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# Seasonal and Yearly Fluctuations of Soil Tests

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Department of Agronomy

# Soil Science News & Views



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## Seasonal and Yearly Fluctuations of Soil Tests

Lloyd Murdock

One of the most important management tasks of a good farmer is taking a good soil sample. The recommendations based on these samples will help determine yield and profitability. A number of factors have an effect on the soil test results.

### Seasonal Fluctuations

Seasonal fluctuations change the results of some of the soil test factors. During the summer and the fall as soils dry, the soil water moves to the surface and brings with it dissolved salts from deeper in the soil. This concentrates some nutrients near the surface and increases their apparent availability as shown by soil tests. The more mobile the element the greater the effect. The most mobile element in abundant supply in a well fertilized soil at this time is ( $\text{NO}_3^-$ ) nitrogen. As the nitrate moves with the water and concentrates in the upper 6 inches, it brings with it cations. At the same time nutrients are being taken from the soil by plant uptake. The overall effect is small and will cause little change in the fertility recommendations.

These increased salts at the soil surface also lower the pH. The increased cations at the surface display  $\text{H}^+$  from the soil into the soil solution. This causes the pH to decrease as the soil dries. The pH is also lowered during this same time by nitrification of ammonium nitrogen released from soil organic matter or added as fertilizer.

At high rates of fertilization these effects are quite significant. Large additions of fertilizer can cause the soil pH at midseason to be 0.6 to 1.0 pH units below that prior to fertilization. If the soil becomes moist some of this effect is alleviated and the pH will increase to some extent.

When sampling in the summer it should be realized that the pH is abnormally low at time of sampling. When sampling in the winter and spring one should keep in mind that the crop will grow in a soil with a pH lower than that shown by the soil test result.

It helps to take the soil samples the same time each year so that the seasonal fluctuations will be removed when comparing soil tests of different years.

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Yearly Fluctuations

How accurate is the soil sample? Soil test results often will vary greatly from one year to the next, causing farmers to question the validity of soil testing. The primary cause of this, in most cases, is in the soil sampling. Many soils are highly heterogenous. In addition to this, uneven soil erosion, type of tillage, depth of tillage, time of sampling, contaminants, uneven soil fertility application patterns, and lack of an adequate number of cores can also cause variation in soil test results. Because of this, a soil sampling history should be established. This would mean testing the soil and recording the results. In future years when test results appear to be unrepresentative, the history can be used to make a decision on the validity of the results. The soil test history is also useful in a number of other ways. The table below shows this variability in a series of samples taken from the same field by a farmer over a number of years. The field was in a corn and soybean rotation for grain production only. It is easy to see that the 1978 results are out of line and should be discarded and recommendations based on another sample or past history.

Yearly Variability of Soil Test Results from Soil Samples Taken  
By a Farmer from a Sloping Upland Field in Caldwell County

<u>Year</u>	<u>pH</u>	<u>P</u> -----lb/ac-----	<u>K</u>
1972	6.5	11	236
1973	6.5	29	255
1978	6.6	7	182
1979	6.6	20	352
1980	6.2	27	285

The best way to minimize the variability which such fluctuations can have on soil test values is to (1) do a good job of sampling the field each time it is sampled and (2) sample at about the same time each year and keep a good field record system to include date at which samples were taken and lime and fertilizer application was made.