The Pharma Innovation Journal 2021; SP-10(9): 707-710

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(9): 707-710

www.thepharmajournal.com
Received: 13-07-2021
Accepted: 15-08-2021

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An impact assessment on the socio-economic conditions of foxtail millet cultivated areas of Kurnool district through front line demonstrations

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Abstract
Small millets though rich in nutrients often popularly known as nutri-cereals, the area and productivity under small millet cultivation is low. One of the major constraints of traditional small millet cultivation is low productivity due to lack of knowledge on recommended package of practices and high yielding varieties. To replace this inconsistency of practices, AICRP on Small Millets, Regional Agricultural Research Station, Nandyal has conducted front line demonstrations in the farmer's field. Farmers were provided with the inputs (improved varieties and package of practices). This resulted in higher yield than that of the farmer's practices.

Keywords: socio-economic, foxtail millet, front line demonstrations

Introduction
Small millets are the oldest cultivated crops in India since ancient times. India is considered as hub for these minor crops, according to the latest data, the world total production of millet grains at last count was 762,712 metric tonnes and the top producer was India with an annual production of 334,500 tonnes contributing 43.85% (http://faostat.fao.org/site/339/default.aspx). They are often grown as dry land crops in dry tracts of India, Popularly known as poor mans crop. Small millets as dry land crops are adversely effected by biotic and abiotic stress yet gives considerable yield. Though they are small millets no small in nutritional aspects. Saleh *et al.*, reported that in addition to their nutritive value, several potential health benefits such as preventing cancer and cardiovascular diseases, reducing tumor incidence, lowering blood pressure, risk of heart disease, cholesterol and rate of fat absorption, delaying gastric emptying, and supplying gastrointestinal bulk have been reported for millet. Due to this speciality the small millets can stand best to compete and overcome the nutritional security. Among Small millets cultivated throughout India. In Andhra Pradesh small millets are grown in area of 21,000 ha with production 16000 tonnes and with a productivity of 762 kg/ha (www.indiastat, 2017). In Kurnool district among small millets grown foxtail millet occupies a considerable area and is one of the major staple crop of tribal and dryland areas of Andhra Pradesh. Though small millets occupy a reasonable area the productivity is very low due to use of local varieties by farming communities and are grown under low input conditions or even left after sowing without any management practices (Pradhan *et al.*, 2010) [5] On the darker side, these are underutilized and neglected crops owing to their lower preference driven by affluence, longer time and efforts involved in processing of the millets and the lower cooking quality. If these problems could be solved, their high nutritional value can make them doubly valuable as food for farming families and a potential source of income. All India coordinated research on Small Millets was initiated in the year 1886 at Regional Agricultural Research, Nandyal. Through Front Line Demonstrations improved varieties and production technologies were disseminated to the farmers of Kurnool and Ananthapur district. In addition to be nutritionally rich due to short growing period they can be cultivated in multicropping systems and dryland farmers can fetch higher income and thereby higher net returns and become potential source of income.

Materials and Methods
The present study was carried out to know the impact of high yielding varieties on the yield potential of small millets. The Regional Agricultural Research Station, Nandyal under All India Co-ordinated Research Project on Small millets (AICRPSM), conducted Front line

demonstrations during kharif season 2018 and 2019. Two varieties of foxtail millet *viz*., SiA 3156 and Suryanandi were demonstrated to farmers of Kurnool district. The farmers were selected based on the surveys during diagnostic visits, training programmes. Orientation training was conducted to the beneficiaries related to the package of practices of foxtail millet cultivation. The root cause for the lower productivity of small millets is due to use of local cultivars and lack of knowledge on improved packages on small millet cultivation. In improved package of practices, good quality seed, recommended balanced fertilizer, line sowing and timely sowing, effective plant protection and chemical and manual weed management and frequent monitoring was made to the farmer's field during cropping season (Table 1). Yield data were collected from farmer's practices and improved practices. Cost of cultivation, gross return, net return and benefit cost ratio (B: C ratio) were computed and analysed.

B: C ratio = Net income (Rs. / ha) / cost of cultivation (Rs. / ha)

% increased over farmers practices = Improved practices – Farmers practices / farmers practices x 100

Table 1: Details of FLD demonstrated villages and mandals during the year 2018

S. No.	Villages covered	Mandals covered	Varieties demonstrated
1	Gopavaram	Mahanadi	SiA 3156 and Suryanandi
2	G. Thanda	Oravakal	
3	Husainapuram	Oravakal	
4	Pudicherla	Oravakal	
5	Kuravalli	Alur	
6	Basnepalli	Maddikera	
7	Chandrapalli	Peapully	
8	Kothaburuju	Dhone	
9	Yellarthi	Holagonda	
10	Ternekal	Devanakonda	
11	Yerragudi	Banaganapalle	
12	Meerapuram	Banaganapalle	
13	Yagantipalle	Banaganapalle	
14	Cherlokothuru	Banaganapalle	
	Total area demonstrated		20 ha
	No. of farmers covered		30

Table 2: Results of high yielding cultivars under FLD during kharif 2018

S. No.	Cultivar	Grain yield (kg ha^{-1})	Fodder yield (kg ha^{-1})	Cost of cultivation (Rs.ha^{-1})	Gross return (Rs.ha^{-1})	Net return (Rs.ha^{-1})	B:C ratio
1	Suryanandi	1713	1704	13964	40769	26804	2.821
2	SiA 3156	1620	1596	13781	38522	24756	2.707
	Mean of improved varieties	1666	1650	13872	39645	25780	2.764
	Farmer practice	1313	1266	12050	31218	18155	2.59

Table 3: Details of FLD demonstrated villages and mandals

S. No.	Villages covered	Mandals covered	Varieties demonstrated
1	Kothapalli	Bethamcherla	SiA 3156 and Suryanandi
2	Illuru Kothapeta	Bethamcherla	
3	Yagantipalli	Banaganapalli	
4	Nandavaram	Banaganapalli	
5	Sakunala	Oravakal	
6	Konthalapadu	Oravakal	
7	Kannamadakala	Oravakal	
8	Nannor	Oravakal	
9	Thellapuri	Gosupadu	
10	Jillela	Banaganapalle	
11	Sanjamala	Sanjamala	
12	Dornipadu	Chakrajuvemula	
13	Sirivella	Gumparaman dinne	
14	Gadivemula	Nandayala	
15	Kaluvula	Oravakal	
16	Penchikalapadu	Gudur	
	Total area demonstrated		20 ha
	No. Of farmers covered		34

Table 4: Results of high yielding cultivars under FLD during kharif 2019

S. No.	Cultivar	Grain yield (kg ha^{-1})	Fodder yield (kg ha^{-1})	Cost of cultivation (Rs.ha^{-1})	Gross return (Rs.ha^{-1})	Net return (Rs.ha^{-1})	B:C ratio
1	Suryanandi	2017	3060	12975	39388	26593	3.08
2	SiA 3156	2042	3016	12823	39039	26331	3.05
	Mean of improved varieties	2030	3030	12809	39214	26462	3.06
	Farmer practice	1404	2088	10148	26937	16791	2.63

Table 5: Mean data of FLD for 2018-19 and 2019-20

S. No.	Cultivar	Grain yield (kg ha^{-1})			Fodder yield (kg ha^{-1})			Cost of cultivation (Rs.ha^{-1})			Gross return (Rs.ha^{-1})			Net return (Rs.ha^{-1})			B:C ratio		
		2018	2019	Mean	2018	2019	Mean	2018	2019	Mean	2018	2019	Mean	2018	2019	Mean	2018	2019	Mean
1	Suryanandi	1713	2017	1865	1704	3060	2382	13964	12975	13470	40769	39388	40079	26804	26593	26699	2.821	3.08	2.95
2	SiA 3156	1620	2042	1831	1596	3016	2306	13781	12823	13302	38522	39039	38781	24756	26331	25544	2.707	3.05	2.88
	Mean	1666	2030	1848	1650	3030	2340	13872	12809	13341	39645	39214	39430	25780	26462	26121	2.764	3.06	2.92
	FP	1313	1404	1358	1266	2088	1677	12050	10148	11099	31218	26937	29078	18155	16791	17473	2.59	2.63	2.61

Table 6: % yield increase of FLD over Farmers practice

Varieties	% increase in grain yield			% increase in straw Yield			Mean increase in gross returns over Farmers practice	Mean increase in gross returns over Farmers practice
	2018	2019	Mean	2018	2019	Mean	11001	9226
Suryanandi	30.46	43.66	37.06	34.60	46.55	40.57	9703	8071
SiA 3156	23.38	45.44	34.41	26.07	44.44	35.26	10352	8648
Mean	26.88	44.59	35.74	34.60	45.11	39.86		

Results and Discussions

Small millet crops are rainfed crops grown by small and marginal farmers. The area under small millet has declined over a past few years and its cultivation majorly confined to the traditional growing areas. The knowledge on cultivation of improved packages of practices and high yielding varieties are lacking among the farming communities. Front line demonstrations are conducted every year with the funding of AICRP on Small millets in different parts of Kurnool district based on the survey on socio economic conditions of the farmers and area under small millet cultivation. In 2018 Foxtail millet varieties *viz.*, Suryanandi and SiA 3156 were demonstrated to about 30 in 2018 farmers and to 34 farmers in 2019 with improved package of practices of small millet cultivation. Front line demonstrations (FLDs) undertaken by the RARS, Nandyal to popularize the improved production technologies of small millets and have yielded better results not only in increasing the yield levels of the crops but also in increasing the utility of these crops for home consumption. The study to assess the economic impact of the FLDs on the district economic scenario revealed worth noticing impacts. The pooled data of two years revealed that grain yields of varieties suryanandi and SiA 3156 were recorded 1865 kg/ha and 1831 kg/ha respectively with an yield advantage of 37.06% and 34.41% over farmers practice. This showed that there was a positive and significant increase in the mean yield of demonstration plots over the farmer practice. The main reasons of the low yield of foxtail millet control plots in villages were the use of poor quality seeds and traditional cultivation methods with poor nutrient and weed management practices. The improved package of practices *viz*., high yielding variety, optimum seed rate, sowing time, integrated nutrient management, weed management practices. This finding is also observed by Vanishree (2018) [10], Mishra (2019) [4], Sunitha (2020) [9], Poonia TC and Pithia MS (2011) [6]. In the years 2018 and 2019 the increase in straw yield is observed over a period of two years. The pooled straw yields of varieties *viz*., Suryanandi (2382 kg/ha) and SiA 3156 (2306 kg/ha) noted higher straw yields compared to farmers practice (1677 kg/ha) with an yield advantage of 40.57% (Suryanandi) and 35.26% (SiA 3156) compared to farmers practice of cultivating local varieties. This results are in confirmation with the findings of Ashwani Kumar Thakur *et al.*, 2017 [1]. This increase in grain yields and straw yields fetched higher economic returns in turn brought an impact on socio-economic conditions of the farmer. Cultivation of improved varieties gave higher gross returns and net returns compared to cultivation of low yielding cultivars. In comparison with farmers practice additional net income of 9226 Rs./ha (Suryanandi) and 8071Rs./ha (SiA 3156) were gained by the farmers. Considering all the frontline demonstrations the highest benefit cost ratio was found in average 2.95 and 2.98 in demonstration plot for the varieties suryanandi and SiA 3156 respectively. Hence there is a wide scope to increase the area and production of foxtail millet crop by providing need based training and demonstration on improved production technology to the farmers. This results are in similarity with the observations of Laxmi Rawat, 2019 [3].

Conclusion

The grain as well as fodder yield under improved practices recorded higher than the farmers' practices, which not only increased the yield per unit area but also enhanced the farmers' income. However, a wide gap in potential yields, demonstration yields and farmers plot yields indicating that there is a need of proper dissemination of location specific technologies imbedded with high yielding varieties to improve productivity and profitability of rainfed farming of Kurnool

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