

Springshed management using soil and water conservation measure

in the hilly region of Uttarakhand

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Drying of spring in the North Western Himalayan region of Uttarakhand is a major concern in relation to water availability for drinking water, domestic use and irrigation purposes. The potential of soil and water conservation measures for springshed management has been demonstrated. The results will be useful for spring water management during the monsoon season and for increasing water resources in the hilly regions by conserving spring water.

Keywords: Climate change, Hilly region, Springshed, Springwater

Springs are the lifeline for people living in the Indian Himalayan Region (IHR). The IHR is under constant threat because of climate change, land use, population growth and changes in rainfall patterns together with anthropogenic activities. Availability of water is essential for socio-economic development and irrigation for agriculture. The natural spring in Uttarakhand locally known as Naula is a result of the discharge of groundwater from the underlying aquifer. The rural population accesses spring water for their domestic use and irrigation purpose through a gravity-based piped system.

The cultivation practices used by farmers were mostly recommended cultivation practices by the NARS and demonstrated through FLDs during seven years (2010–11 to 2017–18) with few modifications such as, enhanced plant to plant spacing of 20 cm instead of recommended 15 cm and innovative additional nutrient management using micro fertilizers and inter-cultivation practices as given below.

Concept of Springshed versus watershed

Most of the programmes of water conservation were based on the foundation of the watershed management concept. It is a unit of land where the rain that falls discharges from a single outlet. Watershed accounts for only surface water over slopes, while spring water is governed by the underlying geology. The concept of springshed management is gaining popularity in the form of pilot-scale projects across IHR states. The approximate unit of springshed is the unit of land where rainfall occurs and then emerges at the discharge point. The problem of water scarcity is increasing in the recent decade due to the drying of spring. The mountain people mostly rely on spring water which is fed by rainfall or snow. In recent years, there has been growing interest among researchers to address the problem of spring management in India.

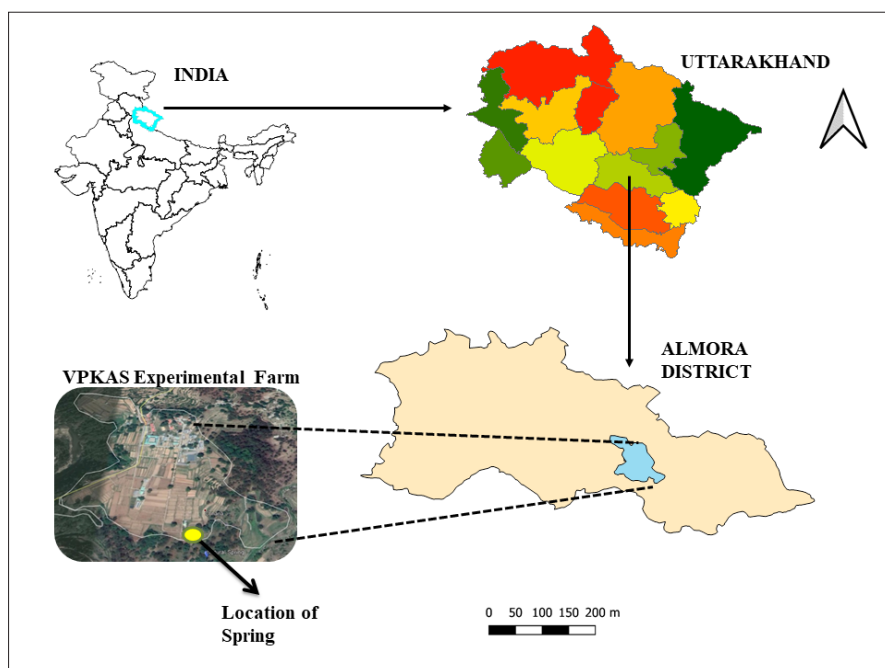
Project site

The study site is located in ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan (VPKAS) in Almora, India. It lies in the mid-

Himalayan region of Uttarakhand and the climate is temperate. The elevation of the Almora district ranges from 470–2757 m above mean sea level. The normal annual rainfall of the state is 1500 mm. The entire area is influenced by the southwest monsoon, which arrives in the later parts of June and continues till the end of September. 70–80 % of the total annual rainfall occurs during this period.

Initially when the project was undertaken the spring water was not properly managed to quantify the spring discharge. The initial condition of the spring water was such that after discharging from the spring it did not come to a single collection point due to a lack of a proper collection basin cum gravity-based piped system. To quantify spring discharge a proper collection basin integrated with a gravity-based piped system was made. To monitor spring discharge characteristics, daily spring discharge was taken using the volume time method.

Spring undertaken in the present study was monitored for one whole hydrological year to understand its discharge characteristics without



Project site

implementing geospatial technique integrated soil water conservation measure. Soil water conservation measures included a mechanical measure (Trench) and agronomic measure (Napier grass) at selected suitable runoff water harvesting sites.

Construction of low-cost poly tanks, trenches and other agronomic interventions in the catchment can improve the water availability in hilly regions. Surplus water during the monsoon season (July–September) can be stored in a low-cost poly tank and can be utilised later for irrigation purposes.

Impact of Technology

Augmentation on spring discharge: Daily spring discharge data was measured from the spring located in VPKAS Experimental farm, Hawalbagh. The daily spring discharge varied between 8.08–22.01

m³. The spring discharge regularly varied with a standard deviation of 3.02 m³. The monsoon rainfall (July–September) and winter rainfall (December–January) are the most common, which affect the behaviour of spring discharge. Spring discharge after implementation of soil and water conservation measures was found to have increased.

Harvesting spring water in multi low-cost poly tanks: Water resource development in hilly regions is very costly and time-consuming due to adverse topology and small terraces. Due to the occurrence of frequent landslide events, laying of the canal network and exploitation of groundwater is not feasible. The demand for domestic water use and irrigation water can be only possible using community-based harvesting of spring water in the multi low-cost poly tank. HDPE pipe for conveyance and Silpaulin sheet



Mechanical measure (Trench)



Agronomic measure (Napier grass)

made low-cost poly tank are found to be cost-effective for storing extra spring water.

SUMMARY

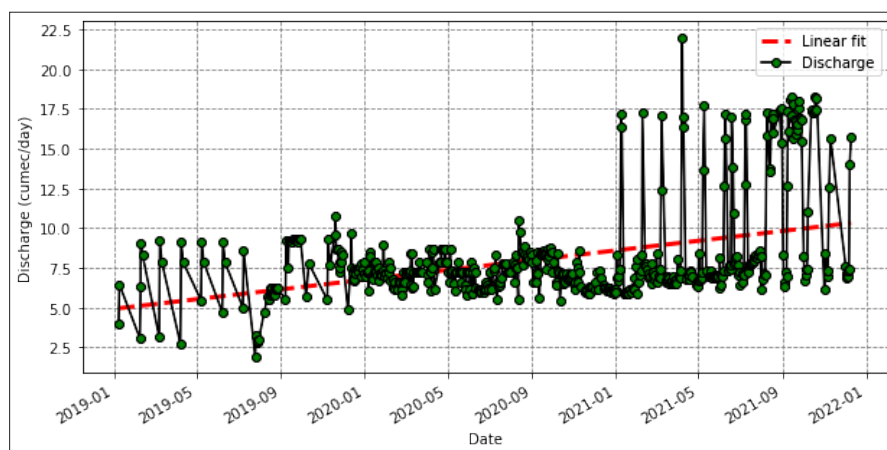
Soil and water conservation measures could be implemented in hilly areas like the lesser Himalayas, Western Ghats, etc. where perennial springs and streams exist. In



Initial condition of the spring



Condition after collection basin-cum-gravity based piped system



Time series of daily discharge

Uttarakhand, 85% of agricultural lands in hilly districts are rainfed as the available spring water is not fully utilised. Therefore, farmers are able to take only two crops in a year because of the scarcity of water. Harvesting spring water using multi low-cost poly tanks is suited for irrigation as well as domestic purposes.

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