SDSU Extension

iGrow Soybean

BEST MANAGEMENT PRACTICES

Chapter 18:
Collecting Representative Soil Samples for Fertilizer Recommendations

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A beginning point for many fertilizer recommendations is to collect a representative soil sample. Based on the amount of nutrients contained within the sample, fertilizer recommendations are developed. The ability of this sample to accurately portray the amount of nutrients contained in the soil depends on matching sampling protocol to prior management and the field's characteristics. This chapter provides soil sampling basics and discusses the importance developing field specific sampling protocols.

Soil sampling basics

Soil sampling and analysis provides a benchmark of the ability of soil to provide nutrients to the plant. However, the accuracy of the sample depends on prior management and how the sample was collected. Soil sampling basics are provided in Table 18.1.

Table 18.1. Soil sampling basics.

- **Decide where the samples will be submitted for analysis and obtain sample submittal information for that laboratory.**
  (Addresses of local laboratories are listed at the end of the chapter.)
- **Decide the primary purpose for collecting the soil samples.**
- **Develop field specific soil sampling protocols that consider the sampling purpose and prior management:**
  - ▹ Over-sampling old fertilizer bands results in lower fertilizer recommendations.
  - ▹ Sample areas where animals were confined (old homesteads) separately from the rest of the field. We have been able to find these areas 50 years after homestead removal (check local USDA-NRCS offices for old images).
- **Collect the sample in advance of needing the information.**
- **Different states use different sampling protocols.**
  Check with your state Extension service to determine the appropriate depths.
- **In South Dakota, use a soil probe to collect samples from the 0-6 (0-15 cm) and 6-24 (15 – 60 cm) inch depth.**
  Samples from the 0-6 inches are used for P and K recommendations, while samples from 0-6 and 6-24 inches are used for N recommendations. Each sample should consists of 15 to 20 composited cores.
- **If possible the field should be separated into zones that have similar soils, management, and yields:**
  - ▹ Look for changes in soil color, texture, slope and history to establish separate sampling areas.
  - ▹ Walk a random pattern over the sampling area, avoiding field borders, field entrances, areas with very low yields, and old homesteads.
  - ▹ At each sampling point, use a clean steel sampling probe to collect the sample.
  - ▹ Place soil cores into a clean plastic bucket.
  - ▹ Submit the sample to an appropriate laboratory for analysis.
  - ▹ A video for collecting samples is available at http://www.puyallup.wsu.edu/soilmgmt/Videos/Video_HowToSoilSample.htm.

Previous fertilizer application approach impact on soil test results

The soil sampling protocol required to collect unbiased samples is influenced by how and when previous fertilizers were applied. If the fertilizer was broadcast applied, collect 15 to 20 cores to mix for a soil sample.

If the fertilizer was band applied, different protocols may be needed. The sampling approach depends on where the N was placed. If the location of the band is unknown, follow the protocols above. If the N was band applied in the center of the interrow, we recommend that 15 to 20 cores be collected from the area halfway between the center of the band and the row (Clay et al., 1997). Sampling the old bands can result in underestimating the fertilizer requirement (Fig. 18.1).

In many fields, P is banded two inches (5 cm) over and two inches below the seed. Obtaining accurate measurements of P-banded fields is difficult. Kitchen et al. (1990) recommended that for a 30-inch (76 cm) row spacing, only one sample out of 20 should be collected from the band, and that the number of samples from the fertilizer band (S) can be estimated with the equation:

$$S = \frac{8 \times \text{row spacing}}{12}$$

example for a 30 -inch rows spacing

$$S = \frac{8 \times 30}{12} = 20$$

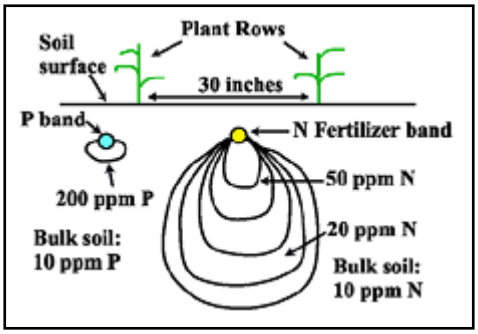

Figure 18.1. A hypothetical diagram showing the influence of N and P fertilizer bands on nutrient variability. The P band was placed 2 inches (5 cm) below and to the side of the seed, and the N band was located in the center of the interrow area. (Clay et al., 1997; 2002)

This calculation shows that if the row spacing is 30 inches, then one core should be collected from the band and 20 cores should be collected from other areas. If the row spacing is 15 inches (38 cm), then one core should be collected for every 15 collected from other areas. Over-sampling the P band increases the difference between the true soil P level and the measured value, which results in underestimating the P fertilizer requirement.

Impact of old farmsteads on soil test values

Old farmsteads may also influence the accuracy and precision of the fertilizer recommendation (Kleinjan, 2002). In many situations, soil samples collected from old farmsteads have higher P levels than the rest of the field (Fig. 18.2). These differences can exist for many years. Based on these results, we recommend that whole field composite samples exclude areas where old homesteads or feedlots were located. Because old homesteads may have been located near field entrances, we recommend that that you do not collect samples from these areas. Old photographs can be obtained from the county USDA-NRCS office. Including subsamples from old homesteads in your composite samples can:

- Bias your results.
- Reduce P fertilizer recommendations.
- Reduce yields over large portions of a field and reduce profits.

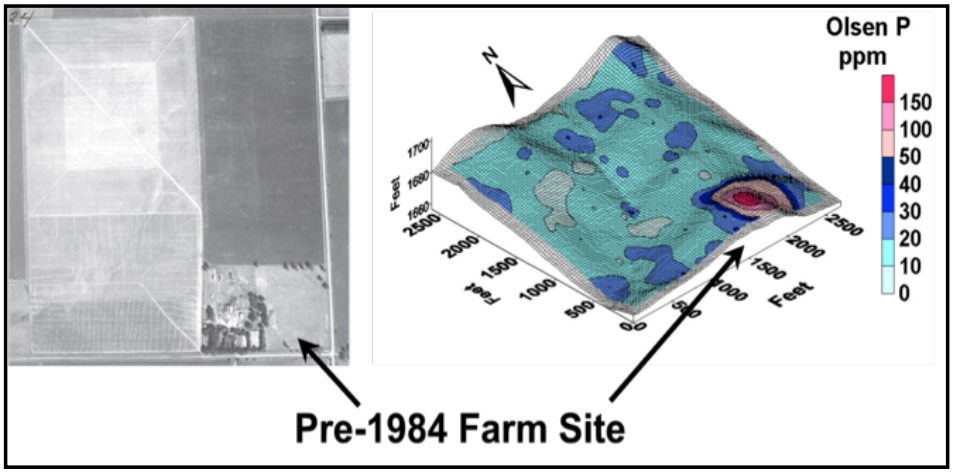

Figure 18.2. A map of soil P superimposed on an elevation map (right) and a 1956 black and white photograph of the field (left). (Clay et al., 2002)

References and additional information

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Stecker, J.A., J.R. Brown, and N.R. Kitchen. 2001. Residual phosphorus distribution and sorption in starter fertilizer band applied in no-till culture. Soil Sci. Soc. Am. J. 65:1173-1183.

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Acknowledgements

Support for this chapter was provided by the North Central Soybean Research Board, United Soybean Board, South Dakota Soybean Research and Promotion Council, USDA-AFRI, and South Dakota 2010 research program.

Clay, D.E., and D.W. Clay. 2013. Collecting representative soil samples for fertilizer recommendations. In Clay, D.E., C.G. Carlson, S.A. Clay, L. Wagner, D. Deneke, and C. Hay (eds). iGrow Soybeans: Best Management Practices for Soybean Production. South Dakota State University, SDSU Extension, Brookings, SD.

Soil Testing Laboratories

Iowa State Soil Testing Laboratory
G501 Agronomy Hall
Iowa State University
Ames, IA 50011-1010
Phone: (515) 294-3076
Fax: (515) 294-5567
Email: spalab@iastate.edu
Web: http://soiltesting.agron.iastate.edu/

Wyoming State Soil Testing Laboratory
Dept. of Renewable Resources, U of Wyoming
PO Box 3354
Univ. Station
Laramie, WY 82071
Email: Soil Test
Web: http://www.uwyo.edu/uwexpstn/soil_test.html

AgLab Express
3600 South Minnesota Ave.
Sioux Falls, SD 57105
Phone: (605) 271-9237
Fax: (605) 271-9238
Email: Anthony Bly
Web: http://www.aglabexpress.com/index.htm

Agvise Laboratory
902 13th St. North; PO Box 187
Benson, MN 56215
Phone: (320)843-4109
Fax: (320) 843-2074
Email: Agvise
Web: http://www.agvise.com

Minnesota Valley Testing Laboratory
326 Center Street
New Ulm, MN 56073
Phone: (800) 782-3557
Fax: (507) 233-7127
Email: mnsoil
Web: http://www.mvtl.com

NDSU Soil Testing Laboratory (North Dakota)
Waldron Hall, NDSU
1360 Bolley Drive, PO Box 5575
Fargo, ND 58102
Phone: (701) 231-8942
Email: NDSU.STL
Web: http://www.soilsci.ndsu.nodak.edu/soiltesting.html

University of MN Soil Testing Laboratory
1902 Dully Ave
Rm. 135 Crops Research Bldg.
St. Paul, MN 55108-6089
Phone: (612) 625-3101
Fax: (612) 624-3420
Email: Soil Test
Web: http://soiltest.cfans.umn.edu/index.htm

SGS Soil Testing Laboratories
236 32nd Ave
Brooking, SD 57006
Phone: (605) 696-7611 Ext. 5
Fax: (605) 692-7617
Email: Angela Carlson
Web: http://www.cropservices.sgs.com/soil-testing-crop-services

Ward Laboratories
4007 Cherry Ave., PO Box 788
Kearney, NE 68848-0788
Phone: (308) 234-2418
Fax: (308) 234-1940
Email: Customer Rep
Web: http://www.wardlab.com