Agro-Ecological Transitions Through Spingshed Based Watershed Development

Devendra Kumar Kurrey
PhD, Agricultural Economics, IGKV, Raipur
*Corresponding Author: drdevendrakurrey95@gmail.com

Challenge is changes in the climate, especially in the way it rains, earthquakes, and the damage to the environment caused by changing how land is used for infrastructure development, are putting a lot of stress on mountain aquifer systems. With less rain in the winter, the problem of dying springs is becoming more noticeable in the mountain regions of the country.

An emerging concern in the field of natural phenomena is the transition of a perennial spring into a seasonal spring, ultimately culminating in the transformation into a dried spring.

Springs have been a source of water for mountain towns for hundreds of years, and bringing them back to life is very important for the region's long-term growth.

In the mountainous part of India, where many people live, springs are the main way they get water. A rough estimate of nearly 200 million Indians who depend on spring water in the Himalayas, Western Ghats, Eastern Ghats, Aravallis, and other mountain ranges means that spring water is important to more than 15% of India's population. (Source: Niti Ayog).

Water us increasingly becoming a critical ingredient for sustainable development, village water sources have been traditionally playing a vital role in providing water security to nearly 80 percent of the rural households. These springs get recharge from the sub-surface flow or from the rainwater that percolates down.

However, over the years, many of these springs are drying up or becoming seasonal and the discharge during the lean season is declining. These have reduced the sponge action of the land and consequently limited water rainwater percolates down creating a hydrological imbalance in some of the watersheds. It has been estimated that less than 15 percent of the rainwater is able to percolate down through deforested slopes to recharge the springs, while the remaining flows down causing floods, it has also been forecasted that global warming and climate change will further adversely affect the spring water resources.

What is a Watershed?

A watershed is synonymous to a catchment area and it is an independent Hydrological unit. It can be defined as the drainage basin or catchment area of a particular stream or river. It refers to the area from where the water to a particular drainage system, like a river or stream, comes from. A watershed may be small, consisting of a few hectares, or huge, covering several thousands of hectares.

What is Watershed Development

Watershed development refers to the conservation, regeneration, and judicious use of human and natural (like land, water, plants, and animals) resources within a particular watershed.

Why Watershed management

It aims at controlling runoff to reduce soil erosion, increase soil moisture security for the field crops and recharge groundwater.

What is Spring

Spring: In India's mountainous areas, groundwater naturally flows out as springs. These springs form where a water-bearing layer (called a "perched aquifer").

What is a Springshed

A springshed is an area whitin a ground or surface water basin that contributes to the springs flow, the boundaries of spingshed are dynamic-they change based on the level of the aquifer.that means a springshed may cover different areas atr different times,depending water level.

Spings are drying up also become seasonal.so, the springshed development focuses on:

1. Increasing the discharge of the spring
2. Increasing the duration of discharge of the spring.

The point where the spring emerges is based on the relationship of the aquifer to the watershed surface. A springshed is a set of watersheds and aquifers that integrate into a system that supplies water to a group of springs.

The boundaries of springsheds are dynamic – they change based on the level of the aquifer (otherwise known as its potentiometric surface). Also spring sheds are the areas within ground-water and surface-water basins that contribute to the discharge of a spring. An aquifer is very much like an underground watershed. Unlike plain areas, in hilly areas, the spring shed is the fractured rocky area under the hills which contribute to flow of water as the springs at the drainage outlet. The direction of the flow of water /spring shed outlet depends on the type of rocks and their geological formation.

What is Springshed development

Water flows from point of higher elevation to point of lower elevation through a force of gravity. Springs are a "window" in the groundwater flows which emerge to the surface as a spring.

The underground flows within a land area that contribute water to a spring vent or outlet comprise the springshed. Implementation of water recharge structures such as dug-out farm ponds, continuous or staggered trenches, water absorption trenches, etc., in the catchment area of springsheds is known as spring shed development.

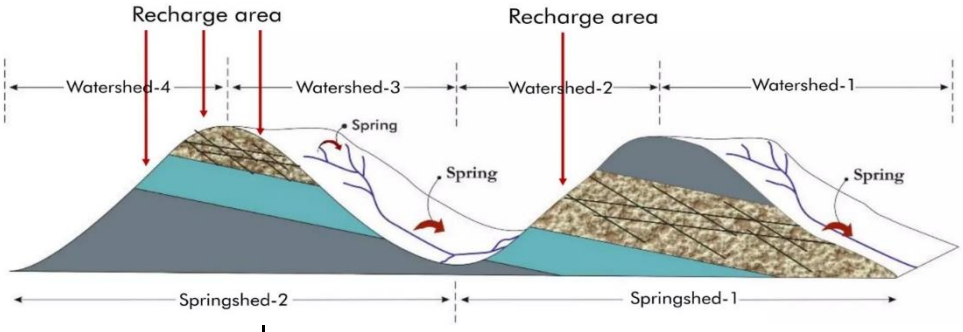

Figure 1: **Springshed.**
Source: Indiawaterportal

Data Requirement

- Web based platform for database
- National Spring Information System (NSIS)
- Spring Coordinate for Atlas & Inventory of Springshed data (Slope % and slope aspects, Landuse/ Land Cover, Vegetation, soil type, Rock type, Household dependence etc.)
- Rainfall
- Spring discharge
- Water quality
- Water demand Vs availability calculation

Why springshed management

The springsheds in hilly regions are life line for the rural community. They provide water for both irrigation as well as drinking water.

1. Revival of dying springs for irrigation and drinking water purpose.
2. Enrichment of soil fertility through control of soil and water erosion.
3. Afforestation for restoration of ecological balance.
4. Dryland Horticulture for the creation of alternate livelihood opportunities for the poor tribal families.
5. Promotional sustainable farming practices like organic farming, etc.
6. Rainwater harvesting.
7. Community organization and community development and
8. Gender development and landless, labor, development.

Core components of the programme

i) Soil, land management, and springshed development (conservation and use).

ii) Water management (conservation and use).

iii) Afforestation.

iv) Livestock management, Pasture (Fodder) development.

v) Agricultural development.

vi) Rural energy management.

vii) Human Resource Development Socio-economic development (community

development).

Criteria for selection of spring shed based watersheds under NABARD source of Funding

A. Physical characteristics

i. Villages with noticeable soil erosion, land degradation, resource depletion or acute water scarcity problems.

ii. Villages in the upper part of drainage systems.

iii. The size of a watershed project i.e., treatable area should be around 300 ha. but normally it should not be less than 100 ha. (the geographical area of the springshed based watershed can be more than 300 ha).

iv. Well defined watersheds with the village boundaries coinciding to the extent possible with the watershed boundary.

v. Watersheds are expected to have treatable area more than 50% of the total geographical area. Watersheds with less than 50% of treatable area may be selected only with specific justification in terms of its impact and sufficiency of treatment measures to achieve desired impact / result.

B. Socio-economic characteristics:

i. Predominantly poor villages.

ii. High proportion of SC/ST in the total population.

iii. There should not be much difference in the size of the land holdings.

The eligible agencies for the project execution can be:

i. Civil Society Organizations / NGOs.

ii. Grama Panchayats (GP).

iii. Krishi Vikas Kendras (KVKs)/ ICAR institutes and Institutions under SAUs.

iv. Institutions/Societies/Trusts promoted by State Governments.

(Traditional Community-based institutions recognized by Government can also act as PFA when other suitable PFAs and GPs are not available).

Key principles are emphasized again and have to be adhered

i. People's participation at all stages and the community shall own and implement.

ii. Ridge to valley - treat every hectare that is required to be treated.

iii. Particular care is to be taken for the involvement of the forest department in the treatment of forest areas on the ridge lines and the implementation of a joint forest management scheme with the community.

iv. Survey number-wise planning involving every farmer.

v. Uninterrupted flow of funds for implementation

vi. Arrangements for providing half-yearly requirements in advance and claiming subsequent requirements after exhausting 60% of the amounts released previously.

vii. Financial releases based on field monitoring and satisfactory progress. Maintenance arrangements to be built in through community involvement and contribution

viii. Use of technology tools, such as GIS, GPS, and Remote Sensing for watershed planning, designing, management, monitoring, etc.

Project Measures

The actual selection of the activities will be based on the net planning and location specific needs of the areas identified for development.

i. Strengthening of bench terraces.

ii. Control of stream bank erosion.

iii. Rainwater harvesting in Syntax/cement structures.

iv. Organic farming including vermicompost production.

v. Afforestation.

vi. Orchard development.

vii. Loose boulder checks.

viii. Gabion structures.

ix. Check dams – depending of hydro-geological suitability.

x. Construction of water diversion structures from smooth handling of runoff.

xi. Construction of staggered / continuous trenches for recharge of springs.

xii. Digging Farm ponds for recharge of springs.

xiii. Alternate livelihood enterprises like dairy, fishery, poultry, piggery, goatery, sheepery, etc.

xiv. Off farm livelihood enterprises like bamboo crafts, candles, pickles, broom grass, etc.

xv. Promotion of SHGs/JLGs/FPOs.

xvi. Cent percent financial inclusion with the opening of bank account for all the beneficiaries etc.

Benefits of Springsheds

- Reduced Lean flow period.
- Higher Plant Survival Rate.
- Increased Biomass production.
- Increased Fodder availability.
- Household water quality.
- Increased life of downstream.
- Storage structures.
- Increase drinking water availability.
- Reduce migration and improve income generating activities.
- Improve irrigation facilities.
- Increased lifestyle of vulnerable community.
- Increase NTFPs collection.
- Reduce wasteland and improve land productivity.

Steps	Activity	Objective	Equipment	Outcome
Step-1	Spring Mapping	To locate spring emergence point/geo-tagging	GPS Device/Android Phone	Spring Atlas/Inventory
Step-2	Spring Discharge	To measure spring discharge	A bucket whose volume is known, Stop watch	Spring Hydrograph
Step-3	Rainfall	To measure rainfall	Rain Gauge	Spring Hydrograph
Step-4	Water Quality	Water quality monitoring	Tracer, on spot water quality testing kit	Water quality report
Step-5	Base-Line (Socio-economic)	Base line survey	Formats, structured Questionnaire	Village water resource map,Demand & Supply status, Vulnerable springs
Step-6	Hydrogeological Mapping	To collect hydrogeological data from the field survey	GPS, Brunton, Clinometer, Hammer Google Earth and Sketch up (Softwares)	Hydrogeological Conceptual layout & spring site cross section
Step-7	Designing recharge interventions and management protocols	Physical and biological measures, social fencing, Behaviour change	Tools for community mobilisation experts as SARAR kit	Spring recharge and protocols for srpingshed management
Step-8	Impact assessment of springshed works	Measurement of benefits from springshed works with other socio-economic aspects	A Bucket whose volume is known, Stop Watch, Tracer, on spot water quality testing kit, Formats structured Questionnaire	Improvement in water availability water quality

Table 1: Steps of methods for Springshed development

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