Don't Call It Waste: Phosph

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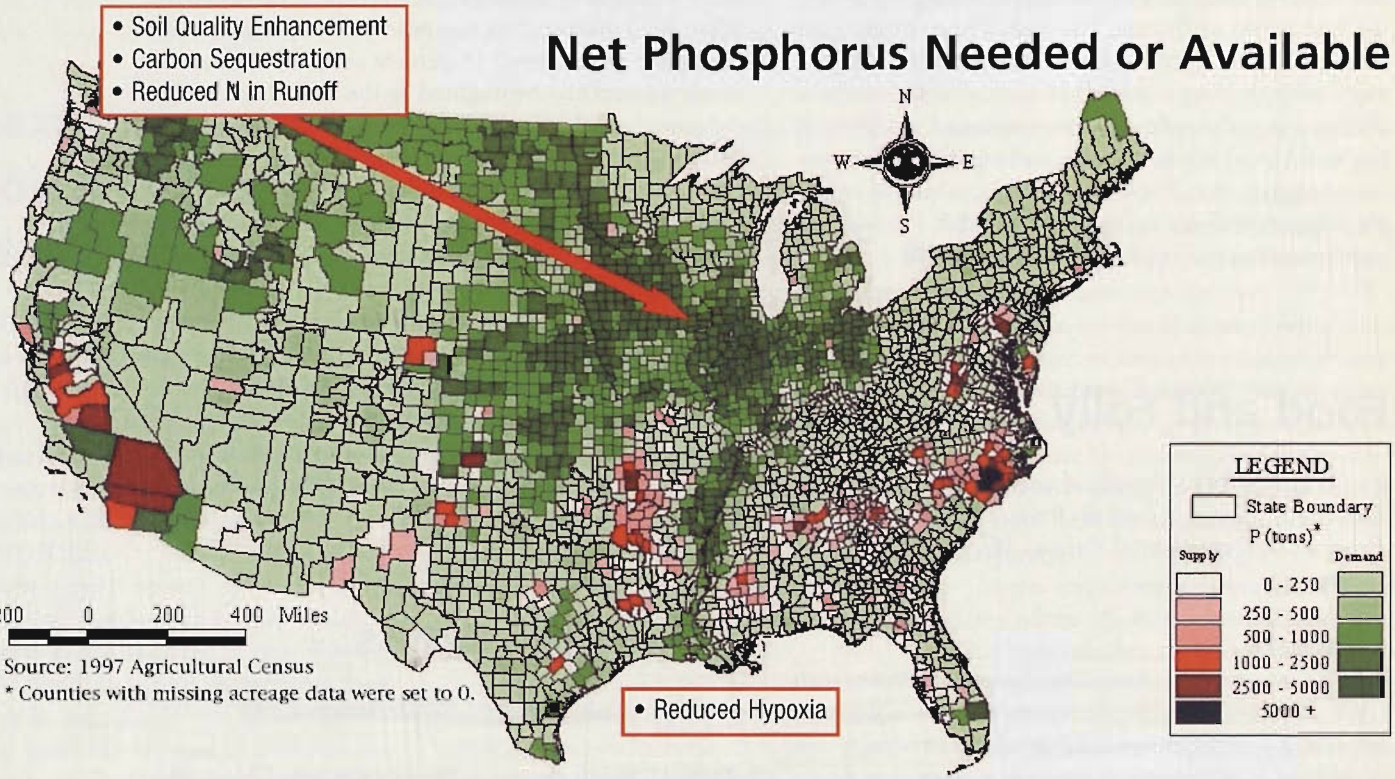


Increased integration in the poultry and swine industries has resulted in increased efficiencies in production, processing, and marketing as well as concentration of the industries in regions with a readily available rural labor force. While a boon to many rural communities, this move has also concentrated the organic by-product manure nutrients in areas with often limited cropland available for recycling the nutrients. The cumulative consequences from the buildup and runoff of phosphorus causes concern in some areas.

Conventional animal manure-handling systems dispose of nitrogen using lagoons. Although lagoons are effective in dealing with nitrogen, they do not remove phosphorus. The systems make it difficult to attain a geographic balance of phosphorus.

Table 1. Counties and Air Mile Distances Required to Balance Animal Manure Phosphorus Supply with Cropland Phosphorus Demand

Example	Scenario 1		Scenario 2	
	Included Counties	Distance (air miles)	Included Counties	Distance (air miles)
Contiguous counties:				
North Carolina	1079	550	1577	800
Arkansas	180	200	309	250
High supply to high demand counties:				
Eastern states to Corn Belt	109	75 – 150	532	200 – 300

Balancing Act: Manure Supplies and Crop Demands

We used counties to examine the supply of phosphorus coming from confined animals including broilers, layers, turkeys, hogs and pigs, fattened cattle, and milk cows. When compared to county levels of phosphorus utilized by dominant harvested crops (feed grains, small grains, hay, oilseeds, sugar, and some specialty crops) it becomes apparent that significant distances are involved in balancing supply and demand for phos-

orus Available.

phorous within contiguous regions. In some cases, phosphorus from the East Coast would have to be transported as far as Indiana.

Our Scenario 1 illustrates a balance between supply and demand for phosphorous. To find this balance, we selected a county in the heart of an area of high potential phosphorus supply. We then summed the phosphorus demands and supplies of contiguous counties until all supplies of phosphorus from confined animal manures were balanced by cropland phosphorus demands. Scenario 2 was the same method, but assumes that only half the cropland is available for animal manure phosphorus application.

Examples from North Carolina and Arkansas illustrate the balance between phosphorus supply and demand within contiguous counties. The North Carolina example required many counties, because there is relatively little cropland and a large supply of animal manure phosphorus in contiguous counties. Balance in Arkansas required fewer counties and fewer miles because there is considerable cropland after about 100 air miles (Table 1).

Reducing phosphorous accumulations by relocating the industries would bring negative economic impacts to many rural communities. To avoid this, ways must be investigated to move the phosphorus or use it in place. Possible remedies include:

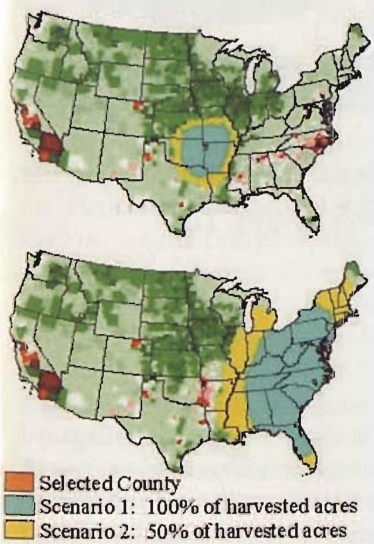
- Developing microbial processes that change the availability and stability of nutrients in manure and reduce pathogens, making the resulting products more useful as feed, fertilizer products, or home gardening products.
- Drying and processing the manure into pellets or granules that can be easily shipped.
- Developing corn that has less indigestible phosphorus. This will reduce overall phosphorus in animal feed and consequently in manure.

Social Benefits of New Technologies

New technologies may result in social benefits beyond their immediate value as fertilizers, feeds, or energy sources. Stabilized and concentrated manure-derived fertilizers could be shipped to regions of high phosphorus demand and blended with commercial fertilizers. The use of the blended fertilizers in the Corn Belt may help improve soil quality, sequester carbon, and potentially reduce nitrogen runoff. Reduction of nitrogen in runoff from Corn Belt fields could eventually ameliorate hypoxia problems in the Gulf of Mexico. Using manure phosphorus for part of the crops' phosphorus needs could also extend the life of the nation's mined phosphorus resources.

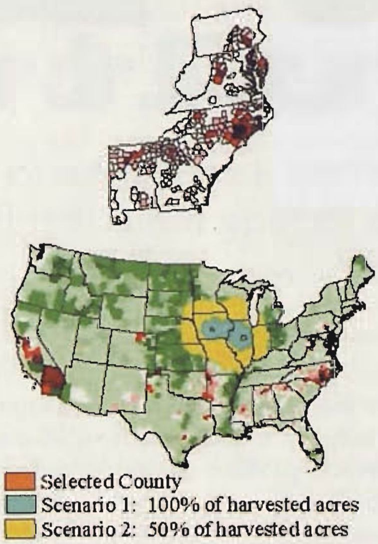
To illustrate this alternative, we took the excess manure phosphorus supply from nine eastern states and assumed it was transported to three distribution centers in the Corn Belt. Note that the number of counties and the air mile radii are only a fraction of the counties and the air miles associated with contiguous-county distribution in North Carolina (Table 1).

Balancing Phosphorus in Contiguous Regions



Method: Select a county of high Phosphorus availablity and draw concentric buffers until available P (tons) <= 0 under 2 scenarios:
1) Manure spread over 100% of harvested acres, &
2) Manure spread over 50% of harvested acres.

Balancing Phosphorus in a High Demand Region



Method: Select all counties with available Phosphorus in 9 eastern states (top map). Assuming transport to the midwest, select 3 distribution centers in heart of crop production area and draw concentric buffers until available P (tons) <= 0 under both scenarios.

For More Information

Kellogg, R. L., C. H. Lander, D. Moffitt, and N. Gollehon. "Manure Nutrients Relative to the Capacity of Cropland and Pastureland to Assimilate Nutrients: Spatial and Temporal Trends for the U.S." Draft Report. United States Department of Agriculture, Natural Resources Conservation Service. Washington, D.C. 2000.

Van Dyne, D. L., and C. B. Gilbertson. *Estimating U.S. Livestock and Poultry Manure and Nutrient Production.* Report No. ESCS-12. United States Department of Agriculture, Economics, Statistics, and Cooperatives Service. Washington, D.C. 1978.

Information Sources: The data presented in the maps are based on the 1997 Census of Agriculture, manure coefficients developed by Van Dyne and Gilbertson, and crop coefficients used in the Agriculture Policy Environmental eXtender model (APEX).