Soil moisture monitoring for improved pasture production

Scott Atkins, Meander Valley

- Type of farm – dairy with irrigated pasture
- Area – the business manages approximately 480 ha split across three properties: Harwood, Synfields and Birds.
- Crops – high quality pasture
- Soils – duplex soils on Birds farm with some areas presenting drainage challenges
- Irrigation – pivot with VRI to accommodate drainage differences across soil types. The new 25 hectare centre pivot on the Birds property will be used to grow high quality pasture to finish prime lambs and pre-feedlot cattle.

Background to soil moisture monitoring

- Soil moisture probe integrated with soil temperature sensors and automatic recording rain gauge to capture rainfall and irrigation application data
- 80 cm probe has sensors every 10 cm, i.e. 8 sensors
- Probe installed spring 2024
- The purpose of soil moisture monitoring to gain a better understanding of how to manage irrigation for effective water use and enhanced pasture production. This helps with irrigation scheduling but the more important benefit is gaining a better understanding of what is happening with soil moisture at depth and with plant water use over time.

Steps to sucess

- This is a stand-alone installation and doesn't require integration with any other agtech that is in use on the farm, but requires 4G connectivity.
- System is reliable as it is a new probe.
- Costs – $2995 for probe + rain gauge; $300 installation and set up of graphs etc. in Wildeye; $300 per year ongoing hosting and telemetry charges (4G data transfer). Estimated life = 10 years
- Regular assistance from Ag Logic at the beginning of the season was invaluable to develop an understanding of what the data means.
- Regular support and data interpretation from Ag Logic was essential as there was no prior operator experience with this equipment.
- Excellent backup service and support – definitely use a local, boots on the ground provider.
- The equipment was installed prior to the commencement of the 2024 spring irrigation program.

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Outcomes

- More effective use of irrigation applications by getting the right amount on at the right time
- With well managed and timed irrigation applications it should be possible to extend the productive growing season of the pasture rather than it going into the reproductive phase too early. This will provide more pasture over a longer period of time.
- Data is visualised through the Wildeye interface, but can also be exported by API (Application Programming Interface). Graphs can be emailed as pdf, or data can be exported.
- The first season has not led to any significant changes in irrigation management. This is often the case with adoption of soil moisture probes. The more important aspect is gaining baseline data and a better understanding of what is happening with soil moisture, how it changes with rainfall and irrigation applications and how it responds to water use by the growing pasture. This will then lead to better decisions next season. The key benefit is a better understanding of when to start irrigation in the spring or after rain to meet the twin requirements of maintaining a soil water storage buffer to cope with spring rains but not drawing the moisture profile down to the extent that it is difficult to apply enough irrigation to meet requirements.
- It is important to recognise that the water applied is not necessarily what goes into the soil, and the probe helps to understand that connection. Infiltration rates differ greatly across soil types and a soil moisture probe can help educate the farmer on how different soils behave.
- The expectation is that in a couple years there will be an improved understanding of what happens to soil moisture after rainfall or irrigation events and there will be much less reliance on the moisture probe data, although the data will still be used for key decision points in the season. As the saying goes, 'if you can't measure it, you can't manage it'.
- Previously the start of the irrigation season was very much rule of thumb – we would start when other neighbours started and apply 25 mm/week. Now we have the ability to target a start date to make best use of existing soil moisture and soil water storage capacity. Soil probes are also good for understanding what is happening in different soils. At present there is only one probe located in an 'average' location, but that still helps in understanding how soils that are better or less well drained might respond to irrigation and rainfall.
- Over time the understanding of what is happening in the soil will become embedded and be second nature in decision-making processes. The data from the soil moisture probe will be used to validate decisions and help identify key markers in the season that are important to get right in order to have effective irrigation. The soil moisture probe doesn't replace the shovel, but it helps you understand what you are seeing with the shovel. They complement each other.

Costs

There is no detail available yet about changes in water use or pasture yield. The primary purpose of the use of the soil moisture probe is to improve understanding of the soil-water status and the impact of rainfall/irrigation so soil moisture can be managed better for improved pasture production.

Indicative equipment and ongoing costs are given below:

- Purchase price – $2995
- Installation cost – $300
- Estimate repairs/maintenance over the life of the equipment – $30
- Subscription costs over the life of the agtech – $300/year
- Estimated lifespan of the ag tech – 10 years

Learnings

- Identification of key times and irrigation management aspects to ensure pasture is kept at optimum performance for as long as possible. Scott recognises that they started irrigating a bit late after a heavy spring rain and lost some potential production as a result, although the decision was complicated by poorly drained areas of the paddock.
- Don't fret about changing irrigation management in the first season of use of probes. The more important part of the process is understanding how soil moisture changes with the application of water and growth of the crop. There are many learnings to be made by following your traditional 'rule of thumb' approach and identifying its limitations through analysis of soil moisture monitoring data..

Conclusion

The greatest value of soil moisture probes is gaining a better understanding of how the soil-water system works. The data are important to underpin irrigation management, but in time management will rely less on the data and more on understanding the system. The data will always be there to support decisions and give confidence.

Probe installation

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