Aquaculture System Selection

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Bringing Knowledge to Life
Aquaculture

- Raising
- Harvesting
- Controlled environment
Considerations

Access Your Resources
- Water, land, capital, time, aptitude and education.

Investigate Production Systems
- Suitable production system for your fish.

Species Selection
- Determine which species would fare best in your area.
- Obtain the necessary licenses (Ohio Division of Wildlife).

Business Planning
- Before you dive in, you'll need a detailed business plan.

Get Involved
- Join a producer association, attend workshops and get to know other farmers.
System Selection

Ponds enclose fish in a coastal or inland body of fresh or salt water. Wastewater can be contained and treated.

Recirculating systems enclose fish in tanks, where water is treated and recirculated through the system.

Cages enclose fish in offshore coastal areas or in freshwater lakes.

Farmers divert water from a waterway, like a stream or well, so that it flows through channels containing fish. The used water is treated before diverting it back into a natural waterway.
Fish Farming Methods: What do they farm?

Ponds:
- Fresh water prawn
- Yellow Perch
- Blue gill
- Largemouth bass

Cages:
- Salmon and Tuna
- Channel catfish and Tilapia
- Rainbow trout

Recirculating RAS:
- Tilapia
- Yellow Perch

Raceways:
- Fresh water prawn
- Yellow Perch
Ponds

Freshwater fish ponds differ according to:

- **Source of Water**
- **Drainage**
- **Fish farming method**
  - Spawning
  - Fingerling
  - Finishing
- **Material and Construction method**
Ponds in numbers…

- Construction Cost: Approx. $15,000.00/acre
- Most popular size: ½ to 1 acre
- Sizes: .25 – 10 acres
- Pond production: 3000-5000 pounds fish/acre
Levee Ponds

Levee ponds are the most common fish production method

*Common food species*
- Catfish
- Trout
- Largemouth bass
- Yellow perch
- Fresh water prawn

*Source of water:*
- Spring: check adequate flow, nitrogen gas
- Well: check dissolved oxygen, pollution

*Soil:*
- Slow infiltration rate
- High runoff rate
- At least 20% of clay
Basic Site Requirements for Levee Ponds

- ✓ Adequate supply of clean water
- ✓ Soil that holds water
- ✓ Suitable terrain for pond construction
Considerations:

- Insure water quality

- Natural movement of new water through the cage since fish cannot move

- Having water deep enough for the waste matter to move well below the cage
  - Water depth: 6 feet
  - Cage depth: 4 feet
  - Placed 10 feet from other cages
Cages

**Advantages**
- Adaptable on existing water sources
- Good for pilot projects
- Inexpensive to build

**Disadvantages**
- Hard to get to commercial size
- Tend to have more disease problems
- Slower growth than in ponds
- Biosecurity is an issue

Carrying capacity 10-20 lbs per cubic foot no more than 1,500-2,000 lbs./acre
Raceways

**Water supply**
Required large quantities of water
Gravity springs are most economical

**Location**
Near water supply

**Topography**
8-10 percent slope
18-24 inch water drop

**Construction**
earthen
concrete

trout culture
Types of Raceways

flow through multiple races  
flow through one race

*Production*: Assumption based on 20,000 to 45,000 pounds per year per cubic foot /sec. (449 gals/min) water flow rate.
Recirculating Aquaculture Systems (RAS)

Main Features

- High-Technology required
- Expensive Capital Costs
- Controlled temperature environment
- Adaptable on refurbished barns
- Conserves water
- Year-round production
- Future of production

Production rates range between 0.25 to 1.0 pounds per gallon depending on filter efficiency and water exchange rate.
Recirculating Aquaculture Systems (RAS)

*Site components*
- pump house
- emergency generator
- 3 phase electricity
- bulk feed storage
- oxygen supply
- building
Recirculating Aquaculture Systems (RAS)

System Components

*Primary*
- ✓ biofilter
- ✓ solids filter
- ✓ tanks
- ✓ pump
- ✓ buffering system

*Secondary*
- ✓ oxygen
- ✓ pumps
- ✓ heaters/chillers
- ✓ lighting
Recirculating Aquaculture Systems (RAS)

Why do we need biological filters?

- It helps maintain water quality in recirculating or closed loop systems.
- It improves water quality before water is discharged from a facility.

**Biological filtration** is the removal of harmful waste chemicals that is produced by fish waste and uneaten food in the tank. These waste products cause the rise of ammonia in the water. Ammonia is very toxic in high levels and it is a common cause of fish deaths.
Fish Farming Methods: What are the issues?

- Ponds
  - The discharge of untreated wastewater from the ponds can pollute the surrounding environment and contaminate groundwater.
- Cages
  - Waste from the fish passes freely into the surrounding environment, polluting wild habitats.
  - Farmed fish can escape and compete with wild fish for natural resources.
  - Diseases and parasites can be spread to wild fish living near the cages.
- Raceways
  - If untreated, wastewater from the raceways can contaminate waterways and spread diseases.
- Recirculating systems
  - Recirculating systems address many environmental concerns associated with fish farming: fish cannot escape, and wastewater is treated.
  - However, recirculating systems are costly to operate and rely on electricity or other power sources.
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