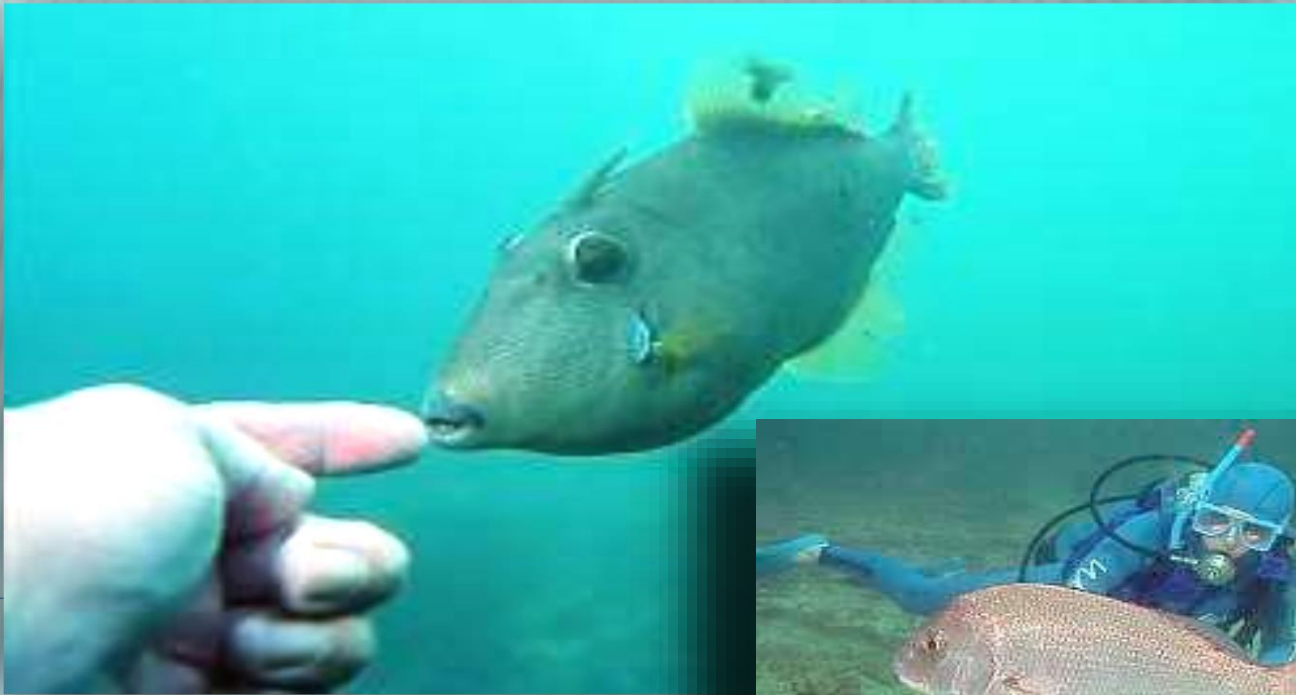


AQUACULTURE: SYSTEMS, METHODS AND TYPES



DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

Aquaculture is classified in several ways, depending upon the different aspects and situations involved in the culture practice.

Some basic and important classifications are :

On the basis of salinity

(a) Freshwater farming

- Farming of aquatic animals and plants in zero saline water

(b) Brackishwater farming

- Brackishwater is a mixture of seawater and freshwater with a salinity less than 30ppt.
- estuaries, backwaters, creeks and mangrove waterways are brackish in nature

(c) Marinewater farming

- Farming of aquatic animals and plants in sea water is marinewater farming or mariculture

DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

On the basis of intensity

Extensive fish farming system

- Least managed form of farming system
- Large ponds ranging 1 to 5 ha in area are used for farming
- Stocking density > 0.5 pcs/sq m (Fish), >5pcs/sq m (Shrimp)
- No supplemental feeding or fertilization is provided
- Harvest – 500 to 2000 kgs /ha

Semi-intensive fish farming system

- Involves rather small ponds (0.5 to 1 hectare in area)
- Stocking density -10000 to 15000 fish/ha, 5 to 10 pcs/sq m (Shrimp)
- Natural food developed by fertilization and withor without supplemental feeding for fish but in shrimp supplement feeding is done
- Harvest – 2500 to 10000 kgs (Fish) and 1500 to 2500 kgs (Shrimp)

Intensive fish farming system

- Intensive fish farming system is the well-managed form of fish farming
- To achieve maximum production of fish from a minimum quantity of water
- This system involves small ponds/tanks/raceways with very high stocking density (10-50 fish/m³ of water)

On the basis of species stocked for farming

Monoculture

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

Polyculture

- 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

On the basis of enclosure used for culture

(a) Pond culture

- Common method of fish culture
- Water is maintained in an enclosed area by artificial construction of dike/bund



(b) Cage culture

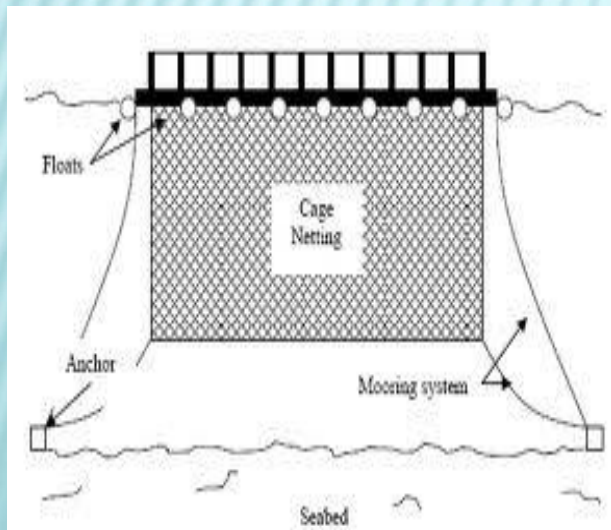
- Rearing of fish from juvenile stage to commercial size in a volume of water enclosed on all sides
- Cage culture is suitable to water areas which cannot be drained

Advantages of Cage Culture

- Effective use of existing waterbodies
- Technical simple
- Lower capital cost
- Easier stock management and monitoring

Disadvantages of Cage Culture

- Vulnerable to external water quality problems eg. Algal blooms, low oxygen
- Stock is more vulnerable to predators such as birds
- Growth rates are significantly influenced by ambient water parameters



(c) Pen culture

- Pen culture is defined as raising of fish in a volume of water enclosed on all sides except bottom
- This system can be considered a hybrid between pond culture and cage culture

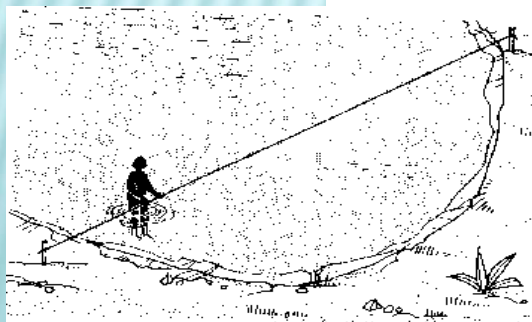
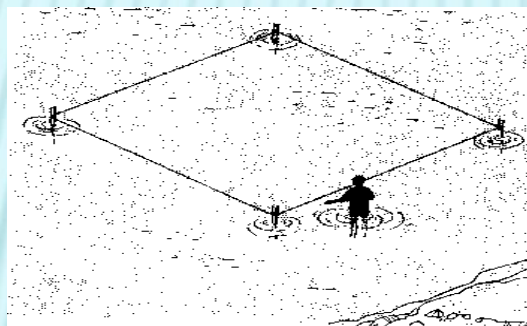
Advantages

- Intensive utilization of available space
- Suitability for culturing many varied species
- Ease of harvest
- The flexibility of size and economy
- Availability of natural food and exchange of materials with the bottom

DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

Disadvantages

- High demand for oxygen and water flow
- Pollution
- Rapid spread of diseases
- Risk of theft
- Conflict with multiple use of natural waters



DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

(d) Raceway

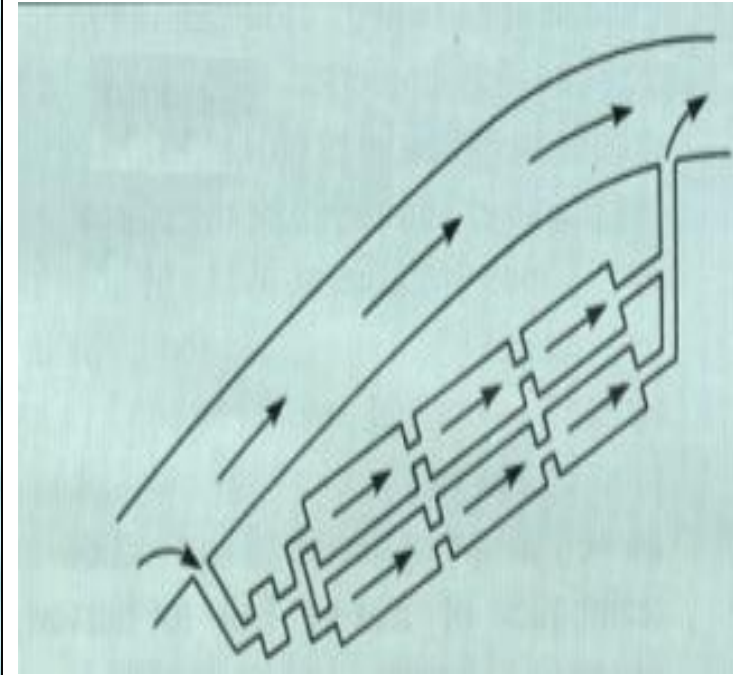
Raceway culture is defined as raising of fish in running water. Raceways are designed to provide a flow-through system to enable rearing of much denser population of fishes

Linear type : Ponds arranged in sequence the volume of water entering each pond is larger and as the same water is used repeatedly from pond to pond, occurrence of disease in initial ponds may directly affect the other connected ponds

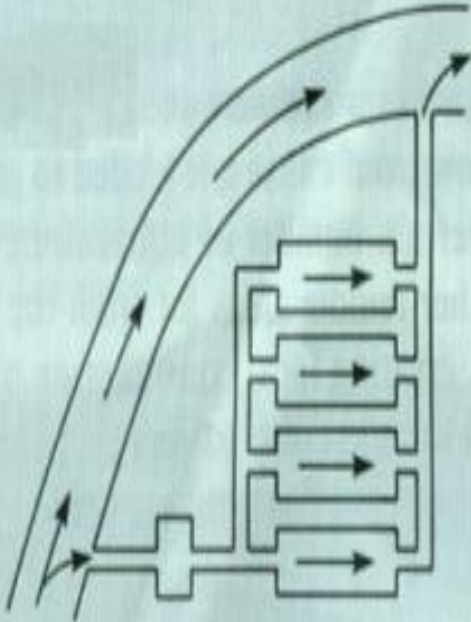
Lateral type : Ponds laid out in parallel in this type the volume of water entering each pond is smaller but a fresh supply of water is always ensured, and no transfer of disease from one pond to another.

DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

LINEAR TYPE



LATERAL TYPE



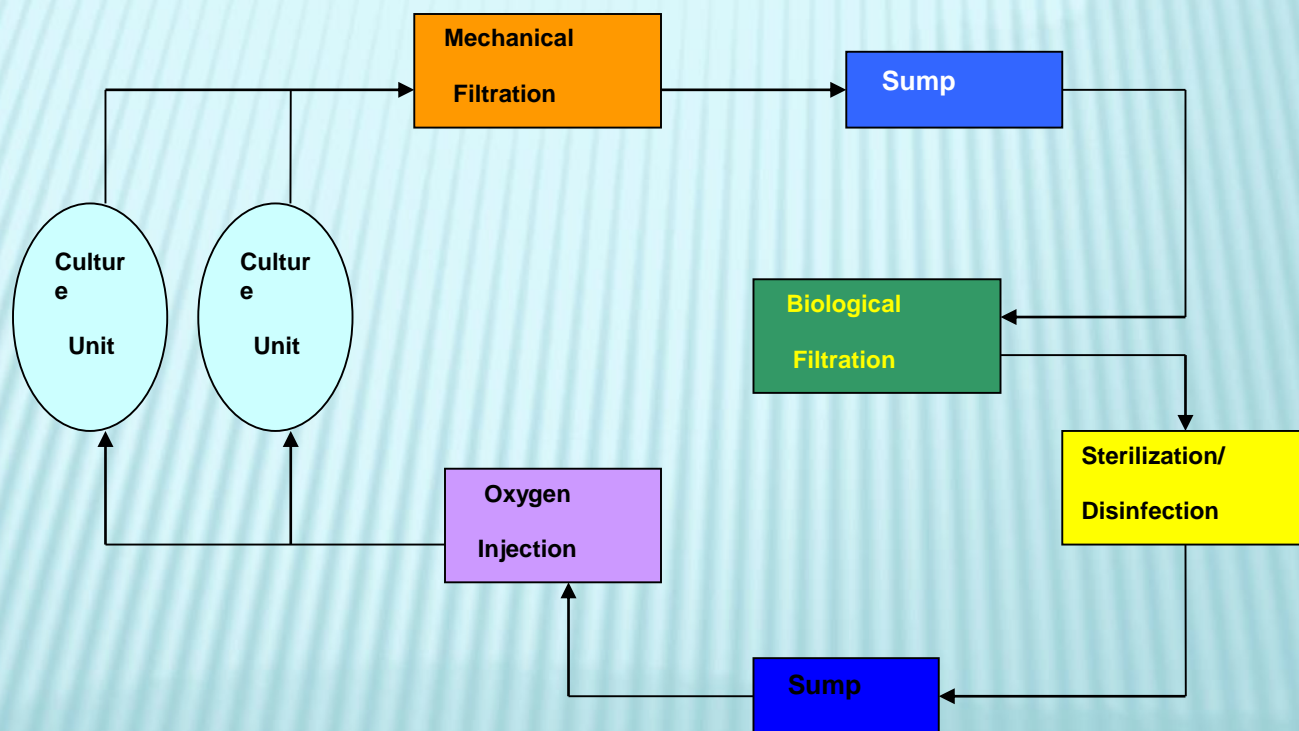
DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE



FLOW THROUGH HATCHERY FOR RED TILAPIA

(e) Recirculating Aquaculture system (RAS)

A Recirculating Aquaculture System (RAS) can be defined as an aquaculture system that incorporates the treatment and reuse of water with less than 10% of total water volume replaced per day.



DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

On the basis of different farm integration

Fish farming with agriculture

Fish culture is integrated with agricultural crops such as rice, banana and coconut, thereby producing fish and agricultural crops

Rice-Fish integrated farming

Rice varieties with strong root system like Tulsi, Panidhan, CR260 77, ADT 6, ADT7, Rajarajan and Pattambi 15 and 16.

Fish species such as Common carp, Tilapia and Murrells are most suitable for culture in rice fields.



Rice fish integrated system

DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

Horticulture-Fish integrated farming

The dykes and the adjoining areas of the ponds can be best utilized for horticulture crops.

Dwarf variety coconut, mango and banana.



Horticulture fish integrated system

Mushroom-Fish integrated farming

Seri-Fish integrated farming



Sericulture fish integrated system

Livestock integrated fish farming

In this integrated farming the excreta of ducks, chicks, pigs and cattle are used directly in ponds to increase plankton production which is consumed by fish or serve as direct food for fish.

Cattle-Fish integrated farming

For 1 ha pond 5-6 cows can provide adequate manure.

A healthy cow excretes over 4,000-5,000 kg dung, 3,500-4,000 litre urine annually.

Fish production - 3,000-4,000 kg fish/ha/year

Milk production – 9000 litres/Year

DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

Pig-Fish integrated farming

60-100 no of pigs are enough to fertilize one hectare area fish pond

A floor space of 3-4m² is required for a single pig

Exotic breeds like White Yorkshire, Landrace and Hampshire are reared in this farming system

Grass carp, silver carp and common carp (1:2:1 ratio) are suitable for integrated farming with pigs



Pig-fish integrated system

DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

Poultry-Fish integrated farming

Chicken droppings are rich in phosphorus and nitrogen

For 1ha fish pond 25,000 chicks can be reared

From poultry 90,000 to 1,00,000 eggs and 2500 kg meat can be produced

3000 – 4500 kg of fish is produced



Chicken-fish integrated system

Duck-Fish integrated farming

Ducks provide a safe environment to fish by consuming juvenile frogs, tadpoles and dragonfly in the pond

The duck dropping contain 25 per cent organic and 20 per cent inorganic substances

To fertilize 1 ha fish pond number of ducks required is between 100 and 3000



Duck-fish integrated system

DIFFERENT SYSTEMS OF AQUACULTURE AND CATEGORIES OF AQUACULTURE

Small ruminants such as goats, sheep and integrated rabbit-fish farming is also practiced only on a very small scale. These system has up to now not received much attention.

