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2s3: Risk management and trade-offs

ENVIRONMENTAL PROTECTION VERSUS CIRCULAR ECONOMY: MICROPLASTICS IN AGRICULTURAL RECYCLING

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Agricultural recycling of biowaste is a traditional example of waste disposal in a circular economy. Nutrients that have been extracted from the soil for agricultural production are recirculated partially to the production system soil by organic fertilizer, e.g., sewage sludge and compost. Also, organic matter is recycled as an amendment to retain or improve the soil structure. During the last three decades, environmental standards for applying sewage sludge and compost as organic fertilizer have been significantly increased to reduce the pollution by substances, which can harm soil or aquatic ecosystems.

Microplastics are a new potentially harmful substance in sewage sludge and compost. Microplastics are defined as plastic particles, fragments or fibers of a size less than 5 millimeters. Microplastics in sewage sludge originate from cosmetics, cleaning products, and textile laundering. Microplastics in compost originate from littering and from residues of food packaging.

Knowledge is still rare on the potentially negative impacts in soil systems, on the accumulation in the soil, and the transport within the soils or into aquatic systems. The methods to analyze microplastics in soils, to sample soils polluted with microplastics, and to estimate microplastic quantities are still in an early stage of development. The number of scientific publications and findings on microplastics in soils is rapidly increasing. However, scientific evidence is still too small to implement environmental policies, which could reduce the potential ongoing and future pollution of soils by microplastics.

Thus, microplastics in sewage sludge and compost are a new reason to question the environmental friendliness of land-based recycling of biowaste. The complex problem creates a conflict between environmental protection and circular economy. From the perspective of a circular economy, the recycling of biowaste as organic fertilizer represents a cost-efficient way to recycle nutrients and organic matter. Farmers and society benefit both: the farmers benefit from the supply of organic fertilizer and the society benefits from the waste disposal service provided by farmers. From the environmental perspective: both, society and farmers, share the objective to avoid the

contamination of soils and water bodies by a pollutant, which potential negative impacts are not yet sufficiently understood. Progress in interdisciplinary research is required to provide sufficient knowledge and to address this new challenge for environmental policy, farmers, and society.

Keywords: agricultural recycling, microplastics, biowaste, soils