

Optimising Water Use on My Farm

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Introduction

There is no doubt that water is the limiting factor on all farms. It is argued about passionately and has entered a very public arena with demands from environmental, political, community and agricultural sectors. The cost of the cuts in entitlements, at a time when volumes in storage and flows are minimal has multiplied the impact.

None of us should be in any doubt as to the value of every litre however, we need to be wise and careful about how we are going to utilise the water we have. As sure as night follows day there will be experts and wiz bang solutions that will solve your every problem. If you scratch just about anyone who has installed an alternative irrigation system, you will find a wiser, often poorer, usually very tired and disillusioned irrigator.

There are good results being achieved both with improvements in management of surface irrigation systems, as well as successful alternative systems. What makes the difference and how are we to determine the best for our farm?

Addressing the problem

On our farm we have invested fairly heavily in irrigation improvements that have been based on good science and experience. This is our first season with on farm storage. We use a mixture of C probes and neutron probes for moisture monitoring. We use permanent beds. The siphon size, hydraulic head and time of run is monitored pretty well to suit the soil type and grade in each block, and there is an interconnecting drainage system. Variable rates of gypsum have been used across paddocks according to soil type. We expected to see efficiencies from the storage, we hoped to extend our watering interval through close monitoring and timely irrigations. We looked for savings in total water used as we shut off syphons according to the individual field requirements. We expected to see less variation due to 'cut' and 'fill' areas.

In considering development in our area we installed, three seasons ago, 140 ha subsurface drip irrigation and 200 ha linear move. We looked for higher yields, improved crop efficiencies through less water per bale. We expected earliness or extra positions through no "waterlogging" at irrigation.

We have 20% of the farm planted to UNR to achieve earliness and hopefully save one watering and other inputs.

But..... This season is our highest water use on record, other than the years we grew rice. The cotton, both 1m rows and UNR have all required 7 irrigations, including watering up.

The drip is not the top yielding field, but used only 6.5 ML/ha – it is in the top 10%, but to justify the investment needs to be the top. The lateral starts with nozzles and then changes to hose drag before row closure – the water use at 6.3 ML/ha is the best but the yield was below average as problems with uniformity and water movement impacted on crop maturity.

Owning up to the problem

- We are not doing very well at all.
- It was a very dry season – only 149mm from July 2001 to June 2002, virtually none effective to the crop
- It was a very cool season but should that have an effect. We did not enjoy the warm finish that characterised most areas.
- Our bale per megalitre production across the whole farm is still below 1.

Have we really changed the way we irrigate? We have implemented many of the best strategies in optimising our water, from design right through to drainage, but what is happening.

Opportunities to improve

Across all systems, the most significant factor to us is soil variation, particularly water holding capacity. From our drip irrigation we have recognised that even though we are applying equal amounts of water in each application, in some soil types this is too much and the crop was vigorous, whilst in other soil types, the crop is shorter and compact. There was no deep drainage, nor losses through evaporation. One of the perceived benefits of drip or overhead systems is to avoid the “cut/fill” syndrome. Our variation in soils follows the contour, with less depth of better soil (Horizon B) on the higher areas. The soil in Horizon C is higher in sodicity, and we have now observed the same behaviour of the crop under the lateral and in the furrow crop.

We do not understand all of the issues, however we are sure that the key for us is to understand the crop needs in each of the soil types, and how to manage water to supply this. The challenge on a commercial farm is that we must continue to improve even though we do not understand all. Our efforts on the whole farm scale are aimed at improving water holding capacity, including Organic matter from mulch crops or rotations, gypsum and ripping.

The tools we are using to improve are:

- Analysis of successes. There are fields achieving 1 bale/ML +. Identify their characteristics.
- Electromagnetic Ground Conductivity Survey, soil cores and testing, soil pits.
- IR mapping of the crop
- Identify relationship between flow rates, irrigation time, advance, wetting pattern
- Cut out areas where yield per ML is worse. Cost of addressing the problem? Deep ripping, gypsum, rotations
- Yield mapping, then incorporating all of the layers of information. Some treatments can be made across whole paddocks, but others will be specific. Cost of treatment must be judged against benefit.

- Closer monitoring of movements of water, particularly in trying to identify system losses, such as reservoir losses. Reliable metering.
- Deep drainage is poorly quantified. We will probably need help in quantifying this.
- Evapotranspiration and Evaporation need to be more correctly understood, particularly as we know that some soils simply require more water to achieve the same plant growth

The Future

It is reality that there is “nothing new under the sun”. The opportunity is there to improve each part of our irrigation system. The first step is to identify limitation and determine it’s cost to production, then the cost of correction. Interest is high at present in systems that will increase field application efficiency however caution is required as each system has different limitations. In furrow irrigation, we actually achieve very good uniformity at the price of overwatering and tailwater, in the alternative systems as we apply closer and closer to the crops needs, there is no “buffer” if something goes wrong, or if infiltration is not uniform. We pay for uniformity of application, but it depends on infiltration of that water. There are features that must be understood. Some of the keys are listed below.

Furrow irrigation

- Maintain performance of good areas. Soil pits to “check health” of paddock.
- Continue to work on least efficient areas with soil conditioners or mulch/rotation crops
- System is physical and hands on, what you see is what you get
- Limiting losses – deep drainage, good design and application in balance with infiltration.

Overhead irrigation

- Application in balance with infiltration – water moving is water lost!
- Drainage strategy
- Operational security is paramount

Drip irrigation

- Establishment of crop is critical - \$4,200/ha to develop but wait for rain to germinate!!!!
- Uniformity of Application in balance with soil characteristics
- Operational security is critical

Irrigation farmers will change practices, some will change crops as higher returns required, but opportunities always exist to improve performance of each litre of water, as it is the key component to our farms.

