**Disease Reduction**


**Figure 11.** Better irrigation practices may lead to additional benefits such as reduced fertilizer use and reduced disease incidence.

Reducing irrigation does not just save on pumping and other water related costs. We have found that growers have gained additional benefits applying irrigation that more closely matches plant daily requirements. As mentioned previously, sensor networks have reduced irrigation application volumes by 50% or more compared with best management practices. Excess irrigation can produce a number of unintended consequences. Improper irrigation frequency and duration can lead to nutrient loss through leaching. More efficient irrigation also leads to reduced disease incidence since plants are not over or under irrigated, which can lead to stress, and infection. Roots are also able to spread more to find water throughout the container, and any residual water inside the container is reduced, which creates a healthier root system. Less water in the container leads to improved aeration, and more oxygen for the roots. All of these factors lead to a healthier plant, and an increased plant growth, which can lead to a shorter production period and a healthier, higher quality plant overall. You may also be able to save money through less frequent fungicide applications (both materials and labor).

**Manipulating growth**

If plants have reached a saleable height (or diameter for trees), sensors can help maintain them at that size until they are ready for sale. This can be accomplished through set point control which keeps the moisture level in the container or root zone at a level that minimizes growth, while maintaining plant quality. Better irrigation control can also lead to reduced vegetative growth and denser canopy development, which reduces pruning requirements to maintain plant size and shape.

As part of the SCRI-MINDS project, we have shown that sensor networks are able to manipulate plant growth, similar to plant growth regulators (PGRs). In a study with Poinsettias, researchers were able to control the height and overall appearance of poinsettias using water deficits instead of PGRs. This saves the labor and expense of application, but also reduces the environmental impact of your operation. More information about this study can be found at the end of this module in: Alem and van Iersel, 2014.

Majsztrik, J., E. Lichtenberg, and M. Saavoss. 2014. Costs and benefits of wireless sensor networks: How a sensor network might benefit your operation. *In*: Managing Irrigation through Distributed Networks Knowledge Center, M. Chappell, P. Thomas, and J.D. Lea-Cox (Eds.). Published online at: https://myelms.umd.edu/courses/1110342 18p.

**Monitoring EC**

Sensors (such as the Decagon GS3) are capable of monitoring EC (electrical conductivity) levels in soils and substrates. Monitoring substrate EC is important for a number of reasons. If plants are being grown in areas with high salt concentrations in irrigation water, sensors can help guide water applications (frequency and duration of irrigation) for leaching salts out of the substrate/soil to minimize plant damage.

Sensors can also be used to determine when slow release fertilizers (SRF) (also called controlled release fertilizers; for example Nutricote®, Florikote®, polyon®), have been depleted. Using EC sensors, growers can monitor increases in soluble nutrients during summer as higher temperatures cause higher nutrient release rates. Containers can be monitored to reduce leaching, so fertilizers remain in the container or root zone, or irrigation can be applied to leach fertilizers so they do not cause damage to the roots. If SRF's have been exhausted in the late summer or fall, the EC data will indicate reduced available nutrient levels, and the grower could switch over to fertigation (only recommended for spray stakes or other precision irrigation systems), or perhaps a reapplication of SRF to maintain growth.


**Figure 12.** Electrical conductivity (EC) sensors can help determine when controlled release fertilzers have run out.

In greenhouses or other situations where fertigation (continuous or discontinuous) is used, sensors can be used to help determine when and how much fertilizer should be applied through fertigation lines. By being able to continuously monitor salt levels, fertilizer can be applied when needed, reducing costs. If continuous fertigation is required, sensors can be used to determine if current rates are too high or low based on salt levels over time.

All of these scenarios help contribute to a reduction in fertilizer cost, which increases your profits.