



More efficient use of phosphorus needed

Phosphorus resources are not threatened in the short-term, but could decline by up to 50 per cent by 2100, according to researchers. Although the predictions are uncertain, they support the need to reduce phosphorus fertiliser use through greater material efficiency measures, such as recycling and better agricultural management.

Phosphorus fertilisers are essential for global food production and come from non-renewable sources, i.e. phosphate rocks, which are being depleted. The use of phosphorus fertilisers also leads to water pollution, which further supports the need for their sustainable use.

The study provides a systematic assessment of the risks of phosphorus depletion using a model that accounted for four different scenarios of economic and agricultural growth and data on phosphorus resources and consumption, sourced mainly from the US Geological Survey (USGS) and the International Fertilizer Industry Association (IFA).

In all scenarios, phosphorus use was expected to increase, but the amount varied according to the scenario. The amount of phosphorus oxide extracted from phosphate rock, ranged between 49 million and 78 million tonnes in 2030 compared to 44.5 million tonnes in 2000. Over time, a stabilising global population, higher efficiency rates of fertiliser application and improved management practices are expected to slow the rise in phosphorus use. Nevertheless, in 2100 the use of phosphorus is estimated to be between 65 and 115 million tonnes of phosphorus oxide.

In all scenarios, the main use of phosphorus is in fertilisers, with the greatest increase in use in developing countries. Another factor is the increasing amount of meat in diets, which requires more animal feed and therefore more fertiliser to produce the feed. In the short-term, this should not cause extensive depletion of reserves, but by the end of the century, depletion could be between 10 and 65 per cent of the current amount of phosphorus depending on estimations of phosphorus resources. If agriculture continues to rely on large amounts of phosphorus fertilisers, depletion could be in the order of 50 per cent.

Major reductions in the use of phosphorus fertiliser can be achieved through several efficiency measures. Using animal manure as a fertiliser and recycling phosphorus content from human and/or animal excreta will reduce demand. Further reductions can be gained by minimising waste and the erosion of phosphorus-containing soil. Reducing meat consumption could also have an impact, as could using alternatives to phosphates in detergents. Increasing efficiency in phosphorus fertiliser application will also need to be accompanied by greater efficiency in extracting phosphorus reserves to bring noticeable improvements in phosphorus availability.

Source: van Vuuren, D.P., Bouwman, A.F. & Beusen, A.H.W. (2010) Phosphorus demand for the 1970-2100 period: A scenario analysis of resource depletion. *Global Environmental Change*. 20:428-439.

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