An agtech adoption journey

- Type of farm – irrigated cropping and livestock
- Area – 310 ha irrigated cropping, 210 ha grazing, 35 ha forestry
- Crops – peas, poppies, grass seed, clover seed, beans, chicory seed, pasture
- Livestock – 2300 ewes, trading 12,000 - 14,000 lambs/y
- Soils – black cracking clay (Vertosol), Panshanger sand (Tenosol)
- Irrigation – 13 centre pivots

Rob & Eliza Tole, 'Greenvale', Cressy

Ag tech background

- 2000 - hard hose irrigator that allowed four speed adjustments along its length of travel, enabling application rate to be changed based on soil type to avoid over/under watering.
- 2002-2018 - irrigation expanded to 13 pivots.
- 2005 - First soil moisture monitoring (Gopher), now has four probes and a weather station.
- 2010 - Sprayer purchase with section control and free-to-air satellite guidance.
- 2012 - RTK guidance was adopted with another sprayer change to provide a one-supplier integrated solution.
- 2015 - Variable soil type and drainage issues led to retrofitting of vari-rate irrigation (VRI) controllers on three pivots (12, 11 and 5 span). The motivation was minimisation of crop losses from wet areas. 'Greenvale' has access to plentiful cheap water, so water saving was not a driver.
- 2015 - Drone captured NDVI imagery prompted VR nitrogen fertiliser application, done with manual rate control due to technology incompatibility. Use of satellite imagery (DataFarming, PCT) to inform crop management decisions, such as VR application of growth regulators on grass seed crops.
- 2016 - Grid soil nutrient mapping of the most uniform paddock revealed a level of variation that led to mapping of the entire cropping area the next season. Grid mapping and VR application may not have reduced fertiliser costs, but inputs are now applied on the basis of need, rather than the average. Upgrade to John Deere Greenstar RTK led to use of John Deere Operations Center as a data management platform.
- 2018 - Land forming adopted to solve clover seed harvest problem. Undulations in the soil surface result in seed losses from non-uniform cutting height and present a damage risk to the harvester. On-farm weather station installed.
- 2024 - Dam level sensor installed

TAPC

Many agtech choices have been driven by curiosity and challenge. Adoption of TerraCutta for land forming was adopted to address the specific problem related to clover seed harvest. While the standard solution was land planning done by eye, Rob actively looked for a way to apply spatial technologies to the operation. In the process, he discovered the opportunity to improve surface drainage.

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Challenges

Rob has been surprised by the lack of technical knowledge amongst suppliers and the consequent lack of support, although this has improved in recent years. Rob regularly uses external service providers (e.g. Ag Logic), particularly for soil moisture monitoring and developing maps for land forming operations. He also relies on staff who have developed an interest in the technology and a desire to solve problems as they arise.

Positives

Underground drainage and surface drainage using TerraCutta, and guidance for all tractor-based operations, are key positives. If starting on a new farm, Rob would first completely map it (EM38, topography) to identify irrigation and drainage management zones, and then undertake land forming followed by subsurface drainage as required. Next would be zones of difference soil sampling to identify nutrition variable. Irrigation, drainage, GPS guidance and soil sampling would be his top four investments if starting again.

Outcomes

The use of grid mapping has led to more effective use of fertiliser inputs and land forming has removed many surface water challenges on the farm. Spatially controlled land forming generated considerable interest in the northern midlands, leading to the establishment of a separate land forming and drainage contracting business (2019).

Underground drainage had been part of wet soils management on 'Greenvale' since 2012, but precision cut and fill for surface drainage coupled with precision depth control for underground drains has significantly improved its effectiveness.

Negatives

Drone photography for NDVI images – other sources of crop imagery are more convenient and not dependent on drone flying time. The drone has been used for other applications (e.g. inspecting sheep, checking irrigator operation) but it is more effective to drive and observe - you see a lot more that way than watching a screen.

VRI – while still used, in most cases Rob would not re-invest in VRI if it broke down. Precision land forming, improved surface drainage and better underground drainage have dealt with many of the issues that were the original motivation for VRI. Growers who pay a lot more for water might find VRI a useful water saving technology.

Conclusions

- **Decide on the issue to be addressed and do it properly - e.g. don't buy a low-end model of agtech that is going to be inadequate in a couple years. Likewise, don't wait for the perfect solution – it might be years away.**
- **For soil nutrients, it is useful to map what is assumed to be the most uniform paddock first to get a sense of whether or not there are gains to be made. If the decision is to go ahead, just do it. Getting returns earlier is better than adoption over a number of years - if variability is there, VR will quickly pay for itself.**
- **If surface and subsurface drainage are required, do surface land forming first to allow more accurate placement of subsurface drains.**

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