

ICAR – Mahatma Gandhi Integrated Farming Research Institute

Model Write up for Background Information

1. **Title of the project:** Development of Organic Rice-Fish-Duck IFS Model in Waterlogging Situations of North Bihar (NRMAMGIFRISIL202100200013)
2. **Funding agency:** Institute Project
3. **Total outlay:** 98.20 lakhs
4. **Duration:** September 2021 to September 2025
5. **Single/Multi-institutional:** Single
6. **Lead center if multi-institutional-** Nil
7. **Cooperating center(s):** Nil
8. **Principal Investigator-** Dr. Shailesh Kumar Singh
9. **Co-Investigators-** Dr. Ravi Kumar
Dr. Subham Mukherjee
10. **Rationale** - North Bihar is highly vulnerable to recurrent floods and prolonged waterlogging caused by the Gandak, Burhi Gandak, Bagmati, Koshi, and Kamla-Balan river systems. These conditions severely limit crop diversification, reduce productivity, and adversely affect farmers' livelihoods. Developing an **Organic Rice–Fish–Duck Integrated Farming System (IFS)** offers a climate-resilient and sustainable approach for improving resource-use efficiency, farm productivity, profitability, and environmental sustainability in waterlogged ecosystems.
11. **Research Gaps-**
 - Rice remains the only feasible kharif crop in severely waterlogged areas.
 - High groundwater levels restrict cultivation of remunerative rabi crops.
 - Location-specific organic rice–fish–duck production technologies are lacking.
 - Limited information is available on suitable rice varieties, fish species, nutrient management, and integrated resource recycling under waterlogged conditions.
12. **Objectives**
 - To evaluate organic farming in rice-fish-duck integrated culture.
 - To assess the fish growth, survival, production, productivity, plankton abundance and occurrence.
 - To study the soil-water environment, productivity, economics and energy efficiency of rice-fish-duck co-culture.
13. **Activities**
14. **Details of experiments**
 - (a) **Treatment details**
 - T1- Organic
 - T2- Organic + Inorganic
 - T3- Inorganic
 - (b) **Replications-** 03
 - (c) **Cropping system-** Rice-Wheat/Mustard-Green Gram/Sesbania
 - (d) **Integrated Components**
 - Rice, Fish, Duck, Dyke Plantation (Papaya, Guava, Mango, Pomegranate & Gliricidia)

(a) Observations to be recorded-

- Crop growth, yield and productivity
- Fish growth, survival and production
- Duck performance
- Plankton abundance and diversity
- Water quality parameters
- Plant nutrient uptake (N, P & K)
- Soil properties (pH, EC, Organic Carbon)
- Energy-use efficiency
- Economics (Cost of cultivation, Gross & Net Returns)

15. GPS Coordinates of Field:

16. Expected Output-

- Standardized Organic Rice–Fish–Duck IFS model for waterlogged ecosystems.
- Enhanced land and water productivity.
- Improved resource recycling and soil health.
- Increased farm income through diversified production

17. Expected Outcome-

- Climate-resilient farming model for flood- and waterlogging-prone regions.
- Improved livelihood, nutritional security and profitability.
- Reduced production costs through organic resource management.
- Sustainable utilization of waterlogged lands with minimum environmental impact.

18. History of the experimental plot

Particular	Details
Field Developed	2022–23
Cropping Sequence	Rice–Wheat/Mustard–Green Gram/Sesbania
Dyke Plantation	Papaya, Guava, Mango, Pomegranate, Gliricidia
Soil Type	Fine loamy mixed Hyperthermic Calcareous Fluventic Haplustepts
Soil pH	8.2
Electrical Conductivity (EC)	0.27 ds/m
Organic Carbon (OC)	0.47%
Available N–P–K	N-191 kg/ha, P- 8 kg/ha, K-145 kg/ha
Micronutrient Status	Zn - 0.4ppm, Fe - 2.6ppm, B- 0.22ppm, Cu- 0.39ppm, Mn - 1.8ppm
Common Pests & Diseases	Y.S.B., Leaf folder, Termite, Blast, Brown spot, Rust, Smut