

Subsoil Sampling and Testing

When you buy a product and receive a rebate coupon for your next purchase, it's like throwing money away to discard the coupon if you know you'll buy the product again. The same is true when it comes to the rebate of extra plant nutrients often available in subsoil clay for crops grown on Coastal Plain soils.

POTASSIUM AND MAGNESIUM

Oppositely charged particles are attracted to each other the same way that positive and negative poles of magnets are attracted. Even though potassium and magnesium are positively charged ions and held by negatively charged sites on clay and organic matter, they still leach down through the soil with time. This is especially true for Coastal Plain soils, which have small amounts of clay and organic matter in the sandy surface depth. The potential for these nutrients to move through the surface depth is also indicated by the low cation exchange capacity (CEC) values on the soil test reports. The CEC is a quantitative measure of the soil's capacity to retain positively charged nutrients (cations) such as potassium, calcium, and magnesium.

The following table illustrates the effect of time and rainfall on the movement of surface-applied potassium in a Coastal Plain soil (Marlboro loamy sand). The soil has 7 percent clay in the surface depth and 40 percent clay starting at the 1-foot depth.

Weeks after application	Accumulative rainfall (inches)	Potassium accumulation (fallowd soil)
5	1.3	Most of the potassium is near the surface
17	10.3	Potassium accumulation at 3 inches (135 lbs/acre) and at 12 inches (115 lbs/acre)
46	42.0	Most of the potassium accumulation is at 12 inches
76	69.4	Only 10 lbs/acre potassium left near the surface. The rest is at 12-inch depth

The following data shows the soil-test results for phosphorus, potassium, magnesium, and sulfur in a field which has several soil types and had been managed under conventional tillage for at least 10 years prior to sampling.

Soil type	Depth to clay (inches)	Soil pH	Phosphorus (lbs/acre & rating*)	Potassium	Magnesium	Sulfur
Norfolk						
—plow layer		6.5	71 H-	106 M	151 H	6 I
—subsoil	8	5.9	0 VL	263 VH	333 H	112 S
Goldsboro						
—plow layer		6.4	63 H-	116 M	215 H	9 I
—subsoil	12	4.6	2 VL	128 M	136 H	97 S
Dunbar						
—plow layer		6.5	66 H-	75 M-	199 H	9 I
—subsoil	15	4.5	0 VL	99 M	135 H	124 S
Noboco						
—plow layer		6.6	37 M-	115 M	184 H	8 I
—subsoil	14	5.1	0 VL	215 H+	249 H	112 S

* H = high, VH = very high, M = medium, VL = very low, I = insufficient, S = sufficient

Samples collected Sept. 8, 1995, at the Coastal Plain Soil, Water and Plant Research Center by Bob Lippert, Extension Soil Fertility Specialist, Clemson University and John Sadler, Soil Scientist, USDA-Agricultural Research Service.

The crop rotations included corn, wheat, sorghum, and soybeans. Each year's fertilizer applications were based on the Clemson University Agricultural Service Lab recommendations. Notice how the phosphorus accumulates in the plow layer but the potassium, magnesium, and sulfur accumulate in the subsoil clay.

For the plants to utilize subsoil nutrients efficiently, subsoiling may be necessary to ensure that a hardpan will not deter access of the roots to the subsoil. The subsoil clay

should also be no greater than 15 to 20 inches from the soil surface and have a pH value higher than 5.0.

SUBSOIL SAMPLING AND TESTING

To sample the subsoil, take samples from the top 4 inches of the clay layer at several locations in the field. Both plow layer and subsoil samples can be taken from the same core locations. Mix the clay cores in a clean container and take the sample to the nearest Clemson University Extension office for analysis by the Agricultural Service Laboratory. The fee is \$5.00 per sample. The lab report will give the pH; CEC; percent base saturation; amounts of phosphorus, potassium, calcium, magnesium, zinc, manganese, copper and boron; plus comments regarding fertilizer application reduction. A test for sulfur requires an additional \$5.00 fee.

If the test results show high or very high levels of potassium in the subsoil, the recommendation for potassium from the plow layer soil test can be reduced by as much as one-half. If a subsoil test indicates a high level of magnesium, then any recommendations for magnesium indicated by the plow layer soil test can be ignored.

SULFUR

Just as magnet poles with the same charge repel each other, the negatively charged sulfate ion will be repelled by the negatively charged clay and organic matter exchange sites in the soil. Subsequently, the sulfur will easily move down through the sandy soil layer with rainfall and accumulate in the subsoil clay. A plow layer test for sulfur, therefore, will give misleading results. The test for sulfur in plow depth samples will likely show insufficient levels in sulfur even though there is a sufficient amount in the subsoil clay (see previous table). The subsoil test is the best analysis to determine if sulfur is needed. The sample collected for the subsoil potassium and magnesium test can also be used for the subsoil sulfur test. If the subsoil contains 20 pounds per acre or more sulfur, then there will be sufficient sulfur for that year's crop.

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