

CROP NUTRITION

By Quirine Ketterings and Karl Czymmek

Following these new soil sampling guidelines for phosphorus will improve soil test accuracy

Getting a good read on P

Getting a reasonably accurate soil test result for phosphorus (P) is important for crop production and water quality. But just because it's important, doesn't mean it's easy. Soil test P levels can vary based on when and where the samples are taken in a field.

The following four points give the current Cornell guidelines for soil sampling for agronomic recommendations as well as the P runoff index:

Build a soil test database

The following five steps build a soil test database so you can evaluate soil test trends over time:

1. Take more soil cores per acre.
2. Collect soil samples at the same time each year.
3. Try to avoid switching labs or type of test.
4. Sample every one to two years.
5. Keep good field-by-field manure and fertilizer records.



Generally, you'll get more accurate phosphorus estimates with three soil cores per acre when soil sampling.

- Collect 10 to 15 soil cores from uniform field areas usually not more than 10 acres in size. That's one to two samples per acre.

- Sample at least once every three years, which is required for Concentrated Animal Feeding Operation (CAFO) farms.

- Resample fields at the same time of the year to decrease the effects of seasonal variability.

- Monitor trends over time.

Many crop advisers ask about the reliability of soil test results for both Morgan P and Morgan P values estimated using Mehlich-3 soil tests and a conversion equation. For example, if a report says the soil test is 40 pounds per acre P is that exact or is it plus or minus 4 pounds? Or maybe plus or minus

8 pounds? Or more? And how great is the chance the field average based on one or two samples per acre is within, say, 10% of the true field average?

Cornell student Scott Grandt, as part of his honor's thesis, addressed those questions. Guided by specialists in geographic information systems, statistics and soil science, Grandt conducted a study on two fields of a dairy farm in central New York to answer three questions:

1. How many soil cores are needed to be greater than 90% sure the sampled field average is within 10% of the actual field average?

2. What are seasonal differences? Grandt compared summer and fall sampling times.

3. Are Mehlich 3 to Morgan soil test P conversions impacted by summer vs. fall sampling?

Grandt took 150 soil cores on each of two 10-acre fields of Lima Silt Loam, both testing around 40 pounds per acre in soil P. Samples were taken in early July and after corn harvest. Each soil sampling location was individually tested, and many statistical tests applied to the results. The same fields were tested again in the fall, one field before manure spreading and the other a couple of weeks after manure had been applied.

The results

In general, independent of the field or the timing of sampling, three soil cores per acre resulted in estimates that were within 10% of the true field average almost all of the time. Taking more than three samples per acre did not improve field estimates enough to be worth the extra time. Depending on circum-

Please turn to page 23

FYI

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Potassium management makes good crop sense *continued from page 22*

past two years. The 420 pounds of potash equated to expected crop removal. (Table 2)

When we add the yields of the past two years, we see no significant response to this extra potash. Though there is a trend to slightly higher yield in the highly fertilized plots, it's nowhere near enough to pay for the potash at current prices. The overall yields in the K fertilized plots may start to pull away from the others in 2009, but the yield differences seen in 2008 don't yet justify the extra K.

How can the lack of an economic response to K on non-manured fields be explained? Where is this potassium coming from? We believe the key is in New York soils – most of them have a fairly high potassium-supplying capacity because of the type and amount of clay present.

Looking ahead

Based on our results, we want to test the current Cornell K guidance on more dairy farms. While we seek funding for this research, we'll conduct limited studies in New York this year.

One thing we know for sure: Dairy farm fields where manure is

Table 2. Alfalfa/grass yields in tons dry matter per acre

		K applied in spring (lbs. 0-0-60 per acre)				
Year	Cut	0	140	280	420	560
2007	Total	2.84 a	2.63 a	2.62 a	2.56 a	2.61 a
2008	Total	6.28 a	5.86 b	6.46 ab	6.74 ab	6.95 a
07+08	Total	9.12 a	8.49 a	9.12 a	9.31 a	9.60 a

Where yields are followed by the same letter (a, b) within a year (so comparing the manure, compost and fertilizer N treatments within a year), we are 95% certain that any slight yield differences are not caused by the treatment.

the main N source during the corn portion of a rotation should be in very good shape for potash going into hay.

Here's our recommended strategy:

- Use the Cornell soil test to determine K requirements before establishing new seedings.
- If you plan to apply extra potash to hayfields with a manure history, consider leaving untreated check strips to begin building some observations on your dairy.

If you're a New York producer and would like to work with us as we expand testing on potassium, let us know. Watch future issues of *Eastern DairyBusiness* for updates on this project. □

Getting a good read on P *continued from page 21*

stances, reliability dropped off quickly when fewer than three soil cores per acre were collected. In two scenarios – sampling too close to manure application and sampling in July instead of after harvest – collecting one soil core per acre gave a 40 to 50% chance that the field average soil test result was more than plus or minus 10 to 15 pounds per acre (plus or minus 20% for these fields). On the other hand, when soil is tested in the fall before manure application, one or two samples per acre were reasonably reliable (plus or minus 15%).

Based on Grandt's study and results from other research work, follow these guidelines where you need or expect higher accuracy on phosphorus soil tests:

10 tips to manage manure on alfalfa-grass fields *continued from page 20*

seedings with companion crops work better on some dairies and in some locations than others, so test it out on a few acres first if you're not sure.

6. For established hay stands, the risks of smothering and/or salt injury increase with manure application rates exceeding 4,000 gallons per cut, especially when applications are delayed beyond three to four days after cutting.

7. Where you want to maintain – not increase – P levels, limit manure application rates to 4,000 gallons per acre for the year across all years of the stand. If fertility levels are very high, it's unnecessary to apply manure in the seeding and early production years.

Here's a practical approach to maintaining P levels: Apply 4,000 gallons of manure per acre after cuttings – where field conditions allow – in the final years of the stand to rebuild P and K levels after drawdown. Always check manured fields for forage K content if you

Conditions	Number of soil cores/acre
Spring/summer sampling	3
Fall/winter sampling before manure application	1-2
Planning to convert Mehlich-3 to Morgan soil test P	3
Fall sampling after manure application	2-3
Annual sampling*	1-2

* *Mehlich-3 to Morgan conversion may provide unsatisfactory results across years. When using a conversion, one sample per acre annually is only a substitute if the accuracy of the conversion equation has been checked (i.e. sample is split, sent in for both Morgan and Mehlich-3 analysis, and both the true Morgan and the estimated Morgan compare well).*

plan to feed the crop to dry cows.

8. If you apply manure in the last production year to address P and K levels, apply it while the crop is actively growing to enhance N uptake during summer or early fall. Then kill the alfalfa-grass the following spring rather than the previous fall to reduce the potential for large N losses prior to planting corn.

9. Follow these practices to minimize wheel traffic damage:

- Plant traffic-tolerant varieties.
- Use small tractors if possible.
- Avoid unnecessary trips across a field.
- Use larger harvesting equipment and drive on fields as soon after cutting as possible.

10. Field applying manure from animals infected with pathogens, particularly Johne's disease, may spread these infections. In the case of Johne's, don't expose animals younger than a year to contaminated pastures or to feed coming from these fields. □