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Statistical tools for managing the Ambikapur aquifer in central India for sustainable hydrological development of the region

S.K. SHARMA
(sks105@rediffmail.com) Haed, Environmental Education, Carman School, Dehradun, India

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Despite India's tremendous progress on all fronts after independence in 1947, the fact remains that it is one of the poorest nation in the world in terms of per capita income and energy consumption which is considered to be the gauge of the economic situation of any country. In case of India, it is nearly one tenth of the developed nations. If economic condition of its people is to be raised, then country has to boost its agriculture production which is largely monsoon dependent and to exploit its conventional and unconventional energy sources at a very rapid growth rate. Although, worldwide, 70% of the water that is withdrawn for human use is used for agriculture, 22% for industry and 8% is used for domestic services. But in India which is a low income country, 82% is used for agriculture, 10% for industry and 8% for domestic services. Therefore, India needs new sources of water to reduce the risk of dependency on the monsoon for the Sustainable Development of the country.

It is in this connection that the Ambikapur Basin in the Central India has been studied for sustainable water withdrawal. At present, the crops in the Ambikapur region are totally monsoon dependent. However, with the initiatives of the State Government, 25 boreholes in an area of about 25 square kilometers have been drilled up to a depth of 500m and completed in the Gondwana sandstone. The water quality and the discharge rates have been established to sustain the crops of the area which is the only livelihood of the local people , in case the monsoon fails. The hydraulic properties of the aquifer like Transmissivity (T) and the Coefficient of Storage (S) were determined following the graphic method of Jacob and Theis. The rate of discharge (Q) of the pumped well was estimated at 4.05 x 10 to the power 3 cubic meters per second and the values of other parameters like T at the well being 2.5 x 10 to the power 3 square meters per second and, T and S at the piezometric head being 1.56 x 10 to the power 2 square meters per second and 5.8 % respectively. The Interference Tests show that the reservoir is communicable. The measurements of bottom hole pressure indicate that it was always greater than the hydrostatic pressure, therefore, the wells will have a self flow. The residency period of the water in the reservoir comes out to be nearly 30 to 40 years.

The reservoir characteristics indicate that the Ambikapur aquifer offers vast water resource worth exploiting the judicious management of which can reduce the dependency of crops on the monsoon and can help a fast sustainable development of the region.

Key words : Gondwana sandstone, Aquifer, Transmissivity, Piezometric head, Interference test,