

Exploring the demand for recycling-derived fertilizers in NW Europe

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Abstract

The nutrients N, P and K are often applied to agricultural fields as mineral fertilizers. Currently, fertilizer production in the EU depends on imported raw materials (P, K) and energy (N). Each year about 2,392 Gg of P is imported into EU-27, mostly in the form of mined rock phosphate or as animal feed. A large part of it ends as sewage sludge being landfilled or incinerated without further valorisation of the ashes. Rock phosphate is a limited and finite resource. Within the scope of sustainable agriculture and a circular, bio based economy, it is crucial to find ways to reduce quantities of non-recycled nutrients and to decrease the dependency on nutrient import.

Within the NWE territory, regional differences can be identified with respect to nutrient supply and demand. Hot-spots with a surplus of P in animal manure in the NWE territory are the Netherlands, Flanders in Belgium and Brittany in France. At the same time, there are regions with potential to replace mineral P fertilizers: its' use is highest in Northern France, Wallonia in Belgium, East-England and Ireland. Within the scope of the NWE Interreg project ReNu2Farm, the opportunities for the replacement of nutrients from traditional mineral fertilizers by recycled nutrients from regions with a nutrient surplus is explored. Recycling-derived fertilizers (RDF's) could be made from animal manure, food waste, sewage sludge, etc. The objective of this paper is to quantify the requirement of N, P and K in various regions within the NWE territory and to formulate the desired properties of the RDF's, from an agronomic perspective.

In a desk study we quantified the demand for nutrients and organic matter in regions within NW Europe. This demand is quantified at the basis of the area of crops grown per region, the yield levels, the fertilizer recommendations, the soil types (clay, silt, loam, sand), the soil quality (bioavailability of the nutrients in the soil), the current legislation and the common fertilizer practice.

At the other hand, the regional availability of nutrients in animal manure and other organic fertilizers is affecting the fertilizer choice and the additional demand for recycled nutrients in each region. For that reason the current use of animal manure per region is also quantified.

From the regional demand for nutrients at the one hand and the regional availability at the other hand, the net potential demand for nutrients in RDF's is quantified.

Roughly, the regional differences in potential demand for nutrients in RDF's could be characterized by the main crops, soil types and quality and the availability of animal manure in that region. An example of the regional differences in P demand (based on crops grown, etc.), P availability in manure and the resulting net demand for P from other sources, like RDF's, is given in figure 1.

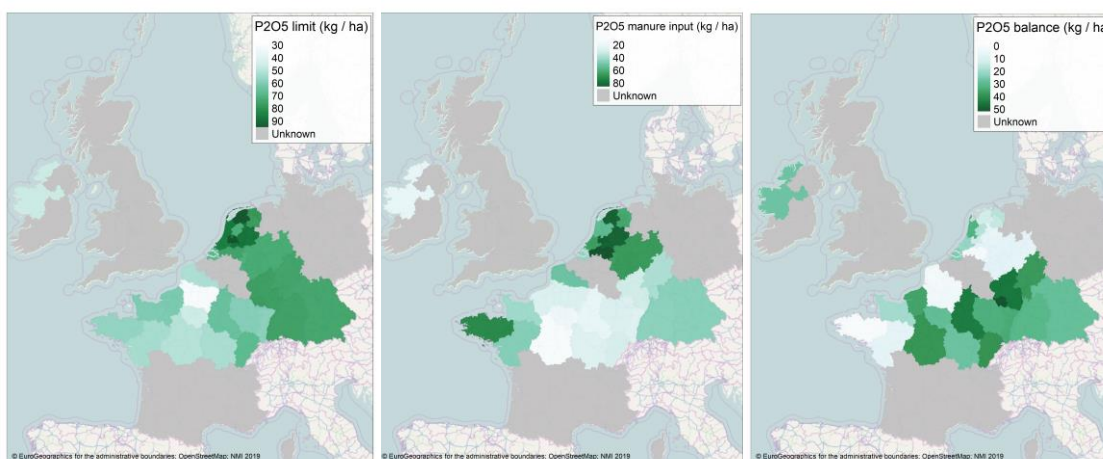


Figure 1. Regional differences in the P demand based on crops, soil types and quality (left), the P input with manure to soils (middle) and the additional P demand (right).

In regions with a high availability and input of P with animal manure, the additional demand for P from other sources (e.g. RDF's) is low. However, there is an additional N and K demand in those regions. In regions with a low input of P with animal manure, there is a significant additional demand for P from other sources, like RDF's. The demand for organic matter is mainly determined by the amount of organic matter that is left as crop residues at agricultural fields. In crop rotations with a high percentage of root crops, the demand for external organic matter inputs is higher than in crop rotations with cereals or grassland.

The regional differences in the demand for RDF's in dependence of the main crops and the availability of manure in that region is summarized in table 1.

Table 1. Overview of the type of RDF that is needed in dependence of the main crops in a region and the availability of animal manure.

	Grassland region	Cereal region	Rootcrop region
High availability manure	concentrated N	concentrated N	NK
Low availability manure		N-P-K	N-P-K + Carbon

For more information about the NWE Interreg project ReNu2Farm see <https://www.biorefine.eu/projects/renu2farm>.