

NITROGEN ON CROPS AND PASTURES*

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N response curve of *Eragrostis curvula*

In an experiment at the Bapsfontein Research Station of AE & CI *Eragrostis curvula* was fertilized with 0, 133, 265, 398 and 530 kg/ha N in the form of urea. Phosphorus and potassium were applied annually at the rate of 25 and 50 kg/ha respectively.

The experiment was started in 1968/69 and finished in 1971/72. In 1968 the *Eragrostis curvula* was 12 years old. The soil form was Hutton and the series Msinga.

Chemical analysis of soil samples taken in August 1972 gave the following results:

pH (KCl)	4,3	Ca	285 ppm
P	31 ppm	Mg	30 ppm
K	67 ppm	Na	32 ppm

The following results were obtained for the four seasons, 1968/69 to 1971/72.

1. Yield of *Eragrostis curvula* hay in tonnes per ha for different N treatments

	NO	N133	N265	N398	N530	Year mean
1968-69	0,97	5,15	8,13	9,46	10,17	6,78
1969-70	1,27	5,97	10,87	12,67	13,41	8,84
1970-71	1,44	5,98	9,18	9,52	10,02	7,23
1971-72	1,61	6,50	10,87	12,57	13,59	9,03
Mean	1,32	5,90	9,76	11,05	11,80	

A statistical analysis of the results was carried out according to 'Analyses of results of series of experiments'. Experimental Designs, W H Cochran and G M Cox, ch 14, p 545.

The linear effect of N was highly significant, but as the quadratic component was also highly significant, there was a marked departure from linearity.

In 1973 a similar experiment was started on a Clovelly form soil (Southwold series). The levels of N were 0, 200, 275, 350 and 425 kg/ha, which were applied in the form of limestone ammonium nitrate. Phosphorous and potassium were applied at the rate of 25 and 75 kg per ha respectively.

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The grass was established under teff in December 1970.

The results were as follows:

Yields of Eragrostis curvula hay in tonnes per ha for different N treatments

Season	NO	N200	N275	N350	N425
1973-74	6,31	12,92	14,49	14,62	14,75

The results of both experiments are given in Figure 1, which shows the yield graphs for the mean of the four seasons, for 1968/69 and 1969/70 of the Hutton experiment and for the 1973/74 season on Clovelly. The yields of the individual seasons on Hutton are given to show that the average response to N was varying with seasons.

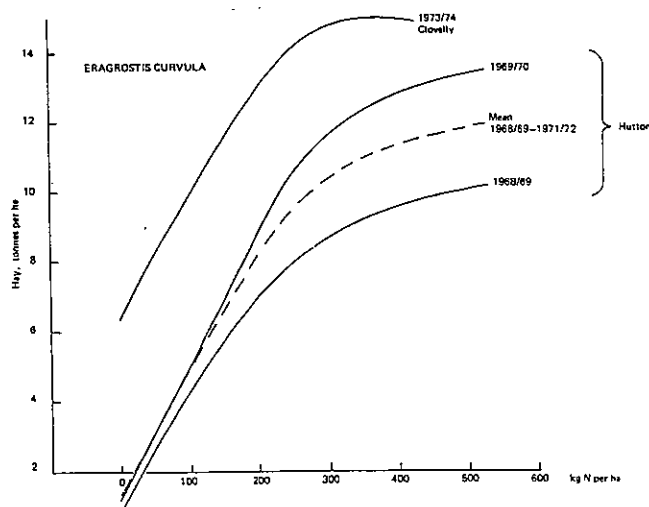


FIG 1 Hay yield response of *Eragrostis curvula* to N application on different soil series.

The mean results show the economic optimum application of N on the Hutton soil to be around 265 kg per ha, as shown in the following table.

N level kg/ha	Earnings from hay R-c	Fertilizer cost R-c	Nett earnings per ha R-c
0	19-80	-	19-80
132	88-50	33-00	55-50
265	146-40	66-25	80-15
398	165-75	99-50	66-25
530	177-00	132-50	44-50

The value of the hay is taken as R15-00 per tonne and the cost of fertilizer as R0-25 per kg N (urea).

The results of the one season on Clovelly form soil showed that the most economic level of N was around 275 kg per ha which closely resembles the results on the Hutton soil.

N level kg/ha	Earnings from hay R-c	Fertilizer cost R-c	Nett earnings per ha R-c
0	94-65	-	94-65
200	193-80	46-00	147-80
275	217-35	63-25	154-10
350	219-30	80-50	138-80
425	221-25	97-75	123-50

The value of hay was taken at R15-00 per tonne and the cost of fertilizer at R0-23 per kg N (LAN).

2 Crude protein yield, kg/ha Hutton form

Year	N0	N133	N265	N398	N530	Year mean
1968-69	54	343	659	958	1 143	631
1969-70	66	357	836	1 150	1 315	745
1970-71	82	375	792	885	1 013	629
1971-72	96	416	789	1 138	1 299	748
Mean	75	373	769	1 033	1 193	

The linear effect of N was highly significant, but there were small deviations from linearity, as shown by the significance (5 per cent) of the quadratic and cubic effects.

No chemical analysis results of the 1973/74 Clovelly form experiment are as yet available.

Figure 2 shows the graph for crude protein yield of the mean of the four seasons and of 1968/69 and 1969/70 individually.

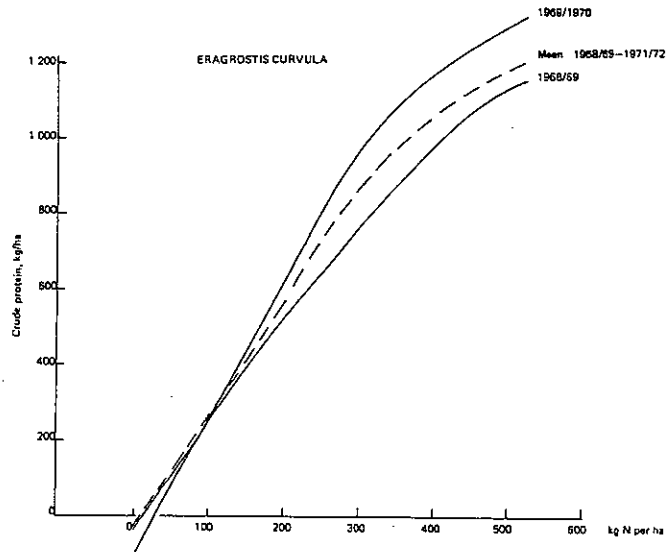


FIG 2 Crude protein yield of *Eragrostis curvula* to N application

Maize

In the 1972-73 season an experiment, comparing the effect of different levels of nitrogen on the yield of maize was started at the Triomf Research Unit at Eloff.

Nitrogen, in the form of urea, was applied at 0, 75, 150 and 225 kg/ha.

The hybrid was SA6.

The soil form is Hutton (Msinga series).

Soil analysis results from samples taken in April 1974.

pH (KCl)	4,6	Ca ppm	409
P ppm	74	Mg ppm	27
K ppm	129		

The following results were obtained in 1972/73 and 1973/74.

Year	Yields in kg per ha			
	N0	N1	N2	N3
1972/73	3 856	4 535	4 738	4 705
1973/74	4 199	6 302	7 100	7 095
Mean	4 028	5 419	5 919	5 900

The results are shown graphically in Figure 3.

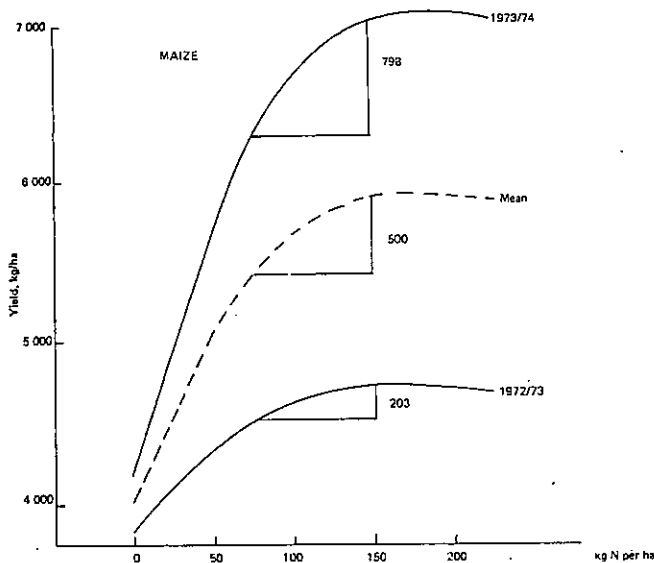


FIG.3 Maize yield response to N applications

The rainfall in the 1972/73 season was 529 mm and in 1973/74 629 mm.

The difference in yield between N150 and N75 was significant in 1973/74, but not in 1972/73.

On average over the two seasons the yield increase of 500 kg/ha from N75 to N150 was economically significant. At R45-00 per tonne grain the yield increase means R22-50 as against R18-75 extra nitrogen fertilizer cost.

The crude protein content of the seed was 8,6 for N0, 9,9 for N1, 10,2 for N2 and 10,3 for N3.

Sunflowers

1 The variety Smena was planted in 1973/74 in a 4x4x2 NPK factorial at Ventersdorp. The fertilizer levels, expressed in kg/ha were:

N0	0	P0	0	K0	0
N1	25	P1	20	K1	30
N2	50	P2	40		
N3	75	P3	60		

The soil form is Hutton (Msinga series). Soil samples taken in August 1973 gave the following analysis.

pH (KCl)	4,3	Ca ppm	180
P ppm	19	Mg ppm	35
K ppm	95		

Only the linear effect of N was significant.

	kg/ha
N0	1 287
N1	1 273
N2	1 448
N3	1 623

2 At Hoopstad a 4x4x2 NPK factorial was carried out during the 1973-74 season on the Smena variety.

The following fertilizer levels, expressed in kg per ha, were applied :

N0	0	P0	0	K0	0
N1	13	P1	13	K1	26
N2	26	P2	26		
N3	39	P3	39		

The soil is Clovelly form (Annandale series).

In this case only the linear effect of phosphate was significant.

	kg/ha
P0	1 321
P1	1 476
P2	1 698
P3	1 772