Journal of Advances and Scholarly Researches in Allied Education
Vol. 20, Issue No. 1, January-2023, ISSN 2230-7540

A study of Irrigation water and Physicochemical quality of Son river water Canal

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Abstract - A present study investigated that "A study of irrigation water and physicochemical quality of Son river water canal" The main objectivise of the study has been Comparison in physicochemical quality of Son river water with round water of various villages nearby in Arwal district Canal. The researchers seem to be still at a loss to identify and analyse the factors contributing to the supposedly unsatisfactory performance of major irrigation projects. The emphasis in canal irrigation has been and continues to be the construction of new projects rather than the management- the operation and maintenance-of the existing systems. Results has been found that The pH range of all groundwater, Measurement of conductivity is an important parameter of TDS and values of ground water, Total harness of ground water, turbidity, calcium concentration in ground water, Magnesium contributes in both carbonate and non-carbonate hardness to water, The BIS standards prescribed range of total alkalinity in water, Chloride is a natural anion that almost found in all types of water, concentration of fluoride was recorded in water, residual chlorine concentration, Biochemical Oxygen Demand and Chemical Oxygen Demand of parameter that finds the pollution status in the water bodies and Nitrate is an essential nutrient for plant of the Son river water canal.

Keywords - Agriculture, Irrigation, Physicochemical quality, Physical climatic and Son River canal etc.

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INTRODUCTION

Agriculture is ubiquitous activity in rural areas which has played important role in shaping the life of the man since the dawn of early civilizations. At present time also, agriculture has dominant position in all economic activities. Agricultural growth is very soon likely to be hampered by a scarcity of natural resources, by the confines of the terrestrial ecosystems and by the complexity of cultural systems. These limitations should, therefore, induce us to economize their use, to reduce them waste, and to avoid their destruction. Besides, the complexity of ecosystems natural and cultural, irregular distribution of their various components and ecological imbalances require careful spatial planning at various levels and they all need international co-operation. The vital need for managing valuable land resources is now increasingly appreciated.

Therefore, development planning itself needs to be oriented to both land resource conditions as at present and optimal land utilization practices. The essential condition for all these ends is the survey of the use of agricultural land resources, specially land-use survey which in turn necessitate land classification. Farming practices are as a result of interrelationship between natural phenomenon, man economy and society. Agricultural geography is a branch of economic geography and it is the study of inter-relationship between man and land in particular. India is a rural country which primarily depends on agricultural activities. The study of Agricultural geography in India is important because India is agricultural based country.

Arwal district is one of the thirty- eight district of Bihar State. It is situated east bank of Sone River. The headquarter is in town, and is situated 60 Kms. south of Patna & nearest railway station at Jehanabad. The nearest airport is at Patna. By road, Arwal is linked with Jehanabad, Patna, Aurangabad and Bhojpur. Arwal town is situated on the right side bank of the river Son, which is a tributary to the river Ganges. The climate of Arwal is of extreme nature i.e. very hot in summers and biting cold in the winter. Availability of Minerals:- Sand, stone minerals are available here. The forest of Arwal total land available in the district is 195966.08 acres. Forest coverage is very small. It has one subdivision & five

blocks in the district i.e. Arwal, Kaler, Karpis Kurthna, Sonbhadhra. The Population of the Arwal district 7,00,843 (PR 2011). And sex-wise distribution of the Male 2011 Lakhs 3,63,497 femsil 2011 Lakhs 3,37,346. Agriculture- Land utilization a total no. of Area 2018-19 Sq. Kms. 634.23 Sq. K.m. and Forest cover 2018-19 Acres 195966.08, Area of Cultivation 2018-19 Sq. Kms. 495.20, Area of Uncultivation 2018-19 Sq. Kms. 8.45.

The present study has been attempted iniew of the subject by selecting 'Arwal' district which is situated in the central part of Bihar. In Bihar 80% of land is under cultivation and 80% of people are engaged in agricultural occupation. In Arwal district more than 85% of land is under cuttivation. In this region mostly cereal crops are grown. Arwal district has been selected as a study area keeping in view following facts.

(i) It is a diversified region for the study of various aspects of Agricultural development.

(ii) Being home land, more detailed and accurate data can be obtained.

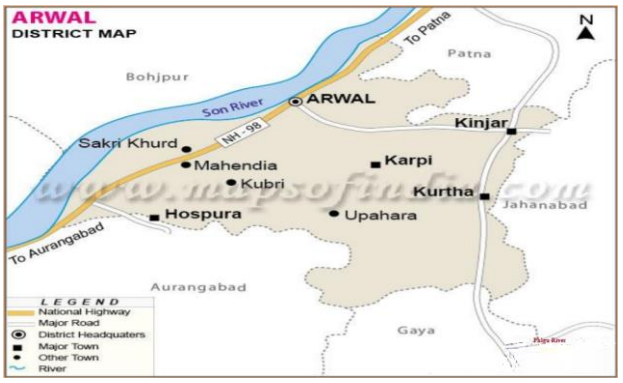
(iii) No study work has been done regarding this aspect.

(iv) Majority of the population is engaged in this occupation.

The Arwal district suffers many problems in agricultural development regarding physical climatic problems and population problems. Climatic problems such as irregular rainfall, draught, drainage, soils and others. In the rainy seasons drought and waterlogging heavily damage the kharif crops. Different types of soils also create problems for agricultural development. The study area suffers many problems related to heavy population growth, low literacy, labour problem, dependency of upper castes on agricultural operations and their unwillingness for agricultural operations. Due to heavy population growth, the field plots are fragmented and these fragmented plots create problems for irrigational facilities, intensive land use and its commercial cultivation.

Various problems related to the infrastructures like lack of roads educational, medical marketing and storage facilities, agro-service workshops, purchasing centres for surplus agricultural productions, irregular and costly electric supply, unduly and untimely loan advancing on high interest etc. create problems for development of agriculture.

Son River- Sone is an important river in the district, rising near the source of the rivers Narbada, Mahanadi and Wain Ganga in Makalu range in the plateau of the central India. The Sone enters the district at the tri-junction of Palamau (Jharkhand), Sonbhadra (U.P.) and Aurangabad and Arwal (Bihar) districts. It moves eastward and then takes a north-easterly direction. It moves eastward 225 km. along the Southern and eastern boundaries of the district until it joins the Ganges near village Bindugar in Barhara. The river is also the source of famous sone sand used extensively in construction of buildings. The river has little water in its bed during the winter and summer months, but it swells up during the rains. The river Durgawati is also an important river of the district. Originating in the Kaimur hills, it flows in the northern direction.



Climatic conditions : The climate of the district is of moderately extreme type. It becomes quite hot during the summer and fairly cool during the winter. January is the coldest month, when the mean minimum temperature comes down to approx. 10° C, winter season starts from the month of November and lasts till February. The temperature begins to rise in March and it reaches the peak in the month of May when the Mercury touches about 45°C.

Rainfall: Rain sets in sometime in June and last still middle of September. Thereafter the humidity begins to fall. The district gets easterly wind from June to September. The average rainfall from 1981-1990 :1055 mm and from 1990-1999 : 395 mm.

Other water features : There are no natural lakes or depressions worthy of mentions which could hold or store rain or drainage water. Almost all large villages in the study area have one or two ponds, with high artificial embankments. Ahers are the most important feature in the study area which function as reservoirs of rainy water and serve for irrigation. The ponds check dams and Ahers are found mostly in unirrigated areas.

Cloudiness : During the winter and summer months skies are generally clear or lightly clouded but towards late summer cloudiness is more in the afternoon. In the monsoon months skies are heavily clouded or overcast.

Wind and Pressure : Light South westerly or westerly winds prevail in the winter and early summer months. Towards the end of summer easterlies set in the continue throughout the monsoon. The atmospheric pressure ranges between 1004.4 mb and 1006.4 mb (November and February) (December and January), but during the hot summer month of May, June and July, the

pressure drops to 792.5 - 989.4 mb. The direction of prevailing wind is south-easterly during the month of May to September and westerly during the rest of the year.

Weather: Locally heavy rain and strong wind are experienced in the study area associated with stroms or depressions originating in Bay of Bengal during the monsoon months.

Sons Water Canal:- The purpose is also to get an idea of the situation prevailing in the head and the tail reaches of the different selected canals, in terms of sharing water between head and tail-reach farmer, through crop pattern difference, soil type, drainage problems, access to water, productivity difference, according to caste, economic assets etc. This provides us a micro or grass root view of the patterns of access to water in different segments of the system and for different sections of farmers and across years, as well as the associated differences in the way land and water are used and the level of productivity per unit of land. It helps to examine whether there is any systematic pattern of variation in terms of location and farm size.

The researchers seem to be still at a loss to identify and analyse the factors contributing to the supposedly unsatisfactory performance of major irrigation projects. The emphasis in canal irrigation has been and continues to be the construction of new projects rather than the management- the operation and maintenance-of the existing systems. Most of the canal systems in India are mainly administered rather than managed (Seckler, 1981/ . It is understood that the functioning of major canal irrigation systems is underprivileged where the aims and objectives are not appreciated. By taking India as a whole estimation, Seckler (1981 : 10) outlines that only about one half of the officially estimated utilized hectare age under canal irrigation as efficiently irrigated, the remainder receiving only irregular and fractional irrigation at best. Even though the massive investments in irrigation have generated higher agricultural yields,8 many large-scale irrigation projects have not been sustainable; that is, after the project was completed, the net flow of costs exceeded the net benefits. The initial plans for many of the major irrigation projects m developing countries have focused almost exclusively on engineering designs for the physical systems. Distribution of water to farmers and subsequent maintenance were frequently not addressed (Chambers, 1980; Bottrall, 198la).

During the past few decades, rigorous studies have been carried out stressing the benefits of irrigation and its role in agricultural development. Of late it has been observed that the economic gains from canal irrigation are not proportionate to the large public investments and subsidy given to the recipient. In addition enormous investment and scanty benefits, canal irrigation in various regions is acutely causing environmental imbalances leading to social catastrophe in the long run. An estimated 80-85% of the total average annual river flows occur in the 3 to 4 monsoon months, which demonstrates the importance of water storage and irrigation in different regions of the country.

There is lack of pre and post operation evaluation of any Sons river projects in Bihar. We get an absolute dichotomy between the pre-construction project and post- construction actuality. The benefits of dam projects such as irrigation, flood control, hydel power and other secondary benefits should be judged vis-à-vis the costs of rehabilitation, deforestation, top soil erosion, water logging, salinity, maintenance cost of the dam and canal network, cost of ensuring dam safety and other social consequences. There is absolute lack of a comprehensive audit at the post construction stage and monitoring costs and benefits not only from the planner's agenda but also from the researcher's schedule. The major influencing factor however is the water distribution. The inequities in water distribution create conflicts between farmers resulting in under utilisation of the potential. It is important to identify such determinants of water distribution to make planning strategies for system improvement.

OBJECTIVE

Comparison in physicochemical quality of Son river water with round water of various villages nearby in Arwal district Canal.

RESULTS

I. pH: The pH range of all groundwater samples were ranged between 6.2 to 7.85 Maximum water samples were found within permissible limit prescribed by BIS and WHO standards except G-9, G-13 and G-15sampling stations. It has been observed that pH values of three sampling stations were found less than 7 that water was acidic in nature.

II. Electrical Conductivity: Measurement of conductivity is an important parameter of TDS which is used to measure of salt that affects that taste of drinking water. The values of conductivity in ground water samples from different locations ranged from 255-1394 µs/cm. The highest value of EC was found at sampling site G-9 and lowest value was recorded at G-14. According to Drinking Water Specifications IS 10500: 2012 and WHO (2012) value for electrical conductivity should be less than 300 µs/cm. This studied has been observed that high values of EC were found in all samples of ground water as compared to standard values and surface water of canal.

III. Total Dissolved Solids: The TDS values of ground water samples were ranged between 125-695 mg/l. A maximum and minimum value of TDS was recorded at sampling site G-9 and G-14. The range of TDS fall between 500 to 2000 mg/L is recommended by BIS standards. The sampling sites

G-1, G-3, G-5, G-7, and G-9 showed higher TDS values and is not considered desirable for drinking water supplies. It has been studied that TDS in ground water is mainly caused by rotting of vegetables, evaporation, contamination disposal and chemical weathering and improper removal of solid waste from the municipality.

IV. Total Hardness: Total harness of ground water samples at various locations were varied between 108-476 mg/L. The desirable limits for total hardness should be 200 mg/L and permissible limit for drinking water should be 600 mg/L as set by BIS standards. Most of groundwater samples were higher than desirable limit of BIS standards. During investigation, it has been found that total hardness was highly varied in ground water samples than surface water of canal.

V. Turbidity: In present study turbidity was recorded from 0.25 NTU to 9 NTU. The values were found within the permissible limit that prescribed by IS: 10500. The permissible limit of turbidity is 5 NTU that was maximum at sampling site G-10 and G-11. Rest all ground water samples are suitable for drinking and domestic purposes as compared to surface water of Sons water Canal.

VI. Calcium: The calcium concentration in ground water samples were ranged from 22-115 mg/L. Maximum value of calcium was registered at sampling station G-1. All ground water samples were under the acceptable limit of BIS standards (75 mg/L) except 2 sampling stations (G-1 and G-3). The present study observed that calcium content in ground water samples was maximum than the surface water of canal.

VII. Magnesium: Magnesium contributes in both carbonate and non-carbonate hardness to water. The concentration of magnesium was found between 9 mg/L to 74 mg/L. It has been observed that the concentration of magnesium was high in most of ground water samples according to the desirable limit of BIS standards (30 mg/L) and found within permissible limit of magnesium 100 mg/L. This study confirmed that ground water samples contained maximum concentration of magnesium rather than surface water of Sons water canal.

VIII. Total Alkalinity: The BIS standards prescribed range of total alkalinity in water is 200-600 mg/L. This study observed the range of total alkalinity from 88 mg/L to 584 mg/L. Maximum ground water samples recorded above of the desirable limit of water except sampling stations G-2, G-4, G-10 and G-14. During investigation of surface water of Sons water canal, it was observed that less values of total alkalinity were found as compared with ground water samples.

IX. Chlorides: Chloride is a natural anion that almost found in all types of water. Chloride is the largest component of earth's crust and major dissolved component of most natural waters. The concentration of chloride was ranged from 10 mg/L to 80 mg/L. All ground water samples were found to be below of the permissible limit of BIS and WHO standards. The chloride content from investigated region was high relative to the canal water samples.

X. Fluoride: In the present study, the concentration of fluoride was recorded in water samples within permissible limit as prescribed by BIS and WHO standards. Maximum fluoride content was found at sampling site G-4 with value 0.70 mg/L. It has been analyzed that fluoride concentration in ground water samples were found to be above than the surface water of Sons water canal.

XI. Residual Chlorine: In ground water samples, the residual chlorine concentration was detected below the permissible limit of BIS standards. Obtained results are similar as surface water of Sons water canal. All ground water samples were found to be below detection limit.

XII. Biochemical Oxygen Demand: BOD is an important parameter that finds the pollution status in the water bodies. In present study period, concentration of BOD was found to be below the permissible limit prescribed by CPCB. All ground water samples were recorded that values were less than one and identical to values of surface water.

XIII. Chemical Oxygen Demand: In present investigation of ground water samples close to the Sons water canal, COD values in water samples were ranged from 6.7 mg/L to 23.2 mg/L. According to WHO standards, the high value of COD was found in most of selected study sites of ground water, above of permissible limit (10ppm). Maximum value of COD was encountered at sampling site G-13. Result data of ground water samples showed the variations among surface water of canal.

XIV. Nitrate: Nitrate is an essential nutrient for plants. During the study period, maximum variation of nitrate content was observed between ground water samples and surface water samples of Sons water canal. The permissible limit of nitrate given by BIS standards is 45 mg/L. The range of nitrate concentration in ground water samples were 3.26 mg/L to 134.81 mg/L recorded. High values of nitrate were found at various locations G-7, G-9, G-13 and G-15 and it was more than BIS permissible limit. It has been observed that maximum content of nitrate with 134.81 value was recorded at G-13 site. Most of ground water samples have found the maximum nitrate concentration as comparison of surface water of canal. This study revealed that ground water is not safe for drinking and irrigation purposes in selected study region.

CONCLUSION

The results of this study can be effectively utilized to identify as well as relax the constraints in canal

projects elsewhere in the Arwal district. A study of this kind would help improve the controllability of water canal system and its allocation-distribution capability in the canal network. Such improvements would help to achieve high water use efficiency, better social equity and higher productivity per unit quantity of water and agriculture.

The climate of the district is of moderately extreme type. It becomes quite hot during the summer and fairly cool during the winter. January is the coldest month, when the mean minimum temperature comes down to approx. 10° C, winter season starts from the month of November and lasts till February. The temperature begins to rise in March and it reaches the peak in the month of May when the Mercury touches about 45°C.

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