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The use of compost on agricultural soils – results of a long-term field trial with special regard to Corg and N dynamics

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The application of compost on agricultural soils is important to close cycles of matter and to contribute to sustainability in plant production. In Austria, biowaste has been collected separately for more than twenty years. More than 90 % of compost corresponds to the quality class A+ and A of the Austrian biowaste ordinance (set into force 1996), which renders this compost suitable for organic farming and agriculture in general.
The Austrian Agency for Health and Food Safety started a field experiment in Upper Austria on a loamy silt soil in 1991 to investigate the influence of compost application on crop yields and soil parameters and to quantify the plant available N in compost.
The field trial consists of a control plot (zero N), minerally fertilised plots (40 kg N, 80 kg N, 120 kg N ha-1 y-1) and biowaste compost, green waste compost, manure compost and sewage sludge compost plots (each treatment corresponding 175 kg N) with a crop rotation of winter wheat, winter barley, maize and pea (without compost application). Within these 18 years, 300 - 450 t ha-1 of compost have been applied according to the N content of the compost (biowaste>green waste>manure>sewage sludge composts). These amounts correspond to 55 tons (manure compost) and 77 tons (sewage sludge compost) of organic matter, respectively, depending on the type of compost.
Based on the average of two crop yields, 62 kg compost N was available for maize and 31 kg N for winter barley (derived from the yield curve) and intermediate values for winter wheat. The yields of all compost treatments (175 kg N) did not result in significant differences. In summary, the plant availability of compost N is rather low, at an average level of 25%.
The results of the soil analyses showed a significant increase of Corg in all compost variants compared to mineral fertilisation in 2007, where the lowest rate of enrichment was 2.6 g kg-1 Corg with manure compost and the highest 5.9 g kg-1 Corg with sewage sludge compost. Besides organic C, total nitrogen was also significantly enriched in all compost plots. However, the omission of compost application for two years resulted in a decrease of up to 15% Corg and up to 7% Nt in the compost variants in 2010.
Furthermore, the effects of compost application on Nmin contents (Wehrmann and Scharpf, 1979) and on the potential N mineralisation (with the anaerobic incubation method according to Keeney (1982), modified according to Kandeler (1993))will be presented and discussed.

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