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Plastic contamination of soil: is compost the source?

Melanie Braun¹, Aylin Krupp¹, Rene Heyse¹, Matthias Mail², and Wulf Amelung¹

¹Institute of Crop Science and Resource Conservation (INRES), Soil Science and Soil Ecology, University of Bonn, Germany

²Nees Institute for Biodiversity of Plant, University of Bonn, Germany

Plastic contamination is a major environmental topic, however, only little knowledge exists about plastic contamination of agroecosystems. Especially the prevalence of plastic in soil and potential entry paths remain largely unknown. Consequently, this study aims at evaluating to what degree compost application is a source of plastic for soil. To do so, we analyzed plastic in 8 different municipal and commercial composts and in topsoil (0-30 cm) of a 12-year compost fertilizer trial with 0, 5, 10 and 20 t compost per hectare. After method testing and adjustment (yielding 76-100% recovery of spiked plastic particles), plastic was analyzed via density separation (ZnCl_2) and light microscopy. We found 12 ± 8 to 46 ± 8 plastic items kg^{-1} compost; concentrations of plastic items > 5 mm were highly variable and ranged between 0.04 ± 0.08 to 1.35 ± 0.53 g kg^{-1} compost. In contrast to sewage sludge, which contains mostly fibers, in compost particles were dominant. In soil we found 0 to 66 ± 8.5 plastic items kg^{-1} soil, with highest plastic concentrations in variants with highest compost application, i.e. soils with compost application had 2 to 2.5 higher plastic concentrations than control variants. However, we also could detect additional plastic sources as fields on the border of the trial (near a road) had 3 times higher plastic concentrations than inner fields, leading to a plastic contamination of up to 23 items kg^{-1} . Consequently, we could confirm compost application as an entry path for plastic into soil, leading to a twofold increased plastic contamination of agricultural soil. The determined plastic input via compost might be a minimum estimate since small plastic items like nanoplastics were not included, which warrants further attention.