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From Scientific Staff of the
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SOIL FERTILITY SHIFTS IN RESPONSE TO CROP NUTRIENT BALANCE

Soil fertility rises and falls in response to crop nutrient balances. Nutrient surpluses raise soil test levels; deficits draw them down. It's not always easy to predict how much, or what the consequences will be, so it's important for the crop manager to monitor both as closely as possible. Recent surveys of soil tests and nutrient balances on the state and province scale point to the need to pay close attention to the same on the farm and field scale.

A new soil test summary is out. The International Plant Nutrition Institute recently completed a survey of the public and private soil test laboratories of North America, similar to surveys done every 4 to 5 years for the past several decades by the Potash & Phosphate Institute. There are numerous challenges to conducting such surveys, since soil test methods and interpretations vary among states and provinces, and change over time as well. Nevertheless, important and consequential trends are showing up.

The 2010 survey included more samples than any previous survey. An estimated 4.4 million soil samples were submitted across North America for this survey compared to about 3.4 million for 2005. The increase likely reflects more widespread and intensive soil sampling by producers, arising from higher and more rapidly fluctuating prices for fertilizers and crop commodities seen in recent years.

In Eastern Canada and the northeastern United States, the soil fertility shifts varied. In many areas, soil test levels for K have moved downward since 2005. For example, in the province of Ontario the proportion of soils testing 80 ppm or less in K grew from 15% in 2005 to 20% in 2010. Soils testing in this range are likely to produce K deficiencies in almost any crop in the absence of fertilization. This trend is not surprising, considering that the amount of K applied to Ontario cropland in the form of fertilizer and manure was only about half that removed by crops in 2009.

However, elsewhere the shifts varied in size and direction. In Pennsylvania, the distribution of soil test K hardly changed at all, while in New York and Virginia, it appears to have shifted upwards.

Soil test P levels often fall into a bimodal distribution. A substantial proportion are in the responsive range, but another large proportion are at levels far above the critical level for crop response. The very high levels result from many years of historical nutrient surpluses. Such soils need to be managed in ways that eliminate the surplus, maximize utilization of the P fertility for the benefit of crop production, and minimize surface runoff and erosion to protect water quality. The frequency of very high soil P tests continued to decline in Ontario, but increased in New York, New England, and Pennsylvania.

The soils of the region remain quite variable in fertility. Even in states and provinces with overall nutrient surpluses, many soils needing nutrient additions can be found. On the other hand, many soils have built up fertility to the point where inputs of P and K amounting to less than crop removal of the nutrient can continue for years. Of course, in such situations it would be important to monitor the decline with regular soil testing.

So, nutrient decisions need to be supported not only by crop nutrient balances, and not only by soil tests, but by both. Using the two tools, you can manage nutrients sustainably.

More detailed information on these changing nutrient balances and soil test levels can be found at this site: **http://nane.ipni.net**.

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Abbreviations: K = potassium; P = phosphorus; ppm = parts per million.