



Phosphorus fertilization requirement in Europe

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Introduction

Phosphorus (P) is an essential plant nutrient but also one of the main drivers for eutrophication of surface waters. For securing the availability of finite P resources and minimizing environmental deterioration, fertilization recommendations need to be based on crop requirement, commonly estimated with soil testing P methods (STP). However, due to a large number of STP methods used across Europe, common understanding of soil P status is lacking. Here we present the concept of the work package on P in a new Horizon 2020 project on "Optimising bio-based fertilisers in agriculture – Providing a knowledge basis for new policies (LEX4BIO)" (Fig. 1). In this project several STP methods, including DGT, are used for estimating soil P status in the European agricultural soils and determining critical STP values for optimal crop growth in different climate regions in Europe.



Figure 1. LEX4BIO aims at enhancing the circular economy by improving the utilization of bio-based fertilisers (BBF) in Europe.

P status in agricultural soils

During 2018, a total of about 12000 topsoil samples (0-20 cm) from agricultural fields (LUCAS survey), both cropland and grassland, were re-sampled from all the EU-28 countries (Fig. 2) by the Joint Research Center (JRC). Out of this soil archive, a representative number of samples is selected, taking into account relevant soil characteristics that affect P availability for plants, e.g. Olsen-P, soil texture, pH and organic matter content. These soil samples will be analyzed with the DGT-method, evaluated against above mentioned soil characteristics and further extrapolated for the whole agricultural soil dataset.



Figure 2. Phosphorus concentration of agricultural soils in the EU according to the LUCAS dataset (Tóth et al. 2014: Eur. J. Agr. 55: 42-52).

P requirement for the optimum yield

Two-year field trials on P-deficient soils in different climatic conditions across Europe will be conducted (Fig. 3). Also past and on-going field trials, with archived soil samples and known yield responses after P fertilization will be evaluated and soil samples analyzed with the DGT-method. Critical DGT values for reaching optimum yield will be determined and P fertilization recommendations across the EU will be presented.



Figure 3. Field trials for determining optimal soil P test values for reaching optimal yields.