Issue Brief

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FOR MOUNTAINS AND PEOPLE

Reviving the Drying Springs

Reinforcing Social Development and Economic Growth in the Midhills of Nepal

Why are springs important?

Midhill village life in Nepal, as elsewhere in the Hindu Kush Himalayas, is a daily struggle to cope with the problems posed by steep slopes and a demanding climate. Streams and rivers often lie far below hill settlements and cannot provide the water needed for daily life due to the prohibitively high cost of carrying by hand or pumping uphill. Thus the springs (or 'mul') that rise in the hills are critical to survival, supplying water for drinking, irrigation, and livestock, and generally sustaining domestic needs and the rural economy, especially during the long dry season. These springs are fed by groundwater which accumulates in underground aquifers during the monsoon. But many are now drying up, threatening a whole way of life.

Springs are the life blood of the hamlets in Nepal's midhills, nevertheless their hydrological dynamics remain poorly understood as do the livelihood implications of changes, and springs are generally overlooked in matters of administration and conservation. The springs are mostly found at many sites around a hill slope or 'water tower' (see Figure 2). They can be relatively short-lived, providing water for a certain period after the monsoon when the groundwater levels are high, or perennial, when they are fed from a level below the dry season water table. If the groundwater recharge rate is less than the extraction rate they eventually dry up. The precise relationship between precipitation and recharge, and actual extraction rates, remain unknown in most parts of Nepal, but experiments have shown that it is possible to increase the life of springs by increasing recharge rates during the monsoon through the construction of pits and ponds and improving vegetation cover.

Loss of springs leads to increased domestic drudgery, with water having to be fetched from more distant sources, and increased stress for those whose livelihoods are based on farming. Loss of water can be a significant push factor in the outmigration of rural labour and youth from the midhills to cities or abroad for permanent

Highlights

- ICIMOD in partnership with the Nepal Water Conservation Foundation (NWCF) has worked with local communities in two villages of Kavre District, Nepal to understand the relationship between rainfall, groundwater recharge and spring water availability, and implications on rural livelihoods.
- The pilot project trained and mobilized local communities to map the spring water sources in their villages, measure rainfall and spring water flow, understand the hydrogeology of the area, and identify recharge ponds to enhance dry season spring water life.
- Under the pilot project, local communities rehabilitated recharge ponds to improve spring water flow and established a grassroots mechanism to maintain the ponds.
- The findings of the action research indicate that a combination of biophysical, technical, and socioeconomic factors is responsible for the drying up of springs in the midhills of Nepal.
- Policies that focus on enhancing the capacities of local communities, empowering local regulatory institutions, and promoting a culture of conservation are suggested.
- The physical aspects of spring hydrology are still poorly understood, as are the social science aspects related to changing water use. Research needs to be continued to establish firmer linkages between local hydrogeology, recharge ponds, and spring water flow and management.

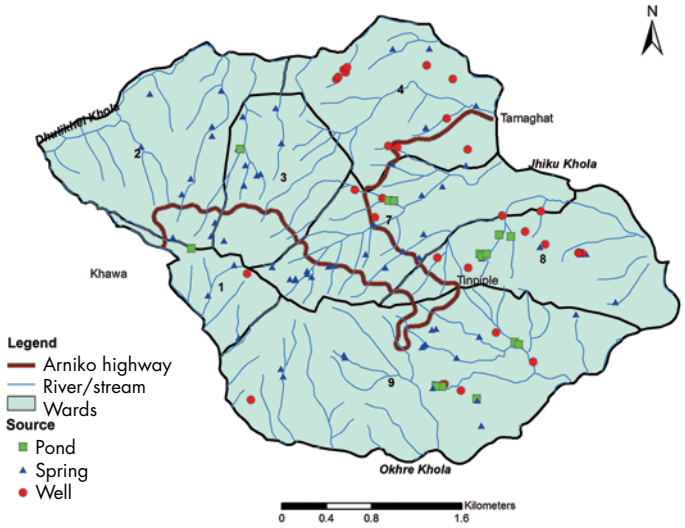


Figure 1: **Tinpiple pilot study site water sources**

Close to 15% of the 70 springs identified in Tinpiple (area 14 km^2) and 30% of the 174 springs in Dapcha (25 km^2) have dried up within the last decade.

or seasonal employment. The resultant labour shortage in the midhills is leading to a sharp decline in food production on the terraced farmlands – a vital national resource built over centuries – and is increasing Nepal's vulnerability to food insecurity. Reversing this trend should be a major element of national policy, and proper local water management is a key adaptive strategy that will facilitate such a thrust.

What are the critical issues for reviving springs?

The action research used a grassroots-based approach to understand the real water stress faced by small farmers in the chosen locations and was able to unearth some critical insights about spring water dynamics and local water management practices:

1. The Nepali midhills are richly endowed with springs. Springs, although central to village life, have rarely been properly mapped. The action research showed that even a small area of a few tens of square kilometres around a hill water tower had over a hundred large and small, seasonal and permanent springs. Permanent springs are critical for drinking water, while seasonal springs are critical for farming in hilly areas. In order to identify all the different types of springs and their varied uses, it is best to map them at the end of the monsoon season when all are active.

2. A combination of biophysical, technical, and socioeconomic factors is responsible for springs drying up. Although declining rainfall, especially during the winter season, has been reported recently, the overriding drivers for springs drying up are poor management and technical and socioeconomic factors. For example, buffaloes used to be kept by many households and were an important source of income. Ponds were maintained for the buffaloes to wallow in, which provided comfort for the animals and also increased milk yields. At the same time, the ponds retained water after the monsoon and helped increase groundwater recharge, thus helping to sustain the springs. As animal husbandry has declined, the need for such ponds has disappeared and many have been abandoned, silted up, or filled for other uses. The acute shortage of domestic water has only been felt relatively recently, and the role of the ponds in recharge was not appreciated.

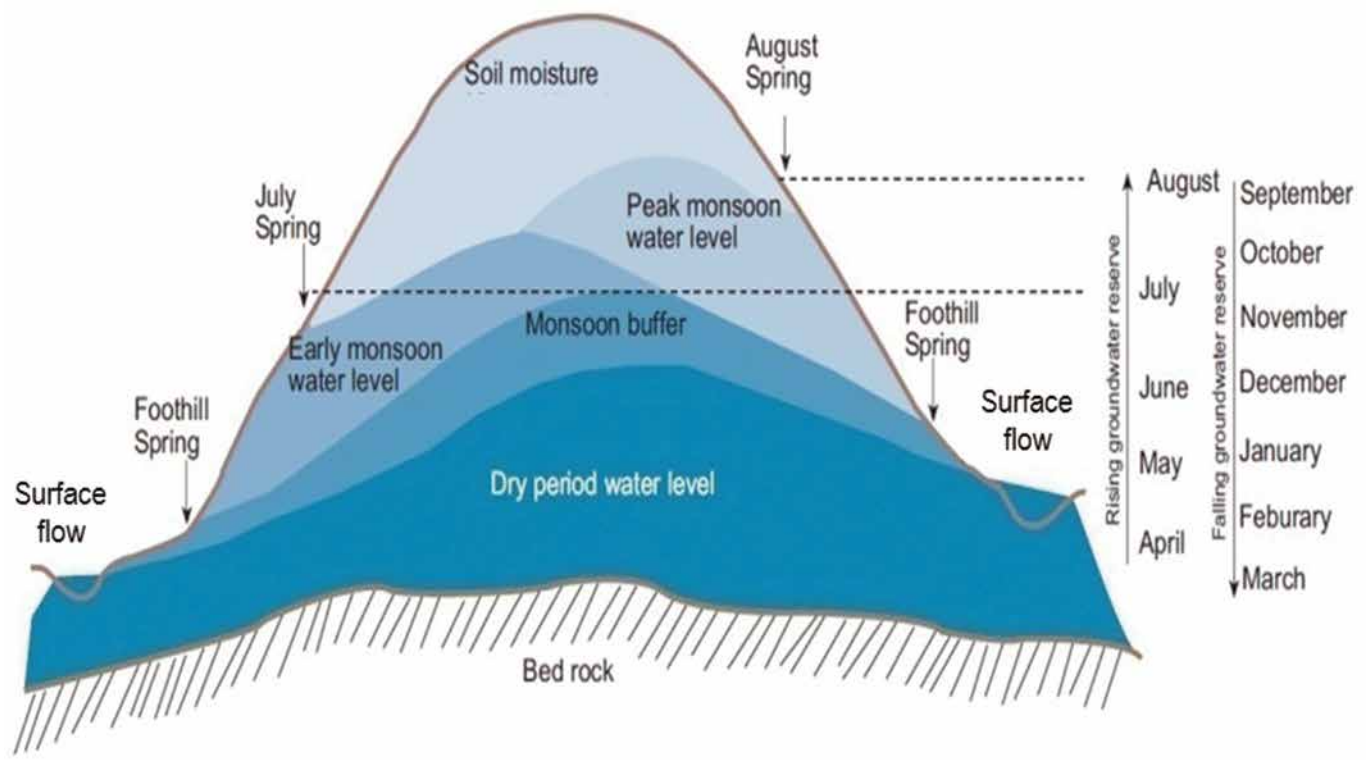


Figure 2: **A generalized 'water tower' and groundwater dynamics in the midhills of Nepal**

3. Unregulated use of new technical approaches needs scrutiny. The average family water requirement in rural areas is about 100 litres per day without livestock, or 200 litres with livestock. Traditionally, water was collected in water jars or 'gagris', and people were careful only to collect as much as needed as there was a lot of effort involved. This hand collection is gradually being replaced by use of PVC pipes and electric motors, particularly by the wealthier and better educated, which leads to over-pumping and wastage as use is generally unregulated. Moreover, the practice of digging deep wells using heavy drilling machines is proliferating rapidly. These wells range in depth from 150 to 200 metres, and in many areas such wells are known to having a marked effect on the water table. The long term sustainability of these wells in the midhills, and their impact on adjacent springs and shallow wells, has yet to be ascertained. Road building, which is also widespread, and tunnel construction may also be affecting recharge.

4. Water use patterns are changing. Water use patterns are undergoing a significant transformation as a result of the availability of new technologies such as pumps, and PVC or cement tanks. Previously, social conventions decreed that water standing overnight was impure 'basi' and this discouraged collecting more than needed. These days, water is pumped into ground or overhead tanks and used unquestioningly after being stored. More people now work off-farm, and come to springs to bathe and wash clothes on Saturdays and holidays. Agricultural practices are also changing, with entrepreneurial farmers changing to commercial vegetable farming using polytunnels and plastic greenhouses in place of dryland crops such as maize and millet, which increases water use significantly.

5. There is a lack of local level regulatory arrangements. Individual, and sometimes collective, efforts to solve water stress problems using approaches like deep boring and cement ring – inars, and direct pumping from wells and springs may make the situation worse for others, and are not necessarily successful in the longer term even for the implementers. There is a lack of both action by authoritative regulatory bodies (such as elected VDCs), and of in-depth scientific understanding of the water endowment in micro-watersheds. A number of formal and informal committees have been formed to manage natural resources at the local level, both permanent, like community forest user groups, and short-term, like construction committees, but water management groups that regulate springs and groundwater use are virtually non-existent.

Policy recommendations

Water scarcity in Nepal's midhills is now an issue that comes up in public discussion, and there are all-too-frequent reports in the media of entire villages being abandoned due to lack of water. However, the idea that hill 'water towers' must be maintained and properly recharged before more water can be extracted is not being sufficiently discussed or addressed in the public policy arena. The action research pointed to the following policy implications for forward-looking water management.

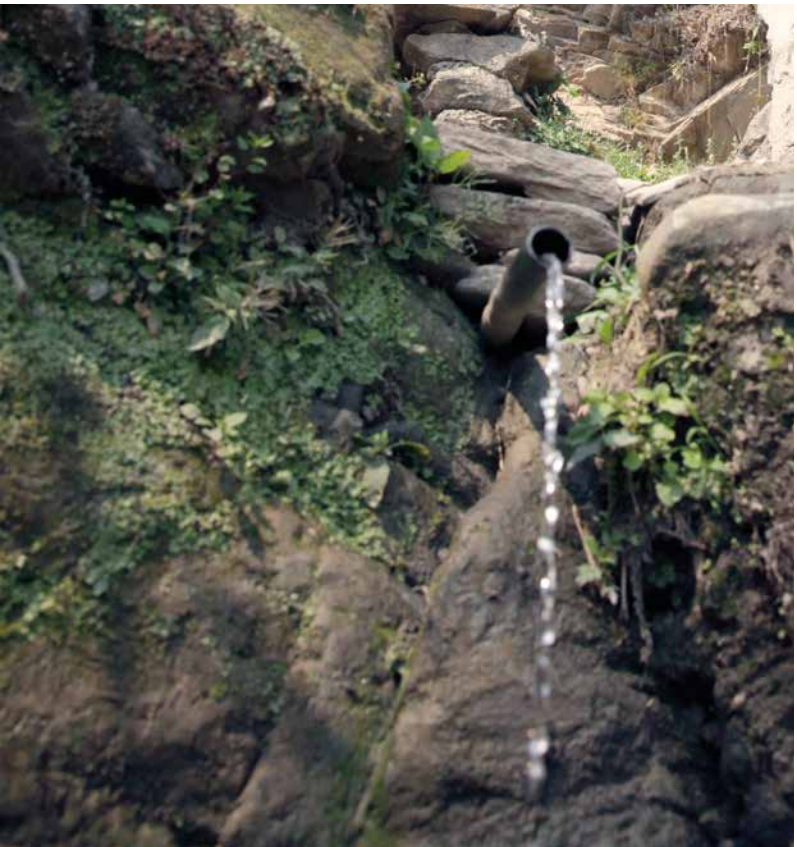
1. Policies should focus on enhancing the capacities of all stakeholders and promoting a culture of conservation. There is a misconception that spring water is free and the supply endless, that one can pump away without giving a thought to extraction limits or groundwater recharge. Pilot exercises such as this action research with a significant capacity development and social mobilization component should be carried out in many places for several years to emphasize the message of harvesting as much rainfall as possible and reviving traditional water harvesting and collection schemes.

2. More effective use of science is crucial. The physical aspects of spring hydrology are still poorly understood, as are the social science aspects related to changing water use, and considerable research is needed. It is important to elucidate how rainfall is actually stored inside a 'water tower', to determine the quantitative correlation between rainfall amount and spring flow as well as factors that affect recharge, and to evaluate how society would respond to recommendations made for water regulation. Advanced scientific methods such as tracer and geological drilling studies are more definitive and much needed, as are modelling exercises. Although they are very expensive, such studies should be carried at the micro-watershed level to establish firmer linkages between local hydrogeology, recharge ponds, and village springs.

3. Grassroots knowledge on water should be used to help design adaptive responses. Development policy should be developed using a twin approach that merges advanced science with community knowledge. Grassroots scientific action research with its 'learning by doing' approach should be coupled with advanced scientific methods using hydrometeorological and

hydrogeological modelling at sites where action research has created an interest in water conservation. Scientific knowledge should be used to identify potential conservation options and appropriate sites for recharge ponds. Local scientific research could include installing low cost rain gauges and temperature measuring facilities at local schools and sites selected by other civic groups such as user groups, and rehabilitating old and constructing new recharge ponds and observing the contribution to spring flow enhancement.

4. Empowered local regulatory institutions with authority to act are key to sustainable conservation. The primary difficulty faced in the pilot action research on building a few recharge ponds was the problem of finding a 'voice of authority' in a highly fractured village system and in the absence of elected local bodies. The presence of legitimate, elected local officials is crucial; ad hoc committees, while useful for a while,



are not sustainable in the long-run. The issue is even more crucial in places where entrepreneurial farmers are shifting to the use of polytunnels, i.e., growing commercial crops with a higher water requirement. The village-level policy should be to make concomitant building of water harvesting and recharge ponds mandatory.

5. The more local the unit, the more effective local water governance. A spring of everyday use is the concern of only few tens of households generally, and a few hundred if of bigger size. Their problems are more visible at the lowest units of governance such as wards within village development committees (VDC). Over the last four years, some progress has been seen in village ward-level planning, budgeting, and implementation following a directive by the Ministry of Federal Affairs and Local Development to establish 'ward-level citizens' forums' ('nirdeshika' or 'woda nagrik manch'). These also show considerable potential for water management. The engagement in local water management, spring conservation, and construction of recharge ponds has to start with such grassroots bodies and then work up to VDC and district development committee (DDC) levels, first with sensitization on recharge science, and then with implementation of action research.

Further Reading

DoLIDAR (2013) *Recharge ponds handbook for WASH programmes*. Kathmandu, Nepal: Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR), Ministry of Federal Affairs and Local Development. (download in English from http://www.rwsspwn.org.np/wp-content/uploads/pdf/recharge-ponds-handbook-for-wash-programme-%20english.pdf and in Nepali from http://www.rwsspwn.org.np/wp-content/uploads/pdf/recharge-ponds-handbook-for-wash-programme-nepali.pdf)

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About the study

An action research project on spring water and rural livelihood dynamics was undertaken from July 2013 to December 2014 by ICIMOD and the Nepal Water Conservation Foundation (NePaSaFa) at two locations in the western catchment of the Koshi river basin: Tinpiple in Panchkhal Village Development Committee (VDC) and Daraune Pokhari in Daraune Pokhari VDC, both in Kavre District just east of Kathmandu. The research used a participatory approach to science that focussed on the real situation on the ground, with the aim of defining the issues from the farmers' perspective and trying to understand what solutions might be acceptable in practice. The action research asked such questions as: How are the springs distributed around a particular 'water tower'? What are their flow characteristics? How are they used and managed within the local water management context? What social and environmental stresses are they facing? To what extent could recharge ponds enhance their dry season life? How can modern scientific approaches, from hydrogeology to management and community mobilization, reach the communities and help them conserve this vital resource? Seemingly simple, the questions actually proved challenging because they had never been asked before. The answers from this action research, although tentative, have serious policy implications for local water management.

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