

Phosphorus levels in croplands of the EU with implications for P fertilizer use

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European Journal of Agronomy, Volume 55, April 2014, Pages 42-52

Phosphorus (P) fertilizer usage must be carried out to secure highest possible yields and sustainable environment. Although P input to soils has had a positive impact on crop production in Europe the impact on the environment - such as eutrophication - has become a problem in the continent.

In the frame of the Land Use/Land Cover Area Frame Survey (LUCAS) sampling of topsoil was carried out on around 22.000 points in 25 EU Member States in 2009 and in additional 2 member States in 2012. Beside other basic soil properties soil P content of the samples were also measured in a single laboratory in both years.

Based on the results of the LUCAS Topsoil survey we performed an assessment of plant available P status of European croplands. Maps of basic regions for the application of regional policies (NUTS2) were used for the regional analysis of P levels in the EU. We applied the measured P concentrations to establish nutrient level categories for each LUCAS topsoil sample. The nutrient level categories were used to perform comparative analysis of P levels in croplands of the EU. Plant available phosphorus levels were determined using two selected fertilizer recommendation systems; one from Hungary and one from the United Kingdom. Wheat was selected as an indicator crop, as it has wide climate tolerance and cultivated in nearly all regions of the European Union. Furthermore it is also a plant with one of the largest areal share in the croplands of the EU.

Results of our assessments show higher P levels in regions where higher crop yields can be expected and where high fertiliser P inputs are reported. The fertiliser recommendation system of the UK does not recommend additional fertiliser use on croplands with highest P supply. This is the case in regions mostly in Belgium and the Netherlands. According to a Hungarian advisory system there is a need for fertilizer P input in all regions of the EU.

We established a P fertiliser need map based on integrating results from the two systems, where the UK method is applied for regions where oceanic and sub-oceanic climatic influence prevail and the Hungarian system is applied in climatic zones under continental and Mediterranean influence. Based on the LUCAS Topsoil data, P input demand of croplands in the European Union was estimated to 3,849,873 tons (P_2O_5)/year. In the meanwhile we found disparities of calculated input need and reported fertiliser statistics both on local (country) scale and on EU level.

The first ever uniform topsoil P survey of the EU highlights the contradictions between soil P management of different countries of the Union while also highlights the inconsistencies between reported P fertiliser consumption and advised P doses. Our analysis shows a status of a baseline period of the years 2009 and 2012, while a repeated LUCAS topsoil survey can be a useful tool to monitor future changes of nutrient levels, including P in soils of the EU. The new data of measured P levels can also help to refine and update incomplete or outdated national spatial phosphorus datasets, but also to provide an independent set of data for cross-comparison for countries where soil P data is available.

Web: <http://dx.doi.org/10.1016/j.eja.2013.12.008>

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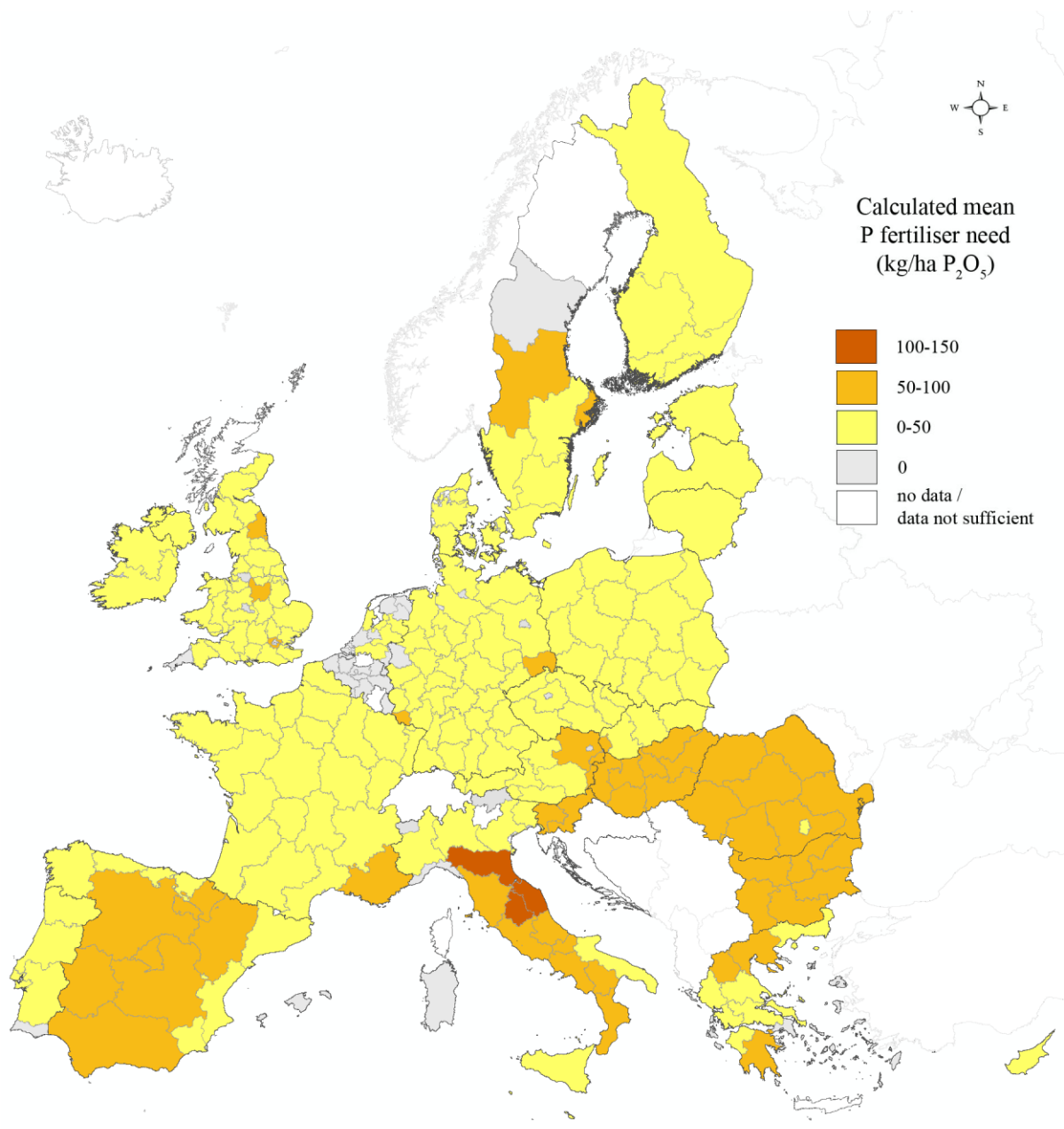


Figure – Calculated mean P fertiliser need map (kg/ha P₂O₅)