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Technological and Extension Gaps in Maize Production under Rainfed Ecosystem

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ABSTRACT

A study was conducted in the district Rajouri by collecting data from 262 front line demonstrations conducted on maize crop by KVK Rajouri for five consecutive years (2012-13 to 2016-17). There was a wide yield gap between the potential, demonstration and farmers yields in maize mainly due to technology and extension gaps. The results of the study revealed that the average yield of demonstration plots and farmers plot (check) were 24.17 q ha^{-1} and 17.52 q ha^{-1} respectively. On overall average bases 38.22 % higher grain yield was recorded under demonstration plots than farmers plot. The technological yield gap and extension yield gap during the study period varied to the extent of 19.70 to 48.20 q ha^{-1} and 1.58 to 10.30 q ha^{-1} respectively. The overall technology gap, extension gap, and technology index in maize crop were 35.25 q ha^{-1}, 6.69 q ha^{-1} and 58.96% respectively. The yield gap analysis emphasizes the need to educate the farmers through various extension means for adoption of improved agricultural technologies to revert the trend of wide extension gap.

Keywords: Maize, Technology gap, Extension gap and Technology Index

Maize (*Zea mays L.*) is one of the most important crops in world agricultural economy grown over an area of 177 million hectares with a production of 967 million tonnes (KPMG, 2014). India ranks fourth in area and sixth in production of maize. Maize is the major crop of hilly districts of J&K State and plays an important role in the livelihood of the people. In J&K maize is predominantly grown as rainfed crop during kharif season and forms a staple food of vast majority of rural households, beside its use as livestock feed and fodder. In J&K, future increases in maize production to meet domestic demand will have to rely on improvements in yield per hectare rather than on the expansion of maize production area. In the Jammu region 75 per cent cultivated area is rainfed (DES, 2011). The productivity of maize at the national level for 2014-15 was 2.56 tonnes ha^{-1} whereas for the same period it was 1.49 t/ha in J&K state (AICRP on Maize, 2016). To boost the production and productivity of maize crop in the district, Krishi Vigyan Kendra (KVK) Rajouri is conducting front line demonstrations (FLDs) on maize crop. The main objective of the FLDs is to demonstrate and popularise the improved production technologies among the farmers.

MATERIALS AND METHODS

Two hundred sixty two Front line demonstrations (FLD) on maize were conducted at farmers' field in district Rajouri (J&K) to assess its performance during Kharif seasons for five consecutive years (2012-13 to2016-17). The area under each demonstration was 0.2 ha. In FLDs' plot, full package of recommended practices was adopted whereas, in the adjoining farmers' fields, crop was grown as per the practices followed by the farmers which served as control/ local check. Regular visits by KVK scientists to FLD plots were made so as to ensure timely application of critical inputs and to solve other crop related problems. The extension activities like field days and Kisan goshtis were also organized at the demonstration sites as to provide opportunities for other farmers of the area.

The primary data on grain yield and farmers' practices was collected from the FLD beneficiary and farmers of check plots through random crop cut methodology followed by personal interviews so that further research and extension activities can be improved. Similar methodologies for assessing gaps have been applied by Sharma *et al.* (2015), Kumar *et al.* (2019), Vaid *et al.* (2017) and Arora, R.K. (2019).

Estimation of Technology Gap, Extension Gap and Technology Index

Yield gap refers to the difference between the potential yield and actual farm yield. Potential yield refers to that which is obtained in the experiment station. The yield is considered to be the absolute maximum production of the crop possible in the given environment, which is attained by the best available methods and with the maximum inputs in trials on the experiment station in a given season. Demonstration yield is the yield obtained on the demonstration plots on the farmers' fields in the study area. The conditions on demonstration plots closely approximate the conditions on the cultivators' fields with respect to infrastructural facilities and environmental conditions. Actual yield refers to the yield realized by the farmers on their farms under their management practices. The data output were collected both in FLDs as well as control plots and finally the extension gap, technology gap, technology index (%) were worked out (Samui *et al.* 2000) as given below:

Technology gap = Potential yield – Demonstration yield

Extension gap = Demonstration yield – Farmers yield

$$\text{Technology index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

RESULTS AND DISCUSSION

Grain Yield

The transfer of improved farm technology under frontline demonstrations (FLDs) resulted in significantly higher grain yield of maize under demonstration plots (18.44 to30.40 q ha^{-1}) than farmers' plot yield (14.00 to 18.40 q ha^{-1}), which may be attributed to the adoption of recommended agro-technologies in FLDs' during study period (Table 1). The percent yield increase in maize in demonstration plots over farmers' plots was lowest in Bio-seed 9621 during Kharif 2013-14 (9.30%) and highest in Proagro 4794 and TipTop during *kharif* 2015-16 (60%). The overall percent increase in yield of demonstration plot over farmer's plot was 38.22%. These results are in conformity with the findings of Shashikumar (2015) on maize and Fale *et al.* (1985) on rice.

Technology Yield Gaps

The technological gap during the study period varied to the extent of 19.70 to 48.20 ha^{-1}. The overall average technological gap was 35.25.The technology gap was highest (48.20 q ha^{-1}) in Proagro 4794 during 2014-15 and lowest (19.70 q ha^{-1}) in HQPM-4. The technology gap observed may be attributed to dissimilarity in the soil fertility status, agriculture practices and local climatic situation (Table 1).

Extension Yield Gaps

The extension gap during the study period varied to the extent of 1.58 to 10.30 qha^{-1}. The overall average extension gap was 6.69 qha^{-1}. This emphasized the need to educate the farmers through various extension strategies like FLDs, for adoption of improved agricultural technologies so as to regress the trend of wide extension gap. Generally, the technological gaps appear even if the FLDs' are conducted under the close supervision of farm scientists on the farmers' fields. This may be attributed mainly to lack of irrigation infrastructure, ill distribution of rainfall, variation in soil fertility and cultivation on marginal lands, non congenial weather conditions and local specific crop management problems faced in order to harness the yield potential of specific crop cultivars under demonstration plots.

Table 1: Technology gap, Extension gap and Technology index in Maize crop

Year	Crop	Variety	No. of Demonstrations	Area (Ha)	Potential Yield (q/ha)	Average yield of demo. plot	Average yield of farmers plot	% age increase over farmers plot	Technology Gap	Extension Gap	Technology Index
2012-13	Maize	Proagro 4794	50	10.00	68.00	25.24	18.40	37.10	42.76	6.84	62.88
2013-14		Proagro 4794	40	9.00	68.00	22.05	17.00	29.70	45.95	5.05	67.57
		Bioseed 9621	30	7.00	55.00	18.58	17.00	9.30	36.42	1.58	66.21
		Double Decalb	27	6.10	65	22.50	17.00	32.00	42.50	5.50	65.38
2014-15		Proagro 4794	12	2.75	68	19.80	15.90	29.00	48.20	3.90	70.88
		Bioseed 9621	13	2.25	55	18.44	14.00	31.00	39.56	4.44	71.92
2015-16		Proagro 4794	10	2.30	68	27.30	17.00	60.00	40.30	10.30	59.26
		Tip Top	07	1.45	55	27.20	17.00	60.00	27.80	10.20	50.54
		PAC-781	10	1.90	45	23.90	17.00	41.00	21.10	6.90	46.88
		Bioseed9621	08	1.60	55	25.20	17.00	48.00	29.80	8.20	54.18
		HQPM-4	08	0.90	45	25.30	18.00	40.00	19.70	7.30	47.77
		HQPM-9	07	0.80	50	24.80	18.00	38.00	25.20	6.80	50.40
2016-17		Double Decalb	18	3.60	65	30.40	21.00	45.00	34.60	9.40	53.23
		Rasi 4794	22	4.40	68	28.30	21.00	35.00	39.70	7.30	58.38
Average						24.21	17.52	38.22	35.25	6.69	58.96

Technology Index

The technology index showed the feasibility of the evolved technology at the farmers' fields. The lower the value of technology index, the more is feasibility of technology. Fluctuation in technology index (ranging between 46.88-71.92%) and overall average technology index was observed 58.96 percent during the 5 years of FLD, may be attributed to the dissimilarity in soil fertility status, weather conditions (low or untimely rainfall), insect-pests, and diseases. Our results are also in conformity with the findings of Shashikumar (2015) on maize crop and Gaddi *et al.* (2002b) on cotton. Some feedbacks were also recorded by interviewing the farmers about low productivity of maize. These are given below:

- High cost of hybrid maize seed
- Lack of awareness about balance dose of fertilizers.
- Less or Untimely rainfall.

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