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INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

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Impact Brief

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Local Seed Systems: The Key to Unlocking Rice Fallow Potential in India

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Executive Summary

In Odisha, 1.6 million hectares of agricultural land remain fallow after the rice harvest due to irrigation and socio-economic constraints, limiting *rabi* (post-monsoon) cultivation. To address this, the Government of Odisha launched the Comprehensive Project on Rice Fallow Management in 2022, focusing on growing pulses and oilseeds in rice fallows.

Partnering with Odisha's Department of Agriculture and Farmers' Empowerment (DAFE), ICRISAT used cutting-edge technology, including remote sensing and science-led community interventions, to tap into the potential of rice fallows to enhance food and nutrition security, farmer incomes, and soil health.

The project's impacts were substantial:

- Fallow land in *rabi* dropped from 83.3% to 41.7%, with 61.9% of farmers growing a second crop for the first time in five years.
- Black gram and chickpea yields increased significantly in rice fallow conditions, and pulse consumption and dietary diversity increased among participating households.
- Nutrient interventions improved soil health, and farm incomes rose by 34%. Over 60% of farmers now store seeds for future planting.

To sustain these gains, a **robust local seed sector is needed** so that farmers have sustained access to quality seeds from reliable sources.

Introduction

Through strategic implementation, the project revitalized fallow lands and empowered thousands of farmers, particularly women, setting a powerful precedent for sustainable agricultural development in Odisha and beyond.

Introducing new varieties and good agricultural practices: The project identified and introduced short-duration, high-yielding pulse varieties that can thrive in the narrow planting window after the rice harvest. It

also introduced biological crop management techniques, including the use of Rhizobium and Phosphate-Soluble Bacteria (PSB) to enhance soil fertility and plant health.

Community engagement and gender inclusivity: The project extensively engaged with the local communities, emphasizing gender inclusivity and ensuring a balanced representation of male and female farmers. This was done in collaboration with a local NGO, Pragati in Koraput.

Capacity building: Recognizing that sustainable change begins with knowledge, the project conducted over 120 comprehensive training sessions that equipped farmers with essential skills in agronomic practices, focusing on seed treatment, optimal sowing techniques, and Integrated Pest Management (IPM).

Monitoring and evaluation: An advanced digital platform was introduced for real-time data collection and analysis, allowing for adaptive management and ensuring that objectives were met with precision.

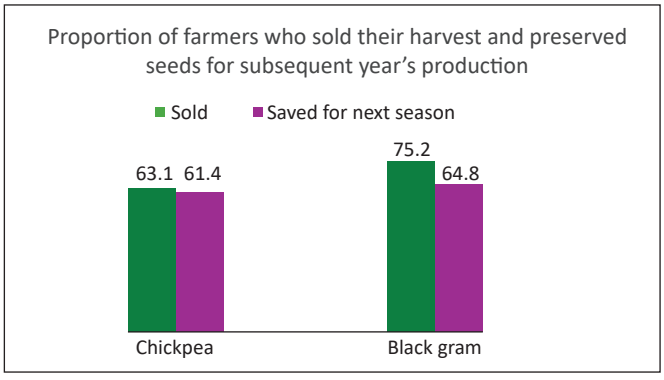
Impact on Ground

The project achieved significant positive outcomes, as evidenced by quantitative data collected from the project sites.

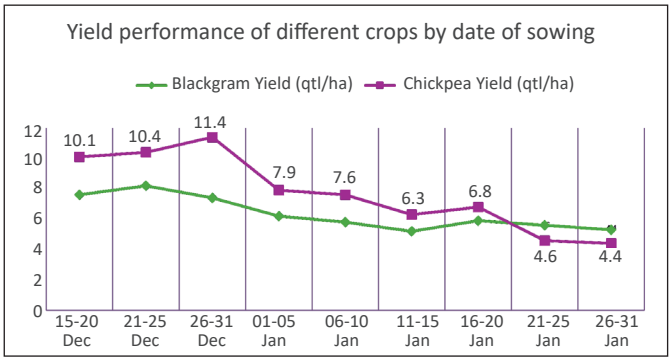
Increased cultivation: Prior to the intervention, 83.3% of sampled farmers left their fields fallow during the *rabi* season. The project reduced this figure to 41.7%, with 61.9% of sampled farmers cultivating a second crop for the first time in the last five years.

Enhanced agricultural productivity: The average productivity for black gram reached 6.2 quintals per hectare (q/ha), with a maximum yield of 8.2 q/ha. Chickpea productivity averaged 6.4 q/ha, with a maximum yield of 10.4 q/ha. These figures represent significant improvements over previous yields in similar ecologies.

Improved soil health: Soil sampling revealed critical nutrient deficiencies, which were addressed through soil test-based targeted interventions. The application of phosphate fertilizers and micronutrients like borax and sulfur has improved soil fertility, supporting sustainable agricultural practices.



Seed use and improved diffusion: Approximately 64.8% of black gram farmers and 61.4% of chickpea growers stored seed for the subsequent year, indicating increased seed security. Additionally, 75.2% of black gram growers and 63.1% of chickpea growers sold or exchanged a portion of their harvest, contributing to increased adoption.



Nutritional Improvement: Per capita daily pulse consumption among participating households increased from 31.7 grams to 40.2 grams, aligning with the Indian Council of Medical Research (ICMR) guidelines. The Minimum Dietary Diversity among Women (MDD-W) aged 15-49 also improved, rising from 29.7% to 43.9%, suggesting a significant increase in diverse consumption by women of reproductive age.

Economic Impact: The project led to a 34% increase in farm income of sampled farmers from *rabi* cultivation and a 10.1% overall increase in all farming activities. This reflects a positive trend in enhancing the livelihoods of participating farmers.

Learnings from the pilot: Pilot findings highlight a strong link between sowing date and yield in short-duration pulses. Early sowing boosts yields, benefiting from favorable conditions in rice fallows, while delayed sowing reduces yields due to moisture stress and pest issues. Short-duration cultivars outperformed longer-duration ones, showing the greatest potential to reclaim rice fallows.

The Challenge

Timely access to quality seeds is crucial for farmers, especially for short-duration pulse crops, where early sowing significantly boosts yields. However, farmers often face challenges in procuring seeds on time due to inadequate access to certified seeds. These challenges can lead to missed optimal sowing windows, reducing productivity and making fields more vulnerable to moisture stress and pests. Addressing these barriers is essential to improve yields and resilience in pulse production.

Other factors that compound the challenge are:

- Private sector involvement is minimal, as seed dealers have limited commercial incentives in these areas.

- Farmers often rely on low-quality, self-saved seeds due to restricted access to improved pulse seed varieties.
- While some farmers save seeds for future planting, this informal approach lacks consistency and quality control, leading to deterioration over time.
- Storage challenges persist, especially for pulses, with traditional methods leading to spoilage, pest damage, and poor germination.
- Lack of awareness and access to modern storage tools like hermetic bags further hinders seed quality and longevity.

Proposed Solutions

Addressing the above challenges requires developing local capacity in the seed sector. Some points to consider include:

- **Empower Self-Help Groups** (SHGs), **Farmer Producer Organizations** (FPOs), and **cooperatives** to serve as alternative production and delivery channels within the seed value chain.
- **Provide targeted capacity-building** and business support to enable these grassroots entities to play a central role in the seed sector.
- **Strengthen market linkages** between local seed enterprises and the formal seed sector.
- **Connect local enterprises with networks** to access genetically pure early-generation seeds (EGS), ensuring seed quality and consistency.

Policy Recommendations

Policy support is important to encourage the cultivation of pulses in fallow lands and motivate more farmers to adopt this practice. Strengthening seed systems through the establishment of decentralized seed production and delivery networks, investment in capacity building, and technical trainings, are essential to ensure the timely availability of high-quality seeds at the local level.

The private sector can play a vital role in driving the success of rice fallow management. By fostering public-private partnerships (PPP), the production, distribution, and marketing of high-quality seeds can be significantly enhanced. This collaboration will also promote the adoption of advanced agricultural technologies.

- **Foster Public-Private Partnerships for Seed Availability:** Encourage partnerships with private sector entities to enhance seed production, distribution, and marketing networks in rice fallow ecology. This approach will ensure timely access to high-quality seeds and promote the adoption of advanced agricultural technologies, ultimately boosting agricultural productivity.
- **Promote Decentralized Seed Production and Delivery Systems:** Establish decentralized seed hubs at the community level, managed by Farmer Producer Organizations (FPOs) and Women Self-Help Groups (WSHGs). These hubs will enhance the local accessibility and distribution of seeds, ensuring farmers can plant within optimal sowing windows.

- **Strengthen Capacity Building for Local Seed Systems:** Provide targeted trainings and technical support to FPOs, WSHGs, and cooperatives in seed production, storage, and quality control to enhance the effectiveness of local seed systems, ensuring consistent availability of quality seeds for the farmers.
- **Establish a "Seed Entrepreneur Program":** Train local youth and potential women and men collectives as certified seed producers to produce and supply quality seeds for their communities in partnership with the public and private seed sector. This initiative will empower communities to produce locally adapted, high-quality seeds, strengthening the local seed system for sustained growth.

Finally, continued research and development should focus on developing high-yielding, moisture stress-tolerant, short-duration crop varieties adapted to changing climate for enhanced agricultural productivity in rice fallows.

Conclusion

The early phase of the 'Comprehensive Project on Rice Fallow Management – 2022-23' in Odisha has demonstrated a successful model for intensifying the cultivation of pulses in rice fallows. The project's impact on agricultural productivity, soil health, farm incomes, and nutrition underscores its potential for scaling across other regions with similar agro-climatic conditions. However, the timely availability of seeds remains the critical limitation for scaling, which could be addressed by building the seed sector locally.

Project Donor

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Coming Soon

SeedPulse – A Policy Brief Series

ICRISAT will soon launch **SeedPulse**, a policy brief series stemming from the Policy Dialogue on the Future of Pulses and Legume Seed Systems in India.

This series explores how effective policies can drive seed innovation, improve access, and promote sustainability.

Tailored for policymakers, researchers, and practitioners, **SeedPulse** will deliver actionable insights and recommendations on critical seed system topics, best practices, and policy implications.

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About

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a pioneering non-profit organization focused on scientific research for development, committed to transforming dryland farming and agri-food systems. Working with global partners, ICRISAT develops innovative solutions to address hunger, poverty, and environmental degradation, benefiting 2.1 billion people across the drylands of Asia, Africa, and beyond.

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