



HydroTech Monitoring Pty Ltd

“Water *your* Future Profit”

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Avocado Irrigation Monitoring Techniques



How it can work for you!

Avocado Conference 2009

Presented By Fabian Gallo



Tensiometer

Water moves to & from the soil through a porous ceramic tip, thus measuring the tension in the soil. The Tensiometer tool measuring in Kpa.

Measurements for Avocado monitoring

- 0kpa is water logged
- 8-10kpa is at full point
- around 20kpa refill at peak cycle



Setup tips

- Put dye in a water of bottle to dilute, than fill the reservoir.
- Use a soft tube to pock down through the reservoir down the side wall and allow the water to fill in the tube.
- Always leave the base of the reservoir 100mm above the ground. This so you can see if the water in the tube is there.
- Make sure when you install the tube the ceramic tip is pushed into some slurry mix, this will allow a good seal around the tip.



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Soil Moisture Probes for Scheduling

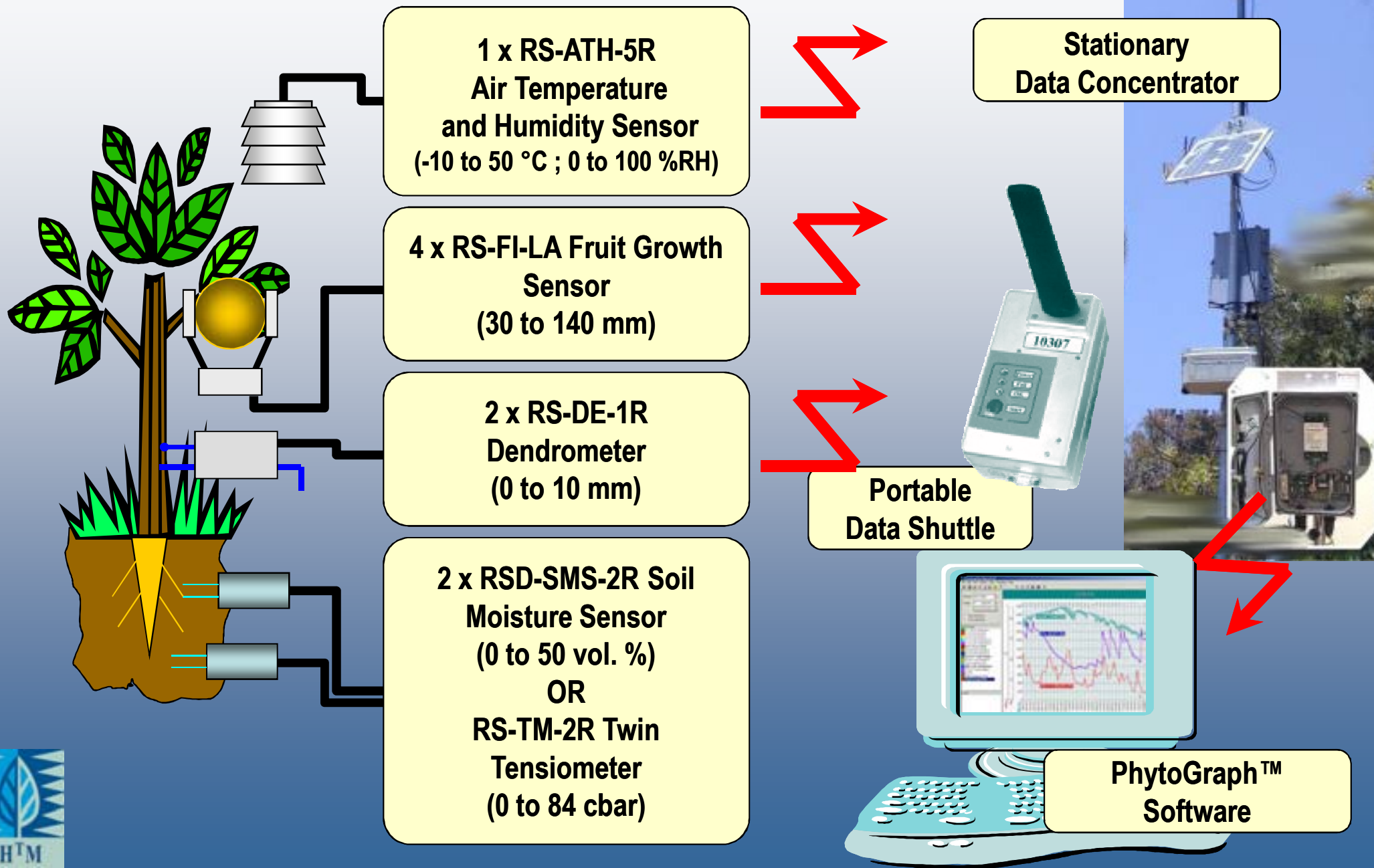


- **EnviroSCAN - Capacitance Probes** use the soils electrical energy by applying voltage to a capacitor in close proximity to the soil, generating an electrostatic field. These measure volumetric water content using multiple sensors, continually logging data.
- **Diviner** – Consists of a single sensor on the end of a probe rod. Manual readings at multiple sites can be measured on the site and downloaded into a computer.



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Recommended setup



WiSA field radio controller

WiSA field radio valve controller



Hydraulic valve linked back to WiSA pump controller or on gravity feed



WiSA hybrid field controller



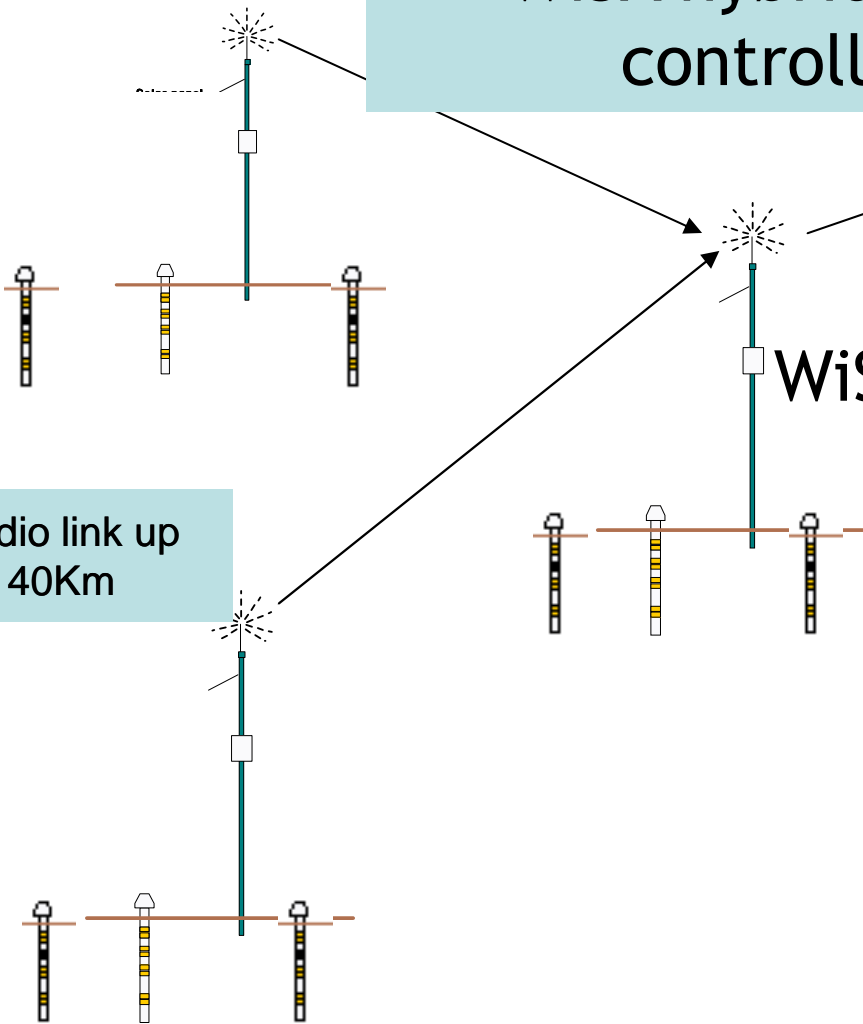
Computer communicates to radio and pumps



Radio link up 40Km

WiSA

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The Importance of Irrigating Correctly....

- The irrigation system has to be capable to match crop water extractions over the needed area during the watering cycle.
- Irrigation is artificially delivering water for plant growth and meeting the crops water demands during peak water use i.e. when a crop is in fruit set or peak growth.

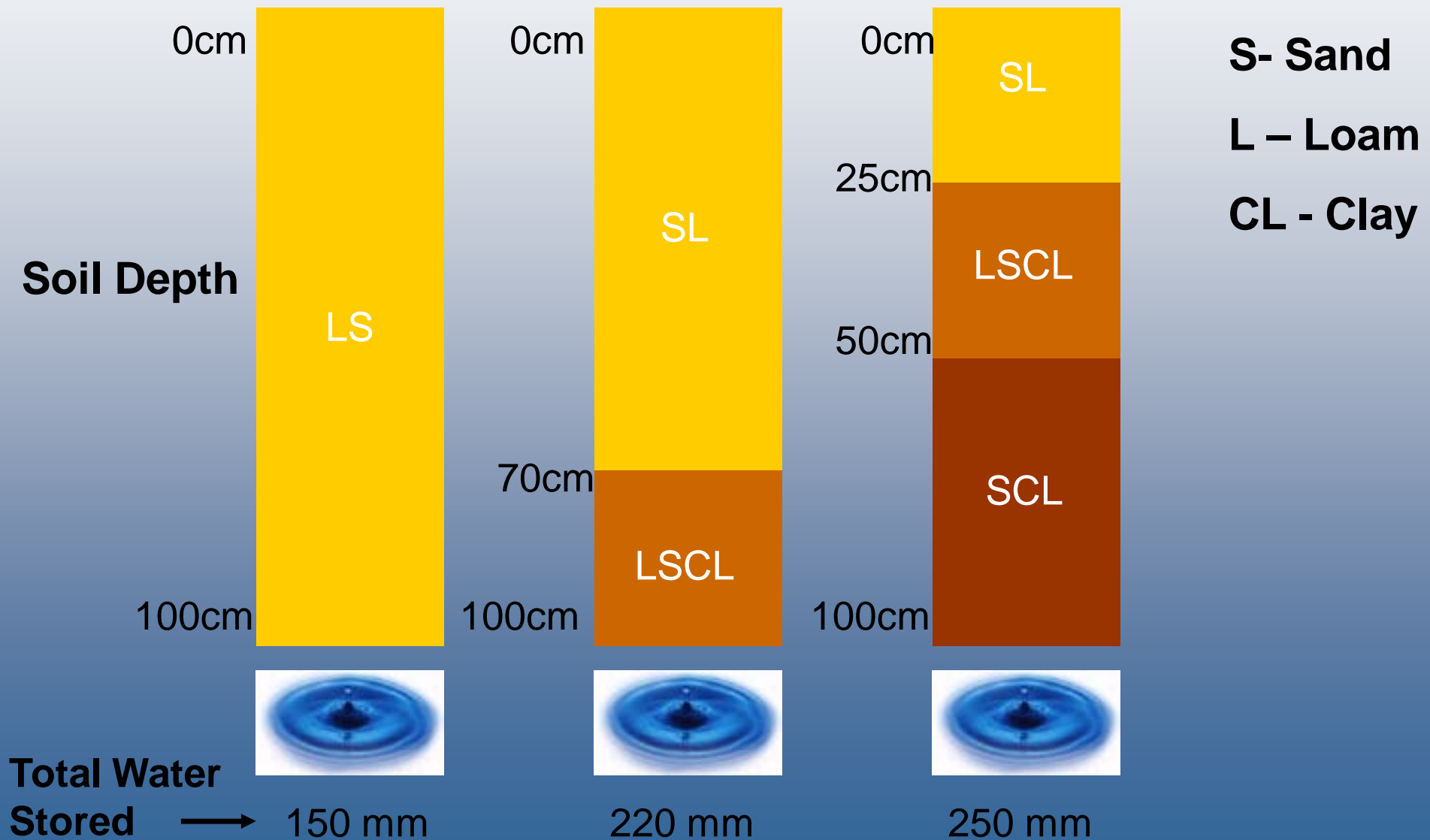


- Identifying the irrigation system used plays a vital role in timing and the period it takes to irrigate the entire orchard during fruit fill.
- It is important to identify how soil texture can influence water availability to the crop, drainage, infiltration and runoff.

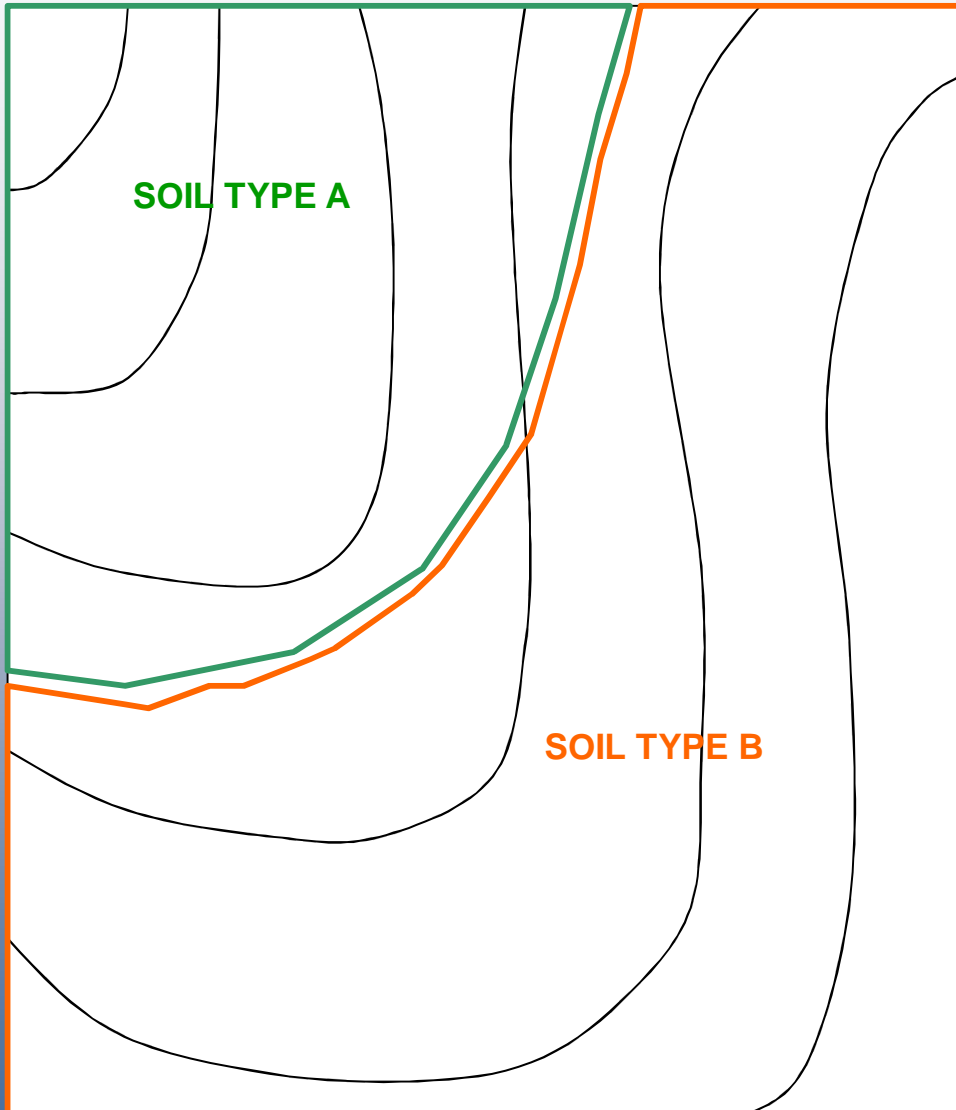
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Soil Profile & Soil Water Storage



Identifying Soil Variability

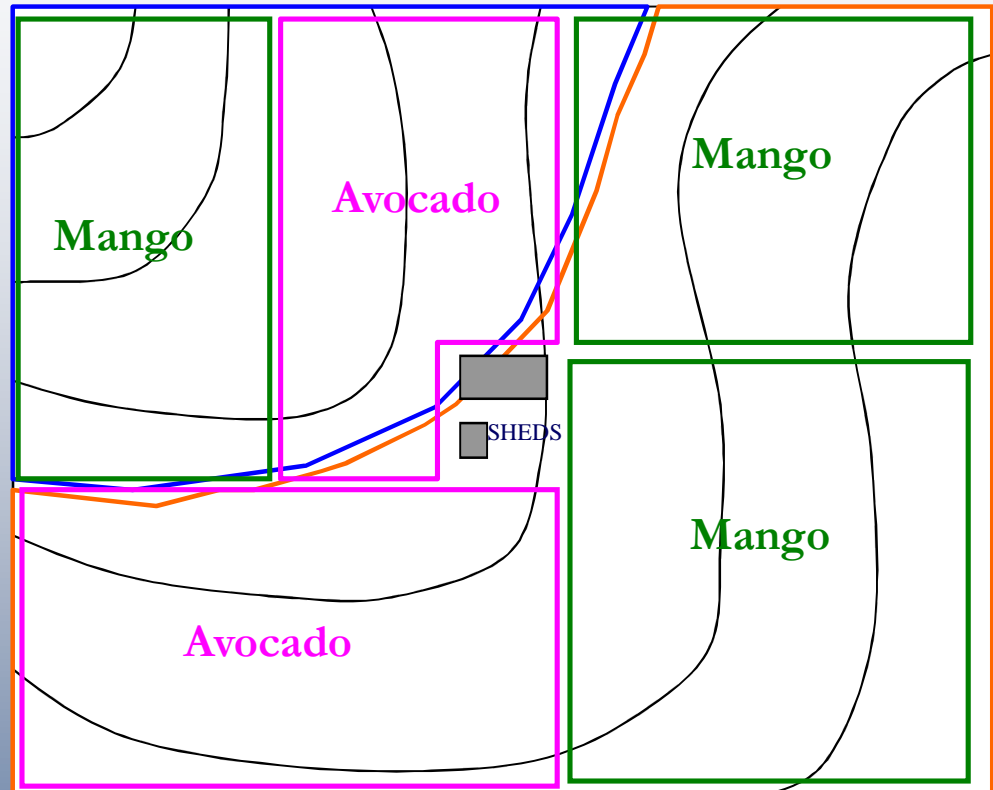


- Identify dominant soil types and key soil properties that affect soil-water storage
- Draw soil map showing areas of similar irrigation management requirements
- Undertake soil survey across property



Scheduling Units

- **Overlay the planting plan of crop types and varieties.**
- **Integrate this information to draw up irrigation scheduling units.**
- **Outline areas that have similar irrigation requirements according to soils, aspect, topographic location and crop type.**



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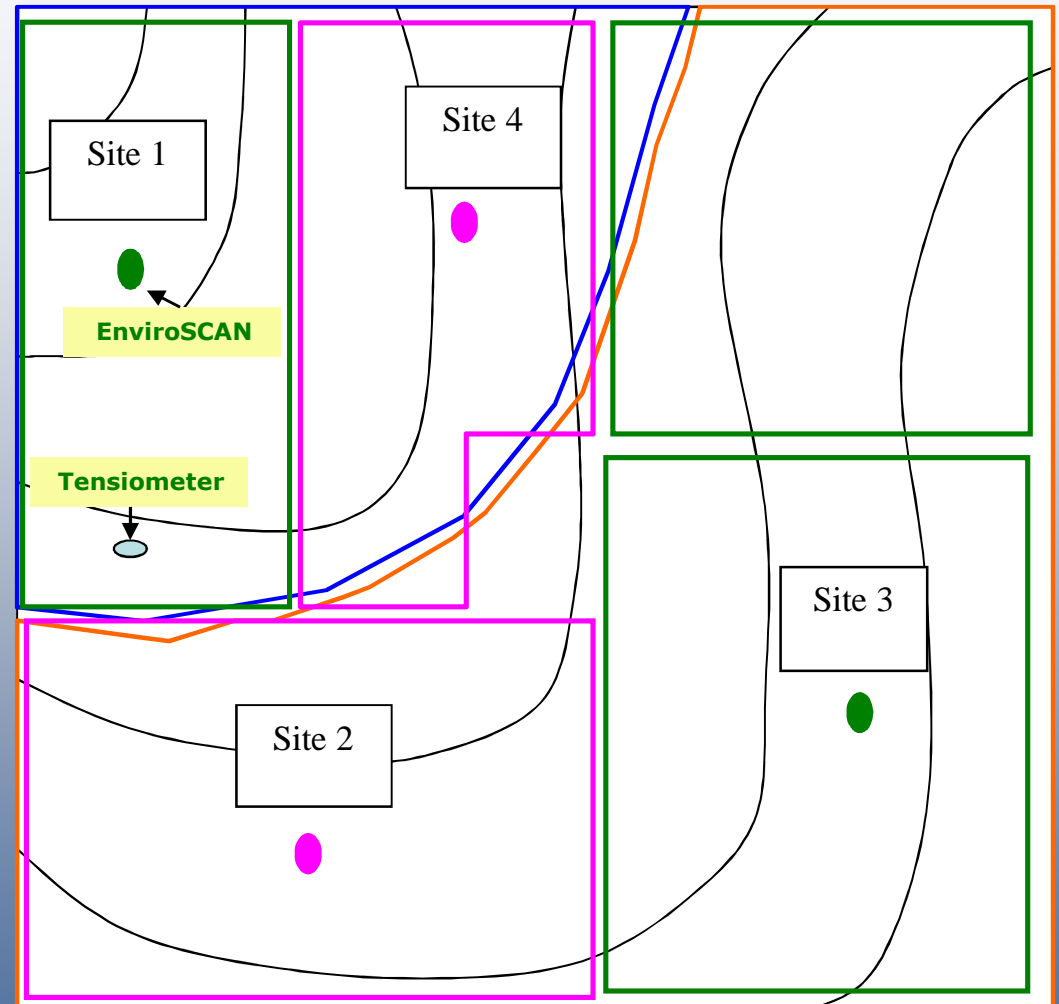
Moisture Probe Site Selection

- Each different scheduling unit will require a monitoring site.

For example:

Two areas of similar soil type, micro-climate and plant type (i.e. orchard at top of hill and orchard in low-lying area), will require individual assessment for each site selection of probes.

- Different soil moisture monitoring probes can be used across the farm i.e. (Site 1) a continuous monitoring probe (EnviroSCAN) in conjunction with Tensiometer.



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Positioning of soil moisture monitoring tools on site

- **Determine soil type variation across the block**
- **Check flow rate across the irrigated block**
- **Identify the wetted area**
- **Check the output of the sprinklers across the block**
- **Check the pressures across block**
- **Lay catch cans under the tree to measure volume and surface wetting area**



Placement of moisture monitoring tools is critical for data accuracy.
A tool placed in the wrong position may not be representative.



Why Irrigation Scheduling is Important...

- Diverse soil types hold different amounts of plant available water
- Avocado varieties water demands differ within the crop cycle
- Comparing water use in young avocado plants versus old trees
- To enhance nutrition management applying it only at the active root zone
- Depending on climatic conditions scheduling is used to manage the effects of rainfall, evaporation and temperature

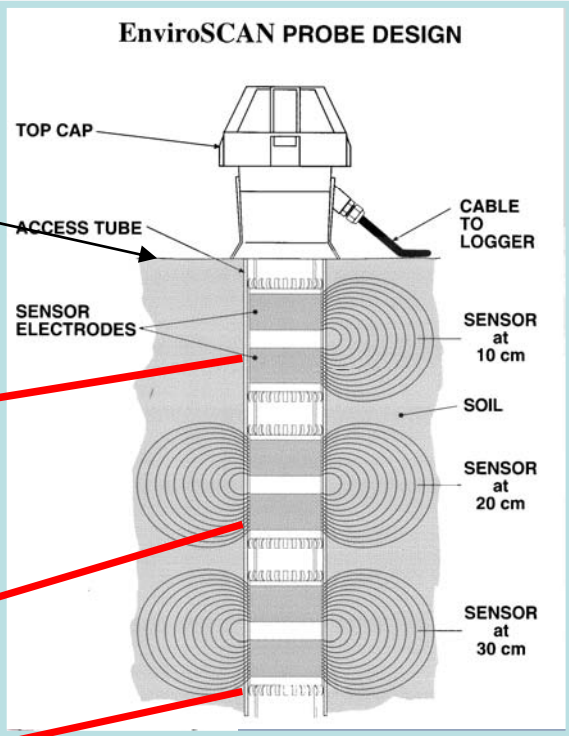
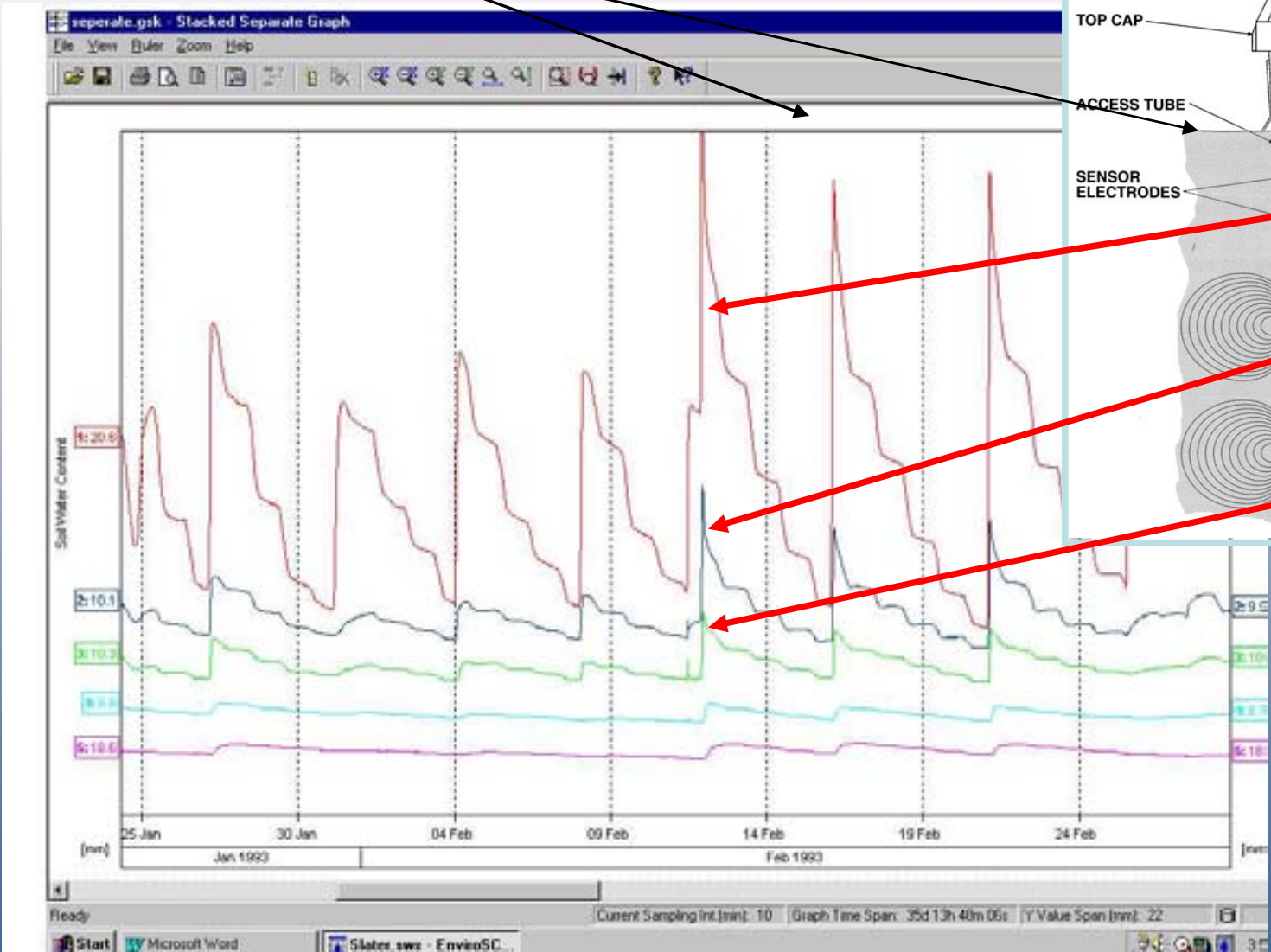


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Probe sensor at different depths shown in stacked graph

Ground level

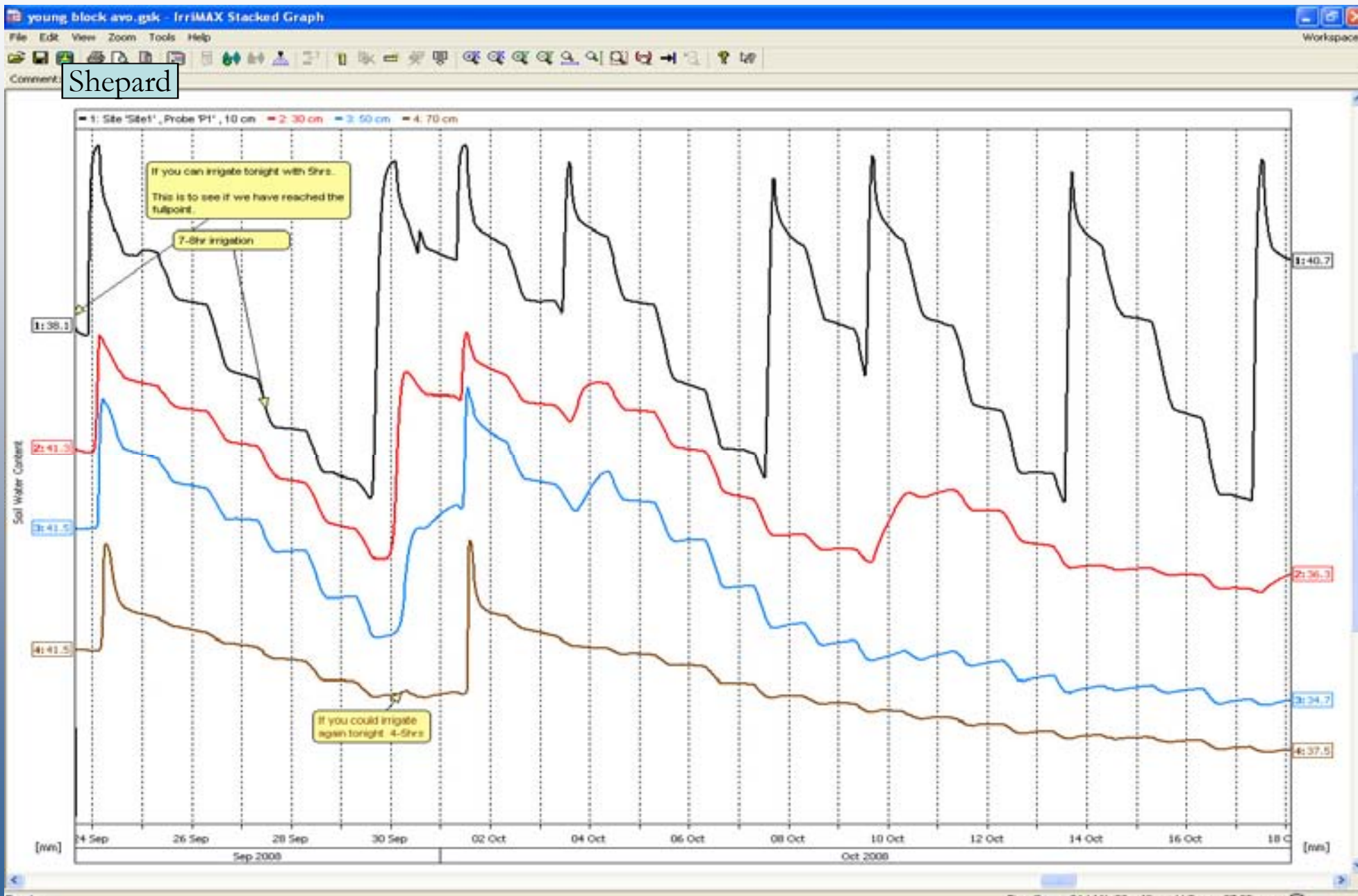


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EnviroSCAN Data from Fruit Fill

EnviroSCAN measurements 10,30,50 & 70cm





EnviroSCAN data crop high water use

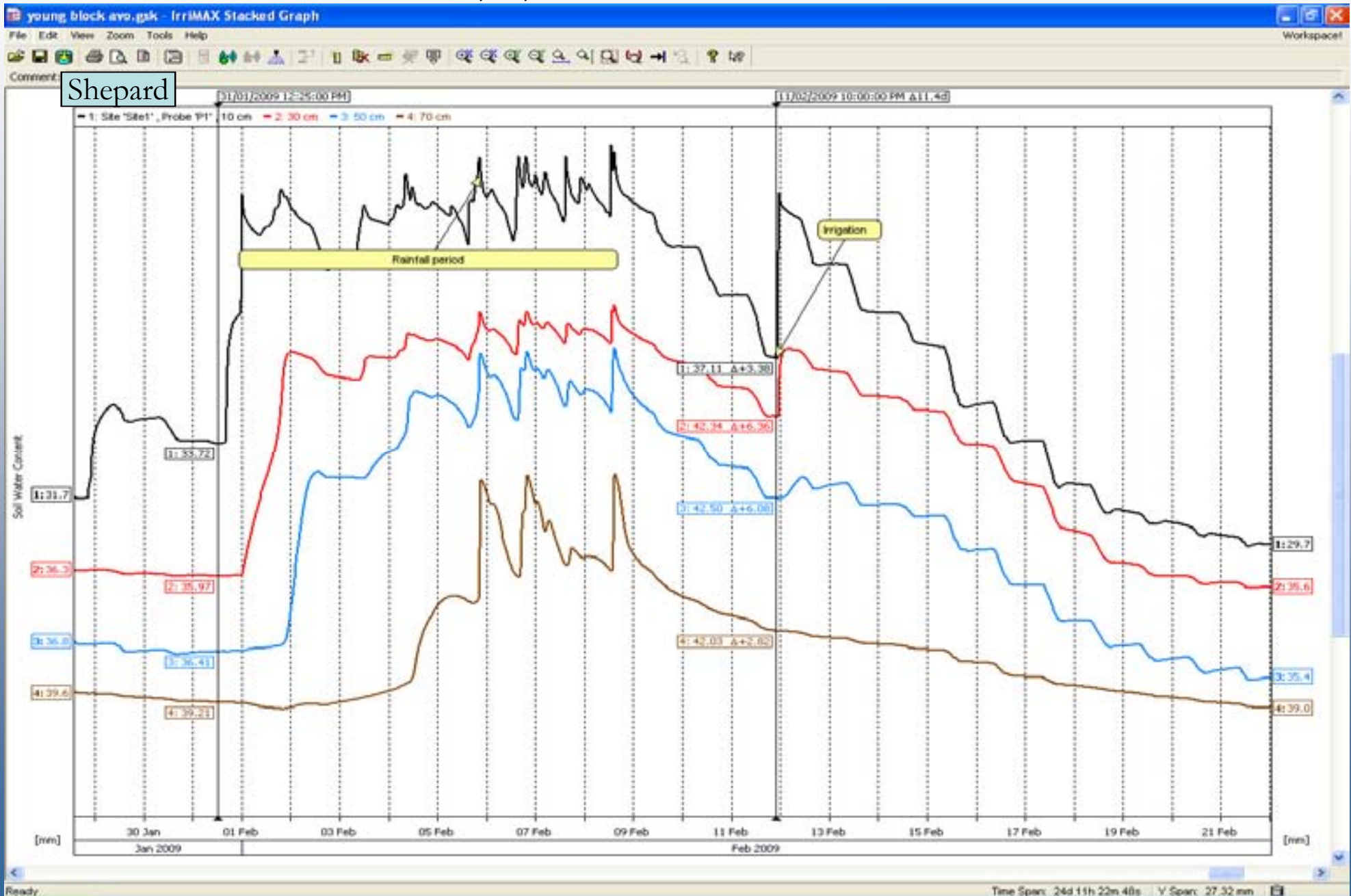
EnviroSCAN measurements 10,30,50 & 70cm



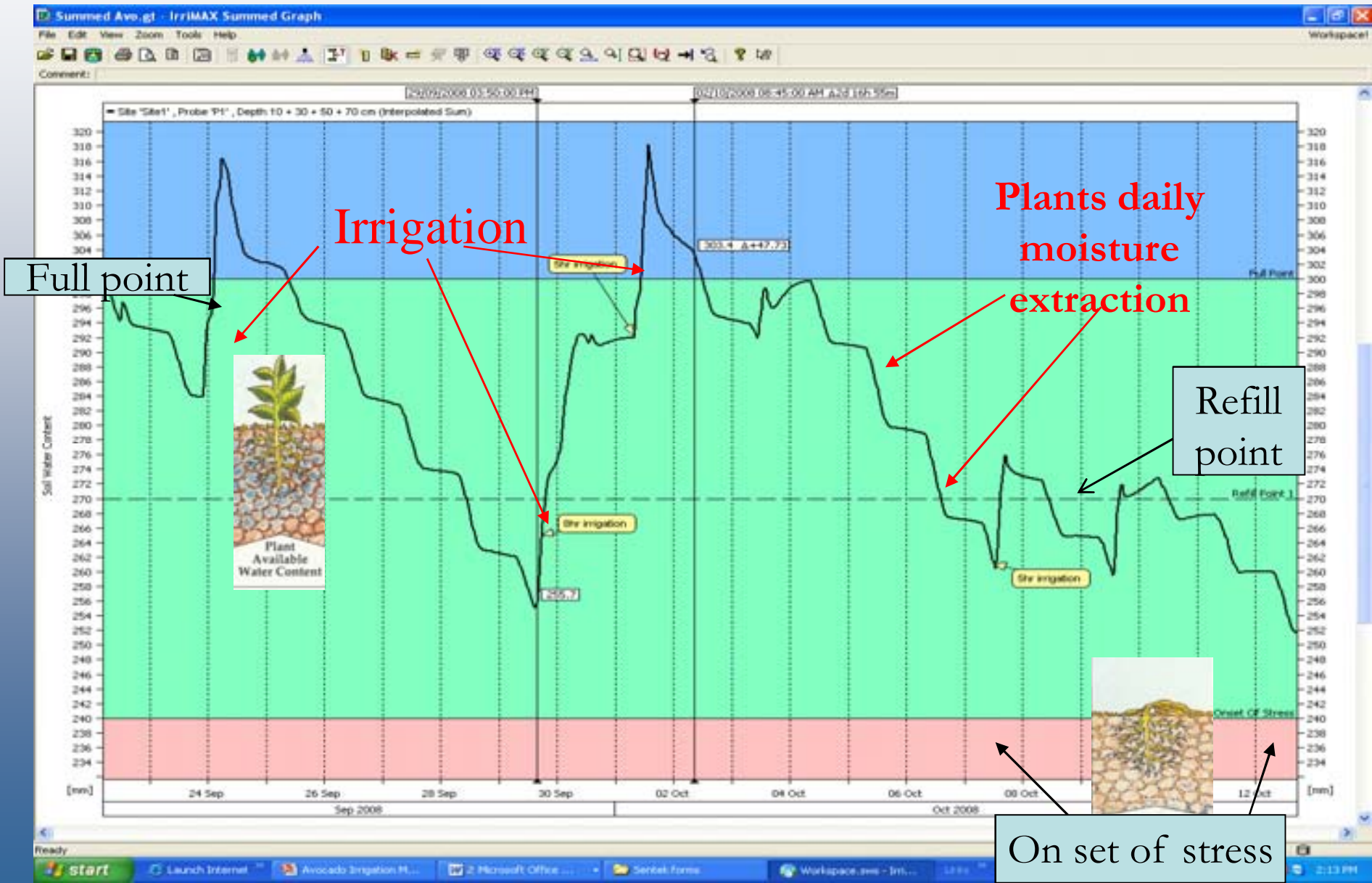


EnviroSCAN data shows Water demand during the wet season

EnviroSCAN measurements 10,30,50 & 70cm



Soil Water Dynamics





Avocado Case Study

Client: Ian and Ann Leighton

The Leighton family having been growing avocados for over 25 years

Property: located 80 km west of Cairns in Mareeba one of their blocks monitored is a 10 ha orchard. The soil is red volcanic and texture is medium clay. Annual rainfall is approximately 800-1000 ml/annum with 80% falling between December and March.

Irrigation supply: Water is supplied to the region through a regulated system and operated by SunWater known as the Mareeba – Dimbulah Irrigation Area supply system, via a channel scheme.

Crop: Avocado – Shepard variety

Initial study: Assessed sprinkler type and output on wetted area, irrigation lines were flushed regularly and checked all sprinklers were working to full capacity at all times. Crop was assessed (age and growth stage), soil type, climatic conditions, productivity goals.

Steps taken: Installed EnviroSCAN to monitor irrigation management of Avocado crop allowing for visual data to be collected and analyse irrigation management techniques.

Case study Irrigation Management

Irrigation Schedule Implemented for Crop Cycle:

- Pre flowering, irrigation commenced earlier than previous year operating at a slight deficit
- During flowering water applications were increased to slowly fill the profile
- On fruit set a full profile was maintained
- During fruit fill the irrigation were frequent , however at times the EnviroSCAN showed the crop was using more than what was applied.
- Pre harvest, maintained water availability at active root zone
(Even during high rainfall periods he still could see the value in irrigating between those events.)

During Peak Crop Water Demand

- Reduced applied water per irrigation thus eliminating deep infiltration
(During early stages of fruit fill not enough was applied)
- Fertigation applied more regularly with smaller amounts
- Frequent irrigation applications were implemented during high temperatures

Avo Case study

Results

Significant improvements to the irrigation practices and overall irrigation management were achieved.

Maintaining soil moisture in the top 50cm of the soil profile produced a 50% increase in yield and fruit quality. The district yield average for Shepard avocados for 5-6 year old trees is around 15 trays/tree while the Leighton family produced over 30 trays/tree.

Water used over the period of twelve months was around 16 ML/Ha with high yields and 10 ML/Ha the previous year and his production down by half. Although more water was used Ian saw the value in increasing his water amounts to complement the whole farm agronomic management and double his production.

Case study

Conclusion

By means of precision irrigation management the Ian was able to maintain water availability to the active root zone thus meeting crop water demand in their Avocado orchard.

Implementing changes to his irrigation scheduling achieved record target yields with minimal impact to the environment.

Acknowledgements

Also acknowledging how the soil moisture monitoring played a big role in their overall farm management.

HydroTech Monitoring would like to thank Ian and Ann Leighton for allowing us to be involved and show their irrigation techniques.

Take Home Message

Of all crop inputs, irrigation can have the most impact on crop yield and quality, hence profitability.

Good irrigation practise is about understanding how much water the plants require, utilising water with other farm imports and how to apply this water efficiently for certain individual profit targets.

Irrigation is something to be taken seriously as plants require specific soil moisture conditions for optimal growth. Insufficient irrigation scheduling can have consequences on crop yields and quality produce, hence affecting your profitability.

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