

Development and assessment of mango-based IFS model for sustainable resource management in flood prone areas of North Bihar

Project Background Information

- 1. Title of the project:** Development and assessment of mango-based IFS model for sustainable resource management in flood prone areas of North Bihar (Project code: NRMAMGIFRISIL202400400020)
- 2. Funding agency:** ICAR-MGIFRI, Motihari
- 3. Total outlay:**
- 4. Duration:** 3 years (May 2024 to April 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 P K Bharti, Senior Scientist, Livestock Production Management
 - Dr Naveen Kumar B. Patil, Senior Scientist, Entomology
 - Dr Lamella Ojha, Scientist, Animal Nutrition

10. Rationale:

Northern Bihar's flood- and waterlogging-prone conditions, coupled with declining profitability of conventional mango orchards, limit efficient land and resource use. Old mango orchards often have underutilized interspaces that can be productively integrated with crops, livestock, rainwater harvesting, and resource recycling. This project aims to develop and evaluate a mango-based Integrated Farming System (IFS) that improves resource-use efficiency, enhances soil health, conserves rainwater, increases climate resilience, and generates year-round income through enterprise diversification. The model promotes sustainable production, efficient recycling of farm resources, and livelihood security for small and marginal farmers in water-congested ecosystems of North Bihar.

11. Research Gaps

- Limited research on mango-based intercropping systems under flood- and waterlogging-prone conditions of North Bihar.
- Lack of scientifically validated integrated farming models combining mango with crops, livestock, and resource recycling enterprises for low-lying areas.
- Insufficient information on resource-use efficiency, soil health, and rainwater management in mango-based IFS under water-congested ecosystems.

- Limited evidence on the long-term productivity, profitability, and climate resilience of mango-based IFS for small and marginal farmers.

12. Objectives

- To develop and assess mango based integrated farming system in water congested ecology of North Bihar
- To find out the economics and resource flow of the various mango-based IFS production systems

13. Activities

- Baseline survey and selection of farmers' fields
- Design and establishment of mango-based IFS models
- Introduction and evaluation of suitable intercrops
- Construction of low-cost poultry and goat units
- Integration of poultry and goats with mango orchards
- Monitoring growth, productivity, and system performance
- Soil and plant health assessment
- Economic evaluation and identification of the best-performing IFS model

14. Details of experiments

(a) Treatment details

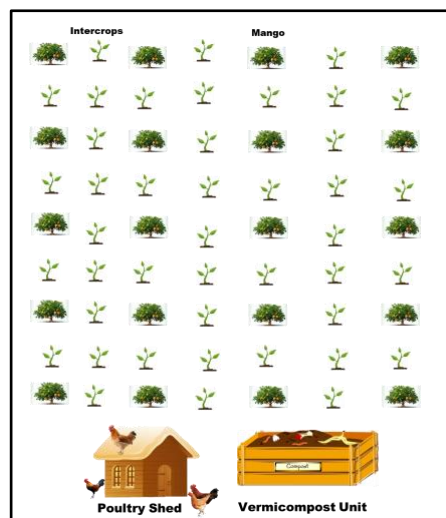


Fig. 1 Farming system model 1 (Mango orchard + intercrop + poultry)

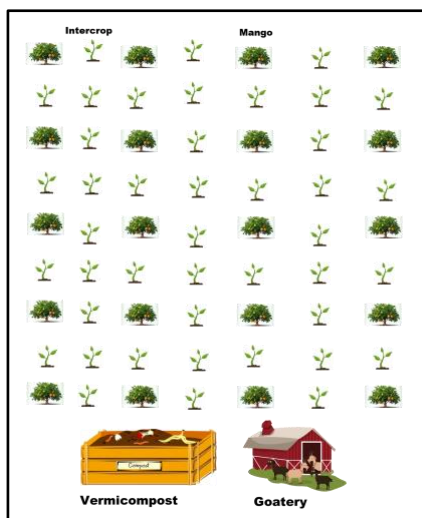


Fig. 2 Farming system model 2 (Mango orchard + intercrop + goatery)

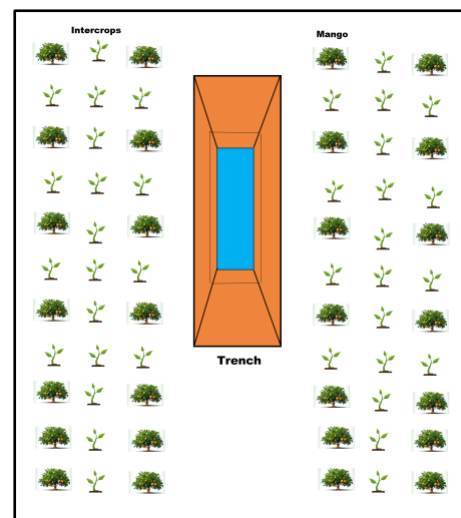
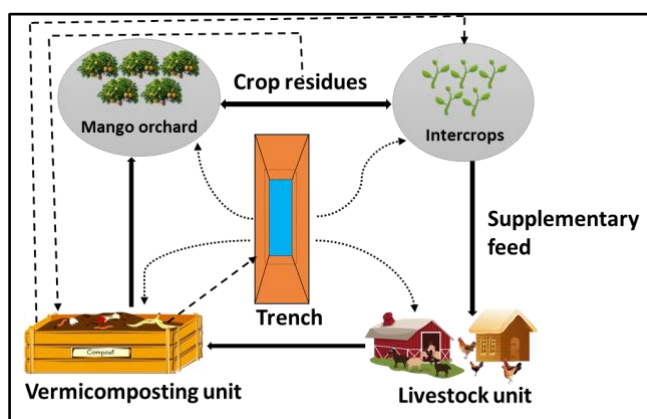


Fig. 3 Farming system model 3 (Mango orchard + intercrop + trench)



(b) Fertilizer doses: NA

(c) Variety: mango: Malda, Bombaiya, Sepia, Sukul etc.

(d) Replications: NA

(e) Observations to be recorded

- Soil Health: pH, organic carbon, available N, P, K, and soil fertility status.
- Plant & Organic Inputs: NPK content of crops, vermicompost, FYM, poultry/goat manure, pond silt, and crop residues.
- Crop Performance: Growth, yield, mango equivalent yield (MEY), and system productivity.
- Livestock & Poultry: Growth, production, mortality, and manure generation.
- Resource Recycling: Quantity of recyclable biomass, compost production, and nutrient recycling.
- Economics: Cost of cultivation, gross return, net return, benefit: cost ratio, and profitability.
- Energy Analysis: Input energy, output energy, net energy gain, and energy-use efficiency.
- Sustainability Indicators: Sustainable Livelihood Index (SLI), resource-use efficiency, and overall system resilience.

15. GPS Coordinates of Field:

16. Expected Output

- Technology on a location-specific mango-based Integrated Farming System (IFS) model for North Bihar for small and marginal farmers.
- Identification of profitable intercropping and allied enterprises (poultry, goateries, etc.) suitable for old mango orchards.
- Improved resource-use efficiency (land, water, nutrients, and biomass recycling) through integrated farming.
- Generation of scientific outputs, including research publications, technical bulletins, extension literature, and farmer advisories.
- 30–40% increase in overall system productivity and farm profitability compared with conventional mango orchards.

- On-farm validation and demonstration of the developed IFS model under farmers' field conditions.

17. Expected Outcome

- Enhanced productivity, profitability, and resource-use efficiency of mango-based farming systems.
- Improved climate resilience and sustainable natural resource management in flood-prone ecosystems.
- Increased adoption of mango-based IFS technologies by small and marginal

18. History of the experimental plot

- (a) When the field was developed: May 2024
- (b) What are crops being cultivated season-wise:
- (c) Soil type: sandy loam
- (d) Soil pH, EC, OC: pH>8, EC>0.23-0.46 ds/m, OC- 0.4--0.7%
- (e) Soil depth: More than 2 m
- (f) Soil NPK and micronutrient status:
- (g) Common pests and diseases: mango hoppers, mealy bugs, stem borer, moths, mango malformation, anthracnose, rust, powdery mildew, aphids etc.