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Soil Nitrogen and Phosphorus Flux from Cattle Excreta Part I: Comparing Three Forms of Grazing Management

Grazinglands Research Laboratory, El Reno, OK May 2017

Rationale: Large pastures managed with beef cattle that continuously graze year round typically develop areas where overgrazing is evident. Overgrazing often results from cattle consistently re-grazing areas by selecting immature and more nutritious forage plants in these areas. Forages in the ungrazed areas of pastures become mature and less nutritious for grazing cattle. Dividing large pastures into smaller paddocks and rotating cattle among paddocks can result in more uniform grazing and utilization of forages and more even distribution of nutrients from urine and feces in paddocks. Feces and urine recycled to pastures by grazing cattle provide important sources of both nitrogen and phosphorus. Limited research has been done in regards as to how different grazing managements may influence the fluxes of these nutrients in the native pasture soils.

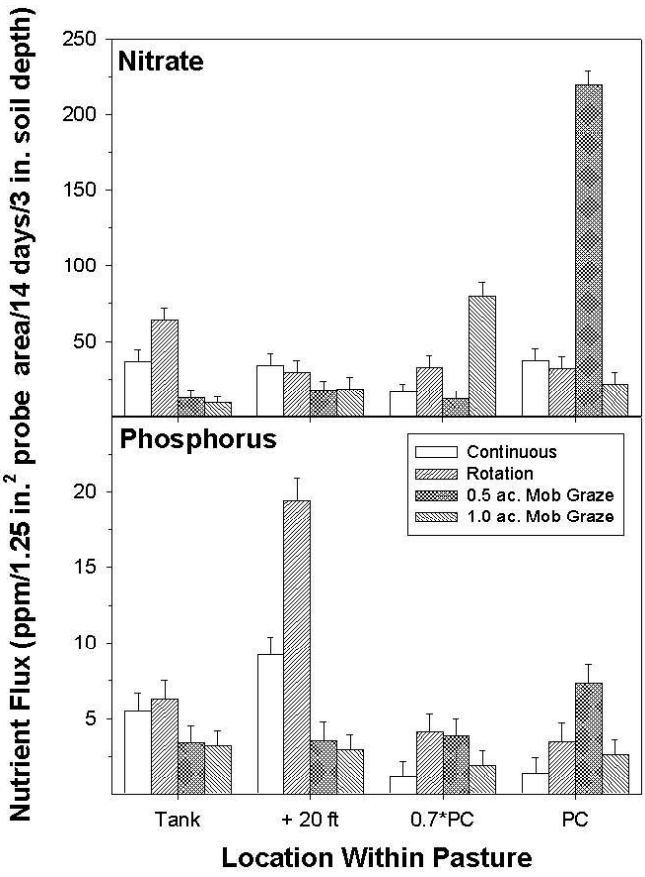
Objective: To determine if the flux of nitrogen and phosphorus in soils of native pasture differed among three systems of grazing management: continuous, rotational, and short-term mob grazing by cow/calf pairs.

What We Did: Cow/calf pairs were managed year-round on continuous and rotational paddocks and in 24-hour grazing bouts on 0.5 and 1.0 acre paddocks beginning in 2009. Rotational pastures were allowed 120 to 180 day rest periods between grazing bouts, while the mob-grazed pastures were grazed once per year. Numbers of animals applied were: 18 cow/calf pairs on 148 acres (150 lb of cow/ac) for continuous grazing; 25 cow/calf pairs on 190 acres in 10 paddocks (165 lb of cow/acre) for rotational; and 25 cows for 24 hours one time per year on the 0.5 and 1.0 acre pastures in mid-August. In spring 2015, transects were laid out from the water source to pasture centers in sets of the pastures under the different forms of management. Pairs of anion and cation probes were inserted vertically into the soil at 0-3 in and 3-6 in depths. The probes were left in place for 2 weeks, then removed and nitrate and phosphorus fluxes determined.

Preliminary Findings--after six years:

- All forms of grazing management resulted in hot spots of nutrient flux of varying degrees in soils after 6 years of applied grazing regimes.
- Continuous stocked pastures had more uniform distribution of nitrate flux (top panel of figure). Pastures managed under the other forms of grazing showed hot spots in nitrate flux; location of hot spots within pastures under different management systems was not consistent.
- Rotationally-grazed pastures had hot spots near water tanks; mob-grazed pastures had hot spots at center of pastures (PC) and 70% of distance between tanks and PC.

- Continuous and rotationally grazed pastures had hot spots in phosphorus flux close to water tanks, compared to pasture centers (bottom panel, figure at right).
- Mob-grazed, 0.5 acre pastures had hot spots in phosphorus flux near pasture centers.
- Hot spots in flux of both nutrients noted in response to rotational and mob grazing occurred after long rest periods from grazing; 6.5 months for rotation, 7.5 months for mob grazed. (Continuous pastures were grazed by cattle year round without rest periods.)
- Such results indicate that 6 years of applied management did not prevent development of point source nutrient concentrations that can affect quality of ground or surface water. Some grazing systems may make it more difficult to identify the location of such potential pollutants.
- Additional measurements are being collected to determine if the distribution patterns in nutrient flux within the rotational and mob grazed pastures occur immediately after grazing of pastures.



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