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RESEARCH ARTICLE

Assessment of Yield and Monitory Gaps Through Front Line Demonstrations Program on Brown Sarson (*Brassica rapa* L.) in the Hilly Areas of Jammu & Kashmir

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Abstract

Demand for edible oil in India has increased substantially and the country imports vegetable oil to meet the deficit. With an effective technology dissemination system, there is ample scope to bridge the production and demand gap. With the objective of demonstrating of potential of oilseed production in the hills of Jammu & Kashmir, frontline demonstrations on improved technologies related to brown sarson were conducted at 15 locations in the years 2020-21 and 2021-22. The results revealed a significant improvement in yield with improved practice (IP) over farmer's practice (FP). IP recorded an average yield of 14.5 q ha^{-1} compared to 10.5 q ha^{-1} obtained under FP. The yield superiority of IP was 38% over FP. Extension gap, technology gap, and technology index were 4, 2.4, and 14.4 q ha^{-1}, respectively. Net returns were ₹53235 ha^{-1} in improved practice and ₹30299 ha^{-1} in farmer's practice. Input costs and net returns were ₹1046 ha^{-1} and ₹22936 ha^{-1} higher in IP over FP. B:C ratio was 1.6 and 0.9 for IP and FP, respectively. The follow-up survey indicated that late sowing of the crop (36%)followed by lack of awareness (20%) are major reasons for the yield gap between potential and yield released at the farmer's field.

Key Words: *Brown sarsoon, yield, Demonstrations, economics, hilly areas.*

Introduction

Oilseed crops find a significant place in Indian agriculture as they make the second largest agricultural commodity after cereals in the country. Nine oilseed crops are cultivated in the country under the diverse agro-ecosystems, among which oilseed brassica stands second after soybean in terms of area (24%) and production (25%). The major oilseed brassica species cultivated in India are; *Brassica juncea*, *B. rapa* syn. *B. compestris*, *B. napus*, *B.carinata, B. oleracea* and *B. nigra*. The first four species are used for edible oil and the last two for seed condiments. India stands third after Canada and China in terms of area and production and fifth after Germany, France, Canada and China in terms of yield per hectare (Jat *et al.* 2019). The productivity of oil seeds, however, is very low compared to the potential and lack of appropriate technologies at the farmer's field, cultivation under low input conditions, and biotic and abiotic stresses are some of the major reasons for low production per unit area. The majority of farmer's are also unaware of the latest varieties of oil seeds and related technologies, which often culminate in low productivity. Among the oil seeds Brown sarsoon(*Brassica rapa* L.) is a major Rabi season crop grown after harvesting rice in Kashmir and it is cultivated over an area of 86000 ha in the valley (Anonymous 2021). There is great emphasis of the government of India on promotion of oilseed sector in the country and under the Holistic Agriculture Development Programme, Govt. of Jammu and Kashmir has also given great thrust on increasing oilseed production and its value chain under the project "Promotion of oil-seeds" (Anonymous 2022). Demonstration of relevant technologies has proved instrumental in bridging the yield

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and income gaps and has been considered an effective tool for farmer's motivation and adoption of technologies in hills (Mubarak *et al.*2013, Sheikh *et al.* 2013) . In view of these, multi-locations demonstrations were conducted in the south Kashmir on latest brown sarson technology verses farmer's' practice.

Materials and Methods

Front-line demonstrations (70 number) on brown sarsoon were conducted by the KVK Kulgam in collaboration with MRCFC over an area of 29.2 ha at 15 locations in the south of Kashmir valley during *rabi* seasons of 2020-21 and 2021-22. The study area falls between 33.62 to 33.70^{0}N latitude and 74.8 to 75.04^{0}E longitude in the south of Kashmir valley located in the lap of Peer Panchal Himalayan Range. The site of study is characterized by temperate climatic conditions with mild summers and harsh winters. The soil texture of demonstration plots ranged from clay loam to silt loam. Based on the understanding of critical factors of yield gap a technology capsule was prepared for the demonstration at the farmer's field involving different components. All cultural practices were similar in both practices except those presented in Table 1. Before the conduct of demonstrations and at different stages of the crop in a field, necessary training and awareness were also imparted to the farmer's. Two practices were compared at each location over and area of 1 acre per demonstration *viz.* Farmer's' own practice (FP) and technology capsule (Table 1) as improved practice (IP). Weather data was collected from the Automatic Weather Station established in KVK premises. The crop was monitored during each season at different stages and yield was recorded for data analysis. The data recorded on crop yield were subjected to statistical analysis through the student's t-test using the Excel data analysis tool and means were compared at $p \leq 0.05$. Parameters other than yield and economics were also calculated using the formulae given below. A follow-up survey was also carried out in 2022 to know the farmer's' perception of the major reasons for the yield gaps. The information was gathered through a pre-designed questionnaire for the purpose.

i. Extension gap = demo yield – farmer's' practice yield
ii. Technology gap= Potential yield – demo yield
iii. Technology Index = $\frac{\text{Potential yield} - \text{Demo yield}}{\text{Potential yield}} \times 100$
iv. Additional gains = Additional returns (₹ ha^{-1}) – additional costs (₹ ha^{-1})

Results and Discussion

Impact on crop yield

The results of demonstrations revealed that yields were comparatively less in second year of study under both practices. This may be due to variability in the amount and distribution of precipitation and temperature observed during the two consecutive years of experimentation. Over congenial weather for the rapeseed crop was observed during the year 2021-22 (Figure 1). From the data it is apparent that a sufficient amount of precipitation was received in the month of October 2020-21, which resulted in better moisture content in the soil, which in turn facilitated better and quick germination of the seed and better crop stand. On the contrary, a very minimal amount of rainfall was received in October during 2021-22. Furthermore, when the crop was at the flowering stage in April 2021-22, a significant amount of rainfall coupled with low temperatures might have hindered the pollination process. Data given in Table 2 shows that yield ranged from 10.3 ha^{-1} to 10.7 q ha^{-1} in farmer's practice and 14.2q ha^{-1} to 14.9 q ha^{-1} under improved practice. The yield was significantly higher in improved practice in comparison to the farmer's practice during both years of study. On average yield was 14.5 q ha^{-1}in IP and 10.5 q ha^{-1}in FP. Improved practice registered an additional yield of 4 q ha^{-1} over farmer's practice with a yield superiority of 38%. This may be attributed to the inclusion of a new variety of brown sarsoon possessing superior growth parameters and yield potential under the existing environment (Asif *et al.,* 2017; Kumar and Alagesan 2017; Chaudhary *et al,*2018). Similar results of yield advantage in rapeseed mustard from improved practice were also reported by Simanta *et al* (2019) and Rajeev *et al (*2020) from other parts of India.

Table 1: Details of improved practice (IP) and farmer's practice (FP)

S.No	*Technology component*	*Farmer's' practice (FP)*	*Improved practice(IP)*
1	Variety	Gulchin/Mixtures	Shalimar Sarsoon -2
2	Sowing time	15-25 October	5-15 October
3	Seed rate	@ 13-15 kg ha^{-1}	@ 10 kg ha^{-1}
4	Plant Spacing	Broadcosting	23 cm between rows
5	Fertilizer application(Kg ha^{-1})	Varied from Farmer to farmer with the range N: 45-80; P2O5 : 17-40; K2O : 0-15	N: 60; P2O5 : 30; K2O : 20
6	Seed bed	Flat beds with no drainage channels.	Opening of small drainage channels at 15 meter interval in the field to facilitate drainage of excess water during

Table 2: Area, number of demonstrations and crop yield of brown *sarson* in the front-line demonstrations at farmer's' field

Year	*Name of Varieties*	*No. of demons.*	*Area under demonstration (ha)*	*Average yield in Farmer's practice (q ha^{-1})*	*Average yield in Improved Practice (q ha^{-1})*	*P(0.05)*	*Additional yield over FP*	*% Increase in yield*
2020-21	Gulchin (FP)* Shalimar sarson-2(IP)**	31	12.4	10.7	14.9	1.19E^{-18}	4.2	39.2
2021-22	Gulchin(FP) Shalimar sarson-2(IP)	47	16.8	10.3	14.2	1.06E^{-21}	3.9	37.8
Total (Demos & Area) / Mean yield & % increase in yield		78	29.2	10.5	14.5	-	4.0	38.0

*FP: Farmer's' Practice **IP: Improved Practice

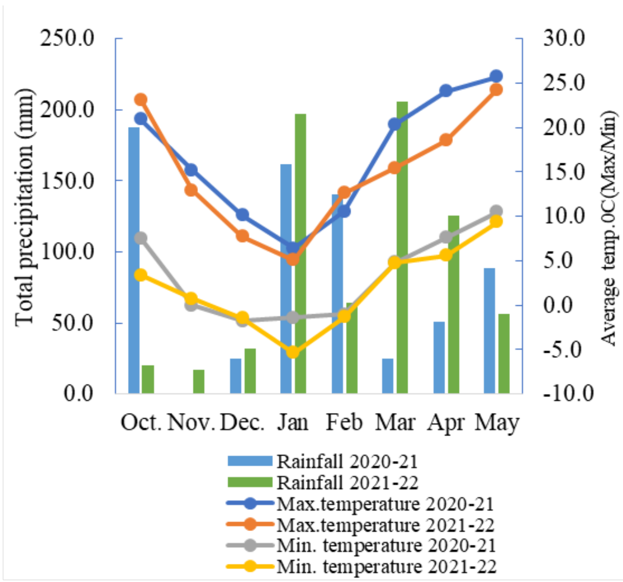

Figure 1: Weather data during the crop season

Gap analysis

Analysis of the extension gap and technology gap under the FLD program on Shalimar sarson-2 indicates that there is a disparity between what is produced at farmer's fields and what can be achieved under similar conditions. The present study revealed that oilseed production can be increased in the valley by popularizing the latest technologies through a technology dissemination mechanism set in the form of Agriculture Extension Agencies like Krishi Vigyan Kendra and the Department of Agriculture and Farmer's Welfare. Data analysis on yield indicates an extension gap ranging between 3.9 to 4.2 q ha^{-1}. The extension gap was lower (3.9 q ha^{-1}) during 2021-22 compared to 2020-21 (4.2 q ha^{-1}). This may be attributed to the correlation of the cultivars to weather parameters. On average the extension gap was 4 q ha^{-1}. Similar results were reported by Saravanakumar (2018) and Mubarak and Shakoor (2019). The technology gap also varied from 2.1 in 2020-21 to 2.8 q ha^{-1} in 2021-22. On average, a technology gap of 2.4 q ha^{-1} and a technology index of 14.4 q ha^{-1} were recorded (Table 3).

This indicates the influence of field-level implications on the technologies developed in the research system and an untapped potential that can be realized through more rigorous technology dissemination efforts including continuous follow-up, input facilitation and capacity building of farmers.

Economic impact

Economics was calculated based on the prevailing operational costs including the cost of seed, fertilizers, pesticides, machinery hiring charges and labor (including the imputed value of family labor) and the value of produce (seed) in the market for both improved and farmer's practice (Table 4). The cost of cultivation and returns per hectare were higher in 2020-21 due to comparatively higher expenditure on labor component during the year. On average, the input costs were ₹32701 in the farmer's practice and ₹33765 ha^{-1} in the improved practice indicating an additional cost of cultivation of ₹1046 ha^{-1} over the farmer's practice. The additional returns and effective gains from improved practice were ₹22936 and ₹21872 ha^{-1}, respectively. Gross and net returns were also higher in improved practice during both the years of demonstration. Maximum net returns of ₹55100 ha^{-1} were achieved from improved practice during 2020-21. Net returns pooled over the years were ₹53235 ha^{-1}

Table 3: Gap analysis and technology Index in frontline demonstration on Brown sarson at farmer's' field.

Year	*Name of varieties*	*Farming situation*	*Extension gap*	*Technology gap*	*Technology index*
2020-21	Gulchin (FP) Shalimar sarson-2(IP)	Rainfed	4.2	2.1	12.3
2021-22	Gulchin(FP) Shalimar sarson-2(IP)	Rainfed	3.9	2.8	16.4
Mean		-	4.0	2.45	14.4

Table 4: Economics of Brown sarson in the frontline demonstrations at farmer's' field

Year	Name of Varieties	Cost of cultivation (₹ ha^{-1})		Gross returns (₹ha^{-1})		Net returns (₹ ha^{-1})		B:C ratio		Additional returns from IP (₹ha^{-1})	Effective gain from IP(₹)
		FP	IP	FP	IP	FP	IP	FP	IP		
2020-21	Gulchin (FP)* Shalimar sarson-2(IP)**	33290	34300	64200	89400	30910	55100	0.9	1.6	24190	23180
2021-22	Gulchin(FP) Shalimar sarson-2(IP)	32112	33230	61800	85200	29688	51970	0.9	1.6	22282	21164
Average		32701	33765	63000	87000	30299	53235	0.9	1.6	22936	21872

*FP: Farmer's' Practice **IP: Improved Practice

in improved practice and ₹30299 ha^{-1} in farmer's practice. B:C ratio also indicated a similar trend.

The average B:C ratio was 1.6 and 0.9 for improved and farmer's practices, respectively. The higher economic benefits with improved practice could be due to improved technology in terms of crop variety and related package of practices. Like other ecologies, varietal interventions play an important role in boosting production under temperate conditions(Mubarak and Zargar, 2009). Patel *et al* (2013) and Simanta *et al* (2019) also reported similar results while assessing the frontline demonstration programs in other parts of India.

Farmer's feedback in the follow-up survey

During the follow-up survey of the target farmers, information was collected to get an idea about farmers' perception of major reasons for lower yields under the farmer's practice compared to the improved practice. The ranking of different reasons for the disparity between production and potential was calculated from the farmer's feedback received through the questionnaire designed for the purpose. The ranking of reasons and the corresponding score on a 1 to 10 scale is given in Table 5. The analysis of the data presented in Fig. 2 reveals that the majority of the farmers (36%) consider late sowing as a major reason for low production at their farms. A good percentage of farmer's (20%) believed that lack of awareness is the major reason, while 12% said that it may be due to poor quality seed. For the rest of the reasons mentioned in the questionnaire, the percentage of farmer's considering these to be the major reasons was small, ranging between 8 to 2%. The data presented in Table 5 also shows that the highest rank and corresponding score were again recorded for late sowing and lack of awareness. Each of these reasons registered a rank of 3 and a score of 7 which was the highest in the study. The interaction with the farmer's and the data analysis clearly indicate that farmers need interventions, especially with regard to resolving the issue of late sowing and lack of awareness. The issue of late sowing is considered a major reason for the under-exploitation of yield potential (Mubarak and Singh 2011, Gogie and Ray 2019) and it can be addressed through the intervention of mechanization. According to Ravinder *et al.,* (2019), farm mechanization has a huge role in agriculture and earlier some researchers highlighted the importance of mechanization in improving the yields of *rabi* crops in Kashmir valley conditions (Zargar and Mubarak, 2011).

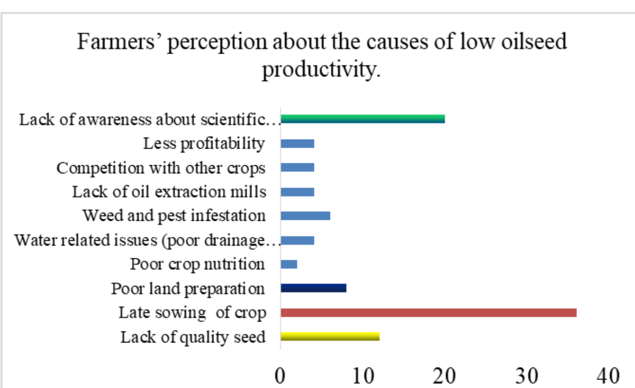

Figure 1: Farmers perception about the causes of low oilseed productivity

While interacting with the farmers small land holding was preventing them from purchasing machinery like tractors and tractor-driven implements. This issue can

Table 5: Reason for low production of Brown sarson in district Kulgam.

S.No	Reason	Rank	Score on 1-10 scale
1	*Lack of quality seed*	6	4
2	*Late sowing of crop*	3	7
3	Poor land preparation	5	5
4	Poor crop nutrition	6	4
5	Water-related issues (poor drainage during snow and rains or water shortage during flowering to maturity)	6	4
6	Weed and pest infestation	4	6
7	Lack of oil extraction mills	8	2
8	Competition with other crops	7	3
9	Less profitability	6	4
10	Lack of awareness about the scientific cultivation of a crop	3	7

be resolved through relevant machinery that suits the land holding and also through custom hiring centers. The follow-up survey gave the impression that farmers need to work in groups which unfortunately is missing at present. Recent initiatives of the government of India and the Union territory government for the promotion of Farmer Producer Organizations (FPOs) provide a good opportunity for the farmers to do farming in groups, which will help in the promotion of mechanization, access to farm inputs, value addition of agriculture produce and creation of better marketing facilities. This will be quite helpful in making oilseed farming profitable *viz-a-viz* bridging the production gaps.

The next important reason as per the survey was a lack of awareness among the farmers about improved practices of oilseed farming. In this regard, it can be suggested that the agencies involved in the dissemination of technologies must increase their outreach and convince farmers to adopt improved practices of farming. The most effective tool for technology dissemination may be the on-farmer demonstration of best-proven technologies. Many other programs like on-farm farmer scientist interactions, Kisan ghosties, farmer field visits, diagnostic visits, and crop field days need to be intensified to realize higher production of oilseed. State Agricultural University conducts demonstrations every year through its network of Krishi Vigyan Kendras (KVKs) but KVK being a frontline extension functionary conducted these programs on a small scale to showcase the potential of the technologies. Such demonstrations on a larger scale will need more manpower and funding. Enough manpower is available with mainstream extension machinery of the Department of Agriculture and Farmer's Welfare at the district level. So involving the department in demonstrations and facilitating farmers through quality seed and other inputs under different government schemes may help in bridging the gap. As per the survey, there are other reasons, which substantially impact the oilseed production and lack of quality seed is one of these. The seed chain for oilseed needs proper supervision as the seed goes through multiple stages from the development of variety to foundation seed before reaching the farmer's. The other reasons for low oilseed production may also be the lower profitability due to the lack of oilseed extraction plants, lack of packing and branding facilities, and lack of market linkages. Weed and insect pest infestation, poor drainage, and poor crop nutrition also add to the issue. Because of these findings, it can be concluded that from a farmer's point of view, interventions in terms of promoting mechanization, creating awareness and supplying good quality seed will be crucial in exploring the untapped potential in agriculture, especially with regard to oilseed production.

References

Anonymous 2021. Agriculture status. Agriculture Production and Farmer's' Welfare Department J&K, UT. *http://www.jkapd.nic.in/statistics.html*

Anonymous 2022. Holistic Developemtn of Agriculture Sector in Jammu & Kashmir Union Territory, Implementation Framework 2023-2028.

Asif M. Iqbal, Parray G.A., Sheikh F.A., Ashaq Hussain, Najeeb S., Bhat Z. A., Shikari A.B., Ganai M.A., Aziz Mujtaba, Mubarak T., Misger F. A. and Zargar M.A. (2017). Frontline Demonstration Programme: An effective transfer tool for adoption of B. rapa production technology under temperate agro climatic conditions of Kashmir Valley.*Cruciferae Newsletter* **36**: 23-25

Chaudhary R. P., Choudhary G. K., Prasad R., Singh R. and Chaturvedi K. (2018). Impact assessment of front line demonstration on mustard crop. *International Journal of Current Microbiology and Applied Sciences***7** (Special issue): 4737-4742.

Gogie M. and Ray L.I.P. 2019.Performance of Winter Potato with varied dates of planting under Mid Hills of Meghalaya.*Indian journal of Hill Farming* Special issue 2019: 19-26

Jat R.S.,Singh V.V., Sharma P.J. and Rai P.K.(2019).Oilseed brassica in India: Demand, supply, policy perspective and future potential. *Oil-seeds and fats,crops and lipids* **26**(8): 1-8

Kumar S.S.and Alagesan P. (2017). Performance of Samba Wheat Variety by Adopting Production Technology in Western Zone of Tamil Nadu. *Indian Journal of Hill Farming* **30** (2): 251-55.

Mubarak T. and Zargar M.A. 2009.Varietal intervention of high yielding low altitude rice into mid altitudes: A case study for location specific technology development. *The Indian Journal of Crop Science* **4**(1-2):153-154

Mubarak T. and SinghK.N.(2011). Productivity, profitability and fertilizer management in different wheat (*Triticum aestivum*)–based cropping systems in silty clay loam soils of Srinagar**.** ***I****ndian Journal of Agricultural Sciences.* **80** (3): 274-276.

Mubarak T. and Shakoor A.(2019). Impact Assessment of Technological Interventions for Reducing Yield Gaps in Rice (*Oryza sativa* L.) Under Temperate Hill Ecology. *Journal of Krishi Vigyan*7 (2): 140-143.

Mubarak T., Bhat Z.A., Zargar M. A. and Akhlaq A. Wani 2013.Impact of improved technology on yield and economics of rice (*Oryza sativa* L.) at farmer's' field in temperate Zone. *Crop Research* **45** (1, 2 & 3): 29-32

Patel M.M., Jhajharia A.K., Khaddaand B.S. and PatilL.M. (2013). Frontline demonstration: An effective communication approach for dissemination of sustainable cotton production technology, *Indian Journal of Extension Education and Rural Development* 21: 60-62.

Saravanakumar S. (2018). Impact of cluster frontline demonstration on black gram in western zone of Tamilnadu. *Journal of Krishi Vigyan***7**(1), 136-139.

Sheikh F.A., Mir S.A.**,** Mubarak T.**,** Itoo H. U., Bhat Z. A., Bhat J. A., Mir I. A., Angchuk P., Shafi S. and Arafat Y.(2013). Impact assessment of front line demonstrations on Brown Sarson: Experience from temperate north-western Himalayan region of India. *African Journal of Agricultural Research* 8(23) **:** 2956-2964.