

Sewage-fed Aquaculture in India: Challenges and Potential Solution

Akash Debnath and Sampa Baidya*

Dept. of Aquaculture, College of Fisheries, Lembucherra

Corresponding Author

Sampa Baidya

Email: sampa.baidya@gmail.com



OPEN ACCESS

Keywords

Sewage-fed aquaculture, Wastewater recycling, Sustainable aquaculture, Nutrient-rich water, Wastewater treatment

How to cite this article:

Debnath, A. and Baidya, S. 2024. Sewage-fed Aquaculture in India: Challenges and Potential Solution. *Vigyan Varta* 5(7): 32-35.

ABSTRACT

Sewage-fed aquaculture, a prevalent practice across various regions in Asia, involves fertilizing fish production with wastewater—a method known for its efficiency in utilizing resources. One prominent approach within this practice is the sanitary engineering pond system, which not only aids in fish cultivation but also significantly conserves energy. Today, sewage-fed aquaculture has become a well-established industry, offering economic stability due to its ability to yield marketable products with proper maintenance efforts. This unique culture system utilizes nutrient-rich water sources from urban and industrial areas for both aquaculture and agriculture, promoting sustainable production. By recycling used water from urban and industrial sources, sewage-fed aquaculture mitigates environmental pollution, fosters a sustainable ecosystem, and contributes to biodiversity conservation.

INTRODUCTION

Protection of the natural ecosystem and the biodiversity, become a serious matter in this centennial, humans are looking at the ecologically sustainable future. Not only India, many other countries are also suffering to the concern environmental issues, particularly for water problems, which directly effect to the natural ecosystems and

biodiversity, in future many countries will face the shortage of clean water sources. The amount of the waste water generate from the urban area by a single year is huge, the presence of nutrient content on the waste water is too high. It is become necessary to reuse this waste water in aquaculture to make an

ecologically sustainable culture system and also fixed the water crisis.

SEWAGE-FED AQUACULTURE

Sewage-fed aquaculture elaborates a totally special type of system where rich nutrient water source is used for aquaculture as well as agriculture available around the big cities for a sustainable production. Recycling of the waste water reduces the environmental pollution. Whole over India, it evaluate that at present the sewage-fed aquaculture units are more than 130 present, around covering 12000 ha area (Ayyappan et. al.,2011) but now presently it is come down to almost around 4000ha because of rapid citification). Almost 80% sites are located in the west Bengal, where the sewage is being used for the fertilization purpose of the aquaculture. In India the exact potency of sewage-fed aquaculture & it's main advantages over traditional methods of treatment of waste water is the diversification of the marketable products and that's why a good amount of income can generated through sewage-fed aquaculture. But the improper management system of sewage aquaculture means adding the untreated or partially treated waste water directly to the natural water bodies affected water qualities of the natural water sources. Presence of heavy metal and various contaminations of the drinking water sources, cause the different harmful diseases.

Challenges for planning a sewage-fed aquaculture

Whole over the world the waste water is the very serious issue for the ecosystem as well as human health also. With the proper maintenance and treatment of this waste water we can recycle or reuse that water. Sewage-fed aquaculture proves to be a sustainable bio-ecological treatment method. Some factors which are the main barriers that are discussed here.

Bioaccumulation of slit & high organic matters:

In the sewage-fed aquaculture because of the presence of high nutrient the fishes can grow without any supplementary feed, but in other hand fish excretes and other high organic matters are gradually accumulates on the bottom part the pond that creates a heavy layer of silt between pond soil and water, which is consist of heavy fishes excretes and other high toxic organic matter, which gradually effects to the water quality and then fishes health (Jana et al., 2000).

Mixing with the toxic materials:

In the sewage-fed aquaculture generally the water comes from the urbanized area along with that form the industrial sites also, although the water is being used after the proper water treatments but then also some of the toxic materials mixes with the culture pond, and make a uncomfortable environment for the fishes.

High chance of contamination and public health:

Various studies has been conducted in Kolkata sewage-fed aquaculture system with the collaboration of All-India Institute of Hygiene and Public Health, Kolkata about the epidemiological aspects of persons included in the system, the quality of fishes in the sewage-fed aquaculture comparatively in freshwater one. From a comparative study of the average microbial growth in four waste water aquaculture farms, it was observed that faecal coliforms, faecal streptococci and pseudomonas/ 100 ml raw waste water – highest at the Rahara and Bandipur farms and the concentration of the heterotrophic bacteria was highest on the Salt Lake (94.09 CFU). Various type of pathogenic bacteria like Staphylococcus, streptococcus, pseudomonas are found in the fish organs (kidney, spleen, digestive track) (Todd and Josephson,1996).

Heavy metals accumulation in water:

The excess level of exposure of heavy metals to the organisms may cause the harmful effects.

Heavy metals can be differentiated by two types, essential heavy metals (cobalt, copper, iron, manganese, and zinc) which is require in trace amount to organisms for the activation of the enzyme functions. Another one is nonessential heavy metals (cadmium, lead, mercury) which more toxic than the essential heavy metals. Heavy metals like mercury and others are used in the production of the electrical appliance, detergent, paint, pesticide, fungicide, industries produced sewages are also go to the municipal and from there may be the heavy metals introduced into the sewage-fed aquaculture sites, and causes toxicity. Accumulation of heavy metals occurred in the liver, kidney, gill; may cause the structural lesions and functional imbalance (Govindan, 1987).

Higher chances of pathogens transmitted to the human: various studies found that the fishermen who is included in the sewage culture areas they are moderately prevalence of diarrhoea, fever, and cold among them. Mostly skinny problems are founded; prevalence of itchy skin lesions seen higher among the Salt Lake fishermen. High prevalence of helminthiasis also seen among the fishermen. Ringworm also founded in the Salt Lake (24.73%) and rahara fish farm (14.29%) (Jana,1998).

Socio-culture aspects of sewage-fed aquaculture product: The negative thinking about the product and lack of general awareness about the wastewater reuse product may mainly reason of barrier to social acceptance of wastewater reuse product.

POTENTIAL SOLUTION TO RESOLVE THE CHALLENGES

- The proper treatment of the waste water before introduced into the pond system, the degree of treatment that should not be any hazard to fish.

- Diluting the waste water before introducing into the pond.
- Based on some study by maintaining the personal hygiene can be solved the pathogenic transmission and ate well cooked fish which raised from the sewage-fed aquaculture.
- By creating the awareness among the peoples about the sewage –fed aquaculture products and their shelf-life.
- For resisting the accumulation of heavy metals, we should produce some green algae and blue – green algae, it releases some organic compounds which can form some complexes with the heavy metals and reduce the free ions concentration.
- By removing the oils and floating objects and by the sedimentation of suspended solids on the bottom of the pond; by the removing of accumulated silt the water can be reused in sewage fed aquaculture.

CONCLUSION:

Sewage-fed aquaculture is a sustainable practice that utilizes nutrient-rich wastewater for fish and agricultural production, offering economic benefits and resource efficiency. While it supports economic stability, especially in regions like West Bengal, India, it faces challenges such as contamination, heavy metal accumulation, and health risks. Proper wastewater treatment, public awareness, and bioremediation techniques can address these issues. By adopting these measures, sewage-fed aquaculture can contribute significantly to environmental sustainability, biodiversity conservation, and water resource management.

**REFERENCE:**

Ayyappan, S., Jena, J. K., Gopalkrishnan, A., Pandey, A. K., (2011), HANDBOOK OF FISHERIES AND AQUACULTURE, NEW DELHI, Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, pp 328-331.

Govindan V.S. (1987) Studies on the treatment of waste water for pisciculture and agriculture. Arch. Hydrobiol. Beih. Ergebn. Limnol. 28:95-100.

Jana, B.B. (1998) Sewage-fed aquaculture: The Calcutta model. Ecological Engineering 11:73-85.

Jana, B.B., Banerjee R.D., Guterstam, B., and Heeb, J. (2000) (eds) Waste recycling and resource management in the developing world. University of Kalyani, India and International Ecological Engineering Society, Switzerland.

Todd J, Josephson B (1996) The design of living technologies for waste treatment. Ecological Engineering.