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Study on the impact of site specific nutrient management technologies in rice under irrigated domains of Kurnool district of Andhra Pradesh

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Abstract

Frontline demonstrations were conducted from 2007 to 2011 in irrigated domains of Kurnool district, Andhra Pradesh to know the usefulness and economic advantage of soil test based nutrient management technology in rice and adoption of integrated nutrient management practices by rice farmers. Five villages were identified and 10 farmers in each of the selected villages were randomly chosen . At the beginning of the demonstrations a base line survey of selected farmers with respect to knowledge and adoption level of different nutrient management practices, rice production costs and productivity levels was carried out. The demonstration of nutrient management technologies covering seven nutrient management practices were conducted in the selected farmer's fields under close supervision of Krishi VIgyan Kendra for a period of five years. After five years, the impact of knowledge and adoption level of soil test based nutrient management technologies and productivity enhancement in rice were assessed. The results clearly indicated that an improvement in knowledge level, adoption level among the selected farmers besides yield advantage and high net income over the existing practice of nutrient application.

INTRODUCTION

The Kurnool and Cuddapah canal and Tungabhadra Low Level canal command area is the most potential belt for paddy cultivation in Kurnool district of Andhra Pradesh. Paddy is being cultivated nearly in one lakh hectares in both Kharif and rabi seasons under all irrigation sources. In order to get highest yields farmers resorted to excess use of chemical fertilizers which affects badly both the soil and crop with nutrient toxicity and deficiency either by over use or inadequate use leading to higher production costs, subsidies on chemical fertilizers and environmental degradation[1]

Five hundred and ninety two (592) frontline demonstrations were organized on *" Soil Test Based Nutrient Management in Rice"* in farmer's fields under irrigated domains of Kurnool district from the year 2007 to 2011, to avoid wasteful expenditure on irrational nutrient(s) application and in rationalizing the apportionment of different nutrient quantities need to be applied to reap maximum returns in paddy from the investment on plant nutrition with financial assistance of ICAR, *Irrigation and Command Area Development (I&CAD)* and *National Bank for Agriculture and Rural Development (NABARD).*

This study was conducted to know the impact of front line demonstrations on Soil Test based nutrient management in rice. Impact of technology assessed based on knowledge, adoptability and sustainability of yield and returns. The specific objectives of the study were to assess the knowledge level of farmers on soil test based nutrient application, cost reduction accrued by adopting this new technology along with constraints in adoption of soil test based nutrient management.

METHODOLOGY

The demonstrations were conducted during the period from 2007 to 2011 in eight mandals of Kurnool district of Andhra Pradesh. The impact of STCR technologies includes ten practices of integrated nutrient management in rice[2]. At the beginning of the programme, a baseline survey of farmers in five villages was carried out and ten farmers from each village whose paddy production cost towards chemical fertilisers was more than Rs.12,500/ha. The knowledge and adoption levels of various technologies were worked out using a three - point scoring pattern[3].Complete Knowledge/adoption was given a score of 3, partial knowledge/adoption was g scored as 2 and no knowledge/ no adoption was given a score of 0 (zero). Thus maximum possible score was 150. The knowledge and adoption indices were worked out by using the following formula.

$$\text{Knowledge/Adoption index (\%)} = \frac{\text{Total score obtained} \times 100}{\text{Maximum possible score}}$$

Based on the knowledge/ adoption index, the farmers were grouped into six categories[5] viz. Complete knowledge/ adoption (100.00 percent), Very high knowledge/adoption (80.00 to 99.00 percent), high knowledge/adoption (60.00 to 79.99 percent), moderate knowledge/adoption (40.00 to 59.99 percent), low knowledge/adoption (20.00 to 39.99 percent), very low knowledge/adoption (0.01 to 19.99 percent), no knowledge / adoption (0.00 percent)

The demonstration of STCR Technology were conducted in twenty five villages among selected farmers under close technical supervision. All the selected farmers were guided and supervised in their fertiliser management practices and regularly recorded the data with respect of number of effective tillers/m^{-2}, grains/panicle, pest and disease incidence and yield. After five years of STCR demonstrations, the knowledge and adoption levels of different technologies were assessed. The fertiliser management and grain yield recorded for the period of five years were tabulated. Further the constraints for low, medium adoption of technologies among the respondents, were documented by using pre structured interview. A simple 't' test is carried out to test the significance of difference in knowledge, adoption indices , grain yield ,cost of production, gross and income level before and after the demonstration of soil test based nutrient management

technology.

SAMPLING PROCEDURE:

SELECTION OF VILLAGES**:** Five villages viz., Dornipadu, Kondapuram, Ramachadrapuram, Bhagyanagaram and Ammireddinagar villages have been selected randomly from KVK adopted villages.

SELECTION OF RESPONDENTS**:** Farmers who are resorting to indiscriminate and excess application of chemical fertilisers and adopting soil test based nutrient management in rice.

SIZE OF THE SAMPLE (N): 50

DATA COLLECTION TOOLS AND METHODS

Interview schedule was prepared and the data from the respondents were collected.(table.1) :

RESULTS AND DISCUSSION:

KNOWLEDGE LEVEL OF SOIL TEST BASED NUTRIENT MANAGEMENT :

The data (table.2) revealed that the results on knowledge level among the respondents clearly indicated an improvement in knowledge level of nutrient management practices which reached very high level of 86.47 percent after the demonstration compared to medium level (46.40 percent) prior to demonstration. Similar trends were noticed in the earlier findings[2].The variation between, before and after demonstration of soil test based nutrient management on knowledge level is found statistically significant at 5 percent level .

ADOPTION LEVEL OF SOIL TEST BASED NUTRIENT MANAGEMENT : The results obtained with respect to adoption of different nutrient management practices before and after the demonstrations among the respondents are presented in Table.3.

The adoption level of most of the nutrient management practices viz., Vermicomposting technique, use of bio-fertilizers, application of urea with neem powder, Soil test based fertilizer application were under very low adoption level (2.67 to 14.00 percent), where as the other practices like green manuring insitu falls under medium category (56.00 per cent)and Split application of Chemical fertilizers belongs to very high category(88.67%) prior to laying of these demonstrations. The average adoption level with respect to nutrient management practices was at low level (34.29 percent).

After demonstration of the technologies, the adoption level of a majority of nutrient application practices were under high to very high level (62.67 to 90.67 percent). The vermi-composting technology witnessed low level of adoption (34.00 percent). Where as medium level of adoption was observed in the usage of bio-fertilisers (56.67 percent).The average adoption level of nutrient management practices was at high level (68.10 percent) indicating an improvement from low (34.29percent) to high (68.10 percent) level of adoption. These results are in tune with the earlier findings [2].

Overall results on adoption level of nutrient management practices among the respondents indicated significant improvement in soil test based nutrient management technologies to high level (68.10 percent) after the demonstration compared to low level (34.29 percent) before the demonstration.

CONSTRAINTS IN ADOPTION OF NUTRIENT MANAGEMENT TECHNOLOGIES:

Of the 7 nutrient management practices covered under soil test based nutrient management, low and medium adoption was recorded for two technologies viz., vermi-composting technique and use of bio-fertilizers. The constraints for low and medium adoption of the said technologies among the respondents were documented and presented in table. 4.

The major constraints for low adoption of vermicomposting technique were, cumbersome process (64.00 percent) and requirement of skills (28.00 percent). Non-availability of inputs (84.00 percent) and non-visible benefit (92.00 percent) were the main constraints as expressed by the respondents for the use of bio-fertilizers which comes under medium adoption level.

YIELD AND ECONOMICS AFTER DEMON-STRATION OF STCR TECHNOLOGY

The data presented in table.5 clearly indicated that the average

Table 1. Interview tools and methods

S.No.	Variables	Measurement method
1	Extent of Crop coverage	Secondary data
2	Knowledge level of the farmers	Interview schedule will be prepared
3	Yield levels for the past five years	Secondary data
4	Adoption of soil test based nutrient management practices	Interview schedule will be prepared
5	Constraints	Open ended questionnaire

Table 2. Impact of demonstrations on Knowledge of soil test based nutrient management practices among respondents: (N=50)

Sl.no	Particulars	Before demonstrations			After demonstration		
		Total score	Index(%)	Category	Total score	Index(%)	Category
1	Soil testing and its importance	54	36.00	L	137	91.33	VH
2	Soil sampling procedure	58	38.67	L	139	92.67	VH
3	Knowledge about the nutrient content in the chemical fertilizers.	38	25.33	L	120	80.00	VH
4	Split application of fertilizers	140	93.33	VH	144	96.00	VH
5	Application of FYM	111	74.00	H	145	96.67	VH
6	Vermicomposting technique	22	14.67	VL	117	78.00	H
7	Green manuring insitu	102	68.00	H	134	89.33	VH
8	Use of bio-fertilisers	56	37.33	L	114	76.00	H
9	Application of neem powder with urea	77	51.33	M	124	82.67	VH
10	Soil test based fertilizer application	38	25.33	L	123	82.00	VH
	Average	**69.6**	**46.40**	**M**	**129.7**	**86.47**	**VH**
	't' Value			**6.35***			

*Significant at 5% Abbreviations : VL-Very low; L-Low; M-Medium; H-High; VH-Very high

grain yield was significantly higher under STCR technology(7227 Kg/ha.) than farmer's existing practice (6904 Kg/ha.).The cost of production was significantly less in STCR trials (Rs. 35763/ha) as compared to farmers practice (Rs. 42196/ha) and net difference in cost of production was Rs.6,433 /ha due to scientific way of chemical fertilizers usage. Gross and net income were significantly higher in STCR demonstrations (Rs. 97009 ha^{-1} and Rs. 61246 ha^{-1}, respectively) as compared to the farmer's practice(Rs. 92837ha^{-1} and Rs. 50641ha^{-1}, respectively).Benefit-cost ratio was also significantly higher in STCR demonstrations(1:2.75)as compared to farmer's practice(1:2.23) due to low cost of production and higher gross income .Similar trends were noticed in earlier findings [1&4].

CONCLUSION:

The adoption of soil test based fertiliser usage through group demonstrations in KC canal commands is one of the solutions to reduce production costs and better soil health for sustainable crop

Table 3. Impact of demonstrations on Adoption of soil test crop response(STCR) based nutrient management practices among respondents

Sl.no	Practice	Before demonstrations			After demonstrations		
		Total score	Index(%)	Category	Total score	Index(%)	Category
1	Split application of Chemical fertilisers	133.00	88.67	VH	136	90.67	VH
2	Application of FYM	99.00	66.00	H	127	84.67	VH
3	Vermicomposting technique	12.00	8.00	VL	51	34.00	L
4	Green manuring insitu	84.00	56.00	M	109	72.67	H
5	Use of biofertilisers	7.00	4.67	VL	85	56.67	M
6	Application of urea with neem powder	21.00	14.00	VL	94	62.67	H
7	Soil test based fertilizer application	4.00	2.67	VL	113	75.33	H
	Average	**51.43**	**34.29**	**L**	**102.14**	**68.10**	**H**
	't' Value			**3.62***			

*Significant at 5% Abbreviations :VL-Very low; L-Low; M-Medium; H-High; VH-Very high

Table 4. Constraints for low and medium adoption of integrated nutrient management technologies(N=50)

Sl.no	Practice	Constraints	Total score	Index(%)
1	Vermicomposting technique	1.Cumbersome process	32	64
		2.Requires skill	38	76
2	Use of biofertilisers	1.No visual benefit	42	84
		2.Non availability of inputs	46	92

production. The specific yield equation based on soil health will not only ensure sustainable crop production but will also steer the farmers towards economic usage of fertilizers depending on their financial status and prevailing market rates of the crops. The same model can be adopted for dissemination of STCR technology in other paddy growing areas to enhance rice productivity and improve soil health besides reduced cost of cultivation towards chemical fertilisers.

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Table 5. Average yield obtained in farmer's fields from the year 2007 to 2011.

Year	Yield (Kg/ha)		Cost of production (Rs /ha)		Gross returns (Rs/ha)		Net returns (Rs /ha)		Benefit cost ratio	
	FP	STCR	FP	STCR	FP	STCR	FP	STCR	FP	STCR
2007	6782	7246	37552	33526	95006	99572	57454	66046	2.53	2.97
2008	7083	7599	41440	34255	106069	113986	64629	79731	2.56	3.33
2009	6894	7295	39800	33862	103175	108736	63375	74874	2.59	3.21
2010	6019	6236	47140	39312	72225	74828	25086	35516	1.53	1.90
2011	7741	7761	45048	37862	87710	87923	42662	50061	1.95	2.32
Mean	**6904**	**7227**	**42196**	**35763**	**92837**	**97009**	**50641**	**61246**	**2.23**	**2.75**
't' value	**3.55***		**9.53***		**3.12***		**7.98***		**6.54***	

*Significant at 5% level ; Abbreviations : FP-Farmer practice ,STCR- Soil Test Crop Response based nutrient application

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