

Monitoring Your Orchard

Know Your Tree's Story Before it Tells You

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Hazelnut farmers are managing many things at once

Without monitoring, stress is often noticed too late

**Irrigation
Schedules**

Tree Stress

**Randomly
fluctuating
yield**

Water Retention
(in root zone)

**Fertilization
Schedules**

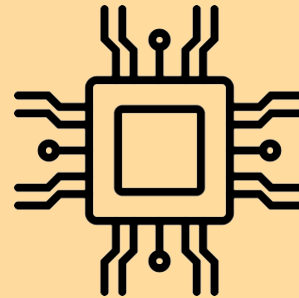
**Variable
Conditions
(across
orchard)**

You cannot efficiently manage what you cannot see





What is a Data Logger?



The “brains” of a sensor suite enabling the user to access the data over a network or via memory storage.

What to prioritize



Weather-resistant hardware



Easy to setup and configure



Power that lasts the season



Upgradable sensors



Access to your orchard data regardless of where you are

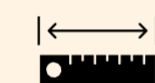
What to avoid



Consumer-grade devices



Weak battery life



Limited communication range



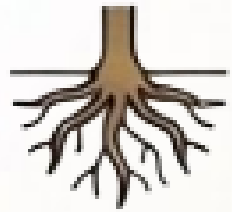
Subscription bills



Closed systems that cannot grow with the farm

Let's Build the Ideal Hazelnut Orchard Setup

Requirements



Root zone visibility



Tree response visibility



Better irrigation timing



Better fertilizer decisions



Built-in insights available on a phone or laptop

Key Questions

1

What sensors do I use?



2

How do I get the data?



3

How do I keep it powered?



4

Where do I install it?

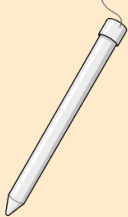
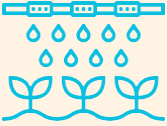
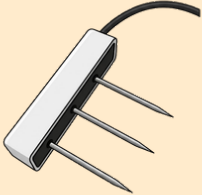
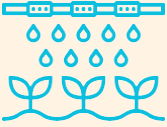
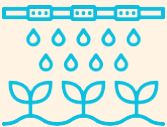
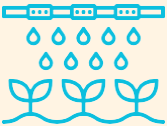
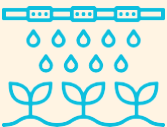
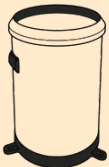


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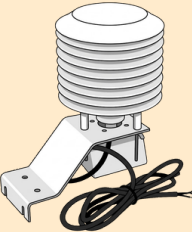
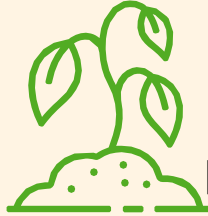
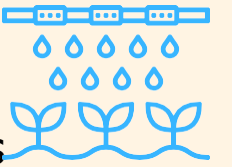
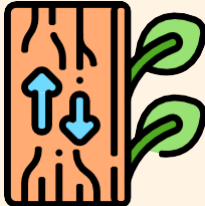
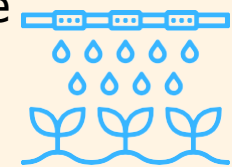
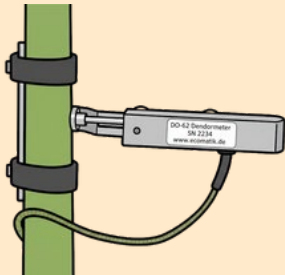
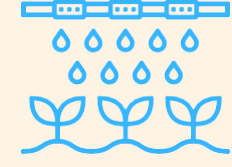
What will the results be?



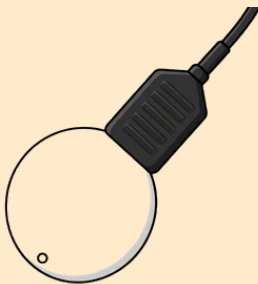
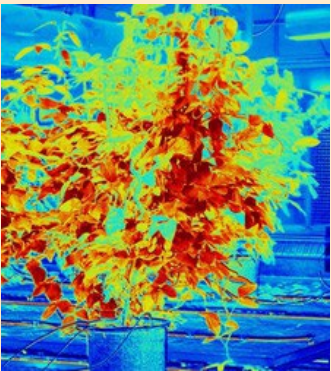
Measuring the Basics: Soil and Microclimate

	Sensor	Advantage	Typical Use
	Soil volumetric water content	Measures water content (VWC); shows how much water is in the root zone	 Schedule irrigation and check if water reaches active roots
	Electrical conductivity (EC)	Measures dissolved salts and nutrients in soil water; detects nutrient buildup or salinity issues	 Adjust fertilizer rates and leaching/irrigation 
	Soil temperature	Measures root-zone temperature; helps explain root activity and nutrient uptake	 Support irrigation, and root-zone monitoring
	Soil matric potential (tensiometer)	Measures soil water tension; indicates how hard roots must work to take up water	 Trigger irrigation before plant water stress develops
	Soil pH	Measures soil acidity/alkalinity; shows how pH affects nutrient availability	 Guide lime, sulfur, and fertilizer management 
	Rainfall Sensor	Measures rainfall amount; helps track how much natural water the orchard receives	 Adjust irrigation after rainfall and monitor total water input

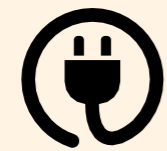
Early Detection: Tree Health Sensors

	Sensor	Advantage	Typical Use
	Vapor pressure deficit (VPD)	Shows the atmosphere's demand for water and risk of high transpiration. When VPD is high , leaf stomata conductance is low .	 Adjust irrigation timing or amount during high VPD periods to reduce drought stress 
	Sap flow sensors	Measure water movement in the xylem ; show how much water the tree is actively using	 Detect early declines in water use and irrigate before stress affects nut development or yield 
	Dendrometers	Measure small changes in trunk diameter ; daily shrinkage can indicate developing water stress	 Schedule irrigation when trunk shrinkage exceeds normal daily levels 

Pest and Disease Management Sensor

Sensor	Advantage	Typical Use
	Detects animal movement and heat signatures; useful for spotting vertebrate pests such as squirrels, especially at low light	 Monitor squirrel activity and target trapping or exclusion in problem orchard areas
	Measures how long leaves stay wet; helps estimate conditions for fungal infection	 Track disease susceptibility/risk and improve timing of sprays or other disease-control actions
	Detects canopy stress patterns that may signal pest, disease, or other plant-health problems before they are obvious	 Scout large orchards and identify hot spots for follow-up inspection

Power & Connectivity Decision



1. Power Source

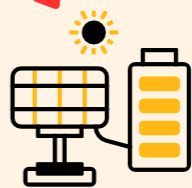
Do you have power nearby?

Yes



Plug-in power
may work for this
location

No



User solar +
battery

Site shaded or sunny?



2. WiFi on Site

Do you have reliable WiFi
at the site?

Yes



WiFi can be
used for data
transmissions

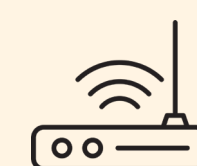
No



3. Extended Connectivity

Is there a WiFi Point
within about 1km?

Yes



Use long range
WiFi Halow or
LoRa to extend
coverage

No



Use cellular
connectivity

Keep it simple, use what you already have, make it reliable

Key Factors in Deciding Monitoring Locations



Orchard Size

Larger farms usually need more monitoring locations.



Irrigation Zones

Separate zones may need separate monitoring if water delivery is uneven.



Sun & Slope

Sun exposure and slope affect evaporation and drying rates.



Elevation

High and low areas can differ in drainage, runoff, temperature, and soil moisture.



Soil Variability

Sandy, loamy, and clay soils store and release water differently.

How Does Monitoring Affect a Hazelnut Farm?

Irrigate based on root zone conditions, not guesswork

Catch tree stress earlier in the season

See differences between orchard zones before they become problems

Adjust fertilization schedules with more confidence

Keep consistency during critical growth stages

↘ **Less hidden water stress during key growth stages**

🕒 **Better timing during high-demand periods**

🛡️ **Fewer surprises from dry spots, overwatering, or nutrient buildup**

🔒 **Better protection of nut fill, tree health, and season consistency**

Action Plan

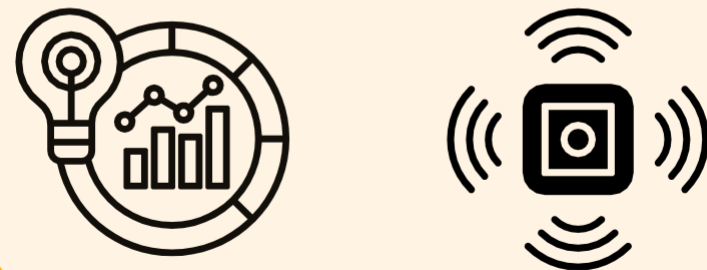
Determine Management Zones

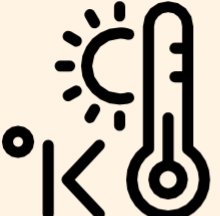


Divide your orchard into management zones

Install Logger(s) and Sensors

Install a logger in each key zone




**Start with soil sensors,
then add plant sensors in
key orchard zones**

Use Data to Guide Care

Use the data to guide irrigation timing and duration and fertilization



Remotely Review Insights



Review built-in insights on a phone or laptop

Wondering what monitoring your farm might look like?

Let's chat!

Questions?

