Litter Dynamics and Particulate Organic Matter Fractions in Smooth Bromegrass Pastures Under Reduced Nitrogen Inputs

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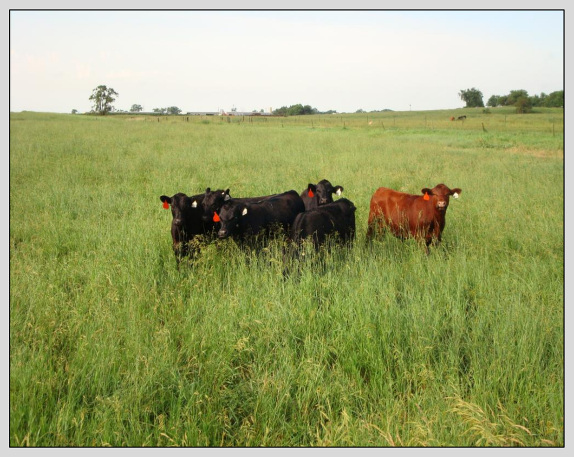


OBJECTIVE

Determine how supplementation of rotationally stocked beef cattle with corn (*Zea mays* L.) dried distillers grains plus solubles (DDGS) in unfertilized pasture affects litter dynamics and particulate organic matter fractions relative to unsupplemented beef cattle rotaionally stocked on unfertilized (CONT) and N fertilized (FERT) smooth bromegrass (*Bromus inermis* Leyss.) pastures.

HYPOTHESIS

Greater herbage trampling and senescence in FERT would increase litter and soil particulate organic matter fractions relative to CONT and SUPP.

MATERIALS AND METHODS

Management systems

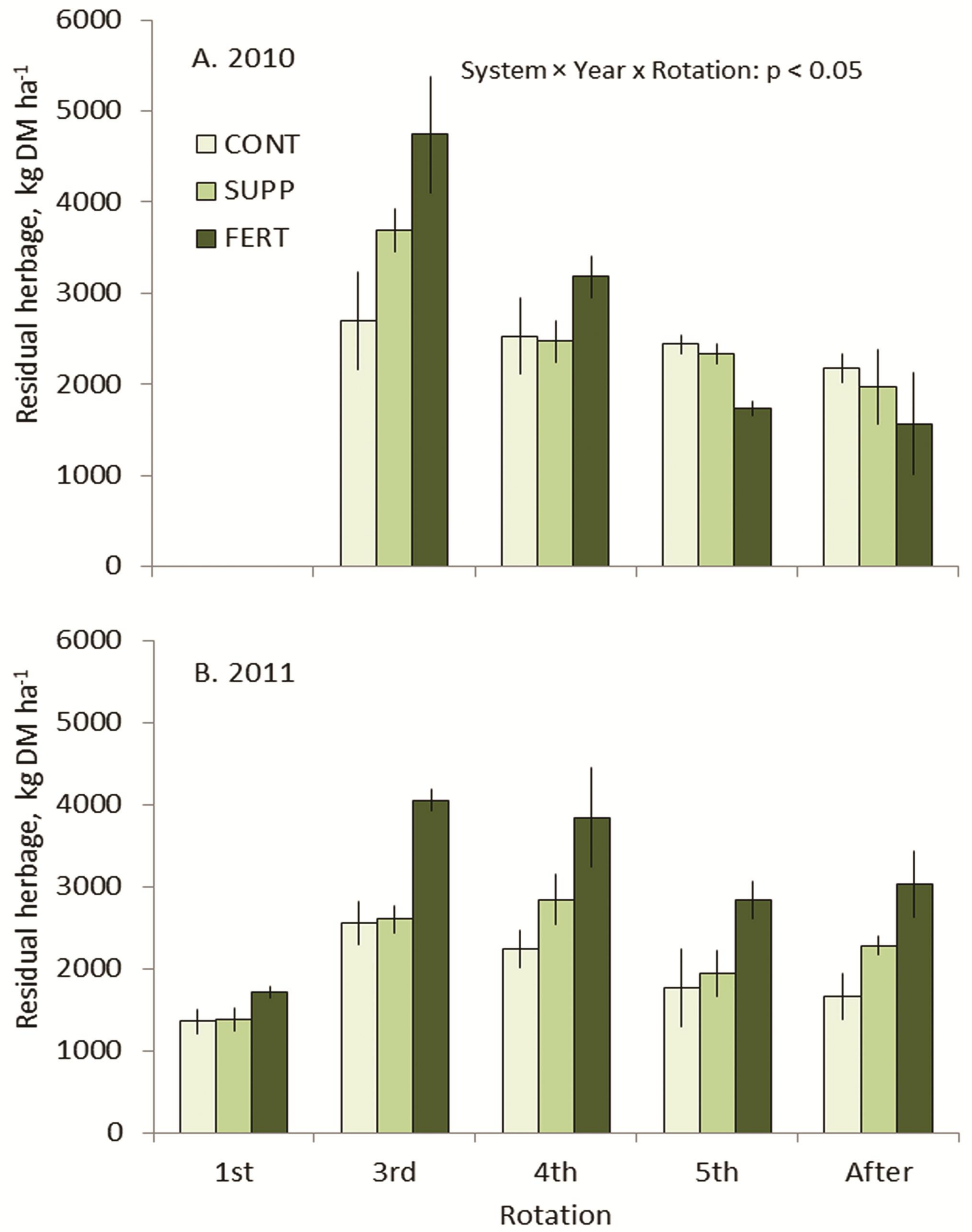
Yearling cattle rotationally stocked within

- Unfertilized pasture at 6.4 AUM ha^{-1} (CONT);
- Unfertilized pasture at 9.9 AUM ha^{-1} and supplemented with 2.3 kg DDGS steer^{-1} d^{-1} (SUPP);
- N-fertilized pasture at 9.9 AUM ha^{-1} (FERT).

RESULTS

Herbage mass

FERT supports more herbage mass, stocking rates, and trampling.

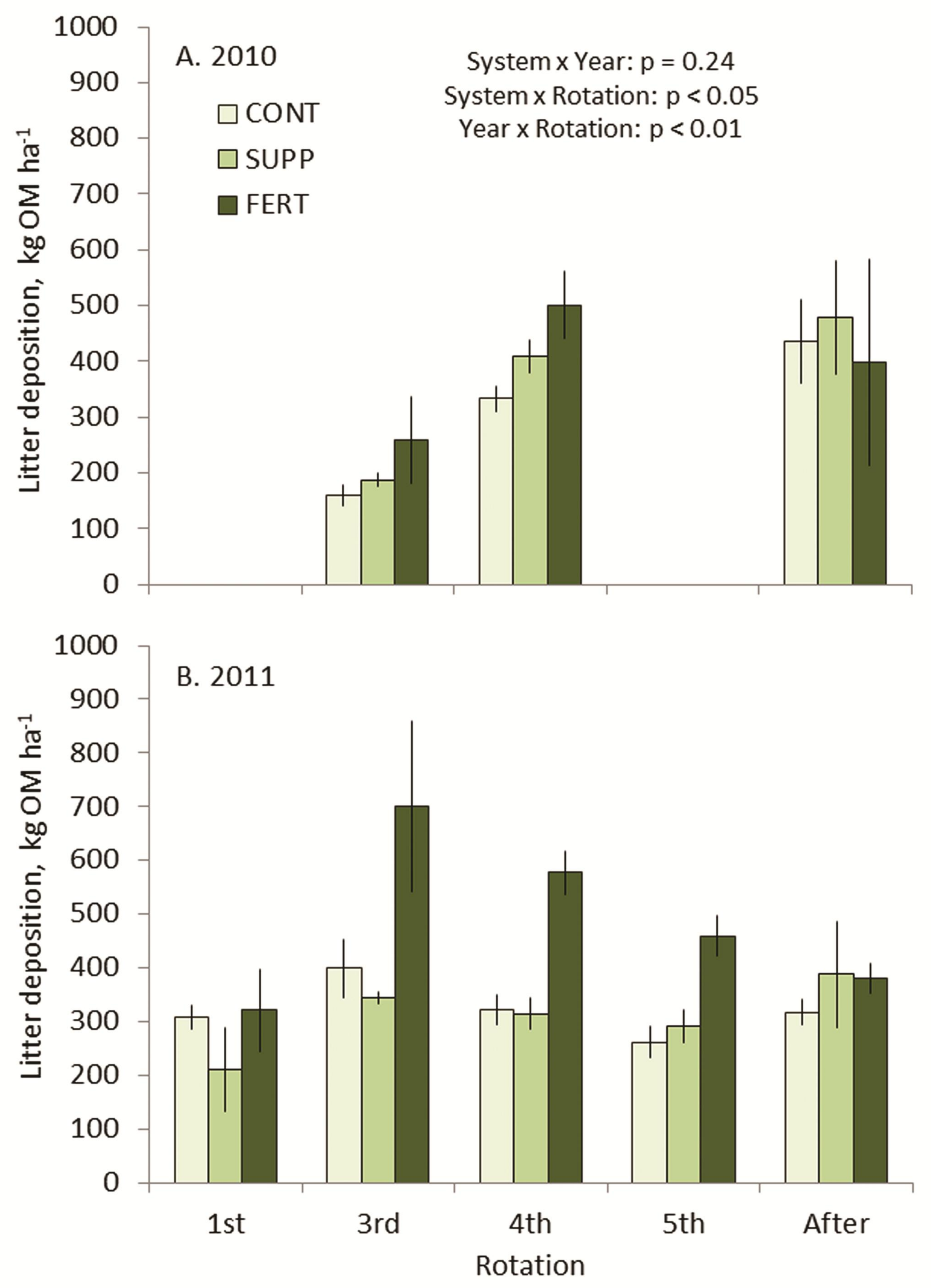


Nitrogen budget

Item	Source	CONT	SUPP	FERT
		Treatment		
		———— kg N ha^{-1} ————		
Input	Fertilizer	0	0	90
	DDGS†	0	43	0
	Deposition‡	7	7	7
	Total	7	50	97
Consumption	Herbage§	55	66	97
	DDGS	0	43	0
	Total	55	109	97
Retention¶		5	9	7
Excretion#		50	100	90
N balance††		2	41	90

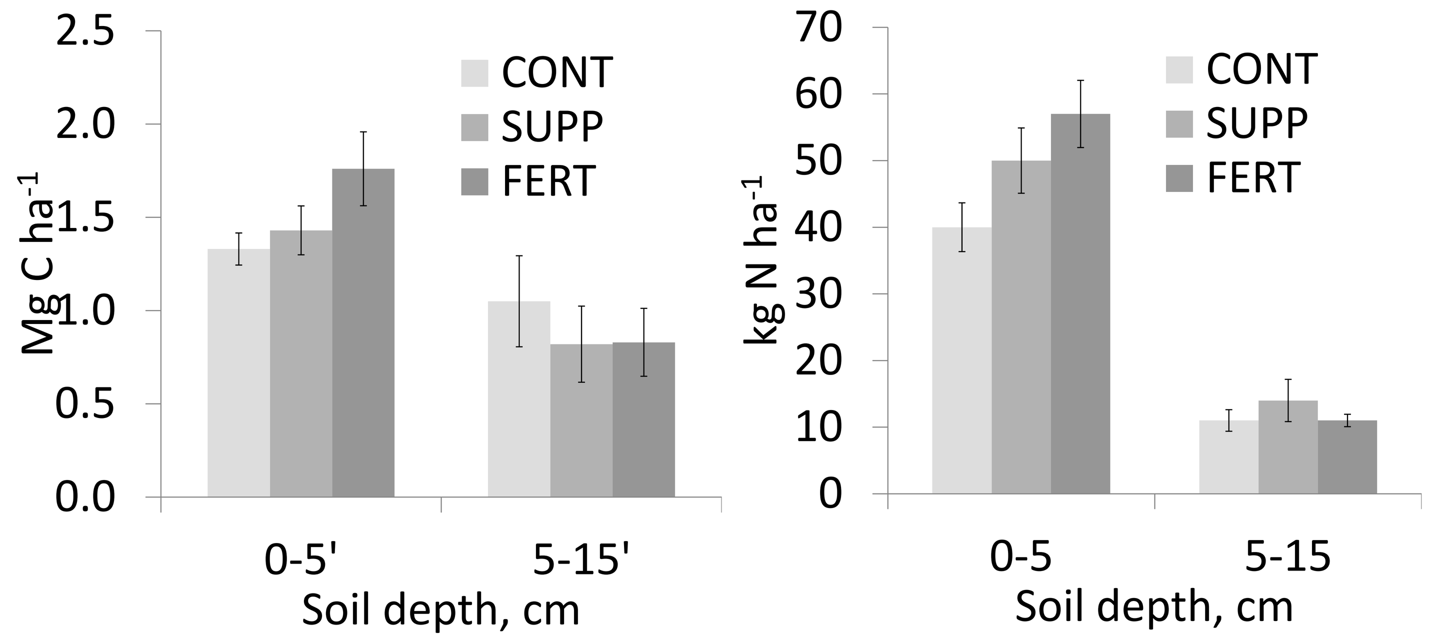
† DDGS N fed = kg AUD^{-1} × 4.6% N × final stocking rate.
‡ National Atmospheric Deposition Program
§ Herbage N consumption = % herbage N × intake × stocking rate (AUD ha^{-1});
¶ Nitrogen retention = N retained AUD^{-1} × stocking rate. Nitrogen retained calculated from NRC (1996) equations.
# Nitrogen excretion = N consumption – N retention
†† N balance (surplus) = total N inputs – N retention

Litter deposition

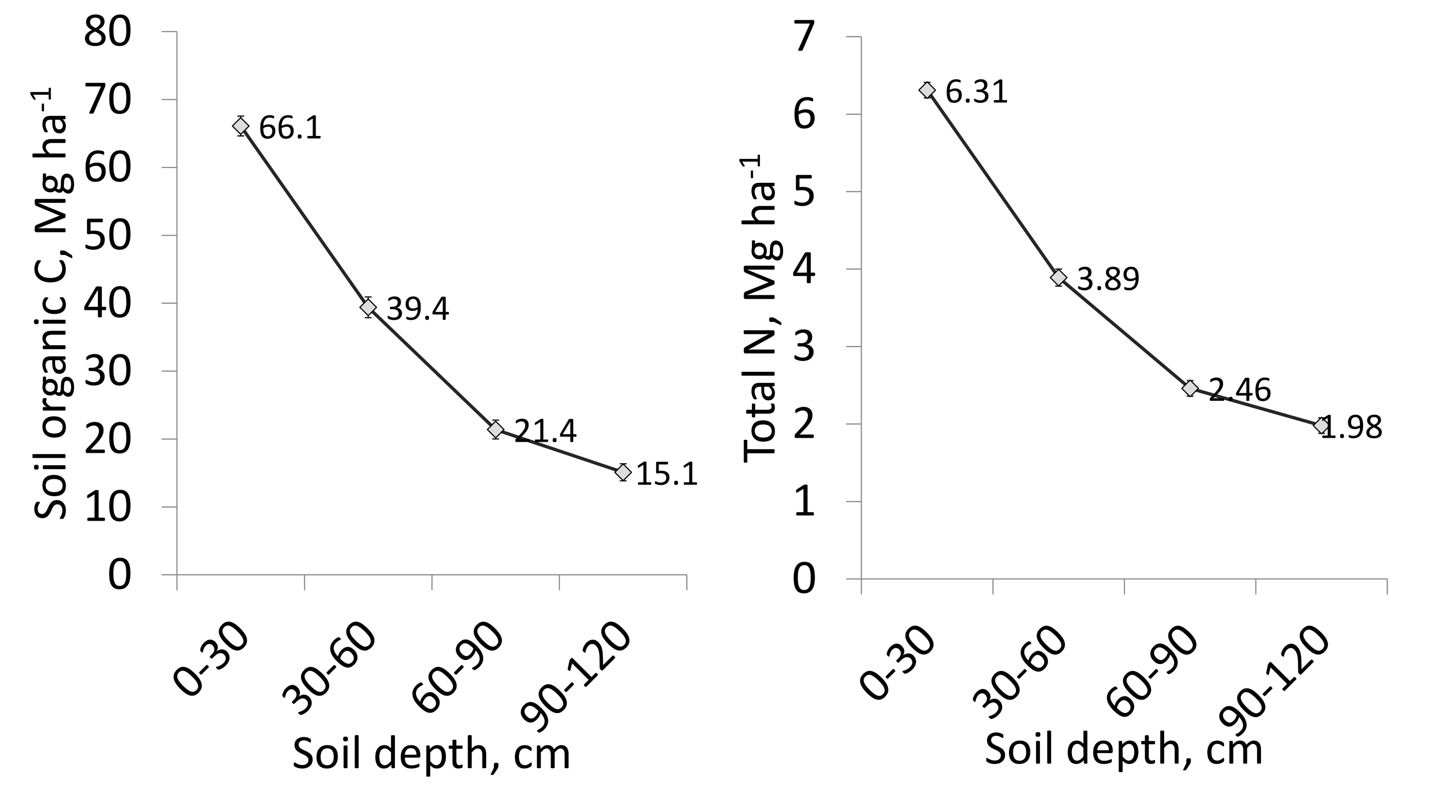


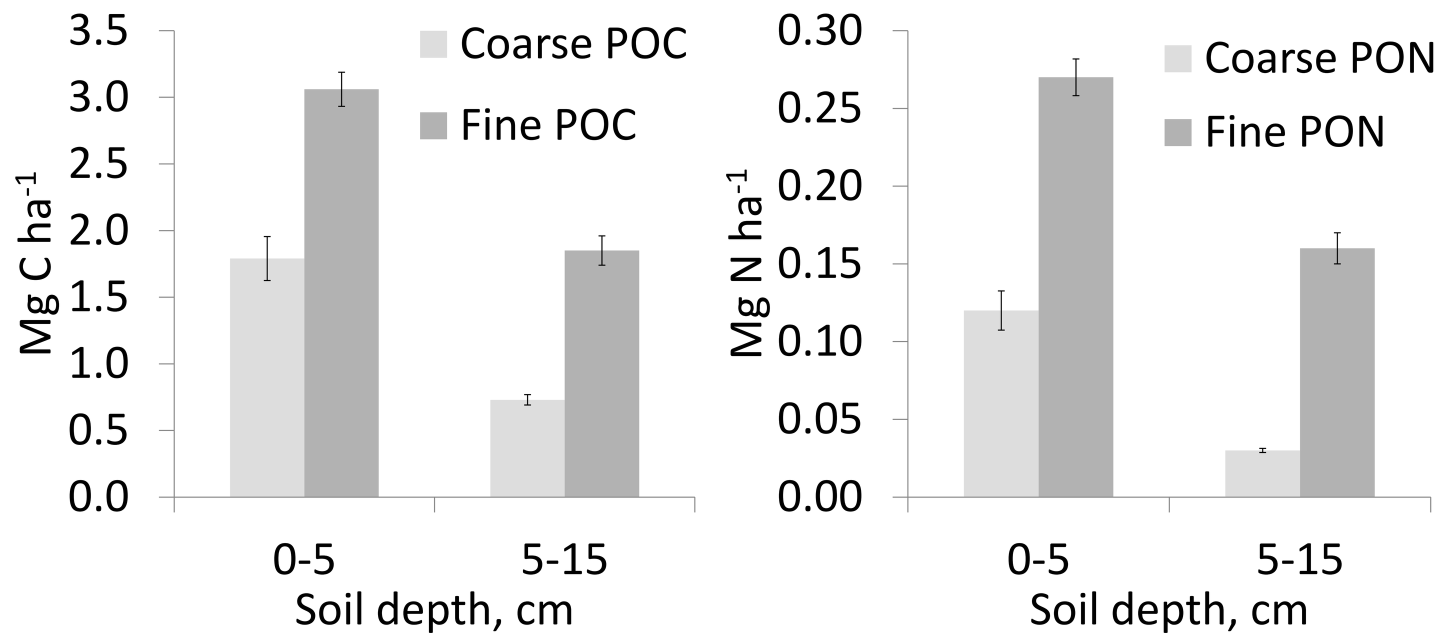
Litter returned 27, 30, and 46 kg N ha^{-1} through the 158-d grazing season, equivalent to 35%, 23%, and 34% of total N returning through litter and excreta in CONT, SUPP, and FERT, respectively.

Root/rhizome C and N



Soil carbon and nitrogen pools





CONCLUSION

- SUPP reduces N inputs and improves animal NUE.
- FERT produces more herbage, litter, and root/rhizome mass.
- Systems with equal cumulative grazing pressures maintain similar soil organic C and total N.
- Increased litter deposition in FERT may reduce annual weeds (Guretzky et al. 2013)
- Reduced litter N return relative to excreta in SUPP may increase N losses.

REFERENCES

Greenquist et al. 2011. J. Anim. Sci. 89:1146-1152
Guretzky et al. 2013. Agron. J. 105: 915-921
Guretzky et al. 2014. Agron. J. In Press.

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