

## **Preferred theme: Nitrogen recycling**

### **Fish sludge as fertilizer**

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#### ***Abstract***

Fish sludge is a residue from aquaculture, containing fish feces and feed spill. The composition of fish sludge depends on the raw material of fish feed and the fraction of feed spill, as well as the salinity of the water (marine/salty or brackish). Fish sludge is usually filtered, dewatered and dried. However, some fish sludge is also used in biogas production or composted and then used as fertilizers.

Fish sludge contains nitrogen, but mostly on organic form, and nutrient content is unbalanced (Brod et al. 2018). Anaerobic digestion increases nitrogen availability (Brod et al. 2017; Foereid et al. 2021). Most research so far has been performed in pot experiment or field experiments in Norway only, and with grain or grass as test crop. In the SEA2LAND project, fish sludge has been tested as fertilizer for broccoli in field experiments, repeated in five European countries (Norway, Estonia, Belgium, France and Spain). Pelleted fish sludge was tested in all countries, and a pelleted mixture of fish sludge and other products was tested in Norway. Application rate was determined based on nitrogen availability found in a preceding pot trial. However, in the field trials, performance varied widely between sites. The causes of this will be further investigated under controlled conditions. A pot trial comparing fish sludge and digestate of fish sludge on nitrogen utilization and greenhouse gas emissions is being performed. Results from the field trial and selected pot trials will be presented and discussed.

*Brod, E., Oppen, J., Kristoffersen, A.Ø., Haraldsen, T.K., Krogstad, T., 2017. Drying or anaerobic digestion of fish sludge: Nitrogen fertilization effects and logistics. *Ambio* 46, 852–864. <https://doi.org/10.1007/s13280-017-0927-5>.*

*Brod, E., Toven, K., Haraldsen, T.K., Krogstad, T., 2018. Unbalanced nutrient ratios in pelleted compound recycling fertilizers. *Soil Use Manag.* 34, 18–27. <https://doi.org/10.1111/sum.12407>.*

*Foereid, B., Szocs, J., Patinvoh, R.J., Horváth, I.S., 2021. Effect of anaerobic digestion of manure before application to soil – benefits for nitrogen utilisation? *Int. J. Recycl. Org. Waste Agric.* 10, 89-99. [10.30486/IJROWA.2020.1897538.1055](https://doi.org/10.30486/IJROWA.2020.1897538.1055).*