Farming Forecaster

MFS Winter Field Day 2020

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Some common questions/comments from producers…

- The probe data doesn't seem to be up to date
- The moisture % readings aren't correct – they are still sitting on 100%
- The rain gauge isn't correct – what impact does this have on the pasture outlook?
- The pasture growth rate does not reflect todays weather

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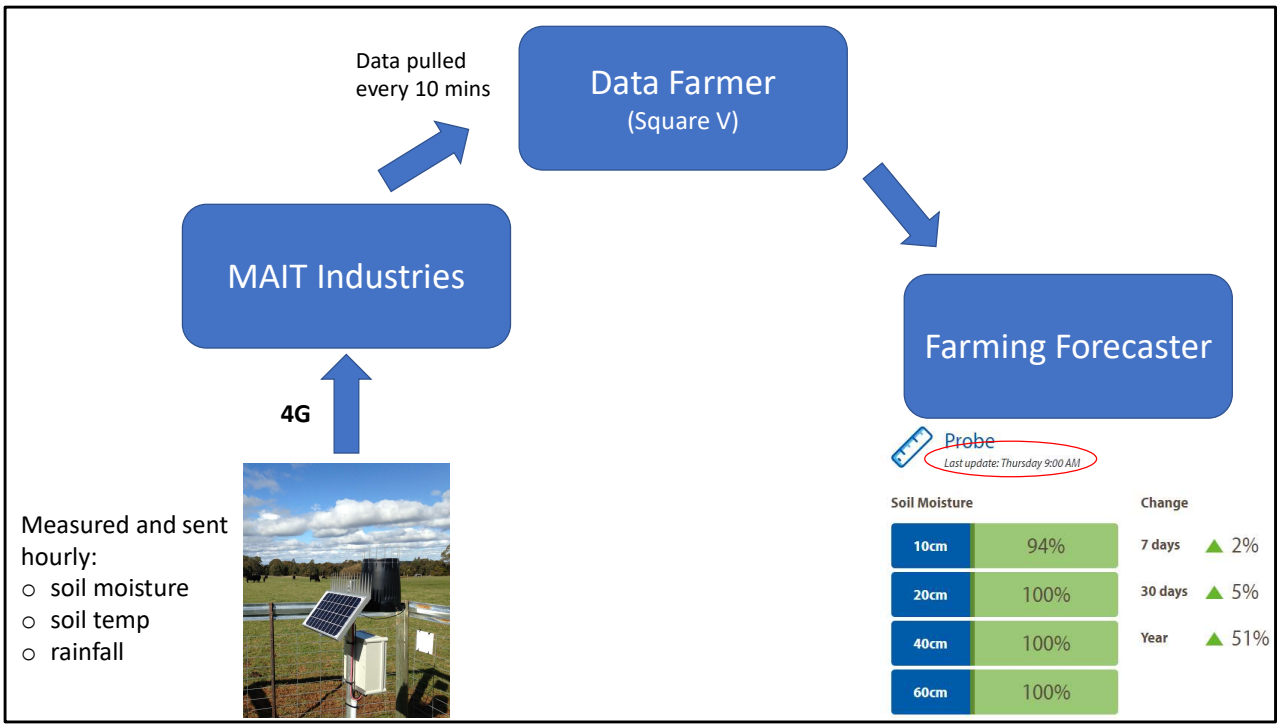
- The probe data doesn't seem to be up to date



When you view the soil moisture information on Farming Forecaster you are seeing the end product.

However, there are a number of cogs that are turning behind the scenes.

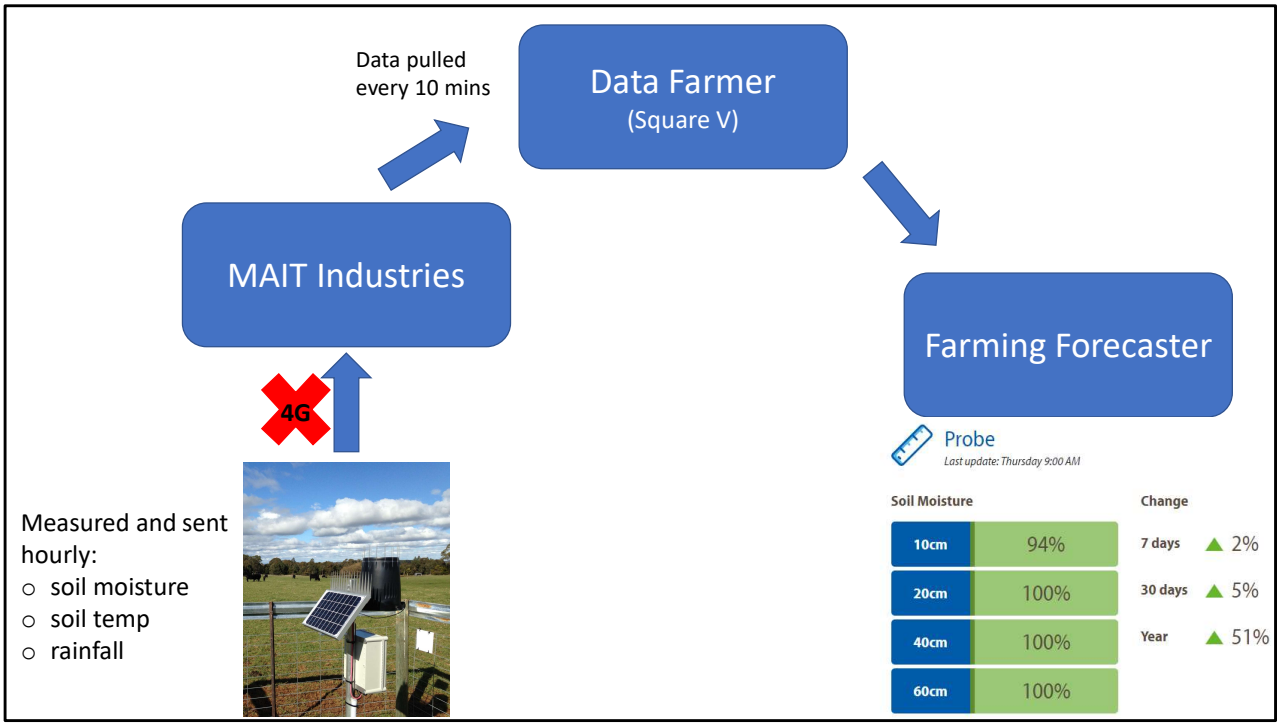
The process starts in the paddock. At all probe sites 3 pieces of data are being recorded and logged every hour of the day – soil moisture, soil temp and rainfall.

Data is sent from the paddock to MAIT industries in Victoria via the 4G network. This is also done every hour.

Data Farmer (software program developed by Square V) pulls the data from MAIT every 10 minutes and immediately feeds this data into the Farming Forecaster website.

The time stamp on the FF website (under the 'Probe Heading') shows when the probe data was last updated to MAIT.

While there are a number of steps, it all happens quite quickly and seamlessly – so we are getting 'real time' data.



However, it's important to remember that the whole process is relying on the 4G network and if the connection is lost for some reason, the data feed stops. This could be due to bad weather, mobile tower works/ updates being done etc.

The battery that powers the modem can also fail when they get a bit of age, which then causes connection issues - i.e. a connection will only be established during the day when the solar panel is providing enough power.

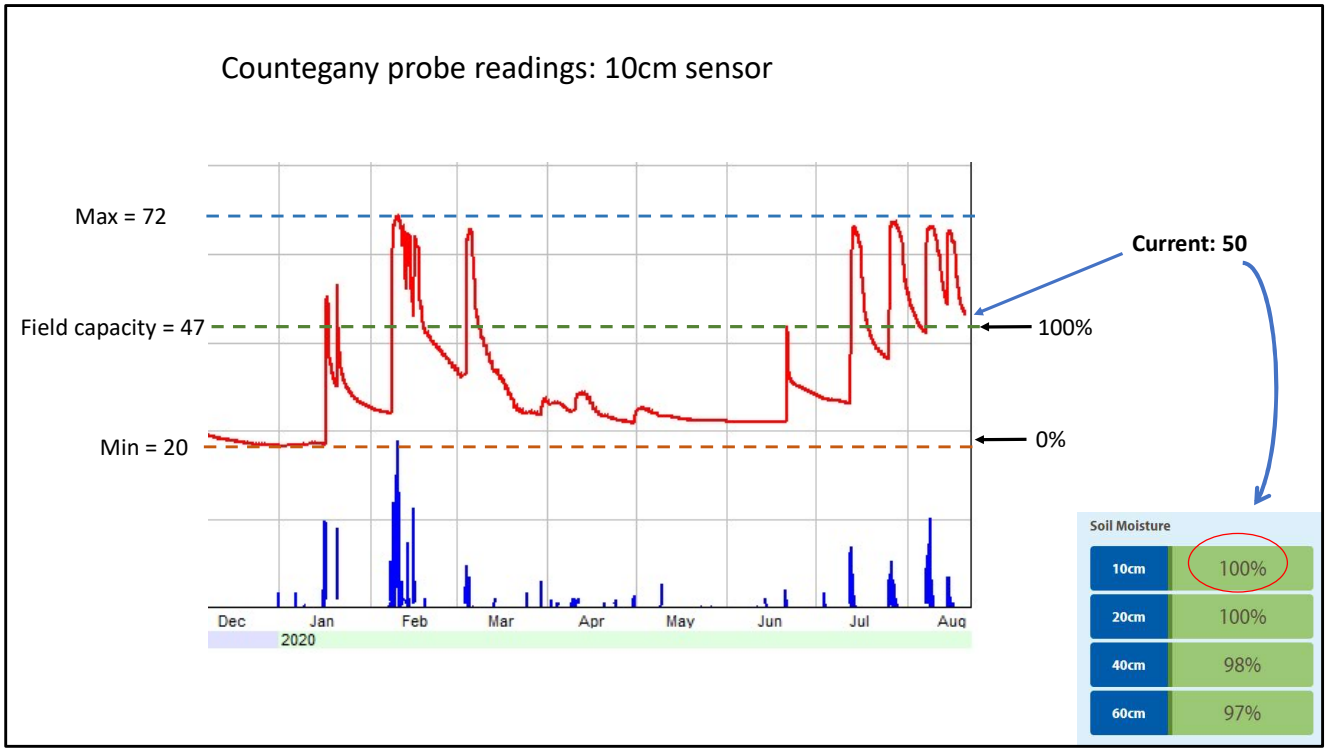
Rough, windy weather can also cause some internal wiring connections to come loose.

So if you notice that data for a particular location isn't up-to-date, it's likely to be a connection issue in the field. Connection issues will cause a delay in the data coming through, so sometimes you just need to try again in a few hours time. If the problem persists for a day or so, let Zoe or Andrea know and they will follow up with MAIT.

The good news is that we don't lose data when there is a connection issue – the backlog of data will be uploaded once the connection is re-established.

Some common questions/comments from producers…

- The moisture % readings aren't correct – they are still sitting on 100%



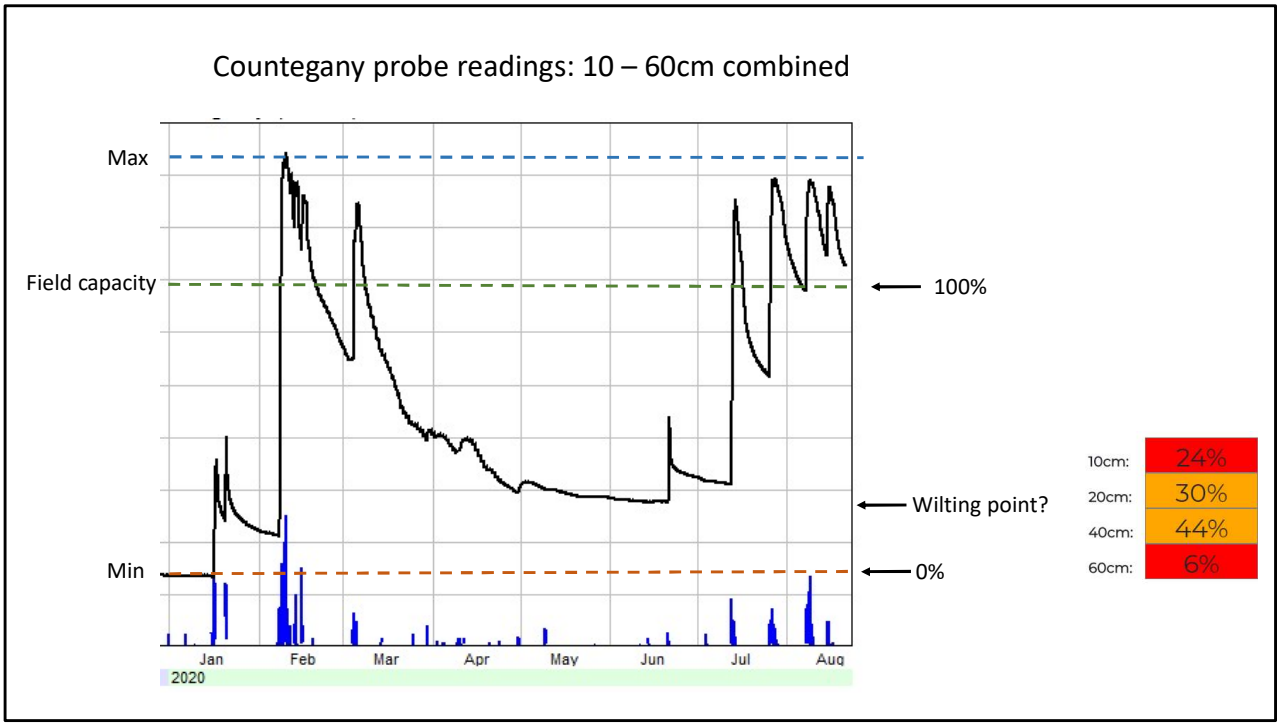
When the probes are installed they start taking measurements straight away. This measurement is just a number and is a measure of the electrical resistance between two copper plates.

The only way we can interpret this number is to wait until the soil goes through a very dry period and a wet period. This enables us to review the raw data and record both the minimum and maximum readings. Once we have these points we can then make sense of the current reading.

The lower limit is very easy to ID and typically occurs during summer. The number we select for the upper reading (referred to as 'field capacity') is not quite as straight forward. We set the upper reading by carefully looking at the data and to see where free drainage has occurred – this point is termed field capacity is the amount of water content held in soil after excess water has been drained away by gravity forces. Think of a large sponge dunked in a bucket of water - when you pull it out the sponge is saturated and water freely drains out, but after a little while the drainage stops. This point in soil terms is field capacity.

For this example the field capacity point has been set at 47. Establishing the minimum reading and the field capacity reading is done for the 4 sensor depths at all sites.

In this example, you can see the current reading is 50, which is 3 units above 47 – hence why the 10cm layer on the website is showing 100%. When the red line drops below the dotted green line, the percentage readings on the website will then start to drop below 100%. If we keep getting rain to top the system up we might find that some of the readings stay at 100% for a while.

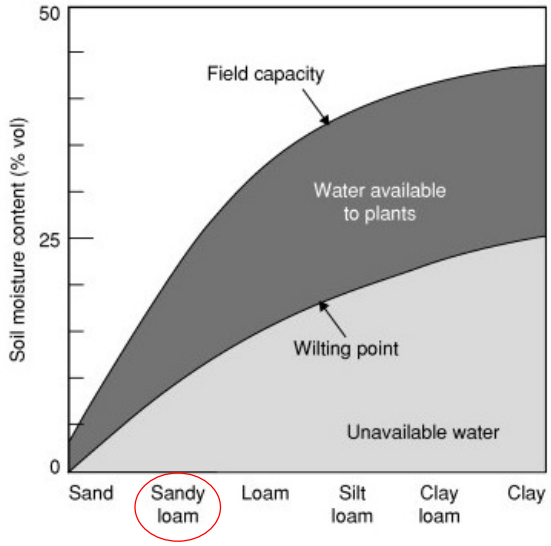


This graph is shows the combined probe readings for the 10, 20 40 and 60cm sensors at Countegany. So this is now a picture of overall soil moisture in the top 60cm.

The dotted lines are indicating the min, max and field capacity points.

Key thing to note here is that plants will stop growing well before the moisture % numbers on farming forecaster reach zero. Remember, if the % number is zero, it means that the soil is extremely dry and is equal to the driest reading that's been recorded – which typically occurs during summer.

For probe hosts it would worthwhile monitoring when pastures hay off in spring – take a photo of the pasture when this happens and send it to Zoe. This would enable MFS to set up a page on the MFS website which has photos for each probe site and the corresponding moisture % readings when pastures hay off (reach wilting point) in spring. This would be valuable information for future reference.



Countegany soil

Horizon	Depth (cm)	Texture
A1	0-4	Sandy Loam
A2	4-25	Sandy Loam
B2	25-90	Heavy Sandy Loam

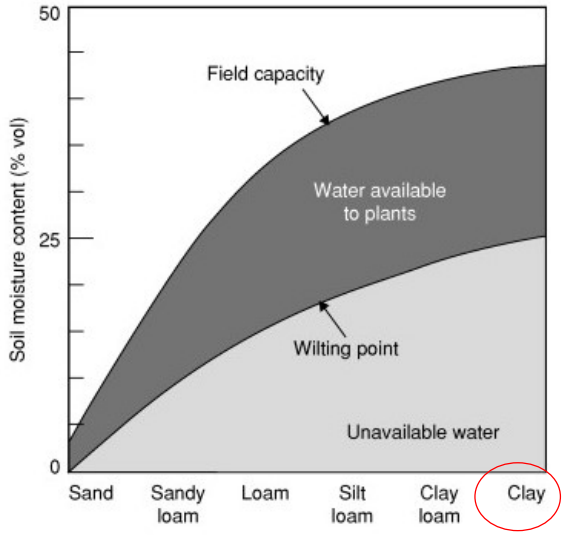
Source: de Oliveira *et al.* 2015

The diagram on the left quite neatly shows the effect of soil texture on wilting point and field capacity.

Field capacity is when the soil is fully wetted up and has free drainage has occurred. Wilting point is the when the soil is dry and the plant can not extract any more water.

The difference between field capacity and wilting point (dark shaded area) is the amount of water available to the plant for growth. In other words, the dark shaded area is an indication of the size of the 'sponge'. In general, the greater the clay content of the soil, the bigger the sponge.

As an example, if we look at the Countegany site we can see that the soil is a sandy loam. This soil would have quite good infiltration rates and quickly respond to small rain events, but it's not an overly big sponge. It would tend to fill up and dry out quite quickly, so regular top up rain events are important.



Source: de Oliveira *et al.* 2015

Coolrigdon soil

Horizon	Depth (cm)	Texture
A1	0-8	Clay Loam
B1	8-30	Light Clay
B2	30-90	Medium Clay

This is the soil from the Coolrigdon site near Cooma.

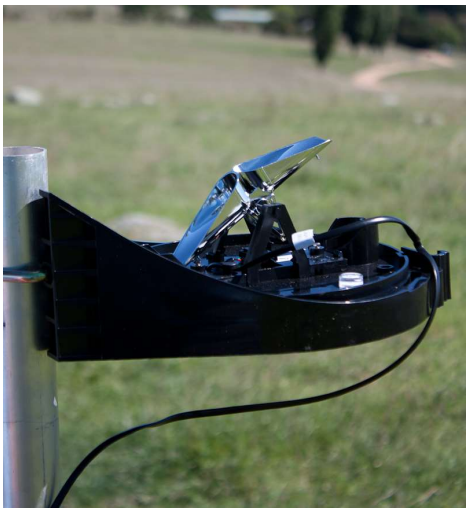
We are now dealing with a much heavier basalt soil with a high clay content. So a much bigger sponge which can store and carry a large amount of water.

However, the high clay soils also have a high wilting point which can work against you when conditions are dry. Once they dry out, you need a bigger rain event for the plants to 'see' the moisture and respond.

Some common questions/comments from producers…

- The rain gauge isn't correct – what impact does this have on the pasture outlook?

1) The automatic rain gauges are not 100% accurate, but still provide valuable information



3 KEY POINTS REGARDING THE AUTO RAIN GAUGES…

POINT 1: The automatic rain gauges are not 100% accurate, but still provide an indication of the amount of rain that has fallen at the probe site. Rainfall data is obviously useful when interpreting the soil moisture readings.

The rain buckets tend to be very accurate when rain is 'normal', but can be up to 12% out when the rain is very heavy or very light. Paul Hudson has tried a range of automatic rain gauges at various price points and his comment is that you can spend a lot more money for no real gain in performance.

Rain gauges do not look after themselves – some maintenance is required – biggest issue over the last couple of years has been blockages from dust. The newer probes that have been installed in the last couple of years have an improved rain bucket design which means they are less prone to blockages from dust and bird droppings. However, it is still important to keep an eye on rainfall measurements and investigate if there appears to be an issue. Also worth spraying some residual insect spray inside the bucket to control spiders and bugs.

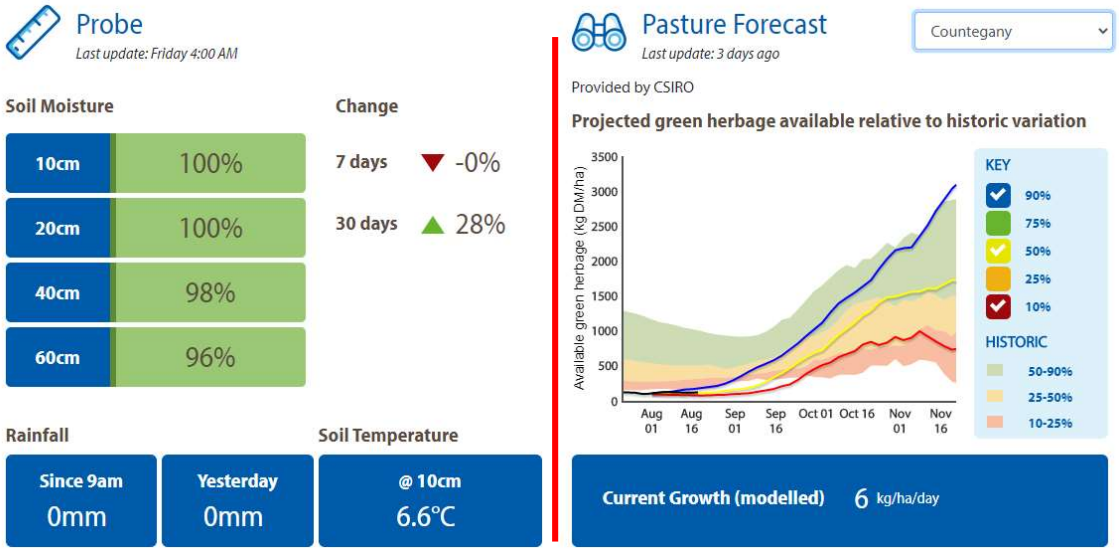
2) The rain gauge and moisture probes are independent

POINT 2: The rain gauge and moisture probe are independent.

The moisture probe will continue to take measurements every hour, regardless if the rain gauge is working or not.

If the rain gauge isn't working correctly, the only impact this has is that the rainfall data on the website will be wrong - which makes it a bit difficult for users to interpret the moisture readings. It looks a bit strange when soil moisture goes up and there hasn't been any rain! MAIT can manually correct the rainfall data if there is an issue with the rain bucket.

3) The rain gauge and pasture outlook are also independent



POINT 3: The rain gauge and pasture outlook are also independent

The pasture forecast, which is generated by GrassGro uses BOM historical climate data, not measurements taken on site. This is done for a couple of reasons:

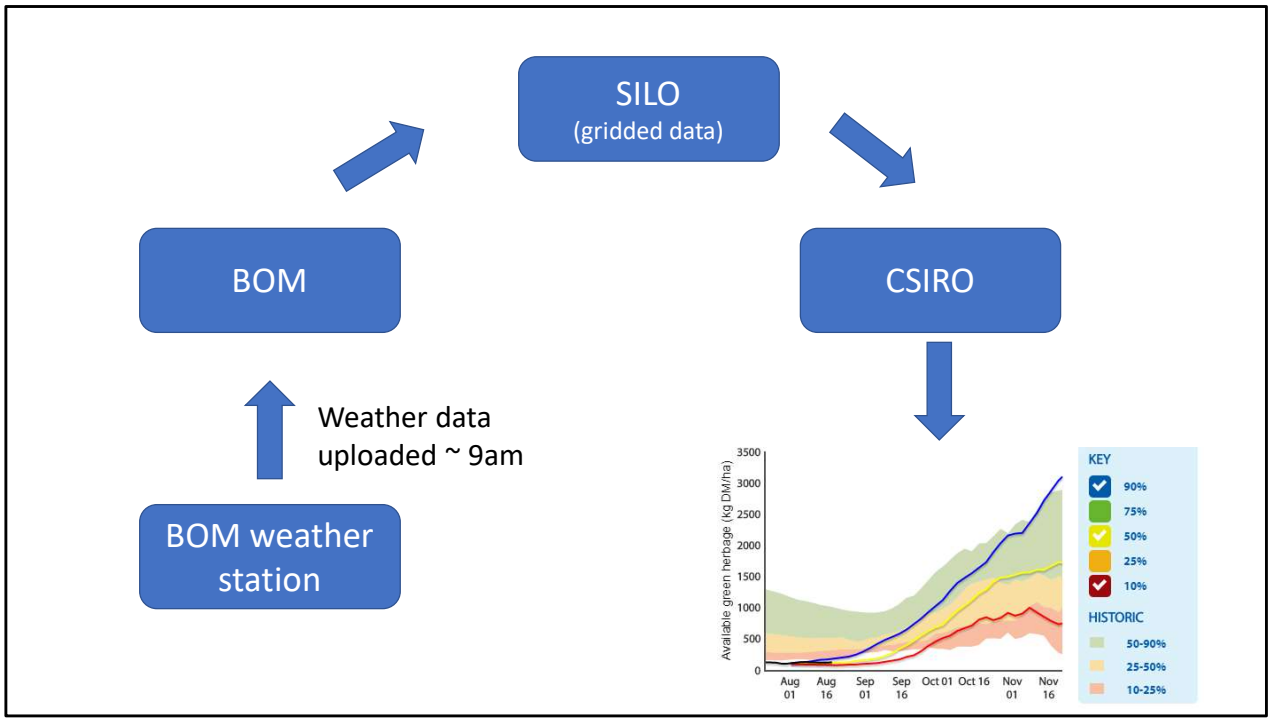
1) In terms of climate data, we are only recording rainfall at the site. For GrassGro to run it needs a whole range of daily climate data including max and min temperature, evaporation, radiation, relative humidity etc.

2) To produce a tactical run in GrassGro (pasture forecast) we also need long-term weather data – with farming forecaster we are using the last 30 years.

So the measurements coming from the paddock (soil moisture, soil temp and rainfall) are not linked to the pasture forecast. In other words, a faulty rain gauge will not have any impact at all on the pasture forecast for that site.

Some common questions/comments from producers…

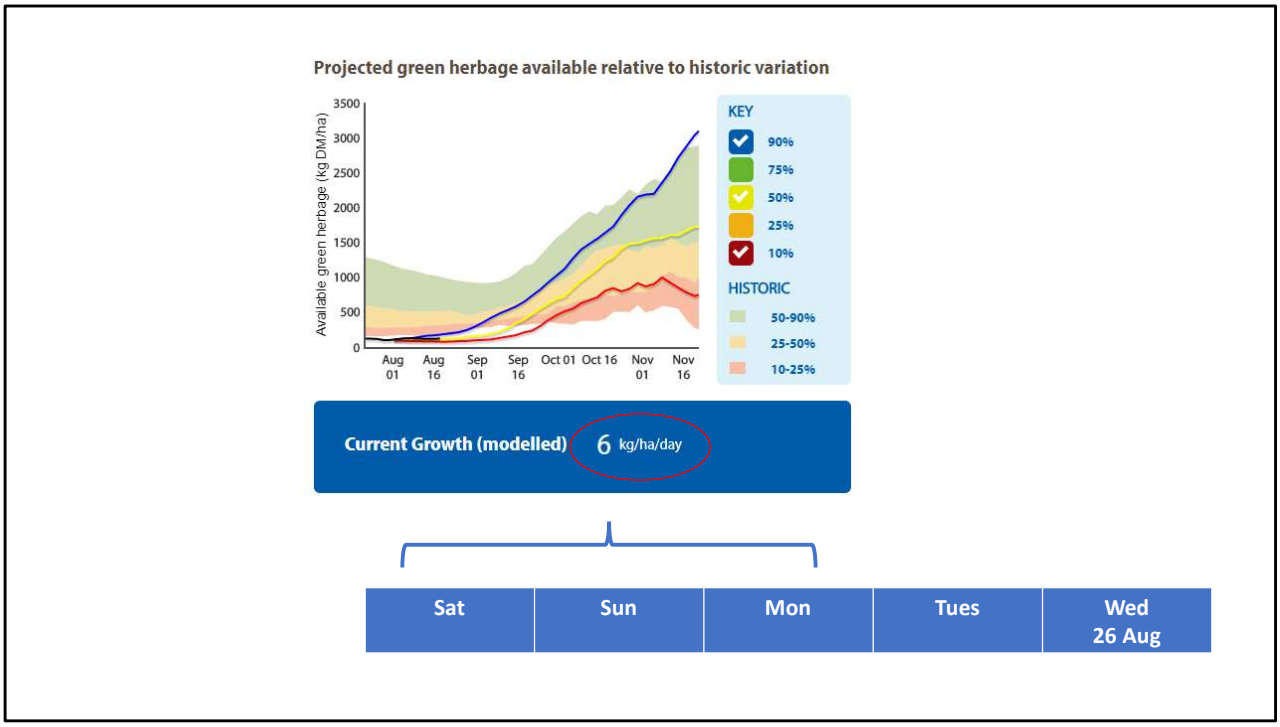
- The pasture growth rate does not reflect todays weather



Bureau weather stations record a variety of weather variables including temperature, humidity, rainfall, pressure, wind, cloud and visibility. Most climate variables are recorded daily at 9am and sent to BOM database. Some variables are assigned to the previous day. So straight away there's a time delay.

For the GrassGro model to run it needs gridded data which is constructed by SILO. CSIRO then uses SILO gridded data to run the GrassGro model for each location.

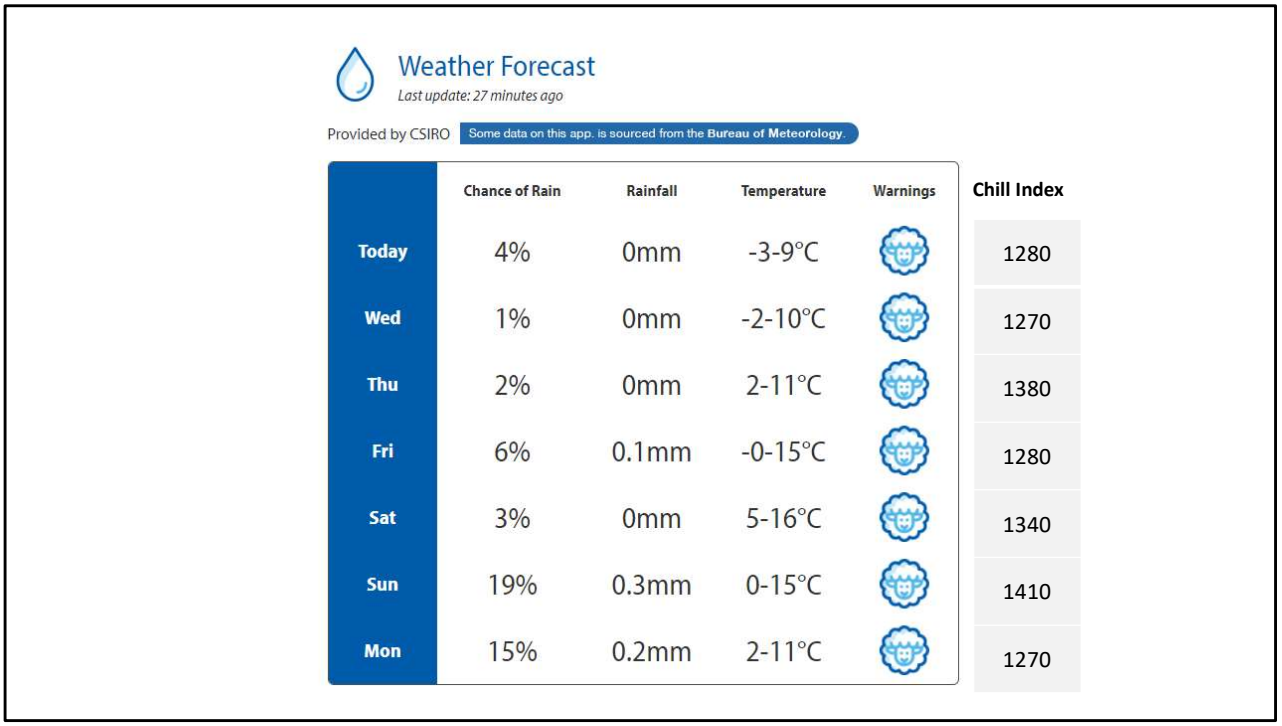
So there are a number of steps in this process – it takes around 2 days for CSIRO to get a complete dataset and run the model. This 2 day time lag is one reason why the pasture growth rate might not be aligning with your expectation.



In addition to the 2 day lag phase, the other thing to note is that the pasture growth rate figure on Farming Forecaster is an average figure over 3 consecutive days.

So, if you go on the website today (26 Aug) and look a growth rate figure, it's actually an average growth rate of last Saturday, Sunday and Monday. This number is sensitive to daily conditions, so you need to think about what the weather was like 2-4 days ago.

It's also important to note the GrassGro model takes water logging into account, which is supressing the growth rate at present at some locations.



Weather Forecast

Last update: 27 minutes ago

Provided by CSIRO | Some data on this app. is sourced from the **Bureau of Meteorology.**

	Chance of Rain	Rainfall	Temperature	Warnings	Chill Index
Today	4%	0mm	-3-9°C		1280
Wed	1%	0mm	-2-10°C		1270
Thu	2%	0mm	2-11°C		1380
Fri	6%	0.1mm	-0-15°C		1280
Sat	3%	0mm	5-16°C		1340
Sun	19%	0.3mm	0-15°C		1410
Mon	15%	0.2mm	2-11°C		1270

In recent weeks we've been working with Square V to include some livestock specific weather warnings on the website.

For example, the 7 day weather forecast now includes a Chill Index Alert. This alert is consistent with the LambsAlive model (used in GrassGro) and is designed to predict the risk of death in new-born lambs from bad weather. The Chill Index is also applicable to sheep off-shears.

The Chill Index is a function of average daily wind speed, average daily temperature and total daily rainfall. The Chill warning (blue sheep icon) appears once the index exceeds the 1100 threshold, however this doesn't give you an indication of severity. Another option is to include the index value beside the warning – that way you can see if it's just been triggered, or if it's up around say 1300 or higher. Over time you will get a sense of what Chill Index value is likely to cause issues on your property.