

Once you have set your irrigation strategy a range of monitoring methods can be used to keep your irrigation on track. There are three common options for helping you monitor your irrigation. Regardless of the option chosen, for successful irrigation you must always record your daily rainfall and any irrigation applications.

1. Manual Soil Water Budgets

Installing a soil moisture sensor in each crop type and for every irrigation system can be costly. Keeping a manual soil water budget is a way of significantly reducing monitoring costs. A reliable source of *potential evapotranspiration (PET)* data is critical for this, alongside your *daily rainfall and irrigation* records. An example manual soil water budget is shown below.

Using a manual water budget can be a simple and accurate method of monitoring irrigation, particularly for pasture. However, if your irrigation practice results in you regularly being in the 'Orange Zone' (where production is compromised), or you are growing annual crops or perennial tree crops that require regular crop factor adjustments through the season, they can be much more challenging to use.

Date	Outputs (mm)		Inputs (mm)		Soil Water Balance
	PET	Crop Factor adjustment	Rainfall	Irrigation	
25/11/2018	1.3	1.0	24.8	0	40
26/11/2018	1.1	1.0	5.4	0	40
27/11/2018	2.3	1.0	0	0	37.7
28/11/2018	3.1	1.0	12.6	0	40
29/11/2018	1.8	1.0	5.6	0	40
30/11/2018	4.2	1.0	0	0	35.8
1/12/2018	3.8	1.0	0	0	32
2/12/2018	3.7	1.0	0	0	28.3
3/12/2018	2.7	1.0	0	0	25.6
4/12/2018	2.8	1.0	0.2	0	23
5/12/2018	4.7	1.0	0	0	18.3
6/12/2018	3.8	1.0	6.2	0	20.7
7/12/2018	4.4	1.0	0	0	16.3
8/12/2018	4.9	1.0	0	0	11.4
9/12/2018	3.3	1.0	0	0	8.1
10/12/2018	3.8	1.0	1	0	5.3
11/12/2018	2.4	1.0	0	0	2.9
12/12/2018	1.2	1.0	6	0	7.7
13/12/2018	1.7	1.0	1.2	0	7.2
14/12/2018	2.7	1.0	0.2	0	4.7
15/12/2018	3.7	1.0	0.2	20	1.2
16/12/2018	1.8	1.0	0.2	0	19.6
17/12/2018	1.9	1.0	0	0	17.7
18/12/2018	6.2	1.0	0	0	11.5
19/12/2018	3.6	1.0	7.8	0	15.7

2. Soil Water Budget Software

There are a growing number of soil water budget software options available in NZ, each with its advantages and disadvantages.

Automating soil water budgets can make your life easy as you don't have to manually collect and enter in daily irrigation and climate data. A crop model is also used to provide better estimates of crop water use than the simple calculations made in a manual water budget.

However, you need to regularly monitor automated data inputs to ensure they are functioning and remain accurate. Other considerations include –

- Your investment in irrigation and climate monitoring data needs to be easily transferrable to different software platforms to avoid your investment becoming obsolete over time.
- Similarly, you need to ensure the software chosen can receive data from external sensors and telemetry equipment other than the providers.
- For software that provides predictions on when to irrigate, you need to check that the assumptions used align with your irrigation strategy - currently many are conservative and often result in over irrigation.

When making your investment you need to keep in mind that soil water budget software informed by new remote sensing technologies, for example NDVI to monitor crop canopy cover and IR for plant stress, will likely become a common irrigation scheduling method within 5 years. It is also highly likely many irrigation systems will have the ability to become autonomous within this period.

3. Soil Moisture Monitoring

Soil moisture monitoring can be an extremely useful tool for informing your irrigation.

There are many soil moisture sensor types available and they come at a range of price points. Each has advantages and disadvantages, but you always get what you pay for.

When deciding on what sensor to install, there are five questions you need to answer:

1. **What is the purpose of installing the sensor?**
Simple stop-start irrigation decision-making or informing precision irrigation practice - this will determine how accurate your sensor data needs to be and how many sensors you require
2. **What soil types need monitoring on my farm?**
Many sensors are not suitable for stony soils, particularly if you require accurate readings
3. **What crops will I be growing?**
Some sensors are not suited to annual cropping due to long 'settling-down' times
4. **Do I need real-time data?**
Is an automated data feed required or are you prepared to take regular manual readings?
5. **Is there support available?**
Does the sensor come with software that graphs the data and is the sensor supported in NZ?

The last question to answer is what is the cost?

It is always better to install the right option for your farm over a longer period of time rather than a cheaper option that does not achieve your needs.