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INLAND AQUACULTURE PRACTICES AND OTHER SCHEMES

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The internship with practical training has been very helpful for manual handling, knowledge, confidence and sharpening the skills, and made aware of the prevailing problems in the fishery sector, and also to look forward for solution in future planning. Through this training programme we came to know about the state fisheries department, their contribution to the growth and development of the inland freshwater aquaculture and the financial growth of the fish farmers and the state government as well as their economical contribution to the country. Through this internship programme we got an opportunity to interact with professors, fish farmers, professional lab instructors and officials; in their day to day life and allied activities.

India is the country that produces the most fish worldwide. The Indian Blue Revolution showed how important the fishing and aquaculture industries are. The industry is regarded as a sunrise sector and is anticipated to have a big impact on the Indian economy soon. From 0.75 million MT in 1950–1951 to the current production of 141.64 MT, fish production in India has increased dramatically. Up until 2019-20(Department of Fisheries, States Government / UTs Administration), marine fish production accounted for the majority of the country's overall fish production. However, inland fisheries in India have witnessed a reversal due to the application of science-based fisheries and now provide almost 70% of the nation's total fish production (Katiha*et al.*, 2005). Therefore, through the holistic approach adopted under PMMSY (Pradhan MantriMatsyaSampadaYojana), inland fisheries offer immense opportunity and potential to enhance production through optimal utilization of fisheries, technology infusion and capacity building (Mohanty, 2010). The aquaculture industry has seen commendable growth in Tripura state in recent years, and fish productivity has improved significantly. The state has a lot of water space that is used for cultured and harvested fisheries, which is a significant potential resource. Fish are produced in two different sectors: cultivation (74434.85 MT; average productivity: 2717 kg/ha/yr) and capture (2528.24 MT). Tripura produces more carp seeds than it needs, and these seeds are sent to states nearby. However, there is a small production and demand deficit in the fish industry, which is filled by importing 11528.35 MT of fish from Bangladesh and 12040.00 MT from other states. India has the largest per capita fish intake. So, that's why further study and training on this inland fisheries will enhance our knowledge and to start up in near future and helping to build the nation. So in this project we have done various type of training like netting breeding programme, area and production of fingerlings, cage culture, pond and bio floc techniques under Tripura Fisheries Training Institute and Krishivan Research Centre for Entrepreneurship Development and Environment, Dehradun, U.K.

Management of Fish Ponds

The availability of land for a fish pond and high-quality fish seeds is a prerequisite for fish culture. Although seed output may be sufficient, it is important to have a solid understanding of how to raise those delicate newborn fish in well-managed nurseries, ponds, and stocking areas. Most government-run fish farms and forward-thinking farmers have the aforementioned kinds of fish ponds. However, the primary goal of the farms/projects is to produce table fish or fish seeds.

Generally, in scientific fish farming number of various sizes of ponds (as stated above) are required for rearing of various stages of fishes namely:-

Nursery pond - rearing of Spawn to Fry stage (approx. Size 4- 15 mm)for about 15 days.

Rearing pond – rearing of fry to fingerling stage (approx. Size: 16-40 mm)for about 2-3 months.

Stocking pond- rearing of fingerling (approx. Size 41- 150 mm) to marketable sizes/ adult fishes.

Water Quality Testing

In order to maintain growth and survival, it is necessary to check the optimal water quality for each species. The health of the organism and the price of bringing a product to market can both be considerably impacted by the water quality in the manufacturing systems. Temperature, dissolved oxygen, pH, alkalinity, hardness, ammonia, and nitrite levels are among the water quality characteristics that are frequently checked in the aquaculture sector. Salinity, chlorides, and carbon dioxide may also be observed, depending on the culture system. Alkalinity and hardness are two variables that are rather constant, however dissolved oxygen and pH are variables that change daily. For your specific circumstance, it is crucial to establish a uniform testing strategy for water quality.

The optimum pH for fish is between 6.5 and 9. Fish will grow poorly and reproduction will be affected at consistently higher or lower pH levels. The Effects of pH on Warm-Water Pond Fish pH Effects on fish 4 Acid death point 4 to 5 No reproduction 4 to 6.5 slow growth 6.5 to 9.

Testing pH of Pond Water with Universal Indicator

Process- Took 4ml of water sample in a test tube then added 2 drops of pH reagent then waited for 1-2 minutes then observed the colour of the sample & then matched to the pH colour chart. Result- 7.8.

Hatchery Technology

A fish hatchery is a facility used to artificially breed, hatch, and nurture young animals, primarily finfish and shellfish. The primary purpose of hatcheries is to produce larval and young fish, shellfish, and crustaceans that are transported to on-growing systems, like fish farms, to mature into harvestable sizes.

Chinese fish spawning facility

Chinese spawning and hatching methods rely on gravity-driven continuous water flow to raise carps and hatch their eggs. Compared to any other design for the same output capacity, a Chinese hatchery is less expensive to build and run. The Chinese hatchery system is currently regarded as being extremely suitable for the production of high-quality fish seed in India. This system is intended for the incubation and breeding of fish. One hatching operation takes 4 days to complete.

Hatchling Receiving Tank

This is a rectangular masonry concrete tank. The inside dimensions are 4 x 2.5 x 1.2 m. This is located at a lower elevation than the incubation pond, so as to drain out the water from it by gravity. Fresh water supply from the overhead tank is provided by a 7.5 cm diameter pipe line, bifurcated into 3 numbers of 3cm diameter pipelines.These pipelines are arranged to provide the spray for aeration. From each of the incubation ponds 7.5 cm diameter pipes are provided for transferring and regulating spawn intake into the spawn receiving pond. Hooks are fixed in two opposite side walls of the pond for fixing the net for the collection of spawn. Steps are also provided for getting into the pond for the collection of spawn. The overflow from this pond is discharged into an open drain and suitably utilized in the earthen ponds, if possible.

Seed Production of IMC

IMC are bisexual (heterosexual) and sexes may be outstanding most effective at some point of the breeding season.

Induced Breeding

Induced breeding is a method whereby mature fish breeders are encouraged to reproduce in captivity by the introduction of pituitary hormone or any other synthetic hormone. It is also referred to as hypophysation. Major carps are the most significant species in terms of food and nutrition value. They have so maintained the interest of scientists and aqua producers. They have the odd habit of reproducing in swiftly moving rivers and streams where they have plenty of room to roam around.

Induced Breeding of Fishes with Ovatide

Ovatide is an indigenous, cost-effective and new hormonal formulation for induced breeding of fishes.

- It is also effective in breeding major carps. The doses for females are 0.20-0.40 ml/kg for rohu and mrigal, 0.40-0.50 ml/kg for catla, silver carp and grass carp. The dosages for males are 0.10-0.20 ml/kg for rohu, mrigal, 0.20-0.30 ml/ kg for catla and 0.20-0.25ml/kg for silver carp and grass carp. Synthetic compound launched by Hermmopharma, Bombay. Combined of GnRH analogue with dopamine antagonist pimozide.

Method of Injection

Usually two methods are adopted for injecting the brooder fish. They are intramuscular and intra-peritoneal.

A) This approach is very practical and efficient. The lateral line is avoided by injecting into the dorso-lateral muscle, which is directed toward the caudal peduncle. To lessen the physical burden on the fish, the pricks are made alternately on the right and left sides as two divided doses are administered for carp spawning. The needle is put beneath the scale in a straight line across the fish's body, and it is then twisted at a 45-degree angle to quickly penetrate the muscle and inject the fluid.

B) Intra-peritoneal Injection: This technique involves lateral placement of a brood fish atop a foam rubber cushion. In carps, an injection needle is placed into a soft area near the base of the pectoral or pelvic fin. Insert the syringe needle while angling it 45 degrees away from the body's longitudinal axis in the direction of the head. It is simple to use a 2ml hypodermic syringe with 0.1ml graduation.

Integrated Fish Farming

Integrated fish farming is a system of producing fish in combination with other agricultural/livestock farming operations centered around the fish pond (Dhawan, and Sehdev, 2020).

Advantages of Integrated Fish Farming

1. Efficient use of fish production wastes from various cultural practises.
2. It lowers the additional expense for fertilization and supplemental feeding.
3. There is no waste in this balanced artificial ecosystem.
4. It offers additional opportunities for work.
5. It boosts output and economic efficiency while reducing input.
6. In addition to meat (chicken, duck, cattle, hog, etc.), milk, vegetables, fruits, eggs, grains, fodder, mushrooms, etc., integrated fish farming also produces fish.
7. The output and socioeconomic standing of the less advantaged members of our society could be improved by this technique.

Types of Integrated Fish Farming

Basically the integrated fish farming is of two types

a) Agri-based fish farming

b) Livestock fish farming

The fish-cum livestock farming is realized as innovation for recycling of organic wastes as well as production of high class protein at low cost.

a) Aquaculture Based on Agriculture

1) The paddy—cum-fish Industry

When there is enough water in the paddy fields, this farming is done in the Indian states of Bihar, West Bengal, Orissa, and Assam. Three to eight months per year, the paddy fields retain water. Due to the usage of pesticides to safeguard high yielding paddy varieties, interest in this practise has decreased recently.

b. Livestock Fish Farming

1) Poultry-cum-fish farming

This system utilizes poultry droppings of fully built- up poultry litter for fish culture. The fish production obtained is about 5000 kg/ha/yr. with 1250 kg chicken meat and 70000 no. of eggs. Approximately 500-600 no. of birds is reared in a 1 ha pond. The Rhode Island or Leghorn variety birds are more preferred over others.

2) Duck-cum-fish culture

The duck are commonly called as biological aerator. They are reared on the dyke of the pond in a low-cost house. This farming is practised in Tamilnadu, Assam, Bihar, Andhra Pradesh, Tripura, Orissa, Karnataka, Kerala and Uttar Pradesh. The 'Indian runner' and 'Khaki campbell' varieties are found more suitable in this culture. About 300 no. of ducklings (some spp. are reared 450-500 in no.) are reared to fertilize the 1 ha. pond.

Biofloc Fish Culture

Biofloc technology is a technique of enhancing water quality in aquaculture through balancing carbon and nitrogen in the system

Design and specifications of biofloc systems Between feedings, "Flocs" are an additional food source that can be eaten (pellet use). One advantage of biofloc systems is their ability to recycle waste nutrients into fish or prawns via microbial protein. Nitrogen is a key ingredient in biofloc, and it is integrated into bacterial cells. The benefit of higher feed conversion ratios from consuming microbial protein is another advantage of biofloc systems.

As they provide the biggest advantages for pond-based aquaculture, bi-floc systems are typically used as pond-based systems (Crab, *et al.*, 2012).

Species Suitable for Biofloc Culture

Major cultivable fish species in BFT A basic factor in designing a biofloc system is the species to be cultured. Some of the species that are suitable for BFT are:

Air breathing fish like Singhi (*Heteropneustes fossilis*), Magur (*Clarias batrachus*), Pabda (*Ompok pabda*), Anabas/Koi (*Anabas testudineus*), Pangasius (*Pangasius sanitwongsei)*

Benefits of Biofloc Culture System

1. Eco-friendly culture system 2. It reduces environmental impact. 3. Improves land and water use efficiency 4. Limited or zero water exchange. 5. Higher productivity (It enhances survival rate, growth performance, feed conversion in the culture systems of fish).

Disadvantages of Biofloc Technology

1. Increased energy requirement for mixing and aeration
2. Reduced response time because water respiration rates are elevated
3. Start-up period required Alkalinity supplementation required.

Cage culture

Cage culture is an aquaculture production system where fish are held in. floating net pens. Cage culture of fish utilizes existing water resources but. Encloses the fish in a cage or basket which allows water to pass freely. Between the fish and the pond permitting water exchange and waste(Halwart*et al.*, 2007).

Conclusion

Work experience in "Fisheries and Aquaculture," which is required as partial fulfillment of the B.F.SC degree programme, provides the chance to develop practical skills and gain experience in a variety of tasks related to the production of fish seeds, fish harvesting, and fish marketing, among other things. We had the chance to connect with professors, fish farmers, professional lab instructors, and authorities as they went about their daily lives and related tasks thanks to this internship programme. The project was undertaken mainly on following topics i.e. Seed production of IMC, Induced breeding by hormone , Hatchery technology, Fish pond management, Water quality testing. The internship with hands-on training has been highly beneficial for manual handling, knowledge, confidence, and skill development. It has also made people aware of the current issues in the fishery sector and helped them plan for potential solutions in the future. Through this training programme, we learned more about the state fisheries department, their role in the expansion and advancement of inland freshwater aquaculture, the financial success of fish farmers, the state government, and their economic impact on the nation.

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