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Popular Article

Peri-urban Aquaculture: An Innovative and Sustainable Strategy of Fish Farming

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Abstract

Periurban aquaculture, or urban or suburban aquaculture, involves cultivating fish and other aquatic organisms near urban areas. This innovative practice offers numerous benefits that can significantly contribute to the growth and sustainability of your business. First and foremost, periurban aquaculture allows for easy access to markets. By establishing your aquaculture operations near urban centers, you can tap into a ready consumer base and reduce transportation costs. Furthermore, periurban aquaculture presents an opportunity for sustainable land use. You can maximize productivity without encroaching on valuable agricultural land by utilizing idle or underutilized urban spaces such as abandoned lots or rooftops. Additionally, incorporating aquaponics systems into your periurban operations allows for efficient nutrient cycling between fish production and hydroponic vegetable cultivation. This win-win scenario reduces waste and increases profitability.

Introduction

Cities are frequently viewed as hubs for entrepreneurship and innovation. However, in this age of urbanization, we need more creative solutions for the numerous environmental issues growing cities bring. This is especially true regarding the peri-urban interface (PUI), a physical and mental setting with which the city center frequently has a tense relationship. The spaces between the city and the countryside shaped by the urbanization of once rural areas into urban areas are referred to as periurban spaces. Periurban aquaculture is a synonym for raising fish near or in periurban bodies of water. The spread of peri-urban aquaculture and a related rise in the percentage of farmed fish in the markets have been prompted by rising demand for fish in city marketplaces. As cities grow horizontally and vertically and the world's population increases, fish is the primary food source for those living in periurban areas. The main challenge for megacities is feeding the vast population. Cultivating fish profitably in the ample periurban surface water, including ponds, lakes, streams, rivers, coastal regions, natural depressions, and estuaries, is possible.

Aquaculture in Periurban Areas: Types of Water Bodies

Canals that connect rivers in urban and periurban areas have long provided a lifeline for city dwellers. Surface water quality has suffered due to unchecked industrial expansion, rural-to-urban

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migration, and river encroachment. Nearly all the trash produced by people, industry, and millions of farm animals enters surface water untreated, along with tonnes of pesticides and fertilizers. As a result, during the dry season, a large portion of the rivers and canals in the cities and their surroundings are biologically dead.

Fish culture can take one of two forms in periurban water surfaces:

1. Water in the Form of Ponds, Lakes, Streams, and Rivers:

Examples of periurban aquaculture on seasonal cropland include pond aquaculture and rice-fish culture (rice and fish together or rice followed by fish).

- a) **Pond fish culture:** The excavation of earth needed to raise the level of the farmhouse floor over the high-water mark during the rainy season results in many households having at least one pit-shaped pond. People who don't have access to a river nearby also need a pond to provide water for their homes. During the rainy season, most ponds are connected to other bodies of water and receive runoff and flooding—ponds at this time shelter local fish that locals catch during and after the rainy season. During the dry season, a lot of little ponds entirely disappear.
- b) **Paddy cum fish culture:** In open water bodies, rice-fish culture began in the 1990s, mainly with carp polyculture and tilapia mixed-species culture.

2. Polluted water from domestic waste, industries waste, or Sewage fed aquaculture:

A significant development in peri-urban aquaculture is using sewage-fed fish culture systems in various cities like Kolkata. Sewage is a general phrase that refers to the combined liquid waste discharges from industrial and domestic sources within a defined area. It is a muddy liquid with a colloidal form, suspended solids, and minerals and organic substances in solution.

It contains about 90-99% water. It also prevents bacteria and protozoa. It is rich in phosphorus (1-14 mg/l) and nitrogen (18-120%). It contains traces of heavy metals such as zinc, copper, chromium, Manganese, Nickel, and Lead. The BOD and COD of the sewage are very high.

Fish stocking in sewage-fed fish culture

All the species of Indian major carps, e.g., *Labeo rohita* (Rohu), *Catla Catla*, *Cirrhinus mrigala* (Mrigal), and Exotic carps, e.g., *Hypophthalmichthys molitrix* (Silver carp), *Ctenopharyngodon idella* (Grass carp), *Cyprinus carpio* (Common carp) are preferred to be stocked. Still, the percentage of Mrigal is kept more excellent, and that of exotic carp is lesser. The popularity of Tilapia and freshwater prawn, *Macrobrachium rosenbergii* is increasing.

Culture System followed in Peri-urban Aquaculture

i. Polyculture

Carp polyculture is a significant component of periurban culture systems. Carp are raised in polyculture in different places with varied species combinations and densities. The availability of



seeds, feeds, fertilizer, etc., and other factors, affect how intensively fish farms use inputs. The stocking density in carp polyculture typically varies between 15,000 and 17,000 fingerlings per hectare. Stocking density is crucial when tilapias are grown in polyculture with carp since the carps multiply quickly due to their prolific reproductive habit.

ii. Monoculture

Catfish monocultures have been a highly well-liked aquaculture activity in periurban regions. Recently, farmers have shown a growing interest in raising catfish in monoculture, particularly the highly sought-after Thai pangus (*Pangusius sutchi*) and other species. Fish farm stocking densities vary depending on the species being introduced and the level of intensification. Farmers typically use continuous harvesting for raising tilapia to maintain a tolerable stocking density. However, this method is frequently challenging to master.

iii. Cage and Pen Culture

On the floodplains, cages and pens culture has been developed. These methods have significance because fish raised in pens and cages are expected to contribute to lower total farmed fish costs.

Periurban Aquaculture Concerns

One of the most severe issues in periurban aquaculture is the need for quality broodstock and seeds. The problem of inbreeding produced by accidental hybridization has brought about several consequences. The inability to obtain adequate feed cheaply led to more significant production expenditures. Poor feed quality raises production costs by interfering with growth. The primary issues limiting fish output in periurban aquaculture are more suitable transportation and storage facilities and outdated fish production technologies.

Conclusion

Periurban aquaculture in and around cities may enhance the environment, minimize waste, provide wholesome food, and create jobs. Before, risks came from the possibility of wastewater pollution. But there are now secure methods for raising fish and cultivating aquatic plants near the city. There is a worry that rising food insecurity may result from climate change. From this perspective, periurban aquaculture signifies an entirely novel type of fish production. Aquaculture has chances to boost food production, which may also improve income, food security, and the standard of living for millions of individuals who live in poverty. Periurban aquaculture systems are situated outside of the cities. These wetlands progressively disappeared due to urbanization's ever-increasing demand for land and water. Floodplain wetlands loss had significant implications, especially for those in poverty.



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