Solving drinking water crisis in hard rock terrain of Peninsular India

A two-day national seminar on 'Government–Industry Interface for Drinking Water Security' was conducted in November 2009 in New Delhi by the Department of Drinking Water Supply, Ministry of Rural Development, Government of India and the Confederation of Indian Industry. Agatha Sangma, Hon. Minister of State for Rural Development, Govt of India, addressing the meeting stressed the need for safe drinking water for human health, particularly of children. About 80% of the drinking water supply in rural areas is met by groundwater, but there are many constraints in the availability of potable drinking water in hard rock terrain both in terms of quality and quantity.

In a hard rock terrain groundwater resources are limited, unevenly distributed and vary within a short distance (Figure 1). Groundwater occurs in secondary fractures developed due to folding, faulting, jointing, etc. and the surface signatures of such features are manifested as lineaments representing mainly subsurface tectonic features. In Peninsular India, different types of rocks occur, viz. granite, gneiss, charnockite, khondalite and quartzite which are hard, massive and at some places devoid of any secondary porosity. In these areas due to erratic monsoon and deficient rainfall there is depletion of water table and severe scarcity of drinking water in summer season. The problem is more acute around mining areas and industrial belts. If a borewell is drilled in region-1 (see Figure 1) fracture will be encountered but fracture will not be encountered in region-2 and the yield of borewell will vary within five metres. Analysis of yield data of 1167 borewells in hard-rock terrains of Orissa, drilled by the Central Ground Water Board, reveals that 54% of the borewells are of low discharge (< 3 lps) and 46% are of high discharge (> 3 lps) in nature[1]. Out of 54% of the low-discharge borewells, 29% have discharge between 1 and 3 lps and the rest has <1 lps. Wells having a yield of 1–2.5 lps are under utilized. In these wells, piped water supply schemes are not economically feasible. But in water-scarce

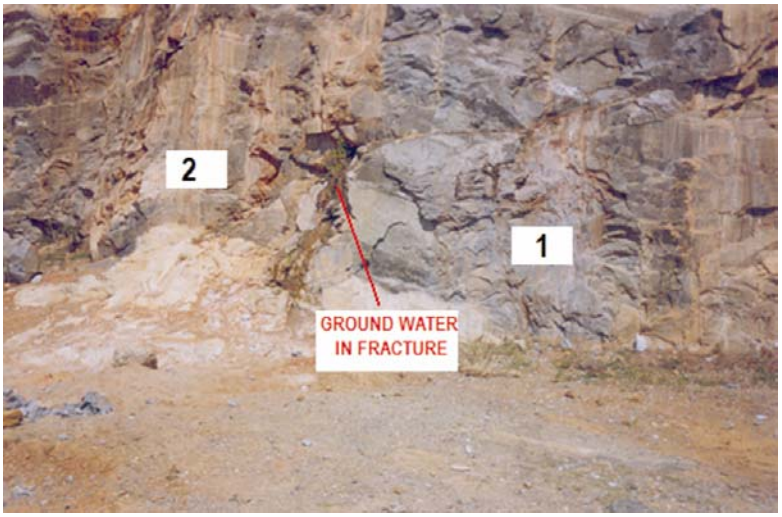

Figure 1. Occurrence of groundwater in deeper fracture in hard rock.

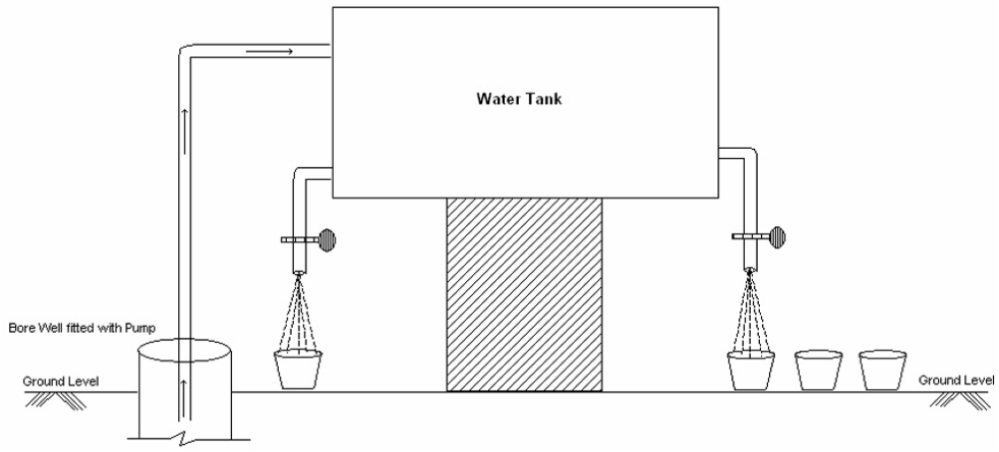

Figure 2. Pumped water in drinking water supply schemes in rural area (medium discharge borewell having yield between 1 to 2.5 lps).

areas and particularly in summer, pumps can be lowered in these wells and *in situ* overhead tanks can be made (Figure 2). These wells have to be utilized after testing the sustainability of the aquifer. The cost of the project will vary between Rs 2 and 3 lakhs depending upon the depth of borewell and capacity of the water tank.

The Bundelkhand area is underlain by hard granitic rocks. The average annual rainfall is of the order of 800–900 mm and major part of which flows as run-off due to undulating terrain. But during the last several years, the rainfall is below normal and there is severe drinking water crisis. Rainwater harvesting is the best alternative to solve the water crisis.

The following are the steps to determine the best well site in a remote rural village:

- The historical data of the area and adjacent areas have to be collected.
- Traditional knowledge of the local people has to be utilized to locate suitable sites.
- Detailed study of Toposheet/Remote sensing/geology of the area has to be carried out.
- Depending on the problem Vertical Electrical Sounding has to be conducted.
- Based on the suitability, borewell or shallow borewell or sanitary dug well can be chosen.

Pumped water supply from borewell is the best source of drinking water. Where the discharge from borewell is poor, one has to look for alternative sources such as treated surface water, large diameter dug wells in valley fills, shallow borewells, springs in hilly areas and water collected from river bed. Traditional water harvesting system in the area has to be taken into consideration. Major handicaps in the promotion and installation of the water treatment technology in India are the absence of community participation in operation and maintenance of the plant after installation. The rural users should be made aware of the rural drinking water project such as depth, discharge, drawdown which determine the optimum depth of lowering of pump in a borewell. In summer due to rapid decline in water level during pumping, the water level goes below the pump and damage is caused to the pump and, as a result, the water supply schemes get defunct. Rural communities should be trained in operation and maintenance of these schemes.

1. Naik, P., *Curr. Sci.*, 2008, **94**, 964.

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