

360 SOILSCAN™ - WHY DO RESULTS VARY FROM A LAB?



As growers begin utilizing their 360 SOILSCAN machine, often times split samples are sent to labs. In some cases the results can vary which begs the question: why do 360 SOILSCAN results vary from the lab?

⊕ SAMPLING AND SAMPLE HANDLING IS VERY IMPORTANT

+ Representative Samples

Many if not most of the variances are likely caused by sample handling. Remember in cases of banded application (versus broadcast) the variance of nitrogen across the row is huge, so taking representative samples across the row is very important.

+ Thorough Mixing

The mixing of the sample after collection is just as important as gathering a representative sample. Variances across the row in banded applications are commonly in the 20 – 30 ppm range less than 12" apart so thorough mixing is very important when sampling a few scoops of the soil.

+ Timing

Once the sample is collected and mixed, 360 SOILSCAN testing should occur within minutes, thus the opportunity for biological changes to the ammonium nitrogen in the sample are minimal. However, when samples are sent to the lab changes can occur to the soil that allow for the nitrification of ammonium N in the sample and change the results. To test this theory we took a sample and thoroughly mixed it. We then froze a sample and sent to a lab that was 300 miles away via standard shipping. We took that same frozen sample and sent it to the same lab except this time we shipped it in a cooler to maintain the frozen state and minimize conversion of ammonium N. The magnitude of the differences surprised us!

The table below shows there was nearly a 2X difference in the nitrates simply from one sample being shipped in a cooler versus standard shipping.

PPM	Sample Frozen & Shipped in Cooler	Sample Frozen & Shipped Standard
	NO3-	NO3-
160# Fall NH3	23	45
160# Spring NH3	25	45
160# Manure	18	70

The next test we ran was taking that same sample and freezing it and shipping to two labs that would be different distances away. Lab #1 was over 300 miles away while Lab #2 was close enough to have same day delivery. What we learned is that the time the sample sat in the mail apparently changed the results, as the sample that was shipped 300 miles away had higher nitrate results vs the lab that was same day delivery. Interestingly we took that same sample and ran it through the 360 SOILSCAN machine and it produced very similar results to the sample that was frozen and shipped via the cooler.

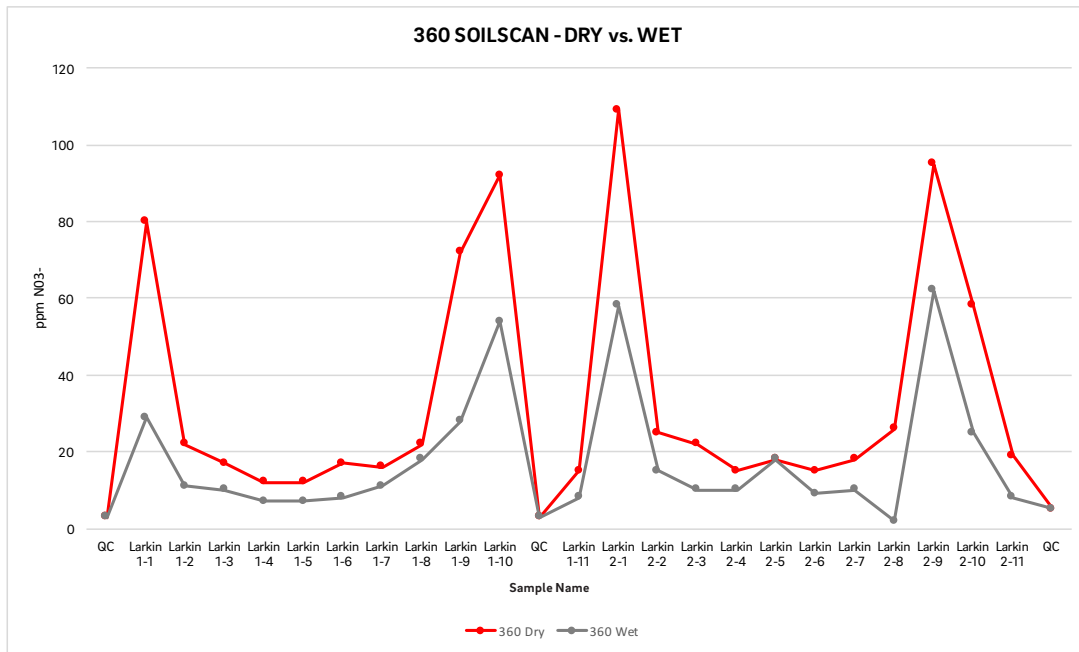
PPM	Lab #1 - Sample Frozen & Shipped in Cooler	Lab #1 - Sample Frozen & Shipped Standard	Lab #2 - Sample Frozen & Shipped Standard	360 SOILSCAN
	NO3-	NO3-	NO3-	NO3-
160# Fall NH3	23	45	32	27
160# Spring NH3	25	45	33	18
160# Manure	18	70	37	22

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⊕ SAMPLING AND SAMPLE HANDLING IS VERY IMPORTANT (CONTINUED)

We conducted a separate set of tests where we collected samples and immediately ran them through the 360 SOILSCAN machine (labeled "360 Wet"). We then took those samples and had them run through the standard lab procedure of drying and grinding and tested them again in the 360 SOILSCAN machine (labeled "360 Dry"). What we discovered is that the process of grinding and drying appeared to affect the samples. This is not to say that the process used by labs is incorrect, only that it differs from the process used with 360 SOILSCAN. In nearly every instance the sample that was dried and ground had higher nitrate N readings. The consistent results of ALP testing of 360 SOILSCAN compared to labs is an apples-to-apples comparison where all participants start at the same point and use the same dried and ground samples. When we compare fresh soil testing against dried and ground soil testing, then we need to take into consideration if ammonium N begins converting to nitrate N during the additional soil prep process. Also note that the samples with higher initial levels of N from manure or applied nitrogen tend to show wider variance which makes sense. The more N a sample contains the more that could be converted during the handling and drying process.



⊕ THE TESTING PROCESS IS DIFFERENT

It is important to remember that our testing methods are different.

+ 360 SOILSCAN

- Sample Pulled
- Mixed
- Tested as Wet Sample
- De-ionized Water as Extractant

+ Soil Labs

- Sample Pulled
- Slowly Warmed and Dried
- Finely Ground
- Chemical Extractants Used

As you look at the two processes you can see that they are different. Again that is not to say that the lab method is incorrect only that it is different than our process and as a result it does not surprise us when on occasions there are differences between samples. It is important to repeat that those differences tend to occur where more ammonium N is present in the initial sample. It is also important to note that results can differ between certified labs as well. Perhaps this could be due to ship times for the sample? There can also be differences among labs in how they process and test samples, as well as their extraction methods. That does not make them wrong, it just makes them different.

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⊕ WHY DO YOU TOUT YOUR ALP LAB CERTIFICATION RESULTS IF LABS ARE DIFFERENT FROM 360 SOILSCAN?

The 360 SOILSCAN machine has gone through two years of certification via the Agricultural Laboratory Proficiency program and you can view our results from Spring 2016 on page 52 of the [ALP Program Participant Web Summary Report](#). We are lab #8PFBBG. You can see in the table summary below, as well, that 360 SOILSCAN has performed very well in the certification results over the years.

Fall 2014

Test Code	Units	Samples	360 SOILSCAN Mean	Grand Mean for All Labs (ppm)	Range for All Labs (ppm)
127 NO3-N ISE	mg/kg	SRS1411	22.9	24.1	21.1-27.0
		SRS1412	36.3	39.0	30.3-47.7
		SRS1414	19.4	24.7	11.1-38.2
		SRS1415	49.2	57.7	33.2-82.1

Spring 2015

Test Code	Units	Samples	360 SOILSCAN Mean	Grand Mean for All Labs (ppm)	Range for All Labs (ppm)
127 NO3-N ISE	mg/kg	SRS1501	60.3	65.9	59.7-72.1
		SRS1502	3.67	4.25	2.76-5.74
		SRS1503	12.7	14.6	9.8-19.4
		SRS1504	128.3	128.3	109.0-147.7
		SRS1505	23.7	30.3	11.1-49.4

Summer 2015

Test Code	Units	Samples	360 SOILSCAN Mean	Grand Mean for All Labs (ppm)	Range for All Labs (ppm)
127 NO3-N ISE	mg/kg	SRS1506	42.0	39.4	32.7-46.2
		SRS1507	132.3	126.3	111.3-141.3
		SRS1508	63.7	62.4	40.6-84.3
		SRS1509	4.00	3.88	3.30-4.46
		SRS1510	43.7	40.9	39.6-45.2

Fall 2015

Test Code	Units	Samples	360 SOILSCAN Mean	Grand Mean for All Labs (ppm)	Range for All Labs (ppm)
127 NO3-N ISE	mg/kg	SRS1511	14.3	17.6	10.5-24.7
		SRS1512	20	20	17.0-23.1
		SRS1513	14.7	15.8	7.1-24.4
		SRS1514	46	44.1	34.0-54.1
		SRS1515	51.3	53.9	47.5-60.2

You might be wondering why we would perform well in this test while at the same time saying we may not match other soil labs? The answer to that question is in the samples themselves. In the ALP lab sampling procedures, the samples are dried in order to minimize conversion of nitrogen in the sample. Those samples are then sent to the various labs for comparison. In that case the samples should not change during shipment or handling because they have been dried prior to testing. We believe that is why the 360 SOILSCAN machine has had two years of outstanding results compared to other certified soil labs.

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⊕ SO DOES THIS MEAN THAT LABS ARE WRONG AND 360 SOILSCAN IS CORRECT?

NO! The results that a lab generates are accurate and correct; in the same way, we are confident the results 360 SOILSCAN generates are accurate and correct. But, they are different because of changes that can occur in the sample handling process and testing procedures.

The difference is in:

- + Fresh soil vs. Dried soil
- + Testing minutes after pulling a sample vs. 24 hours after pulling a sample
- + Field moist soil vs. Drying soil at 104 degrees F to stop the microbes working

Also keep in mind as we approach side dressing time, it is likely that the conversion of ammonium forms of applied N is nearly complete and so the differences that can occur in sample handling should be minimized somewhat. As a result the difference from a lab to 360 SOILSCAN should also be minimized.

⊕ WHAT DOES ALL THIS MEAN?

We have complete confidence that the results from 360 SOILSCAN are accurate to the sample provided. The process utilized in the machine is a proprietary process and has been independently tested and validated through third party sources. We are confident that when used in connection with other 360 Yield Center tools, such as our Nitrogen Calculator App, that the results of those recommendations will be consistent on your farm and represent what the corn plant is able to access in your soils.