A-6013
[1-5]

Assessment of Frontline Demonstration on Rice Production in Telangana

M. Shankar[1], Shaik N. Meera[4], S. Arunkumar[4],
R.V.T. Balazzii Naaik[2], K. Sumalini[3], V. Ravindernaik[3]

10.18805/IJARe.A-6013

ABSTRACT

Background: Rice is a major cereal crop and a staple food for more than half of the world's population. Frontline demonstrations on rice with improved rice varieties, production and protection technologies were organized to increase crop productivity and profitability of farmers.

Methods: Frontline demonstrations (FLD) on rice with recently released short-duration varieties, RNR 15048 and KNM 118 and proven technologies in crop production and crop protection were conducted on farmer's fields by Krishi Vigyan Kendra, Kampasagar, PJTSAU, Nalgonda, Telangana during the *kharif* seasons of 2017-2019.

Result: Higher mean yield (6314.0 kg ha^{-1}) was obtained in improved varieties RNR 15048 and KNM 118 with the latest agro-technologies such as seed treatment with carbendazim @ 1g lt^{-1} of water, seed rate @ 62.5 kg ha^{-1}, application of carbofuran 3G in rice nursery, recommended dose of fertilizers in the main field, need-based plant protection practices such as formation of alleyways, installation of pheromone traps at 25 DAT, application of carbofuran 3G @ 25 kg ha^{-1}, spraying of Pymetrozine @ 250 g ha^{-1} to control brown plant hopper in rice against the local check MTU 1010 (5823.0 kg ha^{-1}) in the farmers' practice and on an average 8.3% superiority was observed over the farmer's practice. Yield contributing traits like plant height (85.3 cm), number of tillers m^{-2} (343.3), effective tillers m^{-2} (319.0), panicle length (21.0 cm) and straw yield (4904.3 kg ha^{-1}) were maximum in improved practice against the farmers' practice, except test weight (24.7 g). Improved practices resulted in higher gross returns (Rs. 1, 10, 890 ha^{-1}), net returns (Rs. 61,675 ha^{-1}) and B: C ratio (1:2.3) than the farmer's practice.

Key words: Economics, Growth attributes, Rice, Short-duration varieties, Yield.

INTRODUCTION

Rice (*Oryza sativa* L.) crop plays a key role for food security of Telangana as well as the country. In India, rice occupies an area of 43.78 m ha with a total production of 118.43 mt and an average productivity of 2705.0 kg ha^{-1}. In Telangana, rice is cultivated in an area of 3.2 m ha with a production of 11.9 mt and a productivity 3700.0 kg ha^{-1} and in Nalgonda district the total area, production and productivity worked out to be 2.8 lakh ha, 9.6 lakh tonnes and 3440 kg ha^{-1}, respectively (Anonymous, 2020). The area under rice in Nalgonda district is nearly about 10 per cent of total area in Telangana where it is grown in *Kharif* and *Rabi* seasons. Mostly the farmers of this region cultivate long duration (150 - 165 days), fine grain popular rice variety BPT-5204 and early duration fine grain private bred varieties like Ankur Puja, Chintu and bold grain early duration public bred variety MTU-1010 *etc.* which covers more than 95% of the rice grown area. As the area is under rice based cropping system, the crops grown during *rabi* season after rice face the problem of late sowing and the productivity of *rabi* field crops was affected by high temperatures coinciding with grain filling stage and summer showers received in March at harvesting. Moreover, the cultivated fine grain varieties are highly susceptible to biotic stresses like BPH and Blast. There is hardly any scope to replace the rice crop under Nagarjuna Sagar Project Ayacut Area. However, multiple cropping system using early duration rice varieties following intensive input management practices may enhance the land use efficiency and increase the production level if sowing of *rabi* crops are made in time (Khanda *et al*., 2005). Hence, there remains a scope to introduce early duration high yielding rice varieties in the existing rice-based cropping system in Nalgonda district.

[1]Regional Agricultural Research Station, Palem, Professor Jayashankar Telangana State Agricultural University, Nagarkurnool-509 215, Telangana, India.
[2]All India Coordinated Research Project on Forage Crops, Professor Jayashankar Telangana State Agricultural University, Rajendranagar-500 030, Hyderabad, India.
[3]College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar-500 030, Hyderabad, India.
[4]ICAR-Indian Institute of Rice Research, Rajendranagar, Rajendranagar-500 030, Hyderabad, India.

Corresponding Author: M. Shankar, Regional Agricultural Research Station, Palem, Professor Jayashankar Telangana State Agricultural University, Nagarkurnool-509 215, Telangana, India.
Email: shankar.ento2007@gmail.com

How to cite this article: Shankar, M., Meera, S.N., Arunkumar, S., Naaik, R.V.T.B., Sumalini, K. and Ravindernaik, V. (2023). Assessment of Frontline Demonstration on Rice Production in Telangana. Indian Journal of Agricultural Research. doi:10.18805/IJARe.A-6013.

Submitted: 24-05-2022 **Accepted:** 20-02-2023 **Online:** 05-06-2023

The technological gap is thus the major problem in the efforts of increasing agricultural production in the country. A need of the day is to reduce the technological gap between the agricultural technology recommended by the scientist and its acceptance by the farmers on their field. Keeping in view the significance of transfer of technology the present investigation attempts to study the yield gaps between front line demonstration trials and farmers' yield, extent of technology adoption and benefit cost ratio.

Front line demonstrations (FLDs) on rice include recently released early maturing, high yielding, fine/bold grained, disease resistant varieties with integrated nutrient management (INM), integrated weed management (IWM) and integrated pest management (IPM) in farmers' field may be useful (Teekam *et al*., 2015). Early duration rice varieties RNR 15048 (fine grain) and KNM 118 (bold grain) have the potential grain yields of 7.0 to 7.5 t ha^{-1} and are suitable for both *kharif* and *rabi* seasons. These varieties mature in 120-125 days in both the seasons which helps to escape heavy rain fall at the time of harvesting *i.e*., November and March during *kharif* and *rabi*, respectively. The lack of improved high yielding varieties, prolonged dry spells, constant warm temperature and high moisture levels that encourage the prevalence of pest and diseases (Samant, 2017), delayed sowing, lack of quality seed, imbalanced fertilizer use and weeds are contributing to the low yields in farmer's fields (Zamir *et al*., 2014). As a result, there is a significant yield gap between farmer's yield and potential yield. Short-duration rice varieties are best suited for growing two or three crops per year (Bagchi *et al*., 2012), whereas recently developed short-duration cultivars have good grain quality, photo insensitive (Islam *et al*., 2016). These are more favourable to escape insect damage, non-lodging, sale the produce at a higher price due to early arrival in the market (Xu *et al*., 2018), reduce greenhouse gas emissions (Hasan, 2014) and escape drought (Ohno *et al*., 2018).

Professor Jayashankar Telangana State Agricultural University (PJTSAU) consistently conducted rigorous research in the field of crop improvement, released and notified new short duration rice varieties *i.e*., RNR 15048 and KNM 118 in 2015 and 2016, respectively. Telangana Sona (RNR-15048) is semi-tall (100 to 115 cm), with short duration (125 days), high yielding (6.5-7.0 t ha^{-1}) with 10-15 ear bearing tillers and long panicle (24-25 cm) and short slender and super fine variety. It is resistant to blast and less BPH incidence, suitable for late sowing conditions. The variety has more than 67% of head rice recovery. Low Glycemic Index variety of 51.0 (Chandramohan *et al*., 2021). The rice culture, KNM 118 is a good alternate variety to mega rice variety, MTU 1010 as it exhibits high yield potential (7.0-8.0 t ha^{-1}) with good test weight and is less prone to grain shattering and lodging at the time of harvest when compared to MTU 1010. It has plant height of 100-106 cm (semi-dwarf) and tolerance to leaf and neck blast and outperformed MTU 1010 in terms of yield, less grain shattering, lodging and disease resistance (Tamilazhaki *et al*., 2020). Hence, FLDs were planned to assess the performance of newly introduced rice varieties *i.e*., RNR 15048 and KNM 118 during three consecutive *kharif* seasons from 2017 to 2019 under real farm situations.

MATERIALS AND METHODS

Krishi Vigyan Kendra, Kampasagar conducted FLDs on rice under irrigated conditions at the Nagarjunasagar left canal area using a cluster approach in three successive *kharif* seasons from 2017 to 2019. The scientists had gathered baseline data on the selected villages before conducting the cluster frontline demonstrations. Farmers were selected through focus groups, interaction meetings, awareness campaigns and field trips. To identify farmer's fields, soil samples were taken at a depth of one meter and analyzed. Each demonstration was taken up in one hectare area while, the nearby field was served as farmer's practice. The recommended practices include using the high yielding, short duration rice varieties *viz*., RNR 15048 and KNM 118, seed treatment with Carbendazim @ 1g lt^{-1} of water, seed rate @ 62.5 kg ha^{-1}, carbofuran 3G application @ 200 g cent^{-1} in rice nursery, recommended dose of fertilizer application (120:60:40 kg ha^{-1}) in the main field and adopting need-based plant protection practices, such as formation of alleyways at the time of transplanting leaving 30 cm row at every 2 m, installation of pheromone traps @ 10 ha^{-1} at 25 days after transplanting to monitor the incidence of yellow stem borer, application carbofuran 3G @ 25 kg ha^{-1} to control yellow stem borer and leaf folder, spraying Pymetrozine @ 250 g ha^{-1} to control brown plant hopper and hexaconazole @ 1 L ha^{-1} for management of sheath blight in rice. Whereas, farmer's practices include traditional agricultural practices that have been adopted by farmers with MTU 1010 as local check. Farmers were advised to adhere to the improved package of practices suggested by KVK scientists in demonstration plots. To spread awareness of the technology among the local farmers, the KVK scientists arranged extension activities such as method demonstrations, farmer-scientist interactions, training, routine field monitoring in collaboration with extension personnel from the Department of Agriculture. Data was collected from farmer's practices and demonstration plots and determined the percent gain or decrease in yield over the check by using standard formula. The observations on plant height, tillers, effective tillers, panicle height, test weight, straw yield and gross returns, net returns and benefit-cost ratio were recorded in improved and farmers' practice as per the standard method.

Per cent gain or decrease yield over the check (%) =

$$\frac{\text{Yield of Improved practice (kg ha}^{-1}\text{) - Yield of farmer's practice (kg ha}^{-1}\text{)}}{\text{Yield of farmer's practice (kg ha}^{-1}\text{)}} \times 100$$

RESULTS AND DISCUSSION

The study revealed that the grain yields were increased successively over the years in demonstration plots. The maximum demonstration yield (6723.3 kg ha^{-1}) was achieved during 2019-20, which was19.42% higher than the demonstration yields of 2017-18 (5630.0 kg ha^{-1}). Over the three years, average grain yield in demonstration was 6314.4 kg ha^{-1} and the increase in yield was from 3.3-12.7 per cent with the mean of 8.3% (Table 1). The higher grain yields in demonstration plots were due to cultivation of high yielding short duration rice varieties *viz*., RNR 15048 and KNM 118 which were found better than the local variety MTU 1010, seed treatment to protect pests and diseases at the nursery stage, early transplantation of seedlings, soil test-based fertilizer application, application of pre and post-emergence herbicides immediately after transplanting and at 20 DAT and granular application of carbofuran 3G @ at 25 DAT, installation of pheromone traps, spraying pymetrozine to control Brown plant hopper and Hexconazole for managing sheath blight. This clearly indicated that the positive effects of front line demonstration over existing farmers practice towards the enhancement of yield of rice with its positive effects on yield attributing characters. Similar findings were found by Geeta *et al*. (2017) who reported that frontline demonstration with improved practices led to higher yields in rice. Sagar and Ganesh (2003) also observed higher yields in rice with high-yielding improved rice cultivars. Frontline demonstration on rice had a significant impact on grain yield with improved agro-technologies (Mubarak and Shakoor, 2019) and Jogender *et al*. (2021) also reported higher yields in frontline demonstrations over the farmer's practice in mungbean. The frontline demonstrations conducted on blackgram, greengram, chickpea, rajmash and lentil with improved varieties in Poonch District of Jammu Kashmir resulted in higher yields in demonstrations against local check varieties (Sanjeevkumar *et al*., 2019). All the growth and yield attributes had a significant increase under demonstration as compared to farmers practice (Table 2). Average of three years indicated that plant height (85.3 cm), number of tillers (343.3 tillers m^{-2}), effective tillers (319.0 tillers m^{-2}), panicle length (21.0 cm) and straw yield (4904.3 kg ha^{-1}) were high in improved practice than the farmer's practice with plant height (71.7 cm), tillers m^{-2} (300.0), effective tillers m^{-2} (239.0), panicle length (18.6 cm) and straw yield (4730.3 kg ha^{-1}), respectively. The test weight was higher in farmers' practice (24.7 g per 1000 seeds) as compared to improved practice (21.6 g per 1000 seeds). The variations in climatic conditions that prevailed during the crop growth period may be observed in yield changes over successive years. Similar findings were reported by Samant (2015) in improved technology that recorded higher yields against farmer's practice. Specific interventions may have a stronger impact on boosting rice productivity depending on the farming condition (Mukherjee, 2003).

The mean higher gross returns, net returns and B: C ratio were recorded in improved practice were Rs. 1,10,890.0 ha^{-1}, Rs. 61,765.0 ha^{-1} and 2.3, respectively than the farmer's practice Rs. 1,01,157.5 ha^{-1}, Rs. 47,150.0 ha^{-1} and 1.9, respectively (Table 1). This might be due to the adoption of recently released high yielding short duration rice varieties, soil test-based fertilizer application, timely transplanting and plant protection measures, regular field monitoring, diagnostic visits, contact phone calls with farmers and

Table 1: Yield performance and economics of rice between improved practice and farmer's practice under front line demonstrations during *kharif* 2017 to 2019.

Year	Yield (kg ha^{-1}) %		Increase yield over control	Gross returns (Rs ha^{-1})		Cost of cultivation (Rs ha^{-1})		Net returns (Rs ha^{-1})		B:C ratio	
	Improved practice	Farmer's practice		Improved practice	Farmer's practice	Improved practice	Farmer's practice	Improved practice	Farmer's practice	Improved practice	Farmer's practice
2017-18	5630.0#	5450.0#	3.3	92332.0#	87745.0#	53750.0#	56400.0#	38582.0#	31345.0#	1.7#	1.6#
2018-19	6590.0#	6055.0#	8.8	117302.0#	106568.0#	46250.0#	52752.0#	71052.0#	53816.0#	2.5#	2.0#
2019-20	6723.3#	5965.0#	12.7	123037.0#	109159.5#	47375.0#	51791.7#	75662.0#	57367.8#	2.6#	2.1#
Average	6314.4	5823.3	8.3	110890.3	101157.5	49125.0	53647.9	61765.3	47509.6	2.3	1.9
t-value	1.25*										
p-value	0.05										

#Mean of 15 farmers; *Non-Significant at P=0.05%.

Table 2: Comparison between improved practice and farmer's practice on growth and yield attributes in rice during *kharif* 2017 to 2019.

Year	Plant height (cm)		Tiller Number m^{-2}		Effective tillers m^{-2}		Panicle length (cm.)		Test weight (g.)		Straw yield (kg ha^{-1})	
	Improved practice	Farmer's practice	Improved practice	Farmer's practice	Improved practice	Farmer's practice	Improved practice	Farmer's practice	Improved practice	Farmer's practice	Improved practice	Farmers' practice
2017-18	80.0	66.0	336.0	296.0	311.4	216.0	20.7	18.6	20.9	24.0	4437.0	4301.0
2018-19	86.0	68.0	331.0	294.0	323.3	233.0	20.0	18.8	21.6	24.9	4894.0	4862.0
2019-20	90.0	81.0	363.0	310.0	322.2	268.0	22.4	18.4	22.2	25.1	5382.0	5028.0
Average	85.3	71.7	343.3	300.0	319.0	239.0	21.0	18.6	21.6	24.7	4904.3	4730.3

*****

farmer-scientist interaction meetings that reduced the cost of cultivation and gained higher net returns and high benefit-cost ratio in demonstration plots over the control plots during the three years of study. The variation in net return and benefit-cost ratio in the years of the study may be attributed to the variation in the price of agri inputs and produce as well. These findings were in agreement with that of Mandavkar *et al.* (2012) in rice. Similarly, Samant (2017); Verma *et al*. (2016) and Mitra *et al*. (2014) reported that FLDs on rice recorded maximum net returns with a high B: C ratio. Mubark and Shakoor (2019) also obtained maximum gross returns, net returns and B: C ratio in FLDs with improved technologies in rice. Madanmohan *et al*. (2021) and Jayalakshmi *et al*. (2021) observed higher gross returns, net returns and benefit-cost ratio in demonstrations as compared to farmer's practice.

CONCLUSION

The findings of the study revealed that wide yield gap existed in improved practice *vs* farmers' practice. By conducting front line demonstrations of proven technologies, yield potential of rice can be increased to a great extent. This will substantially increase the income as well as the livelihood of the farming community. Thus, under sustainable agricultural practices, FLD programmes are very effective in educating the farmers in adoption of improved technologies.

Conflict of interest: None.

REFERENCES

Anonymous, (2020). Directorate of Economics and Statistics, Department of Agriculture, Co-operation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare. DAC, Govt. of India.

Bagchi, B.D., Bardhan, R., Jaim, W.H. and Hossain, M. (2012). Diversity, Spatial Distribution and the Process of Adoption of Improved Rice Varieties in West Bengal. In: Adoption and Diffusion of Modern Rice Varieties in Bangladesh and Eastern India. [Hussain, M., Jaim, W.H., Paris, T.R. and Hardy, B. (eds.)]. International Rice Research Institute, Los Banos. Philippines, pp. 161-214.

Chandra Mohan, Y., Krishna, L., Surenderraju, Ch., Damodharraju, C., Varma, N.R.G., Jagadeeshwar, R., Kiranbabu, T. and Raghurami, R.P. (2021). Telangana sona (RNR 15048): A short duration, low glycemic, super fine grain, high yielding rice variety. Journal of Rice Research. 14(2): 56-62.

Geeta, R.C., Sunil, G.P. and Kacha, D.J. (2017). Popularization of improved variety of rice mahisagar through frontline demonstrations in Gujarat. Gujarat Journal of Extension Education. 28(1): 109-111.

Hasan, E. (2014). Proposing mitigation strategies for reducing the impact of rice cultivation on climate change in Egypt. National Water research centre. Egypt science direct. Water Science. 27: 69-77.

Islam, M.R., Sarker, M.R.A., Sharma, N., Rahman, M.A., Collard, B.C.Y., Gregorio, G.B. and Ismail, A.M. (2016). Assessment of adaptability of recently released salt tolerant rice varieties in coastal regions of South Bangladesh. Field Crops Research. 190: 34-43.

Jayalakshmi, M., Prasadbabu, G., Chaithanya, B.H., Bindhupraveena, R. and Srinivas, T. (2021). Impact of soil test based fertilizer application on yield, soil health and economics in rice. Indian Journal of Extension Education. 57(4): 147-149.

Jogender, S., Singh, K., Hemender and Premdeep. (2021). Impact assessment of frontline demonstrations on summer mung productivity under irrigated agro-ecosystem of Haryana. Legume Research. 44(12): 1470-1474.

Khanda, C.M., Mandal, B.K. and Garnayak, L.M. (2005). Effect of nutrient management on nutrient uptake and yield of component crops in rice-based cropping systems. Indian Journal of Agronomy. 50: 1-5.

Madanmohan, M., Ramalakshmi Devi, S., Srinivasulu, D.V and Veeraiah, A. (2021). Performance assessment of cluster frontline demonstrations in chickpea (*Cicer arietinum* L.) for productivity enhancement under rainfed vertisols of YSR District andhra Pradesh. Agricultural Science Digest. 41(1): 66-70.

Mandavkar, P.M., Sawant, P.A. and Mahadik, R.P. (2012). Evaluation of front line demonstration trials on rice in raigad district of Maharashtra. Rajasthan Journal of Extension Education. 20: 4-6.

Mitra, B., Mukherjee, S. and Biswas, S. (2014). Promotion of short duration rice variety Gotra Bidhan-1 (IET 17430) through front line demonstrations in terai region of West Bengal. Journal of Crop and Weed. 10(1): 111-114.

Mubark, T. and Shakoor, A. (2019). Impact assessment of technological interventions for reducing yield gaps in rice (*Oryza sativa* L.) under temperate hill ecology. Journal of Krishi Vigyan. 7(2): 140-143.

Mukherjee, N. (2003). Participatory Learning and Action. Concept Publishing Company, New Delhi, India, pp. 63-65.

Ohno, H., Banayo, N.P., Bueno, C., Kashiwagi, J., Nakashima, T., Iwama, K. and Kato, Y. (2018). On-farm assessment of a new early-maturing drought-tolerant rice cultivar for dry direct seeding in rainfed lowlands. Field Crops Research. 219: 222-228.

Sagar, R.L. and Ganesh Chandra. (2003). Performance of frontline demonstration on *kharif* rice (*Oryza Sativa* L.) in Sundarban, West Bengal. Journal of the Indian Society of Coastal Agricultural Research. 21(2): 69-70.

Sanjeevkumar, Vishal, M., Pawan, K.S. and Suraj Prakash. (2019). Impact of front line demonstrations on the production and productivity of moong (*Vigna radiata* L), mash (*Vigna mungo* L), rajmash (*Phaseolus vulgaris* L), lentil *(Lens culinaris* L) and chickpea (*Cicer aeritinum* L) under rainfed ecology in mid hills of J and K, India. Legume Research. 42(1): 127-133.

Samant, T.K. (2017). Evaluation of front line demonstration on drought tolerant rice (*Oryza sativa* L.) variety satyabhama in Mid Central Table land Zone of Odisha. International Journal of Bio-resource and Stress Management. 8(6): 871-876.

Samant, T.K. (2015). Impact of front line demonstration on yield and economics of hybrid rice (Rajalaxmi). Indian Journal of Agriculture Research. 49(1): 88-91.

Tamilazhaki, L., Vijaya kumari, R., Suhasini, K., Seema, Srinivasachary, D., Janaiah, A. and Damodarraju, C. (2020). Constraints in adoption of improved rice varieties of PJTSAU. Multilogic in Science. 10(34): 909-911.

Teekam, S., Pun, K.B., Satapathy, B.S., Kanchan Saikia and Lenka, S. (2015). Incremental yield and returns from rice variety Naveen in front line demonstrations-an analysis. Oryza. 52(1): 59-64.

Verma, S.D., Singh, P., Singh, N.K. and Singh, V.K. (2016). Promotion of rice variety NDR 8002 in rainfed lowland condition of Eastern Uttar Pradesh. International Journal of Bio-resource and Stress Management. 7(4): 761-765.

Xu, L., Zhan, X., Yu, T., Nie, L., Huang, J., Cui, K. and Peng, S. (2018). Yield performance of direct-seeded, double-season rice using varieties with short growth durations in central China. Field Crops Research. 227: 49-55.

Zamir, A., S.K., Singh, P.K., Gautam, R.K. and Dam Roy, S. (2014). Yield gap analysis of rice through frontline demonstrations in Tropical Andaman Islands. Journal of Indian Society of Coastal Agricultural Research. 32(2): 1-7.