Int.J.Curr.Microbiol.App.Sci (2020) *9*(2): 1156-1161

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 2 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.902.136

Yield and Gap Analysis of Wheat Productivity through Frontline Demonstration in Tribal District Pratapgarh of Rajasthan

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Keywords

Demonstration, Economic, Gap analysis, Grain yields, Wheat

Article Info

Accepted:
08 January 2020
Available Online:
10 February 2020

A B S T R A C T

Front line demonstrations on wheat variety Raj-4037, Raj-4120 and Raj-4079 were conducted on farmer's fields in Pratapgarh district of Rajasthan, India, during Rabi season of the year 2013-14, to 2018-19 about 18.10 percent higher grain yield was recorded under demonstrations over the farmers practices. The extension gap, technology gap and technology index were observed to be 6.89 q per ha, 3.54 q per ha and 7.30 % respectively. An additional return of Rs. 9168 per ha was obtained with additional investment of Rs. 1217 per ha coupled with scientific monitoring of demonstrations and use of other non-monetary factors. Fluctuating MSP and or sale price of wheat during different years also influenced the economic returns per unit area. On average basis the incremental benefit: cost ratio was found as 7.54.

Introduction

Wheat is the second most important staple cereal food in India after rice. It is not only the staple food for wheat consuming population of India but also the major source of their dietary energy. Improvement in productivity of wheat crop has played a key role in making the country self sufficient in food production. Efforts are being made at various levels to sustain food security through wheat production. There is no scope for area expansion, additional production has to come by increasing the per hectare productivity (Nagarajan, 1997). Wheat is a major rabi crop grown in Pratapgarh, over 63634 ha area with 241538 ton of production and 37.96 q/ha productivity (Fourth Advance Estimate, 2018-19). The productivity level of wheat crop of the Pratapgarh district low because farmers are not following the recommended package of practices. Therefore, on the basis of 'seeing

is believing' principal it is very essential to demonstrate the latest technologies at farmers field so that the farmers see the results and adopt the technology in totality. A wide gap exists in wheat production with the use of available techniques and its actual application by the farmers which is reflected through poor yield of wheat crop on farmer's fields. There is a tremendous opportunity for increasing the productivity of wheat crop by adopting the improved technologies. There are many technologies generated at agricultural universities and research stations but the productivity of wheat is still very low due to poor transfer of technology. To demonstrate the scientific cultivation of wheat front line demonstrations should be laid out at farmer's field. The basic objective of FLDs is demonstrate the proven technology at farmer's field through KVKs. Keeping the importance of FLDs, the KVK, Pratapgarh had laid out demonstrations of wheat crop on farmers field under irrigated situations during rabi 2013-14 to 2018-19 in consecutive six years.

Materials and Methods

Front line demonstrations on wheat were conducted at farmer's field in district Pratapgarh, (Rajasthan) to assess its performance during the four consecutive rabi seasons 2013-14, 2014-15, 2015-16, 2016-17, 2017-18 and 2018-19. Soils of the demonstration sites were clay loam, semi deep in organic carbon (o.35-0.41%) low to medium in phosphorus (11.26 kg/ha.) and medium to high in potash (221-335 kg/ha.) with black soil (pH 7-7.8). The demonstrations were laid out on irrigated fields with soybean, wheat and maize-wheat rotations, which are most prevalent in the district. Each demonstration was of one acre area and recommended package was provided to the farmers through one day on campus training at KVK. The sowing was done during mid October to last week of November and harvesting of crop was done during last week of march to second week of April. The demonstrations on farmer's fields were regularly monitored from sowing till harvesting by scientists of Krishi Vigyan Kendra, Pratapgarh. The grain yield of demonstration crop was recorded & analyzed. Different parameters as suggested by Samui *et al*. (2000) were used for calculation gap analysis, costs and returns. The analytical tool used for assessing the performance of the FLD on wheat is as follows:

Extension gap=Demonstration yield-Farmer's practice yield

Technology gap=Potential yield-Demonstration yield

Technology index= (Potential yield-Demonstration yield) x 100/Potential yield

Additional return= Demonstration return-Farmer's practice return

Effective grain=Additional return-Additional cost

Incremental B:C ratio=Additional return/Additional cost

Results and Discussion

Yield parameters

The increase in grain yield under demonstration over the farmer's local practices was in the range of 6.55 to 58.68 percent because of good variety, seed treatment, balanced fertilization and weed management followed in frontline demonstrations (Table-2). The table 2 depicted that the average wheat yield of demonstrations was 44.96 q/ha which was higher as compared to local plots (38.07 q/ha). The increase in yield was 18.10 in frontline demonstrations over local check. During 2015-16, the yield in demonstration plots was increased upto 58.68 per cent over

local check. The similar results were also observed by Verma *et al*., 2016, Singh *et al*., 2007.

Gaps and technology index

The extension gap ranging from 2.9 to 14.23 q per hectare was found between frontline demonstration and farmers practices during the different time line and on average basis the extension gap was observed to be 6.89 q per hectare [Table-2]. The extension gap was lowest (2.9 q/ha) in year 2013-14 and was the highest (14.23/ha) in year 2015-16. Such gap might be attributed to adoption of improved technology in demonstrations which resulted in higher grain yield than that in the farmer's practices. Wide technology gap were observed during these years and this was lowest (0.64 q/ha) during 2017-18 and was highest (11.52 q/ha) during 2015-16. On average basis the technology gap of all the 569 demonstrations was found to be 3.54 q per hectare. Technology gap during different years could be due to differential feasibility of recommended technologies during different years. Similarly, the technology index for all the demonstrations during different years were in accordance with technology gap. Average technology gap was 7.30 % during the study period. Higher technology index reflected the inadequacy of technology and or insufficient extension services for transfer of technology. These results are corroborating with the findings of Hiremath and Nagaraju (2009) and Dhaka *et al*. (2010).

Table.1 Comparison between demonstration package and existing practices under wheat FLDs

S. No.	Particulars	Demonstrations	Farmers practice
1	Farming Situation	Irrigated	Irrigated
2	Variety	Raj- 4037, Raj- 4120 and Raj- 4079	Lok-1
3	Time of sowing	II week to last week of November	II week of November to II week of December
4	Method of sowing	Line sowing with proper crop geometry (50 cm x 20 cm)	(30 cm x 20 cm)
5	Seed Treatment	Seed treated with thiram 75% WP@ 2g/kg	Nil
6	Seed rate	150 kg/ha	150 - 200 kg/ha
7	Fertilizer dose	120:40:30 (NPK kg/ha)	150:50:0
8	Irrigation	6 irrigations	6-8 irrigations
9	Plant Protection	Need based application of chloropyriphos for termite	Nil
10	Weed Management	Isoproturon, Metxuron Sulfosulfuron+ Metsulfuron methyl post-emergence followed by one hand weeding at 30 days after sowing	One hand weeding at 30- 35 days after sowing

Table.2 Yield, extension gap, technology gap and technology index of wheat as grown under FLD and farmers practices

Year	Demo. Variety	No. of Demo.	Area (ha)	Yield (q/ha)		% increase over check	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
				Demo.	Check				
2013-14	Raj-4037	63	25	47.19	44.29	6.55	2.9	2.81	5.62
2014-15	Raj-4037	25	10	45.58	38.88	17.23	6.7	4.42	8.84
2015-16	Raj-4037	31	10	38.48	24.25	58.68	14.23	11.52	23.04
2016-17	Raj-4120	275	80	43.95	38.60	13.86	5.35	3.05	6.49
2017-18	Raj-4120	75	30	46.36	42.18	9.91	4.18	0.64	1.36
2018-19	Raj-4079	100	40	48.2	40.2	19.90	8	1.8	3.60
Average		**569**	**195**	**44.96**	**38.07**	**18.10**	**6.89**	**3.54**	**7.30**

Table.3 Gross Return, Net Return, Gross cost Cultivation and BC Ratio of wheat as grown under FLDS and farmers practices

Year	Cost of Cultivation		Gross Return		Net Return		B:C Ratio		Additional Cost of Cultivation (Rs./ha)	Additional Return (Rs./ha)	Incremental B:C ratio
	Demo.	FP	Demo.	FP	Demo.	FP	Demo.	FP			
2013-14	22800	22400	73145	68650	50345	46250	2.21	2.06	400	4095	10.24
2014-15	18300	16850	75207	60264	56907	43414	3.11	2.58	1450	13493	9.31
2015-16	20750	18340	66100	54800	45350	36460	2.19	1.99	2410	8890	3.69
2016-17	22065	21280	75140	65450	53075	44170	2.41	2.08	785	8905	11.34
2017-18	24990	24710	74170	67488	49180	42778	1.97	1.73	280	6402	22.86
2018-19	27536	25561	91580	76380	64044	50819	2.33	1.99	1975	13225	6.70
Average	**22740**	**21524**	**75890**	**65505**	**53150**	**43982**	**2.34**	**2.04**	**1217**	**9168**	**7.54**

Economic analysis

Different variables like seed, fertilizers, herbicides and pesticides were considered as each input for the frontline demonstrations as well as for farmers practice. It is observed that an additional investment of Rs. 1217 per ha was made under frontline demonstrations. Economic returns was observed to be a function of grain yield and Minimum Support Price (MSP) or sale price which varied along different years. Additional returns of Rs. 13493 per hectare during the years 2015-16 was obtained due to higher selling price. The higher additional returns under demonstrations could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring. The lowest and highest incremental benefit: cost ratio (IBCR) were 3.69 & 22.86 in 2015-16 and 2017-18, respectively [Table-3] which depends on grain yield and MSP or sale price. The results are in conformity with the findings of earlier work Joshi *et al*. (2014).

In conclusion, the frontline demonstration on wheat revealed 18.10 per cent increase in yield over local check. This increase was with an extra even expenditure of Rs. 1217/ha which is very less and even small and marginal farmers could also afford. Thus it is not the cost that deters the farmers from adoption of latest technology but ignorance is the primary reason. It is quite appropriate to call such yield gap as extension gap. The extension gap was found to be 6.89 q/ha. The IBCR (7.54) is sufficiently high to motivate the farmers to adopt the technology. Therefore, FLD program was effective in changing attitude, skill and knowledge of farmers towards improved/recommended practices of wheat cultivation. This also led to improvement in the relationship between farmers and scientists and built confidence between them.

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How to cite this article:

Yogesh Kanojia, Prakash Panwar and Damor, R. K. 2020. Yield and Gap Analysis of Wheat Productivity through Frontline Demonstration in Tribal District Pratapgarh of Rajasthan. *Int.J.Curr.Microbiol.App.Sci.* 9(02): 1156-1161. doi: https://doi.org/10.20546/ijcmas.2020.902.136