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Impact and Management of Agricultural Pollutants on Water Resources near Haridwar and its Adjoining Areas

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ABSTRACT: Water pollution is a rising global challenge that has expanded in both developed and developing nations, discouraging the growth of the economy as well as the physical and environmental health of billions of individuals. Recognizing the significance of water, the 2030 Agenda for Sustainable Development has incorporated certain water quality mark that is needed to be attained in Sustainable Development Goal (SDGs) . Human settlements, industries, and agriculture are the main causes of water pollution. Water pollution in agriculture is complex and multidimensional, and its effective management requires a comprehensive package of responses. Such responses need to act on key drivers of agricultural expansion and intensification, such as unsustainable dietary shifts and food waste and loss; limit the export of pollutants from farms; protect water bodies from agricultural pollution loads, and help restore already-affected water bodies. Responses for influencing both farm and landscape-scale practices may include regulation; the use of economic instruments; education and awareness-raising; cooperative agreements; and research and innovation. Policies to change farmer behavior and incentivize the adoption of good practices are the key to prevent pollution at the source. Demonstrating the economic benefits to the farmers for adopting good practices has also been shown to be effective in areas near Haridwar and adjoining ones.

KEYWORDS: management, agricultural, water, pollution, Haridwar, adjoining areas, policies, agenda

I. INTRODUCTION

Water pollution from agriculture has direct negative impacts on human health; for example, the well-known blue-baby syndrome in which high levels of nitrates in water can cause methaemoglobinemia – a potentially fatal illness – in infants. Pesticide accumulation in water and the food chain, with demonstrated ill effects on humans, led to the widespread banning of certain broad-spectrum and persistent pesticides (such as DDT and many organophosphates), but some such pesticides are still used in agricultural practices near Haridwar, causing acute and likely chronic health effects. [1,2]Aquatic ecosystems are also affected by agricultural pollution; for example, eutrophication caused by the accumulation of nutrients in lakes and river waters has impacts on biodiversity and fisheries. Water-quality degradation may also have severe direct impacts on productive activities, including agriculture in Haridwar . For example, dam siltation caused by the mobilization of sediment due to erosion has cost much. Irrigation using saline or brackish water has limited agricultural production in Haridwar. However, the environmental and social costs of water pollution caused by agriculture probably exceed billions of dollars annually . Diagnosis, prediction and monitoring are key requirements for the management of aquatic ecosystems and the mitigation of harmful impacts in resources near and in Haridwar. If they are to design cost-effective measures for preventing pollution and mitigating risks, managers, planners and lawmakers need to know the state of aquatic ecosystems, the nature and dynamics of the drivers and pressures that lead to water-quality degradation, and the impacts of such degradation on human health and the environment. [3,4]



II. DISCUSSION

The physico-chemical parameters of the water were determined. The effect of monsoon on the water quality was studied by collecting and analyzing the pre and post monsoon samples.



The possible sources of water pollution have been determined and discussed. It has been observed that the main sources of pollution are municipal, industrial and agricultural activities, land disposal of solid wastes, sewage disposal on land and geochemical reactions. The poor quality of groundwater up to 50 ft is due to the leaching of inorganics and organics in the aquifers. The results obtained from wastewater indicate that it is highly polluted. The effect of monsoon on the water quality has been studied and no marked effect other than dilution effect of the rain has been found on the water quality of the district. In some of the cases, the value of chemical oxygen demand (COD) has increased in the post monsoon season. It may be due to the addition of certain chemical in water resources in post monsoon season. [5,6]

The results obtained were compared with the permissible values (Indian standards) and it was found that the water quality of surface and groundwater is safe except in some cases. It has also been observed that the quality of groundwater is poor in the upper zone while it is better at depths above 100 feet. The SAR values calculated for the surface, ground and wastewater indicate that the waters are of excellent and good classes from the irrigation point of view.



Besides, pace of modernization and increasing industrialization, urbanization, agriculture and other human activities are among serious aspects for causing Ganga canal water pollution and resulted deterioration in its water quality. Rapid industrial growth and urban development have resulted into inclusion of variety of pollutants into Ganga canal. Haridwar district has also grown up as industrial hub of the Uttarakhand state, therefore assessment and monitoring of metals in Ganga canal has become necessary for assessing metals pollution of various metals namely calcium, copper, magnesium, manganese, cadmium, lead, zinc, chromium and iron in its water. Presence of metals in water leads metal contamination, when found in excess than desirable or permissible limits and thus, it has become an issue of concern. These metals are entered into rivers naturally through rocks weathering as well as variety of human accelerated activities such as mining, smelting, electroplating and other industrial process. In addition, rapid growth of industrialization and urbanization are also adding metals into the river water system.[7,8]

The water quality assessment and regular monitoring of Ganga canal water between origin and exit points at Uttarakhand is essential in order to determine level of metals in its water and subsequently, to adopt corrective and preventive actions to avoid from further deterioration of its quality. Out of seven metals, only one metal i.e. manganese exceeded its desirable limit (0.1 mg/L), whereas iron was found more than its respective permissible limit (0.3 mg/L) as per BIS standards. This might be ascribed due to geo-genic activities and discharge of untreated/ partially treated consumer waste into Ganga canal water. ANOVA showed that any of the analyzed water quality parameter does not show significant site variation at any site of Ganga Canal. Contrary to this, a total of eight metals such as calcium, copper, magnesium, manganese, lead, zinc, chromium and iron were found statistically significantly ($P \leq 0.05$) different as per monthly investigation. These variations in water quality parameters of Ganga canal might be attributed mainly due to the anthropogenic and hydro-geological activities. Therefore, anthropogenic and hydro-geological activities should be prevented to avert the contamination of heavy metals in the water of Ganga canal at Haridwar Parameter (Uttarakhand), India.[9,10]

III. RESULTS

The impact of agriculture on surface and groundwater is determined as negative. On the other hand, agriculture is negatively influenced by wastewater and polluted groundwater in areas in and near Haridwar. Nutrients, such as nitrogen and phosphorous, are two of the main macronutrients in fertilizer that promote plant growth. Synthetic fertilizers containing both nitrogen and phosphorus are applied imprecisely to farm fields, often at rates far higher than what the plants need or what the soil can absorb. The excess nutrients from fertilizer leech into surface and groundwater, causing algal blooms and nitrate contamination, impacting drinking water, recreational activities (such as swimming and boating), fishing/shell fishing and marine and aquatic ecology in and near Haridwar. High quantities of nutrients in water from industrial crop fertilizers and animal waste cause excessive aquatic plant growth — a process

known as “eutrophication,” which, in turn, causes “hypoxia,” or water that is low in oxygen. Harmful algal blooms (or HABs) occur when aquatic algae grow rapidly out of control. Some types of HABs produce biotoxins, which can kill fish and other aquatic life and cause human illnesses, while others use up the oxygen in the water producing “dead zones,” where aquatic creatures cannot live in and near Haridwar.[11]



Nitrogen fertilizer applied in the farm fields along with runoff from animal waste, is one of the leading causes of the so-called “Dead Zone,” an oxygen-deprived in which no fish can survive in water resources of Haridwar and nearby places. Ammonia from agricultural runoff can also degrade ecosystems by acidifying waterways, which can affect the ecology of streams and rivers there. [12,13]

IV. CONCLUSIONS

Animal waste contains a high level of pathogens (disease-causing microorganisms). Swine waste, for example, can contain more than 100 pathogens that cause human diseases. When factory farm areas near Haridwar and areas around leak, contaminated water can end up in waterways and in groundwater. Pathogens can survive after being sprayed onto farm fields, leaching into groundwater, or being transported to surface water due to runoff. People can become sick simply by ingesting water during recreational activities (e.g., swimming or boating) or by consuming contaminated drinking water. [14]

Well-known principles for reducing pollution, such as “polluter pays”, are hard to apply in practice to non-point agricultural pollution because identifying the actual polluters is neither easy nor cheap. Typical regulatory instruments include prohibitions on the direct discharge of pollutants; limits on the marketing and sale of dangerous products; and restrictions on agricultural practices or the location of farms in and near Haridwar. Regulatory approaches require inspection or self reporting to ensure compliance, with violations subject to penalties such as fines and compensation payments; enforcement remains a challenge. Policies to change farmer behaviour and incentivize the adoption of good practices are key to preventing pollution at the source in and near Haridwar. Such policies need to include (free) advisory services and training for farmers. Demonstrating the economic benefits to farmers of adopting good practices has also been shown to be effective. Benchmarking can promote behavioural change among farmers by showing them how they perform compared with their peers (without identifying the best and worst individuals). Benchmarking can be applied to the application of fertilizers, manure and slurries, and pesticides. A more subtle form of persuasion is the incorporation of environment modules into school curricula and involving students in raising environmental issues in and near Haridwar communities.

Finally, policies need to be coherent. Interventions aimed at increasing food production and farm income on the one hand and at mitigating pollution on the other should be mutually supportive – or at least not conflicting, although this may be hard (politically) to achieve in practice in and near Haridwar. For example, the subsidies frequently in place for agrochemicals do not act as an incentive for efficient use, and they encourage farming on more fragile lands. Effective inter ministerial cooperation mechanisms are required to increase policy coherence in and near Haridwar[15].

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