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Hydrological Analysis of Mountain Spring Systems in Nepal for Improved Watershed Management

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Abstract

Springs are naturally occurring discharge features of groundwater flow systems and an important source of drinking water and irrigation in the hills and mountain regions of Nepal. Despite the importance of springs for the hill and mountain communities, a comprehensive understanding of the hydrology of these mountain spring-shed systems and their management plans is still not adequate. There is still lack of information on their occurrence, source areas, and impacts from land use activities and possible climate change. Increasing anecdotal evidence suggests that natural and anthropogenic processes are leading to the drying of springs. Therefore, under the Building Climate Resilience of Watersheds in Mountain Eco-regions project (BCRWME), a Five year field monitoring network has been set up in two study watersheds in Shikharpur and Banlek Village Development Committees (VDCs) of Far West Nepal to collect precipitation, spring and stream flow data as well as to collect samples for environmental isotope analysis. Springs in Shikharpur VDC are located between 1900 to 2500masl and they emerge at the contacts of phyllite and karstic limestone. Likewise, springs in Banlek VDC are located between 700 to 1100masl and they emerge at the contacts of colluvial soil and fractured quartzite. The stable isotopic variation in precipitation suggests that the altitude effect are -0.30 ‰ for δ18O and $^{-1}$.73 ‰ for δD, and -0.26 ‰ for δ18O and $^{-1}$.41 ‰ for δD for Shikharpur and Banlek VDCs respectively. Based on local geological settings and isotopic information, the recharge areas for springs in Shikharpur are located at the altitude of 994 to 1100 masl. Likewise, the recharge areas inferred for springs in Banlek are located at the altitude of 631 to 715 masl. The preliminary results therefore suggest that a high proportion of precipitation from the previous year make up spring discharges and the spring recharge areas lie in the opposite valley for both spring sites. These results indicate that the spring recharge and watershed management programs have to extend beyond the study watersheds and cover a much larger area.

Keywords: Environmental Isotopes, mountain Springs, Nepal, Spring recharge areas, Watershed Management

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