Unit 5: Site selection and construction of fish farm

Site selection

Appropriate site selection is one of the most important factors that determine the success of the fish farm. Before construction of the pond, the water retention capacity of the soil and the soil fertility has to be taken care of because these factors influence the response to the organic and inorganic fertilization in the farm pond. The selected site should have adequate water supply round the year for pond filling and other uses. The pond construction has to be based on the topographic area. In swampy and marshy areas, bunds should have a greater accumulation of soil to build the pond of a preferable size. Self-draining ponds are ideal for higher elevation areas. The site should be easily accessible by road or any form of transport to reach the market for easy fish disposal. In addition to this, the accessibility of inputs such as feed, seed, fertilizer and the construction material should also be available nearby the site. The site should be free from pollution, industrial waste, domestic waste and any other harmful activities.

For, site selection the following ecological, biological and social factors need to be considered.

Ecological factors

In site selection for a pond, the ecological factors to be considered include soil, water, topography and climate.

Soil

The soil quality influences the pond productivity and water quality and determines the dyke construction. The properties of soil texture and soil permeability are determined to decide the suitability of a site. Pond bottom should have the ability to hold the water. Loamy, clay loamy and silt clay soil types are most suitable for pond construction. A good quality gravel should not exceed 10 percent. Thus the rocky, sandy, gravel and limestone soil types are to be avoided.

Evaluation of soil suitability

Soil suitability can be evaluated by three methods.

- In squeeze method, take the soil in wet hand and squeeze the soil by closing your hand firmly. If it holds its shape even after opening the palm of your hand, soil is suitable for pond construction.

- The ground water test is the best method to evaluate the soil suitability. Dig a pit of one-meter depth and cover it with leaves for a night. If the pit is filled with ground water in the next day morning then a pond could be built. However, in such soils, drainage may require more time due to the availability of sufficient groundwater. If the pit is empty the next morning, the site is suitable for pond construction, but the water permeability has to be tested.
- The third method is the water permeability test. Pour the water into the pit and cover with leaves. If no water is found in the pit on the next day morning then there is seepage. To confirm this, once again pour the water into the pit and cover it with leaves. If the water availability is high then the site is suitable for construction. But if the water is drained, the site is not suitable for pond construction. However, the site can be used through use of plastic or heavy clay to cover pond bottom.

Water

An adequate amount of water is required to build the fish farm because water depth needs to be adjusted at regular intervals. Natural water bodies such as reservoir, river, and lakes have stable water quality parameters (Water temperature, dissolved oxygen, pH, alkalinity and water hardness) when compared to borewell and well water. The site should be away from the flood area. Water should not be acidic or alkaline and if found to be so, suitable correction is to be done by applying lime or organic manure respectively.

The ideal water temperature is 20 – 300C for a fish farm. Water Salinity is the amount of salt dissolved in water. A few freshwater fishes such as tilapia and catfishes grow even in salt water, but the carps can withstand only in freshwater.

Topography

Type of pond construction is determined by the land topography. Normally, flood prone areas and poor rainfall areas need to be avoided. Areas such as industrial zones, fields with underground oil pipelines, irregular land area, fields with high electricity poles and radio masts and highly rooted vegetation area are also not recommended for pond construction.

Biological factors

Biological factors include the species to be cultured, seed source and culture type and they need to be considered before site selection of farm.

Social and economic factors

The ecological and biological factors are a prerequisite for good practices in aquaculture site selection and site management. It is also important to get to know the social and economic background of the area and understand the culture and traditions, particularly ideas and beliefs locally associated with aquaculture practices. The social fabric, market, and its structure, services directly or indirectly linked with aquaculture sector such as transportation, storage, wholesale market aspects etc are to be considered. The land identified for farm should be without legal issues and fish farming should be accepted by the local people. Other factors include availability of labour, electricity, medical facilities, and transportation.

Pond Construction

An intelligent design and layout is a prerequisite for an efficient pond construction. The excavated earth should be used to construct the dyke and with a plodding slope towards the outlet for the proper draining facility. Preferably construction of pond has to be completed during summer so that the pond can be used for stocking.

Steps in pond construction

Normally, the pond construction includes the following steps.

Step 1: Prepare the site by removing unwanted things such as the trees, bushes, and rock

Step 2 : Construction of seepage-free and secure dyke by using the clay core

Step 3 : Digging the pond and construction of dyke over the clay core

Step 4 : Inlet and outlet construction

Step 5 : Pond dyke covered with soil and plant grass species (avoid long rooted plants such as Rhodes grass and star grass)

Step 6 : Pond should be fenced to avoid theft and entry of predatory animals

Site preparation

The place is cleared of ropes, cables and other items. Trees and bushes and other obstacles that hinder movement of heavy equipment around the site are to be removed - manually / animal power /using machinery. All vegetation including wood are to be cleared in the area (inclusive of 2 to 3 m beyond the dyke for workspace). Trees within 10 meters surrounding, tree slumps, large stones, are also to be removed. The surface soil which has the highest concentration of

roots and organic material is not suitable for pond construction. Hence, about 30 cm of surface soil has to be removed.

Construction of dyke

Dykes should be compact, solid and leak free. A desirable dyke is constructed using 15 - 30 percent of silt, 45 - 55 percent of sand and 30 - 35 percent of clay. A sufficient width of the berm (not less than 1 m) is required to stabilize slope. The embankment slope in horizontal to vertical should be 2:1 in good quality clay soil and 3:1 for loamy silt or sandy soils. To raise the dyke, the clay buddle (1:2 sand and clay) is deposited as 10 - 15 cm thick layer and it can be formed at centre or inside the waterside of the pond. The crest of the dyke should be sufficient to help allied farm activities and the top of embankment should be above 1 m. Extra outlet is essential on the embankment as a safety measure to avoid damage due to excess raise in the water level.

Digging the pond and construction of dyke

Types of pond

Specific kinds of ponds are required for specific life stage development of fishes - such as nursery, rearing, stocking, treatment and broodstock pond. The rectangular pond is preferred than round shaped corners as it prevents the fish escape during harvest. An ideal length and breadth ratio of the pond is 3:1 is ideal, with breadth not more than 30 - 50 m. The total farm area can be divided as - nursery - 5 % of total farm area, rearing pond - 20 %, stocking pond - 70 %, and bio pond or treatment pond - 5 % of the total farm area.

Nursery pond - The size of the nursery pond is about 0.01 to 0.05 ha with a depth of 1.0 – 1.5 m. The spawn (3 days old) are stocked in nursery pond, reared for a maximum of 30 days (to attain 2 – 3 cm length).

Rearing tank - a tank where the fry are reared into fingerlings (to attain a size of 10 – 15 cm) and the culture duration is 2 – 3 months. The size of pond varies from 0.05 – 0.1 ha with water depth of 1.5 – 2.0 m.

Stocking pond - In stocking pond, the fingerlings (TL 10 – 15 cm) are reared into marketable size. The culture duration varies from 8 – 10 months. The stocking density varies according to the target fish production. The stocking pond is used as broodstock pond and breeding pond as

per the requirement. However, the pond area ranges from 1 – 2 ha with a greater water depth of 2.5 – 3.0 m. There are no hard rules regarding the size of the ponds.

Bio pond or treatment ponds - these are large settling tanks, where the water used for fishponds is purified biologically. They may also be used as stocking pond. However, an even flat bottom is recommended for easy netting operation.

A productive farm should use its higher altitude area for construction of nursery pond followed by the rearing pond. The lowest area of the farm should be used to build the stocking pond, which will help in reducing the cost of construction and increase ease of farm management.

Pond construction types

The ponds are constructed by two types namely, dug out and embankment pond.

The dug out pond is constructed by digging the soil and is most suitable to construct ponds in plain areas. It is to be scientifically constructed maintaining shape, size, depth and other factors.

Embankment pond is more appropriate for hilly areas. Dykes may be erected on 1 or 2 sides based on need. This pond is economically viable but not ideal for fish culture because the size, shape and depth of pond cannot be fixed as per scientific fish culture specifications.

Inlet and outlet construction

Feeder canals are constructed to provide sufficient amount of quality water to the ponds except in ponds which are filled by rainwater. Inlets are provided at top of the pond and screens are used to filter the pumped water to avoid entry of unwanted particles to the culture system. The inlet pipe size has to be designed is such a way that it should not take more than 1 or 2 days to fill the pond.

The outlet pipe is set up at bottom of the pond. It is used to dewater the pond during harvest and partial draining for pond water exchange to maintain the water quality of the pond during the culture period. The outlet is constructed prior to pond dyke construction.

Soil and vegetation coverage of Dyke

To reduce the soil erosion, creeping grass can be grown on the top and sides of dyke. The banana and coconut trees can be planted in the embankment. The slope of the embankment can be planted with grasses such as Hybrid Napier, gunny grass and elephant grass to supply feed to the grass carps reared in the ponds.

Pond fencing

The ponds are fenced to protect from theft. Live fences also serve as windbreak, increase farm diversity, provide privacy to farm and improve the appearance of the fish farm. There are several ways to make fences. These include live fence, piled fence, woven fence, post and rail fence, wire fence, wire netting fence and stone wall. Each type of fence has its own advantages and disadvantages. Wired net fence is primarily used in fish farms to stop intruders and protect the fish stock.

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