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Wastewater Management in Agriculture Practices

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Abstract: *About 80% of India's water use is in agriculture, mainly for irrigation, pesticides and fertilizers, and livestock. Also in the value chain, water is used for food preservation and processing. Future projections suggest that total water demand will increase to 1,447 km3 by 2050. Due to population growth, rapid urbanization, and the effects of climate change, Indian cities are projected to have a water demand-supply imbalance due to extreme weather events such as droughts and floods. Farmers prefer municipal wastewater because of its high nutrient content, which increases crop yields in the short run. In addition, using wastewater can save on the cost of extracting groundwater, prevent freshwater exploitation and save the amount of groundwater available for generations to come. However, there have been concerns about upstream effluents in wastewater, which are not always adequately treated by Sewage Treatment Plants. The increasing load of industrial waste in wastewater and its high toxicity have had negative long-term effects.*

Keywords: Wastewater; Agriculture; Irrigation; Urbanization; Freshwater

I. INTRODUCTION

Farmers do not want to overuse available freshwater resources, they want to conserve groundwater (Saldías et al., 2017). Sewage water is readily available but due to a lack of infrastructure and proper treatment, partially treated municipal wastewater and untreated sewage have over time reduced soil quality, contaminated groundwater, and crop yields.About 80% of India's water use is in agriculture, mainly for irrigation, pesticides and fertilizers, and livestock. Also in the value chain, water is used for food preservation and processing. Future projections suggest that total water demand will increase to 1,447 km3 by 2050. Due to population growth, rapid urbanization, and the effects of climate change, Indian cities are projected to have a water demand-supply imbalance due to extreme weather events such as droughts and floods (Khalid et al., 2018).

As there has been more allocation of surface water and uncontrolled dependence on groundwater for agriculture has increased. The heavily subsidized electricity for the sector (originally introduced to maximize food production) has also encouraged this. The proliferation of borewells/pumps has led to an alarming drop in the water level. Considering the future of the severe water crisis, options such as increasing supply by reusing wastewater for irrigation efficiency and 'sewage farming' are worth considering.However, there are also many challenges in relying on these alternative options for water supply. At present, the amount of wastewater being generated is a mixture of domestic and industrial wastewater and there is a lack of data on its quantity and quality. Existing treatment capacity is low and treatment plants do not meet normal discharge standards (Frascari et al., 2018).

About 39% of Sewage Treatment Plants (STPs) do not conform to the normal standards prescribed under the Environment (Protection) Rules, hence large amounts of sewage are discharged into rivers without treatment. Most urban rivers have minimal natural flow for most of the year due to upstream dams and therefore partially treated or untreated sewage flows through these channels which are used by downstream farmers in some areas (Deckin et al., 2016).

The potential for reusing municipal wastewater from Class I and II cities for agriculture was estimated by the International Institute for Water Management (IWMI). According to IWMI, the total wastewater generated in Class I and II cities is about 38,254 MLD, of which about 31% is treated. This total wastewater has the potential to irrigate about 11,02,935 hectares of land (AmeraSinghe et. al 2013). Recently, the CPCB assessed the status of domestic wastewater generation and available treatment capacity by the Indian urban population and compiled it as the National List of Sewage Treatment Plants, according to which only 13.5% of the total sewage generation is treated goes.

The government recognizes the importance of using treated sewage in irrigation and this has also been emphasized in the Water (Prevention and Control of Pollution) Act 1974. As stated in the status report of CPCB, the use of conventionally treated sewage is also important for irrigating crops that are not consumed in raw mode, thereby saving i) fresh water, ii) Nutrient pollution in water sources will be prevented and iii) the nutritional value of sewage can be used for irrigation. In addition, as urbanization increases, the amount of municipal wastewater will also increase, making it a major resource for irrigation.

Given the importance of reusing nutrient-rich treated sewage water for irrigation, TERI undertook a preliminary study to understand the opportunities and challenges faced by peri-urban and urban farmers living in Delhi-NCR. Focused group discussions with farmers confirmed that municipal wastewater production, especially in towns and cities, is readily available for use while the availability of fresh water is uncertain (Buneno et al., 2017). Here, unless sufficient fresh water is available through canals or groundwater, such as in Dhankot where groundwater is available at less than 10 feet, urban and peri-urban farmers mostly depend on sewage water (treated and untreated) for irrigation. and use sludge generated from some STPs as fertilizers (Krzeminski et al., 2017).

Farmers prefer municipal wastewater because of its high nutrient content, which increases crop yields in the short run. In addition, farmers of Kaliyawas village in Gurgaon understand that using wastewater can save on the cost of extracting groundwater, prevent over-exploitation of fresh water and save the amount of groundwater available for generations to come. could. However, now farmers have become concerned about the upstream effluents in the wastewater, which are not always adequately treated by STPs. The increasing load of industrial waste in wastewater and its high toxicity have had negative long-term effects (Salen et al., 2016).

Water management refers to the optimum use of water resources and due to the ever-increasing demand for water, the need for proper management of water is being felt throughout the country for many years. Water management also includes the management of water-related risks such as floods, droughts, and contamination (Lam et al., 2015). This management can be done by the local administration and also by an individual unit. Proper water management involves managing water in such a way that it reaches all people in sufficient quantity (Englande et al., 2015).

II. METHODOLOGY

This study was a narrative review based, and the research article was searched from electronic databases like NCBI, Scopus, SpringerLink, ResearchGate, Google Scholar, etc. In this research, only the paper included peer-refereed and English language.

III. RESULT

3.1 Current Status of Water Crisis in India

Considering some facts about water availability and use in India, India has only 4 percent of the global freshwater source, which has to provide water to 18 percent of the global population (Indian population).According to statistics, about 330 million people (a quarter of the country's population) across the country have been affected due to severe drought after two consecutive years of weak monsoons.

The Composite Water Management Index report released by NITI Aayog in the year 2018 states that around 21 major cities across the country (Delhi, Bangalore, Chennai, Hyderabad, and others) will reach zero groundwater level and due to this about 100 million People will be affected.Also, the report states that by 2030, the demand for water in India will almost double its supply.

The per capita availability of water in the country was 6000 cubic meters in the year 1994, which decreased to 2300 cubic meters in the year 2000 and is expected to further decrease to 1600 cubic meters by the year 2025.Statistics show that 970 lakh people in urban areas of India do not get clean drinking water.Whereas in rural areas of the country, about 70 percent of people are forced to drink polluted water and 33 crore people are forced to live in dry places (Falkenberg et al., 2018).

If we talk about the capital of the country, Delhi, a recent report released by the Bureau of Indian Standards revealed that the water supplied by the Delhi Jal Board does not meet the BSI standards and is not potable.About 70 percent of the water in India is polluted, and India was ranked 120 out of 122 countries on the Water Quality Index.

3.2 Current Status of Wastewater Management in India

Apart from the main rivers flowing in India, we get an average of 1170 ml of rainwater annually, apart from renewable water conservation we also get 1608 billion cubic meters of water every year. With the kind of strong backup we have got and the ninth-largest freshwater reserve in the world, India's water crisis reflects our mismanagement of water conservation, not water scarcity.

Due to the population explosion in the country, the level of pollution in various water bodies like rivers, lakes, and ponds is increasing day by day. The groundwater level in most parts of the country has depleted relatively significantly (Agnihotri, 2011). It was revealed in a UNESCO report that India is the largest use of groundwater in the world.Water management helps in developing efficient irrigation systems for the betterment of agriculture in the country.Water resources are limited and we have to save them for the next generation also and this cannot be possible in the absence of proper water management. Water management helps to maintain the cycle of nature and existing biodiversity.

Since water plays an important role in sanitation, cleanliness in the country cannot be fully ensured unless the water is properly managed. Water crisis also negatively affects the economy of the country and with the help of water management, this negative effect can be avoided by eliminating the water crisis.

3.3 Domestic Gray Water Management

Disposal of gray water at source by every household is a more suitable and economical proposition. There should be technology where there can be zero or minimum community waste. For its disposal, the area/courtyard/land around the family will need to be available. Domestic gray water disposal can be done in the following three ways.

A. Kitchen Garden

The kitchen garden is the most preferred option at the household level as the family receives some edible items such as fruits or vegetables from the garden. However, this would be possible only where open land is available near the house.

If the gray water is cleaned before pouring into the kitchen garden, the garden grows well. This can be done by passing water through a very simple method such as silt and grease traps. Silts, greases, and other solid materials need to be separated from wastewater effluent. For this purpose, interceptor tanks or chambers are made as per the requirement (Agnihotri, 2018).

Garden irrigation can be done in two ways. Filter water will reach the roots of plants directly through underground PVC pipes. This method would require maintenance of the pipe and the filter bed. The second method is that of "surface irrigation". It is simple and inexpensive and requires little maintenance. But the yield may be less and the excess water will flow out (Agnihotri, 2019).

B. Soak Pit

Soak pit is a very simple and cheap option for gray water management. For domestic purposes, a cubical pit is dug in the soil of about 3 feet in length, 3 feet in width, and 3 feet in depth. The pit wall surface and pit bottom surface provide more soil surface area to absorb water. To stabilize the pit and distribute the incoming water to the available surface area. The pit is filled with pieces of stone of the prescribed size. At the top the pit is covered with supporting material such as a tree branch or a sack etc. and sand is laid over it so that the water coming in is not exposed.

In the middle, a filtered inlet, a perforated pot filled with grass is placed, through which the water enters the pit. Stone pieces are also more efficient in distributing water across all water-absorbing surfaces. One important point is that ordinary pieces of bricks or pebbles etc. should not be used as a filler material because brick pieces tend to break when wet. Later they block the flow of water on the sides of the pit toward the soil surface.

C. Leach Pit

If the availability of open land is a constraint and the gray water content is high, a domestic leach pit may be a suitable alternative. For this, the family will have to bear some construction costs. A leach pit is a circular pit made of brick, which is made like a beehive, whose diameter is about 3 feet. There should be a proper insect-proof cover for the pit. Water should be passed into the pit through a water seal trap so that insects cannot enter and mosquitoes do not breed (Bhuvaneshwari et al., 2018).

3.4 Community Gray Water Management

In very dense settlements, where sometimes the walls of houses are adjacent to each other, it may not be possible to manage gray water at the household level. In such a situation, the domestic gray water goes out of the house. The result is that community gray water can accumulate. It will have to be collected, made drained, and transported in open space or outside the village for purification. Several treatment options can be used to manage such gray water. In rural areas, gray water is generated due to overflow in public places such as water stand posts, hand pumps, public wells, etc. This gray water is usually cleaner but it also needs to be managed properly. Such water management can be done on the side itself by adopting suitable technical options (Adegoke et al., 2018).As mentioned above, the following options can be exercised for the management of gray water generated from stand posts, hand pumps, etc. on the side:

1. Plantation with Intercepting Silt Chamber
2. Community leach pit
3. A system to absorb water

These methods are very similar to the methods adopted for domestic gray water disposal but involve the construction of large pits over a larger area.

This is another method of managing community gray water on the side. This system can also be useful for limited amounts of community gray water from households. Here a kind of sedimentation cum filter bed is constructed, on top of which plants like Markus, etc. are planted. Oxygen is provided through the roots of the narcula, which also takes care of the polluting elements (Sonkamble et al., 2018). The exit of water from this system is well-stagnant and germ-free. It can be used for gardening etc.

Water is an integral part of life, but it is a fragile and finite resource that is fragile in quality and limited in quantity. By 2025, 60% of the world's total population is expected to face the problem of water scarcity. Wastewater is often used to water crops in areas where fresh water is scarce. Although not legally permitted in most countries, the use of untreated wastewater for irrigating crops is practiced in many countries around the world due to a lack of quality water (Sharma & Choudhary, 2017).

Sources of wastewater include various human activities such as B. Industrial, Commercial, and Domestic Activities. Municipal wastewater can also be divided into urban, rural, and agricultural areas/sources. With the rapid expansion of population, urban, industrial and domestic water supplies, the volume of wastewater is increasing at the same rate. The average amount of wastewater produced daily by human activities depends on domestic water volume availability, cultural level/type, water cost, and economic conditions (Moss, 2018).

IV. CONCLUSION

About 85 percent of the total water consumption in the country is used in the agriculture sector. Whereas only 10 percent of water is used in industries and only 5 percent in homes. This can be achieved by establishing proper standards of water quality, ensuring regular supply, and moving through the formality of using sewage water for irrigation through regular monitoring and evaluation of the same. Treated wastewater can become a resource for farmers that can be used for irrigation and the surplus can be traded. There is a need for a strong institutional arrangement with an emphasis on systematic data collection of discharge quality and quantity, infrastructure development, regulations, reuse policies that sustain population growth and urbanization, and resources in wastewater management related to agriculture. Incorporates the principles of efficiency and circular economy. It would not be an exaggeration to say that India is on the verge of a serious water crisis. The existing water resources are in crisis, the country's rivers are getting polluted, the water-harvesting mechanisms are deteriorating and the groundwater level is continuously depleting. Despite all this, the topic of the water crisis and its management has not found a place in the discussions of the general public in India.

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