METHODOLOGY

Watershed Development Strategy

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

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

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

Scientific Planning

i) Cluster Approach

This envisages a broader vision of Geo-hydrological unit which involves treating a cluster of micro-watershed. The IWMP-1 Project consists of six micro- watersheds namely 4V10a, 4V11a, 4V11b, 4V25a, 4V26a, 4V29b as their respective codes. The project falls in part of 13 GramaPanchayats under four Block Panchayats.

ii) Transect Walk

Transect walk is a kind of exploratory walk, under taken by the team with the villagers to collect information on the soil type, land use pattern, cropping pattern, existing resource etc.,

In order to identify the areas to be treated, proposed work sites and assess the feasibility, the experts carried out a reconnaissance survey through transect walk. The sites were marked and the different treatment measures required for the treatment of the area were also recommended. During the exploratory walk the present status of the watershed is observed along with their problems. The ground water level is observed and analyzed by the team during the summerand winter. The transect walk also enables in the understanding of the plantation crops and vegetables grown in the watershed area. Livestock populations are also accounted. Various pending and unsolved problems are located and are given prior importance as EPA.

iii) Base line Survey/ Household survey:

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

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

- Demographic Information
- Socio Economic Information
- Agriculture / Horticulture Activities and its marketing
- Animal Husbandry activities and its marketing
- Fodder production and Availability
- Assets (domestic and agricultural)
- Land ownership,

- Land use
- Irrigation (water availability)
- Crops and productions
- Common Property Resources and Its usage

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

Secondary data: The secondary data was obtained through Census reports (2001) and Panchayat Level Statistics (2010). Data pertaining to social profile is also collected through Census reports. Secondary data related to different kinds of capital assets were collected from different departments of Government agencies such as Village Office, KrishiBhavan, Primary Health Center, District Rural Development Agency initiative-SGSY Programme office, Kudumbasreeworking on poverty alleviation, GramaPanchayat, other NGO's and development societies etc. Climatic information like annual rainfall with monthly distribution of five year and temperature is collected from the Indian Meteorological Department. The Resources Maps prepared by Kerala State Land Use Board provides the details of land use/land cover, drains, transport network, assets and other water resources. The Detailed Soil Survey report prepared by Department of Soil Survey and Soil Conservation was used to understand the soil classification, texture, depth, erosion and land capability.

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

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

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

- Improve overall efficacy of the measures.

iv) Participatory Rural Appraisal (PRA)

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

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

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

Need for PRA

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

Objectives of PRA

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

Purpose of PRA

- To collect first hand information about the village community.

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

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

v) Focus Group Discussion

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

Problems Identification

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

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

vi) Use of GIS and Remote Sensing for planning

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

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

Planning: A action plan matrix was been formulated by taking into account various features like the slope percent, soil depth, soil texture, soil erosion in the area for wasteland, forest land and agricultural land. Global Positioning System (GPS) was used to identify each and every water conservation structures available in the project area. This was used to create a map. Contour Map of vertical interval of 10 meter at a scale of 1:25000 was used for identifying various location specific recommendations for soil and water conservation structures.

Hydrological modeling: Hydrology modeling technique was been used for locating drainage, stream length, flow direction, sink, and flow accumulation. This model overlaid over cadastral map help to calculate the catchment area of each structures like the check

dam etc. This has helped to remove the human error which generally occurring while calculating the catchment area of a check dam.

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

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

	9. Automatic water level recorders & sediment samplers	No

Usage of Data

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

Preparation of Action Plan and Approval from Grama Sabha

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