

## **QUALITY OF GROUND WATER IN PUNJAB**

The quality of ground water varies from place to place, stratum to stratum and season to season. The quality of irrigation water is assessed based on its chemical characteristics. The suitability of ground water for irrigation depends upon its own quality along with other factors such as:-

- a) Soil to be irrigated
- b) Crops to be irrigated
- c) Climate and
- d) Management of irrigation and drainage.

There is no such classification of irrigation water which may be utilised under all circumstances. The same quality of water can be considered suitable for a certain type of soil or crop but may be unsuitable for others.

The Water Resources & Environment Directorate had been monitoring groundwater quality in the State through the network comprising of dugwells, hand pumps and tubewells numbering more than one hundred since 1973. The water quality monitoring was, however, discontinued as most of these monitoring wells were rendered defunct and needed to be replaced so as to establish the groundwater quality monitoring network.

The Water Resources & Environment Directorate is presently in the process of installing network of observation wells in the entire State of Punjab for monitoring ground water level and quality under the World Bank aided H.P-II. Nearly two-third of the total number of observation wells have been installed till now. Regular monitoring of ground water quality is likely to be undertaken from the pre-monsoon season of the year 2012-2013.

In the earlier groundwater quality monitoring carried out by the Directorate in the State, the ground water samples were collected from Shallow tube wells/ hand pumps and analysed for  $\text{HCO}_3^-$ ,  $\text{CO}_3^{2-}$ ,  $\text{Cl}^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ . The Electrical Conductance (E.C.), pH, Total Dissolved Salts (TDS) Residual Sodium Carbonate (RSC) etc. of water samples were also determined.

In certain representative water samples, trace elements like  $\text{NO}_3^-$ ,  $\text{B}^-$ ,  $\text{Fe}^{++}$  were determined to assess the toxic nature of ground water.

The ground water quality has been classified according to the following criteria as adopted by Punjab Agricultural University, Ludhiana.

<b><u>Quality Parameters</u></b>	<b><u>Fit</u></b>	<b><u>Marginal</u></b>	<b><u>Unfit</u></b>
<b>E.C. mmhos/Cm at 25<sup>0</sup>C</b>	< 2000	2000-4000	> 4000
<b>R.S.C.meq/1</b>	< 2.5	2.5 – 5.0	> 5.0

### **Fit Water**

Fit water zone having E.C. less than 2000 mmhos/cm at 25<sup>0</sup>C is found covering districts of Hoshiarpur, Gurdaspur, Ropar, Jalandhar, Ludhiana, Kapurthala and part of Sangrur, Patiala, Amritsar and Ferozepur. The districts cover UBDC, Bist Doab, Kandi area and part of the area lying south of river Sutlej.

The ground water of the area has predominance of calcium and magnesium cations and bicarbonate anions. The ground water is fit for irrigation purpose. Fresh ground water is also found in belts adjoining the major rivers and canals of Punjab region where infiltration from rivers and canals provide fresh water recharge. The river Sutlej, Eastern and Bikaner canals have improved the quality of ground water because of seepage in blocks Ferozepur, Guruharsahai, Jalalabad and Fazilka (Ferozepur). The area around the river Ghaggar has improved the quality of ground water in block Jhunir (Mansa) because of the seepage from the river.

The analytical results of water samples of the area falling between Barnala to Bhatinda indicate a belt of fit water.

### **Marginal Water**

The marginal water zone having E.C. ranging from 2000 and 4000 mmhos/cm at 25°C passes through the blocks Lehragaga (Sangrur) Budhlada (Mansa) Rampura, Nathana (Bhatinda), Kotakpura, Faridkot (Faridkot) Muktsar, Malout (Muktsar) and Abohar (Ferozepur),

The ground water in the blocks Muktsar (Muktsar), Abohar and Khuyan Sarwar (Ferozepur) is fit to marginal and overlies the unsuitable/saline water.

The quality of ground water in and around Mansa is saline at higher depth.

### **Unfit Water**

The quality of ground water in block Jhunir (Mansa), Talwandi Sabo, Sangat (Bhatinda), Abohar and Khuyan Sarwar (Ferozepur) which are situated on the interstate border with Haryana and Rajasthan is very poor. This area is at the tail end of the state canal system and is of semi arid climate. Quality of groundwater is generally fit upto the depth of 30-50 metres beyond which quality deteriorates with increasing depth.

The water in the upper aquifers in block Lambi, Malout (Muktsar) and Khuyan Sarwar (Ferozepur) is unfit for irrigation. E.C. ranges from 5300 to 10200 mmhos/cm at 25°C at depth upto 40 metres.

### **Alkali Hazard:**

In blocks Bhunerheri, Samana (Patiala), Lehragaga, Sunam Sehna, Barnala (Barnala) part of block Nihal Singhwala, Moga I-II, Baghapurana (Moga), the concentrations of  $\text{HCO}_3^-$ ,  $\text{CO}_3^{2-}$  and anions are comparatively more and the ground water in the area is of low salinity and Medium to high RSC i.e. E.C. 2000 mmhos/cm at 25°C and RSC is between 2.5-5.0 meq/litre or higher.

In certain areas of block Lehragaga (Sangrur) and Budhlada (Mansa), the ground water on irrigation does not infiltrate and stands on the surface in the fields leading to the formation of Kallar. The analytical results of water samples of the area indicate high concentration of sodium.

The ground water of the blocks Patti, Valtoha, Bhikhiwind (Tarn Taran) also contains high concentration of sodium ions. The ground water in the area has E.C. 2000 mmhos/cm at 25°C and RSC from Marginal to unfit.

### **Depth-wise Groundwater Quality in S-W Districts**

One time study on depth-wise groundwater quality was undertaken in South-Western part of the State comprising of districts Moga, Faridkot, Ferozepur, Muktsar, Bhatinda, Mansa and part of Sangrur upto the depth of 35 metres. It was found that the quality of ground water is brackish / saline in these districts which generally deteriorates with depth. Depth-wise studies of ground water quality conducted in this area reveal that ground water quality is saline / alkaline in nearly 50% of the area at depth of 35 meters as against 17% at the depth of 10 meters. The ground water quality is fresh in over 62% of area at 10 meters depth while it is nearly 30% at 35 meters depth. Ground water quality problem is more severe in the districts of Moga, Mansa, Bathinda & Muktsar. High concentration of Fluorides is reported in the districts of Bathinda, Mansa & Muktsar. The distribution of ground water quality in the region at various depths is given below:

<b>Distribution of Ground Water Quality in South-western Districts</b>						
<b>Sr. No.</b>	<b>Quality of Ground water</b>	<b>% of Area at depth (m)</b>				
		<b>10</b>	<b>15</b>	<b>20</b>	<b>25</b>	<b>35</b>
1.	Fresh	62.18	53.36	55.14	38.48	28.75
2.	Marginal	20.54	24.24	17.0	27.0	21.10
3.	Saline	17.28	22.40	27.86	34.52	50.15

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