

Original Research Article

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Impact of Lime and Secondary Nutrient Management on Economics of Paddy Cultivation in Coastal Karnataka, India

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ABSTRACT

A field experiment was conducted during *kharif* of 2014, 2015 and 2016 at Zonal Agricultural and Horticultural Research Station, Brahmavar, Udupi district, Karnataka, to study the economics of paddy cultivation in soil acidity and secondary nutrient management practices. The experiment was laid out in RCBD design with three replications and nine treatments involving different levels of lime applications and magnesium sulphate in comparison to package of practice as control. Economics of paddy cultivation in soil acidity and secondary nutrient management practices was studied for three years 2014, 2015 and 2016. Results over three years of experimentation clearly shows that significantly higher net returns and B:C ratio was obtained in treatment T₄: 100% NPK + Lime application equivalent to 50% exch. Acidity + 30 kg magnesium sulphate and followed by treatment T₅: 100% NPK + Lime application equivalent to 50% exch. Acidity + 40 kg magnesium sulphate.

Keywords

Paddy, economics, acidity, lime, levels, B: C ratio, kharif

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Introduction

Globally, agriculture has to produce more food from less area of land through more efficient use of natural resources in order to meet the growing demands of increasing population (Hobbs, Sayre, & Gupta, 2008). In India rice crop plays vital role in our national

food security and is a means of livelihood for millions of rural households. India is the world's second largest producer (129.2 million tonnes) of rice on an area of 43 million ha and with the productivity of 3 tonnes per ha (ASG. 2015.) and ranks next to china. At the accelerating current growth rate of 1.8 per cent of population in India rice

requirement by 2020 AD is projected around 140 million tonnes. The rapid increasing in food production over the past three decades was at the cost of corresponding increase in the removal of nutrient from the soil.

Soil fertility is a dynamic natural property and it can change under the influence of natural and human induced factors. Soil organic matter is an important factor in deciding management system of the forest soil fertility. The forest soils vary in physico-chemical changes with time and space resulting in variation among topography, climate, weathering processes, vegetation cover and microbial activities and also biotic and abiotic factors (Sannappa and Manjunath., 2013).

In acidic soils less availability of nutrients (N, P, K, Ca, Mg and S) besides inadequate nutrient management practices. Paddy is a exhaustive crops and removes large amount of macro and micro nutrients from soil (Singh and Singh, 2001). Though many nutrient management studies have been carried out in paddy, the location specific study on soil acidity and secondary nutrient management in rice for the farmers of coastal region of Karnataka is not up to the mark.

Despite slow growth in paddy productivity, the production reached to 106.54 million tonnes in 2013-14. Increase in input prices including human labour did not deter farmers from increasing investment on inputs which resulted in reducing profitability in paddy production, particularly in regions of low paddy productivity (Subramanian, 2000).

There is a common concern about declining profitability in Indian agriculture and paddy production is not an exception. Indian economy experienced overall growth but there is a need to understand the causes of distress in farming and production of principal crops. Keeping in view these

observations, an attempt has been made in this paper to explore trends in cost of cultivation and profitability among paddy farmers in Bihar and Punjab which have almost contrasting scenario in productivity and use of inputs. Keeping the above points in view, a field experiment was carried out to study the economics of paddy cultivation in soil acidity and secondary nutrient management practices.

Materials and Methods

A field experiment was conducted during *kharif* season of 2014, 2015 and 2016 at Zonal Agricultural and Horticultural Research Station, Brahmavar, Udupi district, Karnataka, to study the economics of paddy cultivation in soil acidity and secondary nutrient management practices. The experimental site is situated between 74° 45' to 74° 46' East longitude and 13° 24' 45'' to 13° 25' North latitude and an altitude of 25 meters above mean sea level.

Soil type is sandy loam in texture and pH was acidic (5.24). The soil was medium in available nitrogen (348.70 kg ha⁻¹), high in available phosphorus (89.21 kg ha⁻¹) and medium in available potassium (62.08 kg ha⁻¹). The organic carbon content was high (0.968 %) in range. MO-4 (Red rice) a popular medium duration variety was transplanted in July with a spacing of 20 cm X 10 cm.

Experiment included nine treatments treatments consisted of T₁: 100% NPK (POP; N:P:K= 60:30:60 kgs/ha), T₂: T₁ + 100% NPK Lime application equivalent to 50% exch. Acidity, T₃: T₂ + 20 kg magnesium sulphate, T₄: T₂ + 30 kg magnesium sulphate, T₅: T₂ + 40 kg magnesium sulphate, T₆: T₁ + Lime application equivalent to 100% exch. Acidity, T₇: T₆ + 20 kg magnesium sulphate, T₈: T₆ + 30 kg magnesium sulphate, T₉: T₆ + 40 kg magnesium sulphate. Yield (biological

and economical) was recorded from individual plots at harvest and converted to kg/ha. Gross income from paddy cultivation is sum of values of main and by product which was estimated to know the net returns.

Standard statistical methods were used for comparing the treatment means. For comparing the increase in cost of cultivation and value of produce, the percentage change of both were calculated across the years. Relative change in increase in value of produce in comparison to cost of cultivation was calculated.

Results and Discussion

Effect of soil acidity and secondary nutrient

management on grain and straw yield is presented in Table 1. After three years of experiment, the data obtained on grain and straw yield is pooled and analyzed statistically.

Result shows that the application of lime and secondary nutrients along with recommended dose of nutrients had very good impact to improve the soil available nutrients that resulted in higher grain yield in case of treatment T₄ (7460 kg ha⁻¹): T₂ + 30 kg magnesium sulphate followed by the treatment T₅ (7288 kg ha⁻¹): T₂ + 40 kg magnesium sulphate, T₉ (7049 kg ha⁻¹): T₆ + 40 kg magnesium sulphate but other treatments showed non-significant difference among the them.

Table.1 Effect of Lime application and secondary nutrient management on Grain and straw yield of paddy over the years (Kg ha⁻¹)

Treatments		2014		2015		2016	
		Grain yield	Straw yield	Grain yield	Straw yield	Grain yield	Straw yield
T ₁	100% NPK (POP;N:P:K= 60:30:60 kgs/ha)	5743	6318	5685	6338	5648	6683
T ₂	T ₁ + Lime 50% EA	6343	7612	6362	7203	6285	7055
T ₃	T ₂ + 20 kg MgSO ₄	6580	7567	6432	7053	6598	7773
T ₄	T ₂ + 30 kg MgSO ₄	7677	8598	7365	7680	7460	7945
T ₅	T ₂ + 40 kg MgSO ₄	7366	8619	7010	7750	7288	8245
T ₆	T ₁ + Lime 100% EA	6647	7977	6495	8050	6593	7615
T ₇	T ₆ + 20 kg MgSO ₄	6776	7793	6530	7593	7003	7660
T ₈	T ₆ + 30 kg MgSO ₄	7217	8588	6780	7840	6925	7580
T ₉	T ₆ + 40 kg MgSO ₄	7184	8406	6620	7565	7049	7447
	SEM±	95.173	110.16	136.44	284.17	88.21	202.96
	CV	2.915	2.939	4.236	7.952	2.704	5.590
	CD (5%)	291.23	340.4	407.551	865.53	266.74	617.21

Table.2 Comparison of crop performance and B: C ratios among the treatments over the years

Treatments		2014			2015			2016			Pooled B:C ratio
		Grain yield	Straw yield	B:C	Grain yield	Straw yield	B:C	Grain yield	Straw yield	B:C	
		Kg/ha	Kg/ha		Kg/ha	Kg/ha		Kg/ha	Kg/ha		
T₁	100% NPK (POP;N:P:K= 60:30:60 kgs/ha)	5743	6318	1.772	5685	6338	1.732	5648	6683	1.687	1.730
T₂	T ₁ + Lime 50% EA	6343	7612	2.042	6362	7203	1.981	6285	7055	1.879	1.967
T₃	T ₂ + 20 kg MgSO ₄	6580	7567	2.066	6432	7053	1.959	6598	7773	1.976	2.000
T₄	T ₂ + 30 kg MgSO ₄	7677	8598	2.377	7365	7680	2.199	7460	7945	2.158	2.246
T₅	T ₂ + 40 kg MgSO ₄	7366	8619	2.295	7010	7750	2.114	7288	8245	2.131	2.180
T₆	T ₁ + Lime 100% EA	6647	7977	2.076	6495	8050	2.016	6593	7615	1.930	2.007
T₇	T ₆ + 20 kg MgSO ₄	6776	7793	2.064	6530	7593	1.964	7003	7660	1.995	2.008
T₈	T ₆ + 30 kg MgSO ₄	7217	8588	2.207	6780	7840	2.024	6925	7580	1.962	2.064
T₉	T ₆ + 40 kg MgSO ₄	7184	8406	2.173	6620	7565	1.957	7049	7447	1.966	2.032
	SEM±	95.173	110.16		136.44	284.17		88.21	202.96		0.025
	CV	2.915	2.939		4.236	7.952		2.704	5.590		2.079
	CD (5%)	291.23	340.4		407.551	865.53		266.74	617.21		0.078

A significantly higher straw yield was obtained in case of treatment T₅ (8245 kg ha⁻¹): T₂ + 40 kg magnesium sulphate followed by treatment T₄ (7945 kg ha⁻¹): T₂ + 30 kg magnesium sulphate and treatment T₃ (7773 kg ha⁻¹): T₂ + 20 kg magnesium sulphate. Similar observations were resulted by Taiwo Agbede and Lawrence Afolabi, 2014, and Rawat and Pareek (2003).

Results pertaining to the economics of paddy cultivation in soil acidity and secondary nutrient management practices are presented in table 2. After three years of experimentation, the data obtained on cost of cultivation, gross returns and net returns are analysed to know the B:C ratio in order to know the economic benefit among the treatments. The data obtained on economics of paddy cultivation over the three years of experimentation is pooled and analyzed statistically.

Results over three years of experimentation

clearly shows that significantly higher net returns and B:C ratio was obtained in treatment T₄: 100% NPK + Lime application equivalent to 50% exch. Acidity + 30 kg magnesium sulphate and treatment T₅: 100% NPK + Lime application equivalent to 50% each. Acidity + 40 kg magnesium sulphate followed by other treatments. same results are obtained by Newase *et al.*, 1990, Subramanian *et al.*, 2000 and Wani *et al.*, 2009.

The present study has analysed the dynamics of cost of cultivation and profitability in paddy cultivation in Coastal Karnataka. However, performance in paddy cultivation in context of gross income to total cost improved during recent past which need further improvement for increasing profitability.

Efforts need to be taken to create an enabling environment to ensure a commensurate income to paddy farmers for improvement in their livelihood. Secondary nutrients like

Calcium, Magnesium and sulfur plays its catalytic or stimulatory effect on physiological and metabolic activities in plants which ultimately influenced the significant increase in grain and straw yield.

Analysis of profitability revealed that the farmers received very little income or losses in paddy cultivation over total cost of cultivation during last decade mainly due to low productivity owing to less mechanization, low use of fertilizers and organic manure, low adoption level of modern technologies and changing weather scenarios.

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