>
</tr>
</tbody>
</table>

**10 Boxculvert**

1. Putting up ring bund 1m top width and 2m bottom width and height 2.5m with 1/2 split coconut post 5m long driving down 2m below bedlevel 80cm c/c both side and tying with 1/3 split coconut post and bamboos alternatively tied with coconut plated cudjan both sides and filling with clay and dismantiling the bund after completion of work.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>16m @ Rs. 3194/m</td>
<td>51104</td>
</tr>
<tr>
<td>2</td>
<td>Bailing out water with SHP Engine and pumpset including hire charges cost of fuel lubricating oil, pay of staff etc. complet.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10 days @ Rs. 1351/day</td>
<td>13510</td>
</tr>
<tr>
<td>3</td>
<td>Earth work excavation in loose clay in or under water and depositing the cutsoil including lead</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Quantity</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td>and lift as per direction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18.9m³@Rs.1117/10m³</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Supplying and stacking well matured coconut posts 5m to 7m long</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4/0.60) +1=6.67 say 7 nos</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.5/0.60)+1 =5.83 say 5 nos</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>5</td>
<td>Driving down wooden piles 2000 to 3000mm dia to lines and levels as per the directions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Qty wide item no.4</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>6</td>
<td>providing sand bedding with clear gritty river sand including applying and spreading the sand in lines and levels</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Rough stone Dry packing for D.R Foundation abow coconut pileing</td>
<td></td>
</tr>
<tr>
<td>Item Description</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
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\[5.6\text{m}^3@\text{Rs} 2148/\text{m}^3\]

\[12028.8\]

<table>
<thead>
<tr>
<th>Item Description</th>
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<th>3.5</th>
<th>0.25</th>
<th>3.5</th>
</tr>
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<tbody>
<tr>
<td>Cement Concrete 1:4:8 using 40mm broken stone in open foundations complete as per drawings and technical specification</td>
<td></td>
<td></td>
<td></td>
<td>3.5</td>
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\[3.5\text{m}^3@\text{Rs} 5370/\text{m}^3\]

\[18795\]

<table>
<thead>
<tr>
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<th>3.5</th>
<th>0.3</th>
<th>4.2</th>
</tr>
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<tbody>
<tr>
<td>Bottom slab</td>
<td></td>
<td></td>
<td>0.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Vertical wall</td>
<td>2No</td>
<td>1.75</td>
<td>3.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Top slab</td>
<td>4</td>
<td>3.5</td>
<td>0.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Hunches</td>
<td>4No</td>
<td>4</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Parapetwall</td>
<td>2No</td>
<td>3.5</td>
<td>0.15</td>
<td>0.75</td>
</tr>
<tr>
<td>Total</td>
<td></td>
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<td>18.0875</td>
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\[18.09\text{@Rs} 98.20/10\text{dm}^3\]

\[177619.2\]

<table>
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<th>Item Description</th>
<th>Qty wide item no.9</th>
<th>19.67</th>
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</thead>
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<tr>
<td>Reinforcement for RCC works including bending tying and placing in position</td>
<td></td>
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\[132\]
<table>
<thead>
<tr>
<th></th>
<th>Earth work excavation in loose clay in or under water and depositing the cutsoil including lead and lift as per direction</th>
<th></th>
<th></th>
<th>2171 Kg</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Wingwall</td>
<td>4No</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>12m³@Rs1263/10m³</td>
<td></td>
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<tr>
<td>12</td>
<td>DR masonry for foundation and super structure including all charges conveyance labour charges etc. for the side protection of the pipe culvert</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Foundation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wingwall</td>
<td>4No</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>56m³@Rs2096/m³</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Super structure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wingwall</td>
<td>4No</td>
<td>5</td>
<td>0.8</td>
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<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Cement concrete 1:3:6 using 20mm broken stone for wearing coat including hire for form work watercuring all labour charges etc. complete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wingwall</td>
<td>4No</td>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>75m³@Rs68/10dm³</td>
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</table>
Earthwork filling with gravelly earth cut and conveyed from available source including all cost of conveyance labourcharge for spreading and consolidating by using power roller or tamping with rammer or 600mm dia stone roller etc complete.

<table>
<thead>
<tr>
<th>No</th>
<th>Item Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>44m3 gravelly earth</td>
<td>34</td>
<td>14</td>
<td>484</td>
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<tr>
<td>5</td>
<td>44m3 gravelly earth</td>
<td>20</td>
<td>1</td>
<td>44</td>
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44m3 @ Rs. 9059/10m3 = 30800.6

GRAND TOTAL 752345.09

TAX 6% 45140.70

TOTAL 797485.79

SAY EIGHT LAKHS RUPEES

11. Open Well Recharging

<table>
<thead>
<tr>
<th>No</th>
<th>Item Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150 mm gutter pipe</td>
<td>1</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>2</td>
<td>150 mm Stopper</td>
<td>2</td>
<td>65</td>
<td>130</td>
</tr>
<tr>
<td>3</td>
<td>150 mm dropper</td>
<td>2</td>
<td>60</td>
<td>120</td>
</tr>
<tr>
<td>4</td>
<td>150 mm GI clamp</td>
<td>7</td>
<td>70</td>
<td>490</td>
</tr>
<tr>
<td>5</td>
<td>63 mm Pipe Gm (4+2)</td>
<td>6</td>
<td>70</td>
<td>420</td>
</tr>
<tr>
<td>6</td>
<td>Supplying and Fixing 300 litre sintex tank</td>
<td>1</td>
<td>300</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Quantity</td>
<td>Rate</td>
<td>10m</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------</td>
<td>----------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>7</td>
<td>Filtering Media (LS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Un forseen Charges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Deepening of Canal/Pond

<table>
<thead>
<tr>
<th></th>
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<th>Quantity</th>
<th>Rate</th>
<th>10m</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Earth Work Excavation in ordinary Soil</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1117</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Adding .4 women for additional 1.5 m lift</td>
<td></td>
<td></td>
<td></td>
<td>151</td>
</tr>
<tr>
<td>3</td>
<td>Adding 20% in or under water or liquid mud</td>
<td></td>
<td></td>
<td></td>
<td>253.6</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>1521.6</strong></td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>QUANTITY</td>
<td>UNIT</td>
<td>RATE</td>
<td>AMOUNT</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
<td>------</td>
<td>-------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Clearing the Tank site</td>
<td>36</td>
<td>m²</td>
<td>1.20</td>
<td>43.20</td>
<td></td>
</tr>
<tr>
<td>Excavation in hard soil for foundation</td>
<td>1.1602</td>
<td>m³</td>
<td>150.00</td>
<td>174.03</td>
<td></td>
</tr>
<tr>
<td>P.C.C 1:4:8 using 20mm broken stone for foundation</td>
<td>0.3867</td>
<td>m³</td>
<td>4828.73</td>
<td>1867.27</td>
<td></td>
</tr>
<tr>
<td>Brick work in CM 1:6 for foundation and basement</td>
<td>1.5822</td>
<td>m³</td>
<td>4286.43</td>
<td>6781.99</td>
<td></td>
</tr>
<tr>
<td>Basement filling with boulders</td>
<td>1.0935</td>
<td>m³</td>
<td>1031.00</td>
<td>1127.40</td>
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</tr>
<tr>
<td>PCC 1:4:8 using 20mm broken stone below base slab</td>
<td>0.45</td>
<td>m³</td>
<td>4828.73</td>
<td>2172.93</td>
<td></td>
</tr>
<tr>
<td>Steel reinforcement for belt and floor concrete</td>
<td>0.5131</td>
<td>Qtl</td>
<td>5213.40</td>
<td>2675.00</td>
<td></td>
</tr>
<tr>
<td>Floor &amp; belt concreting in R.C.C 1:11/2:3, using 20mm broken stone</td>
<td>1.1695</td>
<td>m³</td>
<td>6020.84</td>
<td>7041.37</td>
<td></td>
</tr>
<tr>
<td>Making steel cage for wall, dome and filter chamber with 8mm &amp; n6mm bars</td>
<td>0.5131</td>
<td>Qtl</td>
<td>7388.40</td>
<td>3790.99</td>
<td></td>
</tr>
<tr>
<td>Supplying and winding with 1 layer of 10 guage, 50 mm x 50mm welded mesh</td>
<td>20.72</td>
<td>m²</td>
<td>228.88</td>
<td>4742.39</td>
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</tr>
<tr>
<td>Supplying and winding with two layers of 10 cage, 12.5x12.5 mm GI chicken</td>
<td>31.574</td>
<td>m²</td>
<td>180.00</td>
<td>5683.32</td>
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</tr>
<tr>
<td>Plastering with CM 1:2.5, 21 mm thick each on both sides of tankwall,</td>
<td>41.44</td>
<td>m²</td>
<td>285.75</td>
<td>11841.48</td>
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</tr>
<tr>
<td>Plastering with CM 1:3, 15mm thick each on both sides of dome and filter</td>
<td>21.71</td>
<td>m²</td>
<td>267.00</td>
<td>5796.57</td>
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</tbody>
</table>
**Material and Labour**

Plastering tank floor by applying one of neat cement slurry and then with CM 1:3, 15mm thick, mixed with water proofing compound and finished with cement flushing coat.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearing the Tank site</td>
<td>16</td>
<td>m²</td>
<td>1.20</td>
<td>19.20</td>
</tr>
<tr>
<td>Excavation in hard soil for foundation</td>
<td>0.4752</td>
<td>m³</td>
<td>150.00</td>
<td>71.28</td>
</tr>
<tr>
<td>P.C.C 1:4:8 using 20mm broken stone for foundation</td>
<td>0.2376</td>
<td>m³</td>
<td>4828.73</td>
<td>1147.31</td>
</tr>
<tr>
<td>Brick work in CM 1:6 for foundation and basement</td>
<td>0.7344</td>
<td>m³</td>
<td>2438.00</td>
<td>1790.47</td>
</tr>
<tr>
<td>Basement filling with boulders</td>
<td>0.6615</td>
<td>m³</td>
<td>1031.00</td>
<td>682.01</td>
</tr>
<tr>
<td>PCC 1:4:8 using 20mm broken stone below base slab</td>
<td>0.2205</td>
<td>m³</td>
<td>4500.00</td>
<td>992.25</td>
</tr>
<tr>
<td>Steel reinforcement for belt and floor concrete</td>
<td>0.3697</td>
<td>Qtl</td>
<td>4211.00</td>
<td>1556.81</td>
</tr>
<tr>
<td>Floor &amp; belt concreting in R.C.C 1:11/2:3, using 20mm broken stone including form work but excluding reinforcement</td>
<td>0.6066</td>
<td>m³</td>
<td>3214.00</td>
<td>1949.61</td>
</tr>
<tr>
<td>Making steel cage for wall, dome and filter chamber with 8mm &amp; 6mm bars including supply of material and labour</td>
<td>0.4197</td>
<td>Qtl</td>
<td>2000.00</td>
<td>839.40</td>
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</table>

**Ferro Cement Water Tank of 5000 litres**

<table>
<thead>
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<th>QUANTITY</th>
<th>UNIT</th>
<th>RATE</th>
<th>AMOUNT</th>
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</thead>
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<tr>
<td>Clearing the Tank site</td>
<td>16</td>
<td>m²</td>
<td>1.20</td>
<td>19.20</td>
</tr>
<tr>
<td>Excavation in hard soil for foundation</td>
<td>0.4752</td>
<td>m³</td>
<td>150.00</td>
<td>71.28</td>
</tr>
<tr>
<td>P.C.C 1:4:8 using 20mm broken stone for foundation</td>
<td>0.2376</td>
<td>m³</td>
<td>4828.73</td>
<td>1147.31</td>
</tr>
<tr>
<td>Brick work in CM 1:6 for foundation and basement</td>
<td>0.7344</td>
<td>m³</td>
<td>2438.00</td>
<td>1790.47</td>
</tr>
<tr>
<td>Basement filling with boulders</td>
<td>0.6615</td>
<td>m³</td>
<td>1031.00</td>
<td>682.01</td>
</tr>
<tr>
<td>PCC 1:4:8 using 20mm broken stone below base slab</td>
<td>0.2205</td>
<td>m³</td>
<td>4500.00</td>
<td>992.25</td>
</tr>
<tr>
<td>Steel reinforcement for belt and floor concrete</td>
<td>0.3697</td>
<td>Qtl</td>
<td>4211.00</td>
<td>1556.81</td>
</tr>
<tr>
<td>Floor &amp; belt concreting in R.C.C 1:11/2:3, using 20mm broken stone including form work but excluding reinforcement</td>
<td>0.6066</td>
<td>m³</td>
<td>3214.00</td>
<td>1949.61</td>
</tr>
<tr>
<td>Making steel cage for wall, dome and filter chamber with 8mm &amp; 6mm bars including supply of material and labour</td>
<td>0.4197</td>
<td>Qtl</td>
<td>2000.00</td>
<td>839.40</td>
</tr>
<tr>
<td>Description</td>
<td>Area</td>
<td>Rate</td>
<td>Total</td>
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</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>------</td>
<td>-------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Supplying and winding with 1 layer of 10 guage, 50 mm x 50mm welded mesh</td>
<td>11.25</td>
<td>132.00</td>
<td>1485.00</td>
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<tr>
<td>over the steel cage including material and labour</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplying and winding with two layers of 10 cage, 12.5x12.5 mm GI chicken</td>
<td>15.255</td>
<td>m^2</td>
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</tr>
<tr>
<td>mesh around the cylindrical steel cage, dome and filter including material</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and labour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastering with CM 1:2.5, 21 mm thick each on both sides of tankwall,</td>
<td>22.5</td>
<td>m^2</td>
<td>4275.00</td>
<td></td>
</tr>
<tr>
<td>applied in layers and finished smooth with cement flushing coat including</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>material and labour</td>
<td></td>
<td></td>
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<tr>
<td>Plastering with CM 1:3, 15mm thick each on both sides of dome and filter</td>
<td>8</td>
<td>m^2</td>
<td>984.00</td>
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<tr>
<td>chamber applied in layers and finished smooth with cement flushing coat</td>
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<td></td>
<td></td>
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<tr>
<td>including material and labour</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Plastering tank floor by applying one of neat cement slurry and then with</td>
<td>3.14</td>
<td>m^2</td>
<td>568.09</td>
<td></td>
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<tr>
<td>CM 1:3, 15mm thick, mixed with waterproofing compound and finished with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cement flushing coat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement washing 2 coats</td>
<td>15.255</td>
<td>m^2</td>
<td>190.99</td>
<td></td>
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<tr>
<td>Providing roof water collection and conveyance system, filter, first flush</td>
<td>LS</td>
<td></td>
<td>1500.00</td>
<td></td>
</tr>
<tr>
<td>and drainage system including material and labour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply and fixing of tap, platform, overflow pipe etc etc</td>
<td>LS</td>
<td></td>
<td>1500.00</td>
<td></td>
</tr>
<tr>
<td>Scaffolding, water, curing, writing etc</td>
<td>LS</td>
<td></td>
<td>1005.00</td>
<td></td>
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<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>22634.90</td>
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</table>
## Supply and Erection of 12501ph ROD plant

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Qty</th>
<th>Description of items</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 Set</td>
<td>Supply of water treatment plant reverse osmosis system capable of removing TDS, fluoride etc: protected drinking water having constantly output capacity of 1250 liter/hrs., operating pressure 5 to 10 kg/cm² and operating temperature 25°C to 40°C. The system will capable of treating of raw water having TDS up to 3000PPM and fluoride up to 10 PPM and beyond the corresponding treated water will confirm to ISS drinking water standard IS 10500/ 1991 and packaged drinking water standard IS 14543 of approved make. The system will have the following essential components.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1Set</td>
<td>Raw water pump set of compressor / centrifugal type of approved make motor having capacity 30001ph.</td>
<td>5000</td>
</tr>
<tr>
<td>2</td>
<td>1set</td>
<td>FRP dual media having media of graded sand and activated carbon with a flow rate of 30001ph, 25 NB PP multiport valve having the size of 14 inch ×58 inch</td>
<td>40000</td>
</tr>
<tr>
<td>3</td>
<td>1set</td>
<td>Micron filter with a capacity of 30001ph micron rating of 10 inch PP jumbo</td>
<td>5000</td>
</tr>
<tr>
<td>4</td>
<td>1set</td>
<td>Anti Scalant Dozer of electronic type with flow rate of 5 liter/hr with container for the storage of chemicals.</td>
<td>20000</td>
</tr>
<tr>
<td>5</td>
<td>1set</td>
<td>A high pressure pump of reciprocating/centrifugal having capacity 3000 LPH, 5 to 10 kg/cm² pressure and motor rating 2 to 3.5 HP</td>
<td>65000</td>
</tr>
<tr>
<td></td>
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<tr>
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<td>---</td>
</tr>
<tr>
<td>6</td>
<td>6Nos</td>
<td>RO membrane will be ESPA or reputed make 4040 spiral wounded of polyamide – 2Nos. each</td>
<td>175000</td>
</tr>
<tr>
<td>7</td>
<td>LS</td>
<td>Valves and pipe lines will be CPVC / SS/PVC</td>
<td>5000</td>
</tr>
<tr>
<td>8</td>
<td>3Nos</td>
<td>The housing of the membrane will be stainless steel 4inch × 8inch</td>
<td>40000</td>
</tr>
<tr>
<td>9</td>
<td>1No</td>
<td>TDS indicating meter</td>
<td>5000</td>
</tr>
<tr>
<td>10</td>
<td>3Nos</td>
<td>Glycerin filled pressure guages</td>
<td>1000</td>
</tr>
<tr>
<td>11</td>
<td>2No</td>
<td>High pressure and low pressure cut off switches</td>
<td>5000</td>
</tr>
<tr>
<td>12</td>
<td>1No</td>
<td>Low and high voltage trip system</td>
<td>In Built</td>
</tr>
<tr>
<td>13</td>
<td>LS</td>
<td>Sampling cocks at appropriate point</td>
<td>1000</td>
</tr>
<tr>
<td>14</td>
<td>1No</td>
<td>Bulk flow meter of ISI C class 20mm mini Dia.</td>
<td>10000</td>
</tr>
<tr>
<td>15</td>
<td>1set</td>
<td>Instrumentation panels with ELCP, proper earthing and wiring</td>
<td>30000</td>
</tr>
<tr>
<td>16</td>
<td>1No</td>
<td>Voltage stabilizer of approved brand</td>
<td>Inbuilt</td>
</tr>
<tr>
<td>17</td>
<td>1Set</td>
<td>A storage tank of raw water capacity 1000 liter of UPVC of approved brand</td>
<td>10000</td>
</tr>
<tr>
<td>18</td>
<td>1Set</td>
<td>A storage tank of raw water capacity 1000 liter of syntax tank with all PVC pipes</td>
<td>10000</td>
</tr>
<tr>
<td>19</td>
<td>1No</td>
<td>Providing clear water storage tank’s platform of size 1.20 ×1.20×1.1m with 1:2:4 CC for foundation and top platform brick work in CM 1:5 using wire cut bricks for super structure, 1:3, 12mm thick plastering 30 × 30 CM glazed tiles to the four sides and top, supplying red earth for the filling of platform including necessary earth work excavation for foundation and cost of supply of materials and all labour charges etc. complete as per the direction of departmental officers.</td>
<td>10000</td>
</tr>
<tr>
<td>20</td>
<td>LS</td>
<td>Providing all tope of pipes and specials of various dia. And materials required for the tapping connection, and delivery of raw and clear water of plant.</td>
<td>8000</td>
</tr>
<tr>
<td>21</td>
<td>1set</td>
<td>Erection and trial running the ROD plant with all pipe line works as per the direction of departmental officers including first year normal warranty.</td>
<td>5000</td>
</tr>
<tr>
<td>Sl No.</td>
<td>Description</td>
<td>Qty</td>
<td>Unit</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>Clearing the Tank site</td>
<td>61.34</td>
<td>Sq.m</td>
</tr>
<tr>
<td>2</td>
<td>Earth work excavation in hard soil for foundation</td>
<td>3.48</td>
<td>Cu.m</td>
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<tr>
<td>3</td>
<td>R.C.C 1:2:4, using 20mm broken stone for belt, including form work and excluding steel</td>
<td>0.70</td>
<td>Cu.m</td>
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<tr>
<td>4</td>
<td>Laterite masonry in CM 1:6 for foundation and basement</td>
<td>3.22</td>
<td>Cu.m</td>
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<tr>
<td>5</td>
<td>Basement filling with boulders</td>
<td>5.04</td>
<td>Cu.m</td>
</tr>
<tr>
<td>6</td>
<td>PCC 1:4:8, using 20mm broken stone below base slab including form work</td>
<td>2.24</td>
<td>Cu.m</td>
</tr>
<tr>
<td>7</td>
<td>Steel reinforcement for belt, floor and pillar</td>
<td>3.23</td>
<td>Qtl</td>
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</tbody>
</table>

TOTAL 4,50,000.00

Rain water harvesting with ferro cement Water Tank

Kannasa Samaraka HSS, Kadapra

Capacity 50000 Litres
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Floor concreting in R.C.C 1:11/2:3, using 20mm broken stone including form work and excluding reinforcement</td>
<td>3.23</td>
<td>Cu.m</td>
<td>7114.0</td>
<td>22978.2</td>
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<tr>
<td>9</td>
<td>R.C.C 1:11/2:3, using 20mm broken stone for central pillar with formwork but excluding reinforcement</td>
<td>0.104</td>
<td>Cu.m</td>
<td>15220.0</td>
<td>1582.9</td>
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<tr>
<td>10</td>
<td>Making steel cage for wall, dome and filter chamber with 8mm &amp; 6mm bars including supply of material and labour</td>
<td>1.79</td>
<td>Qtl</td>
<td>7397.4</td>
<td>13241.3</td>
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<tr>
<td>11</td>
<td>Supplying and winding with 1 layer of 10 guage, 50mm × 50mm welded mesh over the steel cage including material and labour</td>
<td>42.13</td>
<td>Sq.m</td>
<td>315.4</td>
<td>13287.8</td>
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<tr>
<td>12</td>
<td>Supplying and winding with three layers of 24 guage, 12.5 × 12.5 mm GI chicken mesh, including material and labour</td>
<td>43.90</td>
<td>Sq.m</td>
<td>227.8</td>
<td>10000.4</td>
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<td>13</td>
<td>Supplying and winding with two layers of 24 guage, 12.5 × 12.5 mm GI chicken mesh for dome and filter chamber including material and labour</td>
<td>32.63</td>
<td>Sq.m</td>
<td>152.7</td>
<td>4982.6</td>
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<tr>
<td>14</td>
<td>Plastering with CM 1:2.5, 21 mm thick each on both sides of tank wall, applied in layers and finished smooth with cement flushing coat including material and labour</td>
<td>73.12</td>
<td>Sq.m</td>
<td>399.6</td>
<td>29218.8</td>
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<td>15</td>
<td>Plastering with CM 1:3, 15mm thick each on both sides of dome and filter chamber applied in layers and finished smooth with cement flushing coat including material and labour</td>
<td>59.05</td>
<td>Sq.m</td>
<td>237.4</td>
<td>14018.5</td>
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<td></td>
<td>Plastering tank floor by applying one coat of neat cement slurry</td>
<td>24.96</td>
<td>Sq.m</td>
<td>254.5</td>
<td>6352.3</td>
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<tr>
<td></td>
<td>Description</td>
<td>Unit</td>
<td>Rate</td>
<td>Amount</td>
<td></td>
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<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>and then with CM 1:3, 15mm thick, mixed with water proofing compound and finished with cement flushing coat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Cement washing 2 coats</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Providing roof water collection and conveyance system, filter, first flush and drainage system including material and labour.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>19</td>
<td>Supply and installation of 1 HP submersible pump, laying of 5 pumping line, 1.5 mm electrical cable and accessories with necessary specials including material and labour.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>20</td>
<td>Supply and installation of 500 litres capacity HDPE tank distribution line, taps, with necessaries specials and valves including material and labour.</td>
<td></td>
<td></td>
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<tr>
<td>21</td>
<td>Stone and writing charge</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>22</td>
<td>Contingencies</td>
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<td></td>
<td><strong>Sub total</strong></td>
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<td></td>
<td><strong>207175</strong></td>
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<td>23</td>
<td>Management charges to SEUF @ 8% as per GO No. 71858/DA1/11/LSGD dated 27/3/12</td>
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<td><strong>16574.0</strong></td>
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<td>24</td>
<td>KVAT including cess @ 4%</td>
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<td>25</td>
<td>KCWWF @ 1%</td>
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<td>26</td>
<td>IT @ 2%</td>
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## ESTIMATE FOR BIOGAS PLANT

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<th>Description</th>
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<th>Unit</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
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<tbody>
<tr>
<td>1 Excavation of hand soil for plant erection</td>
<td>4 labours</td>
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<td>500</td>
<td>2000</td>
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<tr>
<td>2 Portable biogas plant with double burner and gas pipe</td>
<td>1 no</td>
<td></td>
<td></td>
<td>60000</td>
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<tr>
<td>3 Cow dung</td>
<td>50</td>
<td>Basket</td>
<td>50</td>
<td>2500</td>
</tr>
<tr>
<td>4 Installation Charge</td>
<td>1</td>
<td></td>
<td></td>
<td>3000</td>
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<tr>
<td>5 Transportation and others</td>
<td>LS</td>
<td></td>
<td></td>
<td>2500</td>
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<tr>
<td>6 Contingency</td>
<td></td>
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<td>696</td>
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<td><strong>Sub Total</strong></td>
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<tr>
<td>7 Management charges to SEUF @ 8% as per GO No.71858/DA 1/ 11/LSGD dated 27/3/2012</td>
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<td>5655.7</td>
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<tr>
<td>8 KVAT including cess @ 4.04%</td>
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<td>2856.1184</td>
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<tr>
<td>9 KCWWF @ 1%</td>
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<td>706.96</td>
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<tr>
<td></td>
<td>Description</td>
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<tr>
<td>10</td>
<td>IT including cess @ 1.01%</td>
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<td>714.0296</td>
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<tr>
<td>11</td>
<td>Service tax @ 12.36% of item no 4</td>
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<td>TOTAL</td>
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<td><strong>81000</strong></td>
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<td>(Rupees Eighty One Thousand only)</td>
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</tbody>
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