

# High Tunnel Tomato Irrigation Management

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# Water Management for Vegetable Crops on Small Farms



Horticulture and Landscape Architecture  
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CROP MANAGEMENT

## Water Management for Vegetable Crops on Small Farms

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**Chapter 1** - Overview: Vegetable Crops/  
Implications for Water Issues - Page 2  
**Chapter 2** - Principles of Water  
Management on Small Farms - Page 7  
**Chapter 3** - Estimating Soil Moisture  
Status - Page 11  
**Chapter 4** - Irrigation Methods and  
Systems - Page 14  
**Chapter 5** - Irrigation Water Quality -  
Page 17  
**Chapter 6** - Mulches and Water  
Management - Page 21

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Water management is critical in vegetable farming. In this publication, Purdue researchers aim to help small-scale and diversified vegetable farms improve their water management practices for open-field and high-tunnel production.



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Indiana State Department of  
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- Both too much and too little water affect plant growth



- Fruit physiological disorders due to poor water management





- Estimate plant water needs at different growth stages?

# • Why 'feel' the soil is not enough?

## Sandy Loam and Fine Sandy Loam Soils

Appearance of sandy loam and fine sandy loam soils at various soil moisture conditions

Available Water Capacity = 1.3 to 1.7 inches per foot

Percent Available: Currently available soil moisture as a percent of available water capacity.

Inches per Foot Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

0 to 25 percent available 1.7 to 1.0 inches per foot depleted

Dry, forms a very weak ball, aggregated soil grains break away easily from ball. (Not pictured)



25 to 50 percent available 1.3 to 0.7 inches per foot depleted

Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away.



50 to 75 percent available 0.9 to 0.3 inches per foot depleted

Moist, forms a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.



75 to 100 percent available 0.4

Wet, forms a ball with wet outline left on makes a weak ribbon between the thumb

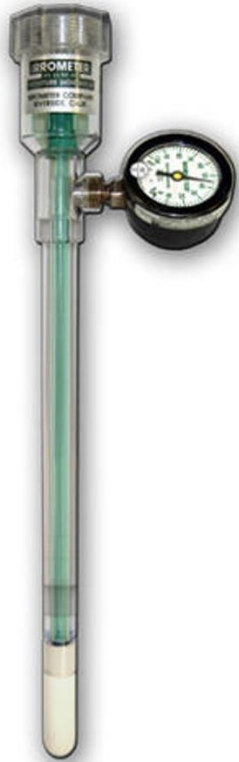
100 percent available 0.0 inches per foot depleted (field

Wet, forms a soft ball, free water appears briefly on soil surface after sq. soil/water cooling on fingers. (Not pictured)



- Soil Moisture Sensors

- ❖ Tensiometer: measure soil tension, force required by plant roots to extract water (kPa or cbar)



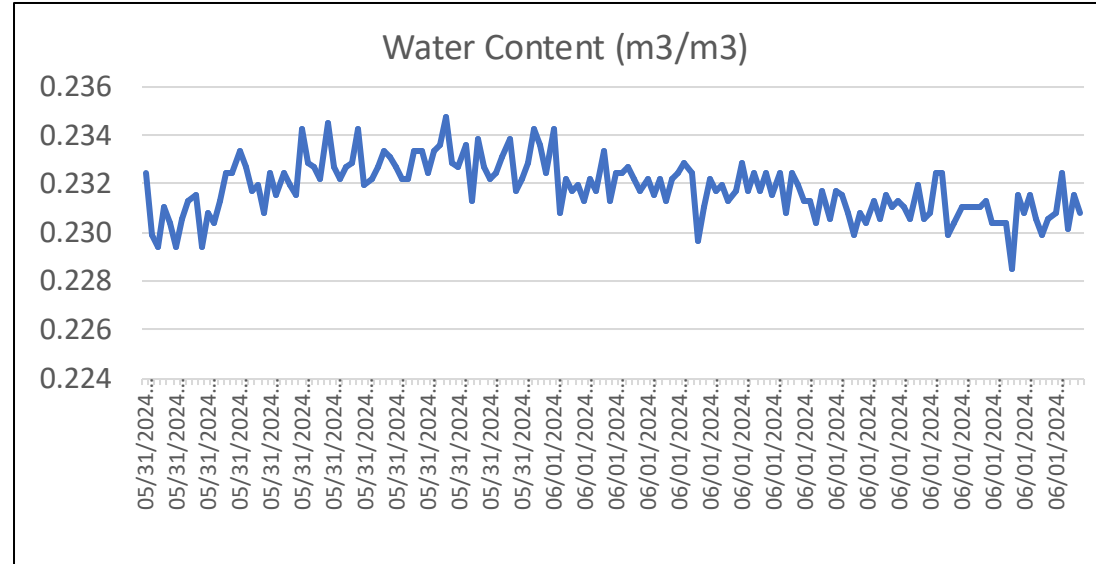
- The higher the reading, the drier the soil.
- When the soil is saturated, the reading is close to 0

# ❖ Digital sensor: measure volumetric water content (% , $m^3/m^3$ )

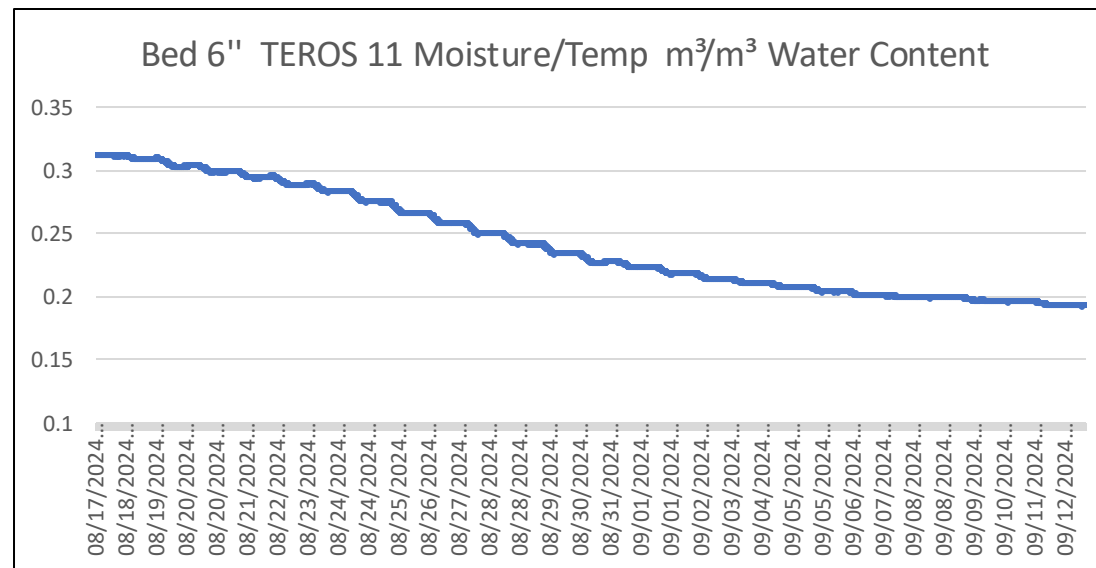
- The higher the number, the wetter the soil



Product pictures are from company's website

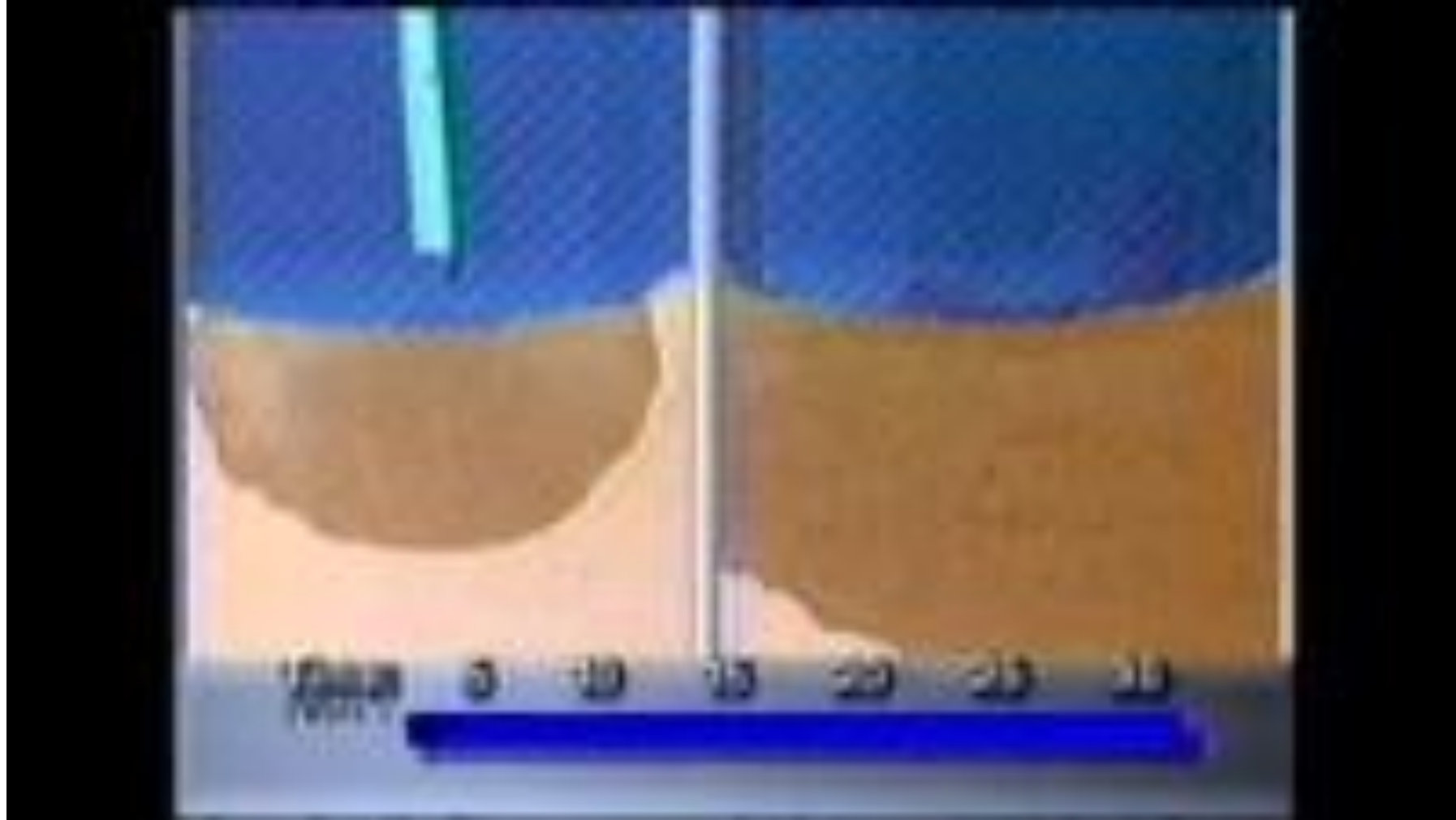


(Dong, Y 2023)



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- Irrigation Frequency



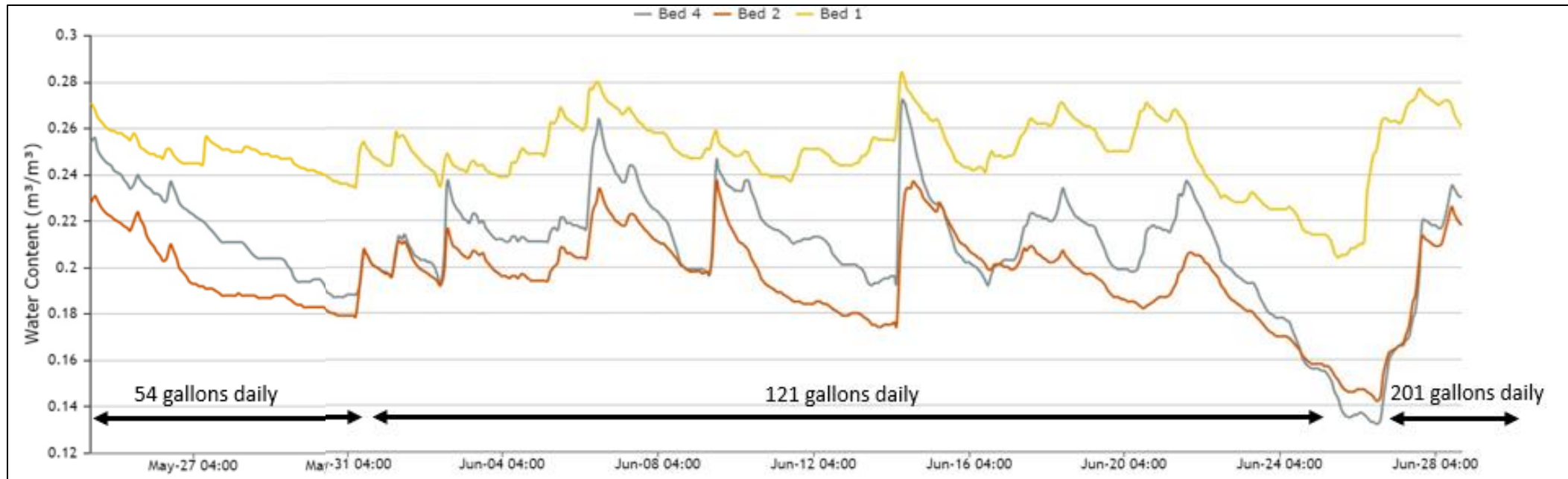
## ❖ Using soil moisture sensors to guide when to irrigate

Soil Texture	Field Capacity	20-25% Depletion of Total Available Water
	Soil Tension Values (in centibars)	
Sand, loamy sand	5-10	17-22
Sandy loam	10-20	22-27
Loam, silt loam	15-25	25-30
Clay loam, clay	20-40	35-45

This table is adapted from the Midwest Vegetable Production Guide ([mwvguide.org](http://mwvguide.org))



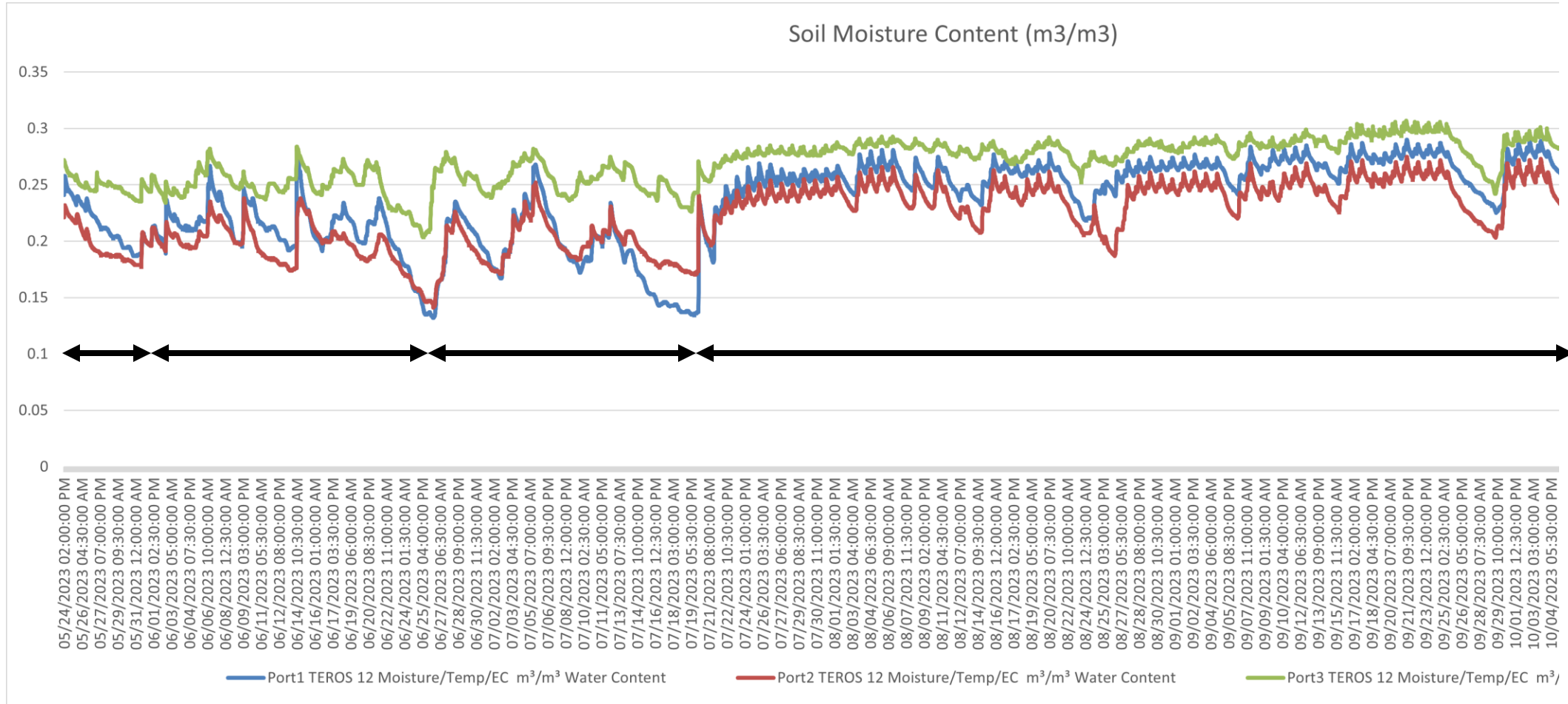
# ❖ Using soil moisture sensors to fine-tune an irrigation schedule



Soil moisture sensors were installed at 12" depth on different beds



- Optimal Soil Moisture Level Vary by Cultivars





Celebrity Plus harvested in Aug.

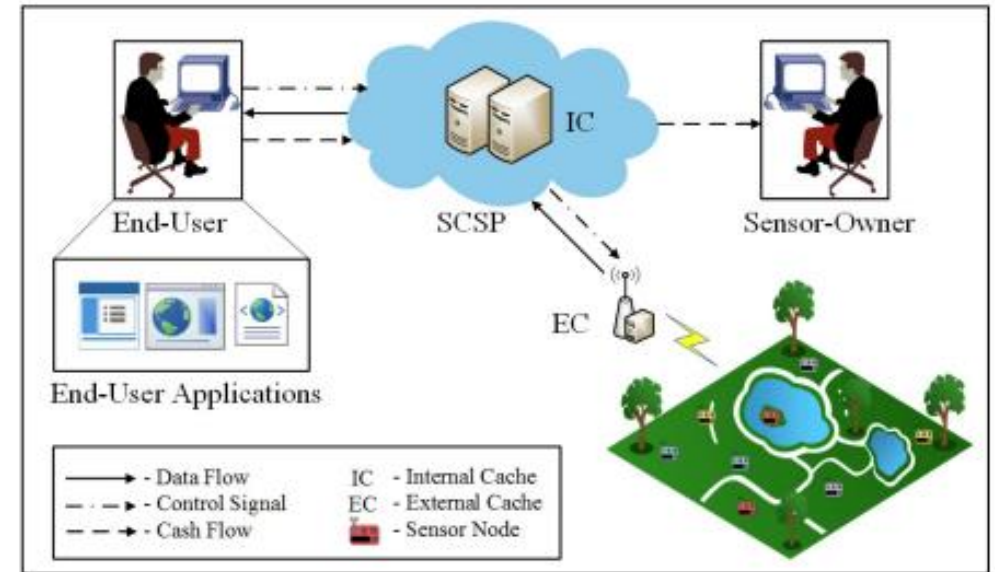


Detailed information about the trial:  
[Evaluation of High Tunnel Tomato Cultivars for Yield and Quality.](#) Midwest Vegetable Trial Report



- Costs of Soil Moisture Sensors

- Sensors
- Data loggers
- Remote data access
- Services



[Cache-Enabled Sensor-Cloud: The Economic Facet](#)

- **Additional Considerations**

- Focus on the amount of water applied, rather than irrigation run time.

- Poor Irrigation water quality can significantly impact tomato production in high tunnels.

- Irrigation and fertilization strategies are closely related.

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