

Pre-workshop: Promoting the Agricultural Use of Sludge

Agricultural Use of Sludge – European Experience

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Abstract:

Agricultural use of sewage sludge remains an important method of utilization across Europe, mainly due to the objectives of resource recovery, circular economy and sustainable land management. At the same time, however, there is a discussion about the risks of agricultural use of sewage sludge, such as chemical and biological contamination – represented by heavy metals, pharmaceuticals and personal care products, per- and polyfluoroalkyl substances, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, adsorbable organic halides, microplastics, pathogens, antibiotic resistant genes etc.

In 2021, over 11.1 million tons of wastewater sludge were generated across the European Union (EU). The safe and efficient recycling of sludge is seen as a strategic response to several interconnected challenges: the need for nutrient recovery, soil fertility degradation, phosphorus scarcity, and the rising demand for organic carbon inputs in European soils.

On average, 20–25 kg of dry solids (DS) per person per year are generated across Europe due to wastewater treatment. This equates to a total of 8.7 million tons DS annually, forming a significant bioresource whose management directly impacts environmental, agricultural, and public health outcomes.

The destinations for sewage sludge in the EU vary widely by country and region.

Current average data reveals the following sludge utilization (*EurEau: Waste water treatment – sludge management, May 2021*):

47.5% is used in agriculture,

27.2 % is incinerated,

8.3 % is applied in recultivation or land reclamation,

5.6 % ends up in landfills, and

11.4 % is directed to other uses.

Agricultural application remains the dominant outlet for sludge in countries such as Cyprus, Denmark, France, Ireland, Norway, Portugal, Slovakia, Spain, and the UK. This preference is

underpinned by the dual benefit of sludge as a source of nutrients (notably phosphorus and nitrogen) and as an organic amendment enhancing soil structure, water retention, and carbon sequestration. In fact, 45% of European soils are estimated to have low or very low organic matter, particularly in southern regions. In this context, sludge offers a viable means to increase soil organic carbon, thus contributing to climate resilience and improved agronomic productivity.

However, the expansion of sludge reuse in agriculture faces several significant challenges. Chief among them is public perception. Despite stringent quality control measures and assurance schemes, skepticism persists among consumers, food retailers, and policymakers.

Several EU countries have responded by establishing voluntary Biosolid Assurance Schemes, designed to provide robust, independently audited certification of sludge quality. These schemes serve to reassure the food supply chain and the wider public that recycled sludge meets environmental and safety standards.

Phosphorus, a finite and non-renewable resource critical for food production, represents another compelling argument for agricultural sludge reuse. Where land application is not viable or safe, mono-incineration followed by phosphorus extraction or pyrolysis producing biochar can serve as an alternative, closing the nutrient loop while minimizing environmental harm.

Policy development is evolving to keep pace with these technical and environmental realities. The 1986 Sewage Sludge Directive is currently under review, reflecting the need for updated risk assessments concerning emerging contaminants and new treatment technologies. Future legislation is likely to incorporate stricter thresholds for pollutants, more detailed monitoring requirements, and clearer guidelines for reuse practices.

In conclusion, the European experience with agricultural sludge reuse offers valuable insights into the balance between environmental protection, resource efficiency, and public engagement. While agriculture remains the preferred route for much of Europe's sewage sludge, its long-term viability depends on a combination of rigorous quality control, policy innovation, public awareness, and technological flexibility. Advancing these areas will be essential to integrating sewage sludge into sustainable agricultural and waste management strategies across the EU.

Keywords: circular economy, EU policy, nutrient recovery, risk assessment, sludge agricultural use