



## POPULAR SCIENCE ARTICLE

## Integrated farming systems: sustainable year-round income for small and marginal farmers

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### Abstract

Small and marginal farmers across NTR District of Andhra Pradesh are increasingly combining crop cultivation with livestock rearing, horticulture and other farm enterprises on the same holding to spread income across the year and reduce dependence on a single crop. Drawing on a field study conducted across the district's canal-irrigated, rainfed and tank-fed farming situations, this article looks at how such Integrated Farming System (IFS) combinations have taken shape on the ground, the challenges farmers still encounter in making them work and what farmers themselves say would help them do better. The discussion is intended to help extension workers, policymakers and fellow farmers understand how a diversified, waste-free approach to farming can strengthen household income and resilience in the district.

**Keywords:** integrated farming systems; sustainable agriculture; NTR District; diversification; farmer income

### Introduction

Ask any farmer what keeps them up at night and the answer is rarely just how to grow more paddy or squeeze a slightly better yield out of cotton. It is usually something bigger: how to earn enough, every month, from the same small piece of land. A single crop, harvested once or twice a year, leaves long gaps with no income and heavy risk if the rains fail or prices fall. This is precisely the problem that Integrated Farming Systems or IFS, are designed to solve (Kumar *et al.*, 2018). The idea is simple: instead of depending on one crop alone, a farmer combines two or more enterprises, crops with livestock or crops with horticulture, on the same land, so that the waste or by-product of one enterprise becomes the input for another. Crop residue turns into cattle fodder. Manure from the cattle shed turns into fertiliser for the field. Nothing goes to waste and income begins to arrive from more than one direction across the year, a pattern earlier work has linked to higher and more stable household income and employment among small and medium farmers (Behera & Mahapatra, 1998).

NTR District sits in the heart of the Krishna river basin and its farmers work under very different conditions within the same district: some depend on canal water from the Nagarjuna

Sagar Project, others farm rainfed black or red soils and still others rely on tank irrigation. Because the land and water situation varies so widely, no single farming model suits every village. What follows is a closer look at how farmers in each of these situations have already begun blending enterprises to their advantage, the difficulties that still hold them back and the support they say would make the biggest difference.

### What Farmers Are Already Doing, Situation by Situation

#### 1. Canal-irrigated red and black soils (near the NSP canal)

In villages served by the Nagarjuna Sagar Project canal, paddy is the mainstay crop, but the smartest farmers do not stop there. Many keep a few cattle, sheep, goats or backyard poultry alongside their fields, feeding the animals on paddy straw and other crop residue while using the manure to enrich the soil, a combination consistent with the enterprise mixes reported among IFS-practising farmers elsewhere in Andhra Pradesh (Chandana *et al.*, 2023). Some farmers alternate paddy with cotton in the kharif season and grow vegetables or chilli in rabi, spreading the harvest and the income, across more months of the year.

## 2. Rainfed black soils

Where rainfall rather than canal water decides the cropping calendar, cotton dominates, often paired with livestock and fodder cultivation. Some farmers have added mango orchards to the mix, giving them a longer-term, tree-based income that cushions the swings of an annual crop like cotton, similar to the crop-plus-orchard combinations found to be viable in other IFS models evaluated in Andhra Pradesh (Rao *et al.*, 2020). Maize combined with livestock rearing is another combination that is working well in these tracts.

## 3. Rainfed red soils

In the red-soil belt, mango orchards paired with livestock, sheep and backyard poultry have emerged as the most profitable combination, echoing similar tree-crop-livestock combinations evaluated as viable IFS models in the Godavari delta (Reddy *et al.*, 2018). Farmers here also pair paddy or cotton with animal rearing, using the same underlying principle: crops for cash income, livestock for a steady secondary income and a reliable source of manure.

## 4. Tank-fed soils

Where irrigation depends on the local tank, farmers have found that pairing paddy or cotton with horticultural crops such as chilli works well, since horticulture brings in income at a different point in the year than the main cereal or fibre crop.

### The Roadblocks Farmers Still Face

Despite these promising combinations, farmers across all these farming situations report similar difficulties:

1. Prices that do not reward the effort — paddy, cotton and milk prices often fail to match the cost of cultivation.
2. Rising input costs for fertiliser, pesticides and insecticides that keep squeezing already thin margins.
3. Fodder shortages in summer, right when livestock need feed the most.
4. Water shortages at the tail end of canal networks.

5. Weather shocks to horticulture, especially unseasonal rain during the mango flowering season.
6. New or resistant pest pressure, such as fall armyworm in maize.
7. Labour shortages during peak harvest, particularly for chilli.
8. Weak market links and limited storage, which often force a hurried, low-price sale of perishable produce.
9. Limited awareness of government schemes, subsidies and modern pest-control practices.

### What Farmers Are Asking For

1. Timely delivery of farm inputs before the sowing window closes.
2. A guaranteed, remunerative price for both agricultural and horticultural produce.
3. Steps to bring down input costs for fertiliser and pesticides.
4. Fairer, more manageable labour wage arrangements during peak seasons.
5. Cheaper livestock feed, especially through the lean summer months.
6. Fewer middlemen between the farm gate and the final market.
7. Regular, timely visits and advice from extension officers.
8. Dedicated market channels for agricultural and horticultural produce.

### At a Glance: Farming Situations, Mandals, Constraints and the Road Map Ahead

The table 1 below brings together the district's major farming situations with the mandals broadly representative of each, the constraints farmers report most often, the strategies already helping them cope and a practical road map, from immediate to longer-term action, to take these solutions further. Mandal listings are indicative, based on the district's known canal-command, upland rainfed and tank-fed zones and are best cross-checked against local KVK or Agriculture Department records before use in planning documents.

**Table 1.** Major Farming Situations, Constraints, Integrated Farming Strategies and Development Roadmap in NTR District andhra Pradesh

| Sl. No. | Farming Situation         | Representative Mandals (NTR District)            | Major Crops                       | Major Constraints                                                                                                                                                                              | Strategies to Overcome Constraints                                                                                                                                                            | Road Map (Short/Medium/Long Term)                                                                                                                                                                                               |
|---------|---------------------------|--------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | NSP Canal Chalka Red Soil | Ibrahimpatnam, G. Konduru, Mylavaram             | Paddy, Cotton, Chilli, Vegetables | Non-remunerative prices for paddy and cotton; shortage of canal water in tail-end areas; high input costs; lack of pest- and disease-resistant paddy varieties; weak marketing for vegetables. | Diversify paddy or cotton with livestock and vegetables; adopt resistant paddy varieties; build on-farm fodder reserves; market produce jointly through Farmer Producer Organisations (FPOs). | Short-term: awareness camps on IFS models and MSP linkage. Medium-term: micro-irrigation and canal desilting for tail-end areas; vegetable collection centres. Long-term: FPO-led direct marketing and cold-storage facilities. |
| 2       | NSP Canal Black Soil      | Vijayawada Rural, canal-fed pockets of Nandigama | Paddy, Chilli                     | Non-remunerative market prices; labour shortage during chilli harvest; limited awareness of modern pest control and government schemes.                                                        | Custom hiring of labour-saving tools; training in integrated pest management; scheme-awareness camps.                                                                                         | Short-term: KVK-led scheme-awareness camps. Medium-term: custom hiring centres for harvest operations. Long-term: local chilli processing and value-addition units.                                                             |
| 3       | Rainfed Black Soils       | Nandigama, Vissannapeta, Penuganchipolu          | Cotton, Maize, Mango              | Limited knowledge of balanced fertiliser use; flower drop in mango; fall armyworm in maize; low milk prices; unseasonal rains damaging mango.                                                  | Soil-test-based nutrient management; pheromone traps and IPM for fall armyworm; mango canopy and flowering-stage management; stronger milk cooperatives.                                      | Short-term: soil health card distribution and pest-monitoring demonstrations. Medium-term: mango orchard management training; dairy cooperative expansion. Long-term: climate-resilient varieties and crop insurance uptake.    |
| 4       | Rainfed Red Soils         | Jaggayyapeta, Tiruvuru, A. Konduru               | Mango, Paddy, Cotton              | Rain shortage at critical crop stages; low remunerative prices for crops and milk; summer fodder shortage; uneven rain during mango flowering; low scheme awareness.                           | Rainwater harvesting structures; fodder cultivation on field bunds; scheme-awareness drives; protective measures during mango flowering.                                                      | Short-term: farm-pond and rainwater-harvesting demonstrations. Medium-term: fodder seed distribution and dairy price-linkage support. Long-term: watershed development and drip irrigation for orchards.                        |
| 5       | Tank-fed Soils            | Reddigudem, Veerullapadu, Vatsavai               | Paddy, cotton, chilli             | Limited awareness of improved technologies; labour shortage at harvest; lack of storage facilities; higher pest and disease incidence.                                                         | Farmer field schools; custom hiring centres; village-level storage facilities; IPM promotion.                                                                                                 | Short-term: farmer field school sessions. Medium-term: custom hiring centres and mini storage godowns. Long-term: tank desilting and modernisation for assured irrigation.                                                      |

## Conclusion

The experience of farmers in NTR District carries an encouraging message: they are not waiting for a textbook model. Across canal-irrigated, rainfed and tank-fed land, they have already begun blending crops, livestock and horticulture in ways suited to their own soil and water conditions. What they need now is support to do it better: assured prices, dependable input supply, fodder security in summer, weather-resilient horticulture practices and stronger market and storage

infrastructure. If extension agencies and policymakers build on what farmers have already started, rather than prescribing something entirely new, Integrated Farming Systems can grow from a smart survival strategy into a genuine engine of year-round income, sustainability and rural prosperity across the district.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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