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BOOK OF ABSTRACTS

Long-term impact of anaerobic digestion of dairy cattle slurry on grass clover yields and soil properties

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Anaerobic digestion (AD) of animal manure generates renewable energy in the form of biogas. However, there is a gap in our understanding of the long-term impacts of AD-treated manure on soil attributes and crop productivity in comparison to untreated manure. To address this, a long-term field experiment was initiated in 2011 within a perennial grass-clover ley. The objective was to investigate the effects on key soil and crop parameters when slurry from organically managed dairy cows underwent AD.

The results (2011-2021) indicated that while the application rate of manures influenced soil nutrient levels and pH, these parameters were unaffected by AD treatment. Higher slurry application rate (220 kg of total N ha⁻¹year⁻¹) led to a surplus of N, while deficits were observed in the untreated (non digested) control and the treatments with low application rates (110 kg of total N ha⁻¹year⁻¹). Treatments were not limited by P. For K, there were deficits in all treatments. Soil organic matter (SOM) concentrations decreased across all plots, especially in those with inherently high SOM levels. This decline in SOM was similar with both untreated (non-digested) slurry and anaerobically digested slurry, and there was no significant effect of application rate. The decline may be attributed to the initial high SOM content, prolonged drainage, and increasing temperatures due to climate change.

Notably, both US and ADS demonstrated similar yields of grass-clover ley (2 cuts year⁻¹) and green fodder, averaging 7.9 and 4.0 kg DM ha⁻¹, respectively. Additionally, within the same production year the mean clover yields of the fertilized treatments did not differ from the control. In terms of crop yields and chemical soil characteristics, the long-term effects (over 10 years) of AD within an organic dairy cattle farming system were generally minor. The advantages of harvesting energy from slurry did not compromise the long-term productivity of grasslands or the soil chemical characteristics.

Keywords: Grass-clover ley; botanical composition; digestate; soil organic matter; organic farming

References

Rittl, T.F.; Pommeresche, R.; Johansen, A.; Steinshamn, H.; Riley, H.; Løes, AK. (2023) Anaerobic digestion of dairy cattle slurry—long-term effects on crop yields and chemical soil characteristics. *Org. Agr.* Volume 13, pages 547–563.