ScaleDirect

The role of direct-seeded rice in promoting sustainable agriculture and improving the livelihood of Bangladeshi farmers

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Amidst the challenges surrounding the agriculture sector, such as water scarcity, greenhouse gas emissions, and climate change, innovations like direct-seeded rice (DSR) offer hope.

The rainfall deficit has compelled farmers to rely heavily on deep wells for irrigation, exacerbating the already significant strain on the dwindling groundwater supplies. The Bangladesh Water Development Board reported that the groundwater level is declining by approximately 50.8 cm per year, particularly in the country's northern region. In response to this challenge, the adoption of DSR in Rajshahi has shown promising results.

DSR is an innovative crop establishment technique in which rice seeds are directly planted in the field instead of growing seedlings in a nursery and then transplanting them in the field. In modern agriculture, this technique is one of the most effective and financially feasible ways to produce rice.

Farmers in Rangpur and Rajshahi in the northern parts of Bangladesh are at the forefront of this shift towards revolutionary techniques that improve food security, address labor shortages, and ensure sustainable agriculture. Farmers are using DSR to transform rice cultivation into a more productive and sustainable endeavor. There is no denying the proven importance of DSR in reducing the negative impacts of climate change and safeguarding food security.

Technological inclusion and enhancement of capacity

Through interventions of the ScaleDirect Project in Bangladesh, various DSR trainings for farmers are being organized. The initiative, focusing on an integrated direct seed system, introduced a combination of varieties, mechanized direct seeding establishment, and better weed management practices to the farmers in Rajshahi District. The on-farm testing organized in farmer fields tested the performance of specific varieties from market segment DELS-R (direct seeded early maturity long slender); namely BRRI Dhan-98 and Binadhan-14, found adaptable to Rajshahi. In view of this, measures are being taken to ensure farmers have ready access to high-yielding quality seeds of better-performing varieties, training on DSR and use of the power tiller-operated seeder, and information materials. Farmers also participate in exposure visits organized by the International Rice Research Institute (IRRI) and Bayer Crop Science.

Farmers received insights from local service providers on opportunities, difficulties, and effectiveness of mechanical DSR sowing and the negative impact of the broadcasting method of rice cultivation on the climate. As a result, ten farmers in Duboil Village, Tanor Upazila in Rajshahi cultivated rice on their land using DRS technology in 2024.

Embracing innovation: Shifting from puddled transplanting to DSR

Md. Mostofa Kamal is a progressive farmer who adopted DSR technology in place of traditional farming methods to boost his output and secure a better future for himself. As an executive member of the local agricultural hub in Duboil, he is also a role model for other farmers in his community.

Photo 1: DSR sowing of seeds at Mr. Kamal's plot

Mr. Kamal lives in Duboil, in the verdant plains of the Rajshahi, where he has been engaged in agriculture as his primary source of income for the past 25 years. He owns 15 hectares of arable land on which he grows potatoes, rice, maize, and mustard. He has replaced traditional farming methods with machines and modern agricultural practices.

Although potatoes were Mr. Kamal's main crop, he also planted rice and maize to supplement his income. Initially, he grew rice using the transplanting method, which is labor-intensive and also requires a longer cropping period. In 2023, he practiced crop rotation of potato-maize-rice. A shift from transplanting to direct seeding created enough window period for cropping system intensification and diversification apart from helping Mr. Kamal reduce the cost of labor and transplanting operations. Crop diversification also proved to be a prudent approach for mitigating crop losses caused by adverse weather conditions or market fluctuations common in the region leading to a more secure system productivity and income.

Photo 2: Mr. Kamal in Duboil Village, Rajashahi

Table 1. Agricultural produce and return on investment of Md. Mostofa Kamals' farming activities

	Cropping Patterns							
Properties	**Potato**		**Maize (Silage)**		**Late Boro**			**Aus**
	2023	**2024**	**2023**	**2024**	**2023 (PTR*)**	**2024 (DSR*)**	**2024 (PTR*)**	**2024 (DSR*)**
Cultivable Land (hectares)	11.3	11.3	2.5	2.5	15.1	15.1	15.1	15.1
Total Costs (USD)	24,228.10	30,375.00	835.5	793.7	6015.3	4101	6015.3	4511.3
Total Returns (USD)	37,595.30	37,595.30	1336.7	1253.2	7519.5	6516.5	7519.1	7310.2
Benefit Cost Ratio (BCR)	1.55	1.48	1.6	1.58	1.25	1.59	1.25	1.62
DSR = Direct-seeded rice **PTR** = Puddled transplanted rice,								

Mr. Kamal successfully grew potatoes in 2023, making notable profits. Seeing how new techniques were quickly transforming agriculture, he also experimented with corn silage production. His conviction in productive farming methods was reinforced by the success of his endeavors (Table 1). Using the transplanting techniques and adhering to long-standing farming customs, Mr. Kamal

cultivated rice during the 2023 boro season, This method cost USD 6,015.00, which is a substantial sum of money for any farmer in Bangladesh. However, he received USD 7,519 in returns (Table 1).

Lower investments and higher earnings in 2024 compared to the previous year were the result of Mr. Kamal's reduction in his potato crop. Though he continued growing maize for silage, his earnings and expenses decreased (Table 1). A thorough adaptation to the changing agricultural environment was evident in these modifications. During the boro season the same year, he decided to farm rice after learning about DSR technology. He decided to cultivate rice on 15.1 hectares of his field using DSR technology. He spent USD 4,101.00 for DSR cultivation and sold for USD 6,516.00 for his overall crop (Table 1).

Using DSR for two seasons of boro rice resulted in notable changes for Mr. Kamal. In 2024, he harvested four crops as opposed to three crops previously. During the subsequent aus season, he planted aus rice in 15.1 hectares using DSR technology. He invested USD 4,511.00 and sold for USD 7,310.00.

Mr. Kamal also made exceptional profits by cultivating rice crops in the 2024 aus season using DSR technology for the first time. He had a substantially higher BCR of 1.62 for aus rice compared to other crops. This extraordinary profitability, which has resulted from efficient cultivation methods, market demand, or excellent growing conditions, emphasizes the success of his crops.

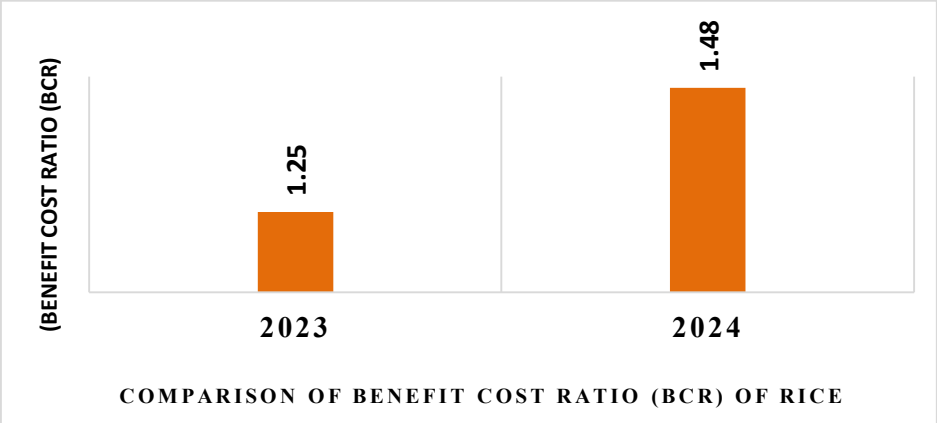

Figure 1. Comparative Benefit Cost Ratio of Mr. Kamals' rice cultivation, 2023 vs. 2024

In 2024, Mr. Kamal boosted his rice farming efficiency by using DSR technology, which resulted in a higher BCR of 1.48 compared to 1.25 in 2023 (Figure 1) as the technology reduced the cost of labor, water, and other resources.

Strengthens, weaknesses, opportunities, and threats of DSR farming practices

Mr. Kamal's case revealed that agricultural output has increased using DSR technology, making farming more profitable and sustainable. The advantages and difficulties of these agricultural inventions should be further investigated through strengths, weaknesses, opportunities, and threats (SWOT) analysis.

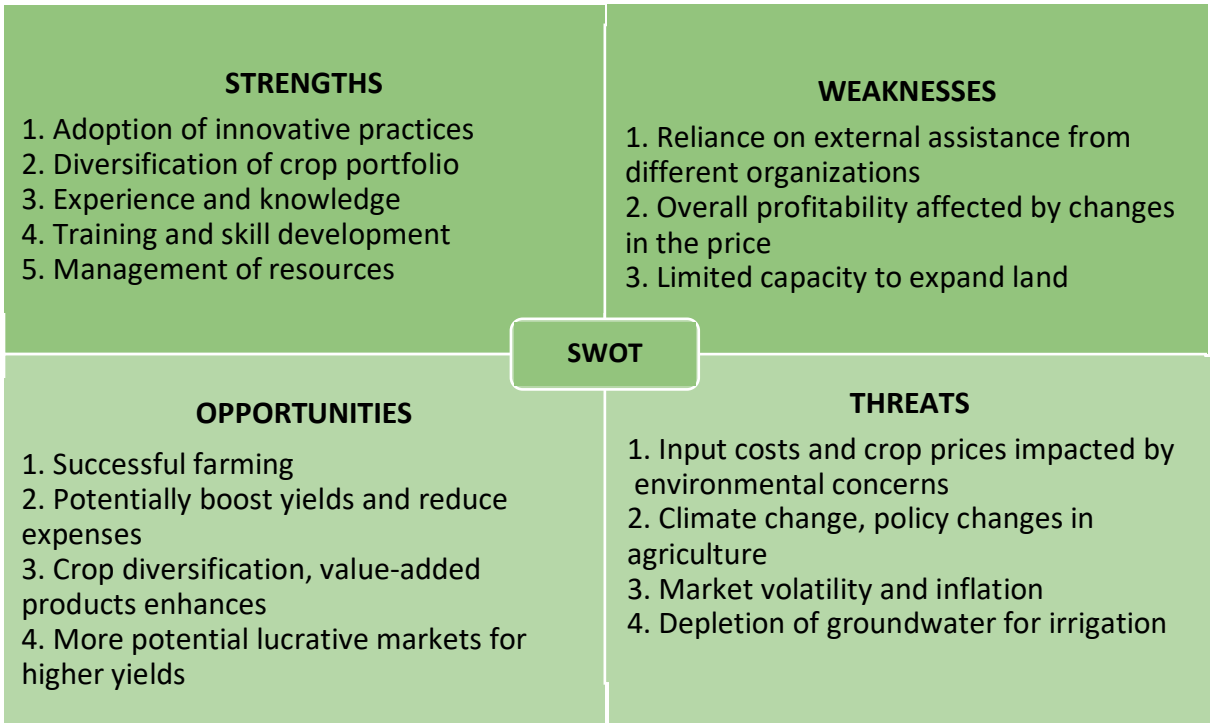

Figure 2. SWOT Analysis of Farmer Md. Mostofa Kamal

Recommendations

Several recommendations can be made for farmers, policymakers, and agricultural researchers based on Mr. Kamal's experience.

Comprehensive training and extension programs that give farmers the skills and knowledge they need are required to help with the adoption of innovative techniques like DSR. During the changeover time, extension services are crucial in sharing knowledge and offering assistance. More research is needed on how DSR and other cutting-edge techniques are used locally.

Farmers must have access to high-quality seeds, fertilizers, irrigation, and other resources to successfully implement innovative techniques. To reduce possible losses during the transition period, farmers should be encouraged to implement risk management methods such as crop diversification and the gradual adoption of new technologies. Government initiatives such as infrastructure development, subsidies, and incentives should encourage the broad adoption of sustainable agriculture techniques.

In Bangladesh's agricultural environment, Mr. Kamal's story is a ray of hope. It demonstrates that farmers can overcome obstacles and achieve greater success if they have creativity, support, and perseverance. Stories such as Mr. Kamal's will inspire and guide Bangladesh to further develop its agricultural sector.

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About the project:

ScaleDirect is a unique Public-Private Partnership engaging IRRI-Bayer, supported by USAID and implemented by IRRI and its NARES Partner networks in 6 countries; namely India, Bangladesh, Nepal, Kenya, Tanzania, and Mozambique