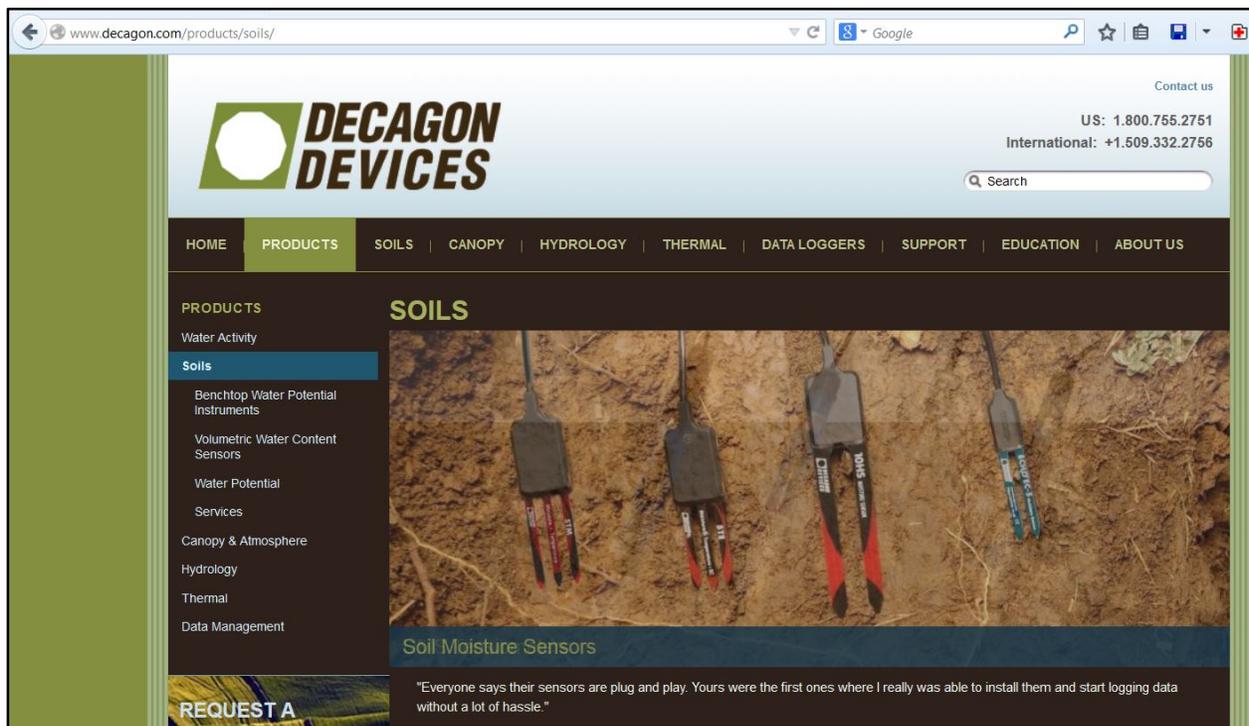


## Under what conditions does a wireless sensor network make sense?

The Decagon wireless sensor network system (<http://www.decagon.com/products/soils/>) that was developed and tested as part of the SCRI-MINDS project, and which has been commercially released as the Plant Point® system, has a number of advantages. A sensor network can start out small, and be expanded as needed just by adding additional nodes and sensors (it is scalable).

Also, sensors and nodes can be easily and quickly moved from one location to another (it is reconfigurable). If you have a problem situation in your operation that you would like to investigate, you can install the system, and monitor it for a period of time (weeks, months, years). When you have answered the questions that you were asking, you can then move it to another area/crop.

There are a number of factors that will impact whether a wireless irrigation system will be profitable at your operation. Some of these factors are discussed below.



**Figure 2.** Decagon Devices, Inc webpage, with information on their latest sensors and nodes.

**The overall size of your operation:**

The larger the operation, the more likely you will benefit. This is especially true if you have one or more people who monitor and/or schedule irrigations on a daily basis. As operation size/complexity increases, more time is devoted to making irrigation decisions, which can be greatly reduced with sensor networks.



**Figure 3.** Larger operation sizes are more likely to benefit from sensors.

**The percent of your revenue from ornamental production:** The higher the percentage of your income from high value crops, the more likely you will benefit from implementing this technology. Since sensors have a cost associated with them (money, time to learn, labor to set up and maintain), the more you are able to use this information to change practices at your operation, the more likely you are to benefit. If for example, your main revenue is from corn and soybean production, but you also grow some bedding plants in the spring, it is unlikely that sensor networks would provide enough benefits to justify their cost. Whereas if your main income was from ornamental, fruit or vegetable production, there is a greater chance that a sensor network could help you become more profitable.



**Figure 4.** Sensor networks can help identify problems in certain areas or certain species.

**Problem areas or problem plants:** Some plants are difficult to irrigate because of slow growth rates or they are prone to root disease. Some areas in your operation may be either too dry or too wet due to differences in soil type, topography, location etc. making it more challenging to discern proper irrigation practices and grow plants there.

**Large areas of plants that are irrigated similarly:**

This may be by design (you grow a lot of pansies), or due to constraints (I am space limited). You may have a number of different species or container sizes in the same irrigation zone.

Sensors can help you determine and confirm which plants you should be monitoring,

and you can then base irrigation decisions on those “indicator species.” For example, sensors can help you determine which plants dry out the fastest, and therefore should be monitored so that irrigation events can be more accurately scheduled for that zone.



**Figure 5.** Large areas of the same or similar plants would likely benefit from sensor networks.

**Labor is costly** – Installing sensors in a block provides continuous data, instead of just subjective spot checks (feeling the soil or lifting the container). Continuous soil moisture data, once correlated to the plant species can then be used to turn the irrigation on and off, manually or automatically, exactly when it is needed. Typically at least 3-4 plants are monitored and an average “set-point” is used to make this irrigation control decision, for safety. But by allowing the sensor network to control irrigation you save the expense of having someone perform these tasks, in addition to many other benefits we will discuss.

More importantly, we have found that by taking advantage of sensor information and the automated irrigation capability of the Plant Point™ system not only do we see savings of about 50% water on average, but irrigation water is applied precisely when the plant actually needs it. That typically means less water stress, faster growth rates, and improved crop quality.