

## Response of rice crop to major nutrients in rice - rice cropping system

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### ABSTRACT

*Experiments were conducted during rabi and early kharif seasons of 2007-2008 and 2008-09 in farmers fields to find out the effect of major nutrients on yield and nutrient uptake of rice in rice-rice cropping system in ten different mandals of Nellore district of Andhra Pradesh. The results revealed that response of rice crop to the nitrogen alone or in combination with phosphorus and potassium was found to be significant. Application of the three nutrients at their recommended doses of 120-60-40 kg ha<sup>-1</sup> during rabi and early kharif resulted the highest yield and nutrient uptake.*

**Key words:** *nitrogen, phosphorus and potassium nutrients, rice-rice cropping system*

Rice - rice is the foremost cropping system in the Nellore district of Andhra Pradesh. Nitrogen, phosphorus and potassium are the three major elements, which were most important both in terms of the extent of their deficiencies in the soil and in terms of their potentials for crop yield increases or losses. Nitrogen is the nutrient limiting growth in most of the rice soils (Savant and Datta, 1982) and there have been indications that many of the rice soils in Andhra Pradesh are becoming deficient in phosphorus and potassium. The decline in productivity of rice and wheat with continuous cropping was related to deficiency of P, K, S, Zn and imbalanced nutrition (Kumar and Yadav, 2005). Hence, a study was under taken to study the response of rice crop to nitrogen, phosphorus and potassium nutrients under continuous cropping of rice in farmers fields.

Experiments were conducted in 24 farmers fields of Buchireddipalem, Dagadarti, Kodavaluru, Vidavaluru, Kovur and Thotapalli Gudur mandals during dry season (October/ November-February/March) and early wet season (May/June-September/ October) seasons of 2007-08 and in 24 farmers fields of Indukurpet, Sangam, Muthukur, Nellore Rural, Kovur and Kodavaluru mandals during dry season and early wet season seasons of 2008-09. The soil was clay loam to sandy clay loam with a P<sup>H</sup> range of 6.13 to 8.25. The EC of the soil were ranging between (0.14 to 1.09%),

available N (128 to 323 kg ha<sup>-1</sup>), P<sub>2</sub>O<sub>5</sub> (14.3 to 56.3 kg ha<sup>-1</sup>) and K<sub>2</sub>O (125 to 682 kg ha<sup>-1</sup>). The experiment was conducted with five different treatments with 24 replications 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 2007-08 and 2008-09 respectively. The five different treatments adopted in the dry season and early wet season seasons were No fertilizer (N<sub>0</sub>P<sub>0</sub>K<sub>0</sub>)(T<sub>1</sub>), application of nitrogen alone @ 120 kg ha<sup>-1</sup>(T<sub>2</sub>), application of nitrogen @ 120 kg ha<sup>-1</sup>and phosphorus @ 60 kg ha<sup>-1</sup> (T<sub>3</sub>), application of nitrogen @ 120 kg ha<sup>-1</sup>and potassium @ 40 kg ha<sup>-1</sup> (T<sub>4</sub>) and application of nitrogen @ 120 kg ha<sup>-1</sup>and phosphorus @ 60 kg ha<sup>-1</sup> and potassium @ 40 kg ha<sup>-1</sup> (T<sub>5</sub>). The effect of these treatments on the grain yield and nutrient uptake of rice crop were studied.

Grain yields of rice in rice-rice cropping system were significantly influenced by different nutrients. The results of the experiments conducted in rice-rice cropping system during dry season and early wet season seasons of 2007-08 & 2008-09 indicated that the response of rice crop to the nutrient N alone or in combination with P and K was found to be significant (Table 1). Application of the three nutrients at their recommended doses of 120:60:40 kg ha<sup>-1</sup> resulted in

**Table 1. Grain yield (kg ha<sup>-1</sup>) of rice as influenced by different treatments**

| Treatment  | Grain yield (kg ha <sup>-1</sup> ) |                         |                 |                         |
|--|------------------------------------|-------------------------|-----------------|-------------------------|
|  | Rabi<br>2007-08                    | Early<br>kharif<br>2008 | Rabi<br>2008-09 | Early<br>kharif<br>2009 |
| T <sub>1</sub> :N <sub>0</sub> P <sub>0</sub> K <sub>0</sub> | 4670                               | 5068                    | 6125            | 4558                    |
| T <sub>2</sub> :N  | 6246<br>(33.8)                     | 6728<br>(32.8)          | 7752<br>(26.6)  | 5708<br>(25.2)          |
| T <sub>3</sub> :NP   | 7038<br>(50.7)                     | 7521<br>(48.4)          | 8352<br>(36.4)  | 6290<br>(38.0)          |
| T <sub>4</sub> :NK   | 6794<br>(45.5)                     | 7815<br>(54.2)          | 8635<br>(41)    | 6590<br>(45.6)          |
| T <sub>5</sub> :NPK  | 7640<br>(63.6)                     | 8626<br>(70.2)          | 9756<br>(59.3)  | 7898<br>(73.3)          |
| SE.m+/-  | 86                                 | 99.2                    | 130.4           | 84                      |
| CD at 5%   | 242                                | 279                     | 367             | 236                     |

• Values in parenthesis are percentage increase in yield over control

the highest grain yield of 7640 kg ha<sup>-1</sup> and 9756 kg ha<sup>-1</sup> during dry season 2007-08 and 2008-09 respectively and 8626 kg ha<sup>-1</sup> and 7898 kg ha<sup>-1</sup> during early wet season 2008 and 2009, respectively. Yadav *et al.* (1998) showed that significant yield decline in rice in the treatments with imbalanced application of N, P and K fertilizers (120-0-0, 120-35-0, 120-0-33). Significant yield increase was observed with addition of each omitted major nutrients and gave nearly equivalent yield as complete fertilization i.e. continuous NPK fertilizer treatment. Similar extent of yield increase was also

**Table 2. Response of rice crop per kilo gram of N, P and K applied**

| Dry season<br>2007-08 |      |      | wet season<br>2008 |      |      | Dry season<br>2008-09 |      |      | Wet season<br>2009 |     |      |
|-----------------------|------|------|--------------------|------|------|-----------------------|------|------|--------------------|-----|------|
| N                     | P    | K    | N                  | P    | K    | N                     | P    | K    | N                  | P   | K    |
| 19.7                  | 14.1 | 15.1 | 13.8               | 13.5 | 27.6 | 13.6                  | 10.0 | 22.1 | 9.6                | 9.7 | 22.0 |

observed when all NPK fertilizers were applied (Shah *et al.* 2008). This indicating that every soil needs complete addition of NPK fertilizers irrespective of seasons whether the plot was continuously fertilized or not.

The response of rice in terms of kg grain produced per kg of N,P and K were found to be 19.7, 14.1 and 15.1 kg during dry season 2007-08 and 13.6,10.0 and during dry season 2008-09, 13.8,13.5 and 27.6 during early wet season 2008 and 9.6,9.7 and 22.1 kg during early wet season 2009. The response for N, P and,K nutrients was higher during dry season than compared to early wet season. Among the three nutrients higher response was observed for potassium. This might be due to non application or application of potassium fertilizers at lower doses by farmers. Higher uptake of nitrogen, phosphorus and potassium was recorded with treatment which received recommended dose of N P K fertilizers.

**REFERENCES**

Savant N K and S K De Datta 1982. Nitrogen transformation in wetland rice soils. *Advances in Agronomy* 35:241-302

Kumar A and D S Yadav 2005. Influence of continuous cropping and fertilization on nutrient availability and productivity of alluvial soil. *Journal of Indian society of soil science* 55(2) : 194-198

Yadav R L, D S Yadav, R M Singh and A. Kumar 1998. Long term effects of inorganic fertilizer inputs on crop productivity in a rice-wheat cropping system. *Nutro. cycl. Agroecosyst.* 51 : 193-200

Shah A L, M R Islam, M M Haque, M Ishaque and M A M MIAH 2008. Efficacy of major nutrients in rice production. *Bangladesh Journal of Agriculture Research* 33(3) : 639-645