

New Metrics, New Insights.

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“What we don’t
measure, can’t be
controlled”

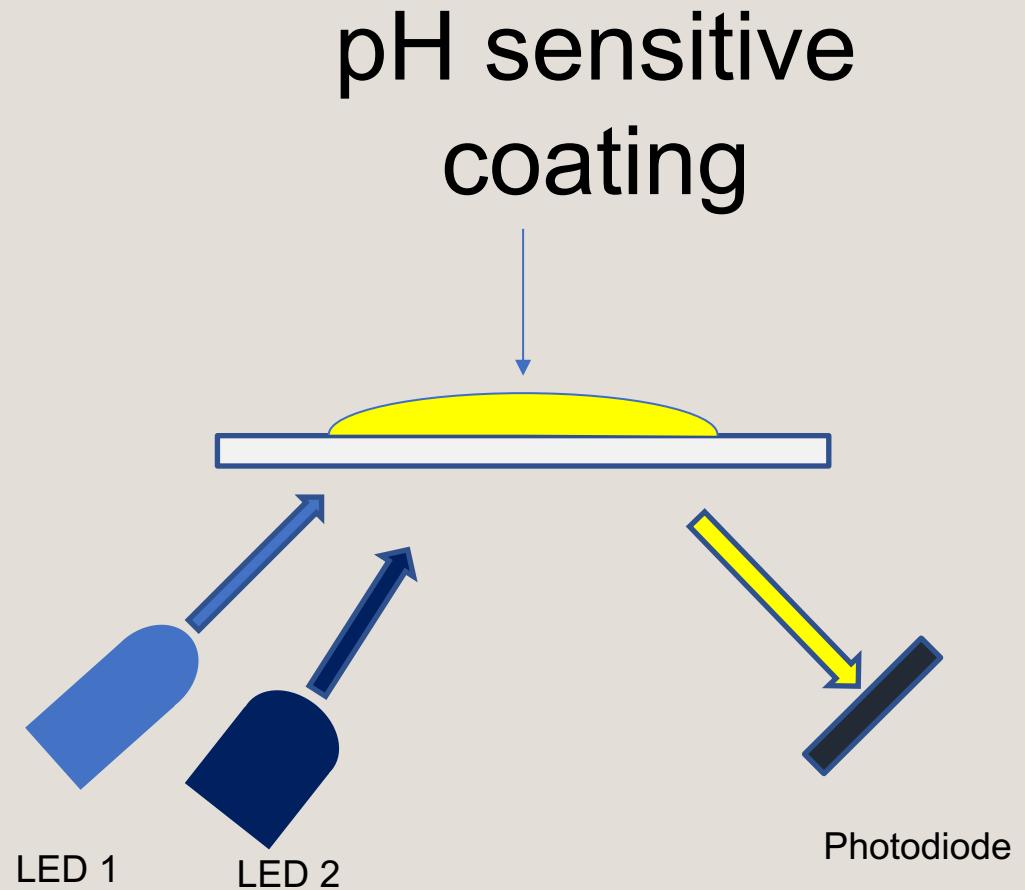
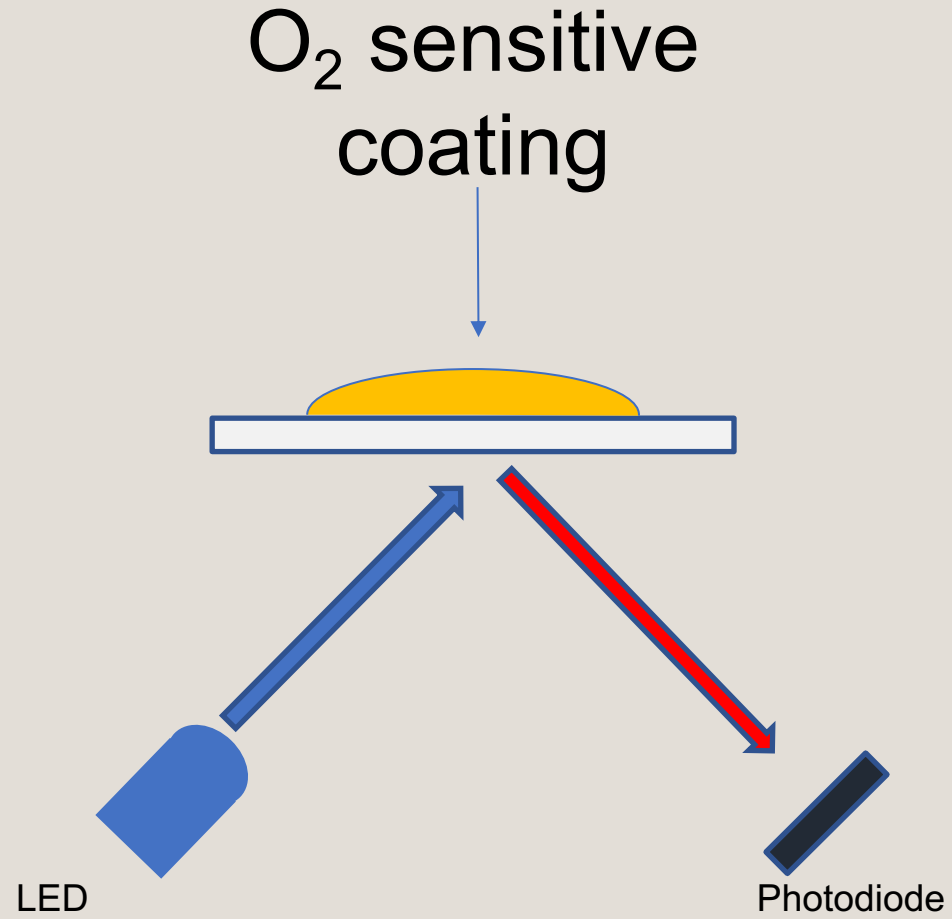




New Sensors/Technology

- Optical oxygen/pH sensor
- Photosynthesis efficiency sensor
- Pointed Microclimate
- Remote networks/IoT

Optrode sensors





The advantages of Optrode sensors

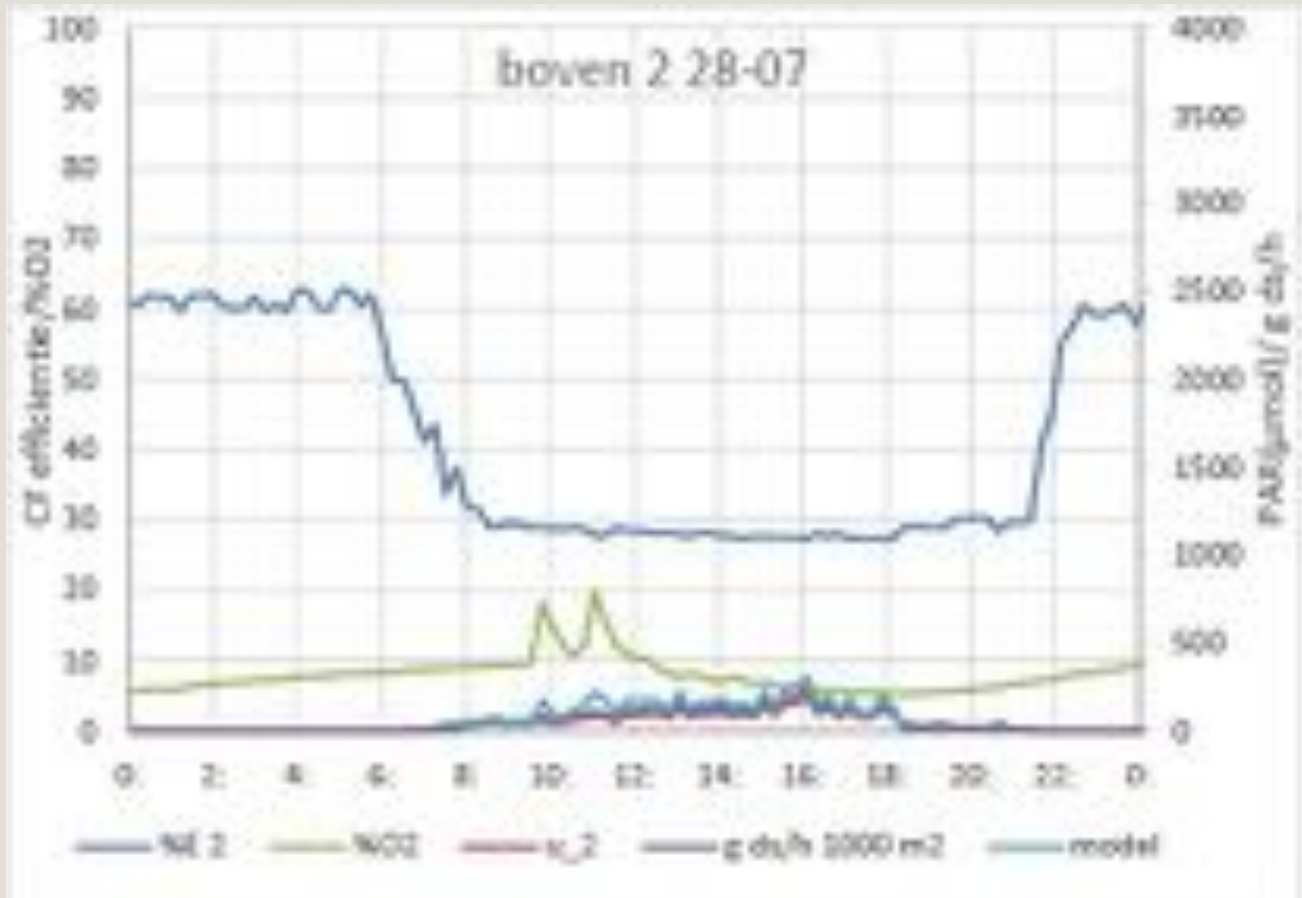
- Minimal calibration
- Ease of Maintenance
- Durability
- Ease of Use



Real-time oxygen and pH readings from the rootzone

- We monitor above ground conditions extensively.
- The rootzone is critical for plant and disease development.
- Oxygen level impacts on the efficacy of uptake of nutrients and water.
- Sufficient oxygen also maintains an aerobic environmental.

How do/can these new metrics add value?



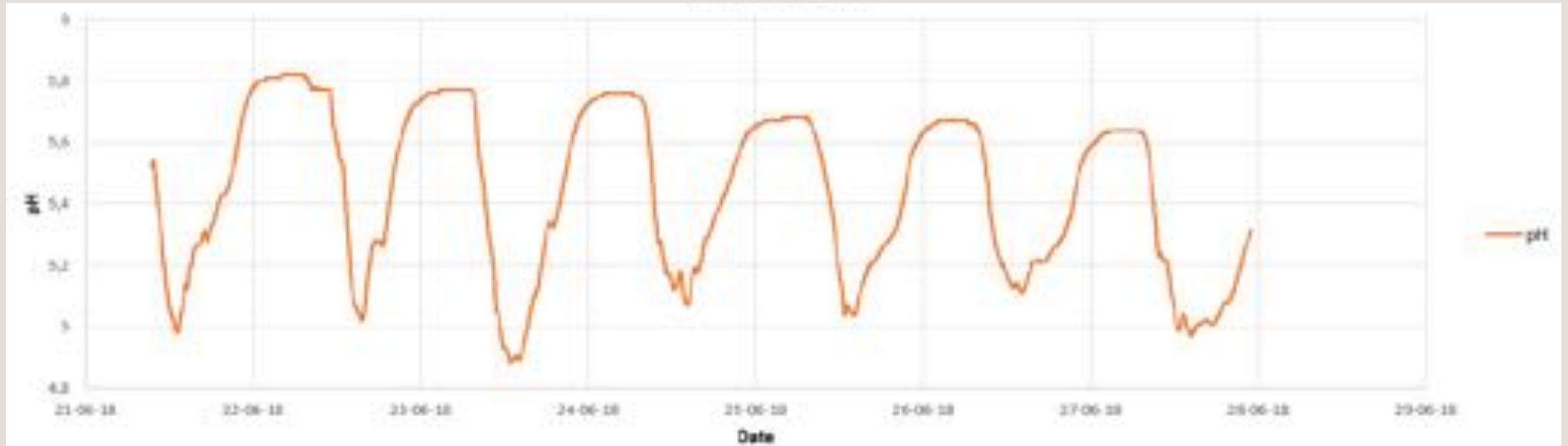
- Low light level and therefore low transpiration.
- Two irrigation events.
- Note the change in trend of %O₂.
- Below 10% oxygen is increasing the risk of Pythium, Fusarium and Phytophthora.



Real-time oxygen and pH readings from the rootzone

- pH influences what nutrients can be taken up by the plant
- Many growers measure – Water pH / Drain pH
- Measuring root zone pH gives a better indication of what is really happening near the roots.
- It is a more representative metric to base decision making.

How do/can these new metrics add value?





Photosynthetic efficiency sensors

- Optical fibre/lead clip combination attached on to a leaf.
- Sensor equipped with a logger function allowing continuous data monitoring for several weeks.
- Most effective when paired with photosynthetically active radiation.



Plant performance optimisation using photosynthesis efficiency

- How is your crop utilising factors such as
 - Light level
 - Temperature
 - CO₂
 - Oxygen levels in the root zone
 - VPD

Once we understand how the crop is utilising these factors we can tweak practices to optimise them.



Photosynthesis efficiency sensor paired with PAR

- Photosynthesis efficiency when paired with PAR can start to indicate changes in other factors influencing photosynthesis.
- Create a model to follow, and predict dry matter and assess performance.
- Improve utilisation and timing of CO₂, irrigation, light etc...



20.1°C

49.3%

20.8°C

9.8°C

1.1 kPa

8.8 g/m³

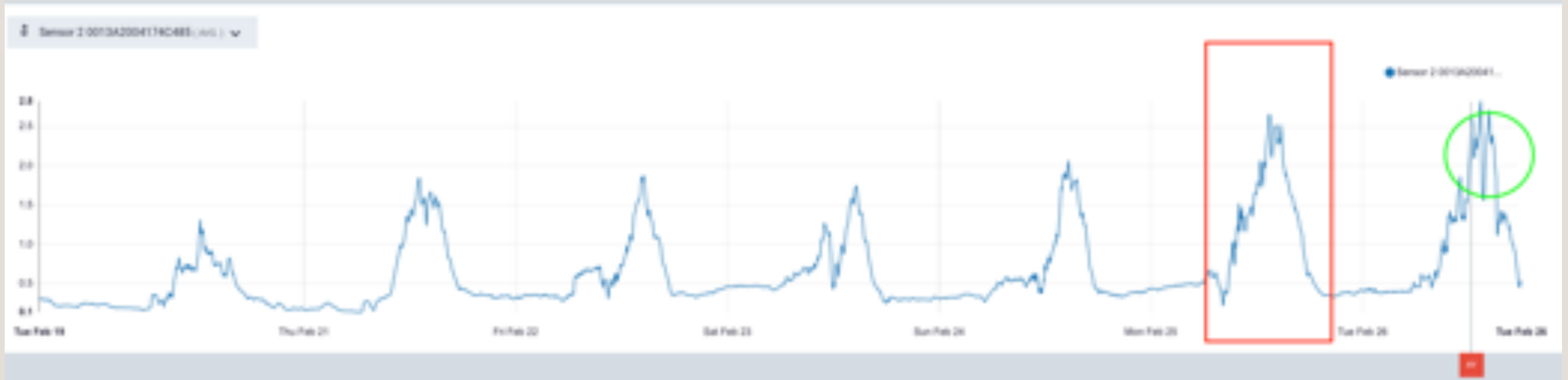
7.9 g/m³

Taking computing off the ground

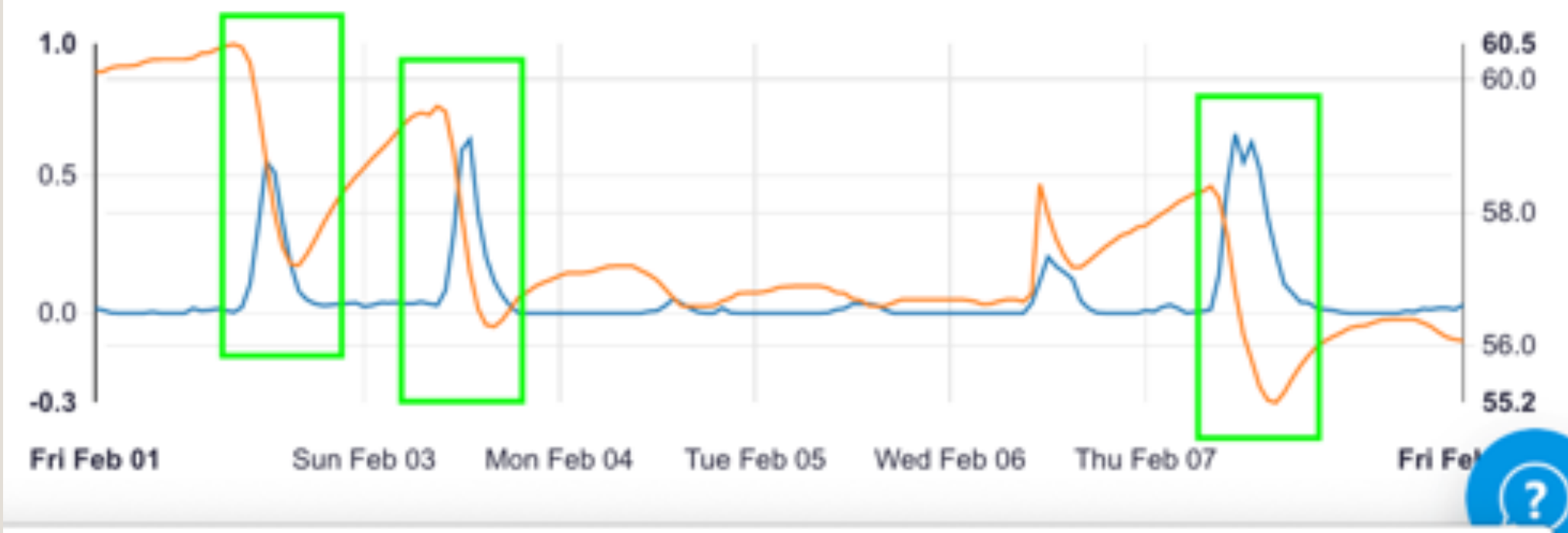
- Sensor size
- Cost
- Power requirements
- Real-time
- Over the air updates



Why is this important?



VPD vs VWC FG1 (2)

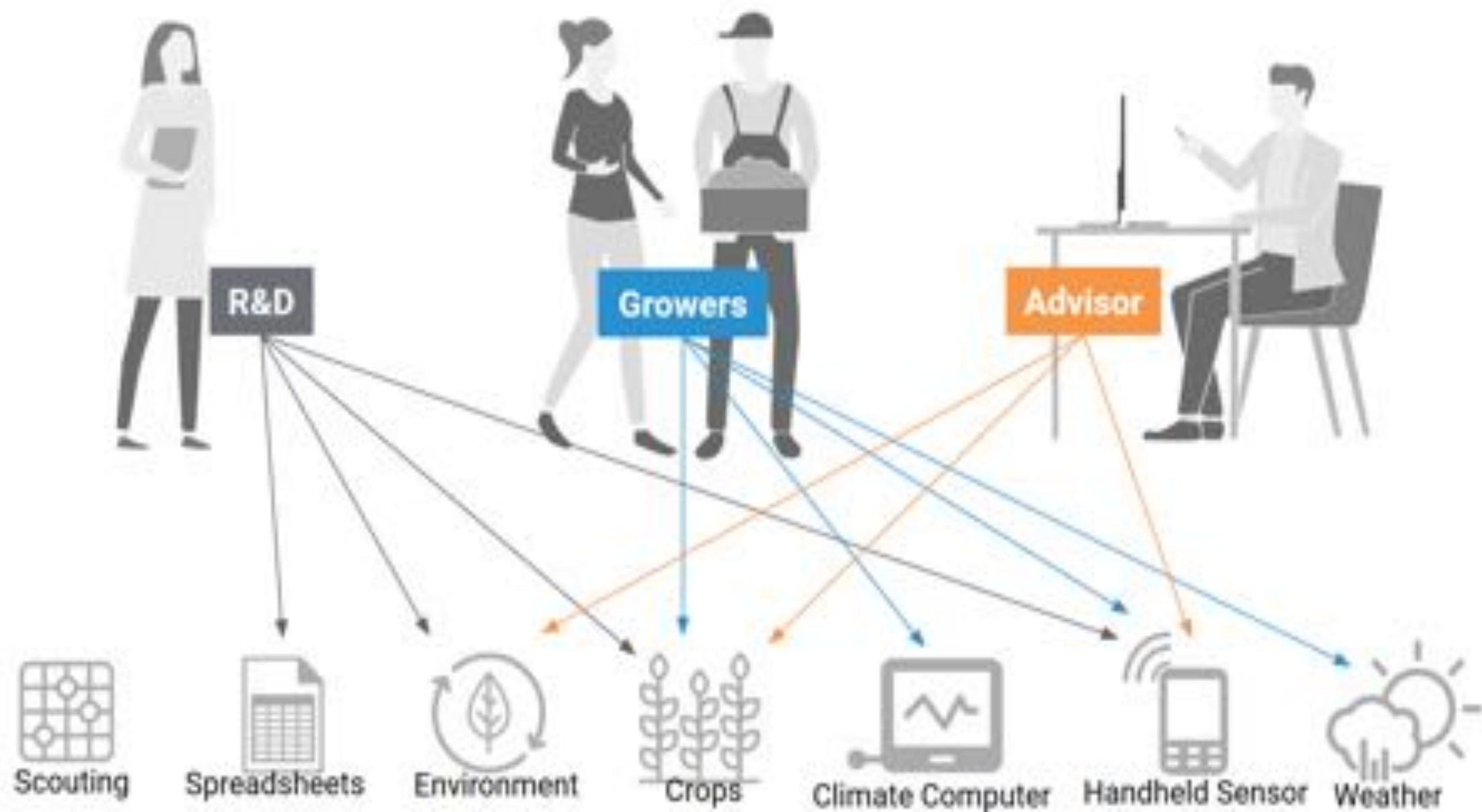


Sensor networks/IoT



- Move towards Precision Horticulture/Hort 4.0
- Networks of sensors speaking to each other to make decisions.
- Reduces waste and enhances productivity.
- Optimises the uses of various inputs Eg; Fertiliser, Pesticides, Microbiologicals.

From data silos...



...to data platform and connectivity





Future Sensors

- Multi/Hyperspectral cameras
 - Fotenix
 - WPS
- Spore Traps
 - Fungi alert
- DNA Analysis Kits
 - MinION
- Electrical signaling



Challenges of these sensors

- How to fit them in to current systems
- How to reduce the cost of implementation
- How to train growers to interpret the results and gain insight.



Solutions

- Make use of existing infrastructure (Boom sprayers)
- Ensure future infrastructure can make use of new sensors.
- Refine the spectrums and signals we are looking for.
- Ensure support is given to adopters of new technology to enable them to gain the most from it.



New Sensors and Ai

- The increased use of sensors and the adoption of new very data rich sensors lends its self to machine leaning.
- Hyperspectral images need to be processed to give insight.
- An image is still a single point in time.
- What conditions have lead to this end point?



How will this add value

- Forecasting and predication.
- Specificity of predictions.
- Optimisation of all aspects of growing a crop...

IR4 Technologies and IPM



Innovation with a Purpose: The role of technology innovation in accelerating food systems transformation, World Economic forum, January 2018



Thank you for your time.

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