Soil Micro Nutrients in Backgrounding Beef Feedlot Site

Annesly Netthisinghe[1], Rebecca Gilfillen[1], Kimberley Cook[2], and Karamat Sistani[2].
[1] Department of Agriculture, Western Kentucky University, 1906 College Heights Blvd. # 41066, Bowling Green, KY 42101.
[2] USDA-ARS Animal Waste Management Research Unit, 230 Bennett Lane, Bowling Green, KY 42104.

INTRODUCTION

The beef cattle backgrounding represent an intermediate tire of the U.S. commercial beef production system and grow out weaned calves from cow-calf enterprises to weights and conditions ready for feedlot finishing (Bradford et al.,1978).

Steer calves in backgrounding feedlots are fed mainly with grains and raised under intensive management on smaller land areas.

In such operations, trace elements such as Fe, Cu, Zn, Mn, and B are added to animal feeds to avoid deficiencies and promote animal health (National Research Council, 2001).

Trace elements fed so are retained in animal tissues in smaller amounts and larger portion pass to the manure and soil (Sheppard et al., 2012).

Beef cattle backgrounding feedlot sites can accumulate high amounts of manure and soil nutrients (Jongbloed and Lenis, 1998). High ;levels of manure nutrients may impact soil and water quality.

Better understanding of magnitude of micronutrient nutrient accumulation and their distribution pattern in backgrounding feedlot land scape helps managing soil nutrients for sustainable beef production.

OBJECTIVE

To quantify the soil micronutrient accumulation in backgrounding feedlot setting and to identify their field scale distribution patterns.

STUDY SITE

This study was conducted at the Western Kentucky University Agriculture Research and Education Complex, Bowling Green, KY.
Feedlot site had 4% slope along the transect.
Except for the feeder area, rest of the site locations had grass/crop ground cover at any time

SOIL SAMPLING

Based on the intensity of animal impact and the position on the landscape the entire site was divided in to three parts and performed soil sampling.
(i) Feeder area (n =20)
(ii) Near Grazing Area (n =11)
(iii) Far Grazing Area (n =12)

For comparison, two other directly non impacted adjacent offsite locations were also sampled.
(iv) Offsite Crop Area (n =22)
(v) Offsite Grazing Area (n =27)

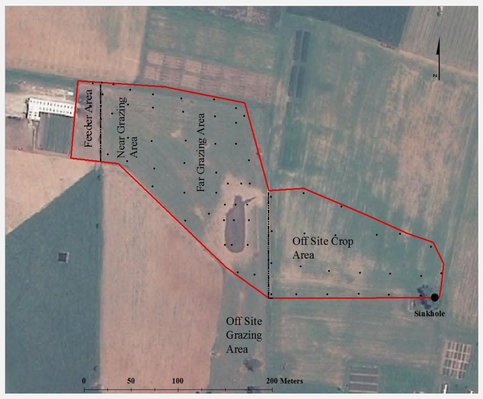
SOIL ANALYSIS

Soil samples were collected to 0-15 cm depth. Five samples collected within 1m radius of geo referenced locations were analyzed for organic matter % by LOI method (Nelson and Sommers, 1996)). Soil Fe, Cu, Zn, Mn, and B levels were determined by Mehlich- 3 extractant (Mehlich, 1984) using ICP.

Acknowledgements
The authors wish to acknowledge the USDA-ARS for cooperation and funding of this research

FEEDLOT SITE LANDSCAPE VIEW

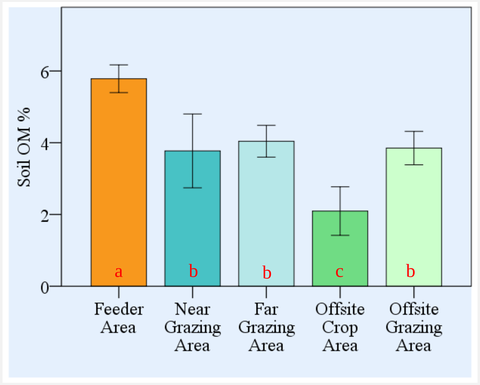
FEEDLOT SITE AERIAL VIEW



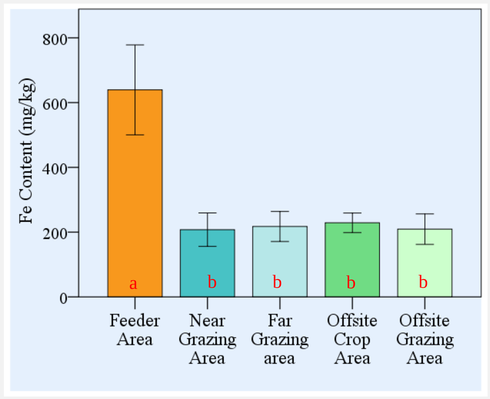
FEEDER AREA

NEAR/FAR GRAZING & OFFSITE CROP AREAS

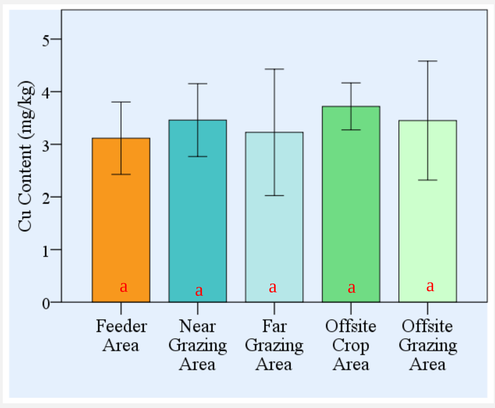
SOIL OM %



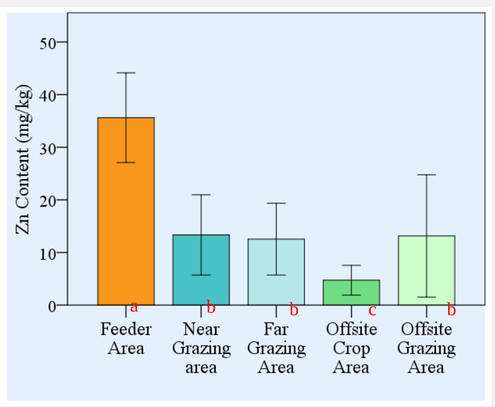
Fe CONTENT



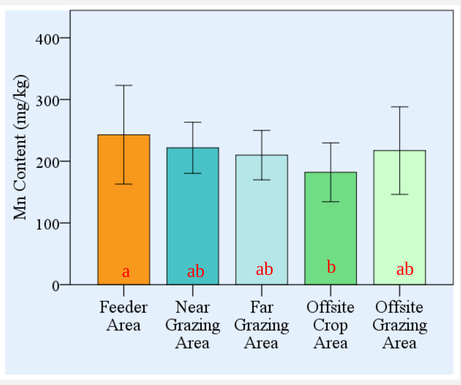
Cu CONTENT



Zn CONTENT



Mn CONTENT



RESULTS

Elevated soil organic matter, Fe, Zn, and Mn contents were found in the Feeder area.

Copper levels across the landscape was uniform.

Fe and Mn content distribution pattern across the landscape followed same trend. The highest Fe and Mn contents were in the feeder area and all the other areas had uniform levels

Zinc and OM% distribution on the landscape followed a similar trend. Zinc and OM% concentrations in the feeder area was highest and the contents in the offsite cropping areas were lower than the overall animal impacted areas.

Zinc and Cu levels in the feeder area did not elevate to reach the pytotoxic levels.

CONCLUSIONS

Manure derived soil organic matter and most of the soil micro nutrients in the backgrounding feedlot settings are confined to the highly animal impacted feeder area.

Grass area surrounding highly manure concentrated feeder areas immediately can prevent soil micro nutrient movement along the landscape

Subsequent site remediation should focus on feeder area where most constituents are concentrated.

REFERENCES

Bradford, G.L., J.A. Boling, S.R. Rutledge, and T.W. Moss. 1978. Comparing management systems for beef cattle backgrounding: a multidisciplinary approach. Southern Journal of Agric. Econ. 78: 57- 62.

Jongbloed, A.W. and N.P. Lenis. 1998. Environmental concerns about animal manure. J. Anim. Sci. 76:2641-2648.

Mehlich, A. 1984. Mehlich 3 soil test extractant: A modification of Mehlich 2 extractant.Commun. Soil Sci. Plant Anal. 15:1409-1416.

National Research Council (U.S). 1996. Nutrient requirement of beef cattle. National Academy Press, Washington, DC.

Nelson,D.W. and L.E.Sommers. 1996. Total carbon, organic carbon, and organic matter analysis. In: Sparks et al. editors, Methods of soil analysis Part 3- chemical methods SSSA, Madison, WI. p. 961-1010.

Sheppard, S.C. and B. Sanipelli.2012. Trace elements in feed, manure, and manured soils. J. Environ. Qual. 41: 1846-1856.