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The Backyard Pond that Feeds Millions

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Abstract

Small scale freshwater aquaculture operates in millions of backyard ponds across Asia Africa and South America. These simple systems produce substantial fish for local consumption and income. This article examines how rural families use low cost technology to raise tilapia carp and catfish. The article draws on case studies from Bangladesh Malawi and India. It explores the environmental benefits of integrated farming where pond water fertilizes vegetable gardens and agricultural waste feeds the fish. The article also addresses challenges such as disease management climate variability and access to quality feed. Evidence from the Food and Agriculture Organization (FAO) and peer reviewed studies shows that backyard ponds contribute significantly to global food security. The article concludes that supporting small scale farmers with better training and fingerling supply could reduce pressure on wild fisheries and build climate resilience.

Keywords: Aquaculture, Small scale, Freshwater, Backyard, Ponds, Food security

Introduction

A family in rural Bangladesh wakes before dawn. The mother walks thirty steps from her kitchen to a small pond no bigger than a village square. She tosses a handful of rice bran into the dark water. The surface explodes with silver bodies. Hundreds of tilapia and carp compete for breakfast. By evening her children will eat fish curry. By year end she will sell a portion of the catch to pay for schoolbooks. This scene repeats across the developing world. The Food and Agriculture Organization reported that global aquaculture production reached an all time high of 87.5 million tonnes of aquatic animals in 2020 (FAO 2022). A significant portion of this came from small scale producers.

Small scale freshwater aquaculture is often invisible to urban consumers who buy vacuum packed fillets from supermarkets. However, a critical re-examination of aquaculture narratives reveals that farmed fish is produced predominantly by a missing middle segment of commercial farms and overwhelmingly remains in Southern domestic markets for consumption by poor and middle income consumers (Belton *et al.,*2018). This challenges the assumption that aquaculture primarily benefits wealthy Northern consumers.

The purpose of this article is to explain how backyard ponds work. It will describe the species commonly raised the integration with other farm activities and the economic logic that makes small scale farming profitable. The article will also discuss challenges including climate change disease and market access. The argument is not that small scale aquaculture can replace industrial farming. The argument is that it deserves more attention and support from governments and development agencies.

The Anatomy of a Backyard Pond

A typical backyard pond in South Asia or Africa is dug by hand or with a small excavator. It covers 200 to 2000 square metres. The depth ranges from one to two metres. Water comes from rainfall groundwater or diverted streams. Farmers do not typically line the pond with plastic. The natural clay bottom holds water effectively in many tropical regions.

In India backyard ponds range from 300 to 2000 square metres with most being perennial and holding water for eight to nine months each year (Taruja *et al.,* 2023). These ponds represent a significant underutilized resource. In southern Malawi pond sizes range from less than 100 to 2000 square metres with an average depth of 0.7 to 1.5 metres (WorldFish Center, 2007). The

recommended minimum pond size is 450 square metres and many farmers are expanding their ponds to reach this standard.

Farmers stock the pond with fingerlings. Tilapia are a common choice because they tolerate poor water quality and reproduce easily. Carp species such as rohu, catla and mrigal are also popular in South Asia. The African catfish *Clarias gariepinus* can breathe atmospheric oxygen and survives in shallow muddy ponds where other fish would suffocate. This hardiness makes catfish ideal for small ponds. A study in Bangladesh found that snails provided an abundant protein source for catfish resulting in high growth rates that allowed two batches of marketable fish to be grown per year (Newton, 2001).

Integration with Other Farm Activities

The genius of backyard aquaculture is integration. The pond does not stand alone. It connects to vegetable gardens livestock pens and household activities. Farmers channel rainwater into the pond. They wash cooking pots near the water allowing food scraps to enter. Chicken or duck manure falls into the pond. The manure fertilises the water. Algae and zooplankton multiply. Fish feed on this natural productivity.

In return the pond water becomes valuable for irrigation. Farmers pump nutrient rich water onto vegetable gardens. The vegetables grow faster. In Malawi integrated agriculture aquaculture systems have been practised since 1986 when the WorldFish Center developed and disseminated these technologies (WorldFish Center, 2007). Farmers practising integration achieve yields of over 1500 kg per hectare per year compared with 900 kg per hectare per year for non-integrated farms. They also generate twice as much annual household income approximately 270 US dollars compared to non-integrated farms.

Some farmers grow vegetables on the pond bunds. In India a cropping calendar for pre kharif kharif and rabi seasons was introduced alongside trellis farming of climber vegetables (Taruja *et al.,* 2023). This vertical space utilisation maximises production from limited land. The basic principle is to convert agricultural wastes and manure into high quality fish protein and to use the nutrients generated in the pond as fertiliser for growing plants (WorldFish Center, 2007). Ponds on the farm are not viewed as a standalone enterprise but as a pivotal component in the whole farm ecosystem.

The Ecopond Approach in Bangladesh

A rigorous study of underutilized homestead ponds in Bangladesh demonstrated the potential of ecosystem approaches. Researchers introduced ecoponds operated by women (Dam Lam *et al.,* 2022). Households with Eco ponds achieved significantly higher fish productivity, fish diversity and income generation potential compared to households with similar underutilized ponds. Furthermore, certain dimensions of women empowerment improved at the individual and household level including control of income and productive assets. This suggests that backyard ponds not only feed bodies but also shift economic power.

Economic Viability Without High Technology

The economic case for backyard ponds is strong. Construction costs are low. Operating costs are also low. Fish feed is the main expense in industrial aquaculture. Backyard farmers minimise this expense by using household waste and on farm forage. In Malawi maize bran is used by over 90 percent of farmers as fish feed (WorldFish Center, 2007). Other feeds include grass leftover homestead food termite ants and vegetable leaves. These materials are often considered waste. In the pond they become fish flesh.

Cash flow is also favourable. Farmers harvest fish gradually not all at once. They catch a few fish for dinner. They catch a basketful for the weekend market. This continuous harvest matches household cash needs. In India the incorporation of small indigenous freshwater fishes along with Indian major carps allows harvesting at biweekly intervals (Taruja *et al.,* 2023). This provides a continuous supply of fresh fish to the household. The pond functions as a living savings account.

Gender and Social Benefits

Backyard aquaculture has a notable effect on women empowerment. In many traditional societies women control household food preparation and small livestock. Ponds often fall under women management. They feed the fish. They decide when to harvest. They keep the income from small sales.

In India the participation of women in aquaculture is lower than in other countries but growing (Taruja *et al.,* 2023). Challenges include lack of awareness of scientific practices and limited access to suitable fishing gear. However, interventions have popularised passive fishing gears like gill nets and traps to enable women to harvest small fish periodically. This ensures continuous availability of fish to their households.

The ecopond study in Bangladesh found that women gained control over income and productive assets (Dam Lam *et al.,* 2022). However, the researchers noted that wider structural inequalities remained unaddressed. This suggests that backyard ponds are a valuable tool for empowerment but not a complete solution to gender inequality. Women also benefit from the location of the pond. Unlike capture fisheries which require travel to rivers or lakes the backyard pond is on the homestead. Women can tend the fish while watching young children or cooking meals. This convenience increases adoption.

Challenges and Vulnerabilities

Backyard ponds are not without problems. The most serious challenge is disease. High stocking densities without aeration can lead to low oxygen and ammonia buildup. Stressed fish become susceptible to infections. In India before interventions farmers were unaware of scientific aquaculture management practices (Taruja *et al.,* 2023). They practiced higher stocking densities without fertilisation schedules or water quality testing. No training had been received on scientific management.

Climate change adds uncertainty. Backyard ponds are shallow and vulnerable to temperature extremes. A drought can shrink the pond to a mud puddle. A flood can wash away the fish entirely. Natural disasters like cyclones and floods resulting in flooding of ponds and loss of fish are identified as major threats in coastal regions (Taruja *et al.,* 2023). Small scale farmers rarely have insurance or emergency funds.

Feed quality is another constraint. Household waste and farm forage provide adequate nutrition for herbivorous and omnivorous fish. But they do not support fast growth. Early trials in India using dry diets low in protein resulted in poor growth and fish mortality (Newton, 2001). It was found that plain cooked rice supplemented with low protein waste led to a constipated condition and rupturing of the stomach wall. Participants who added insects prior to feeding achieved a better feed response indicating that some sort of appetite stimulant may be necessary.

Access to quality fingerlings is uneven. In India farmers initially bought seed from local sellers which resulted in low quality and high mortality (Taruja *et al.,* 2023). Interventions created linkages with State Fisheries Departments and private hatcheries for quality seed procurement. This significantly improved outcomes.

Policy and Extension Opportunities

Governments and non-governmental organisations can support backyard aquaculture without large budgets. The most effective interventions are low cost and high return. One intervention is extension training for farmers. In India critical interventions included training on testing water quality, liming, periodic fertilisation and supplementary feeding (Taruja *et al.,* 2023). Farmers were taught to calculate biomass and feed accordingly. Feeding method was changed from broadcasting which led to wastage to placing feed in tied plastic gummy bags with holes.

Another intervention is improving fingerling supply. In India reservoir ponds were maintained in villages for continuous replenishment of homestead ponds with small indigenous fishes (Taruja *et al.,* 2023). This ensured availability of quality seed without dependence on distant hatcheries.

Climate adaptation is also important. Extension agents can teach farmers to deepen ponds to prevent summer drying. They can recommend planting trees on the pond bank to shade water and reduce evaporation. In India the availability of perennial ponds with water for eight to nine months a year was identified as a strength that could be built upon (Taruja *et al.,* 2023).

Finally, governments should recognise backyard ponds in agricultural statistics and development plans. The FAO has emphasized the importance of small-scale fisheries and aquaculture for achieving the 2030 Agenda for Sustainable Development (FAO, 2022). A reallocation of even modest portions of aquaculture development budgets toward extension and fingerling banks would reach millions of households.

Conclusion

The backyard pond is a quiet revolution. It does not require patents or venture capital. It requires a shovel some water and a family willing to learn. Millions of households across the tropics have already adopted this technology. They produce fish with lower carbon emissions than many alternative protein sources. They recycle nutrients that would otherwise become pollution. They feed their children protein that supports brain development. They earn income that keeps daughters in school.

Disease climate change and feed constraints limit productivity. However, these challenges are solvable with targeted low cost interventions. Training fingerling banks and climate adaptation techniques have proven effective in field trials from India to Bangladesh to Malawi. Governments and development partners should prioritise these investments. They will not see

quick profits for export markets. They will see better nourished children more resilient communities and slower depletion of wild fish stocks.

The pond in your backyard is not just a water hole. It is a pantry a bank a pharmacy and a school. It is also a reminder that sustainable food systems do not always need to be big and fast. Sometimes they need to be small and slow and rooted in the daily life of a family. That family knows the truth. The fish are always hungry. The water always needs watching. And the harvest always comes if you feed the pond with care.

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