Preferred theme: Nitrogen recycling

Recycling Nitrogen from urban wastes to organic farming – a scenario analysis

Marie Reimer[1,2], Kurt Möller[2,3], Jakob Magid[4], Sander Bruun[4]

[1] Department of Agroecology, Aarhus University, Denmark, [2] Department of Fertilization and Soil Matter Dynamics, University of Hohenheim, Germany, [3]Center for Agricultural Technology Augustenberg (LTZ), Institute of Applied Crop Science, Germay, [4] Department of Plant and Environmental Sciences, University of Copenhagen, Denmark

E-mail: mreimer@agro.au.dk

Abstract

The EU aims to expand organic farming to 25%, yet the sector faces constraints in nutrient availability, particularly phosphorus and nitrogen. Societal waste, such as household compost and sewage sludge, contains valuable nutrients for organic farming but requires assessment for nitrogen availability, carbon storage, and contamination risks (e.g., heavy metals). Existing field trials often lack organic management practices, hindering accurate evaluation. To address this gap, a 100-year scenario analysis using the DAISY soil-plant-atmosphere model assessed four crop rotations with varying reliance on legumes, applying different nitrogen rates from various waste sources (household waste compost, sewage sludge, stored human urine) and controls (cattle manure, slurry, deep litter, and mineral fertilization). The model was validated using results from the CRUCIAL trial (*Magid* et al., 2006). Short-term nitrogen recovery rates ranged from 50-60%, increasing to 60-70% in the long term. Deep litter, cattle manure, and compost had the lowest values followed by sewage sludge, human urine, cattle slurry, and mineral fertilization. Nitrogen losses accounted for 34-40% of applied nitrogen, following the same pattern. The opposite trend was seen for the carbon sequestration factor (compost=0.39, manure and deep litter=0.12, sewage sludge=0.09, slurry=0.02). Compost and sewage sludge resulted in surplus Cd and Cu, while Zn levels also increased for the animal manures. Yet, levels remained below EU thresholds after 100 years of continuous application. The study underscores the suitability of societal waste for organic farming, emphasizing the trade-off between nitrogen fertilizer value and carbon storage.

References

Magid, J, Luxhøi, J, Jensen, LS, Møller, J, Bruun, S, 2006. Establishment of a long-term field trial with urban fertilizers - is recycling of nutrients from urban areas to peri-urban organic farms feasible? in J Raupp, C Pekrun, M Oltmanns & U Köpke (eds), Long-term field experiments in organic farming. *Stollfuß Medien, Berlin, Scientific Series / ISOFAR, pp. 59-78.*