**FISH FARMING (AQUACULTURE)**

This is the artificial rearing of fish in a controlled environment like a pond, cage or tank for food or sale.

**Importance of fish farming**

1. It is good source of proteins and minerals.
2. It is a good source of employment.
3. It is a source of foreign exchange after exporting the fish.
4. Source of income to fish farmers.
5. It makes fish available nearby when reared in ponds.
6. It helps the farmer to diversify his or her income.
7. It is a source of animal feeds e.g. fish meal.

Advantages of fish farming

* It can be practiced on limited land.
* It is a cheap and good source of proteins, vitamins and minerals.
* lt makes proper use of land which is not Suitable for crop or livestock production.
* it reduces dangers associated with fishing in rivers, lakes etc.
* It provides an easy and cheap source of fish instead of going to rivers or lakes.
* Farmers can economically control the type and number of fish in a pond.
* The market for fish and fish products is widely available.
* The fish fetch high incomes for the farmers.

**Species of fish reared in Uganda.**

1. Tilapia: it belongs to the family Cichlidae. It grows quickly in the pond, it is resistant to many diseases, it  
   breeds well and can adapt easily to temperature changes in the pond, it has a better taste compared to other fish, and it has the highest demand on the market.
2. Cat fish: it has the ability to breath and remain alive even after the pond has dried, it can withstand high temperatures in the water, it can feed on a variety of foods in the pond e.g.  
   snails, worms and small fish, it can be kept in very shallow waters, can be kept together with tilapia in the same pond.
3. The carp: it breeds well, grows faster and resistant to many diseases. It can be kept in cold waters or where temperatures fluctuate frequently.
4. Nile perch; It attains a maximum weight of [200](tel:200) kg. It is a fresh water fish, has distinctive dark black eyes with a bright yellow outer ring. Reaches maximum length of nearly 2 meters. It is a predatory fish.
5. The silver cyprinid or silver fish (Rastrineobola argentea) also known as the Lake Victoria sardine or **mukene**, is a species of pelagic, freshwater ray-finned fish in the carp family, Cyprinidae from East Africa. it is the only member of the genus Rastrineobola

FISH POND

This is an area which is dug and prepared so that the fish can be introduced into it.

**Features of a good fish pond**

* Permanent/reliable water Source flowing throughout the year to ensure oxygen supply.
* The site should be free of gravel or stones and sand to prevent drainage of pond water.
* Should have a clay basement and walls to hold water.
* Gently sloping that allows free water flow in and out of the pond.
* Close to the homestead for security and supervision.
* Close to the market center since fish is perishable
* Water must be free from any pollutants such as chemicals and other wastes

**Soil test procedure**

**Procedure A**

* Take a handful of wet soil.
* Knead in between fingers and roll into a ribbon.
* Throw it into the air and catch it.
* If the ribbon does not break, it is truly clay.

**Procedure B**

* Dig a hole 1m deep by 30cm wide.
* Fill it with water in the evening and leave overnight, and then fill again in the morning.
* Good soil should retain water up to the evening of the second day.

*Factors to consider when selecting a good site for a pond.*

* Topography i.e. a place where water flows gently from the source.
* Soil type: Soil should be clay
* Source of Water should be available and free flowing.
* Security e.g. near homestead.

**Procedure establishing a fish pond**

* Clear the site of vegetation, tree stumps and stones.
* Mark out the area of the pond with pegs
* Digg out the top and sub soils. Topsoil is separated from the other. Upper side is 0.5m deep and lower side is 1.5m deep.
* Build the walls (dykes) firmly using soil mixed with sand to prevent leaking of water through cracked walls.
* Fix inlet and outlet pipes in the walls which may be made of bamboo or  
  metallic or plastic to improve pond drainage.
* Allow the floor/base of the pond to slope evenly and gently towards the lower end.
* Put lime on the floor to maintain pH in pond water.
* Walls of pond should be planted with grass to control soil erosion.
* *Construct the fence round the pond*.

**Constructing the Inlet, outlet and spillway**

*Inlet*: This canal or pipe at the entrance of the pond to bring in fresh water. It should be fitted with a screen to prevent entrance of undesirable fish species.

*Outlet*: it is made at the deeper end of the pond. A screen is fitted at the mouth of the outlet to prevent fish swimming away.

*Spillway*: this is channel to remove excess water back to the river or stream. It is made at the top of the dyke at the lower side of the pond. It prevents water from overflowing on the dykes.

**NB:** Grass is planted on the dyke and land around it tostabilize the ground. This prevents dyke erosion.

The pond is fenced to keep off predators and unauthorizedpersons.

**Features of a good fish pond**

* Should permit free flow of clean fresh water in and out of the pond.
* Mud should not stir up from the floor or the walls.
* Should provide good conditions for:  
  - Efficient food utilization by the fish.  
  - Health of the fish.  
  -Rapid breeding of the fish.
* Should be easy to drain.
* Should be easy to fertilize to stimulate algae growth.
* Should be well protected (fenced) from wild animals and predators.

**Care and maintenance of the fish pond**

* Plant vegetation on the wall tops to control soil erosion.
* Cement the walls to avoid leakage.
* Slash or mow the vegetation that is over grown around the ponds to control predators.
* Maintain a good level of water in the pond and if the level is low, top it up.
* De-silt or drain the entire pond of foreign matter if needed.
* Maintain a proper fence around the pond to avoid predators.
* Remove weeds that grow from the pond.
* Fertilize the fish pond to stimulate algae growth.
* Dig out the pond floor, flatten and add lime from time to time.
* Add dewormers into the pond wator to control worms in the fish

**Fertilizing pond water**

The application of organic or inorganic fertilizers at least once every two weeks in  
pond water. Organic fertilizers recommended for new ponds are; Compost heap, Chopped vegetation and leaves, Animal manure and Urine. For old ponds, use Phosphatic fertilizers  
Application of fertilizers encourages the development of natural feeds (algae).

**Introduction of fish in the pond**

* Obtain fry (small recently hatched fish) or fingerlings (young fish about 10 cm long) from a fish breeding station for the new pond.
* Transport them in oxygenated clean water contained in plastic bags or oil drums. Take care not to injure the fingerlings or fry.
* Before putting the fish in the pond, make sure that the pond water has the same temperature as the container water. Young fish often die due to shock, especially if they are introduced into hotter or colder ponds.
* Gently lower the bag or container into the pond and allow the young fish to voluntarily swim out. Do not force them out or pour them into the ponds to avoid death through shock.
* Introduce the right number of young fish into the pond about 5-10 fingerlings per 5m2. .

**Factors that determine stocking ratesof fish ponds**

* The fish species.
* Fertility of the pond water.
* Availability of food at the time of introduction.
* Size of the pond.

**Oxygen in the pond**  
Fish use the gills to take oxygen from the water during respiration.  
  
The amount of oxygen in ponds may depend on;

* Water temperatures.
* Wind
* Salinity of the water.
* Plant photosynthesis.

The amount of oxygen in ponds may  
be reduced by;

* Muddy pond water which reduces the amount of sunlight reaching the plants under water.
* Low rate of photosynthesis on cloudy days when the sunlight supply is low.
* High pond temperatures which reduces the water holding capacity for oxygen.
* Oil covering the pond water which prevents the sunlight rays from reaching the planktons located under the water.  
    
  Ways of increasing oxygen in ponds
* Use inorganic instead of organic fertilisers.
* Drain old water and replace it with fresh clean water.
* Introduce more plants into the pond.

**Feeding Fish**

1. They mainly feed on planktons.
2. Other Fish foods include: kitchen wastes, fishmeal, chicken and pig dung, bread crumb. chopped grass/cassava/sweet potatoes, Ground nut cake, kitchen waste, slaughter house waste, leaves.
3. Provide a complete diet.
4. Feeds must be floating since sinking feeds fall at the bottom where fish  
   cannot reach.
5. Feed fish daily at least 6 days a week while observing them eat.
6. Feed between mid-morning and late afternoon when temperatures are  
   optimum.
7. Over feeding fish lowers water quality and increases costs of fish feeding.

Underfeeding fish lowers the growth rates of fish.

1. Change of food should be gradual.
2. Manure and fertilizer should be added to encourage growth of planktons.

**Predators of fish and their control**  
Predatory birds, snakes, rats, frogs other carnivorous fish.  
  
**Ways of controlling predators of fish**

* Drain the pond to kill unwanted creatures left on the floor.
* Apply poisonous chemicals that kill predators e.g. ratenone.
* Use a net to catch some of the predators.
* Scare out predators like heron/eagles.
* Use the animals that eat the predators without catching the fish.
* Slashing vegetation around the pond.
* Constructing a wire mesh around the fish pond to obstruct predators.

**Fish health**  
The following should be done in order to maintain fish health;  
- Keep the system clean from falling objects.  
 -Constantly remove algae from the bottom and from the sides of the   
 pond/cage to improve water quality.

**-**Minimize bacterial infections in your fish farming operations by disinfecting  
tools such as nets.  
-Keep pond water clean and of good quality.  
  
**Signs of disease in fish**  
-Skin discolouration.  
-Open wounds and lesions.

**-f**in erosion.  
Spots on the skin.  
General erratic behavior.

**Considerations when conducting fish farming**  
-Depth and overall size of the pond.  
-source of the water.  
-Soil types.  
-Drainage system of the area.

-Power supply for aeration of the watrer.

-Feeding rate.

-Fish harvesting.

**Systems of fish cultures**  
1. **Pond system:**  
2. **Cage system**: raising fish in large, submerged cages that can be used in  
ponds that otherwise would not be ideal for fish farming. The cage size  
determines the number of fingerlings to be purchased or stocked.  
Stocking rate is 7 or 5 fingerlings per cubic foot.  
Example; if a cage is 4 ft wide, 4 ft long and 4 ft deep, the stocking rate is:  
4 x 4x 4 =64 cubic feet  
Stocking rate 64 x 7=[488](tel:488) fingerlings  
**3. Recirculating aquaculture systems**: An indoor system that allows farmers to control environmental  
conditions. It has a high maintenance cost.

**Causes of fish mortality in ponds**

* Wounds from territorial fighting or accidents.
* Oxygen depletion, low levels of dissolved oxygen in the water.
* Toxic algae blooms;
* Hydrogen sulfide; is a toxic gas created under cinotoxic conditions often found on pond bottoms covered with large amounts of organic matter.
* Bacterial or parasite infections.
* Sewage disposal into the pond.

**Cropping and Harvesting of Fish**

This is the removal of fish from the pond ready for marketing. Tilapia reach  
maturity at 12 months, carp at 18 months

**Cropping**

This is the removal of only marketable size of fish from the pond.

**Harvesting**

This is the removal of all the fish from the pond by draining the pond.

**Methods of harvesting fish**  
**1. Drainage of pond water**:

* The inlet is closed stopping water inflow.
* Normal cropping is done using a sine net to remove all large fish.
* Outlet is opened to allow water to flow out. Provide screens on the outlet pipe to prevent small fish from escaping.
* A scoop net is used to catch the fingerlings which are kept in holding pond.
* Water is completely drained for the pond to dry up.

Draining is the best method used for harvesting fish.

**2. Use of nets**: large fish is caught with a gill net having a mesh size of about 3cm. The net is reached at both ends of the pond with stones tied at the bottom. The nets are then dragged along the pond three or four times to catch the fish. This is the best method for cropping fish.

**Tools used to catch fish**

* Baskets
* Spears.
* Hook and line.
* Nets.
* Draining.

**Advantages of using seine nets over hook and line**

* Only marketable sizes of fish are caught.
* Fish are not injured in the mouth.
* Ensure large number of fish is cropped.

**Maintenance of the pond**

* Repairing the dyke or any structure on it.
* Cleaning the pond and remove foreign materials.
* Plant grass where necessary.
* Remove undesirable vegetation.
* Remove silt.(desilting).
* Restock after 2-4 weeks by returning the fingerlings to the pond using a scoop net.
* Control predators.

**Fish processing and Preservation**

**Practices carried out on fish before preservation**

* Clean the fish to remove mud and worms.
* Remove scales and slime.
* Open the fish to remove the gut and intestines (gutting).
* Clean the abdominal cavity thoroughly.
* Keep fish in open containers.

**Preservation methods**

**Sun Drying**: the fish is dried under the sun to reduce the moisture content of the fish thus reducing bacteria growth rates.  
**Salting**: the fish is cut open along the backbone i.e. dorsally and the internal organs removed. It is then covered in alayer of salt.  
**Smoking**: fish is cut open and soaked in brine and placed in a large oven where smoke and heat from wood dries the fish at a temp of 70oC  
Canning: it involves sealing cut pieces of fish in metal or glass containers and cooking under pressure. The high pressure and temperatures kill any bacteria present.  
**Freezing**: fish is placed in very cool temperatures of about 10°C to kill any bacteria and prevent decaying.  
**Dehydration**: involves removal of water from the body of fish under controlled conditions under mechanical means while maintaining the nutritional value of the fish.

NB: Fish are transported to the market in refrigerated containers to prevent rotting.

Fish are exported or sold locally.