Peak Phosphorus

Author: Beardsley, Timothy M.

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Peak Phosphorus

Just as we were facing up to peak oil—the maximum in the rate of global oil production that is imminent or (by some estimates) has just passed—we have another peak to worry about. Peak phosphorus has not yet happened, but ecologists see it looming in coming decades. Phosphate-rich rocks are becoming harder to find, a development likely to benefit Morocco and a handful of other countries that have significant deposits. Peak phosphorus is, in different ways, both more and less alarming than peak oil, though the shortages predicted by each peak together threaten a double whammy.

Peak phosphorus is scarier than peak oil in that there are no possible substitutes for the element. As any biologist knows, phosphorus is an essential component of all living cells, and a lack of phosphorus must curtail the expansion of the biosphere. In particular, peak phosphorus could threaten agriculture later this century, when the human population will still be growing and greater food production will be a necessity. The fertilizers that maintain current crop yields contain phosphorus in good measure. The still-early squeeze of the element has magnified spikes in fertilizer prices and stoked food price increases.

Yet there are ways to manage the effects of peak phosphorus. There is an abundant but often ignored source of phosphorus available for recycling worldwide: human and animal wastes. (Henning Brand discovered the element in 1669 by distilling urine.) Already, as Daniel L. Childers and his colleagues report in the article that starts on p. 117, some cities in Sweden are requiring the use of urine-diverting toilets. These authors outline and argue for the development of methods to close the human phosphorus cycle—that is, to retrieve for fertilizer production a large part of the phosphorus that currently enters wastewater and agricultural runoff, where it pollutes aquatic sediments and promotes eutrophication. Keeping phosphorus out of wastewater would thus bring environmental benefits as well as forestall a hike in the cost of fertilizer.

There are also many ways that agriculture could be made more phosphorus efficient, including genetic engineering of crops, erosion control, and targeted application of fertilizer. For a more down-to-earth solution, a return to the practice of growing crops near where farm animals are raised, so their manure and urine can replenish phosphate in soil, would be a good step. Reducing overconsumption of food would also help.

The double whammy arises because biofuel feedstocks, grown in increasing amounts to meet demand as oil becomes harder to find, require fertilizer as well as agricultural land. Manufacturing the fertilizer raises demand for phosphorus in addition to further limiting the energy benefit of biofuels.

Serious consequences from a phosphorus crunch are avoidable if concerted efforts are made to implement good practices: Promising possibilities exist, and the ideas for closing the human phosphorus cycle sketched by Childers and company ought to stimulate further research. Fortunately, major symposia are now being devoted to the topic. Agronomists, water treatment experts, and ecologists might take note of an area that seems destined to grow in importance.

TIMOTHY M. BEARDSLEY
Editor in Chief

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