

Background Information (QR code)

1. **Title of the project:** Nutritional Evaluation and Efficient Utilization of Feed Resources in Cattle-Based Integrated Farming Systems in Water congested Areas of Bihar
2. **Funding agency:** ICAR-MGIFRI, Motihari
3. **Total outlay:** 84.40 Lakh
4. **Duration:** 5 years
5. **Single/Multi-institutional:** Single
6. **Lead center if multi-institutional-** NA
7. **Cooperating center(s):** NA
8. **Principal Investigator:** Dr. Lamella Ojha (Animal Nutrition, ICAR-MGIFRI, Motihari, Bihar)
9. **Co-Investigators:**
 - : Dr. P. K. Bharti (LPM, ICAR-MGIFRI, Motihari, Bihar)
 - : Dr. Pratapa M.G (Fish Health, ICAR-MGIFRI, Motihari, Bihar)
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10. Rationale:

Dairy farming is an important source of livelihood, income and nutritional security for small and marginal farmers in India. Its importance is particularly high in flood- and waterlogging-prone areas of Bihar, where recurrent flooding disrupts crop production and adversely affects the availability of quality livestock feed. Cattle are largely maintained on crop residues such as paddy straw, wheat straw and maize stover, which generally have low nutritive value, high fibre content and poor digestibility (Bediye, 2007; Karangiya et al., 2016). However, systematic information on the availability, nutritional value and utilization of locally available feed resources in these areas is limited.

During floods, the availability of conventional green fodder is further reduced. Azolla and perennial tree fodders such as Moringa, Mulberry, Leucaena and other locally suitable species can serve as alternative protein-rich feed resources. Azolla can be cultivated using harvested rainwater in silpaulin-lined structures, while tree fodders can be maintained on field bunds, homesteads and other non-cultivable areas. Processing these resources into dried meals may facilitate their storage and incorporation into livestock diets during periods of feed scarcity.

Following flood recession, feed shortages may continue due to delayed recovery of fodder and crop production. Densified complete feed blocks (DCFB) offer a practical approach for efficient utilization of locally available crop residues and other feed resources in a compact, balanced and easily transportable form. Such technology can reduce feed wastage, improve uniform nutrient intake and facilitate feed storage during periods of scarcity (FAO, 2012; Beigh et al., 2017).

Despite the potential of these resources, limited information is available on the integrated use of Azolla, tree fodders and densified feed technologies for improving cattle feeding

under flood-prone conditions. Their effects on feed intake, nutrient utilization, milk production, economics and resource-use efficiency also require systematic evaluation. Therefore, the present study is proposed to assess the availability and nutritional characteristics of locally available feed resources and to evaluate Azolla and tree fodder-based feeding strategies during flood conditions and densified complete feed blocks during the post-flood period. The study will further assess their effects on animal productivity, nutrient utilization, economic returns, energy-use efficiency and carbon footprint in cattle-based integrated farming systems in water-congested areas of Bihar.

11. Research Gaps

- a. Limited region-specific feeding strategies and feed database.
- b. Poor utilization of locally available feed resources.
- c. Lack of data on energy efficiency and environmental sustainability.
- d. Need for sustainable feeding systems for cattle-based IFS in flood-prone Bihar.

12. Objectives

1. To assess the nutritional status of cattle under prevailing feeding practices in water-congested areas of Bihar.
2. To evaluate the utilization of locally available feed resources through improved feeding strategies in cattle under water-congested areas.
3. To assess energy use efficiency, carbon footprint, and economic returns of cattle-based feeding systems utilizing local feed resources.

13. Activities

1. To conduct a survey and document the availability, utilization and nutritional characteristics of major feed and fodder resources of cattle under water-congested and flood-prone areas of Bihar.
2. To evaluate Azolla and tree fodder-based feeding strategies for improving feed utilization and productivity of lactating cattle during flood conditions.
3. To develop and evaluate densified complete feed blocks (DCFB) using locally available feed resources for efficient feeding of cattle during the post-flood period.
4. To assess energy-use efficiency and carbon footprint of cattle-based integrated farming systems under existing and improved feeding practices.

14. Details of experiments

Experiment I: Azolla and Tree Fodder-Based Feeding Trial During Flood

(a) Treatment details – 4 Treatments

Sl. No.	Treatment	Treatment details
1	T1	Control – Basal diet
2	T2	Azolla meal replacing 30% of concentrate
3	T3	Azolla meal + tree leaf meal replacing 30% of concentrate
4	T4	Fermented Azolla meal + tree leaf meal replacing 30% of concentrate

(b) Tree fodders – Moringa, Mulberry and Leucaena

(c) Animals – 4 indigenous lactating cattle

(d) Design – 4 × 4 Latin Square Design

(e) Experimental period – 4 periods × 22 days (15 days adaptation + 7 days data collection)

(f) Observations – Feed intake, nutrient digestibility, milk yield and composition, blood metabolites, rumen fermentation, rumen metagenomics, feed efficiency and economics.

Experiment II: Densified Complete Feed Block and Postbiotic Feeding Trial During Post-Flood

(a) Treatment details – 3 Treatments

Sl. No.	Treatment	Treatment details
1	T1	Control – Basal diet
2	T2	Densified Complete Feed Block (DCFB)
3	T3	DCFB + low-cost postbiotic

(b) Animals – 6 indigenous lactating cattle

(c) Design – Replicated 3 × 3 Latin Square Design (2 squares × 3 animals)

(d) Experimental period – 3 periods × 35 days, with 14 days initial adaptation and 14 days washout between periods

(e) Observations – Feed intake, nutrient digestibility, milk yield and composition, blood metabolites, rumen fermentation, feed efficiency, economics, energy-use efficiency and carbon footprint.

15. GPS Coordinates of Field:**16. Expected Output:**

- Development of a database on availability and nutritional composition of feed resources in flood-prone areas of Bihar, along with assessment of the nutritional status of cattle.
- Development and evaluation of efficient feeding strategies through nutritional enrichment and utilization of locally available feed resources to improve nutrient utilization and animal performance.
- Assessment of resource use efficiency, energy use efficiency, carbon footprint, and economic returns of improved feeding strategies in cattle-based farming systems.

17. Expected outcome:

The main beneficiaries of this study will be farmers, particularly those in waterlogged areas of Bihar. The study will help them better understand the feeding challenges they face and enable more efficient utilization of locally available feed resources. By improving feeding practices, the study is expected to enhance growth performance, milk production, and nutrient utilization, thereby increasing overall farm income.

In the long term, it will support farmers in maintaining a more stable and sustainable dairy farming system under challenging conditions.

18. History of the experimental plot

Location of experiment: Animal Farm, ICAR-MGIFRI, Motihari, Bihar

(a) When the field was developed: Fodder plot developed during 2026–27

(b) What are fodders being cultivated season-wise:

- **Kharif:** Hybrid sorghum, Bajra, maize etc
- **Rabi/Winter:** Oat, berseem etc
- **Perennial fodder/tree fodder:** Hybrid Napier, Moringa, Mulberry, Leucaena etc

(c) Soil type: Sandy loam

(d) Soil pH, EC, OC

(e) Soil depth

(f) Soil NPK and micronutrient status: Not assessed

(g) Common pests and diseases: Leaf-eating insects, wasps, Aphids