Water on and water off – precision drainage for improved crop production

John Ramsay, 'Ratho', Bothwell

- Type of farm – irrigated cropping and livestock
- Area – 1800 ha total, 550 ha under cropping
- Crops – potatoes, poppies, carrot seed, cereals, clover and brassica pastures for grazing
- Livestock – sheep
- Soils – everything from sand to clay, various duplex soils and stoney red soil
- Irrigation – two VRI pivots (one Zimmatic, one Valley)

Surface drainage based on digital mapping

- Surface drainage was first used when cropping started 20 years ago.
- Drainage plans using accurate topographic mapping and installation using tractor guidance started in 2021
- Drainage is installed to manage surface water in conjunction with VRI on a largely flat cultivation landscape.

Process

- The first step in developing a drainage plan is EM38 mapping with accurate topographic data.
- The topographic data is used to create a 3D model of the paddock surface to allow design and placement of drains.
- For crops such as potatoes and carrot seed, ridges or beds are an integral part of the drainage design. The direction of planting is oriented to facilitate the best drainage solution, and drains are added to deal with issues not addressed by the ridge or bed layout.
- In some situations at 'Ratho', potatoes are sown on the curve to fit with the arc of the centre pivots, which becomes part of the drainage plan design.
- EM38 mapping and topographic data collection, as well as 3D modelling and drainage plan design was done by Ag Logic.
- The mapping and modelling was done between cropping seasons and drains installed prior to the season.
- The cost is ~$750/paddock for the drainage plan, on top of $30/ha for the EM38 and elevation mapping.
- The drainage plan includes not only the location and slope of the drains but also the dimensions in terms of width and batter slope.
- The drainage plan is uploaded to the tractor or grader GPS, making installation a relatively easy task.
- Drains are installed with a grader using 'Ratho' farm resources. A local contractor is used if an excavator is required.
- Guidance lines for surface drains are uploaded to John Deere Operations Center so drains can be cleaned up and maintained using 'Ratho' resources whenever required.

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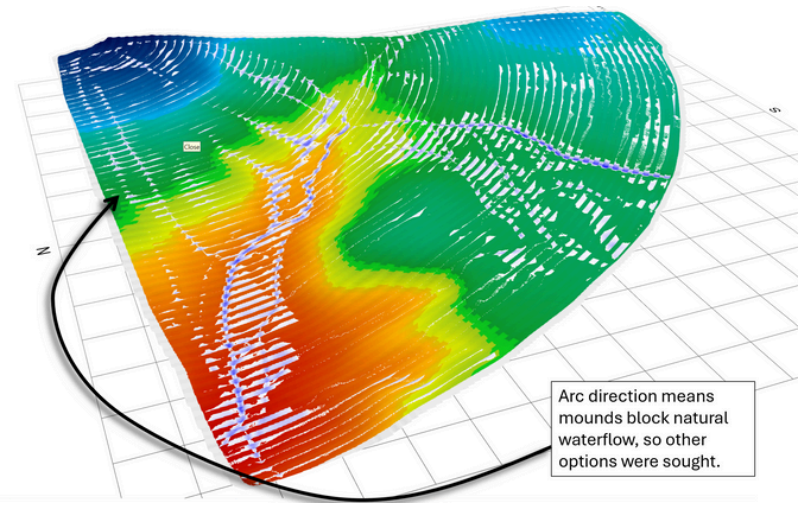
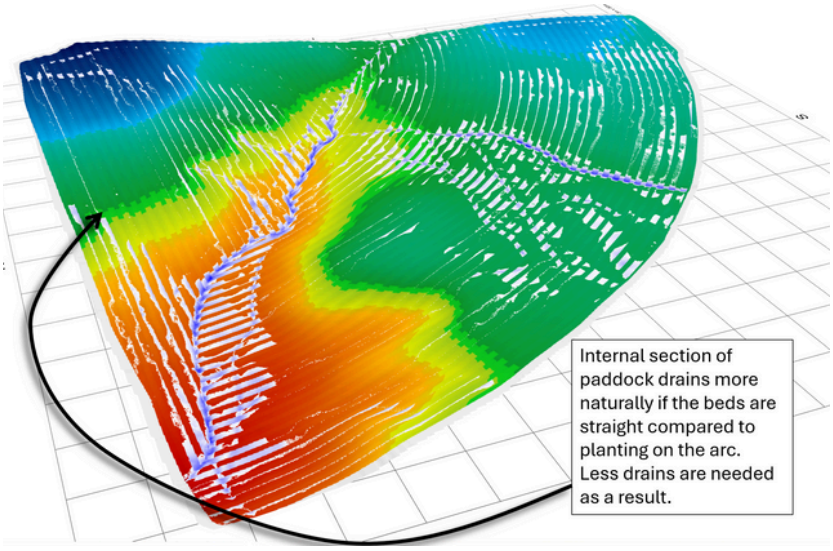


Drainage in action



Outcomes

- There have been labour savings and improved convenience during the irrigation season as the improved surface drainage, when combined with VRI, has reduced the chance of irrigator and vehicle bogging.
- The mapping data used for drainage design and VRI maps can also be used for other purposes, such as risk mapping.
- The installation of well-designed surface drainage has reduced waterlogging of sensitive crops (e.g. potatoes) and it is expected this will lead to improved yield through the minimisation of rot losses.

ROI

John does not bother calculating an ROI for drainage. It is a no-brainer and the payout is obvious.

Positives

Drainage plans developed from 3D modelling are very good and require minimal adjustment in the field.

Conclusions

- **Effective management of crop and soil water dynamics is a combination of getting the water on at the right time and place and getting excess water off the paddock.**
- **Accurate 3D mapping and soil type identification through EM38 mapping is required for designing effective drainage plans and the type of drains used.**
- **Installation of drains is a relatively simple task once the plan has been developed and installed in the tractor or grader GPS.**

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