

## **An Assessment of Ground Water in Muzaffarpur District, Bihar**

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### **Abstract**

After air, water is the most essential commodity for the survival of life on the earth. No life can be assessment of without water. Access to safe drinking water is an important issue for health. The increasing population and urbanization has raised the demand for quality water. The artificial recharge to ground water is an indispensable measure which is substantially beneficial, as this will help to store the surplus rain water in the form of ground water and in turn arrest the depletion of ground water and degradation of the quality and it is also eco-friendly.

Ground water is a major source of drinking for the people of Muzaffarpur district. It is less susceptible to contamination in comparison to surface water bodies. More than 90 percent of people of this district drink shallow ground water due to water availability at lesser depth.

**Key words :** Alluvium, composition, Depletion, Salinity, Susceptible,

### **Introduction**

Water is essential for life on the earth. It is primary source as well as necessity for plants and animals, without its life is not possible. Ground water resource is an important source of water which is being used for drinking, irrigation and industrial purposes. Access to safe drinking water is an important issue for health. The

increasing population and urbanization has raised the demand for quality water. The artificial recharge to ground water is an indispensable measure which is substantially beneficial, as this will help to store the surplus rain water in the form of ground water.

Ground water is the water present beneath earth's surface in soil pore spaces in the fractures of rock formations. The depth at which soil pore spaces or fractures and voids in rock becomes completely saturated with water is called the water table. Central Ground Water Board has covered the district under systematic hydro geological survey. District hydro geological report has been issued. Three exploratory tube wells in the district e.g. Sahebganj, Bochahan and Aurai and three observation wells have drilled in the district. There are 22 Hydrograph Network Stations (HNS) to monitor the water level of phreatic aquifer. These HNS are monitored 4 times in a year as a part of ground water regime monitoring.

Chemical quality of water is important in deciding its suitability for irrigation, industrial and drinking purposes. Chemical quality of ground water of phreatic aquifer is found suitable for drinking and irrigation purposes. The ground water is mildly alkaline in nature with pH ranging from 7.36 to 8.43.

The total cropped area in the district is 285 ('000 hac). The net sown area is 219 ('000 hac), fallow land is 1.07 ('000 hac) and 66 ('000 hac) of the land is sown more than once. The cropping pattern includes paddy, wheat, maize, pulses, oil seeds etc. The

cropping intensity is 130.0 %. The gross irrigated area is 81.02 ('000 hac) out of which irrigated from canal is 2.5 ('000 hac) are from state and private tube wells are 87845 is irrigated 78.9 ('000 hac) and from other sources (e. g. open wells, borewells etc.). (Agriculture contingency plan for district: Muzaffarpur 2019). The irrigation from (Gandak Project) surface canal is operational since 1970, which is a part of Tirhut and Vaishali canal system.

### **Objective**

- (i) To know the Ground water potential of the district which can be exploited to increase the cropping intensity of the district.
- (ii) To access the ground water availability in the district.

### **Study area**

Muzaffarpur district is a part of Tirhut division, It is extended between 25 Degree 54 Min. to 26 Degree 23 Min. latitude. The district is longitudinal extend between 84 Degree 53 Min. to 85 Degree 48 Min. East longitude and total geographical area is 3172 K.M. Sq. The District is entitled by three rivers namely Gandak, Budhi Gandak and Bagmati. The Gandak constitute the southern boundary, the Bagmati forms the Northern boundary and the Budhi Gandak passes through the head quarter of the district.

Muzaffarpur district constitutes two Sub-divisions, 16 community development blocks, 1811 panchayats. It occupies an area of 3172 sq. km. The total

population of the district is 4778610 (2011). The district mainly constitute of rural population. The total population of the district is 4778610, rural population is 4308714 and urban population is 469896.

### **Drainage System**

This district is situated between Gandak and Budhi Gandak rivers and its govern the drainage system in the district. The river Budhi Gandak meets the district at Barji Rampur and flow from west to east along the northern boundary of the district. The Budhi Gandak flows from northwest to southwest forming the northeastern boundary of the district.

### **Hydrology :-**

The entire district is underlain by thick unconsolidated sediment of Quaternary period. The thickness of alluvium range between 500 to 700 meter in the district. The older alluvium of Pleistocene age occupy the higher ground and it consists of calcareous nodules. The younger alluvium of Holocene age occupies lower ground and consists of thick sequence of clay, silt and sand.

The water bearing granular shallow zones is restricted up to a depth of 50 m and deeper zones between 55.5m to 121.85m (depth of exploration). Ground water occurs under unconfined conditions in the shallow zones and under semi-confined to confined condition in the deeper zones. The irregular slope of the bed over which the sediment rest, controls the saturated thickness of the aquifer.

## **Chemical Quality of Ground Water**

Chemical quality of water is important in deciding its suitability for irrigation, industrial and drinking purposes. Chemical quality of ground water of phreatic aquifer is found suitable for drinking and irrigation purposes. The ground water is mildly alkaline in nature with pH value ranging from 7.60 to 8.65. The ground water is suitable for irrigation and drinking purposes. However, Arsenic has been reported from some villages of the Minapur, Motipur, Muzaffapur Sadar and Bochahan block, Sampling from hand pumps of arsenic risk zone areas has been done for arsenic concentration analysis. The arsenic contaminated water above permissible limit of 50 ppb is hazardous for human health.

## **Status of Ground Water Development**

The development of ground water is mainly through shallow tube well sunk to depth of 2.09 to 7.63 mbgl (2011) below ground as per the Govt. of Bihar (2011) minor irrigation census data, there were 34874 shallow tube wells, 108 state owned deep tube well 54000 and 16 dug well were available for the irrigation. Ground water through shallow and deep tube wells irrigates 1326.54 hectares while canals irrigate only 204.86 hectares.

## **Water conservation and Artificial Recharge**

All the blocks of the district fall under the safe category. Artificial recharge and rain water harvesting technique may be accepted in the Kanti, Marwan

and Sakra blocks where the stage of ground water development is high. As the entire district covered by alluvial formation, contour bonding and recharge ponds are most suitable structure in the rural area of the blocks. It is advisable to adopt water conservation and artificial recharge measures. The water conservation and artificial recharge to ground water by rainwater harvesting may be adopted in the Kanti, Marwan, Saraiya block where even post-monsoon water level falls below 0.67 to 5.21. As the entire district is covered by alluvium formation, contour ground level and recharge ponds are most suitable structure in the rural areas of the blocks. Artificial recharge measures can also be adopted in the dense affected blocks especially in low affected habitations. It may help in dilution of arsenic concentration in ground water.

### **Ground Water Related Issue and Problems**

There is no ground water related issues and problems in the district.

Contamination of ground water of shallow Kanti, Marwan, Saraiya and in a few villages of Kanti, Marwan, Saraiya and Paroo indicate major ground water issues. Public Health Engineering Department, Government, of Bihar has painted the affected hand pump with red colour and safe hand pump with blue colour in the affected blocks of the district. The arsenic contaminated water is generally restricted within the shallow aquifer (50m).

### **Conclusion and Suggestions**

The surface water logging and soil salinity problems in parts of Kanti and Paroo blocks of the district is another major issues. This issue occurs due to violation of cropping pattern and irrigation benefits in the upper reaches of canal.

The stage of ground water development is 53%. The stage of ground water development is highest in Mushahri blocks (90%) and lowest in the Kanti blocks (40%). As stage of ground water development in all the blocks is less than 70%, and there is no long-term decline in water levels, all the blocks are under safe category.

There is need to adopt an integrated approach of development of ground water resources developed with ground water augmentation to provide sustainability to ground water development.

Ground water development in the district can be done with the help of shallow tube well, bamboo borings and deep tube well. The overall stage of ground water development is 56.8%. Therefore, there is scope for the development of ground water potential of district can be exploited to increase the cropping intensity of the district.

Drinking water supply should be provided to the villagers of the Kanti blocks from deep tube wells. Shallow aquifer up to 50 m depth must be cement sealed, while constructing deep tube-wells in the affected blocks. Changing cropping pattern in the upper reaches of the area of Vaishali and Tirhut canals may

reduce the water logging table. Use of ground water should be from shallow and deep tube wells in the water logged area. Changing of cropping pattern in the regularly and partial flooded blocks should be undertake. Water conservation and Artificial Recharge (AR) measures should be adopted in the highly exploited blocks. Diesel operated pump sets enhances the lifting cost of tube-well water. In order to reduce financial burden, alternative low cost energy should be provided for the energisation of pumps. Non conventional energy resources can be used for the energisation of pumps-sets, where it seems feasible.