

The inroads of direct-seeded rice with the low-input responsive PR-126 variety (A case study from Odisha's smallholder ecosystem)

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Rice is a crucial staple food for over 95% of Odisha's population. This principal cereal bears immense significance culturally and economically. Bargarh District is known for its vast rice acreage and productivity. Rice is grown in about 235,000 (6.5% of total rice area) hectares every year. Compared to neighboring districts, irrigation is better in Bargarh and farmers tend to grow rice using traditional cultivation. This involves transplanting rice seedlings into puddled soil which requires intensive labor, water resources, and energy. However, the changing climate and water scarcity in the rainfed areas and huge water in the lowland areas of Odisha have prompted farmers to consider alternative planting methods such as the dry direct-seeded rice (DSR) production system. The fear of lower yield, high weed infestation, and machine unavailability often deter farmers from adopting DSR. Moreover, shifting to DSR confronts several behavioral barriers.

The International Rice Research Institute (IRRI), a long-standing partner in the region, has been actively demonstrating improved rice technologies and scaling their adoption. Recognizing the multifaceted constraints associated with DSR, IRRI deployed a comprehensive package of DSR that includes variety, machines, and best practices for weed management. This support is aimed at overcoming the significant challenge that often hinder farmers from opting for DSR—a suitable and competitive variety.

Why is DSR relevant in Bargarh?

The reduced monsoon spell and associated water crisis in the region have encouraged farmers to shift towards DSR. The areas around the Hirakud Water Reservoir, which benefits irrigation water, provides an opportunity for wet DSR with a drum seeder. On the other hand, dry DSR with a seed drill is apt in areas where water scarcity is severe. The communities in the region have been customizing the establishment practices according to the need and feasibility. The high demand for labor during transplanting, labor scarcity, rising wage rates, and cost of cultivation in puddled transplanting rice has further motivated farmers to explore direct seeding because it requires significantly fewer person-days per hectare.

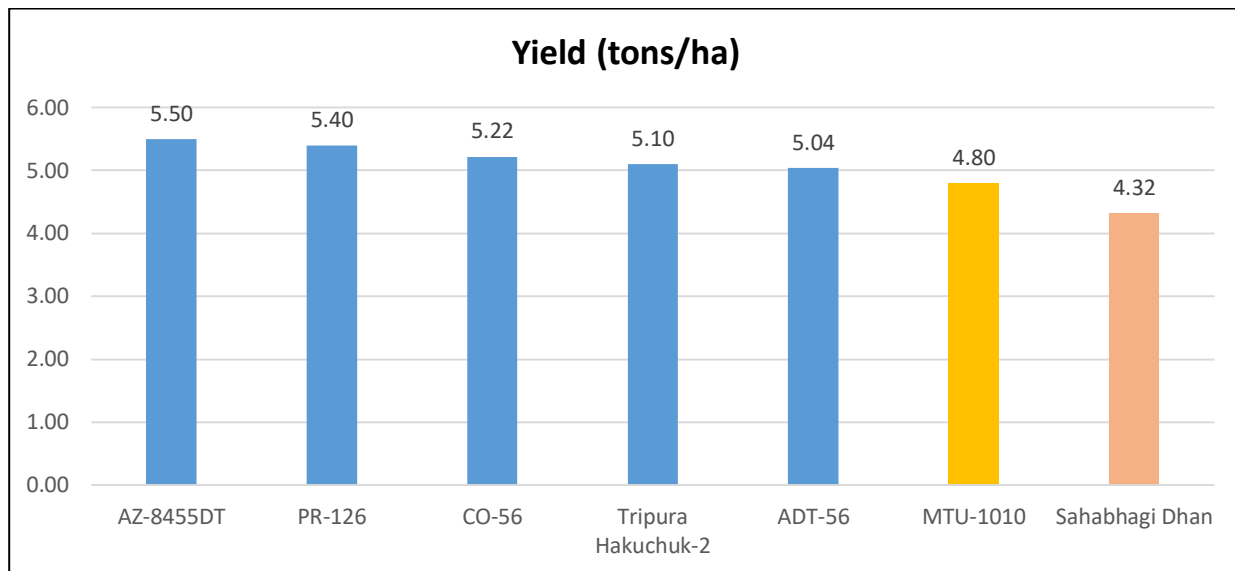
About the intervention

Through ScaleDirect's interventions, 15 host farmers from the local community were mobilized to evaluate a pool of new hybrids and inbred rice varieties that perform better in DSR establishment. It included a local check (MTU-1010) and benchmark (Sahabagi dhan) varieties as well. The MTU-1010 has been grown in the region for a long time. The varietal trials were conducted in the villages of Katapali in Bargarh, Pada in Bijepur, Baulsinga in Bhatli, and Archa in Padampur. The villages were selected using a GIS-based DSR suitability map. The experiment involved sowing these varieties in dry conditions using a seed and fertilizer drill machine. The seeds were sown on the same date, maintaining equal distance and area.



Photo 1: Farmers at PR-126 demonstration plot

In addition to varieties, IRRI's team of researchers facilitated the availability of a seed drill machine engaging local service providers, which is crucial in DSR for good crop establishment. The machine sows the crop uniformly. Through a series of community meetings, experts disseminated weed management practices in DSR including the judicious and needful application of pre-and post-emergence herbicides using a sprayer. Manual weeding when the need arises was also advised. Because the farmers mostly use the puddle-transplanted rice method in the region and stay away from DSR for crop management production problems, the field team monitored and facilitated the process in coordination with the community. District and block-level agriculture officers were consulted for their expert opinion and field support to ground this intervention. The nearest Krishi Vigyan Kendra Knowledge Network (KVK) and a community-based organization provided support in implementing the intervention at the targeted site. They were also engaged in field monitoring and timely advice.



The on-farm results

Seven varieties were tested under direct-seeded early-maturity market segmentation in the on-farm trials where the hybrid variety AZ-8455DT was the top performer overall and produced a yield of 5.5 tons/ha. PR-126 stood out as the highest yielder among the inbred varieties. The high yield of PR-126 (5.4 tons/ha) was significantly higher than other test varieties and local checks.

What other traits did the farmers like in PR-126?



Photo 2: PR-126 trial field

Fitting duration

The yield is not the only reason why farmers choose a variety. PR-126 exhibited reasonable tolerance to water scarcity during the reproductive phase. Moreover, its early maturity (110 days) is an added advantage for planting subsequent crops. The other test varieties also have shorter durations, but yield-wise, they are not competitive.

Lodging tolerance

Another reason for the suitability of this variety for DSR is its height and strong stem. It reaches a maximum height of 108 cm, which is equal or higher to Sahabhazi dhan and MTU-1010 but lower than other varieties. On the other hand, the AZ-8455DT exhibited susceptibility to lodging.

Tillering capacity and spikelet fertility

PR-126 and AZ-8455 DT produced the same average number of tillers of 13. The high tillering and spikelet fertility (94%) ensured a good harvest from PR126. The average grain per panicle was highest in AZ-8455 DT (243), closely followed by PR-126 (241).

Immediate impact on farmers

Adopting PR-126, Tripura Hakuchu-2, and other suitable varieties for DSR could have a transformative impact on the farming community in Bargarh. The reduced labor requirements and

enhanced resilience to water scarcity offer farmers a more sustainable and economically viable alternative to traditional transplantation methods. Since there is no significant reduction in yield and good varieties are available, DSR can be a strategic choice for farmers.

“I have never tried DSR in my whole life, but I participated in this trial and it piqued my curiosity,” said Tarun Pradhan, a 52-year-old farmer from Bargarh. “I will explore it further.”

The more we demonstrate this technology, the more it will get acceptance from farmers, according to a KVK specialist from the district.

PR-126 stands out as a promising DSR-specific rice variety, addressing the challenges posed by water scarcity, labor shortages, and changing climate patterns in Bargarh, Odisha. The collaborative efforts of IRRI, KVK Bargarh, the Department of Agriculture, and Odisha's leading non-profit organization Anchalik Jana Kalyan Anusthan in conducting on-farm trials have paved the way for the adoption of innovative rice cultivation practices in the region. As the demand for sustainable agriculture practices continues to grow, PR-126 represents a beacon of hope for farmers seeking resilient and high-yielding varieties in the face of evolving environmental conditions. The success of this initiative underscores the importance of research, collaboration, and technology transfer in promoting agricultural sustainability and food security in regions facing similar challenges.

The way forward

Moving forward with encouraging performances of PR-126, large-scale community-led cluster demonstrations are being set up led by local institutions, to popularize and diffuse knowledge about this variety. Alongside this, IRRI in its capacity as a catalysing institution is facilitating critical linkage between breeding research networks and state seed corporations, private seed agencies, and individual seed growers for early-generation seeds, to quickly accelerate localized seed availability. This will catalyse farmers' seed access and accelerate the adoption of the varieties.

DSR as a technology needs constant improvement in putting the right mix of best-fit varieties, agronomy, weed management and machines, customized as per local needs and feasibility. It is envisaged that through persistent effort and ground truthing, the best technology combination that supports DSR and benefits farmers could be validated and scaled.

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