



# Greenhouse Environmental Report

Comprehensive Analysis & Recommendations

**Report Date:**  
November 03, 2025 at 02:01 PM

**Report ID:**  
20251103-140112

**Data Source:**  
Oracle APEX

## Overall Greenhouse Health

55/100

NEEDS ATTENTION

## Current Sensor Readings

Sensor	Current Value	Status	Assessment
■■ Temperature	28.9 °C	Acceptable	■
■ Humidity	43.5 %	Critical	✗
■■ Air Quality (MQ135)	0.0 ppm	Good	✓
■■ Light Level	1133.0 lux	Dim Indoor	■

■ CO2 Level	400.0 ppm	Good	✓
■ Soil Moisture	0.0 %	Critical (Low)	✗
■ Pressure	1005.0 hPa	Normal	✓

# AI-Powered Recommendations

## 1. Temperature Too High

Temperature at 28.9°C exceeds optimal range. Improve cooling or increase ventilation to prevent heat stress on plants.

## 2. Humidity Too Dry

Humidity at 43.5% is critically low. Too dry - add shading to reduce evaporation. Close vents to retain moisture.

# Alert Summary

Critical Alerts	Warnings	Total Sensors
1	1	7

# Active Alerts:

[WARNING] Temperature: Temperature suboptimal: 28.9°C

[CRITICAL] Humidity: Too dry: 43.5% - Add shading

# Detailed Improvement Recommendations

## ■ Temperature Management

### Temperature Slightly High:

- Increase ventilation during peak heat hours
- Deploy light shade cloth (20-30%)
- Ensure adequate air circulation with fans
- Water plants adequately to support transpiration cooling
- Monitor for heat stress symptoms (wilting, leaf curling)

## ■ Humidity Control

### URGENT - Humidity Too Low:

#### Immediate Actions:

- Increase watering frequency
- Mist plants 2-3 times daily
- Place water trays near heating sources for evaporation
- Reduce ventilation temporarily

#### Short-term Solutions:

- Install a portable humidifier
- Use wet burlap or shade cloth to increase humidity
- Group plants together to create microclimates
- Mulch soil to retain moisture

#### Long-term Improvements:

- Install automated misting/fogging system
- Add evaporative cooling pads
- Improve greenhouse sealing to prevent moisture loss
- Consider hydroponics or aquaponics to increase ambient humidity

## ■ Soil Moisture Management

### URGENT - Soil Moisture Too Low:

#### Immediate Actions:

- Water plants immediately with room-temperature water
- Check irrigation system for malfunctions or clogs
- Inspect soil for hydrophobic conditions (water running off surface)
- Add mulch to reduce evaporation
- Move sensitive plants to shadier areas temporarily

#### Short-term Solutions:

- Increase watering frequency or duration
- Add wetting agent to soil if hydrophobic
- Check for root damage or soil compaction
- Apply organic matter or compost to improve water retention
- Group plants by water needs for efficient irrigation

**Long-term Improvements:**

- Install automated drip irrigation with timers
- Add soil moisture sensors for real-time monitoring
- Improve soil structure with organic amendments (compost, peat, coco coir)
- Install smart controllers that adjust watering based on sensor data
- Consider sub-irrigation or self-watering systems
- Apply 2-3 inch mulch layer to retain moisture

## ■■ Air Quality & Gas Management

**Air Quality - Good:**

- Maintain current ventilation practices
- Continue routine equipment inspections
- Keep gas sensors calibrated (replace every 2-3 years)
- Ensure adequate fresh air exchange (0.5-1.5 air changes/minute)

# Troubleshooting Guide

Common issues and their solutions for optimal greenhouse management:

## ■ Temperature Won't Stabilize

**Symptoms:** Frequent temperature swings, difficulty maintaining target range

**Possible Causes:**

- **Poor insulation:** Heat loss through walls, roof, or foundation
- **Inadequate thermal mass:** Lack of heat storage capacity
- **Undersized/oversized equipment:** HVAC not matched to greenhouse size
- **Air leaks:** Drafts from doors, vents, or structural gaps

**Solutions:**

- Add insulation: bubble wrap on walls, thermal curtains, weather stripping
- Install thermal mass: 55-gallon water drums painted black, gravel beds, concrete blocks
- Upgrade to appropriately sized heating/cooling systems
- Seal all air leaks with caulk or weatherstripping
- Use automated controllers with temperature sensors for consistent management

**Prevention:** Regular maintenance of HVAC systems, annual insulation inspections, proper greenhouse design with adequate thermal mass

## ■ Humidity Too High (Persistent)

**Symptoms:** Constant condensation, mold/mildew growth, fungal diseases

**Possible Causes:**

- **Poor air circulation:** Stagnant air pockets allowing moisture buildup
- **Overwatering:** Excess soil moisture evaporating into air
- **Inadequate ventilation:** Insufficient fresh air exchange
- **Night condensation:** Temperature drops causing moisture release

**Solutions:**

- Install horizontal airflow (HAF) fans for continuous circulation
- Reduce watering frequency; use drip irrigation instead of overhead
- Increase ventilation during high-humidity periods (early morning, evening)
- Use thermal screens to prevent night condensation
- Install dehumidifier for extreme cases
- Space plants further apart; prune dense foliage

**Prevention:** Proper greenhouse design with ridge vents, side vents, and fans; regular monitoring; avoiding evening watering

## ■ CO2 Levels Low or Unstable

**Symptoms:** Slow plant growth, CO2 readings below 400 ppm, enrichment not effective

**Possible Causes:**

- **Excessive ventilation:** Fresh air exchange removing enriched CO2
- **Leaks in system:** CO2 escaping before reaching plants

- **Poor distribution:** Uneven CO2 levels across greenhouse
- **Timing issues:** CO2 released when stomata are closed

**Solutions:**

- Balance ventilation: enrich CO2 during low-ventilation periods (early morning)
- Check CO2 distribution system for leaks and proper placement
- Use circulation fans to distribute CO2 evenly
- Release CO2 during photosynthesis hours (sunrise to 2-3 hours before sunset)
- Install CO2 sensors to monitor and control enrichment automatically
- Consider burner or generator systems for larger operations

**Prevention:** Regular system inspections, calibrate sensors annually, maintain 1000-1500 ppm during active growth

## ■ ■ Poor Air Quality Persists

**Symptoms:** High gas readings (MQ135/MQ2/MQ7), odors, plant stress despite ventilation

**Possible Causes:**

- **Combustion equipment issues:** Incomplete burning producing CO
- **Gas leaks:** Propane or natural gas escaping from lines
- **Decomposing organic matter:** Compost or wet soil producing ammonia/methane
- **Chemical contamination:** Pesticides, paints, or cleaners releasing VOCs

**Solutions:**

- Inspect and service all combustion equipment (heaters, generators)
- Perform leak test on gas lines with soapy water or detector
- Move compost piles away from greenhouse; ensure proper aeration
- Remove or properly store chemicals; ventilate after application
- Install air filtration system with activated carbon filters
- Switch to electric heating if gas issues persist

**Prevention:** Annual equipment servicing, proper chemical storage, adequate ventilation, regular gas sensor calibration

## ■ ■ Light Levels Inadequate

**Symptoms:** Leggy plants, slow growth, poor flowering/fruiting, low lux readings

**Possible Causes:**

- **Dirty glazing:** Algae, dust, or mineral deposits blocking light
- **Shading:** Nearby structures, trees, or shade cloth during low-light seasons
- **Short day length:** Insufficient natural light in winter
- **Glazing degradation:** Old plastic or glass with reduced transmittance

**Solutions:**

- Clean greenhouse glazing regularly (monthly minimum)
- Remove or trim nearby vegetation blocking light
- Remove shade cloth during low-light months (fall/winter)
- Install supplemental LED grow lights (full-spectrum, 12-16 hours/day)
- Replace old glazing with high-transmittance materials
- Use reflective mulches or white paint to increase light reflection

**Prevention:** Regular cleaning schedule, proper greenhouse orientation (east-west for year-round), quality glazing materials

## ■ Soil Moisture Inconsistent

**Symptoms:** Some areas too wet, others too dry; uneven plant growth

**Possible Causes:**

- **Uneven watering:** Manual watering missing spots or over-saturating areas
- **Soil variation:** Different soil types retaining water differently
- **Drainage issues:** Poor drainage creating waterlogged zones
- **Irrigation system problems:** Clogged emitters or broken lines

**Solutions:**

- Install drip irrigation with pressure-compensating emitters
- Use soil moisture sensors in multiple zones
- Amend soil with compost or perlite to improve consistency
- Ensure proper drainage with gravel beds or slope
- Flush and inspect irrigation lines regularly
- Group plants by water needs

**Prevention:** Uniform soil preparation, automated irrigation with sensors, regular system maintenance

# Recent Historical Data

Last 20 readings from APEX database

Time	Temp (°C)	Humidity (%)	Soil (%)	Light (lux)	CO2 (ppm)
10/30 15:09	28.9	43.5	0.0	1133	400
10/30 15:09	28.9	43.6	45.0	1120	400
10/30 15:08	28.9	44.0	45.0	1100	400
10/30 15:08	28.9	44.2	45.0	1071	400
10/30 15:08	28.9	43.1	45.0	1018	400
10/30 15:08	28.9	42.2	45.0	1143	400
10/30 15:08	29.0	41.9	45.0	994	400
10/30 15:08	29.0	41.5	45.0	1005	400
10/30 15:07	28.9	41.7	45.0	1469	400
10/30 15:07	28.9	41.9	45.0	1462	400
10/30 15:07	28.9	42.1	45.0	1462	555
10/30 15:07	29.0	42.0	45.0	1243	545
10/30 15:07	28.9	42.4	45.0	1306	539
10/30 15:07	28.9	42.5	45.0	1452	538
10/30 15:06	28.9	42.3	45.0	1517	538
10/30 15:06	28.9	41.8	45.0	1489	539
10/30 15:06	28.9	41.3	45.0	1906	543
10/30 15:06	28.9	41.3	45.0	1824	540
10/30 15:06	28.9	41.5	45.0	2079	542
10/30 15:06	28.9	41.5	45.0	1455	538

# Gas Sensor Readings



Sensor	Reading (ppm)	Status	Safety Level
MQ135 (Air Quality)	0	Good	✓ Safe
MQ2 (Flammable Gas)	0	Safe	✓ Safe
MQ7 (Carbon Monoxide)	0	Safe	✓ Safe

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Generated by **EcoView Greenhouse Monitoring System**  
Smart monitoring for optimal plant growth and environmental control  
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