**-Greene Organix Greenhouses-**

The role of Internet-of-Things (IoT) in precision agriculture and smart greenhouses has been reinforced by recent R&D projects, growing commercialization of IoT infrastructure, and related technologies such as satellites, artificial intellige nce, sensors, actuators, uncrewed aerial vehicles, big data analytics, intelligent machines, and radio-frequency identification devices.

1. **IoT Infrastructure**

**What would be a typical IoT infrastructure setup for our greenhouses?**

* **Crop Monitoring**
* Growth,insects and disease detection
* **Environment Check**
* Rain,athmosphere pressure,solar radiation,luminosity
* **Heat Monitoring**
* Air Temperature,air humidity
* **Substrate Monitoring**
* Soil temperature,soil moisture,Ph,chemical elements
* **Fertilizer and medicine system for plants growth and behaviour**
* **Lighthing settings for plants’ needs**
* **Gas Pressure Sensor**
* **Oxygen Sensor**
* **Wind Speed Sensor**

1. **Constraints**

**What are some constraints we may be dealing with within our greenhouse operation?**

* + **Common problem No. 1: Air filtration**

Typically, greenhouses are not sealed environments (such as hybrid facilities with glass roofs), but rather forced air/positive pressure environments. This means that they should be equipped with air filtration and sterilization capabilities on both the intake air and the exhausted air. The intake air is filtered and sterilized for pest and disease prevention. A proper ventilation system also allows a grower to control vapor pressure deficit (VPD) to some degree.

* **Common problem No. 2: Greenhouse temperature swings**

With such extreme environmental temperatures, one possible recourse that doesn’t require increasing air conditioning capacity is to use either shade cloth or a greenhouse whitewash to control excessively hot environmental conditions, both ambient temperatures as well as radiant temperature.

* **Common problem No. 3: Watering and fertigation systems**

After harvest and in between crop cycles is the perfect time to troubleshoot and repair/replace any and all worn out, broken or defective irrigation or fertigation equipment.

Measure the flow rate to determine whether a fertigation system is functioning properly. Ideally, growers will have a baseline that was first measured after the system was installed against which to compare.

* **Common problem No. 4: Constant mold and pest problems**

Besides the overall function of the watering/fertigation system, close attention to disinfection is a major priority. Pythium and other vectors for disease can be transmitted by contaminated irrigation equipment and/or contaminated water

* **Common problem No. 5: Crops drying out**

If crops seem consistently dehydrated, inspect all related electronic controls responsible for watering, timing and cycles for clogs or mechanical failures to prevent possible over/under watering or not watering on time.

* **Common problem No. 6: EC/nutrient level spikes**

If there are noticeable spikes in nutrient solution electrical conductivity (EC) (which growers would notice in runoff testing) but levels are normal at the solution source, consider examining the fertigation lines, as fertilizer salts may have accumulated.

**References**

* **Anon (2011). Anonymous. The other side of greenhouses. The Organic Farmer, No. 77, October 2011, pp. 1, 5, 6.**
* **Baille A (1999). Greenhouse structure and equipment for improving Crop production in mild winter climates. Acta Horticulturae 491:37-47.**
* **Yamane T (1967). Statistics: An Introductory Analysis, 2nd Edition, New York: Harper and Row.**