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ECONOMICS OF FERTILIZER APPLICATION IN THE PRODUCTION OF "FEIJÃO DE CORDA" AT VARIOUS LOCATIONS OF CEARÁ

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INTRODUCTION

Crops continually remove from the soil the nutrients that are essential for their growth and nourishment. Since, the natural recoupration of these elements is a slow process, fertilizer has to be applied to maintain the productivity of land.

Reliable knowledge about the contribution of various factors responsible for increasing agricultural production is indispensable for planning and policy decisions. This holds for fertilizer use which has been recognized as one of the quickest and, perhaps, the cheapest means for increasing agricultural production as well as income of the farmers.

In this study an attempt is made to calculate net returns to the "Feijão de Corda" growers at various levels of phosphorus (P_2O_5) at various locations.

SOURCES OF DATA

Through efforts of SUDENE and Ministry of Agriculture a national system of agricultural marketing information was established, including for the first time all of the States of the Northeast and North region of the Country. The price data, at producer level, utilized in this study come from the monthly SIMA bulletins for Ceará (2).

The commodity and fertilizer data are obtained for "Programa de Pesquisa com a Cultura do Feijoeiro"(1) and utilized for economic analysis with the verbal permission of chairman of Fitotecnia Department. The information on cost of applying fertilizer, cleaning and bagging of "Feijão de Corda" during 1977 is obtained from the Department of Fitotecnia.

METHOD OF ANALYSIS

Analysis technique used is the straightforward benefit/cost analysis. For a given location increase in production, total variable cost, gross value of increase and net returns associated with each level of phosphorus (P_2O_5) are calculated.

Cost and Returns from Application of Phosphorus (P_2O_5) to "Feijão de Corda" at Quixadá, Redenção and Russas Based upon 1977 Fertilizer Trials

It should be noted that some growers of "Feijão de Corda" migth have obtained somewhat higher yields and phosphorus responses than the yields and respon-

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ses shown in Tables 1-3. Nevertheless, these experimental yield increases should still be useful guide for phosphorus application under average conditions.

Total yields and increased yield/ha for various levels of phosphorus at various locations is given in Tables 1, 2 and 3. The comparison of these tables suggest that phosphorus responses at Quixadá were significantly higher at all phosphorus levels as compared to the responses at other locations. The tables also reveal that the lowest yield response occured at Redenção experimental farm shown in table 2. But the yield increase per hectare for all levels of phosphorus are lower at Russas.

At Quixadá experimental farm the yield as well as increased yield data formed an upward trend and peaked at 60kg of P_2O_5 application, then formed a downward trend following the Law of Diminishing Returns. Similar trend in yield and increased yield is observed at Russas experimental farm where yield and increased yield curves peaked at 80kg of phosphorus application. However, the data on yield and yield increases form Redenção experimental farm violated the principle of Diminish-

TABLE 1

Yields and Yield Increases of "Feijão de Corda" at Various Levels of P_2O_5 on Experimental Farm at Quixada

Quantity of P_2O_5 Employed (kg/ha)	Yield (kg/ha)	Increase in Yield Over that Withoud P_2O_5 (kg/ha)
0	968	–
20	1425	457
40	1514	586
60	1724	756
80	1645	677
100	1526	558

TABLE 2

Yields and Yield Increases of "Feijão de Corda" at Various Levels of P_2O_5 on Experimental Farm at Redenção

Quantity of P_2O_5 Employed (kg/ha)	Yield (kg/ha)	Increase in Yield Over that Withoud P_2O_5 Over
0	352	–
20	690	338
40	636	284
60	787	435
80	815	463
100	707	355

ing Returns by following a cyclical pattern.

Margin per hectare over phosphorus (P_2O_5) and associated costs for various levels of P_2O_5 and prices at Quixadá, Redenção and Russas are given in Table 4, 5 and 6, respectively .

Suppose the product form Quixadá experimental farm is sold at the price of Cr$ 3.55/kg, then the value of increased yield would be Cr$ 3.55 (756) = Cr$ 2,683.80 per hectare from 60kg of P_2O_5. The cost of elemental P_2O_5 is Cr$ 10.77/kg as triple superphosfate is

TABLE 3

Yields and Yield Increases of "Feijão de Corda" at Various Levels of P_2O_5 on Experimental Farm at Russas

Quantity of P_2O_5 Employed (kg/ha)	Yield (kg/ha)	Increase in Yield Over that Withoud P_2O_5 (kg/ha)
0	1025	–
20	1132	107
40	1172	141
60	1186	161
80	1305	280
100	1195	170

used. Cost of 60kg of P_2O_5 would then be Cr$ 10.77 (60) = Cr$ 646.20, and the cost of application P_2O_5 assumed to be Cr$ 20.00/ha would raise the cost to Cr$ 666.20/ha. But the cleaning and bagging of the extra 756kg of "Feijão de Corda" would add another Cr$ 0.20 (756) = Cr$ 151.20 to the total variable cost of increased yield with the application of 60kg of elemental P_2O_5. Therefore, net margin over fertilizer cost would be Cr$ 2,683.80 – Cr$ 817.40 = Cr$ 1,866.40 per hectare. The highest net returns at Quixadá were obtained with the application of 60kg of P_2O_5 and the application of 100kg of P_2O_5 yielded lowest net returns. The return per cruzeiro of P_2O_5 at 60kg level would be Cr$ 2,683.80 ÷ Cr$ 817.40 = Cr$ 3.28 wich is less than Cr$ 4.96 for 20kg of P_2O_5 application. According to the above analysis, 60kg of elemental P_2O_5 per hectare are recommended to growers of "Feijão de Corda" at Quixadá inorder to maximize net returns.

The results of Table 5 suggest that the highest gross value of increased production of "Feijão de Corda" at Redenção is obtained when 80kg of elemental P_2O_5 are apllied. However, maximum net returns are attained with the application of 60kg of P_2O_5. This suggest that the highest level of production or maximum increase in yield due to the use of fertilizer may not be the most economical or profit maximizing level of production.

The analysis of Table 6 dictates that all levels of P_2O_5 application do not bring positive net returns to "Feijão de Corda" growers at Russas. It is recommended that growers at Russas should only apply 20kg of elemental P_2O_5 if they want to maximize net returns.

TABLE 4

Margin per Hectare Over P_2O_5 and Associated Costs for Various Levels of P_2O_5 and Various "Feijão de Corda" Prices[a] Based Upon Yields Increases from P_2O_5 at Quixada as Shown in Table 1

Level of P_2O_5		Prices/kg "Feijão de Corda" 1977		
		October	November	December
		Cr$ 3.55	Cr$ 3.72	Cr$ 3.79
20kg of P_2O_5	Gross Value of increase	1,622.35	1,700.04	1,732.30
	Added Cost[b]	326.78	326.78	326.78
	Margin over costs	1,295.57	1,373.26	1,405.25
40kg of P_2O_5		Gross Value of		
	Gross Value of increase	2,080.30	2,179.92	2,220.94
	Added Cost[b]	567.96	567.96	567.96
	Margin over Costs	1,515.34	1,611.96	1,652.98
60kg of P_2O_5	Gross Value of increase	2,683.80	2,812.32	2,865.24
	Added Cost[b]	817.40	817.40	817.40
	Margin over Costs	1,866.40	1,994,92	2,047,84
80kg of P_2O_5	Gross Value of increase	2,403.35	2,518.44	2,565.83
	Added Cost[b]	1,016.92	1,016.92	1,016.92
	Margin over Costs	1,386.43	1,501.52	1,548.91
100kg of P_2O_5	Gross Value of increase	1,980.90	2,075.76	2,114.82
	Added Cost[b]	1,208.50	1,208.50	1,208.50
	Margin over Costs	772.40	867.26	906.32

[a] Price date were obtained from SIMA (2)

[b] Phosphorus Cost Cr$ 10.77 per kg of elemental P_2O_5 Plus Cr$ 0.20 per hectare of application cleaning and bagging Costs Cr$ 0.20/kg.

TABLE 5

Margin per Hectare over P_2O_5 and Associated Costs for Various Levels of P_2O_5 and Various "Feijão de Corda" Prices* Based upon Yield increases from P_2O_5 at Redenção as Shown in Table 2

Level of P_2O_5	-	Prices/kg "Feijão de Corda" 1977		
		October	November	December
	-	Cr$ 3.55	Cr$ 3.72	Cr$ 3.79
20 kg of P_2O_5	Gross Value of increase	,199.90	1,257.36	,281.02
	Added Cost**	302.98	302.98	302.98
	Margin over Costs	896.92	954.38	978.04
40 kg of P_2O_5	Gross Value of increase	1,008.20	1,056.48	,076.36
	Added Cost**	507.56	507.56	507.56
	Margin over Costs	500.64	548.92	568.80
60 kg of P_2O_5	Gross Value of increase	1,544.25	,618.20	1,648.65
	Added Cost**	753.14	753.14	753.14
	Margin over Costs	791.11	865.06	895.51
80 kg of P_2O_5	Gross Value of increase	,643.65	1,772.36	1,754.77
	Added Cost**	974.12	974.12	974.12
	Margin over Costs	669.90	784.24	780.65
100 kg of P_2O_5	Gross Value of increase	1,260.25	1,320.60	1,345.45
	Added Cost**	1,167.90	1,167.90	1,167.90
	Margin over Costs	92.35	152.70	177.55

* See foot note [a]
** See foot note [b]

TABLE 6

Margin per Hectare over P_2O_5 and Associated Costs for Various Levels of P_2O_5 and Various "Feijão de Corda" Prices * Based upon Yield Increases from P_2O_5 at Russas as Shown in Table 3

Level of P_2O_5		Prices/kg "Feijão de Corda" 1977		
		October	November	December
		Cr$ 3.55	Cr$ 3.72	Cr$ 3,79
20 kg of P_2O_5	Gross Value of increases	379.85	398.04	405.53
	Added Cost**	256.78	256.78	256.78
	Margin over Costs	123.07	141.26	148.75
40 kg of P_2O_5	Gross Value of increases	521.85	546.84	557.13
	Added Cost**	480.16	480.16	480.16
	Margin over Costs	41.69	66.68	76.97
60 kg of P_2O_5	Gross Value of increases	571.55	598.92	610.19
	Added Cost**	698.34	698.34	698.34
	Margin over Costs	−126.79	−99.42	−88.15
80 kg of P_2O_5	Gross Value of increase	994.00	1,041.60	,061.20
	Added Cost**	937.52	937.52	937.52
	Margin over Costs	56.48	104.08	123.68
100 kg of P_2O_5	Gross Value of increase	603.50	632.40	644.30
	Added Cost**	1,110.90	1,110.90	1,110.90
	Margin over Costs	−507.40	−478.50	−466.60

* See foot note [a]
** See foot note [b]

SUMMARY

The results of experiments at Quixadá, Redenção and Russas suggest that increased yields at all levels of P_2O_5 application was higher at Quixadá as compared to other two locations. At Quixadá, the application of 60kg of elemental P_2O_5 yielded the highest net returns. At Russas, the yield inceases associated with 60kg and 100kg of elemental P_2O_5 applications were not enough to cover their own cost.

SUMÁRIO

Os resultados dos experimentos em Quixadá, Redenção e Russas sugerem que o aumento de rendimento em todos os níveis de aplicação de P_2O_5 foi maior em Quixadá do que nos dois outros locais. Em Quixadá, a aplicação de 60kg de P_2O_5 produziu os mais altos retornos líquidos. Em Russas, os aumentos de rendimento associados com as aplicações de 60kg e 100kg de P_2O_5 não foram suficientes para cobrir seus custos.

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