

Taking and Using Soil Moisture Measurements



With Field Scout Meter

Getting going

- Follow set up instructions. Make sure that the meter shows the correct probe length and soil type.
- Have a notebook or recording sheet for your measurements, or set up to download to your computer.
- **Walk across a paddock taking measurements and noting them down, just to get a feel for how the measurements vary – with topography, slope, irrigation (e.g. a k-line block, or a gun, or roto-rainer). A diagonal line corner to corner is suggested, but make sure to pick up variations in terrain. See if there are any patterns.**
- **Try this again in a few weeks when the soil is either wetter or drier (e.g. before/after irrigation). Compare with your previous readings. Is it what you expected?**
- **Take 3-5 different measurements in the same small area see if they vary much. Try out the 'average' button.**

Work out wet and dry trigger levels

The Field Scout measures volumetric water content (VWC), which is a % of how much moisture is in the soil.

Field capacity¹ (FC) of soil can range from 15% to 44% VWC, depending on the soil type, and Plant Wilting Point¹ (PWP) from 6% to 22%, so you need to get a feel for the numbers for your soil types.

We don't have numbers that we can give you. There is a table in the User Manual (appendix 1) with data from North America that gives some guidance.

What to do: Over at least a year, take 3 - 5 readings each time, in a range of dry and wet soil conditions around the same site. Record the results and the location of the site. Choose at least two sites for each soil type. Compare your results with other farms on similar soils. Decide on the volumetric water content % for both the 'dry' point (PWP) and 'wet' point (FC) for your soil type/s.

Water Deficit

Once you have established your 'wet' and 'dry' VWC values then you can programme these into your meter and get a value for water deficit (mm) when you take a measurement.

Water deficit is the amount of irrigation or rain needed to get the soil water content to the wet point. You can have up to 5 soil types with different wet and dry settings. See user manual for more details.

WHY MONITOR?

Soil moisture monitoring helps make better irrigation decisions, so that you are not over- or under-irrigating. It also assists to optimise your system.

Every farm is different, so there isn't a single set of instructions about how many sites to monitor, and when.

For compliance purposes you need to have evidence that shows the Farm Environment Plan auditor how you are using the results to make decisions.

¹ For more about these terms: Irrigation NZ soil-texture-water/ or Guide to Good Irrigation (DairyNZ). See links from www.mgiirrigation.co.nz

Example Auditor Questions

How do you know if your soil moisture measurement is telling you that you have applied too much water for your soil type?

How do you use your water deficit measurements to plan your irrigation?

Making Decisions based on soil moisture measurements

You need to show that you are using your irrigation water wisely. More water isn't necessarily better. Take and record measurements regularly over the first season. If you have moveable irrigation, try to measure every time the irrigation is shifted on at least one block. Choose a block or blocks that you consider are representative of your irrigated area.

WHAT TO DO

Each day:

Measure and record soil moisture within the area that will be irrigated today

A. Choose at least 2 different locations in different terrain e.g. in a gully and on main slope or where grass growth looks different

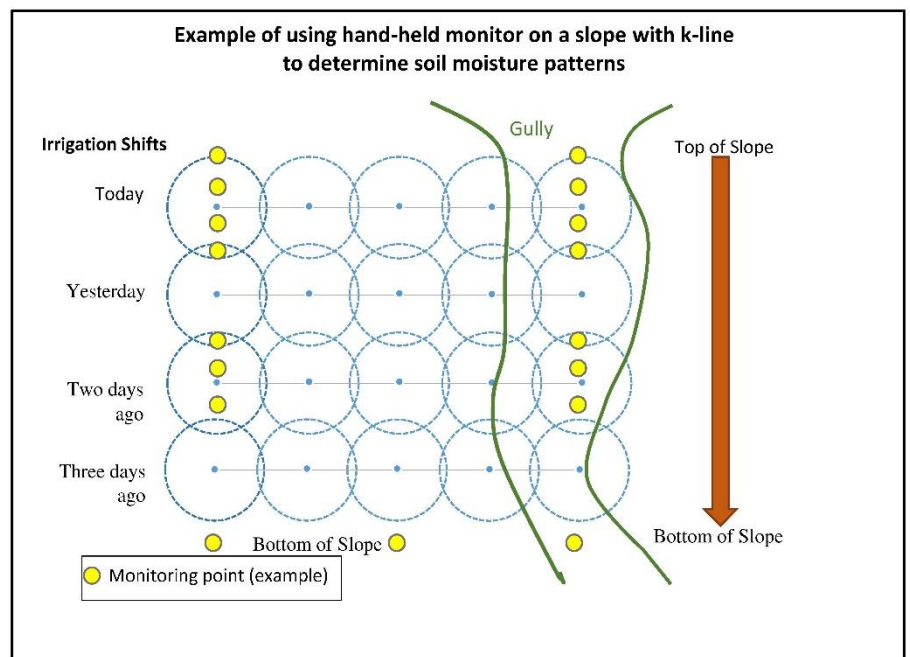
Measure 4 locations within each pod – up and down the slope, not across

B. Also take measurements on a recently irrigated run where the water has had 24 hours to soak in

Choose 2 locations, and take measurements, as above

C. After the lowest run, measure 2-3 of the dampest spots at the foot of the block.

If these are very wet (above field capacity) review location, spacing etc. of runs on lower slope



If the auditor asked these questions what explanation and evidence could you provide?

For any run (e.g. k-line):

- How do you know whether the amount of water that you have been applying filled the soil but didn't get to field capacity?
- What would you do if the soil moisture was above field capacity?
- What would you do if the soil was still very dry in large areas?

Good answer

I did some probe tests within the area watered 24 hours previously and in areas about to be watered, choosing a range of locations (e.g. higher/lower areas, different soils). Here are the results. I made decision xxxxx based on this information

Recording Your Measurements

Soil Moisture Results Example only				
Date	Site location	Probe size	Water content (%)	Notes
31/08/2015	Paddock 33 NW	med	40	Soil Very wet
31/08/2015	Paddock 33 SW	med	38	Soil Very wet
1/10/2015	Paddock 33 NW	med	30	Soil drying out
1/10/2015	Paddock 33 SW	med	30	Soil drying out
20/10/2015	Paddock 33 NW	med	25	Need to irrigate if no rain
20/10/2015	Paddock 33 SW	med	22	Need to irrigate if no rain

This is an example of a recording sheet.

You can get a blank copy of this (word document or spreadsheet) at:

www.mgiirrigation.co.nz.

You may prefer to keep a notebook and pen with your meter.

After one or two seasons - where to from here?

Over the first couple of seasons that you use the Field Scout you should be able to develop a longer term monitoring and recording programme so that you can optimise your irrigation system, and minimise over- and under-watering. One objective will be to show that your irrigation does not allow soil moisture in plant root zone to exceed Field Capacity¹.

When you consider long term monitoring, you may also want to think about other soil moisture measurement systems that could work for your property.

The hand-held probe is good for taking measurements over wide areas as you can easily shift it around. However, it is not so good for measurements over time, as you have to manually repeat the job each time you want new information. Note that it measures about 3 cm around the length of the probes.

Buried soil moisture sensors are better for taking measurements over time, as they record continuously, but only measure at a specific site. Each measurement is over a wider depth and area than a single probe measurement.

Neutron probes are also located at pre-determined sites. A contractor manages the whole process and provides both the data and irrigation recommendations. You can also get a contractor to manage your buried sensors and provide the information.

More information on soil moisture monitoring options or how to buy a 'Field Scout':

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Or go to
www.mgiirrigation.co.nz



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QUICK GUIDE

FOR USING FIELD SCOUT

SOIL MOISTURE METER

TDR 300 soil moisture meter



To Measure Soil Water Content

This meter measures the volumetric water content (VWC) which is the ratio (%) of water to overall volume of soil. For agriculture, the range to be in is 15-45%, depending on soil type.

1. Unfold the shaft and secure.
2. Select the probes (usually MEDIUM 12 cm for irrigated soils) and screw in. **Do not use on stony soils, as bent probes give incorrect readings.**
3. Turn **ON** the meter. The Battery Full % shows. Wait a few seconds. The current settings show. **Check: Probe length(PL) and soil type.**
4. **To change probe length (PL):** Press **MODE** then **DELETE/CLR AVG** button. There are 4 choices: **Turf**, **Short (7.6 cm/3")**, **Medium (12 cm/4.7")** and **Long (20cm / 7.9")**.
5. **To change soil type:** Press **MODE** (top left corner). There are 2 standard settings for soil type: **Standard** and **High Clay (>26% clay)**.
6. Push the full length of the rods into the soil. The rods **must** be fully inserted into the ground. Make a pilot hole that is narrower than the probe, if necessary,
7. Press **READ** to initiate measurement. To get an average of several readings, move the probe and repeat.
8. Write down the date, location and readings in a notebook or use the data logger to download data to PC (see full manual).
9. **If in doubt, read the 'User Manual', which is in the case. There is also a 'Product Manual' which has more detail that can be downloaded from www.specmeters.com.**