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Technological Interventions for Productivity Improvement of Sesame in Kymore Plateau and Satpura Hills Zone of Madhya Pradesh

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ABSTRACT: Sesame (*Sesamum indicum* L.) is one of the ancient crops in the world, usually cultivated as *kharif oilseed crops* in India. The constraints for its low productivity are inadequate supply of nutrients and poor production practices. Technology demonstrations were conducted at 69 locations covering 29 ha area in a participatory mode using improved cultivar JTS 8 and TKG 22 (for six consecutive crop seasons) during 2007-08 to 2012-13. Line sowing was done after seed inoculation with azotobacter and PSB. Soil test based nutrients, i.e. NPK and sulphur were applied @ 60:40:20:40 kg/ha. To avert the crop from weed infestation, pre-emergence herbicide was applied through flat fan nozzle knapsack sprayer immediately after sowing. Results showed that an average seed yield of 538.67 and 577 kg/ha was recorded with improved cultivar JTS 8 & TKG 22, respectively, with full package under the technology demonstrations which was 90.5 and 72.64% higher over farmers' practice (303 and 334.33 kg/ha). An additional seed yield of 235.67 and 242.67 kg/ha obtained with technology package using JTS 8 and TKG 22 cultivars, respectively, which was correspondent in 77.8 and 72.6% of the farmers' practice yield. The economic analysis of the frontline demonstrations indicated that an additional average net return of ₹ 6518 and 6789/ha was obtained using JTS 8 and TKG 22 cultivars, respectively, with an incremental benefit cost ratio of 0.75 and 0.73 over the farmers' practice. The cultivar wise technology gap was estimated to be 161.33 and 373 kg/ha in JTS 8 and TKG 22, respectively, however, as a whole in six consecutive crop seasons an average technology gap of 267.17 kg/ha was observed which was close to the cultivars' potential with 31.16% technology index in the frontline demonstrations. The average extension gap in the seed yield of JTS 8 during 2007-08 to 2009-10 was observed 235.67 kg/ha, however, in case of TKG 22 it was 242.67 kg/ha during 2010-11 to 2012-13.

Key words: Productivity, improved cultivar, Frontline demonstrations, net return, technology gap, extension gap, technology index

Introduction

Sesame (*Sesamum indicum* L.) is one of the oldest oilseed crops in the world, cultivated during Indus Valley civilization known to mankind belonging to family Pedaliaceae. Sesame is an important source of edible oil and is widely used ingredient in food products, especially in bakery foods and animal feed because of its high methane content. Sesame seed contains 50-60% oil and 25% protein with antioxidants such as sesamolin, sesamin and has been used as active ingredients in antiseptics, bactericides, vermicides, disinfectants, other repellants, ant tubercular agents (Bedigian *et al*., 1985) and a considerable source of calcium, tryptophan, methionine and many minerals (Johnson *et al*., 1979). Sesame seed oil is still the main source of fat used in cooking in the near and far east. Sesame oil has many medicinal and pharmaceutical values and is being used in many health care products. It is good for respiratory disorders, eye-infections and digestive ailments. The oil having 85% unsaturated fatty acids has a reduced effect on cholesterol and prevent coronary heart diseases. Due to its numerous uses, it is known as the "green of oils". Sesame can be grown in a wide range of environments, extending from semi-arid tropics and subtropics to temperate regions. It grows best in the areas having an altitude of 500 to 800 meters above mean sea level (msl) and it can grow even up to 1250 msl on well drained soils of moderate fertility. It is an annual and occasionally perennial crop, needs a growing period of 70 to 150 days; usually 100 to 120 days (Nath *et al*., 2000). It is grown in more than 50 countries in the world. It is a small farmers' crop in the developing countries (Gulhan *et al.*, 2004). Its center of origin is thought to be in Africa, Ethiopia (Bedigian and Harlan, 1986). India is the largest producer of sesame in the world. It ranks first in production i.e. 0.76 million tonnes with the productivity of 422 kg/ha. Nearly 23% of the world production (3.34 million tonnes) and 24% (1.8 million hectares) of the sesame acreage in the world (7.54 million hectares) is from India alone (FAI, 2012). Among the sesame growing states, West Bengal alone accounts for 25% of the total production in India. The other major sesame-producing states are Gujrat, Madhya Pradesh, Tamil Nadu, Maharashtra, Karnataka, Rajasthan and Uttar Pradesh.

Potential yields are probably as extravagant as 2000 kg/ha (Mkamilo and Bedigian, 2007). On the whole, the average productivity of sesame continues to be lower (144-234 kg/ha) than anticipated from agricultural technology for the last two decades, largely due to its cultivation of marginal lands, under poor management without inputs except, seed. The foremost constraints accountable for lower yield are inapt production technologies *viz* sowing by broadcast method, no or very less use of fertilizers and untimely weed management (Khalque and Begum, 1991 & Singh and Khan 2003). The improved technology packages were also found to be financially attractive. Yet, adoption levels for several components of the improved technology were low, emphasizing the need for better dissemination (Kiresur *et al.*, 2001). Several biotic, abiotic, and socio-economic constraints inhibit exploitation of the yield potential and these needs to be addressed. Use of improved production technologies offers a great scope for increasing productivity and profitability of sesame. To appraise the impact of an improved cultivar with a balanced use of nutrients, weed management and other need based practices on productivity, profitability and to identify the yield gaps of sesame, technological demonstrations were conducted in a participatory mode within Kymore Plateau and Satpura hill zone of Central India for six consecutive crop seasons from 2007-08 to 2012-13.

Materials and Methods

Technological demonstrations were conducted in a participatory mode for six years during to 2007-08 to 2012-13 to evaluate the effect of technology package in sesame-wheat cropping system at 69 farmers' fields located in four villages spread over three blocks of Katni district (Table 1) falls under Kymore Plateau and Satpura Hills zone of Central India. The upland mixed red to shallow black soils of the demonstration sites was generally silty clay loam in texture. Soils are very low to low in available N, medium in available P and K, and low in available sulphur. Each demonstration was conducted in an area of 0.40 ha. Check plot closest to the demonstration site was considered as a farmers' practice. The improved production technology package included short duration, phillody (Mycoplasma) resistant varieties of sesame, JTS-8 in 2007 to 2009 and TKG 22 in 2010 to 2012 during the demonstrations. Seed treatment was done with the contact and systemic fungicides *viz.* thiram @ 2 g and carbendazim @ 1 g/kg seed and subsequently inoculated with azotobactor and phosphate solubilizing bacteria (PSB) @ 10 g/kg seed for increasing the availability of nitrogen to the crop and better phosphorus use efficiency. The crop was sown during 12 to 24 July in 2007, 02 to 13 July in 2008, 21 to 24 July in 2009, 28 July to 08 August in 2010, 03 to 12 July in 2011 and 19 to 27 July in 2012 using the seed rate of 5 kg/ha. The row to row 45 cm and 10 cm distance was maintained between the plants. The NPK and sulphur was applied @ 60:40:20:40 kg/ha on the basis of soil test values. Fertilizer sources included are urea (46% N), single super phosphate (16% P_2O_5 and 12% S) and potassium chloride (60% K_2O). Entire quantities of P, K and S and half of the total N were applied at the time of sowing. The remaining N was top-dressed in pre-flowering stage. Pre-emergence herbicide i.e. pendimethaline was sprayed through flat fan nozzle sprayer @ 1kg a.i./ha immediately after sowing for efficient weed management. The crop was harvested at physiological maturity stage during 01 to 19 October in 2007, 28 September to 05 October in 2008, 10 to 15 October in 2009, 11 to 23 October in 2010, 01 to 10 October in 2011 and 03 to 14 October in 2012. The year wise details of the technological interventions are given in Table 1.

Yield attributes, i.e. number of capsules/plant, number of seeds/capsule, number of branches/plant and seed yield were recorded in each crop during the study. Economic comparisons for each year included analysis of net returns, as well as the additional returns, incremental B:C ratio in each individual location and mean over the locations. Agronomic efficiency and feasibility was assessed on a individual crop and cropping system basis. Yield gaps and technology index was also analyzed to assess

Table 1 : Details of technological interventions under demonstrations and farmers' practices

Year	Area (ha)	No. of demonstrations	Location		Variety used		Nutrients applied (kg/ha)		Seasonal rainfall (mm)
			Village	Block	Improved practice	Farmers' Practice	Improved practice	Farmers' Practice	
2007-08	05	12	Padaria	Katni	JTS 8	Local *'Tili'*	$N_{60}P_{40}K_{20}S_{40}$	$N_{32}P_{34}K_0S_0$	586
2008-09	02	05	Padaria	Katni	JTS 8	Local *'Tili'*	$N_{60}P_{40}K_{20}S_{40}$	$N_{32}P_{34}K_0S_0$	702
2009-10	5.2	13	Padwar	Bahoriband	JTS 8	Local *'Tili'*	$N_{60}P_{40}K_{20}S_{40}$	$N_{32}P_{34}K_0S_0$	449
2010-11	5.2	13	Banda	Katni	TKG 22	Local *'Tili'*	$N_{60}P_{40}K_{20}S_{40}$	$N_{32}P_{34}K_0S_0$	911
2011-12	5.2	13	Imaliya	Dhimarkhera	TKG 22	Local *'Tili'*	$N_{60}P_{40}K_{20}S_{40}$	$N_{32}P_{34}K_0S_0$	781
2012-13	5.2	13	Imaliya	Dhimarkhera	TKG 22	Local *'Tili'*	$N_{60}P_{40}K_{20}S_{40}$	$N_{32}P_{34}K_0S_0$	989
Total	27.8	69			-		-	-	-
Mean	4.63	11.5			-		$N_{60}P_{40}K_{20}S_{40}$	$N_{32}P_{34}K_0S_0$	736.33

the feasibility of the technological demonstrations. The results reported here are year wise averages of the locations and average of 6 years of study.

The feasibility of technology in the demonstrations was a workout through technology gap, extension gap and technology index. Technology index thus indicates the feasibility of the evolved technology. To assess the technology gap, extension gap and technology index, following formulae given by Kadian *et al.* (1997) was used:

Technology Gap = Potential Yield - Demonstration Yield

Extension gap = Demonstration yield - farmers yield

Technology Index = (P-D/ P) x 100

Where, P= Potential yield, D= Demonstration yield

Results and Discussion

The year wise seasonal rainfall and its distribution given in Figure 1 reveals that rainfall behavior, pattern and distribution observed to be *normal, but erratic; normal and uniform; deficient and erratic; above normal; normal but erratic* from 2007 to 2010 and *above normal* during 2011 and 2012, respectively. The long dry spell during mid crop season in 2007-08 affected the crop growth, which resulted in low seed yields especially in local check plots. The erratic rainfall behavior, especially lesser rains in 2009-10 and heavy and continuous rains received during pod filling and maturity stage in 2010-11, 2011-12 and 2012-13 (Figure 1) caused seed sprouting and shattering problems in standing crop conditions which affected the productivity of technological demonstrations and farmers' practice. Despite heavy rainfall received in 2012, the pattern was almost uniform during the crop season, as it not remarkably affected the demo and local check productivity which was similar to that of previous year yields.

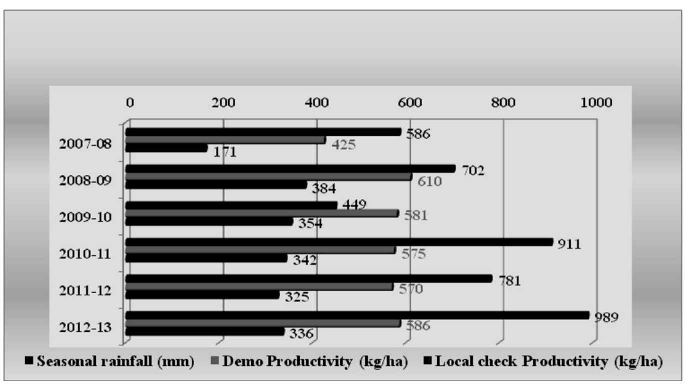

Fig. 1 : Year wise seasonal rainfall *vs* Average sesame productivity in Demo and Local check plots

The data presented in Table 2 deals with yield attributes such as number of capsules/plant, number of seeds/capsule and number of branches/plant recorded in each season during 2007-08 to 2012-13. The number of capsules/plant ranged from 26.21 to 39.43 in technological demonstrations in both cultivars (JTS 8 & TKG 22) and 23.37 to 32.13 in farmers' practice during 2007-08 to 2012-13. The average number of capsules/plant was recorded 35.77 in technology demonstrations with an increase of 18.66%

Table 2 : Yield attributes of sesame in technological demonstrations and farmers' practices

Year	Number of capsules/plant		% age increase	Number of seeds/ capsule		% age increase	Number of branches/plant		% increase
	Improved practice	Farmers' practice		Improved practice	Farmers' practice		Improved practice	Farmers' practice	
2007-08	26.21	23.37	12.15	68.46	48.34	41.62	3.00	2.10	42.86
2008-09	39.43	30.85	27.81	72.37	61.29	18.08	3.40	2.64	28.79
2009-10	37.76	31.58	19.57	68.58	61.52	11.48	3.00	2.66	12.78
2010-11	35.88	31.72	13.11	65.83	59.44	10.75	3.24	2.82	14.89
2011-12	36.55	30.81	18.63	71.28	60.76	17.31	2.85	2.64	7.95
2012-13	38.78	32.13	20.70	70.43	62.23	13.18	3.24	2.60	24.62
Average	35.77	30.08	18.66	69.49	58.93	18.74	3.12	2.58	21.98

over farmers' practice (30.08) during the demonstration period. The number of seeds/capsule in technological demonstrations under both cultivars was recorded to be 68.46, 72.37, 68.58, 65.83, 71.28 and 70.43, however, 48.34, 61.29, 61.52, 59.44, 60.76 and 62.23 in farmers' practice during 2007-08 to 2012-13, respectively. The mean value of seeds/capsule over the years was 69.49 in improved practice with an increase of 18.74% next to farmers' practice (58.93). The number of branches/plant was in the range of 2.85 to 3.40 with the average of 3.12 in technological demonstrations using JTS 8 & TKG 22 and 2.10 to 2.82 with an average of 2.58 in farmers' practice during the study period. An increase of 21.98% was noticed in mean number of branches/plant under technological demonstrations than that of farmers' practice over the years.

The data pertaining to test weight (g 1000/seed), seed yield (kg/ha) in improved technology, farmers' practice and additional yield in technological demonstrations given in Table 3. It is evident from the table that the test weight was in the range of 2.86 to 3.29 g 1000/seed in improved variety JTS 8 during the 2007-08 to 2009-10 with the mean value of 3.11 g 1000/seed which was 21.54% higher to that of farmers' practice (2.56 g 1000/seed). The technological demonstrations conducted with improved cultivar TKG 22 during 2010-11 to 2012-13 indicated that the test weight ranged from 3.13 to 3.21 g 1000/seed with the mean value of 3.17 g 1000/seed which was 18.61% higher to that of farmers' practice (2.67 g 1000/seed). Sesame productivity in the technology demonstrations with JTS 8 variety, laid in Kymore plateau and Satpura hill zone, was recorded 425 to 610 kg/ha during 2007-08 to 2009-10 with the mean yield of 538.67 kg/ha over farmer's practice (303 kg/ha). Similarly the average yield in the technology demonstrations with TKG 22 variety was recorded to be 575 to 586 kg/ha during 2010-11 to 2012-13 with the mean yield of 577 kg/ha over farmer's practice (334.33 kg/ha). The additional yield under technological demonstrations with JTS 8 variety was estimated between 226 to 254 kg/ha during 2007-08 to 2009-10 with a mean value of 235.67 kg/ha over farmers practice. It was analyzed from the data that under the technology demonstrations with JTS 8, an enhanced productivity of 148.54, 58.85 and 64.12% noticed during the 2007-08 to 2009-10, respectively with the mean value of 90.5% to that of local check (farmers' practice). Under the technological demonstrations with TKG 22, the additional yield varied from 233 to 250 kg/ha with the mean additional yield of 242.67 kg/ha over farmer's practice. The data indicated that the technology demonstrations laid with TKG 22 cultivar increased the sesame productivity by 68.13, 75.38 and 74.40% during 2010-11 to 2012-13, respectively with the mean value of 72.64% over farmers' practice. Both the improved varieties resulted in greater yield over farmer's practice, however, the average seed yield was high under the technology demonstrations laid using TKG 22 cultivar to that of JTS 8. The yield enhancement under the technology demonstrations was perhaps due to the use of improved and disease resistant varieties, adoption of adequate methods for uniform and line sowing, balanced use of nutrients, use of biofertilizers, band placement of fertilizers, efficient weed management techniques and need based insect pest management practices.

Table 3 : Test weight and seed yield of sesame in technological demonstrations and farmers' practices

Year	Variety	Test weight (g 1000/seed)		% increase	Average yield in improved practice (kg/ha)			Yield in farmers' practice (kg/ha)	Additional yield over FP (kg/ha)	% increase
		Improved practice	Farmers' practice		Max.	Min.	Av.			
2007-08	JTS 8	2.86	2.29	24.89	686	305	425	171	254	148.54
2008-09	JTS 8	3.29	2.68	22.76	710	550	610	384	226	58.85
2009-10	JTS 8	3.17	2.71	16.97	625	535	581	354	227	64.12
Average		3.11	2.56	21.54	673.67	463.33	538.67	303	235.67	90.50
2010-11	TKG22	3.13	2.67	17.23	635	500	575	342	233	68.13
2011-12	TKG22	3.16	2.69	17.47	630	510	570	325	245	75.38
2012-13	TKG22	3.21	2.65	21.13	642	528	586	336	250	74.40
Average		3.17	2.67	18.61	635.67	512.67	577	334.33	242.67	72.64

Significance of nutrient management in sesame has been studied by many researchers. Tripathi and Rajput (2007) reported that higher fertilizer doses are needed in high yielding varieties and also in those soils which are low in fertility. It has been reported by Taylor *et al.* (1986); Schilling and Cattan (1991); Malik *et al.* (2003) and Shehu *et al.* (2010) that application of N and P fertilizers to sesame increased dry matter and seed yields of sesame. Hegde (1998) observed in his study that integrated nutrient management resulted in 36% enhanced productivity to that of local varieties of sesame. It was reported by Imoloame *et al.* (2007) that superiority of row planting over broad casting was observed in weed control and this factor resulted in considerable yield increase over broad casting. Singh *et al.* (2014) reported that the increased seed yield of sesame with improved technologies was mainly because of line sowing, use of *Phytopthora* and Phyllody resistant variety, integrated nutrient management and timely weed management.

The data presented in Table 4 deals with the cultivation costs incurred in improved and farmers' practices, net returns and benefit cost ratio. The economics of sesame cultivation and its feasibility in technological demonstrations was measured considering the existing prices of inputs and production costs over farmers' local practices. The cost of production under improved variety JTS 8 varied from ₹ 6905 to 7040/ha during 2007-08 to 2009-10 with an average cultivation cost of ₹ 7000/ha in comparison to that of ₹ 5505/ha under local check (farmers' practice). ₹ 1400 to 1550 additional cost of cultivation incurred in the improved practice using JTS 8 cultivar with the mean value of ₹ 1535/ha over farmers' practice (local check). Under the technological demonstrations laid with TKG 22 cultivar, the cultivation cost varied from ₹ 7040 to 7285/ha during 2010-11 to 2012-13 with an average value of ₹ 7122/ha in comparison over that of ₹ 5505 to 5720/ha with the mean value of ₹ 5577/ha under farmers' practice. ₹ 1535 to 1565 additional cost of cultivation incurred in the improved practice using TKG 22 cultivar with the mean value of ₹ 1545/ha over farmers' practice (local check). The additional cost incurred in the improved practices was mainly due to additional cost involved in fertilizers for balanced nutrient application and herbicide for weed management. The net return in sesame cultivation was noticed to be remarkably higher under improved technology demonstrations with JTS 8, which varied from ₹ 7395 to 13835/ha, with the mean value of ₹ 11315/ha in comparison to that of farmers' practice in which it ranged from ₹ 309 to 7551/ha with the mean net return of ₹ 4797/ha. Similarly the net return under technological demonstrations with TKG 22 varied from ₹ 12340 to 13225/ha, with the mean value of ₹ 12692/ha in comparison to that of farmers' practice where it ranged from ₹ 5545 to 6123/ha with the average of ₹ 5903/ha. These results are in agreement with those of Khan *et al.* (2009) and Singh *et al.* (2014) who observed similar findings in their studies conducted on sesame. Further the economics of sesame cultivation revealed that an additional net return of ₹ 7086, 6284 and 6183 was found under the technology demonstrations laid with JTS 8 cultivar in the respective years from 2007-08 to 2009-10 with an average net return of ₹ 6518/ha over farmers' practice. Under the technological demonstrations conducted with TKG 22 cultivar indicated that an additional net return of

Table 4 : Economics of sesame cultivation in improved and farmers' practices

Year	Variety	Average cost of cultivation (₹/ha)		Additional cost over FP (₹/ha)	Average net returns (₹/ha)		Additional return over FP (₹/ha)	B:C ratio		Incremental BCR over FP
		IP	FP		IP	FP		IP	FP	
2007-08	JTS 8	7055	5505	1550	7395	309	7086	2.05	1.06	0.99
2008-09	JTS 8	6905	5505	1400	13835	7551	6284	3.00	2.37	0.63
2009-10	JTS 8	7040	5505	1535	12714	6531	6183	2.81	2.19	0.62
Average		7000	5505	1495	11315	4797	6518	2.62	1.87	0.75
2010-11	TKG 22	7040	5505	1535	12510	6123	6387	2.77	2.10	0.67
2011-12	TKG 22	7040	5505	1535	12340	5545	6795	2.75	2.00	0.75
2012-13	TKG 22	7285	5720	1565	13225	6040	7185	2.82	2.06	0.76
Average		7122	5577	1545	12692	5903	6789	2.78	2.05	0.73

₹ 6387, 6795 and 7185 was found during 2010-11 to 2012-13 with an average net return of ₹ 6789/ha over farmers' practice. It was noticed that TKG 22 variety gave higher net returns in comparison to JTS 8 over farmer's practice. The technology demonstrations also resulted in a higher benefit cost ratio during the demonstration period and it was noted to be 2.05 3.00, 2.81, 2.77, 2.75 and 2.82 against the farmers' practice in which it was noted to be 1.06, 2.37, 2.19, 2.10, 2.00 and 2.06 from 2007-08 to 2012-13, respectively. The cultivar wise BC ratio was also greater in TKG 22 (2.78) in comparison to JTS 8 (2.62). An incremental BC ratio of 0.99, 0.63, 0.62, 0.67, 0.75 and 0.76 recorded in technological demonstrations during the study period since 2007-08 to 2012-13 with the average BCR of 0.74. The cultivar wise mean incremental BC ratio was noted to be 0.75 and 0.73 in JTS 8 and TKG 22, respectively over farmer's practice. The results of the study clearly indicate the viability and effectiveness of the technology demonstrations using both cultivars conducted during the six consecutive years.

The data presented in Table 5, indicate the technology gap, extension gap and technology index of the technology demonstrations conducted during 2007-08 to 2012-13 in six consecutive crops. The technology gap in the demonstrations using JTS 8 cultivar was found as 275, 90 and 119 kg/ha, respectively, during 2007-08, 2008-09 and 2009-10 with the mean value of 161.33 kg/ha which was close to the cultivars' potential, clearly indicates that the technology packages used involving above cultivar are feasible in the region. Similarly the technology index in the above cultivar was estimated to be 39.29, 12.86 and 17% during 2007-08 to 2009-10 with the mean value of 23.05%, which was also close to the cultivar' potential, indicated the feasibility of evolved technology. The technology gap in the demonstrations using cv. JTS 22 was found as 375, 380 and 364 kg/ha, respectively, during 2010-11, 2011-12 and 2012-13 with the mean value of 373 kg/ha which showed a remarkable yield gap with the cultivars' potential, however, the productivity was in general, higher to the previous year demonstrations conducted with JTS 8, indicates that the technology packages used involving above cultivar are viable as well in Kymore Plateau and Satpura Zone of Madhya Pradesh. The technology gap calculated as a whole in six consecutive crop seasons shows that an average of 267.17 kg/ha yield gap with 31.16% technology index was evident in the demonstrations conducted on farmers' fields which may perhaps emerge due to various climatic and soil factors. There are ample possibilities to minimize the above yield gaps to enhance the crop productivity in the zone. The average extension gap in seed yield of JTS 8 during 2007-08 to 2009-10 was observed 235.67 kg/ha, however, in case of TKG 22 it was 242.67 kg/ha during 2010-11 to 2012-13, which can be minimized by disseminating adequately the technological packages in the region and up scaling the adoption percentage to increase the crop production and productivity.

Table 5 : Yield gaps and technology index in sesame under technological demonstrations and farmers' practices

Year	Variety	Potential yield (kg/ha)	Average yield (kg/ha)		Technology gap (kg/ha)	Extension gap (kg/ha)	Technology Index
			Improved practice	Farmers' practice			
2007-08	JTS 8	700	425	171	275	254	39.29
2008-09	JTS 8	700	610	384	90	226	12.86
2009-10	JTS 8	700	581	354	119	227	17.00
Average		700	538.67	303	161.33	235.67	23.05
2010-11	TKG 22	950	575	342	375	233	39.47
2011-12	TKG 22	950	570	325	380	245	40.00
2012-13	TKG 22	950	586	336	364	250	38.32
Average		950	577	334.37	373	242.67	39.26

Conclusions

Based on the results obtained from the study conducted on sesame it may be concluded that the whole technology packages are required to be adopted to get the optimum crop productivity. Failing to do so remarkable reduction in the crop yield may be encountered. Delayed sowing; imbalanced fertilizer application; inappropriate weed management practices and unsuitable plant protection measures may fundamentally lower the seed yield of sesame. The demonstrated technology is also feasible in adverse climatic conditions, i.e. below or above normal precipitation, which is reflected by year wise grain yields. The technological demonstrations using both cultivars (JTS 8 & TKG 22) were observed to be effective and economically viable in the region as these resulted higher net returns and minimized the technology gap and index during the study.

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