SOIL AND WATER CONSERVATION FOR CLIMATE RESILIENCE

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Resource Degradation

Degradation of the primary natural resources viz. soil and water is major concern with respect to food production and other related activities at present. Soil degradation is defined as "a process which lowers the current and/or the potential capability of soil to produce (quantitatively and/or qualitatively) goods or services (FAO, 1979). In other terms it is the "decline in soil quality caused through its misuse by humans". It refers to decline in the soils' productivity through adverse changes in nutrient status and soil organic matter, structural attributes, and concentrations of electrolytes and toxic chemicals. For the holistic management of the natural resources integrated with sustainable production, the concept of watershed management is of much importance which is also relevant in terms of climate resilient agriculture.

Watershed management

As mentioned above, watershed is identified to be the ideal unit for implementing all the NRM programmes because

- Watershed, a geographical and hydrological unit draining to a common outlet point, is recognized an ideal unit for planning, conservation, and development of land, water and vegetation resources.
- Watershed concept is an integrated approach of harmonized use of natural resources like land, water, vegetation, livestock, fisheries and human resources.
- Watershed management is a single window, integrated, participatory and sustainable area development programme.
- Integration of technologies within the natural boundaries of a drainage area (from the highest point (ridge) to the outlet) for optimum development of land, water and biomass resources to meet the basic minimum needs of the people in a sustainable manner.

Here the major stress is on "WATER", as healthy development of other resources like plants, animals and humans revolves around water. A wide variety of programmes and institutions are involved and these cannot be successful

without People's participation. Systematic and proper implementation of this concept allows accurate measurements and monitoring of hydrologic components.

Water is the most important natural resource today. That is why all NRM programmes undertaken by the Govt. revolve around water, in terms of 'watershed'. The major source of water on earth is precipitation by means of rainfall and snowmelt. Kerala receives an average annual rainfall of 3055 mm which is almost three times the national average of 1,170 mm. But owing to the steep terrains and improper land uses, the state is not able to conserve enough water to meet the drinking water and irrigation purposes throughout the year and often fall susceptible to drought.

Why the water shortage?

It does not matter how much rain we get. If we don't capture and manage it properly we can still be short of water. It is unbelievable but true that Chirapunji which gets 11,000 mm annual rainfall suffers from serious drinking water shortage during lean seasons. Even though Kerala receives an annual average rainfall of 3,055 mm, we still face water shortage in summer mainly because of the topography, improper management, and many anthropogenic factors.

Principles of soil and water conservation

Soil conservation and water conservation are mutually depended in such a way that without one the other could not be achieved. For conservation of soil and water, integration of biological and mechanical measures are required depending upon degree of the problems.

The essential interventions for soil and water conservation could be undertaken in four stages

I Between the sky and soil

- Vegetation cover
- Crop geometry/Plant population
- Improved crop varieties /planting materials and plant protection measures
- Cover cropping
- Mulching

II Maintenance of a healthy soil

- Tillage practices
- Soil fertility management: physical and chemical properties of soil

- Crop rotation
- Application of amendments
- Green manuring
- Crop residue management

III Measures against overland flow

- Erosion permitting and resisting crops/strip cropping
- Contour farming
- Vegetative barriers

IV. Drainage line treatment measures

- Diversion structures
- Temporary and semi-permanent check dams/grade stabilizers
- Permanent grade stabilization structures like check dams, drop structures, etc.
- Silt detention dams and water harvesting structures
- Slope stabilization measures like retaining walls, revetments etc.

Water resource of Kerala - threats and management issues

I. Deforestation - Land use changes:

- Conversion of watershed area has altered the hydrological regime while enhancing the silt movement – lowering water yield in the catchment affecting the groundwater recharge.
- Large-scale deforestation in the Western Ghats and introduction of plan tation crops in highlands replacing the natural vegetation reduced the storage capacity of soil and resulted in surface soil erosion in watersheds and sedimentation in rivers.
- This has affected summer flow in rivers and some perennial rivers and rivulets have become seasonal in the last few decades due to large scale land cover changes.

II. Sand Quarrying and River Bank Agriculture

Sand quarrying in rivers and watersheds are killing the rivers. Such activities lead to bank erosion, lowering of water table and create several environmental problems.

- Ground water level in some of the watersheds has gone down by nearly one meter in the last two decades.

- Agricultural practices in the riverbanks (and also inside the dry riverbeds) during non-rainy months also add to bank erosion and sedimentation in rivers.

III. Degradation of Water Resources

All 44 rivers in Kerala are highly polluted due to inflow of untreated domestic, industrial wastes and agriculture runoff.

- Most of the industries are near the thickly populated riversides, often near cities and towns. There is no efficient water treatment system in industries and city municipalities.
- Pollution level in some of the sites is far above permissible limits.

IV. Land Reclamation and Construction

Sand filling of ponds, farmlands, wetlands and other water bodies affects natural water flow and groundwater recharge

- Construction of new roads and buildings has blocked many canals, which were important for navigation and freshwater
- Vast areas of wetlands and paddy fields have been converted into settlement and industrial areas in the recent times.

V. Bacteriological Contamination in Drinking Water Source

Wide spread bacteriological contamination of fecal origin in sources of public drinking water supplies, viz. traditional open dug wells, bore wells and surface sources. These concerns for ground and surface water contamination relate to close proximity of increasing numbers of leach pit latrines under varying soil conditions, laterite (midland) and sandy soils (coastal area); Non point sources of pollution in the catchment area including possible agricultural and surface run off, especially during the rainy season etc.

References

FAO, UNEP, UNESCO. 1979. A provisional methodology for Soil degradation assessment, FAO, Rome.