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Impact Assessment of Front Line Demonstration on Sorghum Crop Under TSP Areas

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ABSTRACT
Sorghum Research Station, VNMKV, Parbhani conducted 265 demonstrations on sorghum variety SPH-1641 and PVK-801, CSH-14 and CSV-27 during two consecutive years from 2017–18 to 2018–19. The critical inputs were identified in existing production technology through meetings and discussions with farmers. Delayed sowing, use of higher seed rate resulting into dense plant population, uneven plant population, uncontrolled weeds, ignorance about fertilizers and lack of plant protection measures, low MSP were the predominant identified causes of low productivity of sorghum. In the same sequence the other parameters like technological impact, economical impact and extension gap were analyzed for Impact assessment of front line demonstration on sorghum crop and feasibility of demonstrated technologies at grass root levels. The average results of two years study revealed that the grain yield & fodder yield under demonstration plots was 1452Kg/ha & 3786 kg/ha respectively as compared to 888kg /ha&1957 kg/ha respectively in traditional farmer practices plots. The average of technology gap, extension gap and technology index for grain & fodder yield were found to be 2031kg/ha, 564 kg/ha &56.95 % and 7039 kg/ha, 1829 kg/ha & 19.93 % respectively. The results clearly indicate the positive effects of FLDs over the existing practices. Percentage increase grain and fodder yield over farmer practice was found 70% & 107 % respectively. Benefit: cost ratio was recorded to be higher under demonstrations against control treatments during the both the years of experimentation.
Keywords: *Sorghum crop, Front Line Demonstrations, Technology and Extension gaps, Technology index, Improved Technologies, Rainfed*

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INTRODUCTION

Front Line Demonstration (FLD) on Sorghum Crop under Tribal sub plane (TSP) is an applied approach to accelerate the dissemination of proven technologies at farmer's fields in a participatory mode with an objective to explore the maximum available resources of crop production and also to bridge the productivity gaps by enhancing the production in national basket along with to increase socio-economy of tribal farmers ant it will help to create a job opportunity and improve standard of living in tribal farmers.

Series of agricultural improvement programmes have been introduced in India to increase the agricultural production and income of the farming communities. But the outcomes of these programmes are not satisfactory in terms of achieving higher agricultural production. Front line demonstration (FLD) is a long term educational activity conducted in a systematic manner in farmers' fields to worth of a new practice/technology. Farmers in the district are still producing crops based on the knowledge transmitted to them by their forefathers leading to a grossly unscientific agronomic, nutrient management and pest management practices.

Sorghum is the world's fifth-most important cereal crop after rice, wheat, maize and barley. Sorghum (*Sorghum bicolor* (L.) Moench) is a crop of world-wide importance and is unique in its ability to produce under a wide array of harsh environmental conditions [6]. Sorghum is an important component in traditional farming systems in the semi-arid tropics of Africa and Asia and has important position in the farming system of India. However, Sorghum crop have given the importance by the government because

vast yield gap exists between potential yield and yield under real farming situation. SRS, VNMKV, Parbhani in coordination with ICAR-IIMR, Hyderabad made intensive efforts on training about scientific cultivation, demonstration on new variety and other interventions. The present study was conducted to impact assessment of front line demonstration on sorghum crop in the TSP area.

MATERIAL AND METHODS

Assessment of gap in adoption of recommended technology before laying out the frontline demonstrations (FLD's) through personal discussion with selected farmers. The awareness programme (preseason training) was organized for selection of farmer's and skilled development about detailed technological intervention with improved package and practice for successful cultivation. Critical inputs for the technologies to be demonstrated (Table 1, 2 and 3) were distributed to the farmers after the training like improved high yielding variety, recommended chemicals and literature and regular visit, monitoring and pest and disease advisory services management by the SRS, VNMKV, IIMR scientist to the demo farmers. Finally field day was conducted involving demonstration holding farmers, other farmers in the village, Scientists from University, officials from Department of Agriculture and local extension functionaries to demonstrate the superiority of the technology for each crop. Crop yield was recorded from the demonstration and control plots for the crops at the time of harvest. The most feasible way by which this could be achieved is by demonstrating the recommended improved technology on the farmer's fields through front line demonstrations with the objectives to work out the input cost and monetary returns between front line demonstration and farmers methods, to identify the yield gaps between farmer's practices and front line demonstrations.

The basic information were recorded from the farmer's field and analyzed to comparative performance of frontline demonstrations (FLD's) and farmer's practice. Detailed package and practices with technological intervention for recommended practice (Table 1, 2 and 3). It was also observed that farmer's mostly didn't use fungicides and weedicide and not maintain proper plant population, they are more focused on fodder production only from sorghum.

Front line demonstration and farmers methods used to identify the yield gaps between farmer's practices and front line demonstrations. The yield data were collected from both the demonstration and farmers practice by random crop cutting method and analyzed by using simple statistical tools.

Selection of village: Villages was selected purposively in which maximum number of farmers are from tribal areas (Ramwadi & Wai and Jawarla). They grow local variety and socio-economically famers are very poor. Topography of village is light soil, soil low in nutrient. Farmers from these villages migrate to other village in search of job.

The technology gap and technological index (11) were calculated by using following formula as given below

Technology gap= Potential yield - Demonstrated yield

Extension gap = Demonstrated yield - Yield under existing practice

$$\textbf{Technology index} = \frac{\text{Potential yield - Demonstrated yield}}{\text{Potential yield}} \times 100$$

Additional return= Demonstration return – farmer's practice return

$$\textbf{Percent increase yield} = \frac{\text{Demonstration yield - farmers yield}}{\text{Farmers yield}} \times 100$$

RESULTS AND DISCUSSIONS

Constraints in sorghum production

Problems faced by the farmers in sorghum cultivation were documented during the study, Famer 's did not get labour for timely harvesting, less MSP on sorghum, because of labor shortage and less MSP farmer ignore the crop production technology and consider the crop only up to own consumption.

Description of Front Line Demonstrations

The improved package and practices is more important with technological intervention for productivity and profitability of sorghum. Detailed package and practices with technological intervention for

recommended practice (Table 2). It was also observed that farmer's use injudicious and mostly didn't use fungicides. Similar observations were reported by (10).

Grain and fodder yield and gap analysis:

The grain and fodder yield and gap analysis of sorghum in demonstrated field's and farmer's practice is presented in table 3&4. Data revealed that average grain yield of demonstrated field's was higher from farmer's practice in both years. The results revealed that average grain yield and fodder yield of sorghum under TSP frontline demonstrations were 1452 & 3786 Kg ha^{-1} respectively as compared to 888 & 1957 Kg ha^{-1} respectively in traditional farmer practices plots. Average grain and fodder yield increase of 70% & 107 % respectively. The above finding was in accordance with Singh et al., (2018). The average of technology gap, extension gap and technology index for grain & fodder were found to be 2031 kg/ha, 564 kg/ha &57 % and 7039 kg/ha, 1829 kg/ha &20 % respectively. (Table 3 &4). This emphasized the need to educate the farmers through various extension means for the adoption of scientific practices in cultivation of all the cereal crops and pulses crops (1) This Extension gap should be assigned to adoption of improved dissemination process in recommended practices which outcome in higher grain yield than the farmer's practice. Similar yield enhancement in different crops in front line demonstration has amply been documented by (3, 8 &7). Yield of the front line demonstration trials and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology and extension gaps (5).

Table 1: Details of Crops, Variety, Nos. of Villages & Farmers and Area of the Front Line Demonstrations.

Sl. No.	Crop	Variety	Nos. of villages	Name of villages	Nos. of Farmers	Area (ha)
2017-18						
1	Sorghum	PVK-801	01	Jawarla	35	14
		SPH-1641			35	14
2018-19						
1	Sorghum	CSV-27	02	Ramwadi & Wai	113	45.20
		CSH-14			82	32.80
	Total		**03**		**265**	**106**

Table-2: Improved package of practice VS Local package of practice

Sr. No.	Particulars	Improved package of practice	Local package of practice	Gap
1	**Variety**	**2017-18:** SPH-1641 and PVK-801 **2018-19:** CSH-14 and CSV-27	Local variety	Full gap
2	**Seed rate**	7.5-10 kg/ha	10-12 kg/ha	Excess use of seed rate in local practice
3	**Land preparation**	In-situ moisture conservation operation by Baliram Plough & 3 hoeing are major considerations for achieving satisfactory crop stand, promote soil aeration, water retention in root zone and availability of water to the crop	Not Follow	Full gap
4	**Time of sowing**	First week of June to first week of July	First week of June to first week of July	No gap
5	**Seed treatment**	Imidacloprid 48% FS	Not followed	Full gap
6	**Spacing**	45*15cm	Not maintained evenly, broad casting	Full gap
	RDF	NPK: 80:40:40 kg/ha, half nitrogen, full phosphorus and full potassium applied as basal and remaing half nitrogen 30 DAS.	Imbalanced use of fertilizer	Partial gap
7	**Weed Management**	1 hoeing and 1 hand weeding	Not done	Full gap
8	**Plant protection**	Use of carbofuron and immectinbenzoate	Not done	Full gap

Economics analysis of sorghum

Economic performance of sorghum under TSP frontline demonstration was depicted in table 5. The economic analysis results revealed that the sorghum recorded higher gross returnfrom SPH-1641 & PVk-801 with recommended practice (FLD's) were 34,158/- Rsha^{-1}and 30,812/- Rs ha^{-1} respectively as compared to 15578 /-Rs ha^{-1}on farmers practice for the year 2017-18 and for year 2018-19, genotype CSH-14 & CSV-27 with recommended package of practice recorded higher gross return over farmer practice i.e. 58009/- Rs ha^{-1}, 58808/- Rs ha^{-1} and 37302/- Rs ha^{-1} respectively. The net returns received from SPH-1641 & PVk-801 with recommended practice (FLD's) for the year 2017-18 were 18348/- Rsha^{-1}and 15755 Rs ha^{-1}recommended practice in comparison to6887 Rsha^{-1} in farmer's practice and year 2018-19, genotype CSH-14 & CSV-27 with recommended package of practice recorded higher gross return over i.e. 33384/- Rs ha^{-1}, 33997/- Rs ha^{-1} and 17335/- Rs ha^{-1} respectively. It was economically observed that additional returns for the year 2017-18 from SPH-1641 & PVk-801 were 11461/- & 8868/- Rsha^{-1} in recommended practice and additional returns for the year 2018-19 from CSH-41 & CSV-27 were 16049/- & 16662/- Rs ha^{-1} in recommended practice. The benefit cost ratio also recorded higher in both the year. Similar result observed regarding bajara crops in frontline demonstration in Haryana state (2).

Table.3: Grain yield and gap analysis of frontline demonstrations on Sorghum

Year	*Crop*	*Average yield (Kg ha^{-1})*		*Per cent increase over local*	*Potential of grain yield (Kg ha^{-1})*	*Extension gap (Kg ha^{-1})*	*Technology gap (Kg ha^{-1})*	*Technology index (%)*
		Improved Technology	*Local practice*					
2017-2018	SPH 1641	1100	561	96	3831	539	2731	71
	PVK 801	1000	561	78	3500	439	2500	71
2018-2019	CSH-14	1869	1215	53	3800	654	1931	51
	CSV-27	1840	1215	51	2800	625	960	34
Average		**1452**	**888**	**70**	**3483**	**564**	**2031**	**57**

Table.4: Fodder yield and gap analysis of frontline demonstrations on Sorghum

Year	*Crop*	*Average yield* **(Kg ha^{-1})**		*Per cent increase over local*	*Potential of fodder yield (Kg ha^{-1})*	**Extension gap (Kg ha^{-1})**	*Technology gap (Kg ha^{-1})*	*Technology index (%)*
		Improved Technology	*Local check*					
2017-2018	SPH -1641	3600	1342	168	7500	2258	3900	30.10
	PVK-801	3200	1342	138	8000	1858	4800	23.22
2018-2019	CSH-14	4062	2572	57	8500	1490	4438	17.52
	CSV-27	4281	2572	66	19300	1709	15019	8.85
Average		**3786**	**1957**	**107**	**108**	**1829**	**7039**	**20**

Table.5:Economic analysis of frontline demonstrations on Sorghum

Year	*Crop*	**Gross Return (Rs ha^{-1})**		**Cost of cultivation (Rs ha^{-1})**		**Net return (Rs ha^{-1})**		**Additional return FLD's (Rs ha^{-1})**	**B:C ratio**	
		Improved Technology	*Local check*	*Improved Technology*	*Local check*	*Improved Technology*	*Local check*		*Improved Technology*	*Local check*
2017-2018	SPH- 1641	34158	15578	15810	8691	18348	6887	11461	2.16	1.79
	PVK-801	30812	15578	15058	8691	15755	6887	8868	2.04	1.79
2018-2019	CSH-14	58009	37302	24626	19967	33384	17335	16049	2.36	1.87
	CSV-27	58808	37302	24811	19967	33997	17335	16662	2.38	1.87

CONCLUSION

Appropriate agronomical management practices with improved varieties are necessary to realize profitable yields from sorghum. The major components of agronomical management consist of proper land preparation, seed treatment and quality, seed rate, planting geometry, varietal options, nutrient management, water management, plant protection measure, hoeing and weed management. Timely and In-situ moisture conservation operation by Baliram Plough & 3 hoeing are major considerations for achieving satisfactory crop stand, promote soil aeration, water retention in root zone and availability of

water to the crop. Selection of varieties has wide options for sorghum and should be selected to specific requirement of farming situations. Thus, for adoption of complete package of practices balanced fertilizer use not only increase crop yield but also improves farmers profit. The day is not so far when the sorghum will have a definite place in enhancing the food security base in the coming years under not only for rainfed areas of the country but also because of medicinal value.

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