

WATERSHED APPROACH FOR SUSTAINING NATURAL RESOURCES IN INDIA

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Agriculture is considered as a very complex system because it involves numerous components or enterprises including crops, trees, livestock, fisheries, bee keeping and many more. These all modules are inter-reliant and subsidies to each other. Similar to any other enterprise, agriculture also depends on several internal and external factors. These factors include environment (atmosphere largely), soil (depth, fertility, physical fitness and drainage) and water resources (monsoon, surface flow and sub- surface flow and run off). In the present scenario environment is in bad shape due to increased CO₂ level, ozone layer depletion, global warming, melting of glaciers, increase in temperature and rising of sea level while the soil is also contaminated due to heavy metal pollution, increased salinity and sodicity, degradation through erosion, waterlogging and shifting cultivation. On the other hand, water resources are not in their best serving phase because of the salinity of water and poor quality of water. To overcome all these problems, different approaches can be adopted, which include the individualistic approach and holistic approach. The individualistic approach comprises front line demonstration and single critical based interventions which have voluminous advantages and disadvantage like lack of linkage with other input, no concern about supporting system and easy to manage and follow. Conversely, a holistic approach which involves watershed management results in linkage with all the other inputs and consideration with life supporting system. The watershed approach aims at alleviating habitat and inhabitant impoverishment through a holistic & participatory approach of conservation & sustainable exploitation of natural& human resources. Watershed is the area that drains into a lake or river via streams and ditches directly over the ground surface or through the ground.

Watershed management

Watershed remunerates natural resources of a particular area and helps in benefiting the surrounding ecosystem that is why considered as a holistic approach. Generally, it works on objectives framed as “Power” which means

- **P**= Production of food, fiber and fodder, pollution control and prevention by flood
- **O**= Over exploitation of natural resources to be limited, operational practicability of all on-farm operations
- **W**=Water storage, wild and indigenous animals, plants conservation
- **E**= Erosion control, eco-system safety, economic stability and employment generation
- **R**= Recharge of ground water, reduction of drought hazards and reduction in siltation in multipurpose reservoir

During watershed management, these objectives are considered as important for the inclusive development of the total area. Watershed generally contains three major portions *i.e.* catchment area (receiving water), storage and command area (distribution area). For the development of catchment, various potentials of that specific area in different aspects should be considered like type and nature of vegetation, slope, size, quantity and distribution of rainfall, expected runoff, generation of runoff, safe channelization of harvested water, silt load reduction and fragmented land holding etc. In the same way storage area should be evaluated on the basis of location, stability and type of storing structures (concrete, earthen, poly film line), size, water availability period and duration, siltation, evaporation loss prevention, operation and maintenance practicability, total expense and expected life of storing area. Command area must be decided according to nature and duration of crop in that particular area, water conveyance system, adopted irrigation system, water availability and total water demand, proper utilization of water in command area distributed from the catchment area. The whole watershed management not only results in injudicious consumption of natural resources like water, land and microclimate of a particular area but also helps in improving the way of life of people residing inside the boundaries of the watershed.

Watershed approaches implemented for sustaining natural resources

For the optimum utilization of natural resources, various mechanical and biological measures are employed:

Mechanical measures

- Prevention from soil erosion through bunding, trenching, terracing, vegetation barriers, grass water ways.
- Harvesting of rainfall water through farm pond, low earthen dams, and percolation tanks.
- Drainage line treatment measures like check dam, gully control structures, spill ways and grass outlets.

Biological measures

- Agronomic practices like contour farming, strip cropping, cover cropping, mulching, crop rotation, mixed farming and tillage
- Cultivation of grasses
- Agroforestry
- Crop diversification and intensification
- Integrated pest and nutrient management
- Use of multiple resources like dairy, goatry, piggery, poultry, apiculture etc.

All these executed measures improve usage of natural resources of watershed area which promotes better returns from different enterprises and uplifted lifestyle of residents.

Success story of several watersheds across India

- **Integrated model watershed at Kokriguda:** This watershed is situated in Orissa's district Koraput at the altitude of 880- 1329 meters with the total watershed area of 317 hectares. Before the watershed development, the whole area was affected by severe erosion through high wind velocity and water resources, denuded hillocks, causing almost nil agricultural accomplishments and other related enterprises. These activities resulted in malnourished livestock and impoverished human population. The situation transformed in a better picture after the watershed development in the particular district.

The participatory rural appraisal was conducted by the government during watershed planning, along with social and resource mapping: improved total irrigation area, net cultivated area and total cropping intensity of watershed in twenty years. In the initial years of 1997 total irrigation area was 3.50 ha, net cropped area was 127.25 ha, and cropping intensity was 77.97% which was estimated to increased up to 93.80 ha, 167.70ha and 155.93% respectively in 2017.

- **Integrated watershed in Konkan Zone of Goa:** Barcem watershed was planned and executed in Konkanzone of Goa state. The geographical area of the watershed is 1625 ha. Land use in the watershed is comprised of 37% net cultivated and 27% barren and uncultivated land. Various activities like crescent shape trenches, sunken ponds, live fencing and check dams were constructed by farmers during the initial development of watershed. Due to increased rainfall harvesting, adequate water-storing reservoirs groundwater recharge takes place rapidly and improved crop intensity. Cashew is the major crop of this particular watershed area which results in high benefits return. Watershed encouraged better utilization of natural resources like land and water, enhanced sustainable agriculture, supported the whole ecosystem in an advantageous manner (Chand et al. 2007).

Conclusion

The degradation of land and wastage of water resources forces to plan a holistic approach for a better future in agriculture. Watershed protects fertile soil from high wind and water erosion through many mechanical and agronomical practices. These practices convert low inputs to high output. Optimum utilization of natural resources enhances agricultural productivity and reduces malnutrition in human as well as livestock. Watershed improves other enterprises like poultry, fisheries, apiculture, sericulture, agroforestry and other allied business of agriculture resulting in the upliftment of families of the farmer.

References

Chand,S.,Korikanthimath,V.S. and Manivannan,S.2007. Impact of soil and water conservation structures on productivity and ground water table in Barcem watershed of Goa.*Indian Journal of Soil Conservation*. 35(2): 172-173.