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Impact of improvised production technology for rapeseed-mustard in West Bengal

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ABSTRACT

Rapeseed mustard is one of the important crops under oilseed scenario in India. Likewise in West Bengal it is also one of the major oilseed crop which contributing 53% of total oilseed production of the state. One of the major constraints is low productivity of this crop due to non adoption of recommended package of practices and situation-specific improved varieties by most of the growers. The ex-post-facto analysis of secondary data pertaining to front line demonstrations (FLDs) in rapeseed-mustard conducted under 'Integrated scheme on Oilseeds, Pulses, Oilpalm and Maize (ISOPOM)' revealed 22.7% yield advantage by adoption of improved varieties may be possible. The other components viz. adoption of right method and time of sowing, seed treatment, application of sulphur and boron, integrated fertilizer and irrigation management, integrated pest and disease management showed 38.5,32.1,26.1, 23.4, 38.8 and 18.6% respectively yield advantage were exhibited over farmers' practice. Popularization of these proven technologies to the rapeseed- mustard growers will help them to get higher economic returns with sustainable production system of the state.

***Keywords*:** Economic potentials, FLD, improved technologies and rapeseed-mustard

India accounts for 12-15% of world's oilseed area, 7-8% of oilseeds output, 6-7% of vegetable oil production, 9-12% of vegetable oil import and 9-10% of vegetable oil consumption (Hegde, 2009). The country produces seven edible oilseed crops *viz.* groundnut, rapeseed-mustard, soybean, sunflower, sesame, safflower and niger and two non edible oilseeds *viz.* castor and linseed. Though the diverse agro-ecological conditions of West Bengal are also favourable for growing all these nine annual oilseeds, rapeseed-mustard, groundnut, sesame and sunflower are the major oilseed crops grown in the state. Rapeseed-mustard solely contributes 53% of total oilseed production with productivity of 764 kg ha^{-1} in the state during 2008-09. The productivity of rapeseed-mustard in the state is comparatively low. However, the improved rapeseed-mustard production technologies show there is a gap in potential and realized yield. This paper captures the productivity potentials and profitability of improved rapeseed-mustard production technologies under real farm situations demonstrated through frontline demonstrations (FLDs) in West Bengal.

MATERIALS AND METHODS

The Technology Mission on Oilseeds (TMO) launched by Government of India in 1986 had a significant impact on overall oilseeds production of the country by raising it from 10.83 million tones in 1984-85 to 24.35 million tones in 1996-97 (Venkattakumar *et al*., 2009). Thereafter there was a plateau in oilseed production when bulk amount was imported. To meet the huge demand of edible oils in the country, the Department of Agriculture and Cooperation (DAC) started implementing the Integrated Scheme on Oilseeds, Pulses, Oilpalm and Maize (ISOPOM) mainly to benefit small and marginal farmers as most of the oilseed area in the country is with this category of farmers. Under this scheme FLDs are conducted every year by Pulses and Oilseeds Research Station, Berhampore, Murshidabad, West Bengal, under the close supervision of scientists for transfer of technology to prove the improved oilseed production technology under real farm situations. These demonstrations included different component technologies, classified as non-monetary (*viz.* choice of improved varieties, right method and time of sowing), low-cost (*viz.* seed treatment, application of sulphur and boron), and cost effective (*viz.* integrated fertilizer and irrigation management, integrated disease management and integrated insect management) production technologies.

More than 100 FLDs on rapeseed-mustard were carried out during *rabi* season from 2005-06 to 2009-10 showed that there was a wide yield gap between improved technology (IT) and farmers' practice (FP). In case of local check plots, existing practices being used by farmers followed were considered. In general the soils of the area were sandy loam with medium fertility status. The results of these demonstrations conducted at various locations over the years (*Anon*.,

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2005, 2006, 2007, 2008 and 2009) have been summarized in the present paper based on data collected from FLD plots as well as the data on local practices commonly adopted by the farmers.

RESULTS AND DISCUSSION

Seed yield

Choice of varieties is a pre-requisite for getting higher production in any area. The popular variety B-9 (Benoy) in farmers practice showed very poor yield in several places due to late sowing, infestation of diseases and insect. The yield increase due to improved varieties ranged from 13.5 to 46.5% with the mean value of 28.1% during 2005-09. The improved variety Kalyan (WBBN-1) showed 46.5% yield advantage over local variety B-9 during 2006-07 (Table 1). The benefit: cost ratios (BCR) were 3.90 and 3.46 with IT and FP plots respectively. Overall, choice of improved varieties of rapeseed-mustard showed 5,790.00 ha^{-1} additional net returns than the local varieties (Table 2).

Rapeseed-mustard is mostly sown after harvest of *kharif* paddy when normal time of sowing is over. Moreover, it is broadcasted resulting poor yield due to uneven plant population. Besides this, rise of temperature during flowering and maturity period due to late sowing results; high incidence of insects and diseases and also force maturity of the crop, thereby reduces seed and oil yields. The (IT) of right method and time of sowing showed 34.8 and 39.1% seed yield advantage with additional net returns of ` 10,807.00 $ha^{-1}$ and ` 7,800.00 ha^{-1} and BCR values of 4.17 and 4.86 during 2009-10 and 2006-07, respectively (Table 1). Overall, the seed yield increased was 38.5% with additional net returns of ` 11,478.00 ha^{-1} (Table 2).

Production economics

Adoption of seed treatment with chemicals showed 32.1% yield advantage with additional net return of ` 7,275.00 $ha^{-1}$ and BCR of 3.98 during 2006-07 (Table 1 and 2). Application of sulphur and boron as an essential element for increasing the oil content and seed yield was demonstrated during 2007-08 and this IT increased seed yield to the tune of 26.1% with additional net returns of ` 3,905.00 ha^{-1} with corresponding BCR of 2.31 (Table 1 and 2).

Demonstration of right dose of fertilizer application and right time of irrigation were conducted in different years at various locations. The results revealed that the seed yield increment was ranging from 14.6% to 34.4% and additional net returns were ranging from 3,680 to 8,025 ha^{-1} (Table 1). Overall, this IT gave 19.5% seed yield advantage with additional net returns of ` 5,937/- ha^{-1} and BCR of 3.39 (Table 2). Tripathi *et al*. (2011) noted similar findings of high seed yield and benefit cost ratio under RDF.

Late sowing of rapeseed mustard is severely damaged by insects mainly by aphids. Proper plant protection measures increased seed yield by 38.8% yield advantage with an additional net returns of ` 9,698 $ha^{-1}$ with BCR of 4.04 (Table 1 and 2). Need-based disease management practices demonstrated seed yield increase to the tune of 18.6% with additional net returns of ` 7,357.00 ha^{-1} and BCR of 4.41 (Table 1, 2).

Impact of field level demonstrations (FLDs)

Altogether 105 number of demonstrations were conducted during the period from 2005-06 to 2009-10 at the farmers field, has been categorized into three, such as 1. Non-monetary technologies, 2. Low-cost production technologies and 3. Cost effective production technology. The first component (non-monetary technologies), adoption of improved varieties and adoption of right method and time of sowing showed 22.7 and 38.5% seed yield advantage over FP, respectively and therefore, farmers can adopt these two technologies without incurring any additional cost. The second component (low-cost production technologies), adoption of seed treatment practice and application of Sulphur and Boron showed 32.1 and 26.1% seed yield advantage over FP, respectively, and hence, these two technologies would also be useful for them to have higher additional returns at minimum costs. The third component including all cost effective production technologies viz. integrated fertilizer and irrigation management, integrated insect and disease management showed 23.4, 38.8 and 18.6% seed yield advantage, respectively following integrated insect management which resulted maximum additional net return (` 9,698.00 $ha^{-1}$) followed by integrated disease management (` 7,357.00 ha^{-1}) and integrated fertilizer and irrigation management (` 5,937.00 ha^{-1}). Popularization of these aforesaid ITs among the oilseed growers would help to get remunerative and sustainable yield with higher economic returns and finally enhance overall oilseed production without bringing more area under these crops in the country.

The per capita consumption of vegetable oil is rising continuously. The country needs to produce at least 55.5 and 66.0 m t of oilseeds by 2015 and 2020 respectively. Adoption of improved technologies will

Table 1: Impact of improved rapeseed–mustard production technologies under real farm situations during 2005-06 to 2009-10

Year	Component	No. of FLDs	Seed yield (kg ha^{-1})		% increase in yield	Cost of cultivation (` ha^{-1})		Gross return (` ha^{-1})		Additional net return (` ha^{-1})	BCR (` ha^{-1})	
			IT	FP		IT	FP	IT	FP		IT	FP
2009-10	Improved variety	8	1134	863	32.3	8244	7773	27453	22425	4557	3.33	2.88
	Balanced fertilizer and irrigation	4	1188	884	34.4	8333	7732	29138	22493	6645	3.50	2.90
	Right time and method of sowing	3	1425	1057	34.8	8683	8167	36167	25360	10807	4.17	3.11
	Insect management	2	1310	990	32.3	8983	7897	32610	23760	8850	3.91	3.00
	Disease management	3	1463	1140	28.4	8404	7718	35120	27360	7760	4.18	3.54
2008-09	Improved variety	8	1354	1193	13.5	7673	7405	31148	27428	3720	4.06	3.70
	Balanced fertilizer and irrigation	4	978	818	19.6	8288	7405	22483	18803	3680	2.71	2.54
	Insect management	4	1285	1058	21.5	8288	7405	29555	24323	5232	3.57	3.26
	Disease management	4	1035	828	25.0	8288	7405	23805	19032	4773	2.87	2.57
2007-08	Improved variety	8	1015	836	21.4	7418	7937	22330	18508	3822	3.01	2.33
	Application of sulphur and boron	4	893	708	26.1	8494	7601	19635	15730	3905	2.31	2.07
	Insect management	4	828	770	7.5	8865	8062	18205	16940	1265	2.05	2.10
	Disease management	4	938	800	17.3	8565	8062	20625	17600	3025	2.41	2.16
2006-07	Improved variety	10	1335	911	46.5	6794	5641	24715	17114	7601	3.64	3.03
	Balanced fertilizer and irrigation	5	1258	1098	14.6	6664	6157	25160	19764	5396	3.77	3.21
	Right time and method of sowing	5	1744	1254	39.1	6715	6092	32880	25080	7800	4.86	4.10
	Seed treatment practice	5	1524	1154	32.1	7230	5809	28817	21542	7275	3.98	3.71
	Insect management	5	1520	1206	26.0	7155	5601	29636	22401	7235	4.15	3.13
2005-06	Improved variety	6	1447	1158	25.0	7553	5960	31620	24578	7042	4.18	4.12
	Balanced fertilizer and irrigation	4	1273	1018	25.0	7640	6592	28050	20025	8025	3.87	3.03
	Insect management	2	1425	1120	27.2	7160	6160	31150	29040	2110	3.35	3.70
	Disease management	3	1266	1146	10.5	7356	5353	28453	23020	5433	3.86	3.30

BCR: Benefit: Cost ratio; FP: Farmers' practice; IT: Improved technology; FLD: Frontline demonstration

Table 2: Impact of FLDs on non-monetary, low-cost and cost-effective production technologies of rapeseed-mustard under real farm situations

Sl.No.	Component	No. of FLDs	Seed yield (kg ha^{-1})		% increase in yield	Cost of cultivation (` ha^{-1})		Gross return (` ha^{-1})		Additional net return (` ha^{-1})	BCR (` ha^{-1})	
			IT	FP		IT	FP	IT	FP		IT	FP
1.	**Non monetary production technology**											
a)	Adoption of improved variety	40	1274	1038	22.7	8055	7896	31417	27367	4050	3.90	3.46
b)	Adoption of right time and method of sowing	8	1804	1303	38.5	8295	7947	43008	25360	11478	5.18	3.19
2.	**Low- cost production technology**											
a)	Adoption of seed treatment practice	5	1524	1154	32.1	7230	5809	28817	21542	7275	3.98	3.71
b)	Application of sulphur and boron	4	893	708	26.1	8494	7601	19635	15730	3905	2.31	2.07
3.	**Cost -effective production technology**											
a)	Balanced fertilizer and irrigation	17	1174	955	23.4	7731	6972	26208	20271	5937	3.39	2.91
b)	Insect management	17	1362	981	38.8	9165	8311	37039	27341	9698	4.04	3.29
c)	Disease management	14	1490	1256	18.6	8589	8177	37941	30584	7357	4.41	3.74

BCR: Benefit: Cost ratio; FP: Farmers' practice; IT: Improved technology; FLD: Frontline demonstration

boost up the oilseed production of the state as well as of the country.

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