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## BRIDGING THE GAP: ENHANCING AQUACULTURE WITH TRAPA IN INTEGRATED FARMING

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In India, one of the significant minor fruit crops is water chestnut (*Trapa natans*), commonly known as 'singhada' in Hindi. It is a perennial submerged plant produced as an 'aquatic nut crop' in tropical and subtropical areas. It is an excellent source of vitamins, fiber, and carbohydrates; therefore, it is widely used as a food crop in many regions of the world.

Farmers can diversify their crops and benefit from the optimal conditions in the area by adding water chestnut farming to aquaculture systems. Additionally, the incorporation of water chestnut cultivation with fish farming benefits both industries, as fish excrement acts as a natural fertilizer for the plants, promoting their growth. This mutually beneficial connection improves resource efficiency and eliminates waste, making farming more sustainable. Furthermore, there are several economic potentials associated with water chestnut farming.

The crop is currently in high demand in local and regional markets, providing farmers with an alternative source of additional revenue. By incorporating water chestnuts into aquaculture systems, farmers can improve food security, diversify their crops, and promote a more nutritious diet.

### Implementation of Integrated Fish Farming With Water Chestnut

#### 1. Selection of Suitable Water Bodies

The first step in establishing water chestnut and fish farming is selecting appropriate water bodies. Water chestnut flourishes in the soft, nutrient-rich waters of lakes, ponds, and streams with pH ranges from neutral to slightly alkaline. On the other hand, efficient fish rearing requires ponds, reservoirs, or tanks with a continuous water supply and adequate

depth. Water chestnuts can also be grown in areas with low-lying marshy soil or shallow water bodies where fertile, well-drained soil is available.

## **2. Establish the water chestnut**

The water chestnut can be planted in the spring, with the tubers placed approximately 6 inches deep and 12 inches apart.

## **3. Selection of species**

In India, two main varieties of water chestnuts are cultured: *Trapa bispinosa* (singhada nut) and *Trapa bicornis* (ling nut). To select suitable fish species for cultivation, consider factors such as market demand, ecological compatibility, and the capacity to adapt to local conditions. Common species in this context include Rohu, Catla, and Tilapia. For advice on selecting fish species, it is advisable to consult local fisheries authorities or specialists.

## **4. Pond Preparation for Fish Farming and cultivation of trapa**

To prepare for fish farming, it is important to remove pond waste and undesirable aquatic plants, as well as to protect the pond from predators by placing barriers. After pond preparation, supply the pond with fingerlings of selected fish varieties. Maintain ideal conditions for fish growth by constantly monitoring water quality parameters. Additionally, plant water chestnut corms in the proper season, and fertilize and control weeds as needed.

## **5. Nutrient Cycling and Pond Management**

One of the most important features of integrated farming is the use of nutrient cycling. The uneaten feed and excreta from fish provide essential nutrients like nitrogen and phosphorous to water chestnut plants. Utilize dead vegetation, fish waste, and other organic inputs to add organic matter to the bed of water chestnut. Ensure sufficient dissolved oxygen, temperature, and pH to maintain good water quality. Aeration or water exchange may be necessary, with regular monitoring.

## **6. Harvesting and Marketing**

Depending on the market need and the growth rate of fish, fish can be harvested. To reduce stress and injury to fish, use the proper fishing equipment and handling methods. Water chestnut is usually ready for harvest after 120 to 150 days (in the months of October to

November). Collect ripe water chestnut fruits using the proper harvesting tools or by hand. To ensure product quality, proper post-harvest handling and storage are crucial. Create marketing channels to promote the sale of both fish and water chestnut products in the neighbourhood or other marketplaces.

## **Benefits and the Opportunities**

### **1. The Versatile Water Chestnut**

Water chestnut provides several kinds of advantages. By oxygenating the water, improving water quality and providing a habitat for many aquatic animals, water chestnut plants contribute significantly to ecosystem services. Fish benefit from water chestnut's shade and shelter, which reduces water temperature changes and algae growth. The combined farming method also diversifies sources of income, enhances farm production, and optimizes the use of land and water.

### **2. Synergistic Benefits with Fish Farming**

The symbiotic relationship that results from combining fish farming and water chestnut farming increases production and profitability. By consuming aquatic plants that compete with water chestnuts for nutrients, fish like tilapia or carp help to naturally reduce weed growth. The water is enriched and the water chestnut plants are nourished by the fish faeces, which also works as an organic fertilizer. This integration encourages environment friendly agricultural methods while improving production and lowering the demand for chemical inputs.

### **3. Nutritional Security and Market Potential**

Aquaculture systems' water chestnut farming enhances food security. The nutrient-rich kernels, which provide ample amounts of vitamin B, minerals such as calcium (Ca), Iron (Fe), Zinc (Zn) and Potassium (K) as well as dietary fiber, serve as an additional source of nourishment. Due to their culinary diversity and use in both traditional recipes and cutting-edge food items, water chestnuts are also in high demand, offering growers profitable marketing prospects.

#### **4. Water Conservation and Environmental Sustainability**

Cultivating water chestnuts promotes environmental sustainability and water conservation. Water chestnuts aid in reducing eutrophication and water pollution by absorbing excess nutrients from the water. Water chestnut production encourages ecologically friendly aquaculture practices and contributes to the overall health of aquatic ecosystems by decreasing nutrient runoff and the demand for synthetic fertilizers.

#### **5. Rural Employment and Livelihood Enhancement**

Water chestnut farming in aquaculture systems has the potential to improve rural livelihoods and create opportunities. Introducing water chestnuts into fish farming provides farmers with an additional source of income, enhancing their socioeconomic well-being and resilience. The expansion of sectors associated with water chestnuts, such as processing and value addition, may also benefit the regional economy.

#### **6. Government Support and Research Initiatives**

Recognizing the potential of water chestnuts in aquaculture, the government has been actively assisting growers through various programs and projects. To encourage the production of water chestnuts and their integration into aquaculture systems, these activities include providing technical assistance, financial support, and research and development initiatives.

### **Challenges**

There are a few challenges that farmers may face when implementing integrated farming of fish with water chestnut. These challenges include:

- 1) **Initial investment:** Compared to conventional agricultural practices, integrated farming may need a larger initial investment. This is due to the fact that farmers must buy equipment, water chestnut plants, and fish. However, integrated farming's long-term advantages might make up for the initial cost.
- 2) **Water quality:** The health of the fish and water chestnut relies on the pond's water quality. Farmers need to maintain the water quality and, if required, take action to enhance it. This may include adding filtration or aeration equipment in the pond.
- 3) **Diseases and pests:** Both fish and water chestnuts are prone to various infections and

pests. Farmers must be aware of these dangers and take precautions to avoid them. This may include applying pesticides or other pest control techniques.

- 4) **Marketing:** Water chestnut and fish might be difficult to market. Farmers must find consumers for their goods and guarantee that they are being paid fairly. A start of contacts with wholesalers or merchants may be necessary for this.

## Conclusion

In conclusion, combined fish and water chestnut farming represents a potential and sustainable farming method. Farmers can optimize resources, ensure food security, and generate profits through these integrated practices. However, successful implementation requires expert guidance, water quality monitoring, and proper management techniques.

Aquaculture systems can greatly benefit from the flexibility, nutritional value, and positive environmental effects of water chestnut farming. Adopting this innovative approach has the potential to boost the aquaculture industry, improve rural livelihoods, and promote environmental sustainability and food security. The future holds immense potential for a healthy and profitable agricultural environment as individuals invest in and study water chestnut aquaculture.

## References

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