

## **Increasing the Productivity and Profitability of Pusa Jawahar Hybrid Maize-1 (PJHM-1) among the Tribal Farmers through Frontline Demonstrations**

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### **ABSTRACT**

The purpose of these Front Line Demonstration's (FLD) was to know the yield gaps, technology gap, extension gap and the technology index by collecting of front line demonstration's and farmers field yields data and to find out the reasons for low yield and specific constraints with the small farmers. Based on the study it was observed that in FLDs, Pusa Jawahar Hybrid Maize-1 recorded average grain yield (63.16 q/ha) and an increase in grain yield to the tune of 50% was observed over farmers practice. Relatively, increase in Total returns, Net profit and C:B ratio was observed over local variety. High technology gap

(3.17) and extension gap (21.14) was observed as compared to farmers practices.

**Keywords** Demonstration, Economics, Gap analysis, Technology gap, Technology index.

### **INTRODUCTION**

The most versatile crop among the food grain crops is maize (*Zea mays* L.) with wider adaptability and highest genetic yield potential. Madhya Pradesh is the second state in maize production after Karnataka contributing 11.37% of total maize production in India (Economic survey 2020-21). Maize is an important staple food among the farmers from the tribal belt of state. But, the undulating topography and variability in the soil, nutrient status is a major challenge, present before the farmers in general where lack of adoption of new technologies is inspecific a major problem mushrooming up in the present time. Be it the approach of farmers towards the technology or the reach of technology generators to the farmers. The both parts i.e. the farmers and scientists are facing challenges. Lack of suitable high yielding variety as well as poor knowledge about production practices are described as main reasons for low productivity of maize in the district. The productivity of maize per unit area could be increased by carried out front line demonstrations on new varieties with recommended production technologies to convincing farmers to adopt improved production management practices

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for enhancing productivity of maize. Therefore, it is important to demonstrate the high yielding maize varieties and their production technologies to boost maize production. A wide gap exists between the available techniques and its actual application by the farmers which is reflected through poor yield in the farmer's fields. There is a tremendous opportunity for increasing the production and productivity of maize crops by adopting the improved technologies.

## MATERIALS AND METHODS

Front line demonstrations using medium duration maize variety Pusa Jawahar Hybrid Maize-1 (PJHM-1) were conducted at farmer's field in different villages of district Barwani and Chhindwara (Madhya Pradesh) during *kharif*. The inter institutional hybrid developed Jointly by All India Coordinated Maize Research Project, Zonal Agricultural Research Station, Chandangaon, Chhindwara (MP), Jawaharlal Krishi Vishwa Vidyalaya, Jabalpur and ICAR-Indian Agricultural Research Institute, New Delhi. The station had laid out demonstrations of maize crop on farmers field under rainfed situations during *kharif* 2019-2020 to 2022-2023 to demonstrate the performance of recommended high yielding maize variety with complete package of practices along with the objective to assess the performance of FLD fields with newly released variety Jawahar Hybrid Maize-1 (PJHM-1) variety of maize was used for demonstration and local variety was used under farmer practice check plots. Under demonstration, For planting maize crop, preparation of field was done by ploughing the land 2-3 times with a mouldboard plough and forming the seedbed by ploughing the land twice and then crush the clods were crushed using a rotavator to bring the soil to fine tilth. However, in farmers practice, maize seeds was sown on flatbed. Farm Yard Manure (FYM) @ 10 t ha<sup>-1</sup> was applied in a field. Trench was prepared at every 3 m distance to facilitate drainage. Under demonstration plots, out of the 120:60:40 kg N:P:K ha<sup>-1</sup>, 25% nitrogen was applied through organic source (FYM). Under farmer's practice only chemical fertilizers were applied. Weeding was carried out at 20 days after sowing, two inter-culturing with were done before silking to keep the crop weed free. At the stage of physiological maturity to harvest the crop, was drained out properly. Plant protection and

other cultural practices were carried out in plots as per the scheduled.

The data on yield of crop, cost of cultivation and monetary returns were collected during the years of study from FLD plots and farmer practice plot to work out the productivity and profitability of rice cultivation. The FLDs were regularly monitored by the scientists of AICRP on maize, from sowing to harvesting. Gap analysis and returns was calculated by using the procedure of Yadav *et al.* (2004).

I. Extension gap = Demonstration yield (D<sub>1</sub>) – Farmers practice yield (F<sub>1</sub>)

II. Technology gap = Potential yield (P<sub>1</sub>) – Demonstration yield (D<sub>1</sub>)

III. Technology index =  $\frac{\text{Potential yield (P}_1\text{)} - \text{Demonstration yield (D}_1\text{)}}{\text{Potential yield (P}_1\text{)}} \times 100$

IV. Additional return = Demonstration return (Dr) – Farmers practice return (Fr)

V. Effective gain = Additional return (Ar) - Additional cost (Ac)

VI. Incremental B : C ratio =  $\frac{\text{Additional return (Ar)}}{\text{Additional cost (Ac)}}$

Sl. No.	Particulars	Farmers practice	Improved interventions
1	Seed rate (kg ha <sup>-1</sup> )	25-30 kg ha <sup>-1</sup>	20 kg ha <sup>-1</sup>
2	Sowing method	Broadcasting	Line sowing
3	Spacing	40 cm×5 cm	60 cm×10 cm
4	Nutrient management	200:50:10 kg ha <sup>-1</sup>	120:60:40 kg ha <sup>-1</sup>
5	Weed management	Pre emergence herbicide	Post emergence herbicide
6	Harvesting	Whole plant along with cob dries	Once grain gets hard and develop aleurone layer

## RESULTS AND DISCUSSION

During the period of study, FLDs in an area of 326 hectares were conducted covering a total of 815 of farmer's field as per the allotment by IIMR, ICAR, New Delhi. Out of 179 demonstrations, all the demonstrations were found in the high yield category

**Table 1.** Details of demonstrations under different yield ranges in maize.

Number of demonstrations conducted during 2019-20 to 2022-23		Number of demonstrations in range different yield (q/ha)		
Allotted	Conducted	< 50	50-60	>60
179	179	0 (0)	0 (0)	179 (100)

i.e. more than 60 q/ha which might be attributed to yield performance of the variety suited for the region (Table 1).

### Grain yield

The increase in grain yield under demonstration over the farmer's local practices was in the range of 48 to 52%. On the average basis 50.32% yield advantage was recorded under FLD demonstrations as compared to farmers practices (FP) of maize cultivation.

### Gap analysis

An extension gap ranging from 20.57 – 21.72 q per hectare was found between FLD demonstration and farmers practices during the different time line and

on average basis the extension gap was observed to be 21.14 q per hectare (Table 2). The extension gap was lowest (20.57 q/ha) in year 2019-20 and was highest (21.72 q/ha) in year 2020-21. Such gap might be attributed to adoption of improved technology in demonstrations that resulted in higher grain yield than that in the farmers practices Khande and Mahajan (2018). Wide technology gap were observed during these years and this was lowest (2.74 q/ha) during 2019-20 and was highest (3.69 q/ha) during 2022-23. On average basis the technology gap of all the 179 demonstrations was found to be 3.17 q per hectare. The difference in 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. Higher technology index reflected the inadequacy of technology and or insufficient extension services for transfer of technology.

### Economic analysis

Different variables like seed, fertilizers, herbicides and pesticides were considered as cash inputs for the FLD demonstrations as well as for farmers practice.

**Table 2.** Grain yield and gap analysis of front line demonstrations of maize on farmers' field.

Years	Number of demonstration	Variety sown	Yield potential (q/ha)	Yield q/ha		Yield increase over farmers practice (%)	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
				Improved technology	Farmers practice				
2019-2020	500 (200 ha)	PJHM-1	66.33	63.59	43.02	47.81	20.57	2.74	4.13
2020-2021	40 (16 ha)	PJHM-1	66.33	63.29	41.57	52.25	21.72	3.04	4.58
2021-2022	100 (40 ha)	PJHM-1	66.33	63.11	42.07	50.01	21.04	3.22	4.85
2022-2023	75 (30 ha)	PJHM-1	66.33	62.64	41.43	51.19	21.21	3.69	5.56
Average	<b>179 (72 ha)</b>		<b>66.33</b>	<b>63.16</b>	<b>42.02</b>	<b>50.32</b>	<b>21.14</b>	<b>3.17</b>	<b>4.78</b>

**Table 3.** Economic analysis of front line demonstrations of maize on farmers' field.

Years	Cost of cultivation (Rs/ha)		Additional cost in demonstration (Rs/ha)	Sale price of grain (Rs/q)	Gross return (Rs/ha)		Additional NER (Rs/ha)	Effective gain (Rs/ha)	Incremental B:C ratio (IBCR)
	Improved technology	Farmers practice			Improved technology	Farmers practice			
2019-2020	113356	96444	16912	2284	76210	42859	33351	16439	1.97
2020-2021	110607	93778	16829	2380	72682	43049	29633	12804	1.76
2021-2022	83532	73318	10214	2150	71271	41055	30216	20002	2.96
2022-2023	82798	64115	18683	2510	77622	39701	37921	19238	2.03
Average	<b>97573</b>	<b>81914</b>	<b>15659</b>	<b>2331</b>	<b>74446</b>	<b>41666</b>	<b>32780</b>	<b>17121</b>	<b>2.18</b>

It is observed that an additional investment of Rs 15659 per ha was made under FLD 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. A maximum return of Rs 76210 per hectare during the year 2019-20 was obtained due to higher grain yield. 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 1.76 & 2.96 in 2020-21 and 2021-22, respectively (Table 3) which depends on grain yield and MSP or sale price. The gap observed may be attributing to the dissimilarity in soil fertility status and weather conditions. Ajay and Ramireddy (2024) have also opined that depending on identification and use of farming situation, specific interventions may have greater implications in enhancing system productivity. The front line demonstration on maize revealed 36% increase in yield over local check. This increase was with an extra expenditure of Rs 15659/ha which is very less and even small and marginal farmers could 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 21.14 q/ha. The average IBCR (2.18) is sufficiently high to motivate the farmers to adopt the technology. Mahajan (2017) was of the same opinion. Therefore, FLD program was effective in changing attitude, skill and knowledge of farmers

towards improved/recommended practices of maize cultivation. This also led to improvement in the relationship between farmers and scientists and built confidence between them. The FLD demonstration farmers acted as primary source of information about the improved practices of maize cultivation. They also acted as source of good quality pure seeds in their locality and surrounding area for the next crop. The concept of front line demonstration may be applied to all farmer categories including progressive farmers for speedy and wider dissemination of the recommended practices to other members of the farming community. This will help in the removal of the cross-sectional barriers among farming community.

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