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# STUDY OF QUALITY OF GROUNDWATER OF SAHARSA DISTRICT

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**ABSTRACT**

A number of old channel beds of the river are traceable in Saharsa district. The River plan- form with typical dune type braid bars and longitudinal bars are well preserved within this abandoned channel beds. In general, these bar deposits from either exposed sand bodies or with minor capping of flood plain mud. In many cases the abandoned channels form lakes or chaurs, which gets filled with water during monsoon creating water-logging condition. Though the major river Kosi has made the regional architecture of the district, numerous interconnected minor rivers participate in carving out features of the plains by reworking and redistribution the sediments deposited by the river Kosi. These small streams (basically groundwater fed) with clayey beds mostly follow the old channels and traverse the district Saharsa in a north-south fashion.

## INTRODUCTION

Saharsa district has abundant surface and groundwater resources. The groundwater level remains usually shallow. Hand boring with one length of pipe is suffice to give adequate discharge to a 5 HP diesel pump set. Like most of other villages in North Bihar Plains, the people in the villages of Saharsa district depend upon groundwater for their domestic supply, including drinking water. Unlike many other parts of the Bihar state, dug wells are frequently met in every village, but presently most of them are not in use. Since water in the district lies very close to ground surface, this was a convenient way getting potable water by digging and setting a ring well of hardly 7 m deep. In last decade and half, people have got an easier way to access the groundwater by auguring a hole up to 5 – 7 m (usually one length pipe) and putting a locally designed hand pump assembly into that. In many cases bamboo is also used as the hand pump assembly pipe. The typical geomorphic set-up evolved by the action of Kosi River has controlled the local land use pattern and groundwater potential in its different parts. The whole of Saharsa district in the Kosi mega fan is covered with Quaternary deposits (fig 6). The alluvial deposits in kosi fan area form one of the most prolific aquifer systems in the North Ganga Plains. Shallow tube wells in the area have the potential of yielding 50 m3/hr for nominal drawdown of 2 m only. The area is underlain by thick unconsolidated sediments of Quaternary age consisting of sands of various grades, gravels, cobbles, pebbles etc up to the explored depth of 80 m. The capping is thin (< 1 m to 5 m) and even absent at many places. The lithological logs indicate that the ground water occurs under unconfined condition. In Saharsa district shallow tube wells are suitable up to a depth of 50 m with discharge of 20 m 40 m3/hr. The deep tube well of more than 100 m depth can also be constructed with estimated discharge of 100-200 m3/hr. Whereas Bamboo Boring of 20 of 25 m depth tapping water table aquifer can yield 10 to 20 m3/hr with a safe draw down. Water level in Saharsa district remains largely shallow (<5 mbgl) during the post-monsoon period, whereas, during the pre-monsoon period, the water level in the western parts of the district, adjoining to the Kosi River goes deeper (up to – 10 m bgl). It may be due to groundwater drainage to the river during the season. Fig 8 A & B depicts the depth to water level scenario in Saharsa district. During the post-monsoon period, major of the district are covered by the water level range of 2-5 m bgl. Pockets, at the northern parts and south-central parts depict water level within 2 m bgl, exhibiting the water-logging condition.

## MATERIALS AND METHODS

The chemical quality of groundwater is available from the water samples collected from different key and hydrograph network stations during pre-and post-monsoon periods from time to time the district. The chemical data obtained is produced below.

**Table-1 Groundwater quality in Saharsa district**

| Chemical constituents (mg/l) | Shallow Aquifer | Drinking Water Standard (As per BIS norms) | |
|---|---|---|---|
| | | Highest Desirable | Maximum Permissible |
| pH | 7.2-8.2 (max.) | 6.5 – 8.5 | No relaxation |
| E.C (Micro-siemens/cm at | 260-970 | 500 | 2000 |
| Total Hardness ($CaCO_3$) | 60-525 | 300 | 600 |
| Bicarbonate | 85-458 | 200 | 600 |
| Calcium | 18-122 | 75 | 200 |
| Magnesium | 5-54 | 30 | 100 |
| Chloride | 11-99 | 250 | 1000 |
| Sulphate | - | 200 | Up to 400 if Mg is <30 |
| Nitrate | - | 45 | 100 |
| Fluoride | - | 0.6 – 1.2 | 1.5 |
| Iron | 0.105 – 16.94 | 0.30 | 1.0 |

The block-wise ground water resource is given in Table-2. The net annual replenishable ground water resource as on 31st March 2009 works out to be 54575 ham. The annual draft for all uses stands at 20052 ham. The average stage of ground water development for the district is 36.7% the maximum being in the block Nauhatta (51.1%) and lowest in Simri Bakhtiyarpur )25.4%). The stage of ground water development in all blocks is less than 70% and there is no long-term decline in water levels recorded in the blocks. Thus, all the blocks are under safe category. The stage of ground water development is depicted is given below.

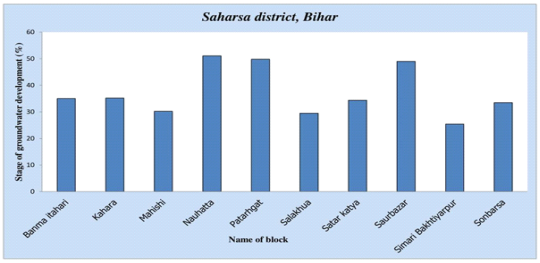


**Table-2 Net groundwater availability (ham) in Saharsa district, Bihar (As on 31st March 2018).**

| Sl. No | Assessment Unit/District | Net Annual Ground water Availability | Existing Gross Ground Water Draft for Irrigation | Existing Gross Ground water draft for Domestic and Industrial Water Supply | Existing Gross Ground Water Draft for all Uses (10+11) | Allocation for Domestic and Industrial Requirement Supply up to year 2025 | Net Ground Water Availability for future Irrigation development (9-10-12) | Stage of Ground Water Development (12/9) * 100(%) |
|---|---|---|---|---|---|---|---|---|

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| 1 | Banma itahari | 2607 | 784 | 128 | 911 | 216 | 1608 | 35.0 |
| 2 | Kahara | 4826 | 1238 | 460 | 1698 | 988 | 2601 | 35.2 |
| 3 | Mahishi | 5403 | 1300 | 334 | 1633 | 564 | 3539 | 30.2 |
| 4 | Nauhatta | 4437 | 2017 | 250 | 2266 | 422 | 1998 | 51.1 |
| 5 | Patarhgat | 4257 | 1942 | 176 | 2118 | 298 | 2017 | 49.8 |
| 6 | Salakhua | 6471 | 1721 | 187 | 1098 | 315 | 4434 | 29.5 |
| 7 | Satar Katya | 5382 | 1621 | 232 | 1854 | 392 | 3368 | 34.4 |
| 8 | Sour bazaar | 7146 | 2313 | 292 | 3505 | 493 | 3441 | 49.0 |
| 9 | Simri | 6796 | 1333 | 396 | 1729 | 668 | 4794 | 25.4 |
| 10 | Sonbarsa | 7251 | 2110 | 320 | 2430 | 540 | 4601 | 33.5 |
| | Total | 54575 | 17278 | 2774 | 20052 | 4895 | 32402 | 36.7 |

## RESULTS AND DISCUSSION

Since all blocks of the district come under safe category from groundwater development point of view, no area is notified either by Central Ground Water Authority of State Ground Water Authority till data. There exists ample scope for development of groundwater for irrigation purposes without disturbing the groundwater regime in the district. About 20 to 30 shallow tube (STWs) can run effectively (within 50 m depth) per $km^2$, considering the safe operational distance between any 2 tube wells to be 200 m. In the western parts of the district, adjoining to the Kosi River, sustainable and economically more viable STWs of less depth can be constructed. To combat the water-logging problem, the status of irrigation from groundwater needs to be increased. Energization of all the wells should be made on priority basis for increasing the cropping intercity. For this, financial support to small and marginal farmers should be provided. Chemical quality of groundwater has been observed to be in general suitable for drinking and irrigation purpose. In areas where high iron concentration is present, domestic water supply should be made after proper treatment of groundwater. Alternate deeper aquifers, free from iron may also found for the purpose.

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