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fact sheet

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Surface irrigation

Key factors to consider when improving furrow irrigation

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Head ditch

- Consistently deliver sufficient water at an appropriate head;
- Maintain a constant flow rate;
- Maintain adequate freeboard (minimum of 0.15 m); and
- Conduct regular maintenance (de-silting & weed control)

Tail drain

- Designed for rapid removal of storm waters to prevent in-field waterlogging;
- Deep enough to prevent water backing up but sufficiently shallow to prevent erosion between the furrow and drain.

Siphons

- Siphon placement - operate under submerged flow conditions, ie discharge under water level in the furrow stream;
- Siphon size - check internal diameter and length. It should be the same. Imperial sized siphons are specified according to their internal diameter and metric siphons according to their outside diameter. Internal diameter of metric siphons vary between manufacturers - mixing these pipes causes variation in flow rate and can have



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significant affect on total water applied over an irrigation;

- Careful rota buck placement. The person starting the siphons should build the rota bucks as they are the individual on the shovel if there are any breakouts.

Irrigation scheduling

- Decide when and how much water to apply to maximise crop productivity;
- Plant, weather and soil based monitoring is available. Use a range of tools and indicators that you are comfortable with, however

keeping a close eye on weather forecasts and visual inspection of the crop is still vital;

- Use Electromagnetic Induction (EM or EMI) surveying, in conjunction with soil sampling to map soil variations across fields and farms. It indicates texture changes and the data can be analysed to produce maps of similar soil types. This can then be used to locate the “majority” soil type within a field;
- Use EM soil survey to site soil moisture probes in the majority soil type in a representative area of the field.

Water Application

- Relatively small management changes may increase water use efficiency significantly;
- **Infiltration opportunity time** is the length of time that water is present on the soil surface for infiltration to take place. To achieve the best performance, the opportunity time for an irrigation should equal the amount of time necessary to apply the required depth of water;
- Manage **flow rate** and **cutoff times** to maximise **application efficiency** and **distribution uniformity** to reduce runoff, deep drainage and loss of nutrients;
- **Inflow rate** typically has the largest influence of any variable that can be managed by the irrigator. It has a major impact on performance due to the speed of water advance down the field. A faster advance is typically more desirable on high infiltration soils;
- Along with inflow rate, **time to cutoff** is a key variable easily managed by the irrigator. In fact, it is typical for these two variables to be managed together. Increased inflow rate is likely to result in excessive tailwater unless time to cutoff is managed accordingly;
- When inflow rate is increased, more precise control is typically required as it becomes easier

to adversely affect performance when the inflow rate is high.

- **Application efficiency** relates the amount of water applied in an irrigation to the amount of water available to the crop for use. A high efficiency means that most of the water applied has remained in the root zone available for plant use. Low efficiency means much of the water has not reached or has moved out of the root zone and gives no benefit;
- **Distribution uniformity** is a measure of how evenly water has been applied. Low distribution uniformity is caused by an uneven opportunity time along the length of the furrow. The result is parts of a field being under-watered and over-watered. Running water longer to ensure sufficient water for the whole field is the most common cause of waterlogging to significant areas of a field; and
- Plan to have water on and off a field in no more than 8 hours to minimise waterlogging, deep drainage and runoff.

Irrigation Evaluation

- It is important to objectively evaluate your surface irrigation system performance, rather than simply increase the inflow rate without making any objective measurements.

Further information:

- Waterpak Chapter 5.3 Surface irrigation performance and operation
<http://crdc.com.au/sites/default/files/pdf/Cotton-WATERpak-2013-.pdf>
- ProWater Surface Irrigation Performance
<http://www.dpi.nsw.gov.au/agriculture/profarm/courses/prowater-surface-irrigation-systems>