Simplified Irrigation
Why Do We Irrigate?

- Produce a crop
- Improve yield
- Improve quality
- Avoid disease and pest pressures
- Avoid plant stress
Plant Water Demand

Carbon dioxide enters, while water and oxygen exit, through a leaf's stomata.
Plant Water Demand

High tension

Low tension
What Is Soil Tension?

Soil tension is defined as the suction exerted by soil particles on the water they hold.

To extract water from the soil, plants must exert suction on that water. As the soil dries, its tension increases, and it becomes harder for plants to extract water from the soil. The amount of energy a plant must spend to extract water from the soil is directly linked to soil tension.
What Is Soil Tension?

Gravitational Water - All capillary pores are full.

Field Capacity - Capillary pores are full - macro pores have air.

Capillary pore with adhesion and cohesion water.

Wilt Point - Water films are thin around soil particles.
Plant Stress

- Plants and trees can adjust their own water use based on soil tension.
- The root system can command the leaves to stop the photosynthesis activity to preserve water.
- There is no visible evidence of this stress – it has to be very severe before it becomes visible.
- In crop production, this mechanism is very costly as it translates into a succession of yield losses.
- To maximize yields and profitability, tension must be managed within a narrow bandwidth.
Benefits of Soil Tension for Irrigation Management

- Exact Measurement
- Directly linked to plant stress and/or plant needs
- Tensiometer (tool used to measure soil tension) acts like a mechanical root
- Proven technology dating back to the 1950’s
How our system works
How our system works

**Tension Response Curve**

- **Wet zone**
  - Lack of aeration
  - Fertilizer leaching
  - Over-irrigation
  - Waste of pumping energy
  - Lower yields

- **Comfort zone**
  - Top yields
  - Right level of irrigation
  - Enough aeration
  - Optimized profitability (for the majority of crops)

- **Dry zone**
  - Water stress (drought)
  - Risk of salt accumulation
  - Risk of heat stress
  - Lower yields
  - Better fruit quality (in some crops where deficit irrigation is practiced)
How our system works
How our system works

Irrolis™ Web Tx³

Data Sent to Internet
How our system works
How our system works
How our system works
How our system works
How our system works
How Real Time Data is Used

Soil Tension Probes
Irrigation Management

Manual assessment of plant needs

- **Dry Zone**
- **Comfort Zone**
- **Wet Zone**

- **Severe plant stress**
- **Whole root zone dry**
- **Too long irrigation run time**

- Manual Assessment - 12” Soil Tension
- Manual Assessment - 24” Soil Tension

8-Jun to 26-Jun
When using Hortau

- Dry Zone
- Comfort Zone
- Wet Zone

Perfect irrigation run time

Irrigation

Drainage

Hortau - 12” Soil Tension
Hortau - 24” Soil Tension

Irrrolis™ - Intelligent Irrigation Management Solution
Grapes
Strawberry

Irrolis™ - Intelligent Irrigation Management Solution
Comparison

Same water content, two different stress situations

Sandy Soil
- Water Content: 20%
- Soil Tension: 5 cbar
- Result: Non-stressed Plant

Clay Soil
- Water Content: 20%
- Soil Tension: 60 cbar
- Result: Stressed Plant
Benefits of Managing Soil Tension in Real Time

- Increased Water Efficiency
- Increased Fertilizer Efficiency
- Better Crop Uniformity season to season
- Maintain consistent crop quality
- Lower Production Costs
Research Goal:
Determine exact “blue zone” for maximum productivity in almonds

High Tension (Dry)

Low Tension (Wet)

Tension threshold: onset of plant stress

Blue band defines optimal growing conditions for yield and water use efficiency
Manual assessment of plant needs

- **Severe plant stress**
- **Whole root zone dry**
- **Too long irrigation run time**

**Dry Zone**

**Comfort Zone**

**Wet Zone**

**Manual Assessment - 12” Soil Tension**

**Manual Assessment - 24” Soil Tension**

**Irrigation Management**

**Irrolis™ - Intelligent Irrigation Management Solution**
When using Hortau

Irrigation Management
Irrlis™ - Intelligent Irrigation Management Solution