

Planning, designing and construction of aqua farm

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Planning of fish farm

- Layout planning
- Man power planning
- Material planning

- **Layout planning**
- Lay out planning is the most important aspect of any aquafarm project, because the shape of the farm ponds and the arrangement of water channels and ponds dictate the efficacy and cost of construction of the farm.
- Layout planning deals with the **distribution of total farm area for various farm elements** depending upon the requirement based on the scientific consideration.
- Layout planning gives the information like location of main channel, required productive area, dimensions of sluice gates etc.
- The best layout would be one that **gives maximum cultivable area and minimizes the area occupied by bunds and channels**, which in turn reduce the cost of construction per hectare of water area of the farm.

- Layout planning also deals with design of all the farm elements like embankments, ponds, inlets, outlets, water channel, drainage unit, hatcheries, other sheds etc.
- Layout planning varies considerably from site to site, depending upon topography, level of the site, location of water recourses and purpose of the farm.
- Layout should also be planned to have a good water exchange system.

- **Man power planning**
- Man power planning deals with economical aspects ie estimation of **cost of the project and time required** to complete the project.
- Total number of skilled labours, unskilled labours, masons, supervisors, technical and scientific personal required in total construction of the farm is calculated in addition to calculation of total number of man days required to complete the project.
- **Sound knowledge of locality, socio- economic condition of the locality, daily wages paid, time period required for various farm elements** is very much desired for proper man power planning. Since it deals with financial aspects of the farm construction, proper care should be taken during planning.

- **Materials planning**

Material planning deals with the procurements of construction materials and equipments.

- All the materials required for construction must be brought and kept in a safe dry store room as non availability of construction materials during the time of construction greatly hampers the progress of the work.
- Construction of a temporary shed to store the materials is also important

Classification of ponds based on culture

- In general, for fish culture ponds can be grouped into following types,
- Nursery ponds
- Rearing ponds
- Stocking ponds

- **Nursing ponds**

Nursery ponds are small and shallow depth. These ponds are used for raising spawn to fry stage (4-5 mm to 20-30 mm). Generally 5 % of total area will be allotted for these ponds. Usually 0.02 to 0.06 hectare area is to be provided. The depth of pond ranges between 0.75 to 1 m.

- **Rearing ponds**

- Rearing ponds are used for growing of fry to finger lings, size (20 -30 mm to 50 -60 mm). Generally 20 % of total area will be allotted for these ponds. Usually 0.06 hectare to 0.12 hectare area is to be used. Depth of rearing ponds ranged between 1.0 to 2 m.

- **Stocking ponds**

- The stocking ponds are larger in size and deeper in depth and serve for the purpose of growing finger lings to the marketable size. Generally 75 % of total area will be allotted for these ponds. Usually 0.2 to 2 hectare area is using and the depth varies from 2 to 3.0 m.

- **Important points to be considered to select the size of the pond**

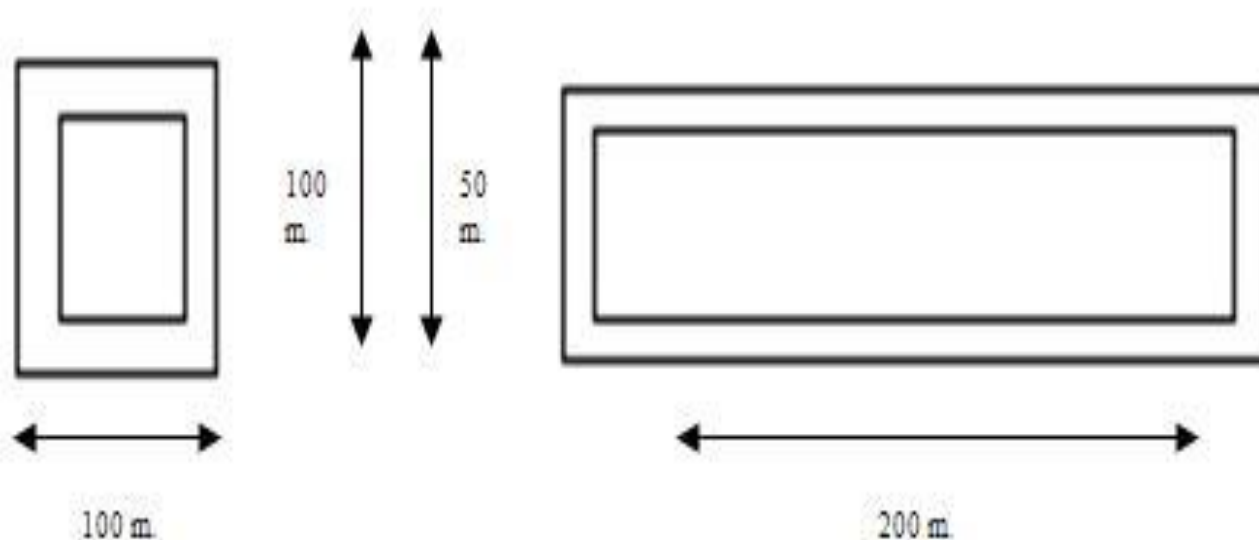
There is no set of standards for ponds size. The sizes are determined based on situation. The following are the some of the important factors to be considered for determining the size of the pond.

- Shape and size of the land.
- Slope of the land.
- Type of fish.
- Type of culture.
- Quantity of fish to be stocked.
- Size of fish.
- Duration of culture.

- **Approximate allocation for different types of ponds**
- Breeding ponds - 0.5%
- Brooders stocking ponds - 1.5%
- Nursery ponds - 2.5% - 5%
- Finger lings - 10%
- Rearing ponds - 23%
- Stocking ponds - 60%

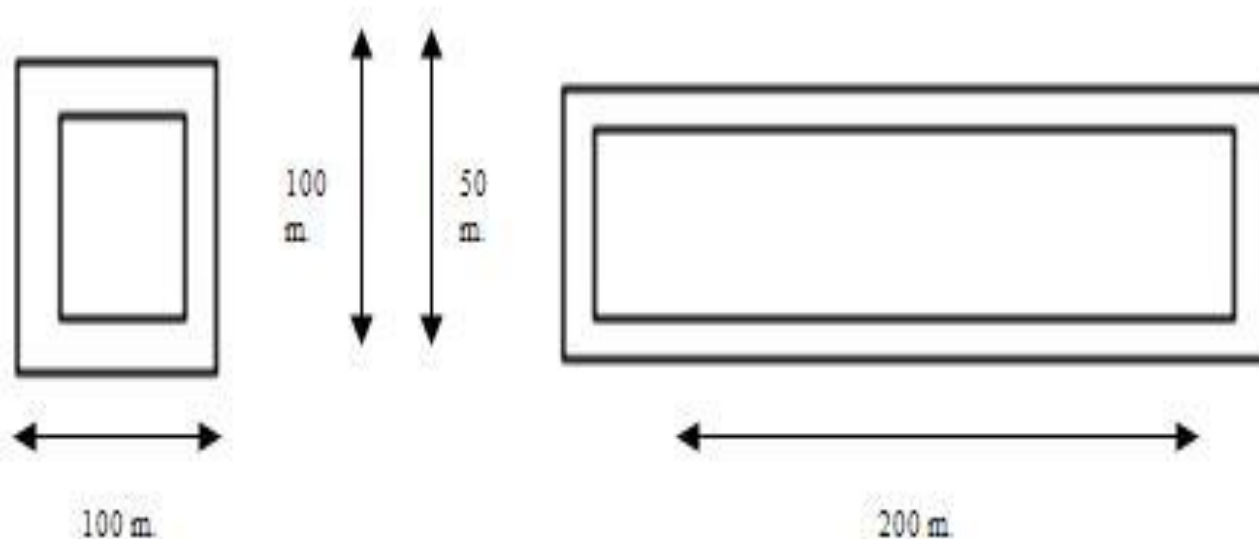
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- Total length of dyke required for construction of one hectare water spread area pond is 400 m. Where as in rectangular shape pond of same area require 500 m length of dyke. Hence the cost of construction of square shape pond is less.
- But from operation, maintenance and harvesting point of view, rectangular shape pond is preferable than square shape pond.
- As far as possible the ponds should be regular in shape. Irregular and oblong shape ponds are difficulty in construction, management and maintenance point of view.

- **Large and small ponds**

In designing pond layout emphasis should be always given to economies of construction, operation and subsequent maintenance of ponds. The cost of construction of large ponds per acre is less compared to cost of construction of small ponds.

- **Advantages of large ponds**

- Cost of construction is less per hectare of water spread area.
- Area required is less per hectare water spread area.
- Availability of oxygen is more in the water.

- **Disadvantages**

- Filling or emptying of ponds takes long time
- High maintenance cost
- Difficulty in controlling diseases.
- Harvesting is difficult.

- **Advantages of small ponds**

- Harvesting can be done easily and quickly.
- Drain and refill can be done easily.
- Treatment for disease is easy.
- Erosion due to wind velocity is less.

Design of ponds

- **Pond geometry**, example shape and size mainly depend upon the intensity of culture, species to be cultured, purpose of the pond.
- The usual practice is to have the pond size between 1 to 5 ha for extensive farming, 0.25 to 1 ha for semi-intensive farming and 0.025 to 0.25 ha for intensive farming.
- Circular and square shapes are more commonly used for smaller ponds. The larger ponds, on the other hand are usually constructed in rectangular shape as it facilitates the pond management and culture operation.

- **Depth of pond**
- Species to be cultured
- Purpose of culture
- Temperature and light penetration

- **Top Width**

- The top width or crown of the dyke depends on the height of the dyke and its purpose.
- Engineering standard require a minimum top width of 2.4 m for all dykes between 3 to 4.5 m high.
- Dykes between 4.5 to 6m require a top width of 3.7 m.
- However in actual practice most of the main dykes of a coastal aquaculture farms are built with a top width between 1.5 to 2.5 m.
- If the dykes are to be used as a roadway a minimum of 3.7 m top width should be provided.

- **Side slope**
- Type of soil - Side slope
Clayey soil - 1:1
Loamy soil - 1.5:1
Sandy soil - 2:1
Loose soil - 2.5:1

- **Bottom slope of pond**
- For intensive and semi-intensive culture system, regular flat bottom pond bed with uniform slope is preferred.
- In case of extensive farming, pond bed maybe designed with trenches which cover usually 20 to 25 percent of the total pond area.
- The pond bottom is provided a slope between 1000:1 to 1000:5 towards the drain to facilitate the water flow during harvest and pond drainage.

Construction of Fish ponds

- **Introduction**
- Type of construction mainly depending upon the availability of raw materials like bricks, stones, cement etc,.
- Type of construction also depends on the function of farm element and culture system, e.g. cement concrete ponds are constructed for nursery ponds.
- Cement concrete ponds are constructed for intensive and super intensive culture practices.
- The best time period to construct the ponds is in between late winter and early summer season.

- **Following are the sequences of operations to be carried out in the process of construction.**
- Survey of the site
- Land clearing
- Land making
- Excavation
- Construction of drainage system
- Construction of dykes and sluices
- Lining of the embankments/ dykes
- Hatcheries and other units
- Office lab, store room etc.
- Construction of residential quarters, watchmen shed etc.

- **Land marking**

After the land is cleared off then the land is to be marked for the construction of various farm elements as per the layout planning.

- This operation involves laying out the features of ponds on the ground in order to mark out the area from where the earth will have to be cut or removed, and also where earth will have to be embanked.
- Initially lines are drawn according to the layout followed by pegging and fixing stakes or posts.