SOIL NUTRIENT CHANGE IN BACKGROUNDING BEEF FEEDLOT AFTER LOOSE MANURE REMOVAL AND SITE ABANDONING

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INTRODUCTION

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

Steer calves in background feedlots are fed with grains and raised under intensive management on smaller land areas. As a result, these sites can accumulate high soil nutrient levels (Jongbloed and Lenis, 1998).

Previous study on this backgrounding feedlot site showed that high soil nutrient levels are associated with the feeder area where animals congregate mostly (Netthisinghe et al., 2012).

Unless properly managed, soil nutrients from backgrounding feedlots can enter surrounding environments impairing soil and water quality.

In addition, feedlots in karst environments, raise extra concerns because of low filtering by shallow soils and rapid transport of contaminants in surface runoff or directly into ground water through karst geomorphic features, like sinkholes.

Even though the main indicator of ground water contamination from feedlots has been nitrates; NH_4,P, K, Ca. Mg, Na could also be used as indicators (Maule & Fonstad 2000).

It is important to identify effective best management practices (BMPs) that help with mitigating environmental impacts of high soil nutrients in feeder areas of backgrounding feedlots for sustainable beef production.

MATERIALS AND METHODS

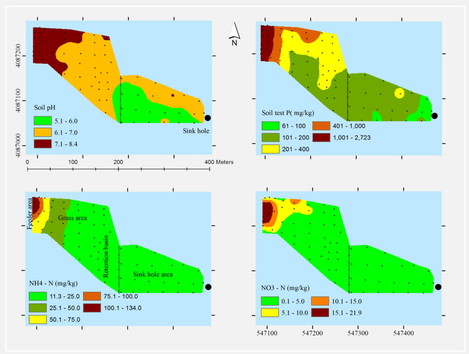
We tested the effects of annual loose manure layer removal and abandoning the site after loose manure layer removal as a management practices to reduce manure nutrient loads in the feeder area.

Each time, we collected 16-18 soil samples from the same feeder area locations (GPS supported) and analyzed them for % organic matter by LOI method (Nelson and Sommers, 1996)), soil test P , Na, K, and Mg levels by Mehlich- 3 extractant (Mehlich, 1984) using ICP, and NH_4 by KCl extractant using flow injection colorimetric analysis with cadmium reduction (Mulvaney, 1996).

We employed following soil sampling schedule during the study period.

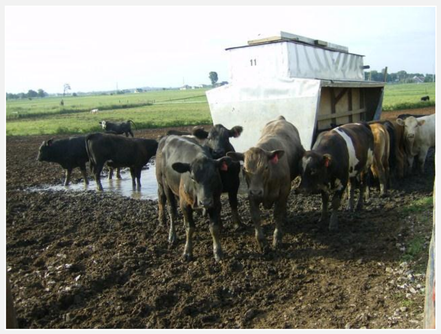
- ★ twice - allowed 8 months for manure nutrient buildup after one scraping (loose manure / manure soil mix).
- ★ twice - 2 weeks after manure scraping. (mixed soil/mineral soil)
- ★ twice - after second annual manure scraping and at 8 month & 12 month after abandoning the site. (mixed soil/mineral soil)

GENERAL SOIL NUTRIENT DISTRIBUTION PATTERN (HIGH SOIL NUTRIENTS IN FEEDER AREA)

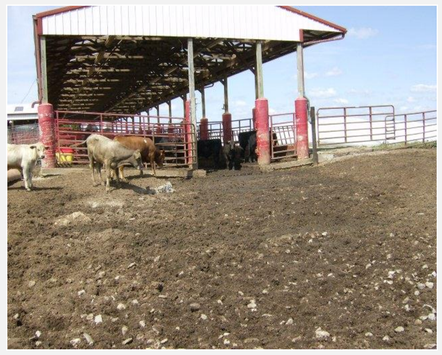


FEEDLOT SITE TRANSECT WITH GRAZING AREA

MNURE BUILDUP - 8 MONTHS AFTER LOOSE MANURE REMOVAL (2009/11 & 2010/11) ★



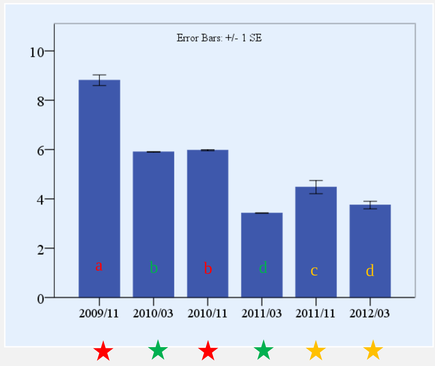
FEEDER AREA - 2 WEEKS AFTER MANURE REMOVAL (2010/03 & 2011/03) ★



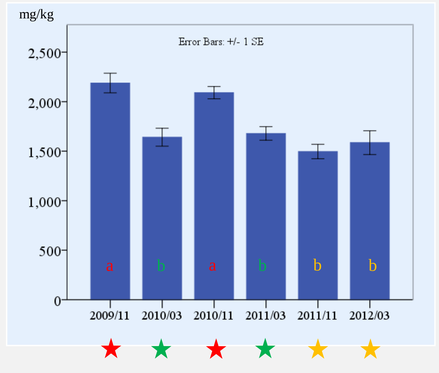
FEEDER AREA AFTER LOOSE MANURE SCRAPING AND ABANDONING ANIMAL INPUT (2011/11 & 2012/03) ★

RESULTS

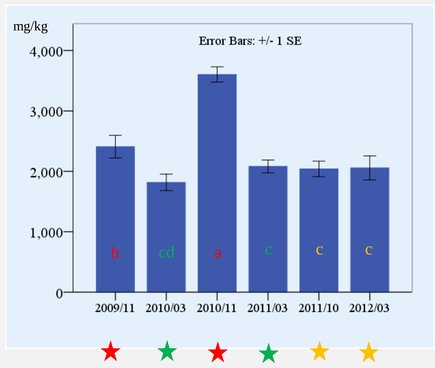
SOIL ORGANIC MATTER % CHANGE



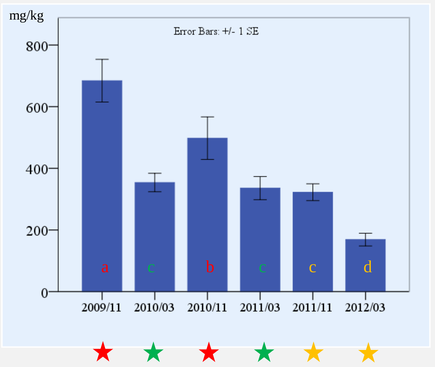
MAGNESIUM (Mg) CONTENT CHANGE



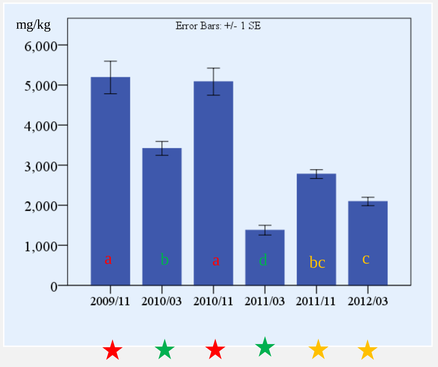
SOIL TEST PHOSPHORUS (P) CONTENT CHANGE



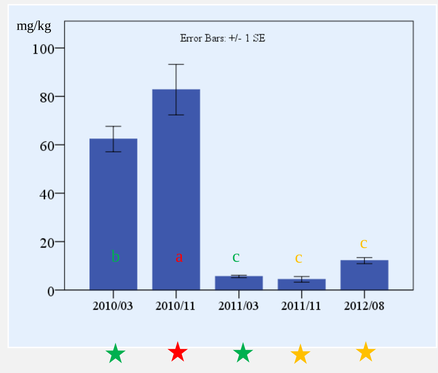
SODIUM (Na) CONTENT CHANGE



POTASSIUM (K) CONTENT CHANGE



AMMONIUM (NH_4+) CONTENT CHANGE



CONCLUSIONS

Removal of the loose manure layer annually, helps reducing %OM, NH_4, P, K, Na, & Mg levels in the feeder areas significantly, as compared to the levels after 8 months of manure accumulation.

Abandoning the site for 1 year after loose manure removal reduced Na & K levels further. But NH_4, P, and Mg concentrations remained unchanged.

Results suggests that, although manure removal and abandoning the site for short periods can help bringing down the levels of some of the soil nutrients in the feeder area, it may still require a much longer abandonment period and/or other specific remediation techniques to restore the soil to previous conditions.

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