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CONSTRUCTION AND MANAGEMENT OF POND FOR FISHERIES

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Abstract
Fish pond preparation is the basic and first step in freshwater fish farming. Pond preparation is to be done intensively to enhance the fish production of the pond. Without proper preparation of the pond bottom if we start the fish culture technique it will create a huge problem and production will be of poor quality. In the case of the pond preparation process, good management practices are the basic solution for obtaining better fish yield. Sustainable methods should always be chosen to make pond preparation more suitable for environment-friendly fish farming technique. The most important component of the fish farming business is to prepare a pond in a proper way. Without the construction of a well-prepared pond, it is not possible to start or run any fish farming business. The present article deals with the preparation for construction of pond and also management for fisheries is discussed.

Key words: Fish Pond, Fish farming, Construction, management.

Introduction

Fish farming, also known as aquaculture, is an important industry in many countries, including India. It is the fastest growing sector in food production and offers many benefits, including providing a source of high-quality protein and income for farmers. However, to ensure the success and sustainability of a fish farm, proper management practices must be implemented. These practices include maintaining the health of the fish, managing the water quality and quantity, and properly feeding the fish and construction and management of Ponds. A fish culturist needs different types of pond for rearing various stages of fish and has layout of farm and the number and sizes of the pond depends on the species of the to be cultured. The primary consideration in construction of fish farm is the site which has to be selected on the basis of soil, water supply and drainage.

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Importance of pond preparation in fish farming

The most important component of the fish farming business is to prepare a pond in a proper way. Without the construction of a well-prepared pond, it is not possible to start or run any fish farming business. The importance of pond preparation is given below.

- Aquatic plants and animals which are harmful to fish are controlled
- Cannibalistic and unwanted fishes are removed
- A healthy environment of the pond is preserved
- Optimum pH for fish production is maintained
- Availability of the feed for the cultured fish is ensured

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Fish Pond construction

Survey

Before constructing the pond, land is surveyed to find out determine its topography.

1. Marking the area of proposed pond is the first step in the construction of a fish pond.
2. The natural slope where the main wall is to be built should be ascertained.
3. The main wall should be marked off at the lower end of the pond, where the slope is the
4. Greatest.

Designing

The first step while designing fish ponds should be to study the soil type, topography and water supply.

1. In designing the fish farm, it should be decided as to where and how many nursery, rearing and stocking ponds are to be constructed.
2. In case of a fish farm constructed solely for the purpose of seed production, only nursery and rearing ponds may be constructed, with a nominal area for the brood stock ponds.
3. In case of grow-out farm, more stocking ponds will be constructed to produce table size fish after stocking fingerlings.
4. For a composite fish farm all three types of ponds are required and their number should be based on the intended stocking density.
5. Fish ponds should be at least one surface acre in size. Ponds smaller than one acre seldom support a satisfactory fish population over many years. They usually require much more intensive fish management and may not justify the costs.
6. It is important to know the exact size, maximum depth, average depth, and water volume of the pond. This information becomes useful in calculating the amount of herbicide needed for weed control and the number of fish fingerlings needed for stocking.

Different kinds of pond

Freshwater fish ponds differ according to their source of water, the way in which water can be drained from the pond, the material and method used for construction and the method of use for fish farming. Their characteristics are usually defined by the features of the landscape in which they are built.

Pond Management & Construction

Before starting pond construction, we have to keep in mind about the pond culture, pond design, pond management and the pond supplies system.

Natural resources, condition, weather and available equipment are the main considerations to look before building a pond. We can construct your pond in the areas where you think commercial fish farming is possible.

Shape of the pond can be any. It can be square, rectangular or any other shape, but you have to make sure that it will be free from unwanted water filling from other sources and also ensure water loss.
Keep adequate water depth, depending on the fish species you are growing. Less than 1 meter depth is not suitable for culturing any fish species.

We have to monitor your pond 24 hours. You can keep a guard or install camera system, otherwise thieves will do their job smoothly. Another way available (used in India and Bangladesh) to keep your

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fish free from thieves. You can keep bamboo poles or tree branches with thorns in the pond. It will be impossible for the thieves to collect fish with net.

The bamboo poles and tree branches will not only prevent the fish from being theft but also will serve the fish some extra natural foods. This system is generally known as periphyton based fish cultivation.
Don't construct ponds for commercial purpose where transportation system is not good and fry/fingerlings are rare.

Try to make the pond ecosystem friendly for fish growth. Ensure adequate amount of sunlight. You can let different types of ducks to explore the pond and the ducks will help making sufficient oxygen supply for the fish.

You can use either manual or mechanical methods for constructing the pond depending on the availability of constructing system in your area.

Pond Management

Carp culture in ponds is basically a three-tier culture system where the first step begins with the rearing of spawn up to fry (2–3 cm) stage for 2–3 weeks in nursery ponds followed by rearing of 2–3 weeks old fry for about 3 months up to fingerling stage (8–12 cm) in rearing ponds before they are finally released in stocking ponds for growing up to table size fish. To ensure high rate of survival and growth during

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all the three stages of rearing, a package of management practices should be strictly followed, and slackness at any stage of the management procedure may affect farm productivity and profitability adversely. Techniques of management involve (i) manipulation of pond ecology to ensure optimum production of natural fish food while maintaining the water quality parameters within tolerance limits of the stocked fish species; and (ii) the husbandry of fish through stock manipulation, supplementary feeding and health care. Broadly, the various steps involved in the management of ponds at all the three stages of culture may be classified as (i) pre-stocking, (ii) stocking and (iii) post-stocking management operations.

Pond environmental monitoring

General considerations

Proper pond management involves a regular and steady supply of nutrient for sustained production of fish food organisms. The supply of nutrients could be from within the pond itself or from outside. It is also required to regulate the physico-chemical parameters of the pond ecosystem within the safe tolerance limits of the cultured fish species. This necessitates periodical monitoring of pond environment and taking corrective measures in time. Olah and Sinha (1984) have developed a practical monitoring system of perennial undrainable ponds which offer the monitoring of basic architecture and production processes of such pond ecosystems in tropical monsoon lands. The system needs simple instrumentation, little working time and labour and reveals sufficient information about the actual nutrient level of pond sediment and water. Most of these parameters can be easily measured at the pond site while some require laboratory facilities. The monitoring system gives reliable guidelines for fish farmers to optimize fish production.

Parameters to be monitored

It is essential for extension workers to name and code-number the ponds in their area. Such coding may be based either on postal district/unit/village farmer's name, etc. The fish farmer should record the following information on his fish farm:

Nature of pond: Perennial or seasonal; nursery pond, rearing pond or stocking pond.

Water area: Measurement of the water area is essential in order to know the size of the pond for proper fish stocking and quantifying the production processes. This can be done easily with the help of a bamboo pole of known length.

Age: Age is one of the most important parameters, since it has direct relevance with the productivity of the pond which usually varies from one year to several hundred years.

Management: Management status should record the existing management techniques and its level (intensive or extensive). The species of fish present, details of culture activities, stocking structure and density, fertilization, feeding, harvesting, marketing, etc, need to be recorded. To obtain qualified data on the organic carbon and biogenic nutrient load it is necessary to know the number of livestock and human population associated with the particular pond.

The fish farmer should also monitor the following parameters on a routine basis.

Water colour: The visual colour of the pond water is a simple but important reflection of the basic production processes.

Water transparency: Water transparency measured with a Secchi disc is intended to quantify the result of those processes which determine and modify the visual colour. However, a low transparency

may result either from high turbidity alone or from dense algal population and thus cannot reflect the correct trophic or production level of the water. However, the Secchi transparency readings together with the visual colour provide valuable information on the productivity of the water.

Water depth: The primary water source is usually the rainfall during the monsoon. After the rainy season the water level gradually decreases which results in a very shallow water column by the end of the dry season. The water depth can be measured with a 4–5 m long bamboo pole fitted at its base with a wooden disc of 25 cm dia.

Soft sediment depth: A soft sediment layer is usually present in the pond bottom. The depth of this layer can be measured with a 6–8 m long bamboo pole having a wooden disc of 10 cm dia at its base.

Solid sediment depth: In older ponds, in addition to the soft sediment layer, a solid sediment layer with a low water content is also present. The thickness of the layer can be measured with a 6–8 m long bamboo pole with a sharp end. The total thickness of the soft plus solid sediment layers has a direct relation to the age of the fish pond, at times the sediment layer measures more than 2 m. Such thick sediment, having a rich nutrient content, is anaerobic in nature with slow bacterial decomposition and mineral cycling rates. This should be properly utilized for fish culture.

Chemical environment in the water column: The water is chemically characterized by pH, alkalinity, NH_4-N, NO_3N and PO_4-P measurements following standard methods. Normally the pH and alkalinity do not change from pond to pond on the same types of maternal soil. The measurements of NH_4-N, NCO_3-N and PO_4-P indicate the basic inorganic nutrient status of the pond.' Simple chemical parameters such as dissolved oxygen and pH may be measured using field kits. Slightly alkaline water (pH 7.0–8.5) and oxygen levels of 6–9 ppm indicate optimum condition.

Steps for pond building and management for fish farming

- Pond drying and liming
- Soil and water management
- Control of aquatic weeds and predators
- Fertilization and manuring
- Water supply
- Species selection and stocking density
- Feed management
- Periodic checking
- Harvesting
- Production

Pond drying

Drying is essential when pond water becomes unproductive or when there is a discoloration to the water. It is also necessary to repair the embankment and remove mud from the old pond bottom. You can dry a pond with sunlight or a pump after harvesting the whole crop.

Advantages

- A dry period can be used for routine maintenance works on the pond banks and drainage channels which are very difficult when the pond is underwater.
- The killing of harmful insects, fish parasites, pathogenic bacteria, and fungus
- Restoration of the fertility of the pond

- Drying is a well-approved measure to stimulate the growth of algae on which the milk fish is fed.
- Drying the pond paves the way for free access of oxygen into the organic debris of the bottom mud and makes it completely oxidized, which leads to the release of nutrients (mineralization)
- Repairing the pond bank
- Increasing the fertility of bottom soil Disadvantages
- Loss of nutrients
- Loss of organisms directly or indirectly beneficial to fish
- Loss of ecological relationship between flora and fauna of the pond
- Loss of all aquatic life in a pond
- In some areas, it isn't easy to supply water after drying.

Pre-Stocking Pond Management

Making the ponds ready before stocking fry/fingerlings is called pre-stocking pond management. You have to prepare the pond properly by removing the causes of poor survival, unsatisfactory growth etc. Along with this, also ensure ready availability of natural food in sufficient quantity and quality for the fingerlings/fry. Here we are trying to describe more about the pre-stocking pond management tasks.

Post-Stocking Pond Management

Post-stocking pond management involves harnessing the pond productivity in the form of natural fish food, maintenance of pond environment congenial to the cultivated fish and fish husbandry, mainly feeding and health care.

Monitoring Pond Environment

Monitoring the pond environment is also a very important factor of pond management. And proper pond management involves a regular steady supply of nutrient for sustained production of fish food organisms.

The supply of nutrients could be from within the pond itself or from outside. You also need to regulate the physico-chemical parameters of the pond ecosystem within the safe tolerance limit of the cultured fish species.

Check water and soil quality on a regular basis. Decrease the amount of supplementary food if you notice the presence of too much natural food in the pond.

Best Tips for Pond Management

Ponds require proper care and maintenance for good growth of the fish. However, here we are trying to share the best tips for managing your ponds.

1. Site Selection and Design is Important

The foundation of successful pond management begins with proper site selection and design. Choose a location with good sunlight exposure for aquatic plant growth.

Ensure proper water source is available near your pond. Avoid areas with heavy runoff or pollution sources. Plan the pond's depth and shape based on its intended use. Ideal depth of pond for commercial fish farming is between 1 and 1.5 meters.

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2. Monitor Water Quality

Regular water quality monitoring is very important for good health of the fish. Invest in a water testing kit and ensure all the parameters are okay.

Ideal pH levels for fish production is around 7.0. Ensure adequate oxygen for fish and other aquatic life.

High ammonia and nitrate levels can harm aquatic organisms. Monitor seasonal variations of temperature and ensure suitable condition for your fish.

3. Perform Vegetation and Algae Control

Maintaining the right balance of aquatic plants is also very important for pond health. Remove excessive aquatic weeds to prevent overgrowth. Use native plants to provide habitat and improve water quality.

Control algae blooms through manual removal and aeration. Consider introducing beneficial bacteria to control algae growth. And doing all this will make your pond's environment good.

4. Aeration and Circulation

Proper aeration and circulation are essential for maintaining oxygen levels and preventing stagnation. You can install a pond aerator to increase oxygen exchange.

Use fountains or waterfalls to promote circulation and reduce stratification. Avoid overstocking with fish, as they consume oxygen and produce waste.

5. Fish Care and Feeding

Feeding the fish with good quality and nutritious food and taking good care of them is very important. Avoid overfeeding, as excess food can lead to water quality issues.

Stock fish species that are suitable for your pond size and climate. Monitor fish health and promptly address any signs of disease. And never feed your fish with contaminated water.

6. Wildlife Management

Ponds often attract wildlife, which can be both beneficial and problematic. Use netting to protect fish from birds and other predators.

Fish Farming Pond Cleaning

Cleaning the bottom of a fish pond is an important part of fish farm management. A build-up of organic matter on the bottom of the pond can create anaerobic conditions, leading to poor water quality and a decrease in fish health. It can also create an environment for the growth of harmful bacteria and parasites. One common method of cleaning a fish pond bottom is through the use of mechanical dredging equipment. This involves the use of a dredging machine that physically removes the sediment and debris from the bottom of the pond. This method is typically used for larger ponds and requires specialized equipment and trained operators. Another method is through the use of a bottom plow or cultivator. This equipment uses a series of blades or tines to break up and mix the sediment on the bottom of the pond. This can help to aerate the sediment and promote the growth of beneficial bacteria that can break down organic matter. Regardless of the method used, it is important to clean the bottom of a fish pond regularly to maintain good water quality and promote healthy fish growth. The frequency of cleaning will depend on the size and stocking density of the pond, as well as the type of fish being raised. It is important to consult with a fish farm specialist or veterinarian to determine the appropriate cleaning schedule for your pond.

Conclusion

Fish farming, also known as aquaculture, is an important industry in many countries, including India. These practices include maintaining the health of the fish, managing the water quality and quantity, and properly feeding the fish and construction and management of Ponds. Pond preparation is to be done intensively to enhance the fish production of the pond. Without proper preparation of the pond bottom if we start the fish culture technique it will create a huge problem and production will be of poor quality. In the case of the pond preparation process, good management practices are the basic solution for obtaining better fish yield. It is important to consult with a fish farm specialist or veterinarian to determine the appropriate cleaning schedule for your pond.

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