**Preferred theme:** 1. How to increase nitrogen use efficiency

**Optimizing nitrogen fertilizer value by post-treatment of digestates**

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***Abstract*** *(250 words, excluding up to 3 references, no figures)*

Anaerobic digestion of animal manures reduces methane emissions during storage while generating energy, benefiting the greenhouse gas footprint. This study presents an innovative digestate treatment approach to enhance the overall nitrogen fertilizer value, increase biomass quantity, and diversify digestate-derived fertilizers for different purposes. Cattle manure was co-digested with grass clover silage to augment total biomass volume, nitrogen availability on farm, and biogas yield. The digestates were separated via a screw press, the solid fraction underwent drying for storage stability and ammonia was stripped. A newly designed desulfurizing bio-filter based on liquid digestate input to remove sulphur from biogas, creating in an acidic liquid rich in sulphur. This liquid was enriched with ammonia from simulated stripping resulting in a sulphur-nitrogen-rich fertilizer product (LiqNS).

The fertilizer value of resulting digestate products and untreated cattle slurry were evaluated in two-year field trials by injection to spring barley. Cattle slurry, anaerobic digestates, liquid digestate, and LiqNS exhibited high nitrogen fertilizer replacement values (NFRV) of 80-90% relative to mineral nitrogen, with no significant difference amongst them. Liquid digestates showed consistent performance over the years and a higher N/P ratio. Conversely, the dried fibre fraction (DF) demonstrated negative NFRV due to nitrogen immobilization. However, as a soil amendment in a nitrogen-independent crop like faba bean, DF balanced P and K uptake without yield reduction.

Overall, this novel approach increased fertilizer quantity while maintaining NFRV through co-digestion, offering diverse fertilizer products to meet various agricultural needs. LiqNS emerged as a promising additional fertilizer from biogas production.