

Integrated Paddy-Cum-Fish Culture

1. Introduction

Integrated Paddy-cum-Fish Culture is a system of producing fish in combination with paddy cultivation using the same resources in the same unit area. Production of fish in paddy fields is almost as primitive as the practice of paddy culture itself. Paddy farming with fish culture is a type of dual farming system in which paddy is the main enterprise and fishes are grown to obtain additional income. Paddy-cum-fish culture is practiced in many paddy-growing belts of the world including China, Bangladesh, Malaysia, Korea, Indonesia, Philippines, Thailand and India. In India it has been a traditional practice largely in the North-Eastern Region.

2. Resources

Paddy and fish are the staple food of India and the country is very rich in natural water resources in the form of rivers, reservoirs, lakes, flood plains, ditches and large areas of paddy fields. Paddy-fish farming involves the simultaneous culture of paddy and fish in irrigated paddy fields so as to obtain an added production of fish with paddy.

3. Status and Potential

The North-Eastern Region of India has vast paddy fields both in valley and hill areas. The region is known for highest amount of rainfall (2000-4000 mm annual average) in the country and hence, the fields remain under water almost throughout the year. Moreover, there are innumerable streams and rivers that irrigate the fields. Hence, these fields offer a good scope for producing fish along with paddy with little or no additional cost or effort. Further, due to hilly terrain as well as pressure to produce rice for consumption, scope for constructing large fishponds in these regions is limited.

Paddy-cum-Fish Culture is easy, cost-effective, sustainable and environmental friendly. Moreover it can increase paddy yield as a result of nutrients and pest control by fish. Besides it can enhance farmers' income and provide nutritional security.

4. Project Location and Implementation

A. Site Selection: Fields having an almost uniform contour and high water retention capacity are preferred. Low-lying areas (where water flows easily and is available at any time when needed) are suitable. Groundwater table and drainage system are important factors to be taken into consideration in site selection.

B. Beneficiaries: Beneficiaries include paddy farmers/ fishers. Selection would be based on their interest and awareness. Registered paddy farmers in a village will be grouped into clusters.

C. Project Implementation:

- Management of Paddy-cum-fish culture will be under the technical guidance of the State Dept. of Fisheries.

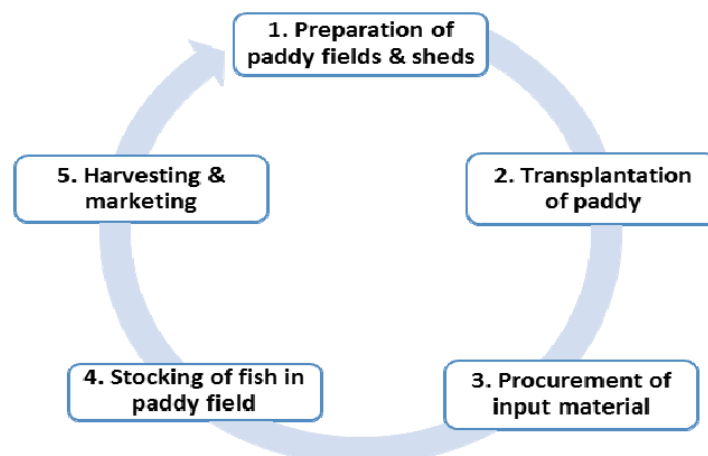
- The Major Components of the project will be established by the Implementing Agency as a common facility and used by the farmers on a shared basis.
- NFDB would provide financial assistance to the States for the development of paddy-cum-fish culture as a livelihood project.

5. Project Components

A. Soil and Water Quality: Soil of the paddy field should be fertile, rich in organic matter and have high water holding capacity. Usually medium textured soils like silty-clay or silty-clay-loam are most suitable for paddy-cum-fish farming/ prawn culture. The soil and water characteristics and their optimum ranges are given below:

Sl.No.	Parameter	Optimum Range
I	Soil Characteristics	
1	pH	5.2-5.9
2	Moisture	15-17.3%
3	Nitrogen	0.71-.025 ppm
4	Organic Carbon	1.98-2.71%
5	Organic Matter	3.22-4.85%
II	Water Parameters	
1	pH	6.2 - 7.6
2	Temperature	14 - 30
3	Turbidity	55.5 - 96 NTU
4	Light Intensity	760 - 1344 Lux
5	Dissolved Oxygen	4.5 – 9.5 mg/l
6	Total Alkalinity	29 – 34 mg/l
7	Hardness	48 – 62 mg/l

B. Paddy Field Preparation: The plots selected for Paddy-cum-Fish Culture are normally prepared in the month of January-February by raising their embankment all around the plots. Strong bunds in the paddy fields prevent leakage of water, maintain desired depth and prevent escape of cultivated fingerlings/fish during floods. Width of bund should be 1.5 m at the bottom and 1.0 m at the top. The bamboo screen matting should be done along the base of bund for support. The paddy field can be provided with inlet and outlet. After the paddy field is ready paddy seedling are transplanted from the nursery bed. Stocking of fish seed will be done 10-15 days after paddy transplantation.



C. Fish Culture Facility:

Sl.No.	Particulars	Grow-Out Zone
1	Type of Pond	Perennial Trench / Refuge Pond
2	Area	0.25 ha
3	Size	74.0 m x 33.8 m
4	Depth	1.0 m
5	Bund Top Width	1.0 m
6	Bund Bottom Width	1.5 m
7	Inner Slope	1:1.2
8	Outer Slope	1:1
9	Inlet & Outlet	1 inlet (10 cm diameter) and 1 outlet (15 cm diameter)

D. Types of Paddy-cum-Fish Culture:

- (i) Simultaneous or Concurrent Method where fish and paddy grow together in the same field at the same time. In this method fish are raised in a Trench/ Refuge Pond which may be in the periphery of paddy field or in the centre of paddy field.
- (ii) Alternate or Rotation Method where fish are cultured in the paddy field during paddy off-season.

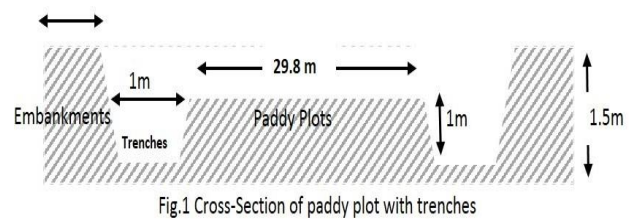
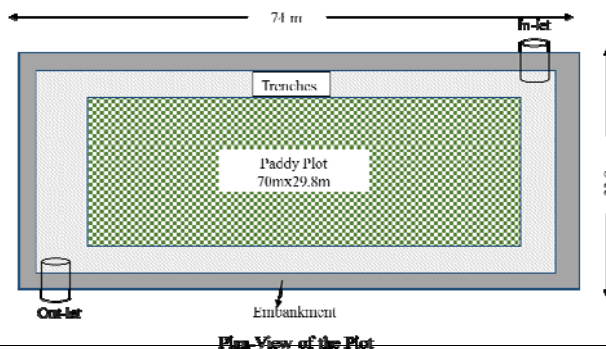


Fig.1 Cross-Section of paddy plot with trenches







Simultaneous Method with Fish in a Trench (above left) or Central Pool (above right) and Rotational Method with Paddy Crop (below left) followed by Fish Culture (below right)

E. Comparison Between Paddy Fields with Fish and Without Fish:

Parameters	Paddy Cultivation Only (without fish)	Paddy Cultivation Integrated with Fish
Size of Paddy Field/Plot	0.1 ha to 1.0 ha	0.2 ha to 1.0 ha
Water Depth	0.2-0.6 m	0.4 m-1.2 m (up to 1.25 m in Refuge Pond)
Bund Width	0.6-1.0 m	1.0-1.5 m
Varieties	Paddy: Heera, Sattari, Kayalni-11, Neela, Tara, TTB 4-7, etc.	Paddy: Local dwarf varieties CRM 10-3630, BG 34-8 Fish: Rohu/ Common Carp/ Tilapia/ Murrel
Density	Paddy: 40-60 kg/ha (spacing 20-24 cm)	Paddy: 40-60 kg/ha (spacing 20-24 cm); Fish Fingerlings: 2,000-6,000/ha (>10 cm)
Culture Period	3-6 months (depends on variety)	3-6 months (depends on variety)
Production	Paddy: 1.7 t/ ha (average)	Paddy: 1.8-2.0 t/ ha (increase by 7.9-8.6%) Fish: 700-2000 kg/ha/cycle
Setup Cost (Rs)	Rs. 9,135/ha	Rs.70,000 /ha (additional cost incurred includes digging trench/refuge pond, strengthening & widening dykes, channels, drains, inlet, outlet)
Operational Cost (Rs)	Rs. 42,000/ha (Paddy seed, manure, etc.)	Rs. 80,000/ha (Paddy & Fish seed, manure, supplementary fish feed with locally available ingredients, labour, etc.)
Total Cost (Rs)	Rs.51,135/ha	Rs. 1,50,000/ha
Income	Rs.1.70 lakh	Rs. 3.20 - 5.80 lakh/ha (Rs.1.8 lakh from paddy and Rs.1.40 – 4.0 lakh from fish)
Profit	Rs. 1.19 lakh/yr	Rs.1.70 – 4.30 lakh/yr
Advantages	---	Paddy yield increased by 7-14%; 3 times more profitable; 47-51% reduction in stem borer pest
Potential States	Pan India	All North Eastern States

F. Selection of Paddy Varieties: The Local dwarf varieties of paddy viz., CRM 10-3630, BG34-8 that can grow under the ago-climatic conditions of the region may be selected. The paddy seedlings are transplanted in the month of April-May.

G. Targeted Fish Species: Common Carp (*Cyprinus carpio*), Murrel (*Channa striata*), Rohu (*Labeo rohita*), Mrigal Carp (*Cirrhinus cirrhosus*), etc., are highly suitable for paddy- cum- fish farming.

	
Common carp (<i>Cyprinus carpio</i>)	Murrel (<i>Channa striata</i>)
	
Rohu (<i>Labeo rohita</i>)	Mrigal Carp (<i>Cirrhinus cirrhosus</i>)

H. Fish Stocking and Yield: After a week of transplanting paddy, fish fry of 20-40 mm size or preferably fingerlings (> 100 mm) will be stocked at the rate of 2500-3500 nos. per ha.

Fish Seed Stocked – 3500 nos./ha

Survival (70%) – 2450 nos.

Culture period – 7- 8 months

Avg. Fish Size at harvest – 450 g

Estimated Total Production – 1102.50 kg

Sale Price per kg – Rs. 200/ kg

Gross Income – Rs.2,20,500/-

6. Integrated Project Components and Unit Costs

Sl.No.	Components*	Unit Cost (Rs)
1	Broodstock Pond	As per actual, limited to eligibility
2	FRP Hatchery for Breeding	
3	Nursery & Rearing Ponds	
4	Grow-out in Paddy Field (Trench)	
5	Transport Vehicle (3- or 4-Wheeler)	
6	Capacity-building/ Training (3-day, 50 per batch)	1.25 lakh

*Major Components of the project will be used as a common facility by the farmers in a cluster on a shared basis.

7. Estimated Project Costs & Returns from Fish

Sl.No.	Particulars	Amount/ Quantity
1	Culture Period for Fish	8 - 10 months
2	Fish Fingerlings Stocked (>10 g; nos./ha)	3500 nos./ha
3	Expected Survival (%)	70%
4	Total Fish Survived (nos.)	2450 nos.
5	Average Size at harvest (g)	450 g
6	Total Production (kg/ha)	1102.5 kg
7	Sale Price (Rs/kg)	Rs. 200/-
8	Gross Income (Rs)	Rs.2,20,500/-
9	Total Expenditure	Rs. 1,50,000
10	Net Profit (Rs./ha/annum)	Rs.70,500/-

8. Expected Socio-Economic Outcomes

As the project sites are selected in regions where agriculture is the main occupation of the residents and their livelihood depends on paddy cultivation and its yield, promoting fish culture by integrating it with paddy cultivation will greatly enhance the yield and production of both fish and paddy within the same time and space. It will not only increase the farm yield, but will contribute greatly towards nutritional security and economic upliftment. The project will also act as a demonstration and encourage other farmers in the village and the neighbouring villages to take up similar activities.

9. Further Reading

Paddy cum Fish Culture. *NAIP Agropedia Raichur*, 2012, ICAR, NAIP. <http://agropedia.iitk.ac.in/content/paddy-cum-fish-culture>

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