Drip irrigation management

With many growers taking the opportunity to adopt drip irrigation systems in recent times, it is important to consider a number of factors to ensure the systems are operating at an optimal level. Like any irrigation system, an understanding of soils and their influence on irrigation management is most important together with ongoing system monitoring and maintenance.

Understanding your soils

Readily available water (RAW) is the estimated water storage within the crop root zone that can be extracted by the plant with minimal stress. A simplistic range of ‘soil suction’ ranges measured in kilopascals between -8 and -60 kilopascals (kpa) are generally used to classify soils and their ability to provide readily available water to a range of crops.

Field capacity refers to the maximum amount of water held within the soil particles before excess water drains away. Field capacity occurs at a soil suction of -8 kPa. Crop stress also occurs when the tension of the water in the soil profile exceeds between -40 and -60 kPa for most horticultural crops.

Understanding lateral spread

Lateral spread refers to the distance irrigation water will spread from the drippers into the mid row. This is an important factor because it determines the amount of available water the crop will be able to access.

Unlike overhead sprinklers, or full cover under-canopy sprinklers, drip irrigation does not wet the full soil profile. A general rule of thumb is to assume the actual lateral spread is approximately a one-third wetted area with drip irrigation. The actual lateral spread can be measured by digging a trench perpendicular to a dripper after a standard irrigation shift has finished to observe the spread of water within the soil profile.

Assessing crop root zones

The crop root zone refers to the depth at which roots can effectively extract water and nutrients from the soil. A crop’s particular root zone is influenced by genetics (root stock), soil properties and water delivery.

Determining the crop root zone of a particular crop will enable an estimation of effective soil depth. This then provides a picture of how much water can be applied before water is lost beyond the root zone. A gouge core will provide a quick appraisal, but a trench or soil pit will provide a more accurate measurement.

Figure 1: Keeping RAW in the ‘Best Crop Growth’ segment is the most cost effective way of maximising crop performance.
Calculating readily available water for drip irrigation

Example: The soil under a drip irrigated citrus crop was identified as a sandy loam to a depth of 80 cm with crop roots to a depth of 30 cm within the soil profile.

### Soil Water Deficit (mm/cm)

<table>
<thead>
<tr>
<th>Soil texture</th>
<th>-8 to -20 kPa</th>
<th>-8 to -40 kPa</th>
<th>-8 to -60 kPa</th>
<th>-8 to -1500 kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>0.33</td>
<td>0.36</td>
<td>0.38</td>
<td>0.62</td>
</tr>
<tr>
<td>Loamy sand</td>
<td>0.45</td>
<td>0.52</td>
<td>0.55</td>
<td>0.87</td>
</tr>
<tr>
<td>Clayey sand</td>
<td>-</td>
<td>0.55</td>
<td>0.60</td>
<td>1.00</td>
</tr>
<tr>
<td>Sandy loam</td>
<td>0.46</td>
<td>0.59</td>
<td>0.65</td>
<td>1.15</td>
</tr>
<tr>
<td>Light sandy clay loam</td>
<td>0.45</td>
<td>0.65</td>
<td>0.74</td>
<td>1.37</td>
</tr>
<tr>
<td>Loam</td>
<td>-</td>
<td>0.69</td>
<td>0.84</td>
<td>2.43</td>
</tr>
<tr>
<td>Sandy clay loam</td>
<td>0.39</td>
<td>0.61</td>
<td>0.71</td>
<td>1.44</td>
</tr>
<tr>
<td>Clay</td>
<td>0.30</td>
<td>0.53</td>
<td>0.65</td>
<td>1.48</td>
</tr>
<tr>
<td>Clay</td>
<td>0.27</td>
<td>0.46</td>
<td>0.57</td>
<td>1.49</td>
</tr>
<tr>
<td>Heavy clay</td>
<td>-</td>
<td>0.25</td>
<td>0.41</td>
<td>1.20</td>
</tr>
</tbody>
</table>

Table 1: Readily available water values at a range of suction levels by soil type (adapted to Riverland growing systems).

**Calculating readily available water for drip irrigation**

Example: The soil under a drip irrigated citrus crop was identified as a sandy loam to a depth of 80 cm with crop roots to a depth of 30 cm within the soil profile.

**Scheduling and monitoring irrigation applications**

A suite of tools is available to inform irrigation management including soil moisture monitoring devices and local weather station data. There are many soil moisture monitoring products on the market and irrigators are encouraged to speak with their local irrigation agronomist to find out more information about the available products.

In the South Australian Murray-Darling Basin region, free local climatic data to assist with irrigation scheduling is available at [www.awsnetwork.com.au](http://www.awsnetwork.com.au).

**Drip irrigation system uniformity**

While drip irrigation systems offer the most precise form of watering and the lowest application use, unintended variation in valve application rates can result in significant differences over a whole irrigation season. This may affect water budgets and crop quality.

Regularly assessing the components is essential in maintaining the efficiency of the overall irrigation system:

- Keep the drip system clean by regularly flushing laterals, delivery mains and filters.
- Check pressure settings at the head works and valves.
- Compare the flow and pressure measurements against design specifications and address any issues.
- Monitor water use by reading your meter and compare the delivered volume against the predicted volume.
- Consult an accredited irrigation designer if you think you should be making changes to your system.
- Consult an irrigation adviser/agronomist to determine what system chemical treatments are necessary to reduce the risks of biofouling, sedimentation or insect colonisation.
Managing rainfall events

While rainfall events may appear to provide crops with a free drink, they can be ineffective in recharging soils adequately depending on their incidence and duration, particularly in more arid regions. Rainfall events should be reviewed for literal effectiveness through a soil moisture monitoring system or simply by digging in proximity to the root-zone.

Conclusion

While drip irrigation offers the potential to achieve significant improvements to on-farm irrigation efficiency, realising these potential water savings requires careful management and ongoing maintenance.

This fact sheet has provided a summary of the key considerations in the management of drip irrigation systems but growers are encouraged to contact their local irrigation agronomist or advisor to explore these matters in more detail.

For more information

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This initiative is supported by the South Australian Murray-Darling Basin Natural Resources Management Board through funding from the Australian Government’s National Landcare Program and the NRM Levies.