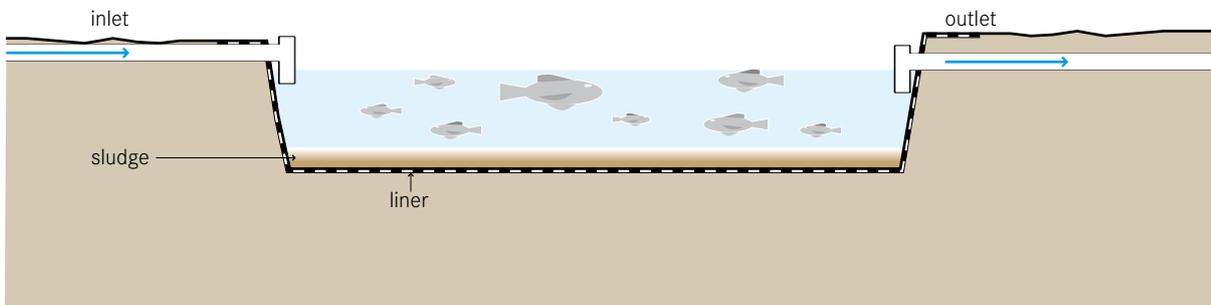


Application Level: <input type="checkbox"/> Household <input checked="" type="checkbox"/> Neighbourhood <input checked="" type="checkbox"/> City	Management Level: <input type="checkbox"/> Household <input checked="" type="checkbox"/> Shared <input checked="" type="checkbox"/> Public	Inputs: <input checked="" type="checkbox"/> Effluent
		Outputs: <input checked="" type="checkbox"/> Biomass



Fish can be grown in ponds that receive effluent or sludge where they can feed on algae and other organisms that grow in the nutrient-rich water. The fish, thereby, remove the nutrients from the wastewater and are eventually harvested for consumption.

Three kinds of aquaculture designs for raising fish exist:

- 1) fertilization of fish ponds with effluent;
- 2) fertilization of fish ponds with excreta/sludge; and
- 3) fish grown directly in aerobic ponds (T.5 or T.6).

Fish introduced into aerobic ponds can effectively reduce algae and help control the mosquito population. It is also possible to combine fish and floating plants (D.10) in one single pond. The fish themselves do not dramatically improve the water quality, but because of their economic value they can offset the costs of operating a treatment facility. Under ideal operating conditions, up to 10,000 kg/ha of fish can be harvested. If the fish are not acceptable for human consumption, they can be a valuable source of protein for other high-value carnivores (like shrimp) or converted into fishmeal for pigs and chickens.

Design Considerations The design should be based on the quantity of nutrients to be removed, the nutrients required by the fish and the water requirements needed to ensure healthy living conditions (e.g., low ammonium levels, required water temperature, etc.). When introducing nutrients in the form of effluent or sludge, it is important to limit the additions so that aerobic conditions are maintained. BOD should not exceed 1 g/m²/d and oxygen should be at least 4 mg/L.

Only fish tolerant of low dissolved oxygen levels should be chosen. They should not be carnivores and they should be tolerant to diseases and adverse environmental conditions. Different varieties of carp, milkfish and tilapia have been successfully used, but the specific choice will depend on local preference and suitability.

Appropriateness A fish pond is only appropriate where there is a sufficient amount of land (or pre-existing pond), a source of fresh water and a suitable climate. The water used to dilute the waste should not be too warm, and the ammonium levels should be kept low or negligible because of its toxicity to fish.

This technology is appropriate for warm or tropical cli-

mates with no freezing temperatures, and preferably with high rainfall and minimal evaporation.

Health Aspects/Acceptance Where there is no other source of readily available protein, this technology may be embraced. The quality and condition of the fish will also influence local acceptance. There may be concern about contamination of the fish, especially when they are harvested, cleaned and prepared. If they are cooked well, they should be safe, but it is advisable to move the fish to a clear-water pond for several weeks before they are harvested for consumption. WHO guidelines on wastewater and excreta use in aquaculture should be consulted for detailed information and specific guidance.

Operation & Maintenance The fish need to be harvested when they reach an appropriate age/size. Sometimes after harvesting, the pond should be drained so that (a) it can be desludged and (b) it can be left to dry in the sun for 1 to 2 weeks to destroy any pathogens living on the bottom or sides of the pond. Workers should wear appropriate protective clothing.

Pros & Cons

- + Can provide a cheap, locally available protein source
- + Potential for local job creation and income generation
- + Relatively low capital costs; operating costs should be offset by production revenue
- + Can be built and maintained with locally available materials
- Requires abundance of fresh water
- Requires a large land (pond) area
- May require expert design and installation
- Fish may pose a health risk if improperly prepared or cooked
- Social acceptance may be low in some areas

References & Further Reading

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