

II) Culture in Pens

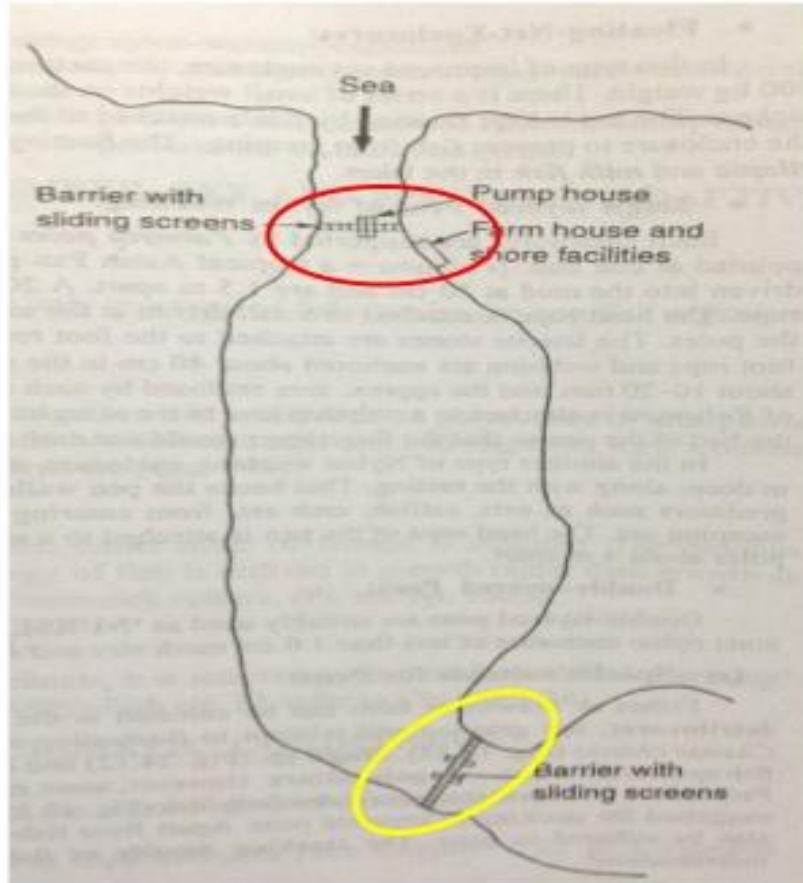
- Pens (enclosure): a small enclosure used for confinement or safekeeping of animals.
 - Pen culture is defined as raising of fish in a volume of water enclosed on all sides except bottom
- Transitional structure between ponds and cages.
- Formed by **damming a bay, fjord (an arm of sea), estuary, river, lake or reservoir.**



Culture Pen



Freshwater and marine pens



- **Site:** Pens are those where barriers can be constructed, in order to reduce the costs and inc the ease of operation.
- Sites must be sheltered against high winds.
- Depth > 1 m.

Area: enclosure area = 2-7 ha.

Barriers: for blind end- one or one series of enclosure.

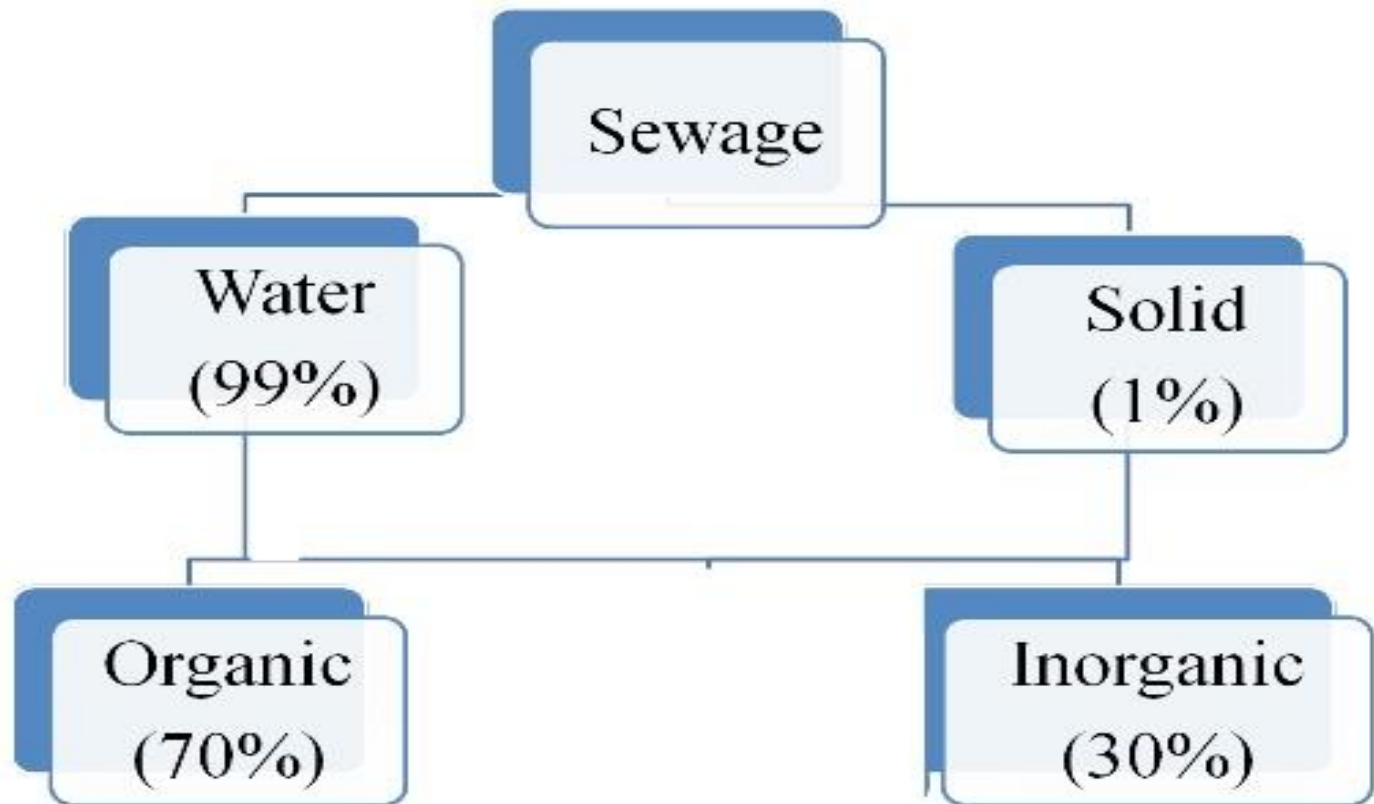
For continuous flow- two or two series, one upstream and other downstream

Advantages

1. Pen culture is a continuous process due to continuous supply of water.
2. Greater production is assured in a limited space with rich food and oxygen supply.
3. Greater growth is possible as energy is saved towards locomotion and feeding etc.
4. Ease of harvest
5. Availability of natural food and exchange of materials with the bottom

Sewage fed farming

- Fertilizer value of sewage in fish farming has been widely recognized in several countries.
- Sewage is: a **cloudy fluid** arising out of waste, containing **mineral, organic** and **inorganic matter** either in solution or having particles of solid matter floating or in suspension or in colloidal and pseudo-colloidal form of dispersed state.






Component of sewage

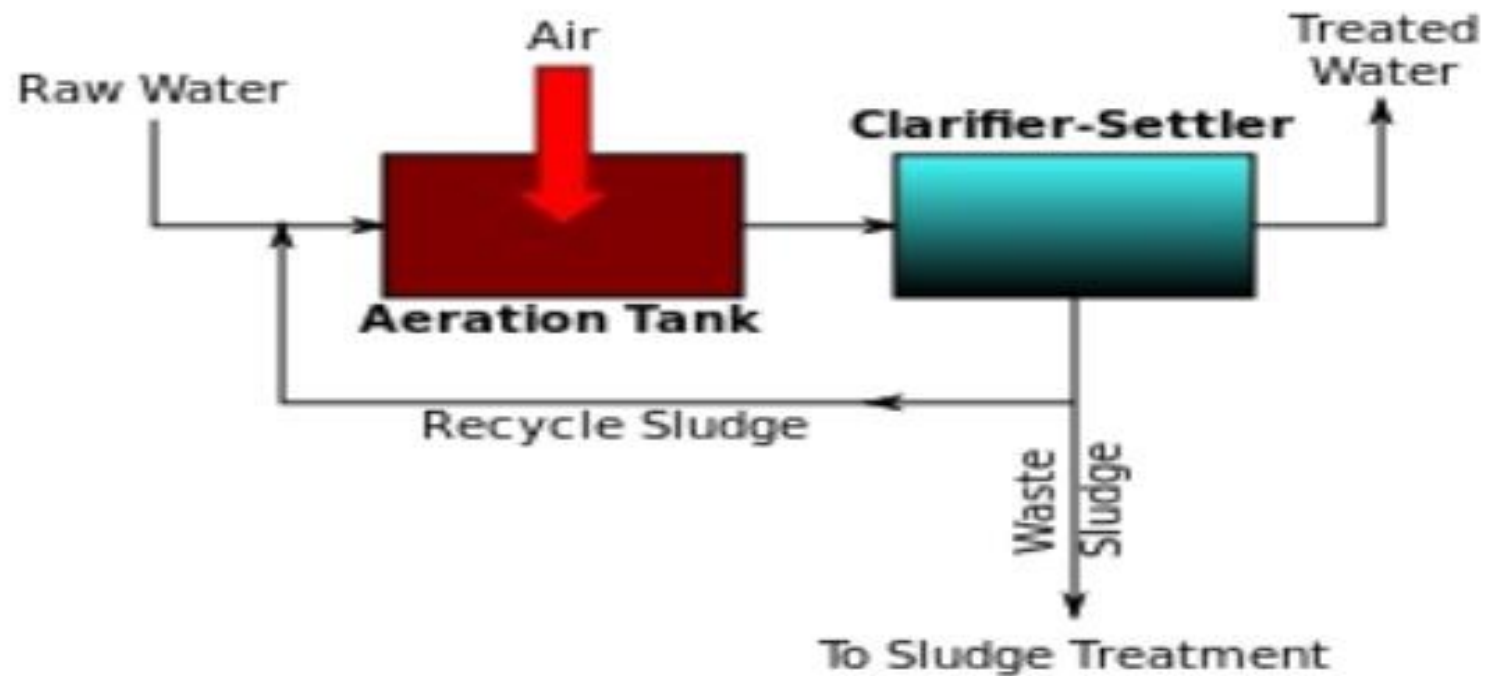
Treatment of sewage for Pisciculture

- Raw sewage – detrimental to fish.

The **strength of sewage** is determined by the **amount of oxygen required** to **oxidized** the whole **organic matter** and **ammonia** present in it.

Treatment processes

1. Mechanical treatment  Primary treatment
2. Chemical treatment 
3. Biological treatment  Secondary treatment
4. Dilution of sewage



Activated sludge process

WASTE WATER TREATMENT

Primary treatment

Removal of solid particles by

i) Screening

(for larger coarse particles)

ii) skimming (floating solids)

iii) sedimentation

(for suspended particles whose density is greater than that of liquid).

Secondary treatment-Removal of organic and inorganic soluble matter. Involves:

Activated sludge

Filtration

Oxidation pond



Coarse screener for large floating garbage and twigs.

Fine screener



Mechanical Skimming device.

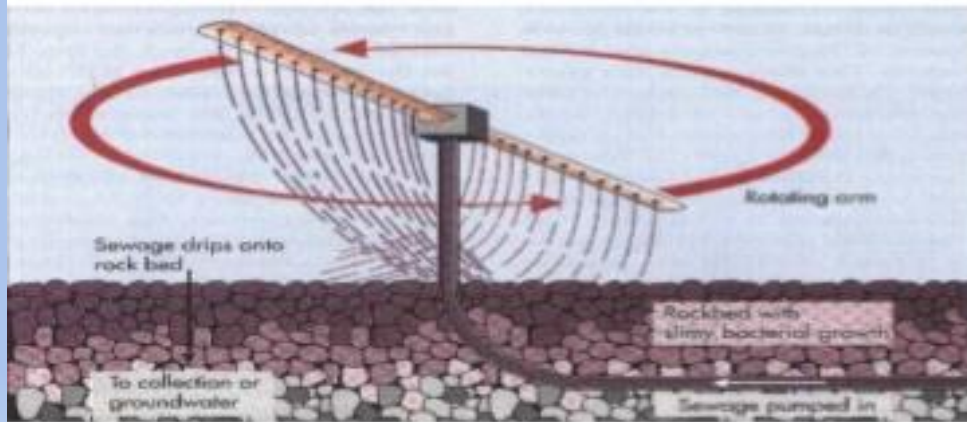
- Non-settleable solids are coagulated and removed
- Initially **Primary clarification** is done by bringing waste waters to **primary sedimentation tanks** so as to remove or reduce suspended solid content

Biological treatment

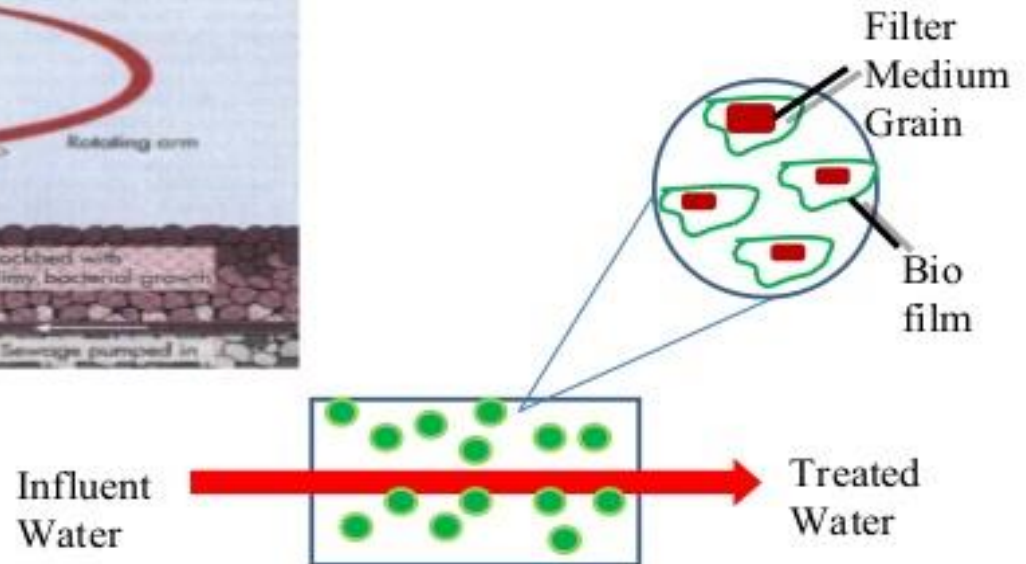
After removal of suspended solid content, the waste water is put to biological treatment for further process:

Filtration

There are two types of filtration process, viz., mechanical filtration and biological filtration such as trickling filter which uses filter medium grains covered with biofilm.



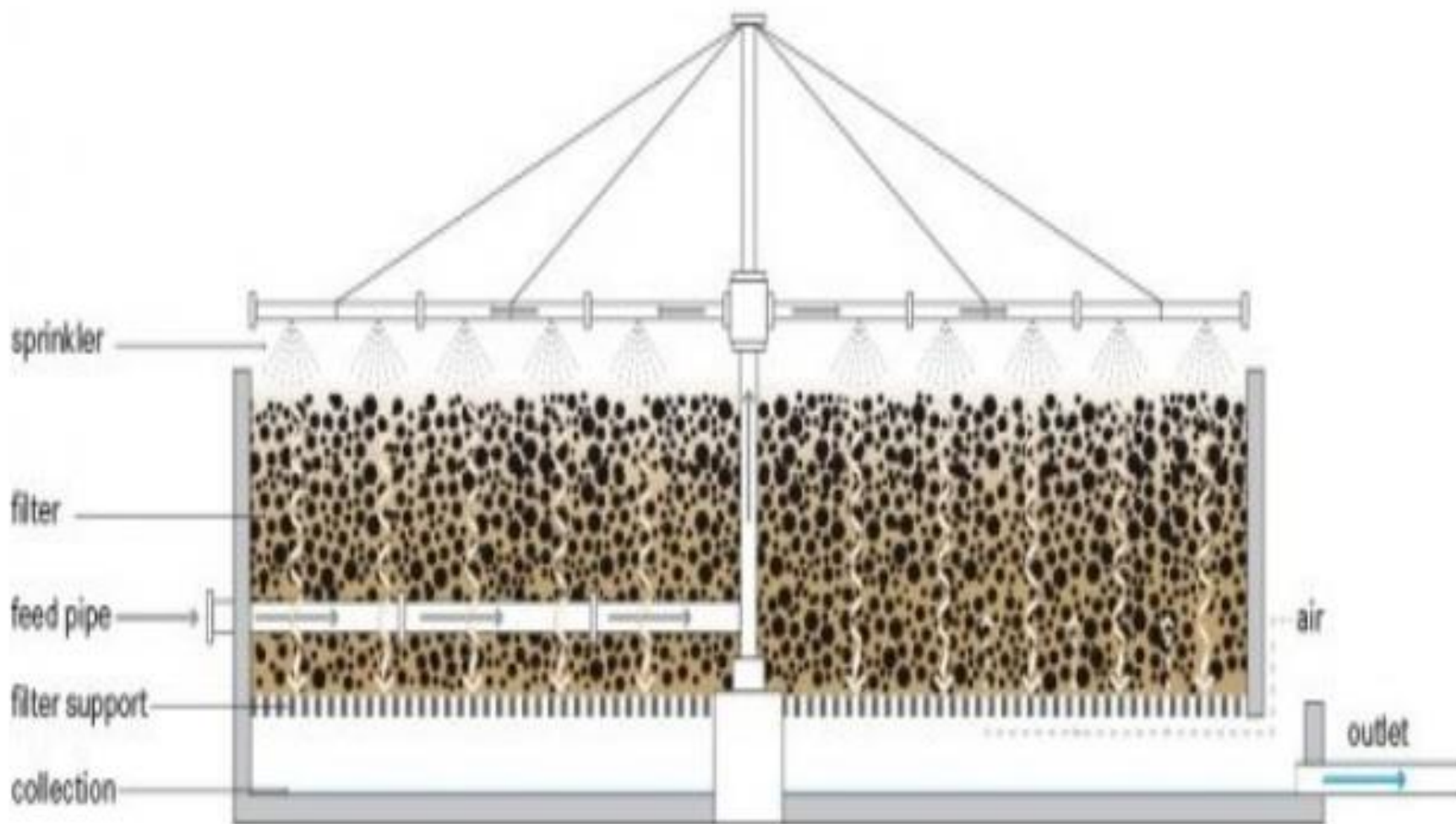
Trickling Filter.



carbon removal through biological filter.

Trickling filter

- A *trickling filter*, (trickling biofilter, biofilter, biological filter and biological *trickling filter*) is a fixed-bed, biological *reactor* that operates under **aerobic conditions**. Pre-settled *wastewater* is continuously 'trickled' or sprayed over the filter. As the water migrates through the pores of the filter, **organic waste are aerobically degraded** by the *biofilm* covering the filter material.



Trickling filter

- The *trickling filter* consists of a cylindrical tank and is filled with a high *specific surface area* material, such as rocks, gravel, shredded PVC bottles, or special pre-formed plastic filter media. A high specific surface provides a large area for *biofilm* formation.
- Organisms that grow in the thin *biofilm* over the surface of the media oxidize the *organic* load in the *wastewater* to carbon dioxide and water, while generating new *biomass*.

Chemical treatment

- This process aimed at coagulation or chemical precipitation.

Involves:

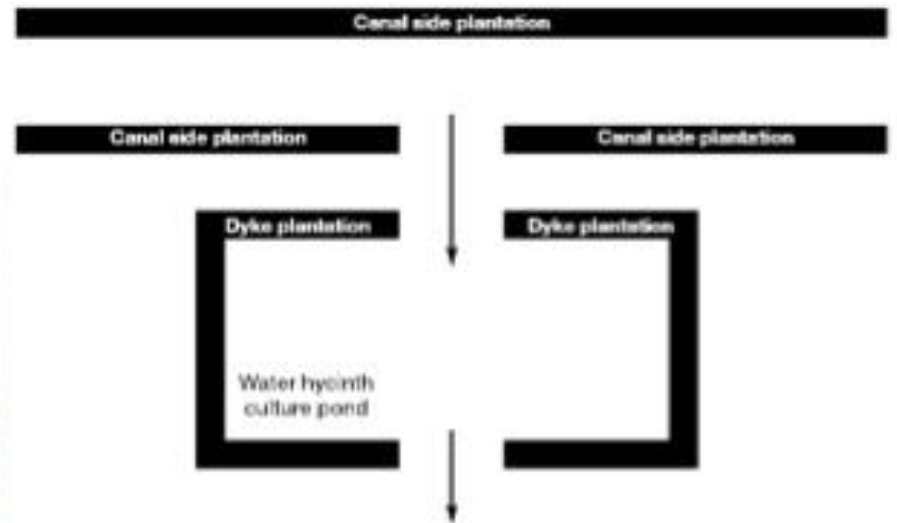
- Deodorization
- Disinfection

Chemicals like ferric chloride, chlorine, copper sulphate are used.

- i. Sewage is passed in to the pond from the canal through bamboo sluice. It is left to stabilize for 15 to 20 days.
- ii. The self purification of sewage takes place in presence of atmospheric oxygen and sunlight.
- iii. When the water turns green due to photosynthetic activity, the pond is considered as ready for stocking



Open channel through which sewage is flown to the pond.



A schematic diagram of sewage – fed farming.

ADVANTAGES

1. The sewage fed fish culture uses the waste recycling process and maintains the good environment around the urban area.
2. Manuring and supplementary feeding is not required due to high content of nutrients in sewage.
3. Input cost is very low and production is very high.
4. This is the biological method of treating waste water before its final disposal in river.

DISADVANTAGES

1. The sewage contain high load of organic and inorganic matters and toxic gases which may harm fish consumers.
2. As the raw sewage is used in fish ponds, there is a chance of infection and pollution to enter into human body through food chain. But this risk can be minimized if good managerial practice is followed.

III) Monoculture

- Only one fish species is reared in a culture system
- Trout, tilapia, catfishes, carps, shrimp

IV) Polyculture (Composite fish farming)

- Two or more different fish species are farmed
- Polyculture practices give higher yield than monoculture

The principal requirements of different species for polyculture are

- Different feeding habits
- Should occupy different columns in a pond system
- Should attain marketable size at the same time
- Should be non predatory in behaviour