

Introduction to Watershed¹

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Land, water and people are the basic resources of a nation. In spite of much theorising and seven five year plans, we do not have a comprehensive approach to make rational use of these resources.

Productive land is the source of human sustenance and security. Economic stability and a wise use of land are inseparable. In our country the land is a private property and its owners are exploiting to get the maximum out of it in a short run. Our planning about water is also oriented towards large irrigation projects, whereas, over eighty percent of our land is at the mercy of rain god. The ground water is 'mined' by those few who can drill deeper borewells and the water of irrigation projects is consumed by those who have comparative advantage - power in its all form - over others.

The gross mismanagement of the land and water resources has resulted in increased recurrence of natural calamities like droughts, floods, earthquakes, landslides, etc. The intensity with which these calamities affect us, has been increasing every year. We hear how many die in drought in Rajasthan, Gujarat and Orissa and in floods in Bihar and Bengal every year.

Water is essential for human survival, yet floods are responsible for increasing loss of life and destruction of crops and property every year. Droughts are caused by absence of water and floods by an excess of it. Nevertheless, one often follows the other since they are usually caused by the same process: excessive environmental degradation in catchment areas.

Drought and floods, though disastrous in themselves, are merely symptoms of a much deeper and more malaise. They are clear signals that the forces have been out down and are being further destroyed, that pasture lands are overgrazed, that the catchments are eroding further. They are warning that the region where they occur will become deserts unless steps are taken to reverse the situation fast.

The experience elsewhere in the world shows a clear relation of these processes with the hunger and poverty of the rural poor. More than one third of the earth's land surface ranges from semi-arid to hyper-arid, characterised by high and drastically fluctuating temperatures, desiccating winds, saline and alkaline soils low in organic matter and mineral nutrients, and most significantly, scant and unpredicted rainfall. Yet over 900 million people live on this land. In fact 85 % of the dryland's rural population struggle to support itself on the 15 % of these lands considered arable.

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These regions of the earth have always presented farmers with major environmental challenges. Over the past few decades, however, explosive population growth and highly destructive agricultural practices as well as poorly designed "solutions" to these problems have greatly intensified the drylands' disadvantages. Food, fodder and fire wood, the three most important commodities for the people of developing world's arid and semi-arid regions, are now in dramatically short supply, and the extent of arable drylands is diminishing. The world has become acutely aware - thanks to Nations of Sahel and Ethiopia and elsewhere for mismanaging their natural resources - that human and environmental crises of immense proportions is at hand. The question is: Is it possible to reverse the ecological deterioration, falling land productivity, food, fodder and fuel wood shortages and loss of human life in arid and semi-arid regions and elsewhere in the developing world?

The scientists, researchers and the development thinkers and practitioners have now concluded that the cause lies in the faulty use of land and water resources. This means regeneration of natural resources and environment through well planned soil and water conservation is need of the hour. It's chief objective is to promote control of soil erosion and better use of farm and range lands over the widest possible area. Since all people, whether farmers or residents of the cities, are utterly dependent on the continuing productivity of land for sustenance of life. soil and water conservation is the concern of all people everywhere. Watershed management is a widely accepted approach which is affective and efficient in environment regeneration.

A. What is a Watershed ?

Watershed is a term first used by American foresters for an area of land which sheds water from rain (snowfall inclusive) into a single outlet of a stream. "Watershed is a geographic area drained by stream or a system of connecting streams such that all the surface runoff originating due the precipitation in this area leaves the area in a concentrated flow through a single outlet". In other words, watershed is defined as a drainage area whose runoff flows past one point. It is an entity from which water flows into a stream, lake or other point of drainage. Watershed may also be defined as the geographic area of over land (surface) drainage that contributes water to the flow of a particular stream at a chosen point. Therefore, watershed is a water collecting and water handling unit. The line which divides the surface runoff between two adjacent basins is called water divide or simply divide. The terms Catchment Area, Drainage Basin, River Basin, Watershed and Catchment area synonymous.

Generally, the term river basin is used for large watersheds that form drainage of river. Thus millions of hectares in the Himalayas and Utter Pradesh form the river basin of the Ganges. The term watershed is generally used by planners and engineers to define a planning unit or a manageable area of operation. The prefixes like sub mini micro- etc. can be used to qualitatively denote smaller drainage units within a larger watershed. Watershed development is an approach to build and strengthen the basic resources found in this area, i.e. a watershed, so as to enable the establishment sustainable life support system. This approach is an integrated approach of development based on a natural hydrologic unit - a watershed. The size of the watershed which a voluntary organisation or an institution takes up may vary depending on several factors of manageability criteria. But it is generally accepted the optimal size of a watershed should be around 300-3000 hectares.

B. Why Watershed Approach?

Though several approaches have been tried and adopted in the past for integrated development of people and/or area, watershed approach offers certain distinct advantages - technologically, socio-economically, and philosophically.

1. The need of the hour is to urgently regenerate the natural resources that are overexploited land mismanaged in the past, particularly in the last hundred years or so. This means a shift from exploitation-oriented development to regeneration oriented development. And we

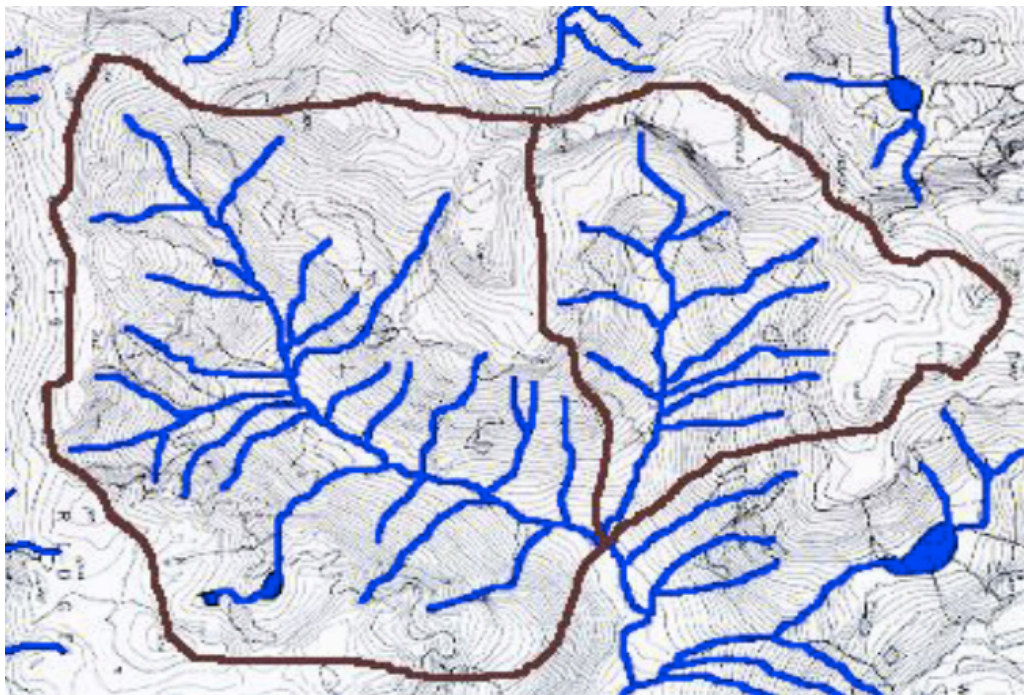


Figure 1: Diagrammatic representation of Definition of a Watershed.

cannot think or regeneration without conserving what we have. Conservation of the basic resources like land and water is the first step in the process. Since soil and water conservation are inseparable, the best way is to chose a hydrologic unit - Watershed.

2. Watershed is a natural unit. It's boundaries are defined by the topography and not by any man-made parameters. A watershed as a living system governed by natural laws. And it is necessary to go close to nature in order to correct the man-made mistakes.
3. To a planner watershed approach enables building and using heuristic, planning models, and algorithms. This is because any watershed - no matter how big or small - has some common characters. The upper, middle, and lower reaches of a watershed are associated with different kinds of life support systems - agriculture, bio-mass and flora, livestock and fauna, people and so on. They behave differently to flow or transmission of rainwater. They demand specific types of management practices and provide economic returns in specific ways. All these have implications (that are socio-economic, cultural and political in nature) relevant to a development planner.

4. Our development planning so far neglected the upper reaches of catchment. (This has a reference to the dichotomy between "watershed"/"catchment" area and "command area). Watershed approach enables us to take care of this neglected lot of people, land, forests, and other elements of the ecology.
5. Watershed approach is not a recent theory of development. In ancient times, our resource-use was based on the principles akin to the modern-day watershed approach. Examples can be cited from ancient Indian and African agricultural practices.

C. What is Watershed Management:

"Watershed Management", as aptly defined MYRADA, "is a framework for an integrated, viable, and decentralised pattern of development of people living in a degraded area where water is a scarce and mismanaged resource, and where exploitation of resources and people have resulted in overall degradation leading to growing poverty, inequality, and inability to cope up with stress". Technically speaking it is "management of the natural resources of a small watershed primarily to strengthen basic life support system of a community by production and protection of water-based resources, including control of erosion and floods".

The ultimate objective of watershed management is to improve the standard of living for the common man in the basin by increasing his earning capacity through increased productivity of land and water. Good farming practices, rational land use, and efficient management of soil water, crops and livestock results in sustained high yields, which provide the best basis for ensuring adequate returns to the farmer and the country as a whole. Under the natural conditions, the rainfall vegetation, animals, soil, and water regimes attain a natural equilibrium. In the effort to bring more areas under cultivation, man disturbs one or more of these factors and thereby disturbs the equilibrium. Watershed management needs to take into account the interrelation of these factors lands then plan for the adequate returns. That is the management of topography for making the best possible use of available land and water resources.

D. Programmes in Watershed Management:

The programmes that can be taken in a watershed may be broadly categorised into three groups -

1. Resource - Regeneration Programmes
2. Resource - Utilisation and Management Programmes
3. Community mobilisation and institutional development Programmes.

1. Resource regeneration : to increase the productivity of land and water, by reducing the runoff, and thereby, soil erosion.

- Contour trenching and plantation on marginal lands
- Farm bunding for in situ moisture conservation
- Gully plugs to reduce flow velocities and increase groundwater recharge
- Harvesting structures across streams for storage and recharge

2. Resource utilisation and management : to increase the production and incomes of poor families by judicious use of regenerated land and water resources

- Capability-based land use planning (forestry, grazing, food and fruit crops)
- Improved water use method
- Appropriate livestock development and management practices
- Promotion of business development services

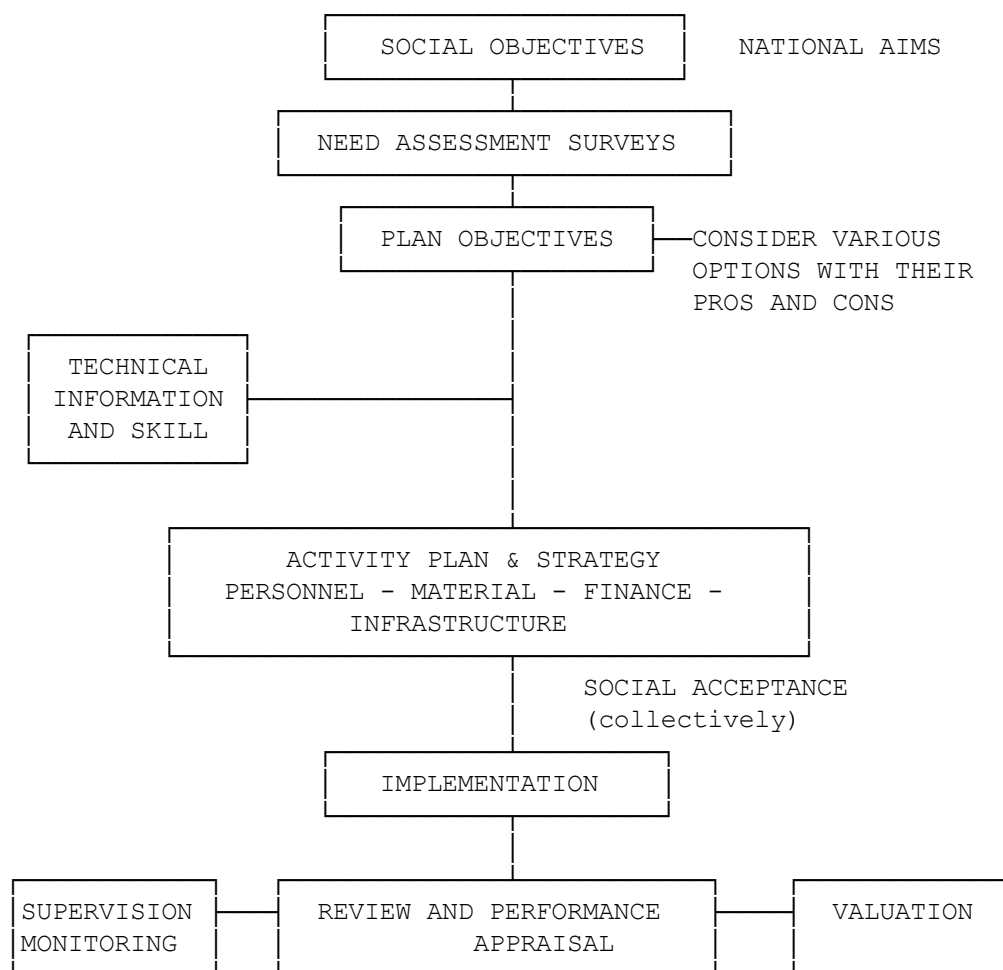
3. Community mobilisation and institutional development : are key to sustainability.

- Awareness and orientation on natural resources management
- Capacity building, viz., identification of leaders, involving them in operational aspects, and formalising such involvement
- Group formation and formalising institutional arrangements

A programme and strategy model, as proposed by MYRADA is attached as Appendix A.

E. Planning and Implementation:

A typical project cycle of any development programme is shown in the following flow-chart -



Since, the development programme is aimed at the betterment of community it starts with spelling out social objectives, which also reflects the national aims. Any planner should take these aims into account while planning, and attempt to fulfil the broader goals of national building.

Before making any decisions about development strategies it is obviously necessary to study the community so that we can determine the needs and ambitions of the people. This is "need assessment study". The need assessment involves working with community or group, and through discussion and examination, finding out what the community is interested in doing and what it considers it needs.

Before we can start on any specific development we need to know a great deal about the human, natural and infrastructural resources, which we must find out about using resource surveys. A more detailed framework is designed by Gokul Prakalpa Prathishthan, Ratnagiri (Appendix B).

Once all the data are collected and analysed, plan objectives can be drawn up. These should be decided in conjunction with the community on common platform. These should be written in the form of clear aims with targets to achieve. In determining programme objectives, we should consider:-

- Ambitions and needs of community
- Potential of area and limiting factors (human, natural, infrastructural)
- Farmers' skills and knowledge.

Then comes the Activity plan and Strategy (please refer to Appendix A) it covers the way we use the resources to meet desired end. While implementing a work plan, it is necessary to supervise it and monitor its performance. Mid-term and continual corrections are often required to steer the programme on the right track. Plans need to be flexible, not rigid, and if the mid-term/continual evaluation shows that certain aspects of the programme are not working, the concerned actors will have to modify the plan.

Programme Strategy to Manage Water in a Watershed

S No	Objective in order of sequence	Actors/Staff	Action/Plans-Programmes
1.	Make the water walk off not run off	1. Technical staff (Agril. Engineers, Surveyors)	1. Technical: Peg-mark Contours, Contour maps, Watershed plan for soil stabilisation, land use map (present and future), revenue map indicating ownership.
	May - June (entry point activities started earlier)	2. Community development workers (watershed managers and staff)	2. Community: Awareness raising, organisation of entry point activities, identification of enlightened leadership, shramadan, etc.
2.	Hold water in site or as close as possible.	1. Technical: (Agril. Graduates with Dryland experience)	1. Technical: Arrangement of credit and package of practices for dryland agriculture to be adopted to the local situation; agriculture land use map (crops number and rotation) record of rights, soil sample; agriculture plan for Kharif.
	June - July 1986	2. Community Development Workers	2. Community: Education and exposure to other experiments, demonstration on contact farmers' field; organising farmers' service societies to manage inputs and marketing; farmers' training during cropping season.
3.	Use water efficiently (Medium term)	1. Community development workers. Priority to local leaders who have been trained in basic skills and are with target group with bias towards poor.	1. Community: Establish viable groups with appropriate system to manage the watershed - functional groups and if required an apex group.
		2. Technical Staff	2. Technical: Identify suitable crops to utilise water efficiently; Protective irrigation form farm ponds.
4.	Distribute water equitably (long term)	1. Priority to local leadership with base in watershed institutions.	1. Community: Well run Institutions with target groups controlling credit and with social status and political power - which throw up new leadership periodically.

Source: MYRADA, Bangalore (PIDOW Project, Gulbarga)

A note on the Economic Upliftment of the Small Farmers through Integrated Watershed Development Programme

The concept of development on watershed basis is internationally accepted for obtaining stabilised yields of crops and maximum, yield of timber, fuel, fodder, etc. The watershed refers to the ridge point separating one drainage basin from another. It also refers to a given point. The major project in the watershed development programme is to control soil erosion and safe disposal of excess water right by following suitable soil and water conservation measures.

Water Characteristics : There are soil slopes, drainage, vegetation, geology, climate and land use which affect functioning of watershed in respect of receiving and disposal of rain water.

Selection of Watershed : The Groundwater Survey and Development Agency (GSDA of GOvt of Maharashtra) has already identified watersheds in every district (the details are available with the district GSDA office concerned). On the basis of this information, micro-, mini- or sub-watersheds can be delineated. The main criteria for selection of watershed will be :

1. Problem intensity
2. Development potential
3. Technology availability
4. Catalytic effect
5. Accessibility
6. Investment aspects
7. Infrastructural availability
8. People's willingness to participate in the programme

Planning of Watershed : In developing plan for integrated development of watershed the following would be considered.

1. Runoff diversion works below public/community lands (usually hilly) to protect the arable lands, lower down the slopes and protection of water-ways into which the diversions till discharge excess water.
2. Planting of trees and/ or improved grasses on public/community and also on degraded private lands.
3. Recommending cropping pattern/sequence for the arable lands together with the recommending crop lay out and cultivation method to measure maximum water retention.

The duties and responsibilities of the different officers involved in watershed development planning and execution are separately summarised in the booklet prepared by the Department of Agriculture.

The Project Formulating Officer will have to coordinate the programme of different departments like Animal Husbandry, Forest, Revenue, Industries, Irrigation, Dairy Development and others in the district, for formulating the project. It is necessary to assess the existing resources in the selected watersheds with regard to land, soil type, rainfall, water resource i.e. number of wells, tanks, irrigation projects, animal and human population and present employment status etc. On the basis of the above information, Project report on the following lines would be prepared for each watershed.

Contents :

1. Physical location and general description of the watershed.
2. Resource Appraisal : Herein describe the details of land, soil type, rainfall and water resources, the major problems, needs land potentials of area.
3. Present land use : The present vegetation and cropping pattern in respect of agricultural lands will be taken into consideration.
4. Soil type and land use capability findings of the soil survey and capability classification.
5. Development measures for productivity optimisation: measures proposed to be taken as well as chemical and biological treatments proposed to be applied for bringing this about.
6. Project land and water management: The details of land use that will result after development in the matter of agriculture and non agriculture areas. The details or cropping pattern should be projected.
7. Phasing of works and costs.
8. Employment status after development and benefit cost ratio: This will include not only agricultural production but increase in animal production, fuel, fodder land increased opportunities for employment.

Source : Gokul Prakalpa Prathisthan, Ratnagiri (MS)