

Agronomic efficiency and additional benefits of sustainable phosphate fertilizers

Supervisory team:

Rothamsted supervisor: Dr Martin Blackwell (Rothamsted Research)

Academic supervisor: Dr Heather Buss (University of Bristol)

Non-academic (CASE) supervisor: Mr Michael Ash (Elemental Digest Systems)

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Host institution: Rothamsted Research (North Wyke)

CASE partner: Elemental Digest Systems

Project description:

The continued supply of phosphate fertilizers that underpin global food production is an imminent crisis. The rock phosphate deposits on which the world depends are not only finite, but some are contaminated with cadmium and other toxins, and many are located in geopolitically unstable areas, meaning that alternative phosphate fertilizers need to be developed to address this issue, such as struvite recovered from wastewater treatment or Thallo fertilizer, a phosphate and micronutrient-rich fertiliser made from abattoir waste and other industrial by-products, produced by an SME called Elemental Digest Systems, and who are the CASE partner on this application. This project will investigate the efficiency and potential additional benefits of these, and other, novel fertilizers. In addition, this project will address another growing global food security crisis – micronutrient deficiency. Micronutrient deficiency, often referred to as hidden hunger, has largely been caused by the use of NPK fertilisers that increase the removal of micronutrients in crops at rates higher than at which they are naturally replenished. Thus, in order to reduce micronutrient deficiencies in crops, animals and ultimately humans, fertilizers must incorporate appropriate concentrations of micronutrients, an opportunity which the manufacture of these novel fertilizers permits. This project will investigate the agronomic efficiency and potential health benefits of a range of recycled, sustainable phosphate fertilizers, fortified to different extents with micronutrients, and assess their impact on soil, crop and animal health.

Rotation project one: This will involve an initial pot trial comparison of different fertilizers and formulations for the production of grass, and analysis of the grass in terms of yield and quality related to micronutrient content. Trials will be carried out in controlled environment facilities at North Wyke, and initially incorporate a single soil type. This will be based at Rothamsted Research North Wyke, under the supervision of Dr Blackwell.

Rotation project two: During this rotation project, sheep will be fed grass produced in plots using both a micronutrient-rich recycled phosphate fertilizer (Thallo) along with grass produced using conventional fertiliser. These plots will be established early in year 1 during the period of the first rotation. Live-weight gain and changes in nutrient levels in blood samples will be monitored to identify any differences in the performance of the two feedstocks. This work will be based at Rothamsted Research, North Wyke, under the supervision of Professor Lee.