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Yield And Economics Of Rice-Green Gram Cropping System In Relation To Site-Specific Organic Nutrient Management With Different Sources Of Organic Manures In Comparison With RDF And INM

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ABSTRACT

Field experiments were carried out at Tamil Nadu Agricultural University, Coimbatore, India during *samba* (August-December) season of 2012 and 2013 to study the effect of different sources of organic manures in comparison with RDF and INM on site specific organic nutrient management practices with different sources of organic manures in comparison with RDF and INM on economics of rice with succeeding greengram during summer 2013 and 2014. The experiment consisted of fourteen treatments which were laid out in Randomized Block Design, replicated thrice and SRI method of planting was adopted during both the years. The gross return per hectare during 2012-2013, extended from ₹ 62,971 to ₹ 1,14,730 for the rice-greengram cropping sequence. Higher gross return (₹ 1,14,730) and net return (₹ 68,245) were associated with the INM treatment (T_{14}) with the grain yield of 6235 kg ha^{-1} and it was corresponded to that observed with T_5 *viz*., 100% RDN through green manure (T_5) with the grain yield of 5084 kg ha^{-1} for gross return (₹ 1,12,979) and net return (₹ 66,978). During 2013-2014, the gross return and net return of the rice-greengram cropping sequence varied from ₹ 63,817 to ₹ 1,17,175 and from ₹ 32,385 to ₹ 70,690 respectively. The INM treatment (T_{14}) recorded with the grain yield of 6270 kg ha^{-1} and the higher gross return (₹ 1,17,175) and net return (₹ 70,690) and which was comparable with 100% RDN through green manure (T_5) with the grain yield of 5140 kg ha^{-1} and the gross return of ₹ 1,15,380 and the net return of ₹ 69,340 respectively. The lowest gross return was registered with the absolute control (T_1) (₹ 63,817) and net return (₹ 32,385) with the grain yield of 3602 and 3646 kg ha^{-1} during the cropping sequence 2013-2014.

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important and extensively cultivated food crop, which provides half the daily food for one of every three persons on the earth. In Asia alone, more than two billion people obtain 60 to 70 per cent of their energy intake from rice and its derivatives. Rice-rice-pulse (Greengram/Blackgram) is the predominant cropping system of major rice growing areas of Tamil Nadu. The cropping sequence of rice-pulse is practically feasible, viable, economical, eco-friendly, water saving technology for sustaining soil fertility and rice productivity. Increased use of inorganic fertilizers in crop production deteriorates soil health, causes health hazard and insecurity of quality food. Energy crisis, higher fertilizer cost,

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sustainability in agri-production system and ecological stability are the important issues which renewed the interest of farmers and research workers in non-chemical sources of plant nutrients like biofertilizers, farmyard manure, green manure, composts etc. Awareness about crop quality and soil health in- creased the attention of people towards organic farming (Sharma, M., *et al*., 2008). Balanced use of nutrients through organic sources like farmyard manure, vermi-compost, green manuring, neem cake and biofertilizers are prerequisites to sustain soil fertility, to produce maximum crop yield with optimum input level (Dahiphale, A.V., *et al*., 2003). The organic manures leave behind sufficient residual effect for the sequence crops (Singh, A., *et al*., 1996). Rice production was almost stagnated for last one decade by oscillating around 95 million tones in India. However, the projected demand by 2025 is 116.5 million tones to keep the present per capita rice availability of 215g/day in future. Better nutrient management strategies can support the needed future yield increase. Modern high yielding varieties producing around 5 t/ha of grain can remove from the soil about 110 kg N, 15 kg P, 129 kg K, 5 kg S, 2 kg Fe, 2 kg Mn, 200g Zn, and 150g B per hectare. Emergence of widespread multi nutrient deficiencies, depletion of native nutrient reserves, imbalanced fertilization are matter of serious concern, causing serious stagnation and declining productivity of various rice ecosystems (Shukla, A.K., *et al*., 2004). Site-specific nutrient management approach is being focused in recent years to reverse the present declining trend in factor productivity (Hemalatha, M., *et al*., 200). Keeping the above points in view , the present study was undertaken to study the yield and economics of rice-greengram cropping system in relation to site-specific organic nutrient management with different sources of organic manures in comparison with RDF and INM.

MATERIALS AND METHODS

Field experiments were carried out at Tamil Nadu Agricultural University, Coimbatore, India during *samba* (August-December) season of 2012 - 2013 for rice and summer season of 2013 and 2014 for residual greengram. Coimbatore is situated in the Western agro-climatic zone of Tamil Nadu at 11^{o}N latitude and 77^{o}E longitude and at an altitude of 426.7 m above mean sea level. The soil of the experimental field was clay loam in texture belonging to *Typic Haplustalf* with low in available N (254.0 and 260.0 kg ha^{-1}), low in available P (16.7 and 17.8 kg ha^{-1}) and high in available K (402.0 and 418.0 kg ha^{-1}) during the first and second years respectively. The experiment consisted of fourteen treatments which were laid out in Randomized Block Design, replicated thrice and SRI method of planting was adopted during both the years. Among fourteen treatments, four treatments with different organic manures at 100 per cent RDN on equi nutrient basis (farm yard manure, vermi-compost, poultry manure and (Dhaincha) green manure) another six treatments consisted of 50 per cent combination of each manure, one treatment with $1/4^{th}$ combination of all the manures and one absolute control (without organic or inorganic). These treatments were compared with the recommended dose of fertilizer (RDF) and integrated nutrient management practice (RDF + Dhaincha @ 6.25 t ha^{-1}). The rice variety CO (R) 48 with field duration of 135 days was used in the trial followed by summer greengram (Co 6) as residual succeeding crop without addition of any manures and fertilizers in both the years of experiment. Separate nurseries were raised for conventional (INM and RDF) treatments and organic nursery for organic treatments. For organic and inorganic treatments separate experimental plots were maintained in both the years of study. Method of planting was SRI, transplanted with 14 days old seedlings. All other package of practices were carried out as per recommendation of (Gomez, K.A. and A.A. Gomez, 1984) for INM and RDF treatments. For organic treatments no herbicide was used, neem seed kernel extract, *Pnchagavyaa* and *Pseudomonos* were used as prophylactic plant protection measures. The experiments were received uniform plant protection and cultural management practices throughout the period of crop growth. The yield and economics of the entire cropping system was worked out for both the years of experimentation.

2.1. Biometric and Yield Observations:

Five plants in each plot were selected at random and tagged. These plants were used for recording biometric observation at different stages of crop growth. The harvested produce from each net plot was threshed, sun dried, winnowed separately and the grain yield was recorded at 14 per cent moisture content and expressed in $kg \cdot ha^{-1}$(Alagappan, S. and Venkitaswamy, R.).

2.2. Statistical Analysis:

The data on various characters studied during the course of investigation were statistically analysed [8] for randomized block design. Wherever treatment differences were significant ("F" test), critical differences were worked out at five per cent probability level. Treatment differences that were not significant were denoted as "NS".

RESULTS AND DISCUSSION

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3.1. Yield and economics of rice – greengram cropping system:

The data on yield and economics of rice- greengram cropping sequence influenced by the imposed treatments in both the years of study were computed and presented in Table 1. Gross return per hectare during 2012-2013, extended from ₹ 62,971 to ₹ 1,14,730 for the rice-greengram cropping sequence. Higher gross return (₹ 1,14,730) and net return (₹ 68,245) were associated with the INM treatment (T_{14}) with the grain yield of 6235 kg ha^{-1} and it was corresponded to that observed with T_5 *viz*., 100% RDN through green manure (T_5) with the grain yield of 5084 kg ha^{-1} resulted with the gross return (₹ 1,12,979) and net return (₹ 66,978). These were followed by the application of recommended NPK fertilizers (T_{13}) with the grain yield of 5603 kg ha^{-1} resulted with the gross return (₹ 98,788) and net return of ₹ 57,586) and 50% RDN through poultry manure and green manure (T_{11}) with the grain yield of 4322 kg ha^{-1} resulted with (₹ 95,832 and ₹ 48,210 as gross return and net return respectively). The least gross return was recorded with 100% RDN through FYM (T_2) with the grain yield of 4164 kg ha^{-1} resulted with the gross return (₹ 92,381) and net return (₹ 19,413) which was superior of the absolute control (T_1) with the grain yield of 3602 kg ha^{-1}, resulted with (₹ 62,971) as gross return and (₹ 31,589) as net return during the cropping sequence 2012-2013. The pure crop of rice without organic manures or dhaincha during the previous season resulted in the least net return and B:C ratio was reported by [9]. Higher B:C ratio (2.47) was registered with the INM treatment (T_{14}) and which was followed by 100% RDN through green manure (T_5) (2.46) the recommended NPK fertilizer (T_{13}) (2.40) and 50% RDN through poultry manure and green manure (T_{11}) (2.01) during the cropping sequence 2012-2013. During 2013-2014, the gross return and net return of the rice-greengram cropping sequence varied from ₹ 63,817 to ₹ 1,17,175 and from ₹ 32,385 to ₹ 70,690 respectively. The INM treatment (T_{14}) recorded with the grain yield of 6270 kg ha^{-1} resulted with higher gross return (₹ 1,17,175) and net return (₹ 70,690) and which was comparable with 100% RDN through green manure (T_5) with the grain yield of 5140 kg ha^{-1}, resulted with the gross return of ₹ 1,15,380 and the net return of ₹ 69,340 respectively. This was followed by 25% RDN through each organic manures (T_{12}) with the grain yield of 5120 kg ha^{-1}, resulted with the gross return of ₹ 1,15,102 and the net return of ₹ 52,011 during the sequence 2013-2014 and which were comparable with the gross return and net return received from (T_9) (₹ 1,12,391 and ₹ 46,267), (T_7) (₹ 1,08,930 and ₹ 47,232), (T_4) (₹ 1,02,475 and ₹ 53,156) and (T_{13}) (₹ 1,02,102 and ₹ 60,900) during the cropping sequence 2013-2014. The lowest gross return was registered with the absolute control (T_1) (₹ 63,817) and act return (₹ 32,385) resulted with the grain yield of 3646 kg ha^{-1}during the cropping sequence 2013-2014. Higher B:C ratio was (2.52) was observed with the INM treatment (T_{14}) and which was followed by 100% RDN through green manure (T_5) (2.51), the recommended NPK fertilizers (T_{13}) (2.48), 50% RDN through poultry manure and green manure (T_{11}) (2.10) and 100% RDN through poultry manure (T_4) (2.08) during the cropping sequence 2013-2014. The reason for the higher net return in the INM and 100% RDN through green manure than the recommended NPK fertilizers was due to higher product price of organic rice than inorganically produced rice as well as the yield obtained in these treatments was more than inorganic fertilizers treatments, similar observations was obtained earlier by.

Table 1: Effect of site-specific organic nutrient management with organic manures, RDF, INM on yield and economics of rice-greengram cropping system (2012-14)

Treatments	*Samba - Summer* 2012-13					*Samba - Summer* 2013-14				
	Grain yield (kg ha^{-1})	Greengram yield (kg ha^{-1})	Gross return (₹ . ha^{-1})	Net return (₹ . ha^{-1})	B: C ratio	Grain yield (kg ha^{-1})	Greengram yield (kg ha^{-1})	Gross return (₹ . ha^{-1})	Net return (₹ . ha^{-1})	B: C ratio
T_1 : Absolute control	3602	251	62971	31589	2.00	3646	258	63817	32385	2.03
T_2 : 100% RDN through FYM	4164	325	92381	19413	1.27	4190	386	94972	20895	1.28
T_3 : 100% RDN through VC	4296	335	95228	12968	1.16	4380	398	99006	16078	1.19
T_4 : 100% RDN through PM	4377	341	96989	47747	1.97	4550	406	102475	53156	2.08
T_5 : 100% RDN through GM	5084	410	112979	66978	2.46	5140	476	115380	69340	2.51
T_6 : 50% RDN each of FYM + VC	3910	305	86780	9165	1.12	3980	370	90362	11859	1.15
T_7 : 50% RDN each of FYM + PM	4721	368	104533	43428	1.35	4833	432	108930	47232	1.77
T_8 : 50%	4236	331	94428	34944	1.59	4316	394	97672	37613	1.63

RDN each of FYM + GM										
T_9 : 50% RDN each of VC + PM	4923	384	108975	43223	1.66	4986	448	112391	46267	1.70
T_{10} : 50% RDN each of VC + GM	4079	318	90494	26363	1.41	4140	382	93897	29413	1.46
T_{11} : 50% RDN each of PM + GM	4322	338	95832	48210	2.01	4430	401	100042	52363	2.10
T_{12} : 25% RDN each of FYM + VC + PM +GM	5004	390	110784	48166	1.77	5120	452	115102	52011	1.82
T_{13} : RDF : (150 : 50 : 50) NPK kg ha^{-1}	5603	437	98788	57586	2.40	5680	502	102102	60900	2.48
T_{14} : INM Practices (RDF + GM @ 6.25 t ha^{-1})	6235	642	114730	68245	2.47	6270	698	117175	70690	2.52
SEd	425	34	8992	3674	-	432	39	9299	3949	-
CD (P = 0.05)	874	70	18883	7715	-	889	81	19528	8293	-

FYM: Farm Yard Manure, VC: Vermicompost, PM: Poultry manure, GM: Green manure (Dhaincha) *Sesbania aculeata*

RDN: Recommended Dose of Nitrogen, RDF: Recommended Dose of Fertilizers, INM: Integrated Nutrient Management

Conclusion:

From this study, it was concluded that, higher grain yield of rice was recorded with the INM practice followed by recommended dose of fertilizers (RDF) treatment. Among the organic treatments, higher grain yield of rice was recorded with 100% RDN through green manure followed by 25% RDN through each organic manures in both the years of study. Higher B:C ratio was registered with the INM treatment and which was followed by 100% RDN through green manure in rice-greengram cropping system during both the years of experimentation. The different sources of organic manures particularly the composted poultry manure at the rate of 5 t/ha application had increased the rice yield as well as the rice fallow pulse (blackgram) yield in the rice-blackgram cropping sequence. Further, it was concluded that the application of 100% RDN through green manure recorded more grain yield with higher B:C ratio among the organic treatments in both the years of experiments. For organic rice production, application of 100% RDN through green manure for realizing better yield and economic returns followed by 25% RDN through each organic manures(farmyard manure, vermi-compost, poultry manure and green manure) for rice-greengram cropping system. These site-specific organic nutrient management practices are seems to be better agronomic package to the organic rice growers. Green manures have a good potential to maintain soil fertility, supplement nutrient supply to rice crop and could contribute to greater food security, which found to be optimum for enhancing rice production for promoting organic rice farming in Western agro-climatic zone of Coimbatore.

REFERENCES

Alagappan, S. and Venkitaswamy, R. Impact Of Different Sources Of Organic Manures In Comparison With Rdf And Inm On Growth And Yield Of Rice-Greengram Cropping System.

Dahiphale, A.V., D.G. Giri, G.V. Thakre and M.D. Giri, 2003. Effect of integrated nutrient management on yield and yield contributing parameters of scented rice. Annals of Plant Physiology, 17(1): 24-26.

Gomez, K.A. and A.A. Gomez, 1984. *Statistical procedures for agricultural research*. John Wiley & Sons.

Hemalatha, M., V. Thirumurugan, M. Joseph and R. Balasubramanian, 2000. Effects of different sources and levels of nitrogen on growth and yield of rice. Journal of Maharashtra Agricultural Universities, 25(3): 255-257.

Sangeetha, S.P., A. Balakrishnan and P. Devasenapathy, 2013. Influence of Organic Manures on Yield and Quality of Rice (Oryza sativa L.) and Blackgram (Vigna mungo L.) in Rice-Blackgram Cropping Sequence. American Journal of Plant Sciences, 4(5): 1151.

Sharma, M., C.S. Pandey and B.S. Mahapatra, 2008. Effect of biofertilizers on yield and nutrient uptake by rice and wheat in rice-wheat cropping system under organic mode of cultivation. Journal of Eco-friendly Agriculture, 3(1): 19-23.

Shukla, A.K., S.K. Sharma, V.K. Singh and N.C. Upadhay, 2004. Rice-wheat system: fertilizer management constraints and their remedial measures. In *Souvenir of national symposium on second generation problem in agriculture and its remedies* pp: 26-27.

Singh, A., R.D. Singh and R.P. Awasthi, 1996. Organic and inorganic sources of fertilizers for sustained productivity in rice (Oryza sativa)--Wheat (Triticum aestivum) sequence on humid hilly soils of Sikkim. Indian Journal of Agronomy, 41(2): 191-194.

Yadav, B.K. and A.C. Lourduraj, 2006. Effect of organic manures and panchagavya spray on yield attributes, yield and economics of rice (Oryza sativa L.). *Crop Research-Hisar-*, 31(1): 1.