Grain & Graze 2
Profit through knowledge

Soil Sampling for Yield Prophet - An Interview with Tim McClelland

Written for Grain & Graze 2 by Mike Roberts Communications, Research and Consulting

At a recent workshop on water use efficiency (WUE), Grain & Graze caught up with BCG (Birchip Cropping Group) Yield Prophet Coordinator Tim McClelland. Here's what agronomists and farmers need to know about soil sampling to help make the best decisions when using Yield Prophet.

Tim, can you give a short introduction to YIELD PROPHET?

Yield Prophet® is an on-line crop production model designed to present grain growers and consultants with real-time information about their crops, providing integrated production risk advice and monitoring decision support relevant to farm management. Operated as a web interface for the Agricultural Production Systems Simulator (APSIM), Yield Prophet generates crop simulations and reports to assist in decision making. By matching crop inputs with potential yield in a given season, Yield Prophet subscribers may avoid over- or under-investing in their crop.

How does Yield Prophet know what my soil is like?

As a user of Yield Prophet you select a soil from the APSOIL (http://www.apsim.info) database that is representative of your paddock. Within those soils in the database there is a bulk density number measured for each of the depths of that particular type of soil. That bulk density number then forms the basis of the calculations of how much plant available water (PAW) and how much plant available nitrogen (PAN) is present.

Tim McClelland at GRDC Water Use Technical Workshop at Tarlee, SA

One of the most difficult things in using Yield Prophet with your soil test results is picking a characterization that is representative of your paddock. There are a few things you can do to help you work out which characterization is going to be the best. You can look at your feeling for what type of soil it is and match it up with the description coming out of APSOIL.

The other thing that you should be doing when you are looking at results is making an assumption about how much water you expect there to be in the soil at the time of soil sampling. We use a formula at BCG where we take 25% of the summer rainfall to give a stored soil water figure and then we add soil moisture to that based on the previous crop type. So if you are growing canola, a pulse or a legume then you might add 20-30mm to that fallow rainfall. That gives you an estimate of the amount of moisture that you are going to have in the soil at the time of soil sampling. That is useful when you come to select a soil from the APSOIL database because when you punch your numbers into APSOIL it will spit out an amount of moisture that is there relative to that specific characterization.

Grain & Graze™ 2
Profit through knowledge

Soil Sampling for Yield Prophet - An Interview with Tim McClelland

Why should you be sampling for nitrogen and water at the start of the year?

By knowing the starting soil moisture and nitrogen content we can get an estimate of what our yield potential might be for that coming season. That can form the basis for some management decisions in season and prior to sowing as well.

In terms of timing, how close to sowing should you sample?

We try to have Yield Prophet sampling completed as close to sowing as we can while still remaining practical. We have to allow enough time for the samples to be sent to the lab and then come back for you to make decisions prior to sowing your crop. Sampling close to sowing minimises any creep between your soil sampling date and the time when your crop is actually in the ground and improves the value of test results.

The length of time it takes for results to come back from the lab varies but a normal turnaround is about two weeks. On our farm we sample in late March to early April and that gives us enough time to get the results back by Anzac Day when we want to start sowing.

Where in the paddocks should you sample?

Where we sample is important because Australian soils are highly variable. With Yield Prophet we recommend sampling from like zones within a paddock. If you have a number of different soil types across the paddock you want to sample from the zone that is predominant, highest yielding or the one with the greatest influence on your crop. The alternative is to sample from multiple zones. It means doubling the cost but you do have more specific information about your crop and paddock.

It is import to avoid sampling from contaminated areas. These are things like gateways, tree areas, stock camps, urine patches and animal tracks. All of those things can have a negative impact on your samples.

How many paddocks should you sample? How many samples per paddock?

At BCG we certainly recommend the use of soil sampling across the farm. Sampling a specific selection of paddocks within a certain part of the rotation enables you to get a cross section of soil water and soil nitrogen results across the farm. A mix of different stubble types will be useful when you come to make your decisions in crop.

Ideally, the more cores you take in a paddock you sample the better, because you will have more information. But we do recognize that there is a cost associated with going out and taking samples and getting them analysed. So what we advocate at BCG when using Yield Prophet is that you use six samples across the production zone. That gives you a good balance between the cost of taking samples and the level of accuracy coming from the results.

BCG research indicates six samples is the optimum number to take in terms of efficiency. Growers should understand that with six samples there might be a 20kg margin of error in nitrogen in terms of the results that you get back.

Sample size should be about 200g of soil. While most labs request at least 200g of soil, when processing samples they only use a small portion of this (approx. 2g per analysis).

Grain & Graze 2
Profit through knowledge

Soil Sampling for Yield Prophet - An Interview with Tim McClelland

What depths do you sample at and how do you do it?

We take six cores across the production zone or the paddock. Those samples are broken up into four different depth layers. The standard that we use is 0-10cm, 10-40cm, 40-70cm and 70-100cm. That enables us to determine the water and nitrogen resources available to our crop at the various layers as the roots move down through the profile. If you were sampling for a non Yield Prophet paddock, the standard is to do a 0-10cm and a 10-60cm sample giving you an indication of water and nitrogen in the largest part of the root zone or the part of our soil profile where our crop is going to be accessing the majority of its water and nitrogen.

The Birchip Cropping Group has a soil-sampling rig that uses a hydraulic unit combined with a hammer that samples down to 1.3m. Contact your local stock and station agent, local farming systems group or Department of Ag for the availability of this equipment. If you wish to invest and purchase one of these rigs yourself, the Soil Matters publication has a whole list of companies who can supply soil sampling rigs, bulk density kits, sampling materials and equipment that can be really useful for you.

Where do you send the samples for analysis?

There are a huge number of laboratories that test soils for their chemical and water properties across the country. You need to use labs that are ASPAC accredited to ensure accuracy of results. If you visit the ASPAC website, http://www.aspac-australasia.com, they have a list of all the labs across the country and what they are accredited to test for.

Sampling for soil water?

Knowing how much water is in our soil is really helpful for us to work out the yield potential of our crop. Many commercial labs offer a service to give you the water content of the soil but there are some problems associated with that. To get the samples to those labs we need to package them in plastic bags and send them through the post. When you do that, the soils often sweat in those bags and that can change the water content that is coming out of those soil test results once they get to the lab.

To overcome this problem, BCG and Yield Prophet recommend that you do your own soil moisture analysis. This involves getting some paper bags, going out and taking the cores, putting the soil samples into the bags and weighing them. Taking scales with you out into the field means that you can weigh them on the spot and then you can write the weight of the soil on the bag straight away. That way you are not leaving any opportunity for moisture to evaporate, disappear and give you misleading results.

Once you have taken those samples and they are in the paper bags you can take them to the lab. Alternatively, you can take them back home and dry them down in an oven for two days at roughly 100 degrees and re-weigh them. Not everyone is equipped with those facilities but certainly there are lots of farming systems groups and your Departments of Ag in each state who are.

Soil Sampling for Yield Prophet - An Interview with Tim McClelland

What about analysing for chemical properties like nitrogen?

To get your samples analysed for their chemical properties you do need to send them to a lab. There are a few procedures you can make use of that will help you get more accurate results. The best way to send samples away is to actually dry them down before sending them. This helps to lock in volatile nutrients like nitrogen.

One of the problems with sending nitrogen samples through the post is that you often can get back confounding results. A big clue that your results have come back and might be a bit dodgy is to look at the ammonia numbers. If the ammonia numbers are off the chart – 20 to 30mg/kg or ppm, that is an indication that the samples have been dried down at too high temperatures or possibly that they have sat around in a post office for too long and sweated in the bag.

What about record keeping?

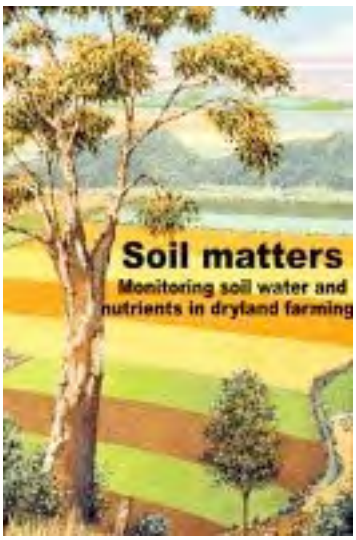
Whenever you are taking soil samples it is important to keep good records. A soil sampling record sheet identifying sampling date, conditions in the paddock at time of sampling, who the sampler was, whose paddock was sampled, where exactly you took the samples from and some observations you may have made in the field can be really useful when interpreting the results.

Labeling is important!

Another key thing to remember is that when you are sending your samples off to the lab make sure you label them correctly. These labs process thousands and thousands of samples every year so try to reduce the chances of your results coming back faulty or misread.

Where can I get more information?

There is a resource that can answer the majority of your questions when it comes to soil sampling. It's a book called ***Soil Matters*** that is produced by CSIRO.



It is available from the APSIM website (www.apsim.info). The website has a pdf version of the book that has all the information about where in the paddock to sample, how to sample and how to measure and calculate your soil moisture. This is a fantastic resource if you are ever doing anything with soil sampling.