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Symbiotic Harvest: Integrated Rice-Fish Farming

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Rice-Fish Farming

Rice-fish farming is an integrated agricultural system where fish are cultivated alongside rice in a combined field and pond environment, with alternating cultivation. Originating in continental Asia, particularly in India, Thailand, Northern Vietnam, and Southern China, this practice is rare in Western countries. Remarkably, it has been in use for over 2,000 years. Common carp was the initial fish used in this system, while Mozambique tilapia (*Oreochromis mossambicus*) is now a popular alternative. The rice-fish system may have originated from pond culture in China; one theory suggests it began when farmers started placing excess fry—juvenile fish that can independently feed—into their ponds and observed beneficial outcomes. The rice-fish system has been recognized as a globally significant agricultural heritage system by the FAO.

Why Rice -Fish Farming?

As the global population grows and food security challenges intensify, the pressure to produce healthy food is increasing. However, reliance on high-yielding varieties and fertilizers not only boosts yield but also pollutes agricultural lands and the environment. Modern rice cultivation contributes to climate change by emitting greenhouse gases, particularly methane

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and nitrous oxide. Rice fields account for 10-12% of global methane emissions. Research indicates that the rice-fish cultivation system can significantly reduce these emissions. Aquatic creatures in this system enhance oxygen levels in both the water and soil, promoting aerobic digestion over anaerobic processes and thereby decreasing methane emissions. Recent estimates show that methane emissions from rice-fish cultivation are 34.6% lower compared to those from traditional rice monoculture systems.

How Rice-Fish Benefits each other

Rice-fish farming operates on the principle of mutualism, where both species benefit from their interaction. Rice plants offer shade and shelter to the fish, while the fish contribute nitrogenous wastes that fertilize the rice. Additionally, the presence of fish helps control pests and insects, such as the brown plant hopper, which can cause wilting and drying of rice crops, and protects against diseases like sheath blight. Fish also play a role in weed management by feeding on phytoplankton, thereby removing weeds from their roots, reducing nutrient competition, and enhancing nutrient recycling in the system.

Varieties and Species used

Varieties used for rice in India are as Follows

State	Varieties
Andhra Pradesh	PLA-2
Assam	IB-1,IB-2,AR-1,353-146.
Kerala	AR-61 25B, PTB-16
Punjab	BR-14 , Jisurya
Tamil Nadu	TNR-1, TNR-2
Uttar Pradesh	Jalamagan
West Bengal	Jaladhi -1, Jaladhi -2

Species used for Fishes are as follows:

- Common crap (*Cyprinus carpio)*
- Tilapia *(Oeochomis niloticus)*
- Silver crap *(Hypophthalmichthys molitrix)*
- Mirror crap *(Cyprinus carpio var. specularis)*
- Rohu (*Labeo rohita)*

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- Mrigal (*Cirrhinus cirrhosus)*

Cultivation Practice of Rice -Fish integrated farming

To cultivate rice-fish systems, channels or trenches are created within a previously flat rice field. These trenches, which help fish continue to grow even after the rice harvest and are particularly useful during low water levels, should be 0.5 meters deep and 1 meter wide. To ensure optimal yields, the total area of trenches should not exceed 10% of the main rice field. Trenches should be located within 10 meters of the rice field, and a water depth of 10-15 meters must be maintained in the channels to support fish survival.

Rice-fish cultivation can be done either concurrently or in rotation. In the concurrent method, rice and fish are grown together. In the rotational method, rice and fish are alternated; after the rice is harvested, the field is converted into a fishpond and stocked with fish. This approach allows farmers to generate income from both crops and fish.

Advantages of Rice -Fish Farming

- Enhances soil fertility by increasing the availability of usable nutrients.
- Reduces reliance on chemical fertilizers.
- Lowers the risk of crop failure.
- Offers an environmentally friendly approach to rice farming.
- Decreases pest and disease infestations.
- Recycles organic matter effectively.
- Provides abundant nitrogen (N), phosphorus (P), and potassium (K).
- Saves farmers time and input costs.
- Preserves biodiversity and maintains productivity.
- Improves the quality of life and economic status of farmers**.**

Conclusion

Fish provide unique nutritional benefits, offering essential proteins and a range of vital micronutrients. The rice-fish system enhances the availability of fish for consumption within farming households. This approach not only promotes climate resilience and biodiversity conservation but also boosts overall farm productivity. Additionally, the rice-fish farming model holds significant potential for expansion and replication, particularly in regions with strong interest from youth and women.