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GIS mapping of groundwater quality of Bahadurgarh block of Jhajjar district (Haryana)

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ABSTRACT

This paper examines the quality of groundwater in a 51408 ha region comprising Bahadurgarh block of Jhajjar district of Haryana state, lies on the western border of New Delhi. 171 groundwater samples from running tubewells in the block have been analyzed for ionic concentrations of CO_3^{2-}, HCO_3^-, Cl^-, SO_4^{2-}, Ca^{2+}, Mg^{2+}, Na^+ and K^+. Parameters such as electrical conductance (EC), sodium absorption ratio (SAR) and residual sodium carbonate (RSC) have been evaluated. According to AICRP classification, it was found that 25.9 % water samples were of good quality, 56.9 % saline and 17.2 % alkaline in nature. Out of the saline water, 19.8, 2.5 and 34.6 % were marginally saline, saline and high SAR saline, respectively. But on the basis of GIS mapping, maximum area (27350 ha) of the block was found in good category followed by marginally saline category (16884 ha) and minimum area (35 ha) was found under saline category. In alkali group, 4.9 and 12.3 % were alkali and high alkaline, respectively. The study revealed that 65.5 % of the samples showed EC upto 4 dS m^{-1} and the maximum value of EC (12.24 dS m^{-1}) was found in village Kanaunda. Residual sodium carbonate (RSC) and sodium adsorption ration (SAR) varied from nil to 7.60 me L^{-1} and 2.50 to 21.87 (m mol $L^{-1})^{½}$, respectively. Contour maps of EC, SAR, RSC and water quality of groundwater used for irrigation in the block were plotted to study spatial variability of these parameter in the block.

Key words: Bahadurgarh, Electrical Conductivity, Geographical Information System, groundwater, Residual Sodium Carbonates, Sodium Adsorption Ratio, salinity, alkalinity / sodicity

INTRODUCTION

India has 2.2 per cent of the global land, 4 per cent of the world water resources and 16 per cent per cent of the world's population (Ramesh and Elango, 2011). Among water resources, groundwater is the major source for domestic, agricultural and industrial purposes in semiarid and arid regions of India. This lead to the overexploitation of the groundwater and are evident from the fact that "overexploited" and "dark blocks" in the country have increased from 250 in 1985 to 1098 in 2005 (India, 2006). The present trend of declining groundwater depth (0.66 % per year) could reduce India's total food grain production by around 25 % or more by 2050 (Gupta and Deshpande, 2004). Apart from water table decline, groundwater quality is also a major concern in many parts of the country. Groundwater quality is influenced by natural and anthropogenic effects including local climate, geology, irrigation practices and industrial pollution. Groundwater contamination reduces its safe supply for irrigation and drinking, posing a threat to agriculture and public health and a challenge to water managers and strategists.

In the area of Bahadurgarh block of Jhajjar district, Haryana state surrounding the western part of Delhi, intensive agriculture become the back bone of livelihood of the peoples residing in these areas and for this, they are extracting huge amount of groundwater resulting depletion of water table and deterioration of groundwater quality. The poor quality of underground water is mainly due to drawing of salty water from lower aquifers. The

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