Strengthening partnerships for sustainable rice production
CURRENT STATUS OF DSR IN PAKISTAN AND EMERGING NEEDS FOR SUCCESSFUL DSR

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In Pakistan, rising water scarcity is a major concern and per capita water availability is shrinking by every year. The per capita water availability fell from 5650 m³ in 1950 to 940 m³ today. This situation is very alarming and has threatened the cultivation of puddled transplanted rice (PTR), the most dominant rice establishment method in the country which requires a huge amount of water and labor. Additionally, labor is also becoming scarce and consequently expensive. Under the current scenario of labor and water shortage, mechanized direct-seeded rice (DSR) is one viable alternative to PTR. Research results in Pakistan have shown that mechanized DSR can save 35-57% water, 67% labor and time compared to PTR without any yield penalty but with higher economic returns. Considering futuristic drivers of change (labor and water scarcity), it is predicted that DSR adoption will increase in Pakistan with time. Other advantage of DSR over PTR reported in Pakistan include positive impact on succeeding wheat yield (0.5 t ha⁻¹), mature rice crop early by 7-10 days, and savings in cost of cultivation by PKR 10,000-15000 (US$ 71-108) acre⁻¹

History of DSR in Pakistan: The scientists of Pakistan Agricultural Research Council (PARC) launched DSR technology in Pakistan in the early 1980’s with the support of IRRI with a small-plot field experimentation at PARC, National Agricultural Research Centre, Islamabad. The PARC scientists tested verified and established Dry-DSR technology through on-station and on-farm trials at different research farms and farmers’ fields in the province of Punjab in mid-1980. In the past, the major problems in scaling DSR were the availability of precise DSR drills and post-emergence herbicides for control of complex weed flora under DSR. The introduction of bispyribac-sodium in 2003, a broad-spectrum post-emergence herbicide provided effective control of weeds in DSR without any phytotoxicity on rice gave impetus to DSR adoption. From 2007-2010, DSR was disseminated to progressive growers under the project entitled "Development and dissemination of water saving rice technologies for South East Asia" funded by Asian Development Bank (ADB) in collaboration with IRRI. Another project entitled “Standardization and popularization of DSR at farmers’ field” funded by Punjab Agricultural Research Board (PARB) and implemented by Rice Research Institute (RRI) Kala Shah Kaku, Pakistan during 2009-12. Under this project, in 2010, Dr. Tahir Awan from RRI, Kala Shah Kaku visited IRRI, Philippines for training on DSR. During his training at IRRI, he used the multi crop inclined plate seeding drill (made in India) and very much impressed by the performance of the drill. In 2012, rabi drill (used for wheat sowing) was changed to plastic fluted ruler drill having line to line spacing of 9 inches for planting DSR but could not produce the efficient results. In 2013, multi-crop inclined plate seeding drill was imported from India under the project of Cereal Systems Initiative for South Asia (CSISA) and tested for DSR in Pakistan. In 2015, through reverse engineering its local manufacturing was started by Green Land Engineering Daska, Sialkot, Punjab with the support of Agriculture Innovation program (AIP). AIP was funded by USAID and implemented in Pakistan through CIMMYT and IRRI. In 2015, 15 DSR drills and in 2016, 40 DSR drills were manufactured and delivered to the farmers. In 2017, further improvements were made to develop more precise DSR planter. Currently, there are >700 DSR drills available with farmers for DSR sowing.

Current status of DSR: In Pakistan, the area under DSR and number of DSR seed drills are increasing concomitantly. A significant DSR acreage is also under broadcasting. By 2017, 230 multi-crop inclined plate seeding drill and 15 plastic fluted roller drills were with farmers for DSR. In 2017, Agri-tech Multan in consultation with scientists of RRI and PARC introduced a new more precise DSR planting drill which can maintain the row to row and hill to hill spacing. In 2018, different agri machinery manufacturing industries started manufacturing DSR drill. In 2018, 560 inclined plate DSR drills were manufactured of which 500 were sold to local farmers and 60 drills were exported to Africa. In 2018, the tentative area under DSR in Pakistan was 46,000 hectares (Punjab province =42, 000 hectares; Sindh province = 500 hectares drill sown and 3000 hectares wet direct seeding; Khyber Pakhtunkhwa and Baluchistan provinces = 200 hectares). Improvement/advancement in the development of precise DSR drill over time is shown in Figure given below.
The area under DSR in Pakistan: The area under DSR in Pakistan is gradually increasing as is depicted from the manufacturing and sale of DSR drills. In 2018, the tentative area under DSR in Pakistan is 46,000 hectares (Punjab province is 42,000 hectares, in Sindh is 500 hectares, DSR and 3000 hectares wet direct seeding and in KPK and Baluchistan around 200 hectares.

Current challenges or major hurdles in the adoption of DSR systems in Pakistan: Three noxious weeds such as Leptochloa chinensis, Eragrostis japonica, and Dactyloctenium aegyptium, are major hurdles in the adoption of DSR systems by Pakistani farmers. If herbicide molecules for controlling these weeds are available to Pakistani farmers, then it is expected that area under DSR will abruptly increase by many folds. Post-emergence herbicides that are registered and available in Pakistan’s market for weed control in rice (bispyribac-sodium, bispyribac sodium + bensulfuron, and ethoxysulfuron) cannot control these three noxious weeds. Based on recent research, herbicide molecule (ethoxysulfuron + fenoxaprop-p-ethyl with safener isoxadifen) from Bayer Crop Sciences provided excellent efficacy against these species. It has not been launched yet in Pakistan. This product, as well as new herbicide molecules which can control these emerging problematic weeds in DSR, is imperative for the success of DSR in Pakistan and to avoid evolution of herbicide-resistance. Grasses and sedges are the main problematic weeds of DSR in Pakistan.

The success story of DSR: Sardar Wasif Hayat Maikan S/O Sradar Sikanadr Hayat Maikan of Village Pehalwan, Tehsil Shah Pur, District Sargodha, planted four basmati rice varieties by using DSR systems on an area of 50 hectares. Super Basmati planted on 20 hectares, win the yield competition, organized by Punjab Government, with 1st position in the District. The average yield of this plot was 6.8 t ha⁻¹ as compared with the plot at 2nd position having production of 5.5 t ha⁻¹, which was transplanted rice.
ABOUT THE CONSORTIUM

The Direct Seeded Rice Consortium (DSRC) is a new public-private multi-stakeholder research for development (R4D) platform on direct seeded rice (DSR), established in December 2017 and officially launched on 6th February 2018 at IRRI HQ, Los Baños in the Philippines.

The DSRC is convened by the International Rice Research Institute (IRRI) with the overall goal of improving the environmental and economic sustainability of rice production systems in Asia by developing, refining, and catalyzing widespread adoption of improved mechanized and precise DSR practices through the public-private partnership.

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