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Assessment of yield gaps and income augmentation through participatory cluster front-line demonstrations on Indian mustard (*Brassica juncea*) in Rajasthan

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Abstract

Present study assessed the yield gaps and income augmentation of 15670 CFLDs on Indian mustard (*Brassica juncea* L.) for the period 2015 to 2020 in 5417.45 hectares (ha) through the Krishi Vigyan Kendras (KVKs) in Rajasthan state. The researcher found the yield of CFLDs higher (18.59q/ha) than farmers' practices (14.70q/ha). The study depicted, the technology gap of 7.54q/ha, the extension gap of 3.89q/ha, and a technology index of 28.26%. The CFLDs realized an additional yield of 3.89q/ha. Subsequently, Rs.15337.00/ha is supplemented, making a total of Rs.9.63 crores. The yields of CFLDs surpassed the state yield by 7.02q/ha and the national yield by 7.53q/ha. The identified technology gaps are attributed to dissimilarity in soil fertility status, weather conditions, and climate vulnerability. However, the adoption of integrated crop management practices could reduce the extension gaps in Indian mustard. Therefore, the professionals of KVKs should adopt location-specific extension methodologies for approaching partner farmer's for enhancing the yield and production of Indian mustard in Rajasthan. Moreover, the lower value of the technology index indicates greater technology feasibility in the particular district.

Keywords: *Cluster front line demonstrations, income, Indian mustard, yield gap*

Introduction

Indian mustard [*Brassica juncea* (L) Czern. & Coss.] is the second most important oilseed crop after soybean covers nearly 25% of the total oilseeds production in the country. Rapeseed-mustard is grown on 6.23 million hectares, yielding 9.34 million tones with an average productivity of 1499 kg per hectare (GOI, 2019-20). The prominent growing states are Rajasthan, Uttar Pradesh, Haryana, West Bengal, Madhya Pradesh, Gujarat, and Assam, accounting for 92% of total production. As per USDA (2016), India has become the leading rapeseed-mustard growing country with 21.6% production globally. As per financial express of 25th February 2021, the country's mustard production in 2019-20 crop years (July-June) dropped 1.5% to 9.12 million tonne due to hailstorms in several areas of Rajasthan, the top producing state, in Feb-March months. However, the delayed withdrawal of monsoon helped retain the moisture content. As usual, farmers in Rajasthan have started harvesting the crop, which was sown around the first week of October. As the country's import dependence on edible oils was over 70%, with an annual outgo of Rs 75,000 crore, the agriculture ministry proposed a five-year plan of edible oil mission estimated Rs. 19,000 crores in the budget of the financial year 2022.

The country's rapeseed-mustard production is all set to be a record 9.99 million tonne in 2020-21 after the sowing area under the crop is said to have reached an all-time high of more than 25 lakh hectares as the government rolled out the oilseed mission as a pilot during 2020-21 in Rabi season. Rajasthan is the leading state particularly in Indian mustard production contributing about 45 per cent of the country, with an annual output of 3.40 million tonne and average productivity of 1558 kg/ha. It is grown on 2.18 million ha. It has a yearly output of 3.40 million tonne and an average of 1558 kg/ha (Anonymous, 2019-20). However, as per financial express 25th February 2021, the Rajasthan government expects the mustard acreage to be around 3 million hectares as per full compiled district-wise data. However, variations in production are due to weather variations, monsoon failing, low adoption of improved varieties, plant production measures, weed management practices, nutrient management, and inadequate knowledge of farmers knowledge. In Rajasthan under CFLD areas, a significant increase in mustard yield was observed in the last years. In 2016-17, the average yield of CFLDs was 17.77q/ha, which were 4.07q/ha higher than farmer's practice, which was 13.70q/ha (Meena *et al.,* 2018). An enhancement of 4.23q/ha was observed in 2017-18 with an 18.99q/ha average yield of CFLDs (Meena *et al.,* 2018). The present study was conducted to evaluate the performance of Indian mustard crop under CFLD in Rajasthan state. Since 2015 to 2020, a total 15670 CFLDs were conducted by the KVKs of Rajasthan in integrated crop management mode to measure the yield gap and income augmentation through the CFLDs of Indian mustard.

Materials and Methods

In the interest of nation, from 2015 to 2020, the KVKs of Rajasthan laid out the CFLDs on the Indian mustard in integrated crop management mode. The CFLDs were carried out in villages using the participatory approach where farmers engaged at all levels. KVKs provided critical inputs such as improved variety seed, bio-fertilizers, soil ameliorates, herbicide, micro-nutrients, integrated pest and disease control, and so on, at a maximum cost of Rs.6000/ha. KVKs organized various extension activities like farmers' fields, and display boards were displayed at the field level for farmers' educational roles. For achieving the potential yields of Indian mustard, the partner farmers were applied the chemical fertilizers (NPK) and the other micro nutrient s per recommendations (Chauhan *et al.*, 2013) has been demonstrated at farmers' fields. The scientists of KVKs visited demonstration fields for interactions at the field level to understand the problems. The fact sheet has been provided to each participatory farmer to maintain all records for confidence development of farmers. Crop analysis between existing and recommended practice is done to rationalize all critical inputs provided under cluster front line demonstrations. As per norm 0.4 ha area is allocated for one CFLD. All the partner farmers (15670) provided the data over the whole package of practices. The yield data were obtained using a random crop cutting process and analyzed using basic statistical methods of proven technologies and farmers' practices. The technology gap, extension gap, and technology index were calculated. Other analyses like gross return, the net return, cost of cultivation, and benefit-loss ratio were also undertaken. The technology gap, technological index, and extension gap were calculated using the following formulas by Yadav *et al.* (2004). The potential yields are given as an average yield of all the varieties grown in respective districts (Table 1).

1. Extension gap = Demonstration yield – Farmer's yield

2. Technology gap= Potential yield- Demonstration yield

3. $$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$$

Table 1: Major mustard varieties demonstrated under CFLDs in Rajasthan state during 2015 to 2020

Name of KVKs	Mustard varieties demonstrated				
	2015-16	2016-17	2017-18	2018-19	2019-20
Ajmer	RH 749	RGN 229	RH 749	DRMRIJ 31	DRMRIJ 31
Alwar-I	NRCDR 2	NRCDR 2	NRCDR 2	DRMRIJ 31	DRMRIJ 31
Alwar-II	-	-	-	DRMRIJ 31	DRMRIJ 31
Baran	NRCDR 2	NRCDR 2	NRCDR 2	NRCDR 2	DRMRIJ 31
Barmer-I	PM 26	-	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Barmer-II	-	-	-	DRMRIJ 31	DRMRIJ 31
Bharatpur	NRCDR 2	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Bhilwara-I	RB 50	DRMRIJ 31	RH 406	RH 406	DRMRIJ 31
Bhilwara-II	-	-	-	-	DRMRIJ 31
Bikaner-I	RGN 229	DRMRIJ 31	DRMRIJ 31	-	DRMRIJ 31
Bikaner-II	-	-	-	DRMRIJ 31	DRMRIJ 31
Bundi	NRCDR 2	RH 749	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Chittorgarh	RB 50	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Churu-I	NRCDR 2	NRCDR 2	NRCDR 2	DRMRIJ 31	DRMRIJ 31
Churu II	-	-	-	DRMRIJ 31	DRMRIJ 31
Dausa	RH 749	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Dholpur	NRCHB 101	RH 406	RH 406	RH 406	DRMRIJ 31
Dungarpur	-	NRCHB 101	RH 406	RH 406	RH 406
Hanumangarh-I	RH 749	RH 749	RH 749	RH 749	RH 725
Hanumangarh-II	-	-	-	RH 749	RH 749
Jaipur-I	NRCDR 2	NRCDR 2	RH 749	RH 749	RH 749
Jaipur II	-	-	-	DRMRIJ 31	DRMRIJ 31
Jaisalmer-I	RGN 229	DRMRIJ 31	-	RH 406	DRMRIJ 31
Jaisalmer-II	-	-	-	NRCDR 2	DRMRIJ 31

Jalore	-	PM 26	PM 26	PM 26	DRMRIJ 31
Jhalawar	NRCDR 2	NRCDR 2	NRCDR 2	DRMRIJ 31	DRMRIJ 31
Jhunjhunu	RH 749	NRCHB 101	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Jodhpur-I	RH 749	NRCHB 101	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Jodhpur-II	-	-	-	DRMRIJ 31	DRMRIJ 31
Karauli	RH 749	NRCDR 2	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Kota	NRCHB 101	NRCHB 101	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Nagaur-I	PM 27	DRMRIJ 31	PM 26	DRMRIJ 31	DRMRIJ 31
Nagaur-II	-	-	-	DRMRIJ 31	DRMRIJ 31
Pali	NRCDR 2	NRCDR 2	NRCDR 2	-	-
Pratapgarh	-	NRCDR 2	RH 406	RH 406	RH 406
Rajsamand	-	RH 406	RH 749	NRCHB 101	RH 406
Sawai Madhopur	NRCDR 2	NRCDR 2	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Sikar	NRCDR 2	RGN 229	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Sirohi	PM 26	-	RGN 229	NRCHB 101	DRMRIJ 31
Sriganganagar	RGN 229	-	-	DRMRIJ 31	DRMRIJ 31
Tonk	RH 749	RH 406	DRMRIJ 31	DRMRIJ 31	DRMRIJ 31
Udaipur-I	NRCDR 2	NRCHB 101	NRCHB 101	NRCHB 101	NRCHB 101
Udaipur-II	-	-	-	-	RH 406

Results and Discussion

Yields of Indian mustard under CFLDs

Table-1 depicts the yields of Indian mustard in the various districts of Rajasthan. It was observed that the average yield of Mustard in demonstrated fields was higher than the farmers' practices. Under the CFLDs, the highest yield (23.11q/ha) was observed in Jaipur-II, because here the average productivity is obtained from two demonstrations in the year 2018-19 and 2019-2020. The availability of irrigation (quality) water, soil type and quality, other external inputs helped to achieve more than 23q/ha yield of mustard. Although, the lowest yield was (13.96q/ha) recorded in Jaisalmer-I due to less rainfall and fewer irrigation facilities. Under the farmers' practices, the yield ranged between 10.88q/ha (Barmer-I) and 19.25q/ha (Jaipur-II). Overall, an average grain yield of Mustard under the CFLD was noticed as 18.59q/ha, which is 3.89q/ha higher than farmers' practices (14.70q/ha). During the five years, the yield was 27.82% higher than the farmers' yield (Fig.1). The year-wise yields and percent change are evident from fig.1.

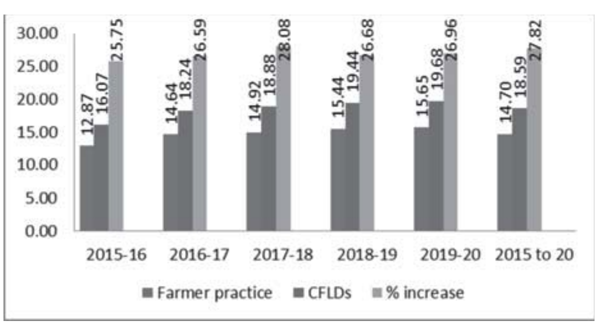

Figure 1. Mustard yield (q/ha) in Rajasthan, India, during 2015-2020 (n=15670).

The KVKs were also classified based on the yields observed in the fields during these five years (Table 3). Out of 43 KVKs in Rajasthan state, five KVK, namely Bhilwara-II, followed by Barmer-II, Jodhpur-II, Bhilwara-I, and Jaipur-I, had reported yield enhancement in mustard by 4.87q/ha. The yield performance of demonstrated varieties was reported as highly superior to local cultivars because farmers could not afford the recommended package and practices, which resulted in lower yield under similar field conditions. For instance, the average result of farmers practice in Bhilwara-II was low (11.7 q/ha.) and the yield gap under CFLD was 18.8q/ha. However, six KVKs, namely Sikar, Hanumangarh-I, Jaisalmer-I, Sriganganagar, Bundi, and Karauli, reported a yield increase of less than 2.91q/ha. In these districts, the gap between CFLD and farmer practices was less because already farmers have partially applied the recommended technological package of practices and proper irrigation facilities. In the remaining 30 KVKs, the range of yield was from 2.91 to 4.87 q/ha (Table 2 & 3).

Extension gap, technology gap, and technology index in Indian mustard

The technical gap, extension gap, and technology index for the Indian mustard crop are computed and presented in Table 2. The extension gap, the difference between demonstration yield and farmer practice yield, was calculated as 3.89q/ha. The highest extension gap reported in the Bhilwara-II district (7.10q/ha), followed

Table 2: Yield of Indian mustard in Rajasthan state during the year 2015-2020 (n=15670).

KVKs	Number of CFLDs	Yield gap minimized (q/ha)							
		Farmers practices (q/ha)	CFLDs (q/ha)	Potential * (q/ha)	Yield increase (CFLDs-FP) (q/ha)	Yield increase (%)	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
Ajmer	375	13.8	18.2	27.4	4.5	32.4	4.5	9.1	33.3
Alwar-I	393	18.4	23.0	26.9	4.6	25.9	4.6	3.9	14.5
Alwar-II	133	13.9	17.1	27.6	3.1	22.6	3.1	10.5	38.2
Baran	525	17.8	20.9	26.5	3.1	17.6	3.1	5.6	21.1
Barmer-I	271	10.9	15.7	26.6	4.8	49.3	4.8	10.9	41.0
Barmer-II	264	13.6	19.8	27.6	6.3	47.2	6.3	7.7	28.1
Bharatpur	600	17.5	20.5	27.3	3.1	17.3	3.1	6.8	24.8
Bhilwara-I	455	12.2	17.5	25.9	5.2	43.3	5.2	8.4	32.5
Bhilwara-II	75	11.7	18.8	27.6	7.1	60.7	7.1	8.8	31.8
Bikaner I	300	15.3	19.8	27.1	4.5	29.9	4.5	7.3	27.1
Bikaner-II	200	18.1	22.9	27.6	4.8	26.5	4.8	4.7	16.9
Bundi	400	14.6	17.2	27.4	2.6	19.0	2.6	10.2	37.2
Chittorgarh	325	14.8	18.2	27.7	3.5	23.6	3.5	9.5	34.3
Churu-I	625	11.64	16.4	26.8	4.8	41.7	4.8	10.4	38.7
Churu II	175	14.8	18.6	27.6	3.8	25.9	3.8	9.0	32.5
Dausa	413	15.4	18.9	27.7	3.5	22.8	3.5	8.8	31.8
Dholpur	488	17.8	22.2	22.8	4.4	24.5	4.4	0.6	2.6
Dungarpur	404	12.0	15.8	21.6	3.7	31.0	3.7	5.8	27.0
Hanumangarh-I	400	17.6	20.4	28.0	2.8	15.7	2.8	7.6	27.3
Hanumangarh-II	225	16.6	19.6	28.0	3.0	17.9	3.0	8.4	30.1
Jaipur-I	475	15.8	20.7	27.3	5.0	30.9	5.0	6.6	24.2
Jaipur -II	225	19.3	23.1	27.6	3.9	20.1	3.9	4.5	16.2
Jaisalmer-I	263	11.2	14.0	26.0	2.8	24.6	2.8	12.0	46.2
Jaisalmer-II	125	12.4	16.8	26.9	4.4	35.5	4.4	10.1	37.5
Jalore	600	12.7	16.8	24.5	4.0	31.4	4.0	7.8	31.7
Jhalawar	400	13.2	17.5	26.8	4.3	32.5	4.3	9.3	34.6
Jhunjhunu	743	14.6	18.1	25.6	3.5	23.9	3.5	7.5	29.4
Jodhpur-I	328	15.0	18.6	25.7	3.5	23.2	3.5	7.2	27.8
Jodhpur-II	150	14.2	20.0	27.6	5.7	40.5	5.7	7.6	27.6
Karauli	400	17.7	20.3	27.4	2.6	15.4	2.6	7.1	25.6
Kota	315	16.6	20.7	23.5	4.1	24.7	4.1	2.7	11.7
Nagaur-I	348	16.3	19.5	25.7	3.28	20.1	3.3	6.2	24.1
Nagaur-II	375	14.3	18.0	27.6	3.7	25.8	3.7	9.6	34.8
Pali	215	10.2	13.9	26.3	3.7	41.4	3.7	12.4	47.1
Pratapgarh	287	12.6	15.8	23.8	3.3	26.2	3.3	8.0	33.5
Rajsamand	435	13.4	16.7	22.8	3.3	24.2	3.3	6.2	27.0
Sawai Madhopur	425	15.7	19.4	27.1	3.7	24.0	3.7	7.6	28.2
Sikar	620	15.3	18.1	26.9	2.9	18.7	2.9	8.8	32.6
Sirohi	368	14.4	18.3	23.5	3.9	26.8	3.9	5.3	22.4
Sriganganagar	257	15.0	17.7	26.9	2.7	17.7	2.7	9.3	34.5
Tonk	544	16.5	20.1	26.7	3.6	22.1	3.6	6.7	24.9
Udaipur-I	682	12.0	15.7	19.1	3.6	32.5	3.8	3.4	17.7
Udaipur-II	44	15.5	18.5	23.0	3.0	19.4	3.0	4.5	19.6

*Mean potential yield of all varieties grown in districts during 2015-2020 (Annex-I); Source: Primary data from 2015-2020

Table 3: Ranking of KVKs based on yield performance (in q/ha) in Rajasthan state, India

Yield (q/ha)	*f*	%
<2.91	6	6.78
2.91-4.87	32	74.42
>4.87	5	11.33

by Barmer-II (6.26q/ha) and Jodhpur-II (5.74q/ha). Partner farmers must be educated and inspired to adopt improved Indian mustard production technologies to address the extension gap. Hence, sincere efforts are needed to disseminate the package of practices of Indian mustard by the government institutes, State Agricultural Universities (SAUs), and Krishi Vigyan Kendras (KVKs). More extension gap indicates that advanced technologies are well-accepted. The technology gap is the output of differences between the potential yield and demonstration yield of Indian mustard. During the year 2015 to 2020, the technological gap was observed as 7.54q/ha, which may be attributed to the dissimilarity in the soil fertility status in the state. The weather conditions and the less technology gap revealed better adaptability of the crop variety in a particular area. In Dholpur, a significantly less technology gap (0.59q /ha) was observed, followed by Kota (2.74q/ha) and Udaipur-I (3.39q /ha).

The technology index indicates the level of feasibility of demonstrated technologies at the partner farmers' fields. The technology index suggests the viability of various farmer's fields; a lower value indicates greater technology feasibility. It demonstrates the effectiveness of related interventions or innovations that are shown in the farmer's field. The lowest value (2.59%) of the technology index was observed in the Dholpur district, followed by Kota (11.68%). However, the average technology index of the Rajasthan state was found 28.60%. In addition to the dissimilarities in soil fertility status, rainfall distribution, disease, insect, pest infestations, and weed severity, other constraints hinder the higher production of India mustard in the state. The other significant limitations are the salt-affected soil and poor-quality irrigation water, moisture deficiency at seeding time, prevalence of higher temperature at sowing time, and continuous adoption of fallow-mustard sequence in the large area leading to *Orobanche* and *Sclerotinia* rot problem. Hence, in these areas, Indian mustard can be replaced by *Taramira* in areas where soil moisture is inadequate. The crop rotation is needed to reduce the infestation of *Orobanche,* especially in some districts. Apiary can be a good option for enhancing the production of Mustard. Moreover, intercropping of Mustard with chickpea and with lentils was found suitable in Rajasthan state.

Economics and income augmentation through CFLDs on Indian mustard

Table-3 shows the economic performance of the Indian mustard crop under CFLDs. The financial analysis results of 5 years revealed that the Indian mustard recorded a higher net return from recommended practice. A higher net return from recommended practices (Rs.49, 669.43/ha) than farmers' practices (Rs.36064.01/ha) obtained by Indian mustard cultivation. The average benefit-cost ratio of the Indian mustard crop from the previous five years under CFLDs was 1:3.23 compared to farmers' practices (1:2.71). The higher net returns and B: C ratio in Indian mustard demonstration can be due to the higher grain yield and better market pricing. During these five years, a total of 15670.00 CFLDs were conducted by KVKs in a 6907.45 ha area in the state. These CFLDs were added to Rs.9.63 crores as an additional income in the states' economy (Fig 2).

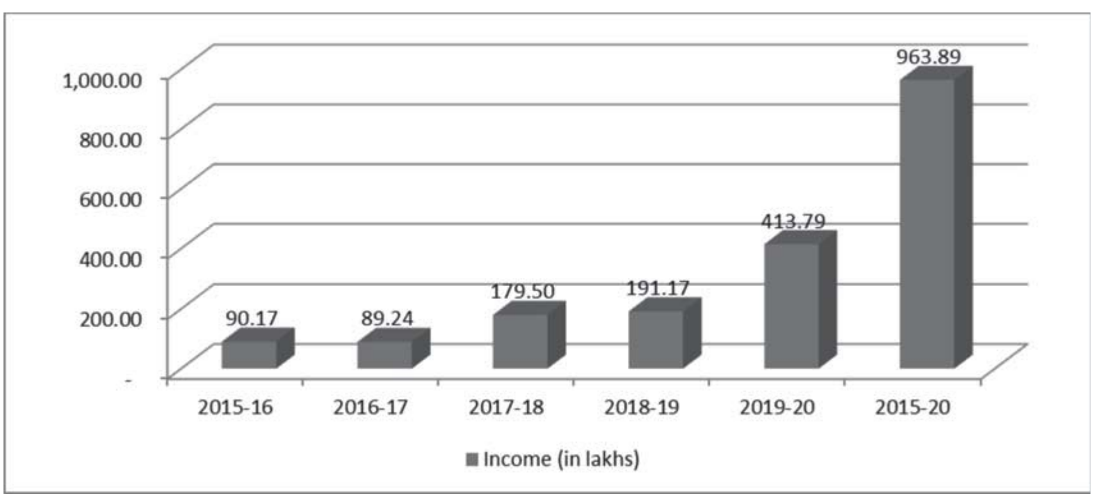

Figure 2. Income enrichment through CFLDs on Indian mustard in Rajasthan, India during 2015-2020 (in lakhs)

Table 4: KVK wise economics of Indian mustard production in Rajasthan state, India (n=15670)

KVKs	Area	CFLDs	Economics of FP (Rs/ha)				Economics of CFLDs (Rs/ha)				Total income
	(ha)		Gross cost	Gross return	Net return	B.C. ratio	Gross cost	Gross return	Net return	B.C. ratio	enhancement in Rs.
Ajmer	180.0	375	23268.0	54988.5	31720.5	2.34	25,050.4	72,514.7	47,465.1	2.86	3,119,280
Alwar-I	226.3	393	22203.1	70382.5	48179.4	2.92	23,079.7	89,152.4	66,072.9	3.93	3,694,958
Alwar-II	76.0	133	30997.0	59972.6	28975.6	1.93	31,286.8	72,619.8	41,333.0	2.32	1,036,269
Baran	210.0	525	19740.1	63111.2	43371.0	2.99	20,497.5	75,887.9	55,390.4	3.50	2,795,180
Barmer-I	185.0	271	20280.0	43442.3	23162.3	2.13	21,829.5	57,318.0	37,500.3	2.62	2,607,345
Barmer-II	180.0	264	28686.5	57015.0	28328.5	2.00	29,831.0	81,904.8	52,073.8	2.75	4,279,350
Bharatpur	240.0	600	20804.3	70297.0	49492.7	2.99	23,824.3	82,678.8	58,704.5	3.45	2,183,330
Bhilwara-I	180.0	455	14756.7	50459.8	35703.1	3.20	16,980.0	67,096.8	50,116.6	3.74	2,704,993
Bhilwara-II	30.0	75	16200.0	65075.0	48875.0	4.02	18,000.0	86,486.0	68,486.0	4.80	588,330
Bikaner I	120.0	300	25125.0	56514.5	31389.5	2.25	27,075.0	72,846.7	45,771.7	2.68	1,765,327
Bikaner-II	80.0	200	23990.0	78028.8	54038.8	3.25	26,235.0	98,762.5	72,527.5	3.77	1,513,675
Bundi	200.0	400	23163.2	57807.0	34643.8	2.46	25,194.0	69,022.5	43,829.9	2.73	1,677,730
Chittorgarh	130.0	325	21266.6	55553.9	34287.3	2.61	22,221.5	71,380.9	49,159.4	3.22	2,004,382
Churu-I	250.0	625	21068.0	43538.4	22270.4	2.04	23,852.4	64,250.2	35,786.8	2.65	2,910,325
Churu II	80.0	175	21000.0	54525.7	33525.7	2.60	22,560.0	68,336.0	45,800.7	3.03	1,028,867
Dausa	210.0	413	36708.4	64081.4	27373.0	1.86	36,566.6	78,595.0	41,622.4	2.26	3,433,410
Dholpur	195.0	488	24066.8	67616.7	43349.9	2.85	25,789.0	83,082.2	57,293.2	3.25	2,941,046
Dungarpur	110.0	404	18425.0	40095.0	21670.0	2.24	22,350.0	56,785.0	34,435.0	2.67	1,385,200
Hanumangarh-I	160.0	400	21664.4	67742.6	46078.2	3.13	22,271.4	78,179.1	55,907.7	3.51	1,582,363
Hanumangarh-II	90.0	225	15481.2	59706.5	44225.4	3.96	17,062.5	70,355.1	53,307.6	4.34	804,790
Jaipur-I	212.5	475	20141.8	65398.7	45256.9	3.18	22,639.2	85,676.2	63,037.0	3.82	4,063,873
Jaipur -II	100.0	225	22952.5	70920.0	47967.5	3.10	24,577.5	84,929.3	60,351.8	3.47	1,238,430
Jaisalmer-I	130.0	263	16783.8	46840.8	30057.1	2.54	17,910.8	59,671.1	41,760.3	3.10	1,588,270
Jaisalmer-II	100.0	125	20943.0	55998.8	35055.8	2.67	24,132.5	75,731.4	51,598.9	3.14	1,654,313
Jalore	240.0	600	23166.7	53603.0	30436.3	2.34	25,083.3	70,406.4	45,323.0	2.86	4,845,235
Jhalawar	170.0	400	27418.5	47510.4	19341.9	1.74	27,378.6	61,672.8	33,201.4	2.35	2,467,187
Jhunjhunu	297.2	743	22910.0	53004.4	30094.4	2.31	24,411.6	64,197.0	39,785.4	2.62	2,978,298
Jodhpur-I	131.0	328	16196.0	52087.5	35891.5	3.25	17,128.0	64,234.5	47,142.5	3.81	1,526,008
Jodhpur-II	80.0	150	16236.3	59430.0	43193.8	3.66	17,583.5	78,776.3	61,192.8	4.48	1,412,440
Karauli	170.0	400	23801.2	71816.8	48015.6	2.88	24,592.0	82,078.2	57,486.2	3.40	1,501,138
Kota	130.0	315	23745.9	66630.3	42897.9	2.81	25,831.0	82,962.9	57,131.7	3.22	1,788,285
Nagaur-I	169.0	348	22751.0	62507.4	39756.4	2.31	23,552.0	75,461.7	51,909.7	3.26	2,250,745
Nagaur-II	150.0	375	27133.3	70054.0	42920.6	2.58	28,749.8	86,764.3	58,014.6	3.01	2,303,543

Pali	100.0	215	15020.8	33926.4	18905.6	2.43	17,202.1	54,132.7	36,930.7	3.30	1,809,766
Pratapgarh	110.0	287	16662.5	44801.3	28138.8	2.68	17,678.8	56,283.8	38,560.0	3.18	1,157,000
Rajsamand	180.0	435	15625.0	54066.3	38441.3	3.60	17,500.0	67,814.3	50,289.3	4.02	2,111,900
Sawai Madhopur	184.0	42	20869.5	63162.0	42292.4	3.11	22,210.8	79,515.4	57,304.8	3.65	2,828,563
Sikar	310.0	620	21480.0	56640.1	35160.1	2.63	22,924.0	67,833.9	44,909.8	2.96	3,370,435
Sirohi	150.0	368	20695.8	57377.9	36682.1	2.60	22,259.5	72,994.1	50,734.6	3.34	2,174,842
Sriganganagar	93.0	257	20936.7	55763.8	34827.2	2.95	22,391.7	65,544.7	42,719.7	3.21	735,745
Tonk	270.0	544	19627.9	69922.3	50294.4	3.37	21,621.7	85,186.1	63,564.4	3.75	3,897,988
Udaipur-I	281.0	682	18574.4	37439.6	18865.2	2.07	21,327.6	51,079.4	29,752.8	2.37	4,368,337
Udaipur-II	17.5	44	24000.0	49600.0	25600.0	2.07	24,250.0	64,750.0	40,500.0	2.67	260,750
Total	**6907.5**	**15670**	-	-	-	-	-	-	-	-	-
Average	-	-	**21548.1**	**57638.5**	**36064.0**	**2.71**	**23,127.7**	**72,905.8**	**49,669.4**	**3.23**	**96,389,239**

Conclusion

The study revealed that improved varieties of Mustard with a feasible technological package gave higher yield and net returns than the existing farmers' practices. However, various components like high-yielding varieties, the adjustment in sowing time, balanced nutrition, weed, insect-pest, and diseases were crucial in achieving higher productivity and profitability. Identified extension and technological gaps are to be addressed for higher the yields at partner farmers' fields with location-specific extension methodologies. Demonstrations of improved mustard production technologies convinced partner farmers to adopt the technologies for the productivity and profitability of Indian mustard in Rajasthan. Moreover, amounts of Rs. 9.63 crores augmented the state's economy. Moreover, more than 68% farmers started to adopt all accepted technological packages in the mustard crop.

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