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

Yogesh Kanojia¹*, Prakash Panwar² and R. K. Dam³

¹Krishi Vigyan Kendra, Pratapgarh, Rajasthan, India
²Department of Extension Education and Community Management, College of Community and Applied Sciences, Udaipur, India
³Krishi Vigyan Kendra, Pratapgarh, Rajasthan, India

*Corresponding author

Abstract

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.

Keywords

Demonstration, Economic, Gap analysis, Grain yields, Wheat

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 (0.35-0.41%) 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 (%) |
|--------|---------------|--------------|-----------|--------------|-----------------------|---------------------|----------------------|----------------------|
| 2013-14 | Raj-4037      | 63           | 25        | 47.19        | 6.55                  | 2.9                 | 2.81                 | 5.62                 |
| 2014-15 | Raj-4037      | 25           | 10        | 45.58        | 17.23                 | 6.7                 | 4.42                 | 8.84                 |
| 2015-16 | Raj-4037      | 31           | 10        | 38.48        | 58.68                 | 14.23               | 5.35                 | 23.04                |
| 2016-17 | Raj-4120      | 275          | 80        | 43.95        | 13.86                 | 9.91                | 11.52                | 6.49                 |
| 2017-18 | Raj-4120      | 75           | 30        | 46.36        | 5.35                  | 4.18                | 0.64                 | 1.36                 |
| 2018-19 | Raj-4079      | 100          | 40        | 48.2         | 8                     | 1.8                 | 3.60                 |                     |
| Average |               | 569          | 195       | 44.96        | 18.10                 | 6.89                | 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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