



Bed planting:

Affordable technique for resource conservation in wheat

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Under ICAR Farmer FIRST Programme, large-scale participatory technological demonstrations on bed planting in wheat were conducted in two adopted villages, i.e. Bure and Dubetta in Hisar district, situated in semi-arid region of western Haryana during three consecutive years (2018–19 to 2020–21) to evaluate the technological feasibility and economic variability of the technique. The results indicated that adoption of technique significantly increases seed yield as well as improve water productivity, saving water and nitrogen use efficiency compared to flat planting or other conventional methods.

Keywords: Bed planting, Grain yield, Net returns, Participatory field demonstrations, Wheat

THE Indo-Gangetic Plains (IGPs) occupy large areas of rice (*Oryza sativa* L.)-wheat (*Triticum aestivum* L.) cropping system in India, Bangladesh, Nepal and Pakistan. Studies in the past decade indicate that sustainability of rice-wheat system in the IGPs has been at risk mainly due to declining groundwater levels, soil organic matter content and nutrient availability, increased soil salinization, incidence of pests and diseases. However, water availability may become a major limiting factor for sustained productivity of wheat crop grown in the dry winter (*rabi*) season and are dependent on supplemental irrigation either by canal or underground water. Therefore, research efforts are urgently needed to develop and promote new technologies to enhance the productivity of water and its judicious use.

In recent years, the furrow irrigated raised bed planting system (FIRBS) has proved to be one of the important components of a low-cost sustainable production system. This planting system facilitates mechanical weed control, increases water-use efficiency, reduces crop lodging and has a lower seed requirement. Moreover, this technology is also suitable for seed production because of the production of bold grain and easy rouging by moving in furrows to uproot unwanted plants. Although yields were nearly identical to those obtained with conventional tillage, and significant savings in seed, fertilizers and irrigation water were realized.

The Farmer FIRST Programme has been initiated by Indian Council of Agricultural Research and is being

implemented by CCS Haryana Agricultural University, Hisar, Haryana since October, 2016 to provide a platform to farmers and scientists for creating linkages, capacity development, technology adaptation and application, on-site input management, feedback and institution building. The project covered two villages in the Hisar district of Haryana, i.e. Bure and Dubetta, having limited resources and sandy loam type soil. The farmers in these villages generally use conventional methods for wheat production, resulting in low yields and a loss of resources. Considering the above mentioned facts, farmer participatory demonstrations on bed planting in wheat were conducted in these villages during three consecutive years from 2018–19 to 2020–2021. The economics were calculated as:

Additional return = Demonstration return – Farmer's practice return

Benefit cost (B:C) ratio: Gross return/cost of cultivation

Per cent (%) increase yield =

$$\frac{\text{Demonstration yield} - \text{Farmer's yield} \times 100}{\text{Farmer's yield}}$$

A total number of 50 participatory technological demonstrations (PTDs) were organized on bed planting in wheat covering 20 ha to showcase the feasibility of the technique. The farmers' field for conducting PTDs was selected from two adopted villages. The area under each PTD was kept 0.4 ha with farmers' practice as control plot. Raised beds (15 cm high and 90 cm wide with 60 cm tops and 30 cm furrows) were made with a

Table 1. Cost of production and revenue of Agave in 2019 Economic analysis of PTDs and farmers' practice of bed planting in wheat (HD 2967)

Year	Average cost of cultivation (₹/ha)		Average gross return (₹/ha)		Average net return (₹/ha)		Additional return (₹/ha)	B:C ratio		Average water saving in terms of monetary returns	
	PTD*	FP**	PTD	FP	PTD	FP		PTD	FP	PTD	FP
2018–19	42480	43560	99828	98445	57466	55200	2266	2.35	2.26	3795	
2019–20	43204	44290	107578	106296	64489	62345	2144	2.49	2.40	3990	
2020–21	47600	48105	103292	101982	55830	54200	1630	2.17	2.12	4210	
Mean	44428	45318.3	103566	102241	59261.6	57248	2014	2.33	2.26	3998.3	

*PTD, Participatory technological demonstration; ** FP, Farmers' practice; B:C, Benefit cost ratio.



Wheat crop on beds

bed planting machine following the conventional land preparation. Wheat seeds (variety HD 2967) were sown in rows in both bed and conventional (flat planting) methods during all three years (2018–19 to 2020–2021). For beds, seeds were sown at 3 rows per bed. The first row was sown at 7.5 cm from either side of the bed and the second row was sown 12.5 cm from the first, with 20 cm in the center of the bed remaining without a crop. For conventional planting, the row-to-row distance was 22.5 cm. All the demonstrations were monitored from time to time during the entire cropping season and farmers were guided accordingly. At the end of cropping season yield was recorded and economics was worked out.

A total of 30, 10 and 10 demonstrations were carried out on 12, 4 and 4 ha area during 2018–19, 2019–20 and 2020–21, respectively. The probable cause for this variance in the number of demonstrations scheduled was availability of finance/inputs with CCS HAU, Hisar, Haryana granted by ICAR under the scheme. It is clear from the data that the average yield of demonstration plots was recorded 51.90, 50.75 and 52.40 q/ha in 2018–19, 2019–20 and 2020–21, respectively. Besides this, yield under farmers' practice was 51.50, 50.20 and 51.80 q/ha for the corresponding years. Average yield under demonstration plots was recorded slightly higher by 0.77%, 1.09% and 1.73% in years 2018–19, 2019–20 and 2020–21, respectively. In general, grain yields in PTD plots was slightly higher as compared to local check in all years, owing to good variety, seed treatment, suggested fertilizer dosages and plant protection measures being followed by demonstrators and scientists in the demonstration plots. However, by using this technique a saving of about 40% irrigation water was also noticed which is the most focused issue of the nation, i.e. 'More Crop Per Drop'.

The economic analysis of demonstrations is presented in Table 1. The expenditure incurred on in PTDs was slightly higher in cultivation practices and inputs. The average gross return of ₹99828, ₹107578 and ₹103292/ha was calculated in the years 2018–19, 2019–20 and 2020–21 respectively. The average net returns for respective years to the tune of ₹57466, ₹64489 and ₹55830/ha was recorded during the study period. Further, it was also found that additional return ranged from ₹1630/ha to ₹2266/ha along with a saving of about 40% irrigation water. The average water saving in terms of monetary returns was ₹3795, ₹3990 and ₹4210 during respective years. This may be attributed to the use of improved technique in participatory technological demonstration plots. Benefit-cost (B:C) ratio was at par in all the years. PTD participating farmers got approximately ₹2014/ha additional income as compared to farmers practice.

SUMMARY

From the study, it can be concluded that farmers' participatory field demonstrations (PTDs) on bed planting technique in wheat conducted by CCS, HAU, Hisar, Haryana under FFP enhanced the yield of wheat and ensured efficient utilization of irrigation water by conducting various extension activities like training programmes, field days, exposure visits etc. organized in farmers' field. However, there was a slightly disparity in demonstration yield and farmers' practice owing to existing technical gaps. Therefore, interventions demonstrated require site specific adaptations for their intended impact on the production and productivity of wheat.

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