Plant Archives Vol. 15 No. 1, 2015 pp. 267-269 *ISSN 0972-5210*

EFFECT OF STCR TECHNOLOGY FOR TARGETED YIELD IN RICE

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Abstract

Soil testing helps the farmers to use fertilizers according to needs of crop. Fertilizer use for targeted yield is an approach, which takes into account the crop needs and nutrients present in the soil. Average productivity of rice Chhattisgarh was 1425 kg ha^{-1} in 2007-08, much lower than the other prominent rice producing states. This might be due to unbalanced nutrient management, which is one of the important reasons for low productivity. For evaluating the effect of STCR (Soil Test Crop Response) equations for targeted yield of rice developed by department of Soil Science, I.G.K.V., Raipur (C.G.), India, demonstrations based on targeted yield in rice were conducted at farmers field by Krishi Vigyan Kendra, Bhatapara at different locations in total area of 0.8 ha for improved rice & 0.4 ha for hybrid rice during *Kharif* 2008. The STCR technology were used for computation of fertilizer doses based on soil test values & targeted yield in hybrid rice 80 q ha^{-1} & improved rice 60 q ha^{-1} and compared with general recommended dose of 150 : 80 : 60 N, P_2O_5 and K_2O kg ha^{-1} for hybrid rice and 100: 60: 40 N, P_2O_5 and K_2O kg ha^{-1} for inbred rice as farmers practice. The demonstrated STCR technology was able to increase yield of hybrid rice & improved rice over the framers practice 11.7 and 13.9 per cent, respectively. Value of net returns from demonstrated STCR technology was observed to be Rs. 48579 & Rs. 35117 in comparison to farmers practice *i.e.* Rs. 42080 & Rs. 18080, respectively for hybrid rice & improved rice. The Benefit Cost ratios of STCR technology and farmers practice were 3.67 & 3.35 and 3.38 & 2.27, respectively for hybrid rice & improved rice. The STCR technology was effective in changing attitude, skill and knowledge of farmers. This also improved the relationship between farmers and scientists and built confidence between them.

Key words : STCR (Soil Test Crop Response) technology, target yield, rice, NPK fertilizer.

Introduction

Degradation of soil health has also been reported due to long-term imbalanced use of fertilizer nutrients. Although, overall nutrient use ($N:P_2O_5:K_2O$) of 4:2:1 is considered ideal for Indian soils, the present use ratio of 6.8:2.8:1 is far off the mark. This imbalance nutrient use has resulted in wide gap between crop removal and fertilizer application. Long-term experiments, in India has in general showed that P and K status in soils at all centres has gone down when only N was applied. The partial factor productivity of fertilizers during the last three and half decades showed a declining trend from 48 kg food grains/kg NPK fertilizer in 1970-71 to 10 kg food grains/ kg NPK fertilizer in 2007-08 (Aulakh and Benbi, 2008; SubbaRao and Reddy, 2009). Multi-nutrient deficiencies have led to the concept of Site-Specific Nutrient Management (SSNM). The number of nutrient-elements deficient in Indian soils increased from just one in 1950 to nine in the year 2005-06, which might further increase by the year 2025 if the imbalanced fertilization continues. Due to inadequate knowledge about soil and crop requirement, costly inputs like fertilizers, chemicals, water and other inputs go waste, resulting in monetary loss and adverse effect on environment. The current status of nutrient use efficiency is quite low in case of P (15-20%), N (30-50%), S (8-12%), Zn (2-5%), Fe (1-2%) and Cu (1-2%). Declining soil fertility and mismanagement of plant nutrients have made this task more difficult. Balanced NPK fertilization has received considerable attention in India (Gosh *et al*., 2004; Hegde *et al*., 2004 and Prasad *et al*., 2004). Soil testing helps the farmers to use fertilizers according to needs of crop. Fertilizer use for targeted yield (Ramamoorthy *et al*., 1967) is an approach, which takes in to account the crop needs and nutrients present in the soil. In the intensive agriculture system integrated fertilizer recommendation is an urgent need since, it balance soil and applied nutrients from inorganic as well as organic sources to balance nutrition of crops and maintenance of soil health.

Rice crop occupies prominent place in agriculture economy of Chhattisgarh, it occupies 3573020 ha. of land with the average productivity of 1425 kg ha^{-1} much lower

Table 1 : Effect of STCR technology in terms of yield and economic parameters in rice.

Crop	Target yield (q ha^{-1})	Demonstration yield (q ha^{-1})	Farmers Practice yield (q ha^{-1})	Increase in yield (%)
Paddy (hybrid) 6444	80	74.2	66.4	11.7
Improved rice variety	60	55.6	48.8	13.9

Table 2 : Effect of STCR technology in terms of average cost of cultivation, gross return, net returns and B:C ratio.

Crop	Cost of cultivation (Rs./ha)		Gross Return (Rs./ha)		Net Return (Profit) (Rs./ha)		B:C Ratio	
	Demo	FP	Demo	FP	Demo	FP	Demo	FP
Paddy (hybrid) 6444	18201	17680	66780	59760	48579	42080	3.67	3.38
Improved rice variety	14923	15840	50040	43920	35117	28080	3.35	2.27

than the northern part of the country (Krishi Diary-2008, IGV, Raipur). This might be due to unbalanced nutrient management which is one of the important reasons for low productivity. For evaluating the effect of STCR (Soil Test Crop Response) equations for targeted yield of rice developed by Department of Soil Science, IGKV, Raipur, demonstration in the area of jurisdiction of KVK, Bhatapara were carried out.

Materials and Methods

Demonstrations based on targeted yield in rice were conducted at farmers field by Krishi Vigyan Kendra, Bhatapara at different locations in total area of 0.8 ha for improved rice and 0.4 ha for hybrid rice during *Kharif* 2008. For evaluating the nutrient supplying capacity of soil in terms of available nitrogen, phosphorus and potassium, soil samples were taken from farmer's field in the area of jurisdiction of KVK, Bhatapara and further after analysis of available nutrients, value of fertilizer nutrients were calculated using appropriate STCR (Soil Test Crop Response) equations for targeted yield of rice developed by department of Soil Science, IGKV, Raipur. The computed value of fertilizer nutrients for their respective yield target were applied at farmers field keeping one local check of general recommended dose. The STCR technology were used for computation of fertilizer doses based on soil test values & targeted yield in hybrid rice 80 q ha^{-1} & Improved rice 60 q ha^{-1} and compared with general recommended dose of 150: 80: 60 N, P_2O_5 and K_2O kg ha^{-1} for hybrid rice and 100: 60: 40 N, P_2O_5 and K_2O kg ha^{-1} for inbred rice as farmers practice. The primary data was collected from the selected farmers with the help of personal interview schedule. The per cent increase in yield & B:C ratio was calculated by using following formula:

Per cent increase in yield = 100 × (Yield of RP – Yield of FP) / Yield of FP.

Where, RP = Recommended Practice; FP = Farmers Practice (GRD)

Benefit - Cost Ratio = Gross Return / Gross Cost.

Results and Discussion

It is clearly indicated in table 1 that demonstrated STCR technology showed higher yield over the farmers practice. The demonstrated STCR technology was able to increase yield of hybrid rice (6444) & improved rice variety over the framers practice 11.7 and 13.9 per cent, respectively. Gosh *et al.* (2004) showed importance of balanced fertilization for maintaining soil health and sustainable agriculture. Singh *et al*. (2008) analyzed comparative response to fertilizer application on the basis of SSNM, State recommendations (SR) and farmers general practice (FP) and clearly found that the FP even though contained higher levels of N or P than SSNM gave lower yields thus advocating the superiority of SSNM.

Economic performance of STCR technology over farmers practice *i.e.* cost of cultivation, gross returns, net returns and B:C ratio are presented in table 2. The data clearly indicated that the net returns from the improved practice (STCR technology) were substantially higher than the farmers practice (GRD) for both the hybrid rice and improved rice. Value of net returns from demonstrated STCR technology was observed to be Rs. 48579 & Rs. 35117 in comparison to farmers practice

i.e. Rs. 42080 & Rs. 18080, respectively for hybrid rice & improved rice. The Benefit Cost ratios of STCR technology and farmers practice were 3.67 & 3.35 and 3.38 & 2.27, respectively for hybrid rice & improved rice.

Conclusion

The nutrient requirement is based on the fact that there is significant linear relationship between nutrient uptake and grain yield. It shows that for required grain yield production, a definite quantity of nutrient must be absorbed by plant. Once the nutrient requirement for a given yield target is known, the fertilizer requirement can be calculated taking in to account the efficiency of soil and fertilizer nutrients. The STCR technology was effective in changing attitude, skill and knowledge of farmers. This also improved the relationship between farmers and scientists and built confidence between them.

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