Development and Assessment of Self-Sustaining Poultry–Fish–Horti Based Integrated Farming System (IFS)

Project Background Information

1. **Title of the project:** Development and Assessment of Self-Sustaining Poultry–Fish–Horti Based Integrated Farming System (IFS)
2. **Funding agency:** ICAR-MGIFRI, Motihari
3. **Total outlay:**
4. **Duration:** 3 years (April 2024 to March 2027)
5. **Single/Multi-institutional:** Single
6. **Lead center if multi-institutional: NA**
7. **Cooperating Centre(s): NA**
8. **Principal Investigator:**
    - Dr. Jadhav Amol Kailas, Scientist, Fruit science
9. **Co-Investigators:**
    - Dr Ravi Kumar, Scientist, Fisheries Resource Management
    - Dr Lamella Ojha, Scientist, Animal Nutrition
10. **Rationale:**
    - Bihar's agriculture is highly vulnerable to recurrent floods, waterlogging, fragmented landholdings, and declining profitability of conventional cropping systems. These challenges reduce crop productivity, degrade natural resources, and limit farmers' income, particularly in low-lying areas of North Bihar. A self-sustaining Poultry–Fish–Horti based Integrated Farming System (IFS) offers a climate-resilient approach by integrating poultry, fisheries, horticultural crops, and resource recycling to maximize land and water use efficiency. Poultry provides regular income and nutrient-rich manure for fish ponds and crops, while pond water and nutrient-rich pond silt enhance horticultural and crop production, creating a circular resource flow with minimal external inputs. Developing and evaluating this integrated model under farmers' field conditions will improve productivity, profitability, resource-use efficiency, and year-round livelihood security for small and marginal farmers in flood-prone ecosystems of Bihar.
11. **Research Gaps**
    - Limited location-specific information on poultry-based Integrated Farming Systems (IFS) under the flood- and waterlogging-prone conditions of Bihar.
    - Lack of scientifically validated integration models combining poultry, fisheries, horticulture, and resource recycling for small and marginal farmers.
    - Insufficient information on resource-use efficiency, nutrient recycling, and waste utilization in poultry-based IFS.

- Limited evidence on the long-term productivity, profitability, and sustainability of self-sustaining Poultry–Fish–Horti based IFS models under farmers' field conditions.

12. Objectives

1. To study constraints & potential opportunities of Poultry farming.
2. To develop a self-sustaining Poultry-Fish-Horti based model for farmers.
3. To assess the economic viability of the developed IFS Model.

13. Activities

- Baseline survey and selection of representative farmers.
- Establishment of Poultry–Fish–Horti and Poultry–Fish–Horti–Crop IFS models.
- Pond development, fish stocking, and integrated water management.
- Establishment of horticultural crops on pond bunds and cereal crop cultivation.
- Construction of poultry units and scientific rearing of birds.
- On-farm validation of IFS models under farmers' field conditions.
- Monitoring productivity, resource recycling, and component interactions.
- Recording system productivity and resource-use efficiency.
- Economic comparison of IFS models and identification of the best-performing system.
- Documentation, dissemination, and preparation of scientific and extension outputs.

14. Details of experiments

(a) Treatment details

Treatment	Components	Brief Description
T_1 (Control)	Poultry	Poultry reared on commercial feed under standard management practices.
T_2 (IFS Model–1)	Poultry + Fish + Horticulture	Integration of poultry, fish pond, and dyke crops (banana, papaya, pigeon pea) with resource recycling.
T_3 (IFS Model–2)	Poultry + Fish + Horticulture + Crops	Integration of poultry, fish, dyke horticultural crops, and seasonal cereal crops (paddy-maize-Wheat-Soyaben/Cowpea) for enhanced resource use and feed self-sufficiency.

(b) Fertilizer doses-NA

(c) Variety:

Poultry: Sonali, Vanraja

Fruit crop: Papaya cv Red Lady, Banana cv. Dwarf Cavendish

(d) Replications-NA

(e) Observations to be recorded

- Poultry Performance: Body weight, feed intake, feed conversion ratio (FCR), egg production, mortality, and manure generation.

- Fish Performance: Water quality (pH, dissolved oxygen, temperature, TDS, salinity etc.), fish growth, survival rate, and fish yield.
- Horticultural & Crop Performance: Plant growth, fruit/grain yield, biomass production, and cropping intensity.
- Soil & Nutrient Status: Soil pH, organic carbon, available N, P, K, and nutrient content of organic manures.
- Resource Recycling: Quantity of poultry manure recycled, compost production, pond silt utilization, and nutrient recycling efficiency.
- Economics: Cost of cultivation, gross return, net return, benefit–cost ratio, return on investment, and system equivalent yield.
- System Performance: Resource-use efficiency, energy-use efficiency, system productivity, and sustainability indicators.

15. GPS Coordinates of Field:

16. Expected Output

- Technology on a self-sustaining Poultry–Fish–Horti based Integrated Farming System (IFS) model for Bihar.
- Identification of efficient resource recycling and enterprise integration strategies involving poultry, fish, horticulture, and crops.
- Documentation of production technologies and generation of research papers, technical bulletins, extension folders, and farmer advisories.
- On-farm demonstration and dissemination of the developed IFS technology to farmers.

17. Expected Outcome

- Improved system productivity, profitability, and resource-use efficiency.
- Enhanced nutrient recycling, soil health, and climate resilience through integrated farming.
- Increased adoption of Poultry–Fish–Horti based IFS by small and marginal farmers.
- Improved farm income, livelihood security, and nutritional security in flood- and waterlogging-prone areas of Bihar.

18. History of the experimental plot

(a) When the field was developed: March 2024

(b) What are crops being cultivated season-wise: Paddy-Maize-Wheat-Soybean/Cowpea and Seasonal Vegetables

(c) Soil type: Sandy Loam

(d) Soil pH, EC, OC: pH>8, EC>0.16-0.34 ds/m, OC- 0.3-.0.6%

(e) Soil depth: More than 2 m

(f) Soil NPK and micronutrient status: NA

(g) Common pests and diseases: Aphids, Thirps, Caterpillers etc