

## Response of rice-rice cropping system to different agronomic management practices

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### ABSTRACT

*Experiments were conducted during dry and early wet seasons of 2007-08 and 2008-09 in farmers fields to study the effect of different agronomic management practices on yield and net returns of rice-rice cropping system in 12 different mandals of Nellore district of Andhra Pradesh. The results revealed that yields of rice-rice cropping system were significantly higher over farmers' practices, by adoption of all the recommended package of practices which includes maintenance of optimum plant population and application of recommended dose of NPK and zinc fertilizers at right stages of the crop growth to both the crops in the cropping system.*

**Key words:** *nutrient management, rice-rice cropping system, optimum plant population*

Rice-rice is the foremost cropping system in Nellore district of Andhra Pradesh. Mostly the fertilizer application is based on the single crop rather than the cropping system as a whole. The imbalanced continual as well as indiscriminate use of fertilizers in the intensive cropping system is leading to decrease in crop yields (Mishra and Kapoor 1992). Plant population is another yield limiting factor especially in short and medium duration rice varieties. Hence a study was undertaken to find out the response of rice-rice cropping system to different agronomic management practices.

Experiments were conducted in 24 farmer fields of Buchireddipalem, Dagadarti, Kodavaluru, Vidavaluru, Kovur and Thotapalli gudur mandals during dry season and early wet seasons of 2007-08 and in 24 farmers' fields of Indukurpet, Sangam, Muthukur, Nellore Rural, Kovur and Kodavaluru mandals during dry and early wet seasons of 2008-09. The soil was sandy clay loam to clay loam with a  $P^H$  range of 6.25 to 8.32. The EC of the soil were ranging between 0.12 to 3.35 and low to high in organic carbon (0.12 to 1.09%), available N (133 to 314 kg ha<sup>-1</sup>),  $P_2O_5$  (14.3 to 58.7 kg ha<sup>-1</sup>) and  $K_2O$  (105 to 776 kg ha<sup>-1</sup>). The experiment was conducted with four different agronomic management practices at 24 locations in randomized block design. The rice variety NLR-34449 (Nellore Mahsuri) was sown during dry season 2007-

08 and 2008-09. The rice varieties NLR-30491 (Bharani) and NLR-34242 were sown during early wet season 2008-09, respectively. The four different agronomic management practices adopted in dry season and early wet season were farmers practice (Planting rice randomly in zig-zag manner without maintaining the optimum plant population (22-28 hills m<sup>-2</sup>), imbalanced and improper application (top dressing of phosphorus) of fertilizers without any basal application of  $ZnSO_4$ , maintenance of optimum plant population, recommended package of practices (15X 15 cm spacing with 120:60:40 kg N,  $P_2O_5$  and  $K_2O$  ha<sup>-1</sup> in dry season and 15X10 cm spacing with 120:60:40 kg N,  $P_2O_5$  and  $K_2O$  ha<sup>-1</sup> in early wet season, application of fertilizers at right time as well as application of  $ZnSO_4$  @ 50 kg ha<sup>-1</sup> to both the crops in the cropping system and basal application of  $ZnSO_4$  @ 50 kg ha<sup>-1</sup> along with farmers practice. Influence of these treatments on grain yield and net returns of rice were studied in rice-rice cropping system.

Grain yield of rice in rice-rice cropping system were significantly influenced by different agronomic management practices (Table 1). The results of the experiments conducted in rice-rice cropping system during dry and early wet seasons of 2007-08 and 2008-09 indicated that traditional practice which was adopted by the farmers resulted in grain yield of 5.67 t ha<sup>-1</sup>, 7.00

**Table 1.** Grain yields (t ha<sup>-1</sup>) of rice in rice-rice cropping system as influenced by different agronomic management practices.

Treatment	Grain yield (t ha <sup>-1</sup> )			
	Dry season 2007-08	Early wet season 2008	Dry season 2008-09	Early wet season 2009
Farmers practice (FP)	5.62	6.16	7.00	6.64
FP + Improved planting management Recommended package of practices	5.98	6.64	7.71	7.51
FP+ZnSO <sub>4</sub> 50 kg ha <sup>-1</sup>	6.63	6.92	8.24	7.96
CD (P=0.05)	6.23	6.44	7.43	7.26
	0.17	0.23	0.32	0.18

t ha<sup>-1</sup> during dry season 2007-08 and 2008-09, respectively and 6.16 and 6.64 t ha<sup>-1</sup> only during early wet season 2008 and 2009, respectively. With the adoption of optimum plant population the yields increased by 6.4% (5.97 t ha<sup>-1</sup>) and 10.2% (7.71 t ha<sup>-1</sup>) during dry season 2007-08 and 2008-09, respectively and 4.83% (6.64 t ha<sup>-1</sup>) and 13.0% (7.51 t ha<sup>-1</sup>) during early wet season 2008 and 2009, respectively. Similar results were obtained by Nandini Devi and Ibopishak Singh (2000) and Yadav and Tripathi (2008). Early and medium duration varieties responded positively to the optimum plant population densities and showed increased yields, which might be to their short vegetative phase when compared to the long vegetative phase of long duration varieties. This shortage time for tillering is compensated by optimum number of hills m<sup>-2</sup>. With the basal application of ZnSO<sub>4</sub> @ 50 kg ha<sup>-1</sup> to both the rice crops in the cropping system along with farmers practice increased the grain yield by 10.8% (6.23 t ha<sup>-1</sup>) and 6.2 (7.43 t ha<sup>-1</sup>) during dry season 2007-08 and 2008-09, respectively and 4.46% (6.44 t ha<sup>-1</sup>) and 9.4% (7.26 t ha<sup>-1</sup>), respectively during early wet season 2008 and 2009. Results indicate that zinc application is required for both the rice crops in the cropping system as against the existing recommendation of zinc application once in three seasons. Similar results were reported earlier by Rajendra Prasad *et al.*, 2000. Adoption of all recommended package of practices resulted in 17.9% (6.63 t ha<sup>-1</sup>) and 17.8% (8.24 t ha<sup>-1</sup>), respectively during early wet season 2008 and 2009. This shows the significance of optimum plant population, balanced fertilizer application and need of zinc application to both the crops instead of one crop in a

cropping system to increase the yields which in turn positively influences the net returns.

Higher net returns of the rice in rice-rice cropping system was realized with the adoption of recommended package of practices in both the year of experimentation (Table 2). This might be due to higher

**Table 2.** Net returns (₹ ha<sup>-1</sup>) of rice in rice-rice cropping system as influenced by different agronomic management practices.

Treatment	Net returns (₹ ha <sup>-1</sup> )				
	Dry season 2007-08	Early wet season 2008	Dry season 2008-09	Early wet season 2009	Mean
Farmers practice (FP)	25,038	33,894	38,542	21,509	29,746
FP + Improved planting management Recommended package of practices	25,926	36,250	45,600	25,247	33,256
FP + ZnSO <sub>4</sub> 50 kg ha <sup>-1</sup>	33,744	40,861	53,682	30,623	39,728
50 kg ha <sup>-1</sup>	28,693	35,967	42,874	23,795	33,832

grain yield and lower cost of cultivation than farmers practice which in contrast results in higher cost of cultivation and lower grain yield.

Maintenance of optimum plant population densities resulted in increased yield. The need of zinc application to both the crops in rice-rice cropping system is clearly demonstrated as against the existing recommendation of zinc application once in three seasons.

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