

Nitrogen leaching after application of biogas residue

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background & hypothesis

Increasing number of biogas plants (end of 2010 > 5700) → more residues
 Fermented slurry → **highly mineralized** → high plant N availability
 → increased yield? → **increased risk of nitrate leaching?**

Objectives: Quantify the N-leaching potential of biogas residues applied to maize compared to animal manure and mineral fertiliser on two different soils.

material & methods

Field crop: Mais (2007, 2008) planted mid April

N-level: 0, 120, 240, 360 kg N ha⁻¹ split to two dressings

Fertilizer: Biogas residue; Cattle- and Pig-slurry; mineral fertilizer

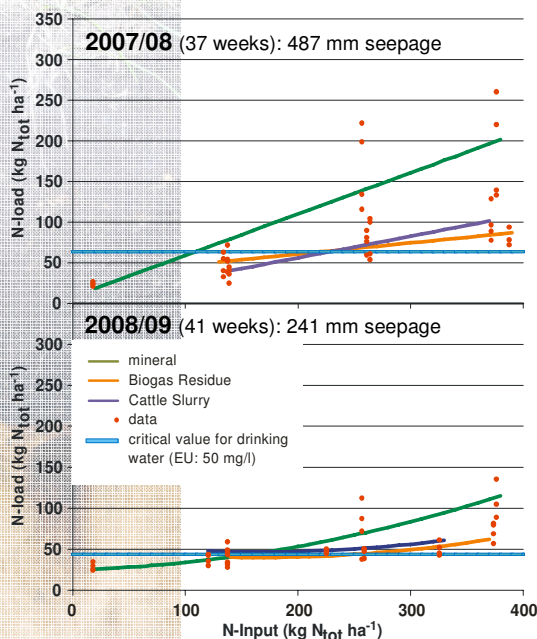
Soilwater extraction: April to March 2007 – 2009; suction cups (250 hPa)

Climate/soil: Eastern Upland 760 mm loamy sand; Geest 830 mm sandy sand

Modell: HUME → soil water potential → drainage · measured NO₃ conc. = N-load

Statistical analysis: SAS Proc Mixed, assuming quadratic function with N-input as covariable

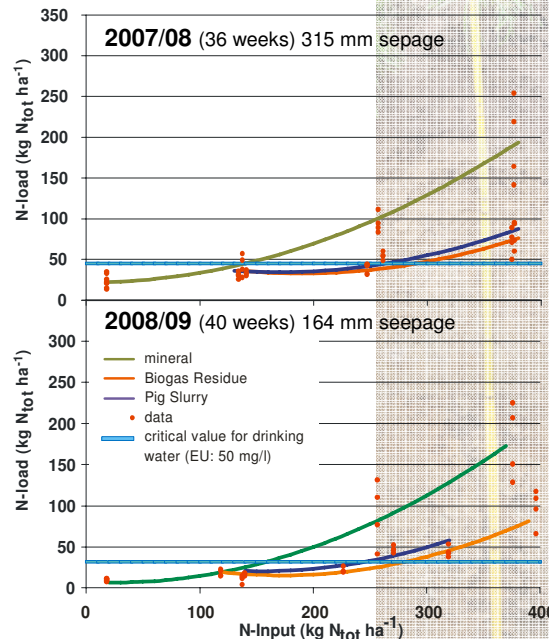
Geest



results

- Corresponding to the total N-input, the mineral fertilizer causes significant more nitrate load than the organic.
- Differences between manure and fermented slurry could not be confirmed.
- When using mineral share of N-input used as covariable, fertilizer type and the interaction between fertilizer type and N-input no longer had an effect on N-load, which confirms the hypothesis, that the mineral share of N-input explains most of the variation among the fertiliser types.
- These statements apply for both locations, the sandy Geest and the loamy Eastern Upland (Tab. 1).

Eastern Upland



Tab.1: Level of significance of means comparisons (slope); adjusted according to Holm (1979)
 KAS – mineral; PS – pig; CS – cattle; BR – biogas residue

| | Eastern Upland | | | | Geest | | | |
|-------------|------------------------|---------|---------|---------|---------|---------|---------|---------|
| | 2007/08 | 2008/09 | 2007/08 | 2008/09 | 2007/08 | 2008/09 | 2007/08 | 2008/09 |
| | N-tot in vs. N-tot out | | | | | | | |
| min - PS/CS | <.00024 | <.00023 | 0.3230 | ≥0.3230 | ≥0.3230 | 0.0080 | ≥0.3230 | ≥0.3230 |
| BR - PS/CS | ≥0.3230 | ≥0.3230 | ≥0.3230 | ≥0.3230 | ≥0.3230 | ≥0.3230 | ≥0.3230 | ≥0.3230 |
| | N-min in vs. N-min out | | | | | | | |
| BR - min | <.00022 | <.00021 | ≥0.3230 | ≥0.3230 | 0.0342 | 0.0076 | ≥0.3230 | ≥0.3230 |

conclusions

- Application of biogas residue resulted in N-losses comparable to animal manure.
- Potential N-losses, however, are underestimated since the monitoring periods did not cover complete years.
- Therefore, the N balance will be simulated in a next step to allow N-loss calculations over the whole 2-year period.