GROUNDWATER QUALITY ASSESSMENT FOR IRRIGATION PURPOSES
BASED ON IRRIGATION WATER QUALITY INDEX IN KODAGU DISTRICT,
KARNATAKA STATE, INDIA.

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Abstract

Good quality water plays an important role in determining the quality of life of all living beings. For the growth of plants irrigation is essential in areas where natural availability of water is insufficient. It is always required to ensure the quality and suitability of the irrigation water for the healthy growth and profitable outcome. Many parameters have to be checked and based on that the acceptability is determined. But it is often considered as a confusing task when few are within the range and few are out of the range. So a single numerical indicator called Water Quality Index (WQI) calculated from a set of parameters is used. It is widely used and compactable method for the identification and comparison of water quality. The purpose of this study is to check the acceptability of water in Kodagu district, Karnataka for irrigation purpose. Considering the major five parameters, the water quality for irrigation purpose is found to be excellent.

Key Words: Irrigation, Kodagu, Water Quality Index, WQI

Introduction

Water can be considered as the elixir of life. It is required for the survival of not only animalhood but also for plants. Even though it is our right to get access to pure and good quality water, we have to compromise it in many situations. Increased demand and pure management of existing water resources can be considered as the major cause for this issue. Since we cannot increase the quantity of fresh water, we should pay much attention when we are managing it.

Plants require water in different quantity during their different stages of growth. Normally their need of water is met by the plants itself, if sufficient rain is available. But since rain is a spatial and temporal variable, we may not be able to fulfill it always. So we have to depend on artificial supply of water which is called irrigation. For irrigation water also, we have to ensure certain quality. The presence of certain minerals will retard the growth of plants or may reduce the outcome. So it is very much essential to satisfy the irrigation water quality standards.

For each water the variation of minerals and parameters will be different which makes it extremely difficult to judge the acceptance of water for particular use. So it is always suggested to use a single index number which incorporates all the parameters. Water Quality
Index is defined as a rating, reflecting the composite influence of different water quality parameters on the overall quality of water.

In the present study, an attempt is made to check the acceptability of water for the irrigation purpose in Kodagu district. Water quality index is the major tool used for the study.

**Description of study area**

Kodagu, also known as Coorg is situated in Western Ghats of South-western Karnataka situated between latitude 11°55′31″N and 12°49′55″N and longitude 75°21′54.8″E and 76°11′15.3″E. The total area of Kodagu district is calculated as 4093.42 km²; across three Taluks called Madikeri, Virajpet and Somvarpet. The river Cauveri is originated from Kodagu. The district is also famous for its coffee plantations. The agro-climatic condition for the district is more favourable to plantation crops. Of the net sown area of the district, 87 percentage is contributed by plantation and horticulture crops.

The district experiences a maximum temperature of 26.60°C and a minimum temperature of 14.20°C. Average annual rainfall is noted as 2693mm. Major rivers flowing though the district are Cauveri, Lakshmana Theertha, Harangi and Chikkihole.

![LOCATION MAP OF STUDY AREA](image)

Fig. 1. Location of study area
Methodology

The water samples are collected from the wells and waterbodies which is used for irrigation purpose. The sampling locations are determined and a total of 46 samples were collected in the month of May 2018. The samples were tested for pH, Electrical Conductivity (EC), Chlorides (Cl), Nitrates (NO$_3$) and Fluorides (F).

Water quality index (WQI) is a single numerical indicator from which we can determined the quality of water calculated from a set of water quality parameters.

Considering the effect on the overall quality of water, health effect and purpose the parameters to be analysed are chosen. For the present study pH, Electrical Conductivity (EC), Chlorides (Cl), Nitrates (NO$_3$) and Fluorides (F) are selected. According to their relative importance in water quality weights ‘$w_i$’ have to be assigned to each parameter. FAO guidelines have been considered while allotting the weights. EC has been given the highest weight and pH, Chlorides and Fluorides have been given the least. Relative weight ‘$W_i$’ is calculated then from the equation

$$W_i = \frac{w_i}{\sum_{i=1}^{n} w_i}$$

After calculating relative weight, quality rating scale ‘$q_i$’ has to be assigned for each parameter using the formula

$$q_i = \left(\frac{C_i}{S_i}\right) \times 100$$

Where $C_i$ is the concentration of each chemical parameter for each water sample and $S_i$ is the desirable limit as per the FAO standards. Sub index ‘$SI_i$’ value is then calculated from

$$SI_i = W_i \cdot q_i$$

Then water quality index is the summation of Sub index.

$$WQI = \sum SI_i$$

The water sample may be then classified into different types based on calculated Water quality index value.

Results and Discussions

From the water quality analysis, the following results were obtained. The pH value ranges from 7.3 to 9.7. The maximum and minimum value for electrical conductivity is 1440 and 490 respectively. Chlorine shows the maximum of 114 and a minimum of 7. 87 is the highest value for nitrates and nitrate less water is also determined in Virajendrapet. Fluorides varies from 0.37 to 0.034. The calculated water quality index extends from 33.76 to 115.35 in Katakeri and Ammatti respectively. All the 46 samples fall under the category of water quality index value 0-150 which is excellent category for irrigation purpose as per FAO classification.
Fig. 2. Variation of Chlorides

Fig. 3. Variation of EC
Fig. 4. Variation of Fluorides

Fig. 5. Variation of Nitrates
Fig. 5. Variation of pH

Fig. 6. Water Quality Index
Conclusions

Water quality index is a variable and unique rating to depict the overall water quality status in a single term. This is very helpful in avoiding the complications of dealing with multiple parameters and also useful for comparing the quality with a single number. This is widely acceptable method because of its compactness to almost all conditions and requirements. The only disadvantage with this method is that individual remedies or actions to the lack or abundance to parameters cannot be determined.

References


