

THE EFFECT OF NP FERTILIZERS ON NP UPTAKE BY A BROMEGRASS AND ALFALFA
MIXTURE GROWN UNDER TWO SYSTEMS OF PASTURE MANAGEMENT

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A pasture experiment with four systems of pasture management was initiated in 1967. Three years later (1970) nitrogen fertilizer at 90 kg N/ha was applied on all pastures. Small fertilizer plots were placed within two of the pasture systems, Put + Take and Fed Barley. In the latter system, the stocking rate was 3.7 steers per hectare and level of rolled grain (barley) was increased gradually until the steers were on self-feed near the end of the season. Nitrogen fertilizer was applied to the small plots at rates of 0, 45, 90, 135 and 180 kg N/ha in 1970. The plots were split in 1971 and 45 kg P₂O₅/ha was applied on one-half of each plot in combination with the nitrogen until 1973. The uptake of N and P in the grass and alfalfa components were measured until 1976 (Figs. 1, 2 and 3). Yield and alfalfa percentage of the sward were reported on in the 1977 Proceedings of the Soil Fertility and Crops Workshop (1).

The N uptake of pasture in 1970 was much higher than the amount applied as fertilizer (Fig. 1) except for the highest rate (180 kg N/ha). Fixation of nitrogen by the legume component would account for a lot of this uptake as soil tests for nitrate-N were low (less than 20 kg N/ha). Exchangeable ammonium measured less than 60 kg N/ha. Uptake of P by herbage appeared greater on the Fed Barley (FB) pasture system. Fertilizer N and P applied from 1971 to 1973 was linearly related to N and P uptake by the herbage (Fig. 2). P fertilizer significantly increased the N uptake by the forage as well. Again, N uptake was greater than the amount of N applied as fertilizer with the exception of the highest rates of N (135 and 180 kg N/ha). Phosphorus uptake by herbage was less than the amount of fertilizer applied at all rates of N and P. Because N and P were applied at rates greater than uptake, residual amounts in the form of Nitrate-N and soluble phosphates were found in the soils. Uptake of nutrients by herbage were increased because of the residual N and P in the soil (Fig. 3). An increased proportion of alfalfa in the sward is concluded to have increased N and P uptake by herbage grown on control treatments. At low rates of N, less legume was in the sward and residual N was low, resulting in lower yields than controls. At the higher rates of N, residual nitrate-nitrogen increased yield which resulted in the curvilinear relationship of N and P uptake with N fertilizer. The mean protein and phosphorus percentage in alfalfa and brome grass are shown in Table 1. In general, nitrogen fertilizer increased protein percentage and phosphorus fertilizer increased P percentage of herbage with some exceptions.

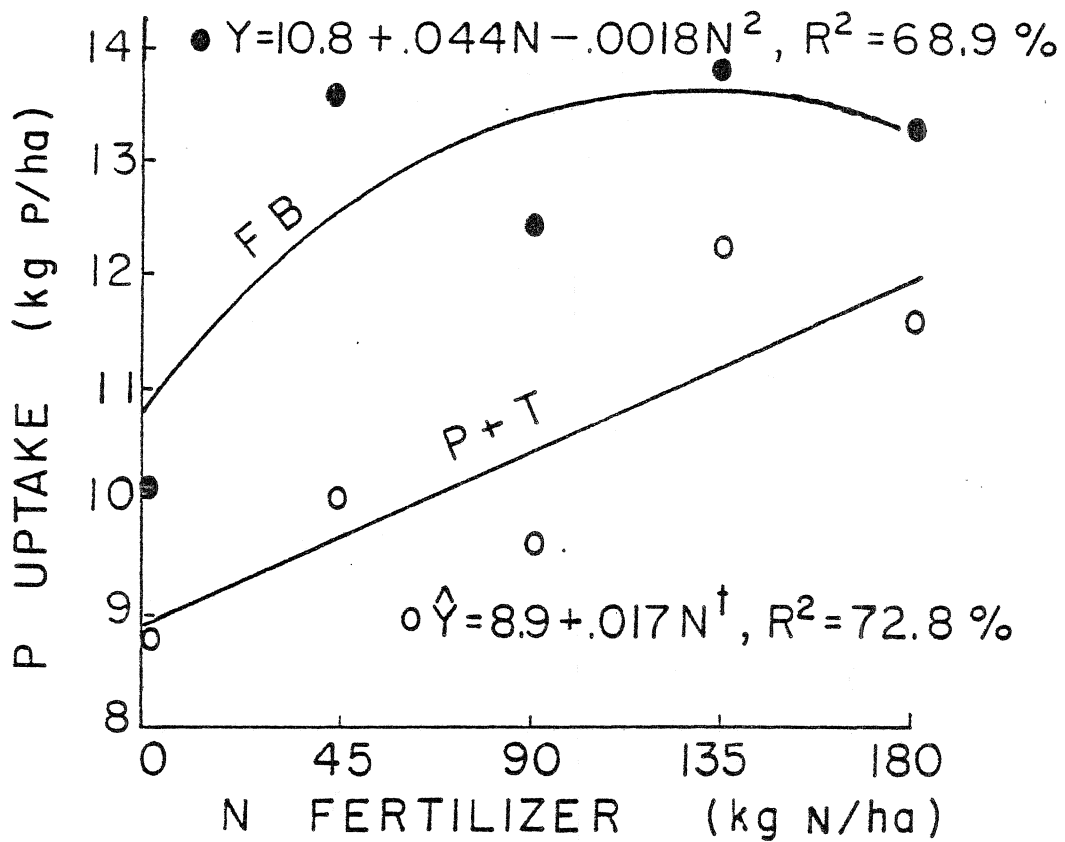
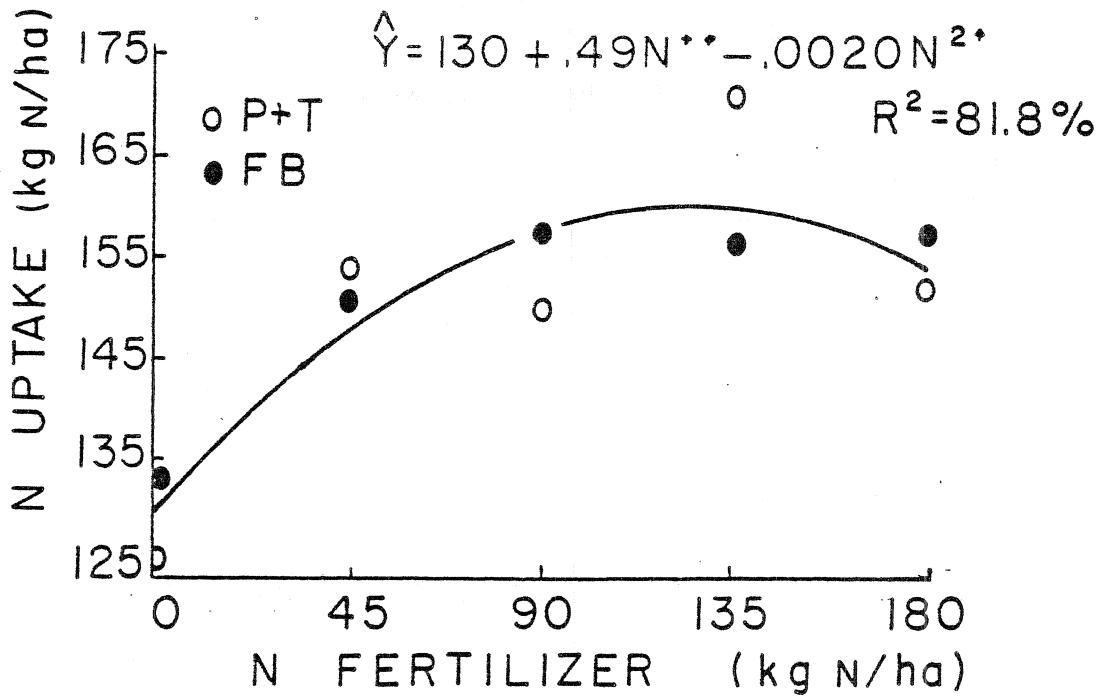


FIG. 1. UPTAKE OF N AND P BY BROMEGRASS AND ALFALFA PASTURE, 1970

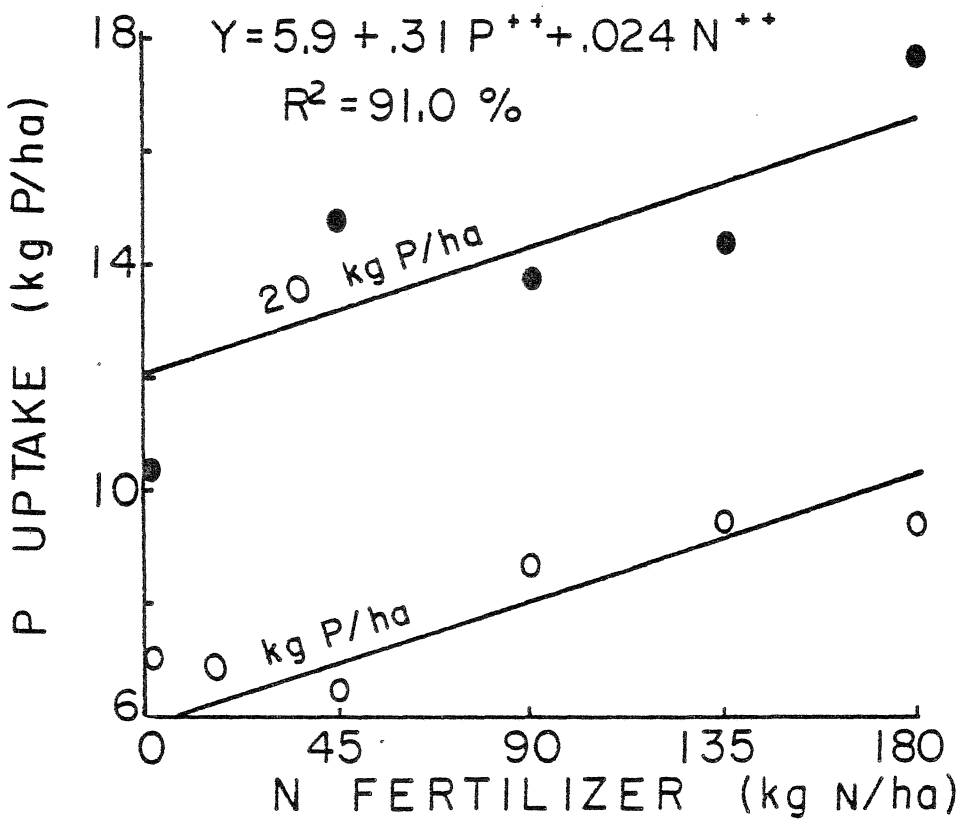
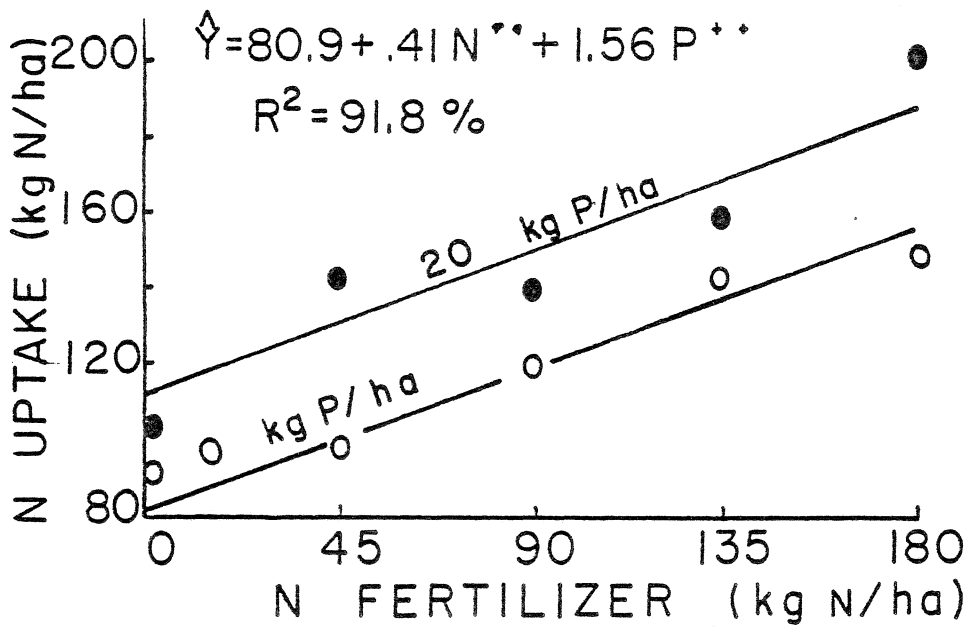


FIG. 2. UPTAKE OF N AND P BY BROMEGRASS AND ALFALFA PASTURE, 1972-73.

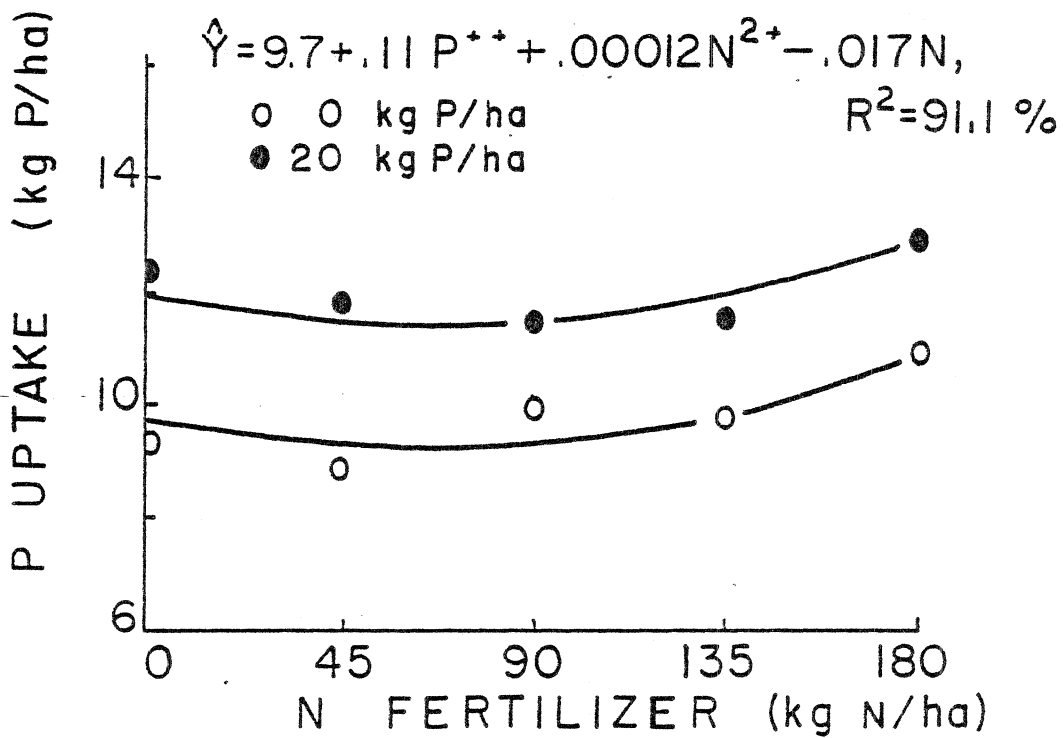
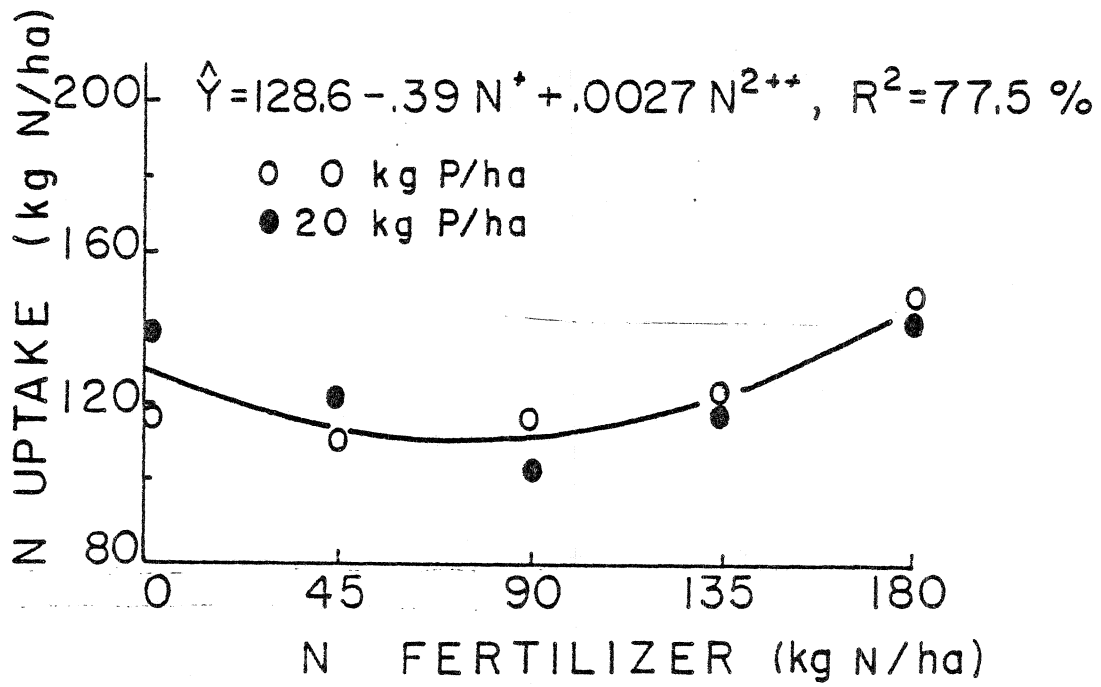


FIG. 3. UPTAKE OF N AND P BY BROMEGRASS AND ALFALFA PASTURE, 1974-75.

Table 1. Protein and Phosphorus Concentration in
Brome grass and Alfalfa Herbage

Year	Herbage component	% Protein		% Phosphorus			
		Cut 1	Cut 2	Cut 1		Cut 2	
				OP*	20P*	OP*	20P*
1970	Alfalfa	23.9	20.9	.285	----	.221	----
	Grass	19.6	15.1	.242	----	.205	----
1972-3	Alfalfa	22.3	19.9	.238	.278	.186	.204
	Grass	16.8	17.2	.225	.289	.190	.236
1974-5	Alfalfa	19.1	25.5	.238	.251	.241	.264
	Grass	14.0	22.3	.238	.279	.285	.340

* P fertilizer rate in Kg P/ha.

REFERENCE:

1. Proceedings of the 1977 soil fertility and crops workshop. Saskatchewan Advisory Council on Soils and Extension Division, University of Saskatchewan. P91-95.