International Journal of Agricultural and Applied Sciences, December 2021, 2(2):141-144
https://www.agetds.com/ijaas
ISSN: 2582-8053
https://doi.org/10.52804/ijaas2021.2221

Research Article

OPEN ACCESS

An impact and yield gap study of frontline demonstrations on fodder sorghum variety CoFS-29 in Panchmahal district of central Gujarat

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(**Received:** 28/07/2021; **Revised:** 19/11/2021; **Accepted:** 30/11/2021)

ABSTRACT
Sorghum plays an important role as fodder, in the health and nutrition of a large livestock population in India. The productivity of green fodder per unit area could be increased by adopting recommended scientific and sustainable packages and practices using a suitable high yielding variety. The present study was conducted to find out the yield gap, economics and impact assessment study of fodder sorghum variety CoFS-29 in Panchmahal district of Central Gujarat. ICAR- Krishi Vigyan Kendra-Panchmahal was planned and conducted 40 front-line demonstrations on fodder sorghum to demonstrate the production potential and economic benefits of improved practices comprising of high-yielding variety CoFS-29 in Panchmahal district during 2019-20 and 2020-21. The results of the present study revealed that the improved variety of fodder sorghum variety CoFS-29 recorded significantly higher green fodder yield (482.50 qt ha^{-1}) as compared to local check (308.50 qt ha^{-1}). The percentage increase in the yield over local check was found to be 56.40. The extension gap, technology gap, and technological index of lucerne fodder sorghum variety CoFS-29 were found to be 174 qt ha^{-1}, 1117.50 qt ha^{-1} and 69.84 percent, respectively. Economic analysis of the yield performance revealed that front line demonstrations variety CoFS-29 recorded higher net return (Rs. 66125 ha^{-1}) with higher benefit cost ratio (3.18) which was very lucrative as compared to local checks (2.14). The farmer's mean knowledge score had increased significantly by 39.36 after implementation of frontline demonstrations. The impact of front-line demonstrations was also analyzed which had reflected significant improvement in knowledge and satisfaction level on the part of farmers.
Keywords: Front line Demonstration, Fodder, Sorghum, Technology, Variety, Yield.

INTRODUCTION

Livestock is a basic part of our farming activities and it has a major impact on the Indian economy and is likely to be the engine for growth and development of the agriculture sector in future. However, nutritional insufficiency for livestock is one of the most burning worldwide problems of agricultural countries including India. Feeding and nutrition is playing a fundamental role in livestock rearing and account for 60-70 per cent of the total cost of milk production. It has been observed that imbalanced feeding with special reference to green fodder has tarnished the production potential of animals which in turn, affects the interest of dairy farmers due to low margin of profit leading to a nasty cycle. Therefore, to increase the production of dairy animals a reality, the availability of sufficient and economically balanced feed and fodder needs utmost attention as it affects both the quantity and quality of milk. Marginal farmers may have limited opportunities to cultivate green fodder, particularly during the lean season, where owning livestock is an alternate income generator. Under fodder, the production of sorghum plays an important role, in the nutrition and health of the dairy animals in India. The productivity of green fodder per unit area could be increased by adopting recommended scientific and sustainable packages and practices using a suitable high-yielding variety (Khadda *et al.,* 2015). The frontline demonstration is one most important and powerful tools of extension because, farmers are generally motivated by the belief that 'Learning by doing and 'Seeing is believing. The main aim of FLD is to demonstrate recently released production technologies related to agriculture and its package and practices in the farmers' field under different agro-climatic regions and farming situations (Meena, 2011). Keeping given the above factors, front-line demonstrations were undertaken systematically on farmers' fields to show the worth of a new variety of fodder sorghum variety CoFS-29 and convince the farmers to adopt improved packages and practices of fodder sorghum production for enhancing the productivity of green fodder. The present study was conducted to find out the yield gap, economics and impact assessment study of fodder sorghum variety CoFS-29 in Panchmahal district of Central Gujarat.

MATERIALS AND METHODS

ICAR- Krishi Vigyan Kendra-Panchmahal was planned and conducted 40 front line demonstrations (FLDs) at the farmers' field to convince the farmers about the potentialities of improved variety of fodder sorghum variety CoFS-29. The study was conducted to assess the yield gap and impact of FLD of fodder sorghum variety CoFS-29 in Panchmahal district of Central Gujarat during 2020-2021. All the participating farmers were trained on various aspects of lucerne production technologies. Recommended agronomic practices and certified seed of fodder sorghum were used for front line demonstrations in 0.25 ha area/ demonstration. A one-fifth area was also devoted to grow local standard checks. Green fodder yield from one fifth area of each plot was recorded. The plant samples drawn out were first air-dried and put in to oven allowing the temperature to reach up to 75°C until the constant weight was obtained. The reduction in weight was treated as the moisture content in sample and rest was recorded as dry matter. Similarly, the dry matter yield of plot was worked out by subtracting moisture from green fodder yield. This dry matter was converted into qt ha^{-1} and recorded as dry matter yield. Air-dried samples were grounded finely for estimation of nitrogen following the standard method. Crude protein content in the plant was computed by multiplying nitrogen content of the plants by 6.25. Protein content thus obtained was multiplied with dry matter yield for the estimation of protein yield. To study on the impact of front-line demonstrations was conducted on all the participating farmers. Production and economic data for front-line demonstrations and local practices were collected and analyzed. The different parameters were calculated using the formula given below:

Extension Gap = Demonstration yield (DY) – Farmers' Practice Yield (FPY)

Technology Gap = Potential Yield (PY) – Demonstration Yield (DY)

Technology Index = (PY-DY/PY) × 100

Additional Cost = Demonstration Total Cost – Farmers' Practice Total Cost

Effective Gain = Additional Return – Additional Cost

Additional Return = Demonstration Return – Farmers' Practice Return

Net returns = Total (Gross) Returns – Total Cost of Production

Incremental B: C Ratio = Additional Return / Additional Cost

Knowledge level of the farmers about improved production practices of fodder sorghum before and after implementation of the frontline demonstration was measured and compared by applying the student's test. The information regarding knowledge were recorded on a scale point of full knowledge, considerable knowledge, least knowledge, and not knowledge was analyzed with score value of 3, 2, 1, and 0 respectively. Further, the satisfaction level of respondent farmers about extension services provided was also measured based on various dimensions like training of participating farmers, supply of inputs, solving field problems and advisory services, fairness of scientists, the performance of variety demonstrated and overall impact of front-line demonstrations. The client Satisfaction Index was calculated as developed by Kumaran and Vijayaragavan (2005) after necessary modification. The information regarding farmers' satisfaction was recorded on a scale value of a five-point continuum *viz*., strongly agree, agree, undecided, disagree, and strongly disagree with a score value of 5,4, 3, 2, and 1, respectively. All respondents were interviewed personally with the help of a pre-tested and well-structured interview schedule. The satisfaction index was calculated with the help of the following formula.

$$\text{Client Satisfaction index} = \frac{\text{Individual obtained score}}{\text{Maximum score possible}}$$

The data thus collected were tabulated and statistically analyzed to interpret the results as per Snedecor & Cochran, (1994).

RESULTS AND DISCUSSION

Performance of front-line demonstrations:

The results related to the productivity of improved production technologies demonstrated vis-à-vis farmers practice are given in Table.1 The perusal data of table 1 reveals that the improved variety of fodder sorghum CoFS-29 recorded significantly higher green fodder yield (482.5 qt ha^{-1}) as compared to local check (308.50 qt ha^{-1}). The percentage increase in the yield over local check was found to be 56.40. More or less yield enhancement in different crops in front line demonstration has amply been documented by Hiremath *et al*. (2007), Kumar *et al*. (2010) Khadda *et al.* (2015) and Khadda *et al.* (2018). The average dry matter yield was recorded 113.66and 73.15 qt ha^{-1} in improved variety CoFS-29 and local check, respectively. The average crude protein was found to be 7.15 and 7.09 percent in the demo variety CoFS-29 and local check, respectively. These results are in consonance with the findings of Manjunath *et al.* (2013). From these results, it is evident that the performance of improved variety was found better than the local check under semi-arid conditions. Farmers were motivated by results of production technologies applied in the front-line demonstrations trials and it is hoped that they will adopt these technologies in the coming years. The extension gap and technology gap were found to be 174 and 1117.50 qt ha^{-1}, respectively. The technology gap may be attributed to dissimilarities in vagaries of weather conditions, soil salinity, fertility and erratic rainfall, in the region. Hence, to reduce the extension gap and technology gap between different varieties, area-specific recommendation seems to be necessary. The technological index of fodder sorghum variety CoFS-29 was found to be 69.84 percent. The technology index shows the viability of the variety at the field level. The results of the present study align with the findings of Khadda *et al.* (2018) and Bhutada *et al.* (2020).

Table 1. Yield attributes, gap and technology index of FLDs (Pooled data of 2 years)

Variables	GFY ($qt.h^{-1}$)	DMY ($qt.h^{-1}$)	CP (%)	CPY ($qt.h^{-1}$)	GFY Increase (%)	Extension gap($qt.h^{-1}$)	Technology gap ($qt.h^{-1}$)	Technology index (%)
CoFS-29	482.50	113.66	7.15	8.13	56.40	174	1117.50	69.84
Local check	308.50	73.15	7.09	5.19	-	-	-	-

*GFY-Green fodder yield, DMY-Dry matter yield, CP-Crude protein, CPY- Crude protein yield

Table 2. Economics of frontline demonstrations of fodder sorghum variety CoFS-29

Variables	Cost of cultivation (Rs. h^{-1})	Gross return (Rs. h^{-1})	Net return (Rs. h^{-1})	Benefit cost ratio
CoFS-29	30375	96500	66125	3.18
Local check	28750	61700	32950	2.14
Additional in CoFS-29	1625	34800*	33175	21.42**

*Effective gain, ** Incremental benefit cost ratio

Table 3. Comparison between knowledge levels of the respondent about improved production technology of fodder sorghum (n=40)

S.N.	Crop production technologies	Before FLD (n=40)		After FLD (n=40)		Difference
		MPS	Rank	MPS	Rank	
1	High Yielding Variety	47.15	V	98.37	I	51.22
2	Field Preparation	72.23	I	94.30	III	22.07
3	Seed Treatment	32.52	X	79.67	VII	47.15
4	Time of Sowing	59.34	III	95.93	II	36.59
5	Seed Rate & Spacing	42.27	VI	87.80	V	45.53
6	Nutrient Management	37.39	VII	77.23	IX	39.84
7	Irrigation Management	51.22	IV	86.99	VI	35.77
8	Weed Management	31.71	IX	78.05	VIII	46.34
9	Pest & disease management	32.52	VIII	76.42	X	43.90
10	Harvesting	64.23	II	89.43	IV	25.20
Overall Mean		47.06	-	86.42	-	39.36
	Calculated 't' value	7.501*				

* Significant at 5% probability level.

Economics of fodder production:

The economics of fodder sorghum (green fodder) production under front line demonstrations were estimated and the results have been presented in Table 2. Economic analysis of the yield performance revealed that front line demonstrations fodder sorghum variety CoFS-29 recorded higher gross returns (Rs. 96500 ha^{-1}) and net return (Rs. 66125 ha^{-1}) with a higher benefit-cost ratio (3.18) which was very lucrative as compared to local checks (2.14). These results are by the findings of Khadda *et al.* (2018) and Bhutada *et al.* (2020). Further, the additional cost of Rs.1625 ha^{-1} in demonstration has acquired additional net returns of Rs. 34800 ha^{-1} with an incremental benefit cost ratio of 21.42 suggesting the higher profitability and economic viability of the demonstration. More or less similar results were also reported by Khadda *et al.* (2015), Khadda *et al.* (2018) and Bhutada *et al.* (2020).

Increase in Knowledge level:

The results of the present study revealed that the mean per cent score of the knowledge level of respondents regarding improved fodder sorghum production technologies was found to be greater (86.42) after front line demonstration as compared to the before implementation of front-line demonstrations (47.06).

Table 4. Extent of farmers satisfaction of extension services rendered (n=40)

Satisfaction Level	Number	Per cent
Low	03	07.50
Medium	08	20.00
High	29	72.50

The data presented in Table 3 also reveals that the knowledge level of respondents regarding different improved fodder production (sorghum) technologies was found to be higher after implementations of FLDs ranging from 22.07 MPS in field preparation to 51.22 MPS in high yielding variety. It could be seen from the Table 3 that the farmer's overall mean knowledge score had increased significantly by 39.36% after implementation of frontline demonstrations, as the computed value of 't' (7.50) was statistically significant at 5% probability level. It means that there was significant increase in the knowledge level of the farmers due to the front-line demonstration. The results align with that of Singh *et al.* (2007) and Khadda *et al.* (2015) and Khadda *et al.* (2018). It might be because continuous contact of beneficiary farmers with scientists of KVK, Panchmahal during conducting different extension activities like training programmes, advisory services,

field visits, field day, diagnostic services, and FLDs at their farm has motivated them to acquire knowledge and skills for adopting improved fodder production technologies for maximizing their yield and income. This shows the positive impact of front-line demonstration on the knowledge of the farmers that might have resulted in higher adoption of improved fodder production practices.

Farmers' Satisfaction:

The extent of satisfaction level of beneficiary's farmers overextension services and performance of demonstrated variety was measured by Client Satisfaction Index (CSI) and results presented in Table 4. Results of the study revealed that the majority of the respondents expressed a high (72.50 %) to medium (20.00 %) level of satisfaction for extension services and performance of technology under demonstrations. Whereas, very few (7.50) per cent of respondents expressed a lower level of satisfaction. These results are in conformity with those reported by Kumaran and Vijayaragavan (2005), Khadda *et al.* (2015), Khadda *et al.* (2018), and Bhutada *et al.* (2020). The medium to higher level of satisfaction concerning services rendered, linkage with farmers and technologies demonstrated, etc. indicate stronger conviction, physical and mental involvement in the front-line demonstration which in turn would lead to higher adoption. This shows the relevance of frontline demonstration.

CONCLUSION

Based on the observation on various aspects it may be concluded that the fodder sorghum variety CoFS-29 was found to be superior in terms of green fodder yield and dry matter yield over local check. After realizing the potential of fodder sorghum variety CoFS-29, farmers are showing their interest to grow CoFS-29 in place of traditional ones. The impact of front-line demonstration was also analyzed which showed that there was a significant improvement in knowledge level and satisfaction on the part of farmers.

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Citation: Balbir Singh Khadda*, Kanak Lata, Raj Kumar, S. Khajuria and A.K. Rai 2021. An impact and yield gap study of frontline demonstrations on fodder sorghum variety CoFS-29 in Panchmahal district of central Gujarat. *International Journal of Agricultural and Applied Sciences*, 2(2):141-144. https://doi.org/10.52804/ijaas2021.2221