

Employment generation through fisheries based farming system in rural areas of Jammu region

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Abstract

In hill states where opportunities of employment are very limited, fisheries and aquaculture can play an important role for the enhancement of farmer's income. Besides due to great portion of population comes under non-veg category, there is huge demand of fishes and other animal proteins. The gap of fish production and consumption pattern is also very big. In Jammu and Kashmir, total annual fish production is around 20,000 tons only while the consumption pattern of the entire state is very much higher. For fulfilling the animal protein demands, state has to depend on other states of country. A great portion of fish demand is being met by importing these from other states.

Introduction

Fish culture is very profitable and enjoyable business. It provides the economic and nutritional benefits to the mankind since time immemorial. Fish are rich sources of protein, essential fatty acids, vitamins and minerals. The fats and fatty acids which are present in fish, particularly Omega 3 fatty acids, are highly beneficial and are difficult to obtain from other food sources. Fish is essentially an Asian farming practice. India is endowed with vast and varied aquatic resources, of which only a small portion is being utilized for aquaculture practices.

Aquaculture continues to increase in volume and value of output in many countries of the world, filling the gap between the supply and demand for fish and fishery products, improving nutrition and contributing to the household economy, particularly in rural areas. There is immense scope for the betterment of mankind through aquaculture. The growing gap between supply and demand globally will impact on the health and nutrition of low income families, unless efforts are made to increase the production to meet the growing demand.

Fish culture/Aquaculture

Aquaculture is a new name for what once we called 'fish culture'. It covers the culture of all commercially important aquatic organisms which involves aquatic animals such as fishes, crustaceans, mollusks as well as aquatic plants such as sea weeds under controlled conditions. Aquaculture continues to increase in volume and value of output in many countries of the world, filling the gap between the supply and demand for fish and fishery products, improving nutrition and contributing to the household economy, particularly in rural areas.

Objectives

The main objectives of aquaculture are:

1. To boost the economy of the country by way of increasing per capita fish production and income.
2. To generate employment opportunities for the unemployed and under employed persons.
3. To utilize full potential of the natural water resources available in the country.
4. To uplift the socio-economic status of the farmers.

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5. To earn foreign exchange revenue by transport of fish and fish products to foreign countries.
6. To boost the ornamental fish industry for overall economic development.
7. To culture the larvicidal fishes for control of mosquito larvae.
8. To increase production of protein food, in the form of fish, and fulfill the increasing demands of nutritious food.

Levels of Aquaculture

Depending on the intensity of operation and degree of management, aquaculture practices are classified into following four levels:-

Extensive aquaculture

In extensive level of aquaculture, low stocking densities of 2000-5000 carp fingerlings are used and no supplemental feed is given. Fertilization may be due to stimulate the growth and production of natural food in the water. In such types of culture system, carp culture does not require water exchange during culture period. The ponds used for extensive aquaculture are usually large. The production is generally low, less than 0.5 ton/ha/yr in the case of carps.

Semi-Intensive Level

Semi-intensive aquaculture uses medium size ponds 0.5 ha each with comparatively higher stocking densities than extensive aquaculture (5000-10000 carp fingerlings/ha). Supplementary feeding is done in moderate amounts. In carp culture, water replenishment is done once or twice a month@10%. The production averages around 3-7 tons/ha/yr of carps. Semi-intensive level of aquaculture is most commonly used in all over the country.

Intensive Level

In intensive level of aquaculture, the pond size is generally small (about 0.2 ha approximately) with very high density of culture organisms i.e. 20000 to 25000 carp fingerlings/ha are stocked. The system is totally dependent on the use of formulated feeds. Feeding of the stock is done at regular intervals. Water replacement under intensive culture is effected on a daily basis. Production under intensive level of aquaculture is much higher, for example, about 12 to 15 tons/ha/year in carp culture.

Super-intensive level

Super intensive aquaculture needs running water supply and complete daily water exchange is performed. This system is mostly practiced in cement tanks, fiberglass tanks and raceways etc. which are fitted with high efficiency biological filters for continues recirculation of water. The size of the tank ranges between 50-100m³. The cultured organisms are fed with high quality formulated feed. The feed is given through demand feeders. The water quality is regularly monitored with electronic gadgets. Stocking density ranges between 40,000 to 50,000 carp fingerlings/ha. The production ranges between 15-20 tons/ha/yr in case of carps.

Importance of Aquaculture

- Integration of fish farming with agriculture and/or animal husbandry is known to be more profitable than agriculture alone.
- Fish culture gives efficient means for recycling agricultural and domestic wastes, in order to help/protect our environment
- Many high valued and commercially important aquatic items such as trout, ornamental fish and many other may helps in earning good returns.
- Artificial recruitment in the water bodies by fish seed produced in fish hatcheries through aquaculture (ranching), could certainly add new fishery resources or increase existing fish stocks.
- Through Aquaculture, we can utilize the unutilized large size water bodies for fish production by adopting pen/cage culture types of culture systems.
- Aquaculture could help in generating employment for many unemployed and under-employed people. Such a step would help to stop the migration from villages to urban areas.
- Besides, from human nutrition point of view, the fish food is not only easily digestive but is also rich in essential amino acids like lysine and methionine. The unique poly unsaturated fatty acids (PUFA) namely, eicosa pentaenoic acid of fish is known to reduce the cholesterol level of blood and save human beings from coronary diseases. Further, vitamins and minerals are also present in good quantities in fish.

Factors to be kept under consideration for doing a successful fish culture

- The major factors to be considered are soil type, topography and water supplies.

- The soil type influences how well the ponds will hold water; soils which have the water holding capacity, are preferred for pond construction because it prevents leakage. The good quality soil containing a lower limit of 20 percent clay is necessary for making ponds.
- The topography determines the size and shape of the ponds. The ponds should not be more than 10 feet depth. For better management, the size of the ponds should not be too much bigger. Sites, where huge individual ponds could be built, can be divided into smaller ponds built in series. The ponds should be rectangular in shape
- The availability and quality of water determine where and what type of pond should be made. Growing and harvesting are more challenging in case of erratic water supplies. A perennial water source is very much necessary for the successful fish culture. Source of water may be canal, stream, river, lake, or bore well.

Characteristics of a Candidate Species

The species to be selected for aquaculture should have following characteristics:

1. It should have high growth rate
2. It should have capabilities of efficiently utilize and convert the organic production of the water into fish flesh
3. It should be compatible with other species under culture
4. It should be hardy to live in changing physico-chemical conditions such as temperature, pH, turbidity, carbon dioxide and dissolved oxygen.
5. Able to reproduce under confined conditions
6. It should be easy to handle and harvest
7. It should have good market demand

In carp culture, usually three Indian major carps viz. *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* and three exotic carps such as *Hypophthalmichthys molitrix*, *Ctinopharyngodon idella* and *Cyprinus carpio* are selected for culture.

This is mainly because of their fast growth and compatibility among each other. However in some temperate areas of state only three exotic carps viz. *Hypophthalmichthys molitrix*, *Ctinopharyngodon idella* and *Cyprinus carpio* are selected for carp culture due to lower temperature. Besides, in cold belts, trout culture mainly of rainbow trout is also in practice.

Culture Systems

Aquaculture is practiced through various culture systems/methods. Freshwater aquaculture is carried out in fish ponds, fish pens, fish cages, raceways and on a limited scale in paddy fields. However, fish culture in ponds is the oldest form of aquaculture and at present, it is the only culture system which is mainly adopted by the farmers for carp culture. Here we will discuss some important points about the ponds culture system.

Ponds Culture system for carp

It is the most common method of fish culture. Water is maintained in an enclosed area by artificially constructed ponds where the aquatic animals such the finfish and shellfish are reared. The ponds may be filled with canal water, rain water, bore well water or from other water sources. The pond must be constructed after proper site selection. The climate, topography, water availability and soil quality of the region influence the character of the fish pond.

Detailed knowledge regarding different types of fish ponds is a prerequisite for a profitable business in fish culture. A fish farm comprises of different types of ponds namely nursery ponds, rearing ponds, production ponds and breeding ponds etc. The number and dimensions of these ponds mainly depends upon the water resource, variety and size of fish to be cultured and type of management. A typical fish pond is a drainable water body with an inlet for the entry of water from water source and an outlet for draining the pond during harvest.

Types of Fish ponds

Nursery Pond

Nursery ponds are smaller (0.02-0.06 ha) and is mainly prepared to nurse the hatchlings for a period of about two to three weeks i.e. until they become fry (2.5-4.0 cm). The depth of the water column may be between 1.0 and 1.5 m. The maximum stocking density of hatchlings is about 10 millions/ha. However these ponds are used as nursery only for a short time, they could be used three or four times in a single breeding season. During the other seasons, the nurseries can also be used as production ponds.

Rearing Ponds

Rearing ponds are fairly larger than nursery ponds and sizes usually range between 0.06 and 0.1 ha. In these, the fry are grown for about two to three months or until they attain fingerlings stage

(4-10 cm). The depth of water column may be between 1.5 and 2.0 m. Like nursery ponds, when rearing ponds are not in use for rearing purpose, they can serve as production ponds

Production Ponds

In production/stocking ponds, the fingerlings are raised to marketable size fish. The size of this pond varies from 0.1 to 2.0 ha, as ponds larger than 2 ha are not suitable for efficient management. In production ponds for carp culture, the depth of water column should be between 2 and 2.5 m.

Breeding Ponds

These ponds are only needed for breeding purposes. These are used to stock brooders of the fish species to breed.

In case the source of water is turbid, a small sedimentation pond or a filtration system may also be constructed to filter the water before its direct entry into the fish ponds. If areas of water scarcity and high seepage are to be utilized for fish farming, cemented ponds may be constructed there. However, such ponds should be treated/overlaid with a soil bed/cover of 30-50 cm soil, in order to give the natural substratum with rich organic matter for higher production and growth.

General management practices for fish culture

The management practices of fish ponds includes mainly the clearing of algal blooms and weeds, eradication of unwanted animals including predatory and weed fishes by poisons, liming, fertilization, seed stocking, regular supply of required supplementary feed, regular monitoring of water quality parameters and fish livestock health as well as harvesting of table size fishes for marketing.

Clearance of algal blooms and aquatic weeds

During fish culture, algal blooms may appear. During night hours, these algal blooms along with different aquatic weeds liberate good amount of carbon dioxide and absorb the dissolved oxygen content available in the fish pond. It is reported that higher carbon dioxide concentration may be responsible for large scale fish mortality. They also compete with fish for nutrients as well as space and also create obstruction in free movement of fishes. Most effective method for the control of algal blooms is introduction of algae feeding fish such as silver carp. Aquatic weeds can be controlled either by

manual/mechanical, chemical or biological methods. Mechanical method can be used against emergent and submerged weeds. When aquatic weeds are not controlled by manual/mechanical method, then they can be removed by applying chemicals like 2,4 D (for emergent weeds and grasses), Simazine, Diuron3 (for submerged weeds) or paraquat (against floating weeds). Aquatic weeds can also be controlled by biological method i.e. by using fish like grass carp @ 150 to 200 kg/ha in culture ponds. These fishes give production without damaging the natural pond ecosystem

Eradication of Predators and Weed Fishes

Presence of undesirable fishes may pose problem as they compete for food, oxygen, space and also prey upon the small seed stocked for culture. Such fishes may be controlled by repeated netting operations, application of mahua oil cake or complete pond drying (if possible).

Control of Predatory Aquatic Insects

Various types of insects either as larvae or adults may not only prey on fish hatchlings but may also compete for food. The most important insects which create problems to fish culture include the water strider, backswimmers, water scorpions, giant water bugs, diving beetles and nymphs of dragonflies. Repeated dragging through water with a fine meshed cloth net may help in the removal of these insects to some extent. However, application of cheap oil soap emulsion (3:1) has been found to be most effective for the control of aquatic insects.

Liming

Liming is done for maintaining soil and water pH. Besides, lime also acts as fertilizers. It should be done one week before fertilization. For a pond having pH around slightly alkaline, dose of lime should be 250-300 kg/ha/year.

Fertilization

We should fertilize the pond for production of natural food organisms and productivity. Fertilizers may be organic (cow dung@10-20 ton/ha/year) or inorganic (urea@300-350kg/ha/year, single super phosphate@200-300kg/ha/yr). However dose should always be based on the condition and quality of pond water. For this, regular monitoring of pond water and fish health is very much necessary for any kind of fish culture.

Stocking of Fish Seed

One should keep in mind about the time, amount and ratio of stocking. Stock the fish early in the morning or evening or during cloudy days, because at that time water temperature is at minimum. Packed container should be kept for about half an hour in the pond water to equate the temperature. For production pond, stocking density for semi-intensive level of aquaculture should be 5000-10000 fingerlings/ha. There is always an optimum stocking rate in a particular situation, which gives the highest production and the largest fish. Under crowded condition at a higher stocking rate, fish may compete severely for the food supply, and thus suffer stress due to aggressive interaction. Fishes under stress eat less and grow more slowly. In static pond waters, too much of excretory products of the fish livestock suppress the growth rate of stock. However with efficient removal of such excretory products by the proper water circulation or aeration of the pond water, the fish production per unit area can be increased. Depending on the natural productivity of the pond, stock the different varieties of fish species in proper ratio. In case of three species combination, stocking ratio should be catla (40%), rohu (30%) and mrigal (30%) while in case of six species combination of IMC and exotic carps, stocking ratio should be catla (15%), silver carp (15%), rohu (20%), grass carp (15%), mrigal (15%) and common carp (20%). However, depending on the seed availability and other local conditions, the stocking ratios can be changed.

Supplementary Feeding

Feed the fish early in the morning and/or evening time. Artificial feed can be prepared either from animal source (fish meal, shrimp meal, silkworm pupae, poultry waste etc.) and/or vegetable source (groundnut oilcake, mustard oil cake, soybean oil cake, rice bran, wheat bran, wheat flour etc.). Supplementary feed should be given daily @1-3%

of estimated body weight (biomass) of fish livestock present in the fish pond.

Health Management

Sometimes, due to high stocking densities and polluted feed or water, fish is prone to diseases. Most common symptoms of diseased fish are sleeping sickness, dots on body part, fin rotting, swelling of body, abnormal swimming, loosening of scale, gill rotting and fish comes to water surface. Precaution should be taken that diseased fish is not stocked, use healthy seed for stocking. After stocking, periodic sampling of fish can be done from pond for regular checking/supervision of the fish health and growth. Always use aqua medicines with the consultation of fisheries experts.

Harvesting

Under favourable conditions, Indian major carp as well as exotic carps attain the marketable size within one year time. After attaining the marketable size fish stock, lower the water level of pond by draining the excess water and harvest the stock with the help of a suitable net.

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