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Yield gap analysis of sorghum through front line demonstrations in Kalaburagi region of northern Karnataka

Anand Naik*, Raju, G. Teggelli, Zaheer Ahamed, B. and Devappagouda H. Patil

Soil Science and Agricultural Chemistry, Krishi Vigyan Kendra, Kalaburagi UAS, Raichur, Karnataka 585 101, India

***e-mail:** anandnaik2@gmail.com

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Abstract: The study was carried out during *Rabi* season of 2011-12 to 2013-14. All the front line demonstrations were carried out in an area of 5 hectares with 12 demonstrations. The results of FLD's showed that improved technologies consisting of use of improved variety, seed treatment with *Azospirillium*, balanced fertilizer application and integrated pest management recorded higher yield as compared to farmer's local practice. The results indicated an increase in yield (14.53 q/ha) and yield attributes in the demonstration package compared to the farmers practice (12.90 q/ha). Average net returns of Rs. 25,110/- with a benefit cost ratio of 3.6 was obtained in demonstration compared to Rs.23, 750/- per hectare of farmers practice with a benefit cost ratio of 3.0. Thus, front line demonstrations are effective tools in introducing new technologies to the farmers on the basis of results obtained in other fields.

Index terms: Front line demonstrations, Sorghum, Yield attribute, Yield potential

Introduction

Jowar (Sorghum) is the fifth most important cereal crop after wheat, rice, maize and barley. Cultivation of sorghum is mainly concentrated in Peninsular and Central India. Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Gujarat, Rajasthan, Uttar Pradesh and Tamil Nadu are the major Sorghum growing states. Sorghum is traditionally grown for food and fodder purposes (Kelley and Rao, 1994; Hall, 2000). As sorghum is cultivated in nutrient poor soils in frequently drought-prone areas, it offers food and fodder security through risk aversion on sustainable basis. Despite of its multiple uses, the area under sorghum in India has declined from 18.61 m. ha in 1970 to 7.93 m. ha in 2008. However, its productivity has increased from 522 kg/ha to 981 kg/ha due to significant improvements made in research and development. There is wide gap between national productivity and yield potential of the improved sorghum technologies developed from the research institutes. Technology transfer refers to the spread of new ideas from originating sources to ultimate users (Prasad *et al.,* 1987). Productivity of the crop can be enhanced by adopting the improved practices as recommended by the Agricultural Universities, Department of Agriculture and ICAR Research Institutes. This study was therefore designed with the objective of assessing the knowledge and adoption of improved practices by the farmers of the agency area.

Materials and Methods

The study was carried out by Krishi Vigyan Kendra, Kalburagi, during *Rabi* 2011-12 to 2013-14 at farmers' fields of adopted villages covering 5 hectares and 12 demonstartions. Before selection of farmers for FLD, a comprehensive list of all sorghum growers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of cultivation etc. were followed as suggested by Choudhary (1999) and Venkattakumar *et al.* (2010). During selection procedure, repetition of the farmers was completely avoided. Thus a total 12 farmers were included in the study. Through survey, farmers meetings and field diagnostic visits during the cropping period, low yield of sorghum was conceived due to local varieties which are low yielding and having long duration, imbalanced use of nitrogenous fertilizer and indiscriminate practices to manage the stem borer. To manage assessed problem, improved and recommended technologies were followed as intervention during the course of FLDs programme. Well before conducting the demonstrations, farmers of adopted villages were trained with respect to identified technologies. The improved variety M35-1 was used as seed material for demonstrations purpose. The demonstration farmers were facilitated by KVK scientists in performing field operations like sowing, spraying, weeding, harvesting etc. during the course of training and visits. Yield data was collected from control (Framer's practices) and demonstration plots and cost of cultivation, net income and cost benefit ratio were computed and analysed.

Results and Discussion

Frontline demonstrations are effective educational tools in introducing various new technologies to the farmers and its adoption by building confidence on the basis of results obtained on their fields. The demonstrations could convince the farmers of the respective localities that high crop yield is within their reach by adopting feasible package of practices. A comparison between the farmers practice and suggested scientific practices would indicate the technology gap in yield adoption (Table-1). The yield performance and its related economic indicators presented in (Table-2) reveals that production of sorghum yield was found to be substantially higher than that of farmer's practices. Higher grain yield of 14.4, 13.2 and 16q/ha observed during the study period in comparison with the local check. Various economic indicators like gross expenditure, gross returns, net returns and Benefit: Cost ratios of frontline demonstrations are also presented in (Table-2). The economic indicators clearly showed that the net returns from the recommended practices were substantially higher than the control plot that is, farmers practices during the demonstration

Table-1: Comparison between demonstration package and farmers existing practice in sorghum production

Particulars	Demonstration Package	Farmers Practice
Farming situation	*Rabi*	*Rabi*
Variety	M-35-1	Local
Seed treatment	Seed treatment with Azospirillium @ 500 gm / ha + Seed priming with $CaCl_2$	Nil
Time of sowing	Early *Rabi*	Late *Rabi*
Method of sowing	Line sowing	Broadcast ing
Fertilizer dose	Application of RDF (50:25:0/ha) + $ZnSO_4$ @ 15 kg/ha	30-20- kg/ha
Plant protection measures	Need based application of Imidacloprid @ 0.3 ml/ltr and Hexaconozole @ 1ml/ltr	Nil
Weed management	Atrazine @ 1 kg/ha as pre-emergence spray followed by 2 hand weedings at 30 days after sowing	Nil

Table-2: Yield attributes and Economics of sorghum under demonstration package and existing farmers practice

Year	Area (ha)	No. of Farmers	Seed yield (q/ha)			% increase over control	Demonstration				Control			
			Poten-tial	Demons-tration	Control		Cost of cultivation	Gross returns	Net returns	B: C	Cost of cultivation	Gross returns	Net returns	B: C
2011-12	5	12	30	14.4	12.9	11.6	2750	36000	33250	13.09	3000	32250	29250	10.75
2012-13	5	12	30	13.2	11.8	11.9	11820	33000	21180	2.79	11250	29500	18250	2.62
2013-14	5	12	30	16	14	14.3	7900	28800	20900	3.65	8300	25200	16900	3.04
Average				14.53	12.90	12.60	7490	32600	25110	6.51	7517	28983	21467	5.47

period. The average net returns from the recommended practice were higher (Rs. 25,110/-) in comparison to farmers practice/control plot (Rs. 23,750/-). Additional income was received through the innovative technological interventions that is correct date of sowing, seed treatment, plant protection measures and balanced cultural practices. Economic analysis of the yield concluded that the benefit: cost ratios of demonstration plots (6.50) were significantly higher over control (5.46). The authors like Hiremath *et al*. (2007) in onion, Kumar *et al.* (2010) in bajra, Mishra *et al*. (2009) in potato, Sharma (2003) in moth bean, Gurumukhi and Mishra (2003) in sorghum and also Singh *et al.* (2007) reported similar findings. The benefit: cost ratios of the system proved the economic viability of the interventions made under demonstration and convinced the farmers on the utility of the interventions. The results of frontline demonstrations showed that the yield of sorghum could be increased with the help of innovative technological intervention coupled with the proper management of pest and diseases. High benefit: cost ratio also advocated the economic viability of the demonstration which motivates the farmers towards adoption of interventions demonstrated. Similar results were also reported by others, namely Mukherjee (2003), Mishra *et al.* (2009), Tiwari *et al*. (2003), Tiwari and Saxena (2001) and Haque (2000) in different crops.

The results of FLDs convincingly brought out that the yield of sorghum has increased with the intervention on balanced nutrition coupled with the disease and pest management in the Kalaburagi region. It can be concluded that frontline demonstration conducted under the close supervision of scientists is one of the most important tool of extension to demonstrate newly released crop production and protection technologies and its management practices in the farmers' field under different agro-climatic regions and farming situations. FLDs are playing important role in motivating the farmers for adoption of improved agriculture technology resulting in increasing their yield and profits. Keeping in view of importance in transfer of technology, FLDs should be designed and conducted carefully and effectively and provisions should be made for other supportive extension activities such as field days, interaction meeting, etc. for speedy dissemination of demonstrated technology among farming community.

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