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Review on Assessment of Water in Sidhmukh Feeder Canal

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Abstract:
The Southern Haryana relies heavily on the sidhmukh feeder canal for irrigation. This research was conducted to evaluate the physicochemical quality of sidhmukh feeder Canal water for the purposes of determining whether or not it is fit for human consumption and agricultural use. The places sampled span the whole length of the sidhmukh feeder, pH, total dissolved solids (TDS), total hardness (TH), turbidity (EC), electrical conductivity (EC), total alkalinity (TA), sodium (Na), potassium (K), chlorides (Cl), fluorides (Fl), and nitrates (NO3) were among the physicochemical parameters tested. There was a comparison of the measured values to the BIS (2012) and WHO Standards. The findings indicated that some of the water samples had too much turbidity and Iron to be used for human consumption or irrigation. It was discovered that these values were too high. All chosen samples had water quality measures within acceptable values, including EC, TDS, TH, Total alkalinity, chlorides, fluorides, BOD, and COD. Compared to the deteriorating groundwater quality in the Haryana and Rajasthan region, the quality of the surface water in the study area seems to be higher.
Keywords: Physicochemical characteristics, Sirhind canal,Water quality.

Introduction

Water is a natural resource that is crucial to human survival. In many ecosystems, it is crucial to the functioning of such systems.Water has physical and chemical components that are beneficial to to outlast any other form of life on the planet [1]. There is a close relationship between the form and character of the geographical features [2] and the existence, distribution, movement, and composition of water on Earth. Everyone, no matter where they live, needs access to safe drinking water. Water is a key source of infections due to its role as a universal solvent. The World Health Organization (WHO) claims that water is responsible for 80% of all ailments. Water contamination and poor water quality are responsible for 3.1% of all fatalities in the world [3]. The groundwater quality in rapidly developing places is impacted by the excessive the use resources and the improper execution of waste disposal.

Hence, both groundwater and surface water quality management and protection are perennial issues [4].

One of the most pressing issues today is the lack of access to clean water; currently, the majority of the world's population relies on water from surface water sources such rivers, dams, lakes, and canals to meet their daily requirements [5]. Domestic and commercial garbage may be safely disposed of in these water sources [6] [7].

The physicochemical and biological characteristics used to assess the quality of water in India's rivers and canals have previously been the subject of much investigation. The evaluations are spoken about. Even though it is a water-poor state, agricultural progress in Rajasthan is among the nation's quickest. The state's agricultural sector might need some work, but institutions like irrigation offices, high-quality seeds, fertilizer usage, and other infrastructural factors are taking the lead. Given the state's water scarcity, wheat and bajra are promising alternatives to rice, although the latter needs between 3,000 and 5,000 liters of water to produce only one kilogram. Because of the promising future of wheat, the state has prioritized its enhancement in recent years.Moreover, 4.24 percent of India is forested, 8.92 percent is protected by trees, 9.88 percent is irrigated, 11.67 percent is cultivated, and 12.42 percent is planted.

1GOR (2012). (2012). In 2012-2013, Rajasthan's GDP grew at a rate of 5.31 percent. There was a 19.88% allocation of 2004-05's constant price GSDP to agriculture, 31.31% to industry, and 48.81% to administration. Under the twelfth five-year plan (2012-2017), it is planned that 5.57 percent of the budget be spent on agricultural and unified administration. Despite the fact that 61% of the state is desert, the productivity of major crops has increased far more rapidly in the last two decades in desert than in non-desert areas. Haryana employs both ground water and surface water for irrigation; the latter is brought in through canals, while the former is pumped up from deep tube wells. Agricultural production in the state would be severely hampered without the use of irrigation systems. Haryana's primary economic crops include wheat, rice, bajra, mustard, sugarcane, and cotton, although the state also produces a significant quantity of sugarcane. The commercial focus of farming in the state has shifted in recent years to include mustard, vegetables, and fruits, while the area under pulses has drastically shrunk. Haryana's irrigation system experienced significant change during the green revolution, however agricultural progress is not uniformly distributed throughout the state. Irrigation in landscapes may come from a wide range of places and be accomplished in a number of ways. In terms of irrigation development, the southwestern part of the state remains well behind the rest of the state. Water is one of the many abundant natural resources in the United States. Nature is warped by the sea. The fact that water is one of the most essential requirements for maintaining living activities makes the adage "there is no life without water" ubiquitous. It's a powerful system made up of organic and inorganic, soluble and insoluble, living and nonliving components. Humans have used water as a source of life support more than any other resource. It's sometimes referred to as a "vast solvent" due to the variety of compounds it may dissolve and the ease with which it can get polluted. Untreated sewage from cities and factories, as well as toxic runoff from nearby regions, are major contributors to water pollution. It means the standard might shift from day to day and from source to source. Natural characteristics should not be altered, since doing so might throw the system out of whack. The importance of having easy access to surface and underground water sources is growing. Just one percent of the water needed for human consumption, agricultural production, electrical generation, industrial usage, transportation, and waste management is really present on the ground.

There has been a lot of pressure on water supplies, and the future of the ecology, the people, and the economy is uncertain because of this. Loss of seawater, freshwater supplies, surface water, and ground water has led to an unsustainable ecosystem, health problems for the poor, and substantial monetary, human, and material losses that will need significant financial expenditures to compensate for. Water quality monitoring, particularly of rivers throughout the globe in recent decades, is essential for ensuring that the world's growing population has access to clean water. The ability to identify long-term trends in water quality and specific water quality measures is only one of the many benefits of water quality monitoring. Continuous water sampling at many locations is often undertaken, with the goal of measuring a wide range of physicochemical properties. Big data, with its complicated data interpretations, is the end outcome.

Around one-third of the world's population relies on freshwater supplies from surface sources including rivers, Dams, lakes, and canals. Garbage from homes and businesses may be flushed down the toilet or dumped into these water sources without harm. There are many ways in which humans have put the Earth's water supply to use. It's both a source of potable water and a supply of raw water for household use in remote areas and developing countries. Farmers depend on it for irrigation, while fishermen make their livelihood off of the fish that inhabit its many waterways. Both residents and tourists use this watering hole to beat the heat. Hence, keeping surface waters clean is crucial. Most effluent water, both raw and partially treated, is to blame for polluting our fresh water supplies. Home and industrial wastewater discharge has contributed to freshwater pollution and a dearth of clean water supplies. Several developing countries lack an infrastructure to manage their enormous quantities of raw sewage. Several major cities have large-scale wastewater treatment facilities (WWTFs), although the vast majority do not. The progeny are often shown as angels in aquatic environments who seem to be unwell.

Literature Review

Sinha and Kulshrestha (2012) compared wheat and pearl millet crop board data and inferred that gross planted area and stimulated wells had a significant role on pearl millet yield. Wheat yields were significantly affected by factors such as precipitation, fertilizer use, cropping intensity, irrigated area, and revitalized wells**.**.

Sanjay Kumar and Grover DK (2017) examined, with the use of discretionary data, the agricultural development in Punjab during the years 1960-61 and 2002-03. According to the study, rice is a significant part of the cropping pattern in the state, accounting for around 33 percent of Gross Cropped Area in 2003–04 compared to just 5 percent in 1960–1961..

Sunita, et al (2017) The analysis relied on supplementary data culled from public and unpublished sources, including many editions of Statistical Abstracts of the Sidhmukh Canal Catchment Region. The findings revealed a substantial shift in the state's cropping pattern as a result of the passage of time. The area, production, and productivity of food grains all increased throughout the study period (1993-2013), with average annual rates of 0.56, 2.56, and 1.93 percent, respectively, whereas the rates of change for heartbeats were all negative. Throughout the analyzed time period, rice, wheat, and grain acreage grew at a much higher rate than jowar, bajra, maize, cotton, sugarcane, and so on acreage. Rice and wheat have taken precedence in the agricultural rotation. Pearl millet and sugarcane have had their planting areas shrink as a result of farmers switching to paddy, while gram has seen its area fall as a result of farmers switching to wheat.

Mc Cord et al., (2015) For farmers in semiarid environments, the decision to diversify their crops might be particularly difficult. More annual precipitation variability in semi-arid systems is possible, even in places where agriculture is not economically viable.

Mythili G (2016) The study supply response of Indian farmers: before and post changes supported the concept that farmers respond to price somewhat by focused use of diverse data sources given a comparable region, but they don't basically contrast between pre and post change periods for dominating portion of the crops..

Manjeet Kaur and Sekhon MK (2015) conducted a study of Punjab agriculture's data growth, total factor productivity, and its subsectors. The study hypothesized that agricultural output in Punjab has been declining during the 1980s, as measured by absolute factor productivity.

Rajeev Sharma (2017) conducted a thorough study of crop growth and agricultural development in Jammu and Kashmir. The inquiry made use of the Herfindahl list and made the presumption that agricultural development and expansion in Jammu and Kashmir State are continually snatching up resources for high-value crops.

Sidmukh Canal Water: Physicochemical Characteristics And Trace Elements

From the beginning of time, water from the Canal has been drawn for the purpose of irrigating crops, providing for cattle, and domestic usage. Ever since then, the amount of water taken from the Canal has been steadily increasing. It has been revealed that there are a lot of effective ways to get the water from the Canal to the surface of the earth. Canal water accounts for around one half to two thirds of the world's total freshwater resources. Consequently, the water in the Canal accounts for about all of the usable freshwater if glaciers and polar ice caps are not taken into consideration. Yet, if this issue is further limited to only the accessible active bodies of Canal water, then they constitute 95% of the overall freshwater supply (calculated by Lvovitch, 1972). 3.5% of water comes from reservoirs, whereas just 1.5% comes from moisture in the soil. Lakes, rivers, and wetlands all contribute to this total (Freeze and Cherry, 1979). The protection of the Canal's water is absolutely necessary for human existence and the continuation of economically sustainable activities. As a result, it is conventionally believed that the significance of canal water is greatest in regions that are humid rather than in regions that are semi-arid or desert. In addition, the inventories of surface and Canal water utilization provide light on the value of Canal water to the global community. This is nevertheless owing to the ease with which it may be obtained, its high naturally occurring quality, and the relatively low cost of its extraction. Thus, it is essential to have an all-encompassing view of the geographical allocation of the Canal water class in terms of its quality and the changes that occur over time, whether they are produced by artificial activities or by natural occurrences (Wilkinson and Edworthy, 1981). Since the natural processes that wash out toxins take time, a canal water supply that has been polluted may stay contaminated for a period of decades or occasionally even for thousands of years after it has been polluted. In addition, there is a substantial degree of connection between the chemical activities that occur in the Canal water and the physicochemical processes that occur in the aquifer material. So, there is a significant potential for the quality of the water to be altered at the point of contact between the physicochemical processes and the aquifer material. The length of time that water spends in the aquifer underneath the Canal, which varies in size and composition, may make such changes more widespread. There are a multitude of geological formations, each with their own unique characteristics, that contain canal water. In the regardless of their age, place of origin, or composition, virtually all of the rocks that make up the top section of the Earth's crust contain openings that are referred to as pores. The water that lies below the surface of the earth contains a trace amount of gases, dissolved organic materials, and a wide variety of dissolved particles. Since water never stops moving, it is constantly mixing with the sediment and rock that make up the aquifer under the earth's surface. As a consequence of this, a significant quantity of mineral stuff may disperse, travel, and deposit itself as the water moves through the Canal. The surface environment, in addition to the subsurface environment, is one of the key determinants of the magnitude of these changes. The composition of rain water, the compositional qualities of penetrating surface water, as well as the rock and soil properties through which Canal water flows all have an effect on the quality of the Canal's water. In addition, the ionic composition of Canal water was controlled by the amount of time that the water in the Canal was in contact with the geological materials that it encountered along its path, the degree of geochemical processes (such as ion exchange, dissolution, oxidation, evaporation, and reduction), and the degree of microbiological processes. The host rock that makes up the aquifers is often the most important factor that determines the quality of the water in the Canal. Furthermore, the water resources of the Canal have a significant potential, in the event that they become contaminated, to disperse a wide range of illnesses.

Table 1. Post Monsoon Major Cations & Anions Grand Canal Table Results

	Sodium (Na^{+})	Potassium (K^{+})	Calcium (Ca^{+2})	Bicarboate (HCO3)	Sulfate (SO4 -2)	Magnesium (Mg+2)
Sample 1	2.90 mg/L	0.8 mg/L	10.05 mg/L	63.00 mg/L	23.63 mg/L	3.0 mg/L
Sample 2	7.45mg/ L	1.68 mg/L	26.54 mg/L	82.62 mg/L	38.62mg/L	18.42 mg/L
Sample 3	6.95 mg/L	1.22 mg/L	30.25 mg/L	74.31 mg/L	35.04 mg/L	16.79 mg/L
Sample 4	8.42 mg/L	2.62 mg/L	28.78 mg/L	89.12 mg/L	43.04 mg/L	20.05 mg/L
Sample 5	10.82 mg/L	3.15 mg/L	31.22 mg/L	118.02 mg/L	47.89 mg/L	21.55 mg/L
Sample 6	11.10 mg/L	3.25 mg/L	32.55 mg/L	125.78 mg/L	50 mg/L	24.05 mg/L
Sample 7	7.48 mg/L	1.72 mg/L	26.89 mg/L	83.45 mg/L	39.12 mg/L	18.22 mg/L

pH All of the water samples have a pH that falls somewhere between 6.8 and 8.07, while the pH of natural water is alkaline. Maximum water samples were found to be in compliance with the allowable level specified by BIS and WHO guidelines. The pH at the sample site C-1 is greater, whereas the pH at the location C-6 is lower. According to the findings of the research [16], the pH of the water was almost consistent in magnitude across all of the samples, and it ranged from 7.05 to 7.50, making it compatible with living systems. Changes in the ideal pH range have the potential to either enhance or reduce the toxicity of toxins found in water sources.

Electrical Conductivity (EC) : The capacity of a substance to carry an electric current is measured by the electrical conductivity of the substance. At several sample locations across the Canal, conductivity values varied anywhere from 124 to 194 s/cm. According to the findings of the research, all of the water samples fall well within the parameters recommended by both the BIS and the WHO [14] [15]. so that the water in the canal may be used for agriculture and drinking without risk. A comparison was made between the electrical conductivity of the Canal and the values of the Narmada River. The values of the electrical conductivity were found to vary anywhere from 230 to 398 s/cm

[9] during the course of the research. The total dissolved solids and the amount of pollution in the river Narmada both contributed to the rise in electrical conductivity values, which resulted in the river having high EC values.

Total Dissolved Solids (TDS) The total dissolved solids (often mineral salts) in water are referred to by the acronym TDS. The maximum concentration of TDS that may be tolerated is 500 mg/l (BIS, 2012) In this particular investigation, the TDS of the water sample ranged anywhere from 150 mg/L to 196 mg/L. In the sample location C-8, a significantly greater TDS content was found to be present. The conductivity measurement may be impacted by fluctuations in the water's concentration of dissolved solids, but this does not provide any indicator of the corresponding quantities of the various components. There is a correlation between the total solids in the water that are dissolved and the conductivity of the liquid. [9].

Total Hardness The quantity of calcium salts, magnesium salts, or both is the primary factor that determines hardness. It is the property of water that prevents leather from forming when soap is combined with it, and it is also the property of water that raises its boiling point [10]. The BIS recommends a maximum total hardness of no more than 200 mg/L. In the current investigation, the hardness of the samples that were examined ranged anywhere from 102 to 118 mg/L as $CaCO_3$. The sample with the greatest overall hardness was C-8, while the sample with the lowest total hardness was C-10.

Turbidity The turbidity of the water is an essential characteristic that impacts the penetration of light below the surface of the water and, as a result, influences the life that lives in the water [17]. The turbidity levels ranged from 27.39 to 180 NTU and were shown to be in excess of the permitted limits established by BIS (10500-2012). With the exception of the C-9 sample site, the majority of the sampling sites had high turbidity readings. There is a possibility that substantial soil erosion and suspended particles are to blame for the rise in turbidity, both of which have the potential to lower the quality of surface water. It has been determined via research that the Buckingham Canal has [11] maximum turbidity readings that have been recorded. There is a correlation between high turbidity and microorganisms that cause illnesses.

Total Alkalinity Due to the existence of hydroxyl, carbonate, and bicarbonate ions in water, alkalinity may be defined as the capacity of water to keep its pH at a level that is reasonably stable over time. According to the BIS Specifications, the acceptable range for total alkalinity is 200-600 mg/L, while the allowed level is 300 mg/L. The total alkalinity of the water samples varied anywhere between 76 and 86 mg/L. The water in Sirhind Canal may have lower total alkalinity levels, which may encourage the development of algae and other forms of aquatic life. It has been discovered that the alkalinity levels of water serve as an indication of the water's capacity for productiveness [18].

Conclusion

The alkaline characteristics of the water may be seen in the river downstream from the Sidhmukh Feeder Canal. Due to the fact that the pH level of the water sample that was collected from such a river is more than 7. There is just a trace quantity of chlorine present in any of the water sources. The water coming from the various sources of water detected has a lower hardness level. Moreover, the quantity of calcium present is quite low. Since iron was not discovered in the water that was collected from various sources, it may be concluded that iron has not been dissolved into the water. In addition, the level of SO_4 is much less than typical, making up just around 10% of the total.

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