In the present study, the impact of grazing on certain structural and functional soil-plant nutrient (N.P.), removal of nutrients through herbage intake and on the annual nutrient budget of the two bhata soil grasslands, viz., protected and grazed grasslands situated near Tarenga village (21°55' North and 81°75' East) of Raipur district M.P. (India).

The details of the findings described in the preceding pages are summarised as under :-

1. 26 species (14 grasses-sedges, 6 legumes and 6 species of forbs) were recorded in the protected site and 17 species (8 grasses sedges, 3 legumes and 6 forbs species) in the grazed site. Eragrostis viscosa (protected) and Eragrostis tenella (grazed) were most dominant species.

2. The total green biomass of the protected site increased from 3.55 g.m.⁻² in May to a peak value of 291.18 g.m.⁻² in August and fluctuated thereafter. At the grazed site it increased from a minimum of 8.41 g.m.⁻² in May to a peak value of 87.96 g.m.⁻² in August and fluctuated thereafter.

3. The total standing dead biomass in the protected site was minimum (2.31 g.m.⁻²) in September and maximum (263.14 g.m.⁻²) in February while at the grazed site it was minimum (0.56 g.m.⁻²) in July and maximum (74.72 g.m.⁻²) in January.
4. The minimum total aboveground biomass (green+dead) was minimum (34.84 g.m\(^{-2}\)) in April and maximum (351.42 g.m\(^{-2}\)) in August at the protected site while at the grazed site it was minimum (25.65 g.m\(^{-2}\)) in May and maximum (136.18 g.m\(^{-2}\)) in January.

5. The litter increased from October and reached its peak value (582.48 g.m\(^{-2}\)) in January at the protected site and in February (318.18 g.m\(^{-2}\)) at the grazed site.

6. The belowground biomass at the protected site increased after June and reached its peak value in January (558.14 g.m\(^{-2}\)). Whereas, it fluctuated at the grazed site and achieved its maximum biomass in May (611.84 g.m\(^{-2}\)).

7. The total biomass of the protected site increased from a minimum of 215.77 g.m\(^{-2}\) in June to 783.58 g.m\(^{-2}\) in August but the maximum biomass was in the month of January (895.00 g.m\(^{-2}\)). Whereas, it fluctuated throughout the year at the grazed site with a minimum biomass of 199.77 g.m\(^{-2}\) in June and maximum of 637.49 g.m\(^{-2}\) in May.

8. The belowground/aboveground ratio at the protected site ranged between 0.98 and 7.24 and at the grazed site between 2.62 and 23.85.

9. The aboveground net production of both the sites has been calculated by 3 different methods -
(i) The aboveground net production by positive difference method came to 497.64 g.m\(^{-2}\) yr\(^{-1}\) at the protected site and to 124.58 g.m\(^{-2}\) yr\(^{-1}\) at the grazed site.

(ii) By the positive increase sum method of individual Sps., it came to 1282.87 g.m\(^{-2}\) yr\(^{-1}\) (protected) and 365.60 g.m\(^{-2}\) yr\(^{-1}\) (grazed) site.

(iii) By the summation of peak biomass of individual Sps., the annual production was 1068.92 and 274.19 g.m\(^{-2}\) yr\(^{-1}\) at the protected and grazed sites respectively.

10. The belowground production was 481.69 and 1025.90 g.m\(^{-2}\) yr\(^{-1}\) at the protected and grazed sites respectively.

11. The total net production was 1550.61 g.m\(^{-2}\) yr\(^{-1}\) at the protected site and 1300.08 g.m\(^{-2}\) yr\(^{-1}\) at the grazed site.

12. The highest rate of litter disappearance at the protected site was obtained between 20 February-19 March (0.86 mg.g\(^{-1}\) m\(^{-2}\) day\(^{-1}\)) and at the grazed site it was obtained between 20 January-19 February (2.14 mg.g\(^{-1}\) m\(^{-2}\) day\(^{-1}\)).

13. The annual herbage intake was 373.06 g.m\(^{-2}\).

14. The annual budget of dry matter was prepared for both sites and the system transfer functions were also determined.

15. The percentage of soil nitrogen ranged between 0.002 and 0.008 (protected) and 0.002 and 0.009 percent (grazed). The percentage of phosphorus in the soil ranged between 0.001 and 0.006 (protected) and 0.001 and 0.007 percent (grazed).
16. The percentage of nitrogen and phosphorus in their green and dead aboveground plant parts varied significantly in different months and in different species at both the sites. The total nitrogen and phosphorus content \( (\text{mg.m}^{-2}) \) in the total aboveground green plant parts of the protected site increased from a minimum \( (N.32.75 \text{ and } P.3.88 \text{ mg.m}^{-2}) \) in May to a peak value in September \( (N.506.18 \text{ and } P.544.02 \text{ mg.m}^{-2}) \). Whereas, at the grazed site it increased from a minimum \( (N.54.10 \text{ and } P.7.80 \text{ mg.m}^{-2}) \) in May to a peak value in August \( (N.1218.08 \text{ and } P.182.31 \text{ mg.m}^{-2}) \). The nitrogen and phosphorus contents in the aboveground dead plant parts did not show any trend at both the sites. The total nitrogen and phosphorus content in the total aboveground plant parts has shown a more or less similar trend as that of aboveground green plant parts at both the sites.

17. The percentage of nitrogen and phosphorus in litter has shown fluctuating trend at both the sites. The values ranged between 0.35 and 1.19 percent (nitrogen) and 0.01 and 0.06 percent (phosphorus).

The nitrogen and phosphorus content in the litter fluctuated throughout the year at the protected site while at the grazed site, nitrogen and phosphorus content increased continuously after September and reached the peak value of \( N.1781.80 \text{ mg.m}^{-2} \) in February and \( P. 75.76 \text{ mg.m}^{-2} \) in January respectively.

18. The percentage of nitrogen and phosphorus in the belowground plant parts did not show a particular trend at both the sites.
The maximum values of nitrogen in the belowground parts were 5469.77 mg.m\(^{-2}\) in January (protected site) and 6852.60 mg.m\(^{-2}\) in May (grazed site). The maximum values of phosphorus content were 361.08 mg.m\(^{-2}\) in December (protected site) and 369.21 mg.m\(^{-2}\) in April (grazed site).

19. The total amount of nitrogen and phosphorus content (aboveground + belowground) increased after June and reached the peak in September (N. 9348.85 and P. 734.23 mg.m\(^{-2}\)) at the protected site. At the grazed site the two elements fluctuated throughout the year. The maximum amount was N. 7021.47 mg.m\(^{-2}\) in May and P. 455.00 mg.m\(^{-2}\) in April.

20. The annual uptake of nitrogen and phosphorus by the aboveground was N. 7059.13, P. 853.05 mg.m\(^{-2}\) (protected) and N. 2709.51, P. 309.68 mg.m\(^{-2}\) (grazed).

The annual uptake of nitrogen and phosphorus by the belowground was N. 6300.00, P. 357.51 mg.m\(^{-2}\) (protected) and N. 11229.64, P. 496.49 mg.m\(^{-2}\) (grazed).

The total annual uptake (aboveground + belowground) of nitrogen and phosphorus was N. 13359.13, P. 1210.56 mg.m\(^{-2}\) yr\(^{-1}\) (protected) and N. 13939.15, P. 806.17 mg.m\(^{-2}\) yr\(^{-1}\) (grazed).
21. The annual release of nitrogen and phosphorus through litter decomposition amounted to N.2350.79, P.122.38 mg.m$^{-2}$ (protected) and N.614.39, P.19.17 mg.m$^{-2}$ (grazed).

The annual release through belowground plant parts amounted to N. 5240.71, P. 216.97 mg.m$^{-2}$ (protected) and N. 10991.57, P. 456.71 mg.m$^{-2}$ (grazed).

The total release of nitrogen and phosphorus amounted to N. 7591.50, P.339.35 mg.m$^{-2}$ (protected) and N.11605.96, P. 475.88 mg.m$^{-2}$ (grazed).

22. The total amount of nitrogen and phosphorus removed by cattle through herbage intake was N.4349.62 and P.543.37 mg.m$^{-2}$ yr$^{-1}$

23. The nitrogen and phosphorus budget for the year 1989-90 was prepared for both the sites and system transfer functions were calculated.