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Enhancing rice yields and farmer livelihoods through improved seed varieties under tribal sub plan

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Abstract

Rice productivity in many regions of Mancherla and Komurambheem Asifabad remains constrained due to the continued cultivation of traditional varieties with lower yield potential. To address this issue and promote improved varieties among resource-poor farmers, frontline demonstrations were conducted by Krishi Vigyan Kendra, Bellampalli. In the years, 2019–20 to 2021–22, under the Tribal Sub Plan (TSP) of KVK Bellampalli Mancherla district 389 number of farmers from 15 villages in 8 mandals of Mancherla and Komurambheem Asifabad district were benefitted with the distribution of paddy foundation seed which includes 123 bags of KNM 118 (kharif and rabi), 85 bags of JGL 24423 (Kharif), 40 bags of JGL 18047 (Kharif), 23 bags of improved sambamashuri. The demonstrations revealed that improved varieties outperformed the locally cultivated varieties in terms of yield and economic returns. Among the paddy varieties evaluated, JGL 24423 recorded the highest yield of 6175 kg ha⁻¹, representing a 12.5% increase over the local variety, followed by KNM 118 (6050 kg ha⁻¹; 10.7% increase) and JGL 18047 (5910 kg ha⁻¹; 8.6% increase), whereas Improved Sambamashuri (RP Bio-226) recorded a 2.3% lower yield than the local variety. Economic analysis showed that JGL 24423 registered the highest net returns (Rs. 55,412 ha⁻¹) and B:C ratio (2.05), followed by KNM 118 and JGL 18047. Farm-level results also indicated significant yield advantages over the local variety (2160 kg acre⁻¹), with JGL 24423 recording the highest yield (2470 kg acre⁻¹) followed by KNM 118 (2420 kg acre⁻¹) and JGL 18047 (2364 kg acre⁻¹). Overall, the demonstrations produced 146,740 kg of rice and generated Rs. 30,27,180.4 income, highlighting JGL 24423 and KNM 118 as promising varieties for improving rice productivity and farmer income in Tribal adopted villages of Krishi Vigyan Kendra, Bellampalli, Mancherla district.

Keywords: Rice productivity, improved paddy varieties, frontline demonstrations, krishi vigyan kendra bellampalli

Introduction

Paddy is the second most extensively cultivated crop in the Mancherla district next to cotton and is also grown in selected pockets of Kumuram Bheem Asifabad, an aspirational district of Telangana. Despite the expansion in cultivated area, productivity levels in both districts remain below the potential yield. The major constraints identified include limited availability of quality, high-yielding varieties and suboptimal crop management practices. The area under paddy cultivation in Mancherla district witnessed a substantial increase expanding from 39,548 hectares during 2018–19 to 65,431 hectares in 2019–20. This sharp rise was primarily attributed to improvements in groundwater availability and the completion of irrigation infrastructure projects which encouraged farmers to shift towards paddy cultivation. Agriculture continues to be the principal livelihood source for Scheduled Tribe (ST) communities in rural Telangana. However, low crop productivity, inadequate access to improved inputs and limited exposure to scientific farming practices have constrained farm income and livelihood security. The Tribal Sub Plan (TSP) are targeted policy initiatives aimed at ensuring equitable resource allocation and socio-economic advancement of these marginalized communities. In this context, Krishi Vigyan Kendra, Bellampalli implemented systematic interventions in paddy cultivation under TSP in Mancherla and Kumuram Bheem Asifabad districts where paddy is a major kharif crop. The interventions emphasized the distribution of high-yielding varieties, promotion of scientific

nutrient management and implementation of Integrated Pest Management (IPM) practices. The present investigation was therefore undertaken to assess the impact of these interventions on crop productivity, rice yield enhancement and economic returns of beneficiary farmers intern livelihood security.

Materials and Methods

After the establishment of Krishi Vigyan Kendra in the year 2018 at Bellampalli mandal of Mancherial district. KVK Bellampalli conducted detailed socio-economic survey, need assessment in the adopted tribal villages and DFI (Doubling of Farmers Income) villages in accordance with the guidelines i.e., the tribal population should be more than 90 per cent. The survey report and need assessment study revealed that majority (95 per cent) of the farmers having poor knowledge on the high yielding new paddy varieties followed by (94 per cent) of the famers were unaware of new innovative technologies and having less knowledge on the best management practices in getting the higher yields. Based on this report and keeping in view of doubling the farmers income, Krishi Vigyan Kendra Bellampalli carried out the technical programme comprising of the capacity building programmes, exposure visits, skill training programmes, on farm trials and cluster front line demonstrations. Krishi Vigyan Kendra, Bellampalli, Mancherial district strategically worked out the Tribal Sub Plan of 2019-20,

2020-21 to benefit the large group of the ST farmers with the provision of high yielding paddy varieties to replace with the existing local low yielding paddy varieties available in the local markets of Mancherial district and Kumuram Bheem Asifabad aspirational district. Accordingly, from the TSP budget, high yielding paddy varieties were distributed to the tribal farmers at free of cost which were procured from Research stations of Professor Jayashankar Telangana State Agricultural University (presently PJTAU) and Indian Institute of Rice Research, Hyderabad (IIRR). A total of 941 tribal farmers were benefitted which include 389 number of tribal farmers were benefitted with the distribution of university seed KNM 118, JGL 18047 (Bathukamma), JGL 24423 (Jagtiala Rice 1) under the Tribal Sub Plan of KVK, Bellampalli, Mancherial district, where as KVK Bellampalli in collaboration with the Indian Institute of Rice Research, Hyderabad benefitted 552 number of tribal farmers from Mancherial and KB Asifabad districts with the distribution of the JGL 24423, JGL 18047 and Improved Samba Mahsuri (RP Bio-226). In the year, Tribal Sub Plan of 2019-20, 223 farmers (200 farmers in rabi season and 23 farmers in summer season) residing in 15 villages of 8 mandals of Mancherial district were benefitted with the distribution of paddy seed of 25 kg bags i.e., 100 bags of KNM 118, 60 bags of JGL 24423, 40 bags of JGL 18047 and 23 bags of KNM 118 mentioned in table 1.

Table 1: Details of the Tribal farmers benefitted under TSP 2019-20:

Sl. No.	Paddy variety	Year/Season	Name of villages	No. of farmers benefitted
1	KNM 118, JGL 24423, JGL18047	2019-20/Rabi (Yasangi)	Mannegudem, Somagudem, Mutyampalli, Dubbagudem, Lamabdi thanda, Gatrampalli, Andugulapet, Pulimadugu, Mailaram, Yellaram, Kundelpahad, Nayakampeta, Metaplli, Koyagudem, Mannegudem	200
2	KNM 118	2020/ Summer	Lambadithanda (K)	23
			Total	223

Under the Tribal Sub Plan, 2020-21 of KVK Bellampalli Mancherial district, 166 number of tribal farmers residing in 18 villages of 4 mandals respectively were benefitted with the

distribution of 166 bags of KNM 118 each 25 kgs during Rabi 2020-21. The details were given in the table 2.

Table 2: Details of the Tribal farmers benefitted under TSP 2020-21

Sl. No.	Paddy variety	Year/ Season	Name of villages	No. of farmers benefitted
1	KNM 118	2020-21 Rabi (Yasangi)	Sandgoan, Burgupalli, Nagaram, Chinnagudam, Peddagopalpur, Gadapur, Babanagar, Narvaipet, Karpalagattam, Challampet, Chandaram, Gudipet (Jandavenakatapur), Dharmraopet, Pallamguda, Somagudem, Buggagudem, Dampur (Jajaravelli), Budhakalan	166

To benefit larger number of tribal farmers, Krishi Vigyan Kendra, Bellampalli, Mancherial district in collaboration with Indian Institute of Rice Research, Rajendranagar, Hyderabad, 552 number of tribal farmers residing in the 20 villages of 8 mandals belongs to the Mancherial and Komurumbheem

Asifabad districts were benefitted with the distribution of Improved Samba Mahsuri (RP Bio-226) and JGL 18047, JGL 24423 during the years 2019-20 and 2020-21. The details were given in Table 3. Further the characteristics of distributed paddy varieties were given in Table 4.

Table 3: Details of the Tribal farmers benefitted under ICAR-IIRR-TSP rice 2019-20 and 2020-21

Sl. No.	Paddy variety	Year/Season	Name of villages	No. of farmers benefitted
1	Improved Samba Mahsuri (RP Bio-226)	2019/ Kharif (Vanakalam)	Yellaram, Perkapalli (LT), Narvaipet, Manneguda, Somagudem, Malkapalli, Savanpalli	152
2	JGL18047, JGL 24423	2019-20/ Rabi (Yasangi)	Burgupalli, Thanimadugu, Kundelpahad, Beruguda, Challampeta, Mamidipalli	200
3	Improved Samba Mahsuri (RP Bio-226)	2020-21/ Kharif (Vanakalam)	Karnapet, Lambadihetti, Ooru mandamarri, Manneguda (Lambadithanda), Gudipet (Savanpally) Chandaram, challampet	200

Table 4: Detail characteristics of the distributed paddy varieties under TSP

Varietal name	KNM 118 (Kunaram Sannalu)	JGL 18047 (Bathukamma)	JGL 24423 (Jagtiala Rice 1)
Developed by	ARS, Kunaram, PJTSAU	RARS Jagtial, PJTSAU	RARS Jagtial, PJTSAU
Released through	SVRC, 2015	SVRC, 2015	SVRC, 2019
Recommended seasons	<i>Kharif and Rabi</i>	<i>Kharif and Rabi</i>	<i>Kharif and Rabi</i>
Duration (Days)	Kharif: 118-120 days, Rabi: 120 -125 days	Kharif: 115-120 days, Rabi: 130 days	Kharif: 120 - 125 days, Rabi: 135 - 140 days
Maturity group	Short duration	Short duration	Short duration
Yield potential	7000 – 8000 kg ha ⁻¹	7000 – 8000 kg ha ⁻¹	8500 kg ha ⁻¹
Grain type	Long slender grain	Long slender grain	Long bold grain
Special characters	Resistant to leaf blast and moderately resistant to neck blast Less shattering and non-lodging	Tolerant to BPH, BLB, Blast and Cold	Resistant to gall midge (biotype 1,3 & 5), Tolerant to BPH, Blast and brown spot, Tolerant to cold at nursery stage, less shattering and non-lodging

Results and Discussion

Yield and Income from the distributed varieties

The performance of different rice varieties was evaluated in comparison with the locally available rice varieties (check) with respect to grain yield and economic returns. The results revealed considerable variation among the tested varieties, indicating the potential advantages of improved cultivars in enhancing productivity and profitability under the prevailing agro-climatic conditions.

The data presented in Table 5 revealed considerable variation in grain yield and economic returns among the rice varieties evaluated. The locally available rice varieties (check) recorded a grain yield of 5400 kg ha⁻¹ with a cost of cultivation of Rs. 53,300 ha⁻¹, resulting in gross returns of Rs. 94,500 ha⁻¹, net returns of Rs. 41,200 ha⁻¹ and a B:C ratio of 1.77. Among the improved varieties, JGL 24423 recorded the highest grain yield of 6175 kg ha⁻¹ representing a 12.5% increase over the check, followed by KNM 118 with 6050 kg ha⁻¹ (10.7% increase) and JGL 18047 with 5910 kg ha⁻¹ (8.6% increase). In contrast, improved Sambamashuri (RP Bio-226) recorded a yield of 5275 kg ha⁻¹, which was 2.3% lower than the locally available varieties this may be due to tolerant to cold at nursery stage, less shattering and non-lodging characteristics as mentioned above and also the higher yield observed in these varieties may be attributed to their improved genetic potential, better adaptability to local conditions and favourable yield-contributing traits. These findings highlight the advantage of improved rice cultivars in maximizing yield compared with traditional or farmer-saved varieties. In contrast, Improved Sambamashuri (RP Bio-226) recorded a slightly lower yield than the local varieties despite having a relatively lower cost of cultivation. The lower yield might be associated with varietal characteristics such as its tolerance to cold at the nursery stage, reduced

shattering and non-lodging nature, which may influence growth duration or yield components under the given field conditions. Although the yield was comparatively lower, the variety still recorded a slightly higher B:C ratio than the local varieties due to reduced cultivation costs. Overall, the results suggest that JGL 24423 followed by KNM 118 and JGL 18047 are more productive and economically profitable compared to the locally available rice varieties. Therefore, promotion and adoption of these improved varieties could significantly enhance rice productivity and profitability for farmers under similar agro-climatic conditions.

Economic analysis indicated that JGL 24423 recorded the highest gross returns (Rs. 108,625 ha⁻¹), net returns (Rs. 55,412 ha⁻¹) and B:C ratio (2.05) followed by KNM 118 with net returns of Rs. 53,075 ha⁻¹ and B:C ratio of 2.00 and JGL 18047 with net returns of Rs. 51,065 ha⁻¹ and B:C ratio of 1.97. Although RP Bio-226 had a relatively lower cost of cultivation (Rs. 50,500 ha⁻¹), its lower yield resulted in gross returns of Rs. 92,312 ha⁻¹, net returns of Rs. 41,813 ha⁻¹ and a B:C ratio of 1.82. Overall, higher net returns and B:C ratio were recorded with JGL 24423 followed by KNM 118, JGL 18047, and RP Bio-226, whereas the lowest net returns and B:C ratio were recorded with the locally available rice varieties, indicating the superior performance of JGL 24423 and KNM 118 under the study conditions. The higher profitability from this variety was mainly due to its higher grain yield without a substantial increase in cost of cultivation. Similarly, KNM 118 and JGL 18047 also recorded higher net returns and B:C ratios compared to the locally available varieties, confirming their economic viability for cultivation under the study conditions. The improved economic returns from these varieties demonstrate that adoption of high-yielding varieties can significantly enhance farm income.

Table 5: Details of compared yield and economics of the rice varieties

Sl. No.	Variety	Yield (kg/ha)	% Increase in yield compared to check	Average Cost of cultivation per ha	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
1	Locally available rice varieties (check)	5400	--	53300	94500	41200	1.77
2	KNM 118	6050	10.7	52800	105875	53075	2.00
3	JGL 24423	6175	12.5	52650	108625	55412	2.05
4	JGL 18047	5910	8.6	52360	103425	51065	1.97
5	Improved Sambamashuri (RP Bio-226)	5275	-2.3	50500	92312	41813	1.82

Table 6: Details of compared yield and economics of the rice

Sl. No.	Variety	No. of farmers	Yield/ acre	Yield difference with the local variety	Difference in net income with the local variety	Total yield in kgs	Total income
	Local variety	-	2160.0 kgs	0	0	0	0
1	KNM 118	315	2420.0 kgs	260.0 kgs/ac	Rs. 4750.0	81900	1496250
2	JGL 24428	150	2470.0 kgs	310 kgs/ac	Rs. 5684.8	46500	852720
3	JGL 18047	150	2364.0 kgs	204.0 kgs/ac	Rs. 3946.0	30600	591900
4	Improved Sambamashuri (RP Bio-226)	352	2110.0 kgs	(-) 50 kgs/ac	Rs. 245.2	(-) 12260	86310.4
				Grand Total		146740	3027180.4

The data in Table 6 indicate the yield performance and economic benefits of different rice varieties compared to the local variety under farmers field conditions. The local variety recorded an average yield of 2160 kg acre⁻¹ which served as the baseline for comparison. Among the improved varieties, JGL 24428 recorded the highest yield (2470 kg acre⁻¹) with a yield advantage of 310 kg acre⁻¹ and an additional net income of Rs. 5684.8 per acre. This variety was cultivated by 150 farmers, producing 46,500 kg total yield and generating Rs. 8,52,720 total incomes. KNM 118, adopted by 315 farmers, recorded 2420 kg acre⁻¹, which was 260 kg acre⁻¹ higher than the local variety resulting in an additional net income of Rs. 4750 per acre and generating the highest total income of Rs. 14,96,250 with a total yield of 81,900 kg. Similarly, JGL 18047 produced 2364 kg acre⁻¹, showing a yield advantage of 204 kg acre⁻¹ and an additional net income of Rs. 3946 per acre, with 30,600 kg total yield and Rs. 5,91,900 total incomes from 150 farmers. In contrast, Improved Sambamashuri (RP Bio-226) recorded a lower yield (2110 kg acre⁻¹) with a yield reduction of 50 kg acre⁻¹ compared to the local variety, generating 12,260 kg total yield and Rs. 86,310.4 total income from 352 farmers. Overall, the improved varieties together produced a total yield of 146,740 kg and generated Rs. 30,27,180.4 total income, indicating that JGL 24428 and KNM 118 performed better in terms of yield advantage and economic returns under the study conditions.

Conclusion

Tribal Sub plan has played a significant role in adopting high yielding newly released varieties in Mancherial and Kumurambheem Asifabad districts in Telangana because of continuous capacity building programmes, exposure visits to fields where on farm trials were conducted. The impact of TSP was reflected through the increase in yields, net returns and B: C Ratio by adopting KNM 118, JGL 18047, JGL 24423 and RP BIO- 226 when compared with locally cultivated varieties.

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