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PERFORMANCE OF CLUSTER FRONTLINE DEMONSTRATION ON PRODUCTIVITY AND PROFITABILITY OF LINSEED (*LINUM USITATISSIMUM*) IN REWA DISTRICT OF MADHYA PRADESH, INDIA

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ABSTRACT

The study was carried out during *rabi* seasons of three selected blocks of Rewa district of Madhya Pradesh during 2016-17, 2017-18 and 2018-19 (three consecutive years). All 225 demonstrations on linseed crop were carried out in area of 90 ha by the active participation of farmers with the objective to demonstrate the improved technologies of linseed production potential. The improved technologies consisting use of new variety JLS-27, seed treatment with *Azotobacter* and *PSB* culture, balanced fertilizer application and integrated pest management. CFLD recorded higher yield as compare to farmer's practice. The improved technologies recorded mean yield of 14.88 q/ha, which was 47 percent higher than that obtained with farmers practice of 10.13 q/ha. Improved technologies gave higher mean net return of Rs. 37449/ha with a benefit cost ratio 3.06 as compared to farmers practice (Rs. 21615/ha, benefit cost ratio 2.33).

Keywords : Cluster Front Line Demonstration, Linseed, JLS-27, Yield, BC ratio.

INTRODUCTION

Linseed is basically an industrial oilseed crop and its each and every part is important with commercial and medicinal use. It is tolerance to biotic and abiotic stresses that is characteristic of this crop. Because of this property the cultivation of linseed is prevailing in wide range of tropical, sub-tropical and temperate regions. Linseed is an important crop grown both for its seed as well as fibre which is used for manufacture of linen. The seed contains oil varying from 33 % to 47 % in different accessions of linseed crop. The flax seed contains high level of dietary fibres and high amount of micronutrients. It also contains omega-3-fatty acids (linoleic acid) that make it edible and it is also useful for heart patients. The seed oil content in improved cultivars varies between 40% and 44%. On a very small scale, the seed is directly used for edible purposes and about 20% of the total oil is used and remaining 80% of the oil goes to industries for the manufacture of paints, varnishes and printing ink, oil cloths, soap and water proof fabrics. The oil cake is most valuable feeding cake for animals, it contains 36% protein and 85 % of it is digestible fibre. The oil cake is also used as manure; it contains 5 % nitrogen (N), 1.4 % phosphorus (P₂O₅) and 1.8 % potassium (K₂O).

The productivity of linseed in India is lower than the world linseed average productivity (852 kg/ha) and is only 395 kg/ha. Among the *rabi* oilseed crops in India, linseed happens to occupy the second position i.e., next to rapeseed-mustard in areas as well as production. At present, linseed is

cultivated on about 4.36 lakh ha with the contribution of 1.67 lakh tonnes to the annual oilseed production of the country.

The productivity of linseed in the Rewa district is very poor (295 kg/ha) than the national productivity, it can be increase by following the appropriate agronomic practices along with high yielding linseed varieties, integrated nutrient management, integrated pest management, proper water management etc. Farmers are using old seeds of JLS-9 or local varieties with higher seed rate i.e. 30-35 kg/ha, growing in marginal lands in *rainfed* conditions, poor insect management and insufficient supply of nutrients, especially farmers are not applying Sulphur, although most of the linseed area of the district is Sulphur deficient.

Keeping this in view, the present investigation was undertaken to study the awareness level of farmer's regarding linseed cultivation, extent of adoption of improved practices, to find out the yield gap in linseed production technology (Devi *et al.*, 2017). Krishi Vigyan Kendra are grass root level organization meant for application of technology through assessment, refinements and dissemination of proven technologies under different micro farming situation in the district (Das, 2007). Frontline Demonstration has been proved a successful tool in enhancing the production and productivity of linseed crop through changing the knowledge, attitude and skill of farmers (Chauhan *et al.*, 2013; Singh *et al.*, 2014, Singh *et al.* 2018). Cluster frontline demonstrations were conducted on linseed during 2016-17, 2017-18 and 2018-19 with disseminate the technology in the district and

to establish production potentials on the farmer's field, assessment of adoption and yield gap and record feedback information from farmer's for further improvement in the research and extension programme.

MATERIALS AND METHODS

The present study was carried out in the Rewa district is located on the North-East part of Madhya Pradesh state and lies at 24°76' N' latitude and 81°60'E longitude with an altitude of 304 m above the mean sea level. Cluster frontline demonstrations were conducted during 2016-17, 2017-18 and 2018-19 (three consecutive years) with evaluation the performance of JLS-27, variety of linseed in Rewa, Sirmaur and Raipur Karchuliyan blocks of the district. In this study, 75 farmer's were selected from aforesaid blocks during three consecutive years under cluster frontline demonstration of linseed. Total 225 front line demonstrations under real farming situations were conducted during *rabi* seasons of 2016-17, 2017-18 and 2018-19 at three blocks namely; Rewa, Sirmaur and Raipur Karchuliyan, respectively under krishi vigyan Kendra operational area. The area under each demonstration was 0.4 ha. The soil was sandy clay-loam in texture with moderate water holding capacity, low to medium in organic carbon (0.036-0.065%), low in available nitrogen (120-210 kg/ha), medium in available phosphorus (11-16 kg/ha), low to medium in available potassium (208-301 kg/ha) and soil pH was slightly acidic to neutral in reaction (6.5-7.1). The area under each demonstration was 0.4 ha. The treatment comprised of recommended practice (Improved variety JLS-27, integrated nutrient management-@ 60:40:20:25 kg NPKS/ha + *Azotobacter* + PSB @ 5 g/kg seed, integrated pest management-deep ploughing + seed treatment with *Trichoderma viridae* @ 5 g/kg seed + Profenophos @ 750 ml/ha etc. vs farmers practice. Deep ploughing was done during the April month. Crop was sown between 25 October to 10 November with a spacing of 30 cm x10 cm and seed rate was 20 kg/ha. An entire dose of P through diammonium phosphate, K through muriate of potash and Sulphur through bentonite sulphur was applied as basal during sowing. The seeds were treated with *Trichoderma viridae* @5 g/kg seeds then seeds were inoculated by *Azotobacter* and phospho-solubilizing bacteria biofertilizers each 5g/kg of seeds. Hand weeding was done once at 30 days after sowing. One sprays of Profenophos @ 750 ml/ha + ready mix combination of Carbendazim+ Mancozeb @ 2.5g/lit water was applied at 30 DAS. Fields were irrigated prior to sowing and at pre-flowering (35 DAS)& seed setting stage (70 DAS) and the crop was harvested between 15th March to 25th of March during three years of demonstration.

Farmer's practice constituted no deep ploughing was done during summer, local seed was used, crop was sown between 10 to 20 October, broadcasting method of sowing, higher seed rate (35 kg/ha) sown, imbalance dose of fertilizers applied (12:28:0 kg NPK/ha), no seed treatment, no biofertilizers, no hand weeding, no irrigation and no plant protection measures were adopted. Crop was harvested on the same time of harvesting of demonstration plots.

Harvesting and threshing operations done manually; 5m x 3m plot harvested in 3 locations in each demonstration and average grain weight taken at 12% moisture. Similar procedure adopted on FP plots under each demonstration then grain weight converted into quintal per hectare (q/ha).

Before conduct the demonstration training to farmers of respective villages was imparted with respect to envisaged technological interventions. All other steps like site selection, farmers selection, layout of demonstration, farmers participation etc. were followed as suggested by Choudhary (1999). Visits of farmers and extension functionaries were organized at demonstration plots to disseminate the technology at large scale. The data output were collected from both CFLD plots as well as farmer's practice plot and finally the extension gap, technology gap, technology index along with the benefit cost ratio were worked out (Samui *et al.*, 2000) as given below:

Technology gap= Potential yield-demonstration yield

Extension gap= demonstration yield-farmer's practice yield

Technology Index = $\frac{\text{Potential yield} - \text{demonstration yield}}{\text{Potential yield}} \times 100$

RESULTS AND DISCUSSION

Yield attributing parameters

The yields attributing parameters like number of capsule/plant and harvest index (%) of linseed obtained over the years under recommended practice as well as farmers practice are presented in Table1. The Number of capsules/plant of lentil ranged from 78 to 93 with mean of 86 under recommended practice on farmers field as against a ranged from 33 to 63 with a mean of 50 recorded under farmers practice. The higher values of number of capsules/plant following recommended practice as well as farmers practice was due to the use of latest high yielding varieties, integrated nutrient management and integrated pest management etc.

Seed yield

The yield performance and economic indicators are presented in Table1. The data revealed that under demonstration plot, the performance of linseed yield was found to be higher than that under FP during three consecutive years of demonstrations (2016-17 to 2018-19). The yield of linseed under demonstration recorded was 13.27, 15.71 & 15.65 q/ha during 2016-17, 2017-18 & 2018-19, respectively. The yield enhancement due to technological intervention was to the tune of 43 % to 49% over FP. The cumulative effect of the technological intervention over three years, revealed on average yield of 14.88 q/ha, 47% higher over FP. The year to year fluctuations in yield and cost of cultivation can be explained on the basis of variations in prevailing social, economic and prevailing microclimatic condition of that particular village especially adverse climatic conditions.

Economics

Economic performance of linseed under front line demonstration were depicted in table 2. The inputs and outputs prices of commodities prevailed during three years of demonstrations were taken for calculating cost of cultivation, net returns and benefit cost ratio. The investment on production by adopting recommended practices ranged from Rs.16575 to 18923/ha with a mean value of Rs.18117/ha against farmers practice where the variation in cost of production was not noticed, it was Rs.16223/ ha during the demonstrations. Cultivation of linseed under recommended practices gave higher net return of Rs.32524-40545

compared to Rs.19345-23220/ha under farmers practice during 2016-17 to 2018-19, respectively. The average benefit cost ratio of recommended practices was 3.06, varying from 2.96 to 3.14 and that of farmers practice was 2.33, varying from 2.30 to 2.34. This may be due to higher yields obtained under recommended practices compared to farmers practice. Similar results have been reported earlier by Tomar *et al.* (1999) and Tomar (2010).

Extension and Technology gap

The extension gap ranging between 4.02 to 5.21 q/ha during the period of study emphasized the need to educate the farmers through various means for the adoption of improved agricultural production to reverse the trend of wide extension gap (Table-1). The trend of technology gap ranging between 2.29 to 4.73 q/ha reflected the farmer's cooperation in carrying out such demonstration with encouraging results in all the years. The technology gap observed may be attributed to the dissimilarity in weather conditions. The technology index showed the feasibility of the evolved technology at the farmer's field. The lower the value of technology index, the more is the feasibility of the technology. As such, the reduction in technology index from 12.72% during 2017-18 to 26.2% during 2016-17 exhibited the feasibility of the demonstrated technology in this region. Moreover, during the study period Human Resources Development Components i.e. training, radio talk, field day, popular articles, training handout, Kisan Mela and Kisan

Sangosthi were also taken to increase the farmers understanding and skill about the recommended practice on linseed production.

CONCLUSION

Cluster frontline demonstration was effective changing of farmers towards the adoption of integrated crop management in linseed production. Most of the farmers became aware about recommended production practices of linseed after conducting the front line demonstration on farmers field. Yield of linseed, net return and B:C ratio were found to increase in demonstrated plot as compared to farmers practice. The productivity gain under CFLD over existing practices of linseed cultivation created greater awareness and motivated the other farmers to adopt suitable production technology of linseed in the district. The demonstrated improved practices were superior compared to farmers' practice. The farmers expressed positive attitude towards the demonstrations through their perception on the technology. However the technology need to be popularized to decrease the extension gaps, technology gap, technology index, adoptions gaps and there by yield gap so as to increase the income of farmers. The economic details of the demonstrations give us a green signal to further popularize them among the farming community for large scale adoption.

Table 1: Growth and yield parameters, Technology gap, Extension gap and Technology index of linseed as affected by recommended practices as well as farmer's practices:

Year	Area (ha)	No. of farmers	No. of capsules /plant		Grain yield (q/ha)			% increase over FP	Straw yield (q/ha)		Harvest index (%)		Technology gap (q/ha)	Extension gap (q/ha)	Technology index (q/ha)
			RP	FP	Potential	RP	FP		RP	FP	RP	FP			
2016-17	30	75	78	33	18	13.27	9.25	43	36	26	26.90	25.50	4.73	4.02	26.20
2017-18	30	75	93	54	18	15.71	10.50	49	41	30	27.70	25.90	2.29	5.21	12.72
2018-19	30	75	88	63	18	15.65	10.65	47	42	30	27.14	26.19	2.35	5.00	13.00
Total/ Mean	90.0	225	86	50	18	14.88	10.13	47	39.6	28.6	27.24	25.86	3.12	4.74	17.30

Table 2: Economics of Cluster Front Line Demonstration of linseed as affected by recommended practices as well as farmer's practices:

Year	No of demonstration	Yield (q/ha)		% increase over FP	Gross expenditure (Rs/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		B:C ratio	
		RP	FP		RP	FP	RP	FP	RP	FP	RP	FP
2016-17	75	13.27	9.25	43	16575	14880	49099	34225	32524	19345	2.96	2.30
2017-18	75	15.71	10.50	49	18850	16570	58127	38850	39277	22280	3.08	2.34
2018-19	75	15.65	10.65	47	18925	17250	59470	40470	40545	23220	3.14	2.34
Total/ Mean		14.88	10.13	47	18117	16223	55565	37848	37449	21615	3.06	2.33

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