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Success Story: Reuse of Sewage Water as Drinking Water and Irrigation Source

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Introduction

Fresh water accounts for approximately 2.50 percent of the total volume of water on the planet out of which two-thirds is trapped in glaciers and ice caps. Aquifers, soil pores, lakes, marshes, rivers, plant life, and the atmosphere hold only 0.77 percent of total water. The availability and long-term sustainability of safe, high-quality drinking water is a globally matter of great concern. More than 40% of the world population is already affected by freshwater scarcity, and more than 1.7 billion people live in a basin with severe water scarcity large area of Indian agricultural land depends on rain water for crop production. Net sown area of India is around 143mha out of which only 68.4 million hectares is under irrigation. To fulfil the gap between present irrigated area and irrigation requirement, there is need to adopt new techniques of irrigation that will enhance irrigation efficiency and/or minimize the loss of water in irrigation system. One of such alternate option can be the utilization of waste water or sewage water.

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CNBC TV18 news channel covered my work in Mission Paani bulletin, July 24, 2019 8:57 AM IST (https://www.cnbctv18.com/videos/economy/mission-paani-ndri-scientists-convert-waste-water-into-drinking-water-for-animals-4046021.htm)

Waste water purification for drinking

The waste water from Effluent Treatment Plant (ETP) of NDRI, Karnal was collected in 1000 liters capacity container and 1000 grams (1 Kg) powdered aluminium sulfate (industrial alum) was mixed thoroughly and kept for 2 hours for complete coagulation and settlement. After this coagulation, 500 grams powdered activated charcoal (PAC)/ dung cake fresh ash was added and mixed thoroughly. This mixed water was allowed to stand 8-10 hours in the same container and clear water was decanted in another container with simple muslin cloth filter and 250 ml 1% sodium hypochlorite solution was thoroughly mixed in water before use to make it free from biological infections. The obtained purified water was analyzed for different quality parameters for use in livestock drinking purpose. All the parameters were within the range of different national and international drinking water standards like IS: 10500, 2012; APHA and EPA standards).

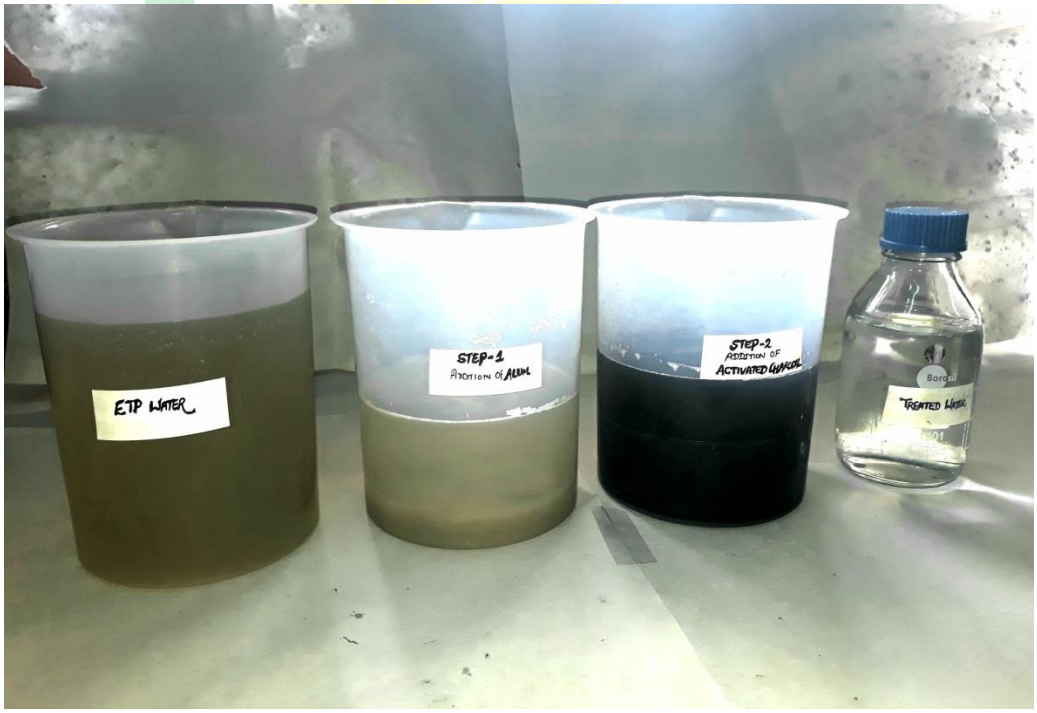

Figure shows different steps of purification of sewage waste water

It has been reported by many scientists that sewage water is a rich source of macro and micro nutrients, which when used in irrigation has resulted in improved plant development.

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However, wastewater should be treated before its use in agriculture to limit the potential of negative health impacts on humans and animals. This water can be used either directly or after treatment (physical, chemical or biological) for irrigation. India generates 72368 million litres of sewage water per day (as per PIB, 9 Dec, 2021) and it has operational treatment capacity of 26869 million litres per day.

The Sewage water can be used in two ways for irrigation,

(1.) The first one is conjunctive use of water which includes either using sewage water with good quality water (canal or groundwater) or mixing the both in a ratio which is below the threshold level to avoid any harm to plants.

(2.) The second method is using the sewage water after proper treatment which may include physical, chemical and/or biological treatment.

(a) Physical method- It include filtration of big and suspended particles present in the sewage water.

(b) Chemical method- It include treatment certain chemicals such as lime, acids, pH neutralizing agents, anti-foaming agents, coagulants and flocculants etc. which minimizes or removes the toxic elements and bad odour.

(c) Biological treatment- It includes three basic methods i.e. the trickling filter, activated sludge process, and the oxidation pond which ultimately reduces the anaerobic bacteria population and biological oxygen demand. Oxidation ponds are used for reducing the biochemical oxygen demand (BOD) of wastewater. It is a very effective and simple technology, consisting of a ring-shaped channel equipped with mechanical aeration devices. In aerobic treatment of wastewater, bacteria and algae are used that maintain aerobic condition throughout its depth.

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Sewage treatment plant at ICAR- NDRI, Karnal

Application of sewage water after treatment for irrigation

Conclusion

Based on the observations purified waste water can be provided as drinking water to animals without causing any detrimental effects and also use for irrigation. It improves the growth rate of plants but also reduces the cost of chemical fertilizers. The application of wastewater to cropland and forests is a smart option for disposal because it can improve the physical properties and nutrient content in soils.