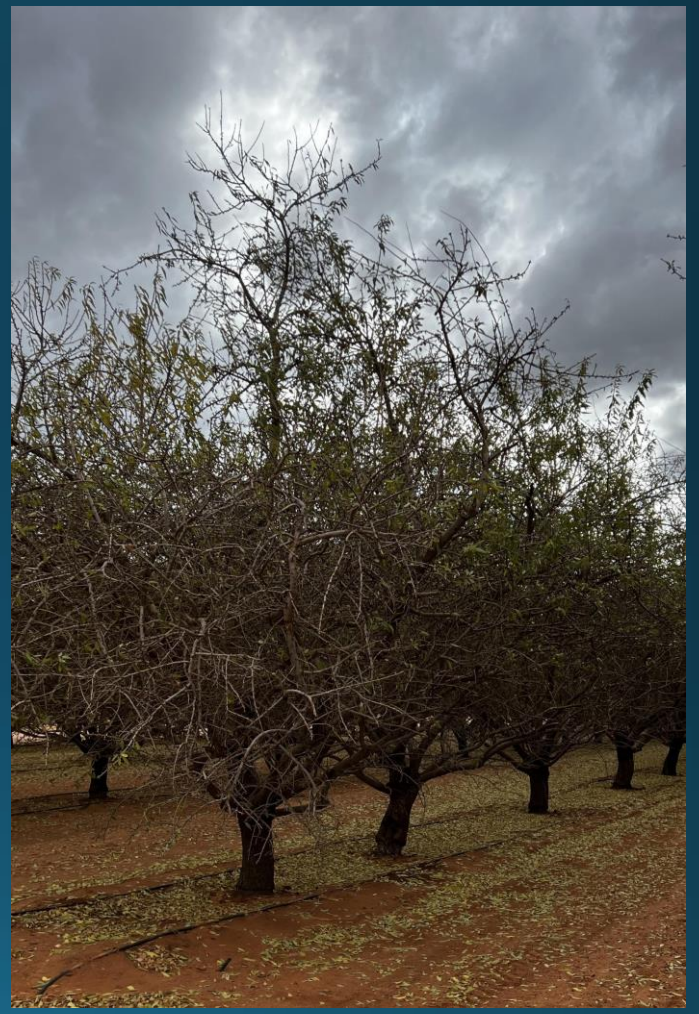
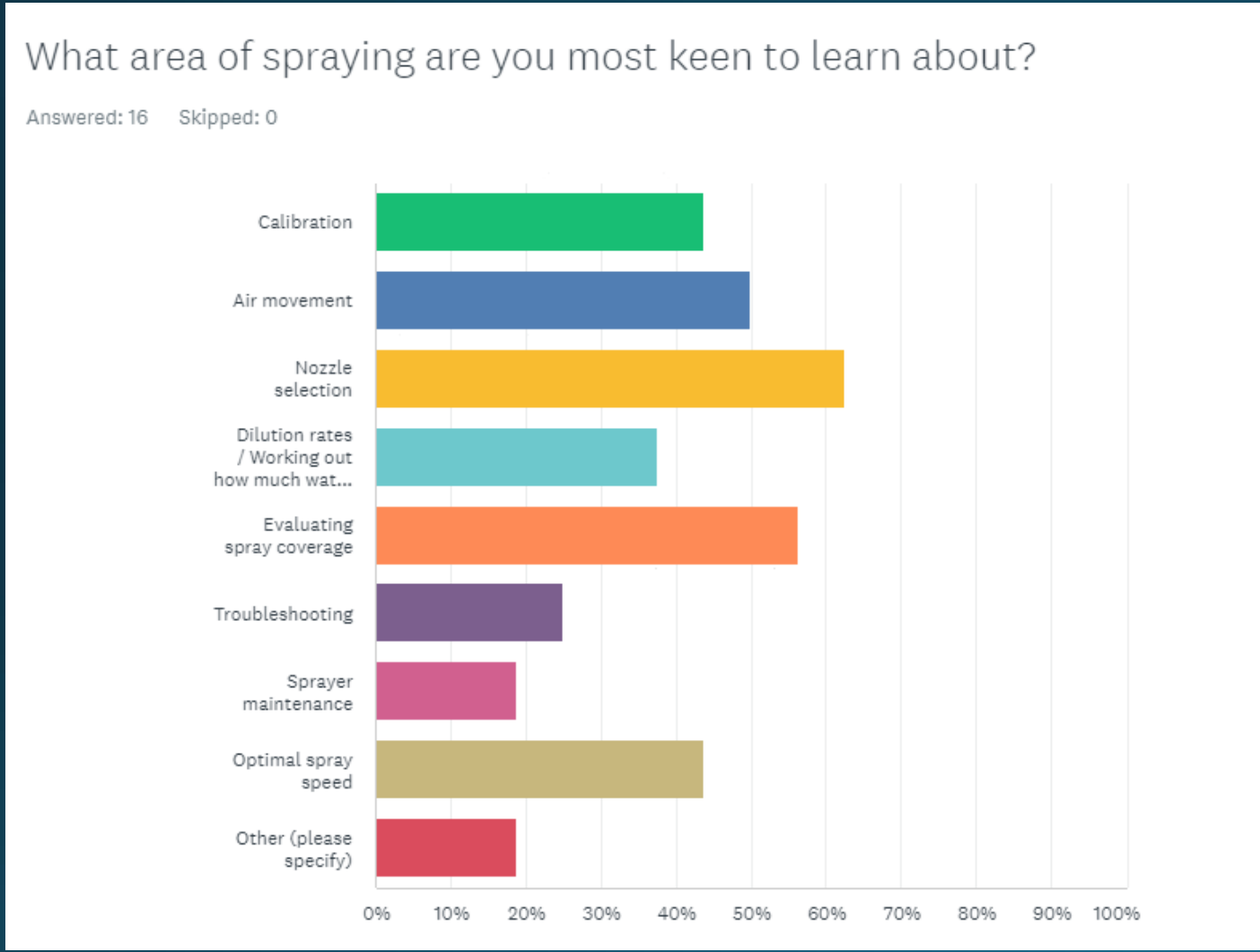
Today's run-sheet

1. Introduction / context - Basics of spraying and concentration factors.
2. Sprayer maintenance / Herbicide unit maintenance / Bonsai & WeedIt overview – at the orchard.
3. Hands-on demonstration 1 - Water sensitive paper is within the trees with the Bonsai unit pulling the sprayer – application 1 at say 4 Km/hr.
4. Syngenta – Vertento introduction.
5. Hands-on demonstration 2 - setting up an assessment – Spray speed test 2 – higher speed. The idea is that we have made a single change in our application to reassess our coverage.
6. Demonstration of Croplands Weed-it sprayer.



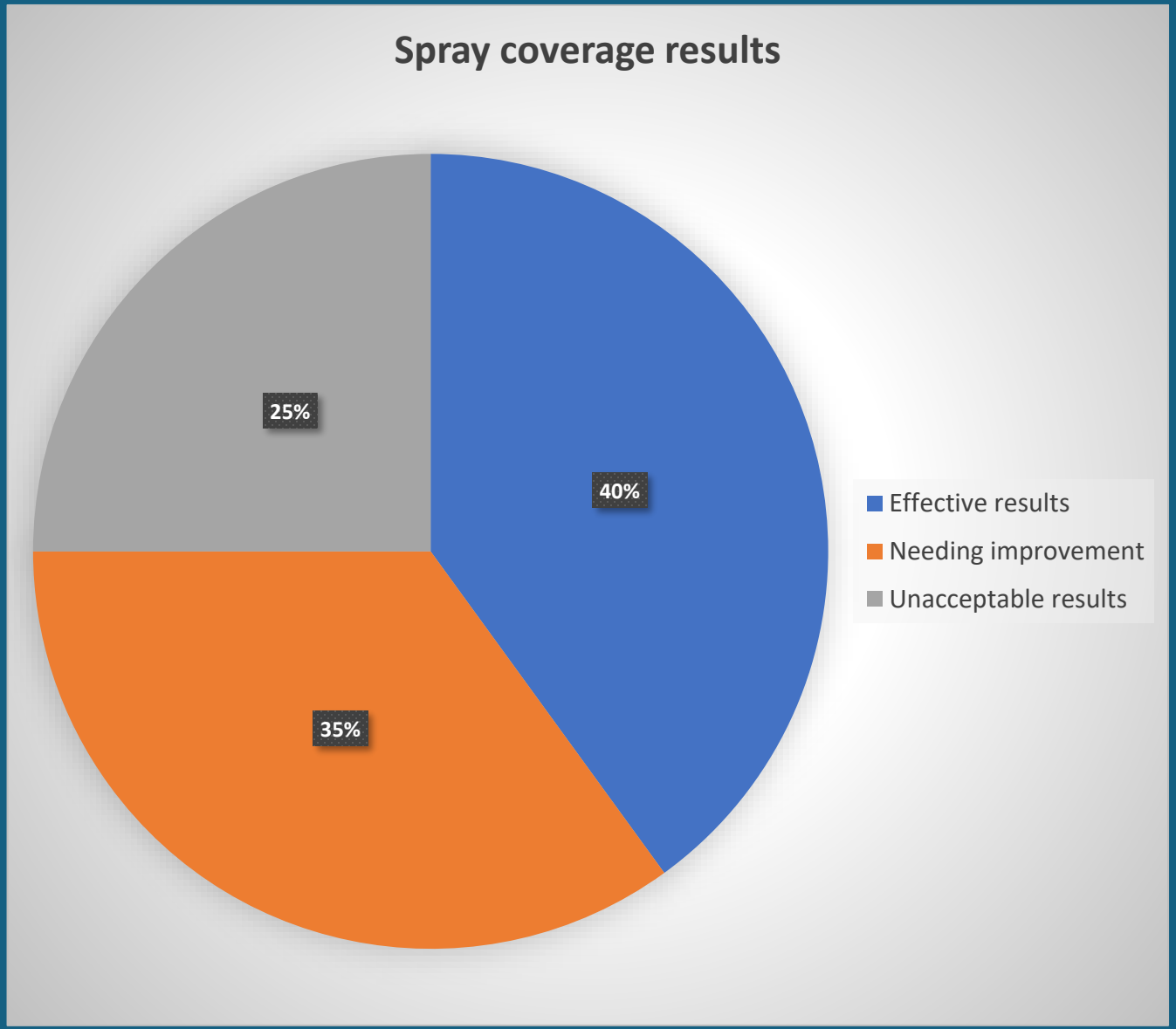
2024 requested topics for discussion.....



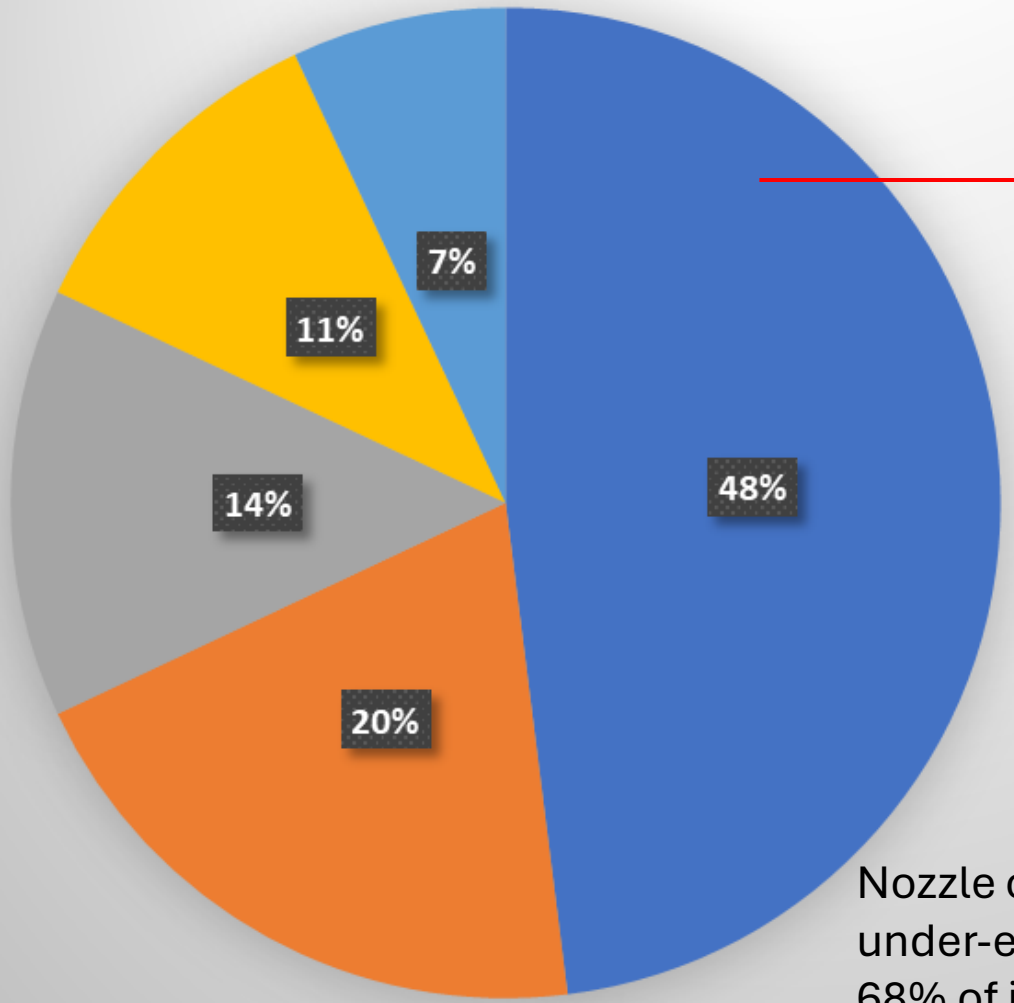
- ✓ #1 – Nozzle selection
- ✓ #2 – Evaluating spray coverage
- ✓ #3 – Air Movement
- ✓ #4= - Optimal spraying speed & calibration
- ✓ #5 – Dilution rates
- ✓ #6 - Sprayer Maintenance

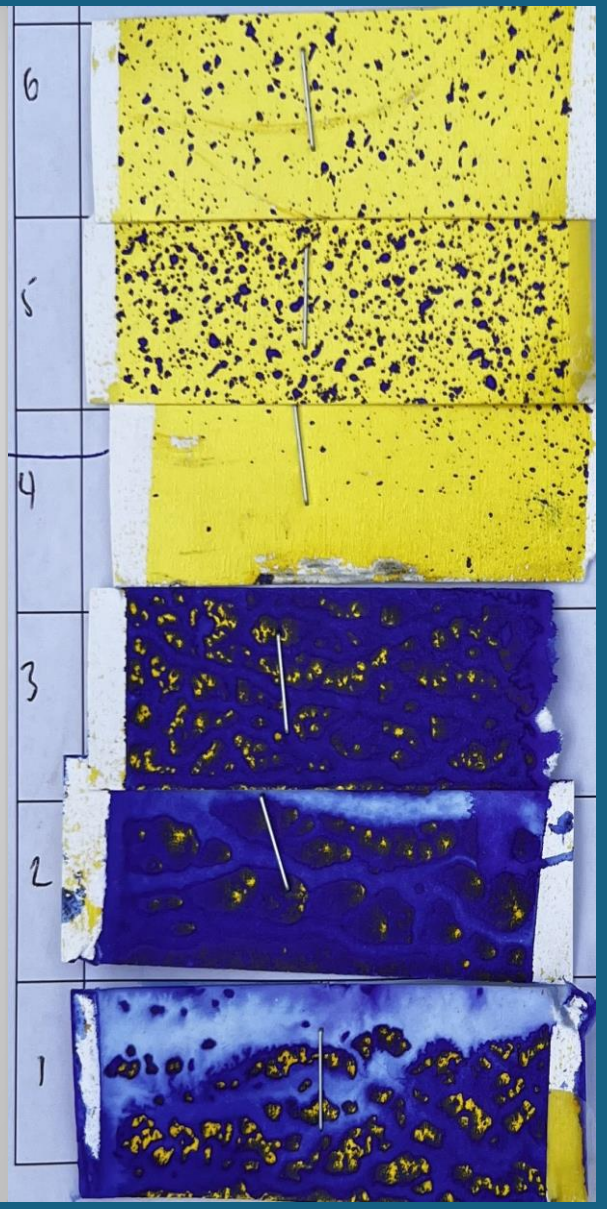
My learnings since 2020

- Data taken from 52 sprayers tested in the first 18 months in application workshops; 16 different crops
- Sprayers scored from 1-10 (one best, 10 worst) in 5 “issues” categories (see next slide)



Main spray application issues

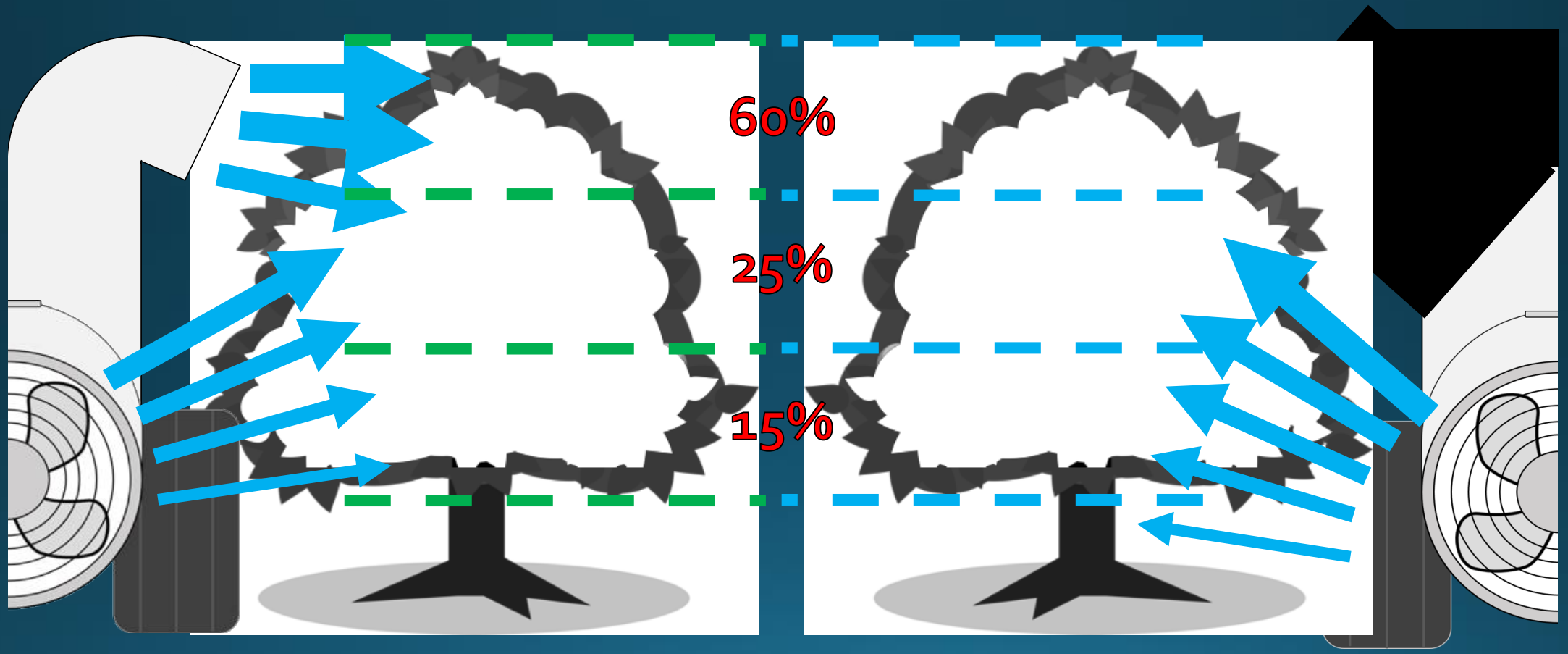




Nozzle output & distribution, and under-estimating application rate = 68% of issues encountered.

1 – Nozzle Selection & Calibration

Spray plume distribution –
nozzle choice & output relative to canopy/target volume



Calibration to suit canopy

A simple method is to divide your spray plume & nozzle ring(s) into 3 sectors

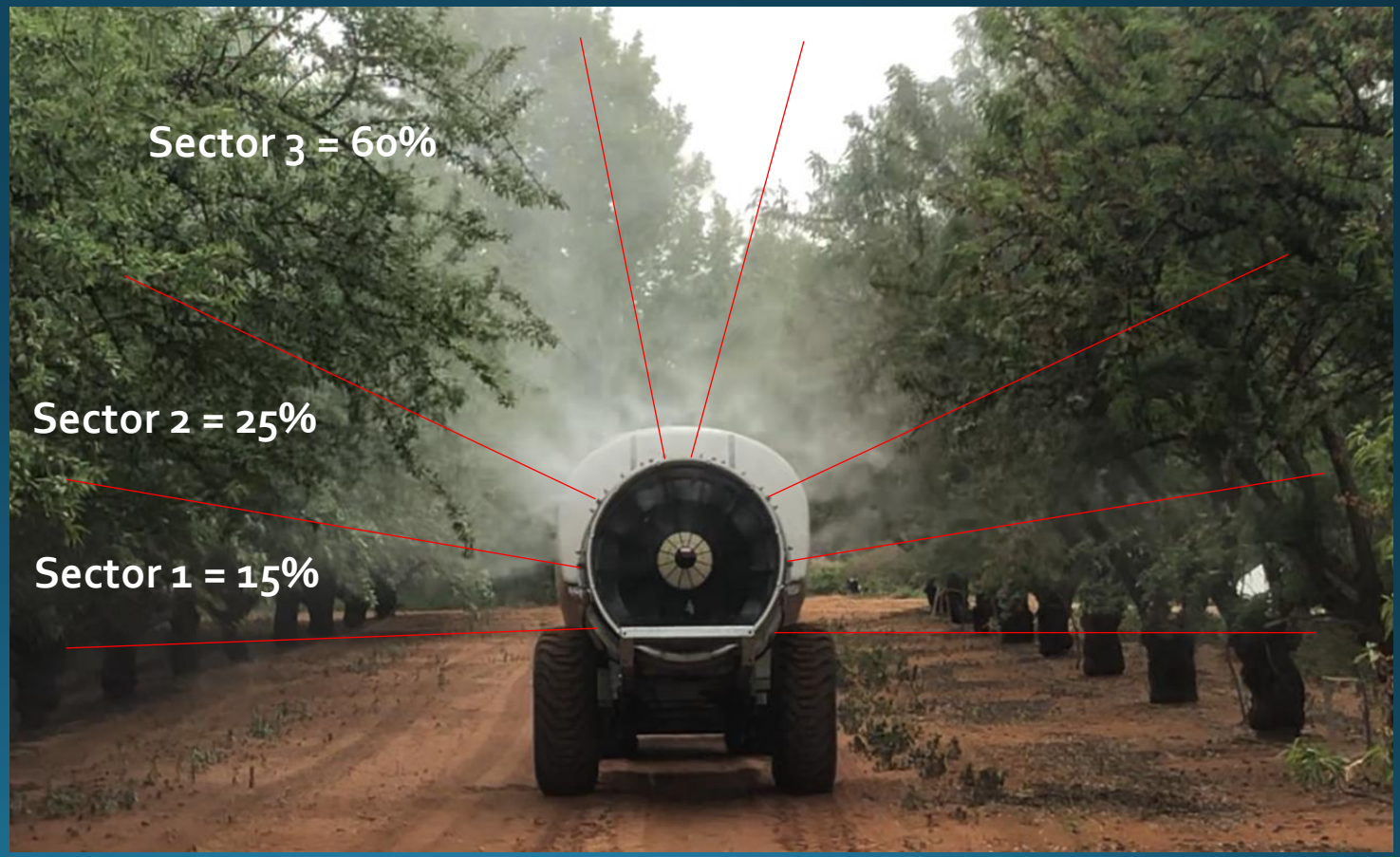
$$\text{L/min (one side)} = \frac{\text{L/ha x Speed x Row width}}{1200}$$

$$42.2 \text{ L/min} = \frac{1500 \text{ L/ha x } 4.5 \text{ km/hr x } 7.5\text{m}}{1200}$$

- 42.2 x 60% (Sector 3) = 25.3 L/min
- 42.2 x 25% (Sector 2) = 10.55 L/min
- 42.2 x 15% (Sector 1) = 6.33 L/min

nozzles Sect. 3 = 6 – av. per nozzle 4.21 L/m
nozzles Sect. 2 = 4 – av. per nozzle 2.64 L/m
#nozzles Sect. 1 = 4 – av. per nozzle 1.58 L/m

KEEP IT SIMPLE.

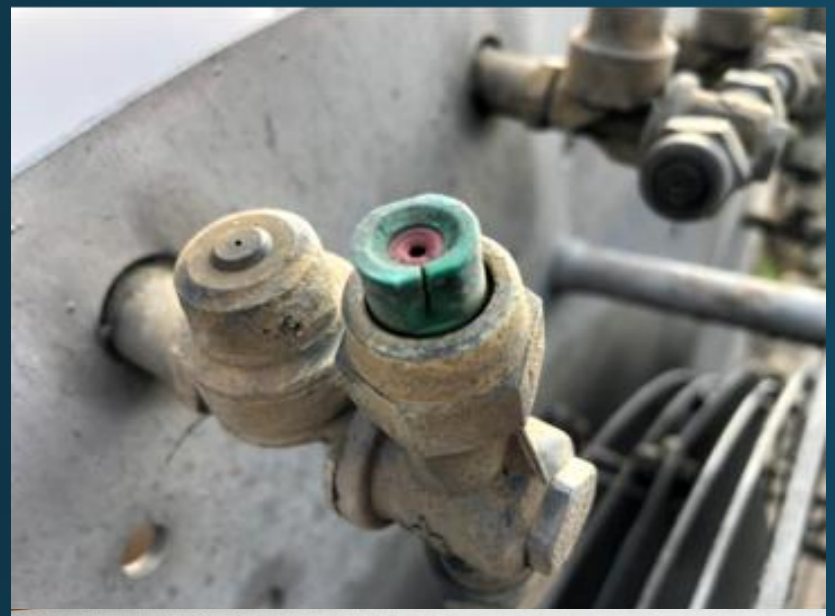


Calibrating for sector output – an example in large almond trees

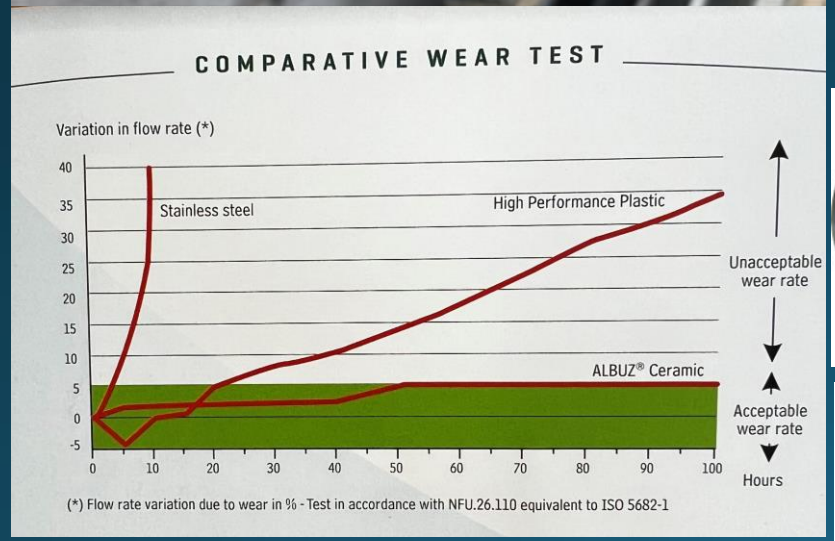
% per Sector	Position from TOP	Required placement %	Target Flow required	Nozzle Selected	Pred Flow per selected nozzle @ test pressure	Predicted flow per Sector	Actual % per sector	Ref	Spray angle
60	1	7.5%	3.40	ISO Brown 05	3.49	27.2	60%	130psi	60
	2	7.5%	3.40	ISO Brown 05	3.49			130psi	60
	3	7.5%	3.40	ISO Brown 05	3.49			130psi	60
	4	7.5%	3.40	ISO Brown 05	3.49			130psi	60
	5	7.5%	3.40	ISO Brown 05	3.49			130psi	60
	6	7.5%	3.40	ISO Brown 05	3.49			130psi	60
	7	7.5%	3.40	ISO Brown 05	3.49			130psi	60
	8	7.5%	3.40	ISO Red 04	2.79			130psi	60
30	9	5.0%	2.27	ISO Red 04	2.79	12.6	28%	130psi	60
	10	5.0%	2.27	ISO Red 04	2.79			130psi	60
	11	5.0%	2.27	ISO Red 04	2.79			130psi	60
	12	5.0%	2.27	ISO Yellow 02	1.40			130psi	60
	13	5.0%	2.27	ISO Yellow 02	1.40			130psi	60
	14	5.0%	2.27	ISO Yellow 02	1.40			130psi	60
10	15	1.7%	0.76	ISO Yellow 02	1.40	5.6	12%	130psi	60
	16	1.7%	0.76	ISO Green 015	1.05			130psi	60
	17	1.7%	0.76	ISO Green 015	1.05			130psi	60
	18	1.7%	0.76	ISO Green 015	1.05			130psi	60
	19	1.7%	0.76	ISO Green 015	1.05			130psi	60
	20	1.7%	0.76	OFF	0.00			OFF	OFF
100%		100%	45.31		45.4	45.4	100		

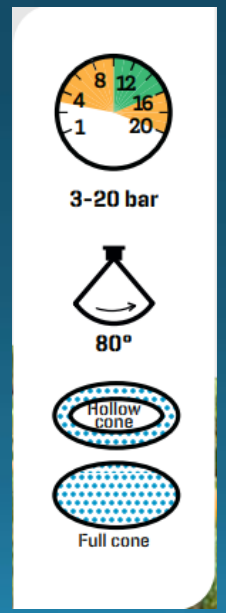
This calibration tool is a guide only, theoretical calculations are based on flow and pressures of new verified ISO nozzles and gauges. Note the theoretical flow and pressure displayed are at the nozzle. All calibration data should be manu and verified before use. Horticultural Spraying Specialists +61 (0)448 511 771

Nozzles – what to use?



- Most commonly used are:
- Two-piece Ceramic – 40/60/80 degree – usually hollow cone, but can be full cone.
- Ceramic Disc & core (usually for higher application rates) – full and hollow cone.
- When should you replace them?





Manufacturers have guidelines for the use of their nozzles

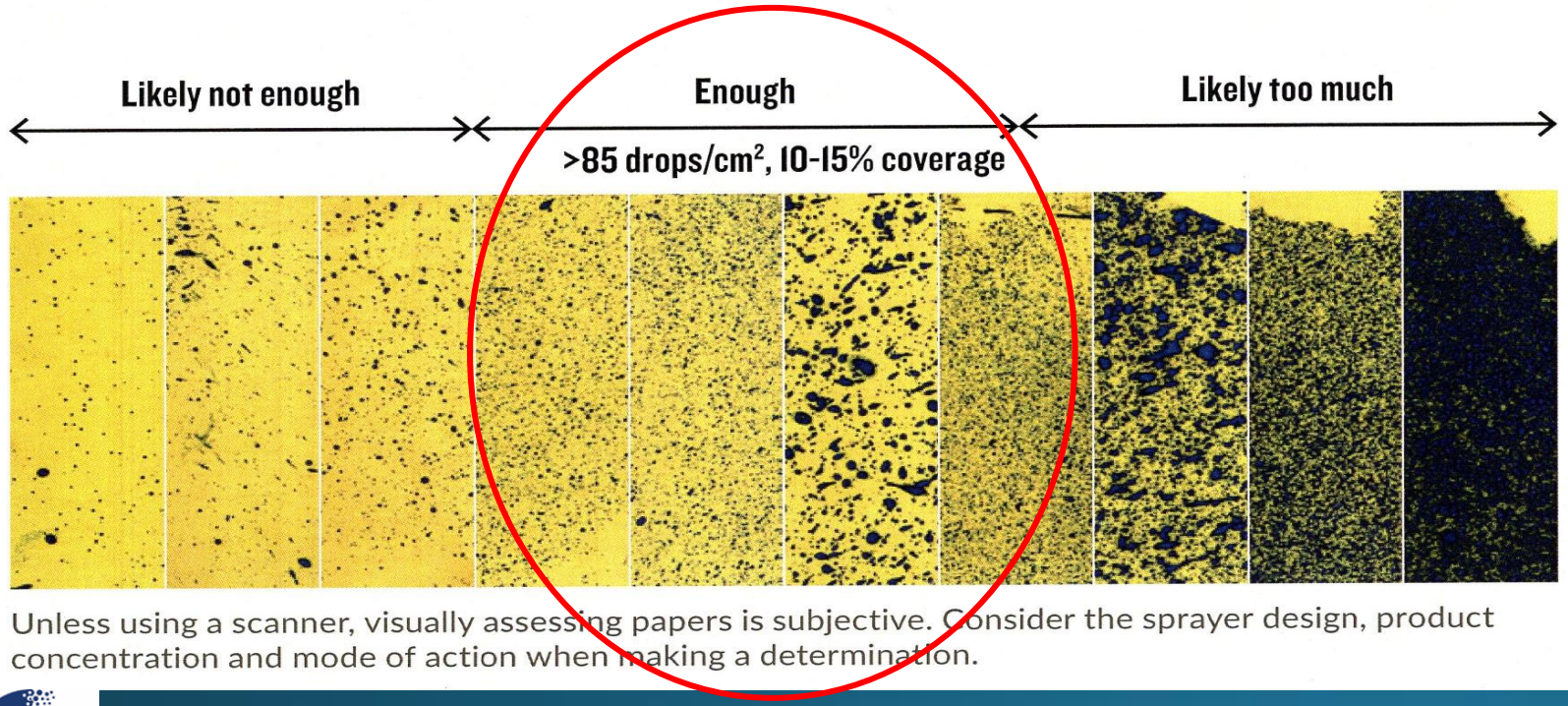
2 – Evaluating Spray Coverage

**We will see 2 examples today, testing speed

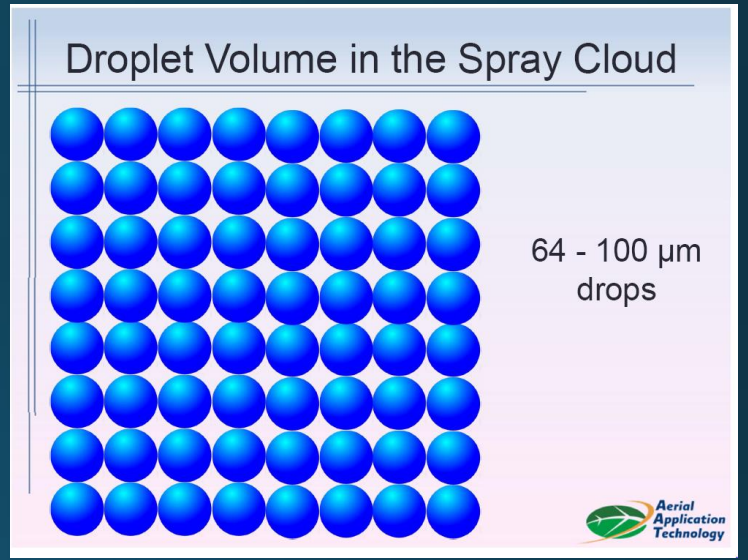
Spray Droplets & coverage

When assessing coverage, be aware of the following exceptions. Consult the following figure and consider the following:

- Make allowances for a paper where adequate coverage was prevented by an obstacle. You often see the silhouette of the obstacle.
- Finer sprays will have higher deposit counts and may or may not cover less surface. If percent coverage seems low, focus more on deposit counts and distribution.
- Coarser sprays have lower deposit counts and may coalesce into blobs. When deposit counts are not possible, focus more on even distribution and consider how much paper is uncovered rather than how much is covered.
- Spray must pass through the canopy exterior to reach the interior. Drenched targets may be unavoidable in the outer region of large and/or dense canopies.

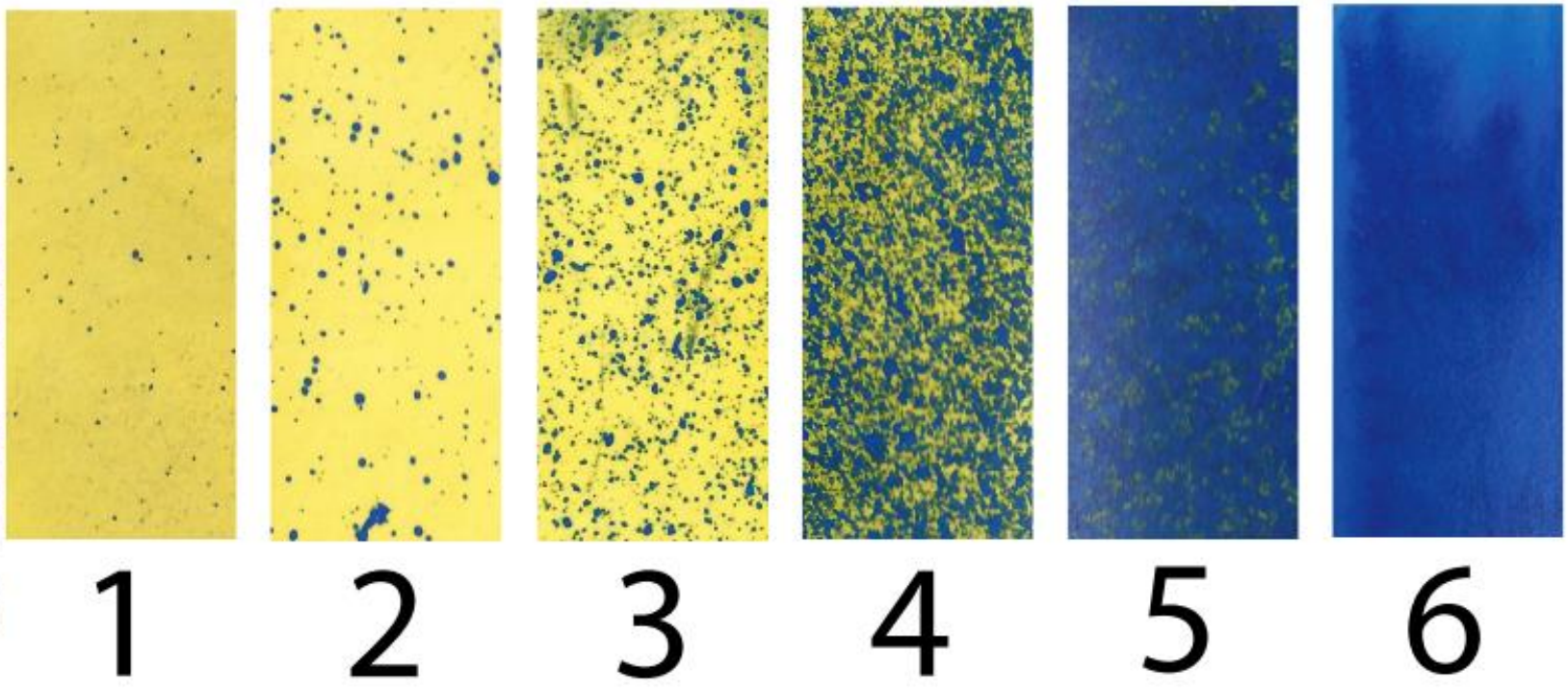


Unless using a scanner, visually assessing papers is subjective. Consider the sprayer design, product concentration and mode of action when making a determination.



Finer droplets are more suited to fungicides & insecticides in tree crops

Simple Rating System

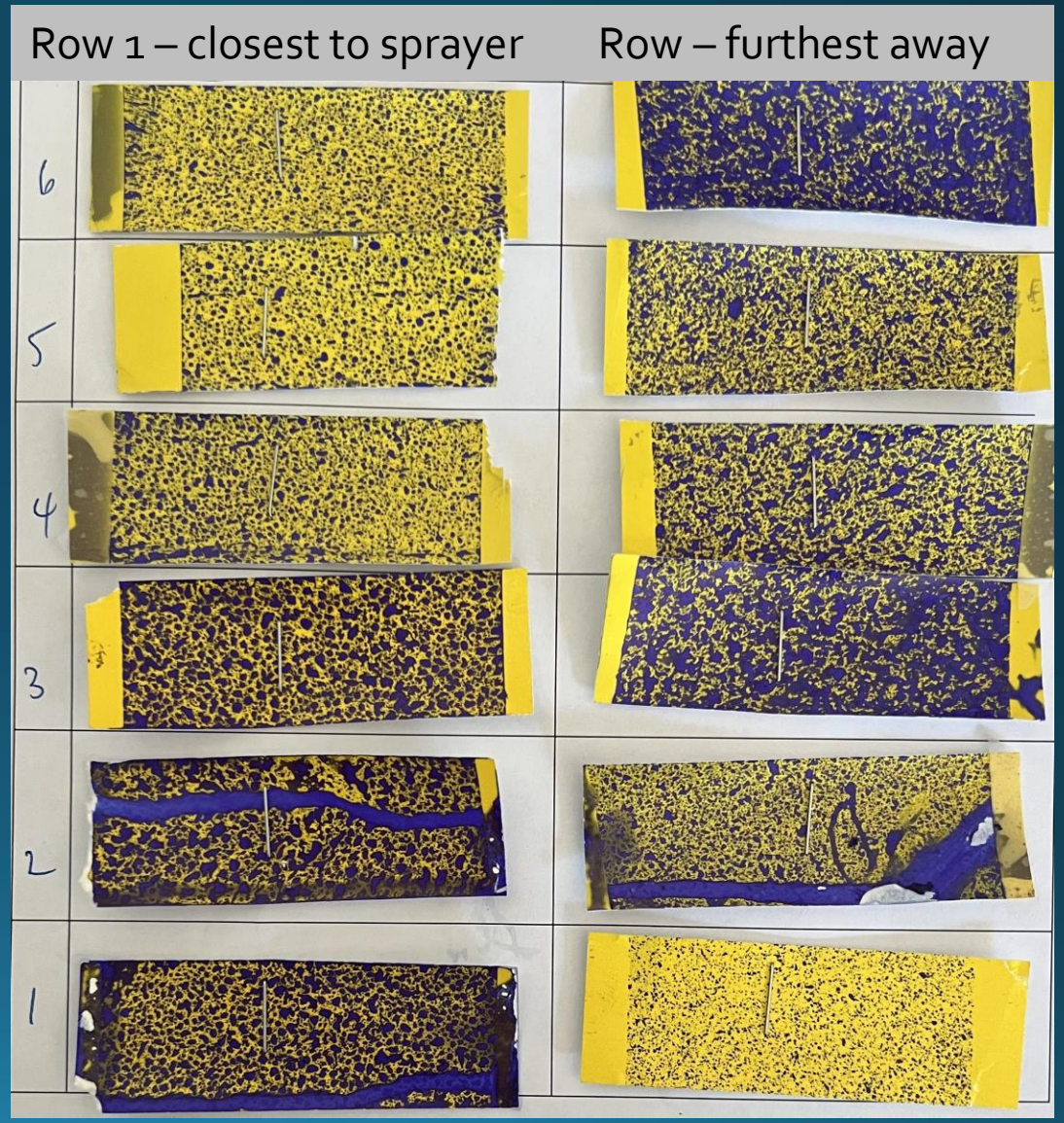


CARD 1 (0.5% Coverage): Few droplets - ineffective crop protection product results
CARD 2 (3% Coverage): Minimal droplets - minimal coverage provides minimal results
CARD 3 (30% Coverage): Numerous droplets - provides reliable results with most broad-spectrum products, but does will produce marginal results with target-specific or contact-only products
CARD 4 (50% Coverage): Quality coverage - maximises the opportunity for success and produces reliable results with nearly all crop protection products
CARD 5 (80% Coverage): Maximum coverage - some droplet runs from broken water tension between droplets and is required be select products that require outstanding coverage
CARD 6 (100% Coverage): Point of run-off - causes products to drip to ground as off-target deposition, though is necessary for certain pests and diseases

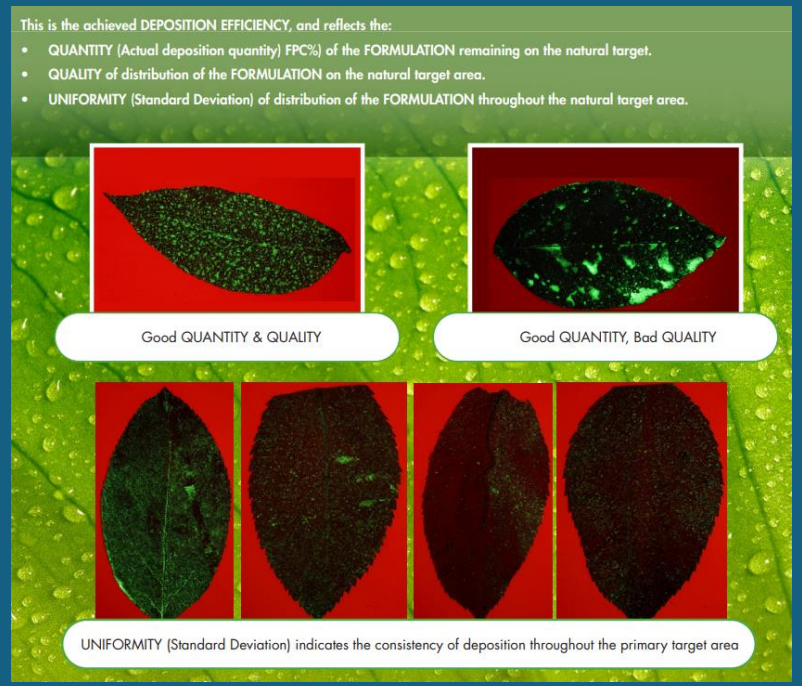
An example of an assessment in Almonds

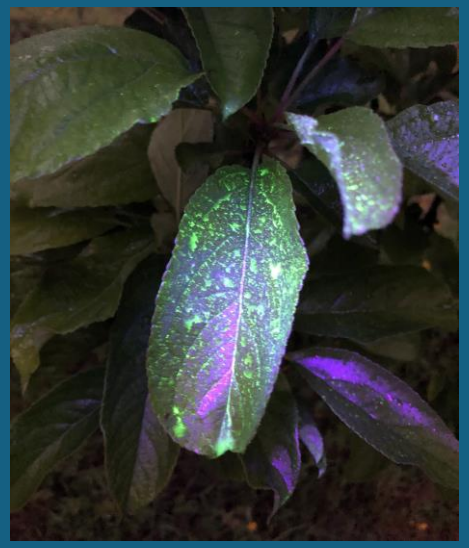
- Utilising a fixed-position spray pole, W/S papers every metre up the pole
- 5.5m tree height
- Full bloom at time of testing
- 2016 plantings, so going into 8th season
- Sprayer set up correctly (nozzle selection adjusted)
- Air delivery well matched for the crop
- 1500 L/ha, 6 km/hr, 7m rows, 6-bar spray pressure, hollow cone nozzles
- Average coverage score = 3.9*

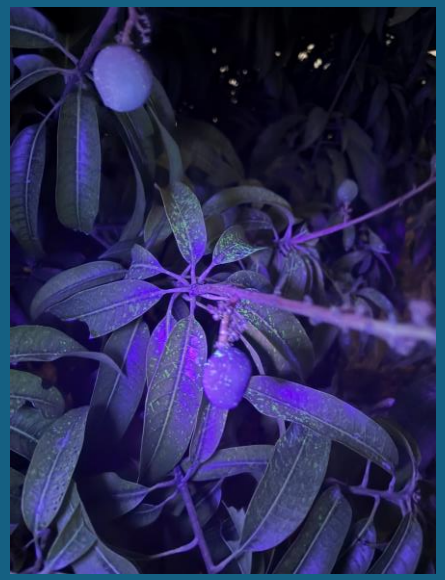
(No excess run-off, perfect for most fungicides & contact products)

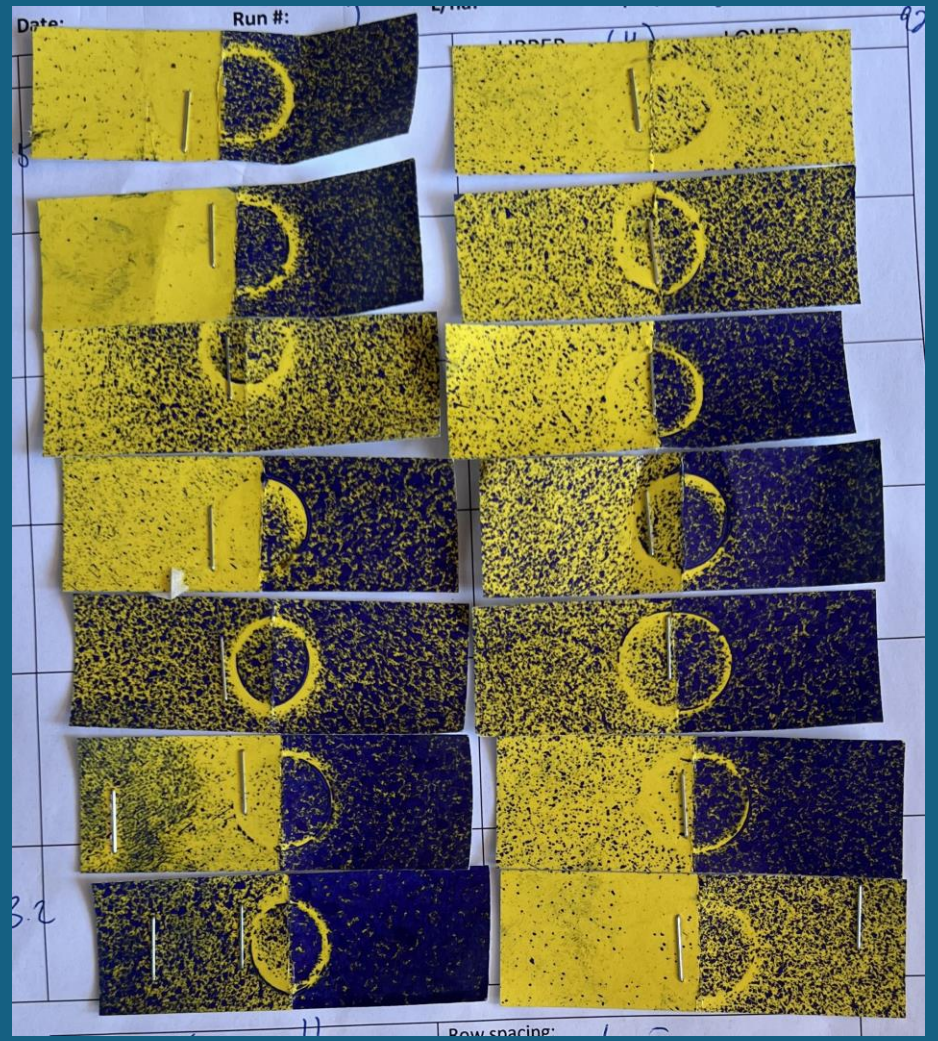


Methods for assessing spray coverage









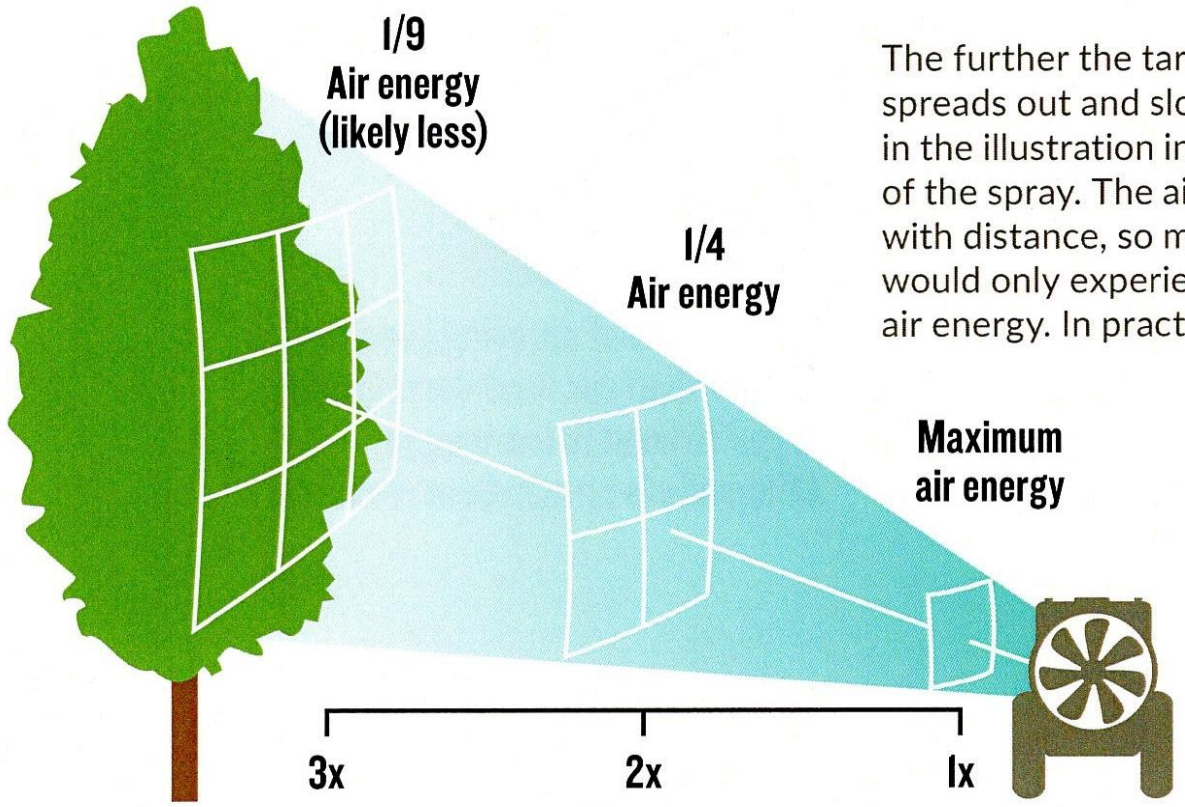
Above: A new product/method is available & will be tested this spring (2025) – it uses a dye formulation & software to evaluate coverage.

Right: Dye nights are very good for a look at spray coverage but can be subjective unless you know a little about droplet deposition.

Water sensitive paper allows repeat treatments in the same location to evaluate any changes & the effect

3 – Air performance & Travel Speed

Air energy



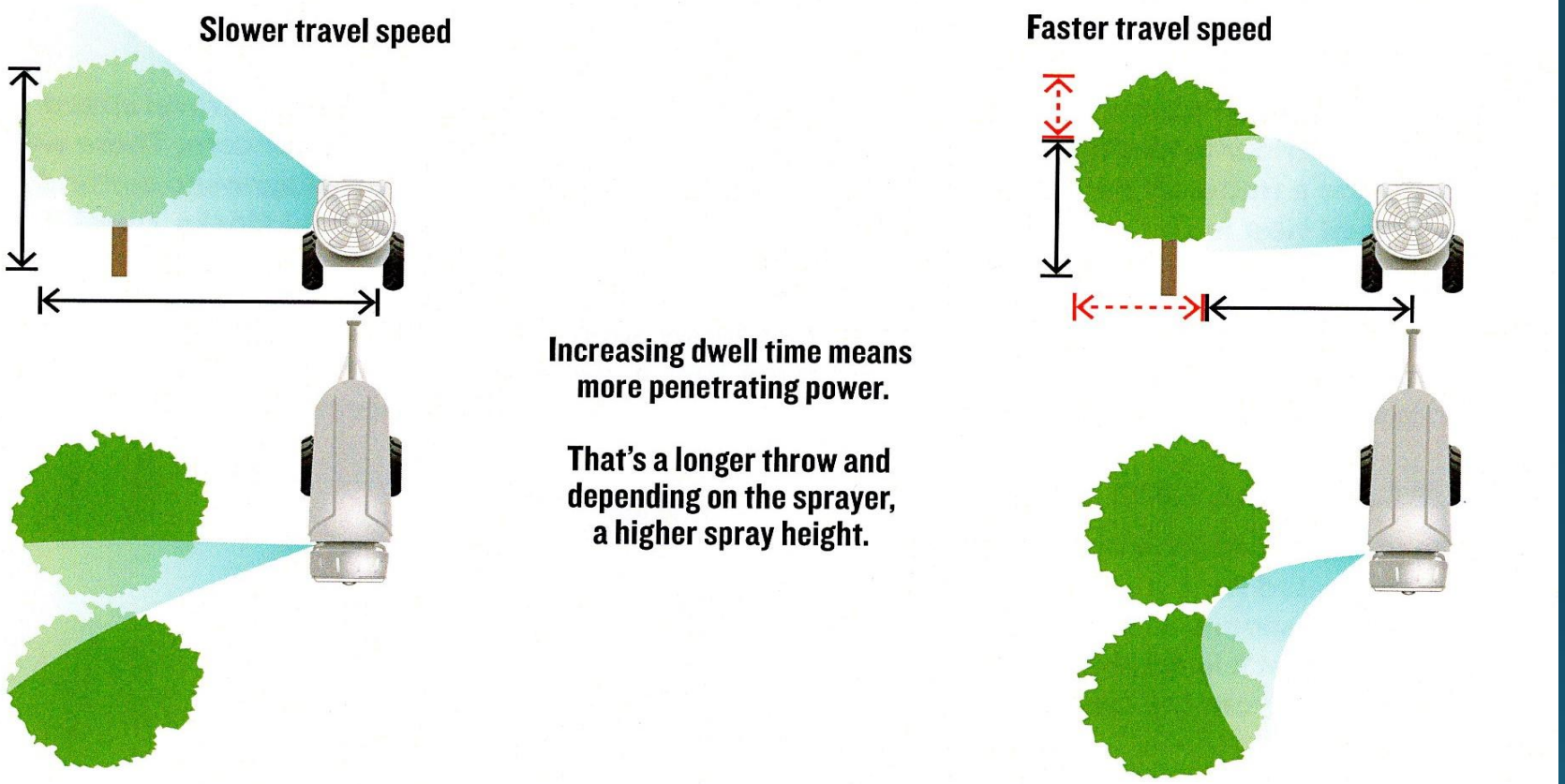
The further the target, the more the spray spreads out and slows down. The three stages in the illustration indicate the cross-sectional area of the spray. The air energy drops exponentially with distance, so mathematically the treetop would only experience a ninth of the original air energy. In practice, it would likely be less.

As trees get larger & denser in their canopy, air energy becomes increasingly important.

Be familiar with your sprayer's air performance in relation to your crop.

At right: 7m tall 30-year-old Almonds. Sprayer = 40" single fan. Max speed 4.5-5 km/hr

Travel Speed



Travel speed can be used to change the duration a target is in the air wash. Slowing down increases throw and spray height. Speeding up decreases throw and spray height. Spray height is more sensitive to travel speed with low profile radial sprayers.)

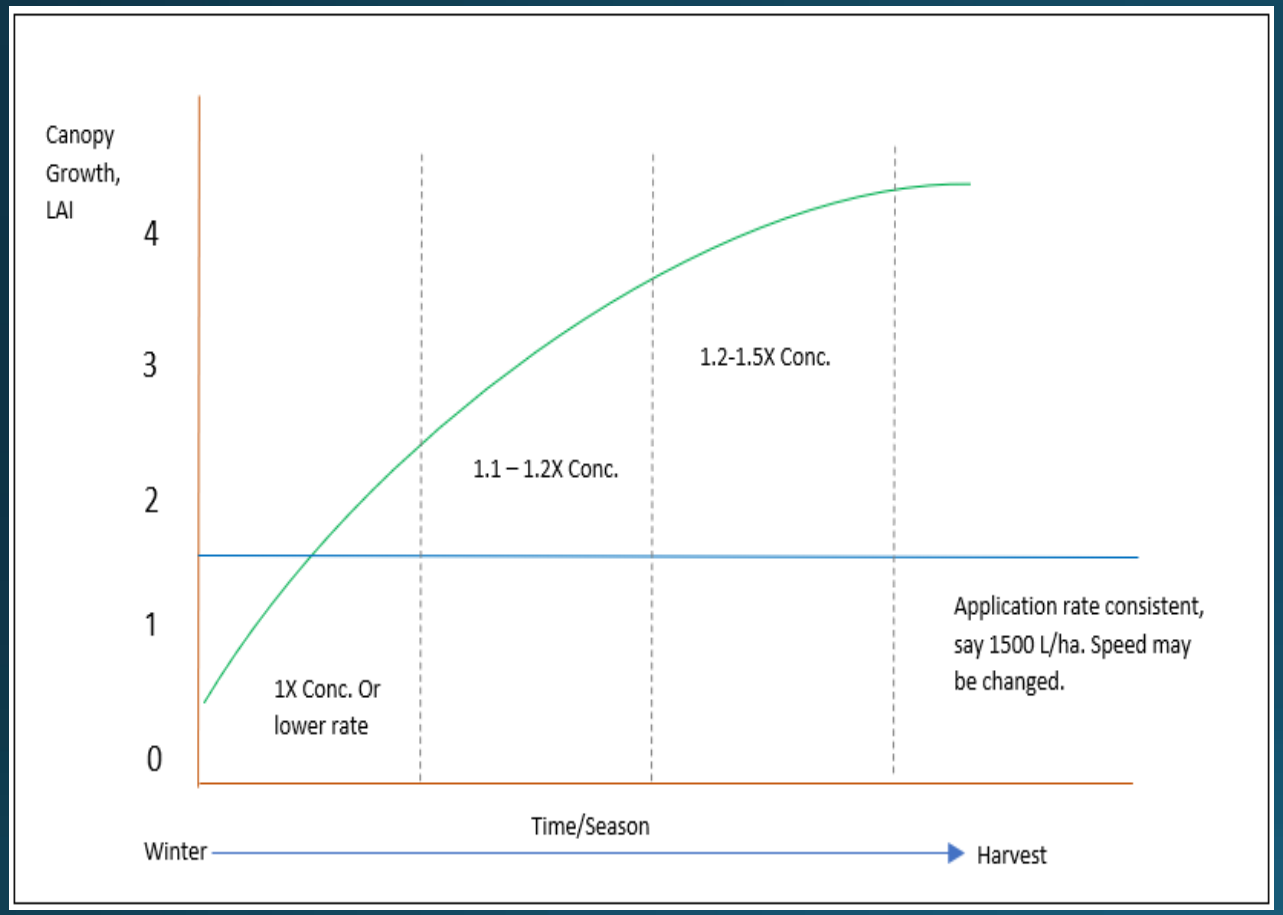
The effect on dwell time and coverage when speed increases

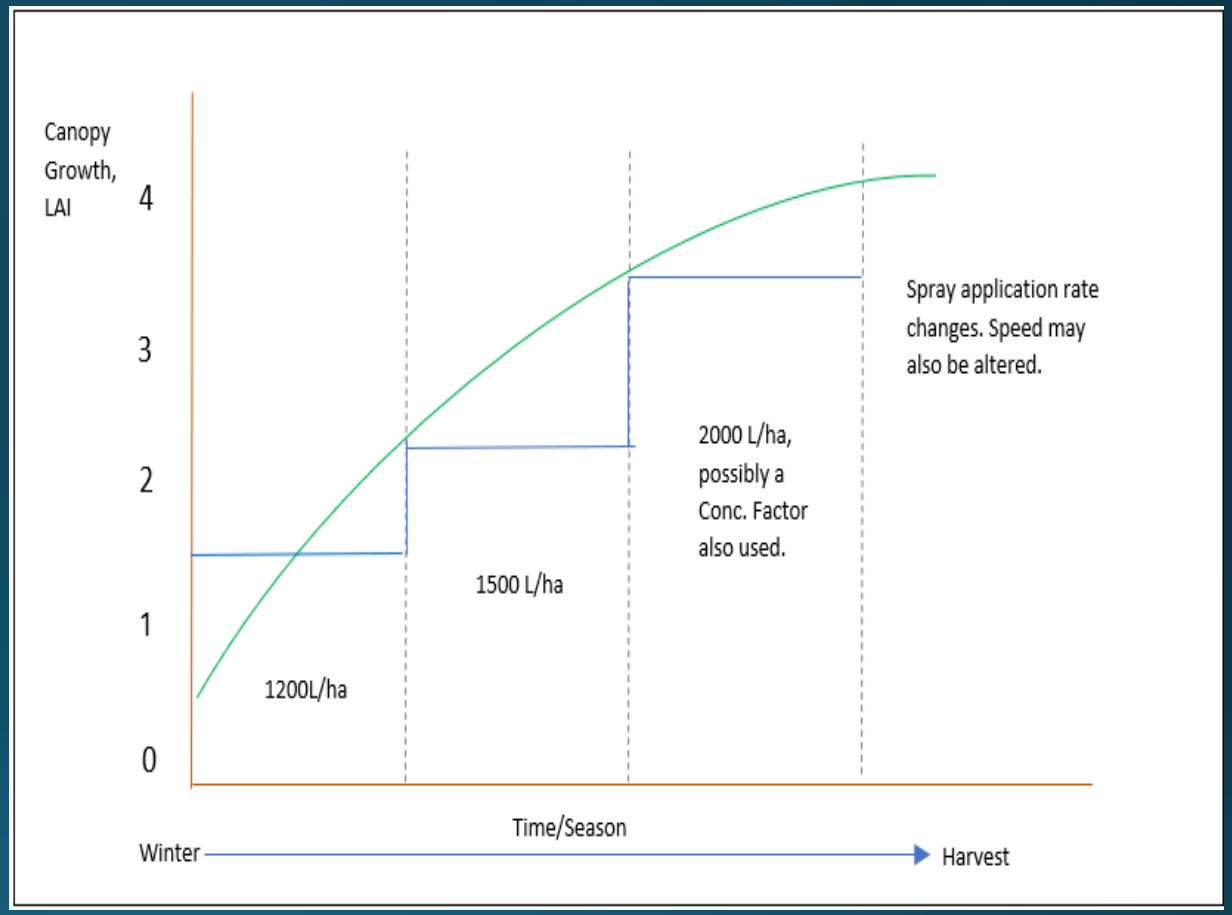
"if you halve your travel speed, you will double the effective air energy"

This is particularly relevant to larger trees

4 – Application rates, dilute and concentrate spraying

Canopy growth vs application





Different strategies to account for canopy growth may be used. Above examples could be for mature, full-crop Almonds. LAI can change from 0-4 in large trees over a season. **Coverage is the key.**

Dilute & Concentrate rates – in Almonds

www.Syngenta.com.au

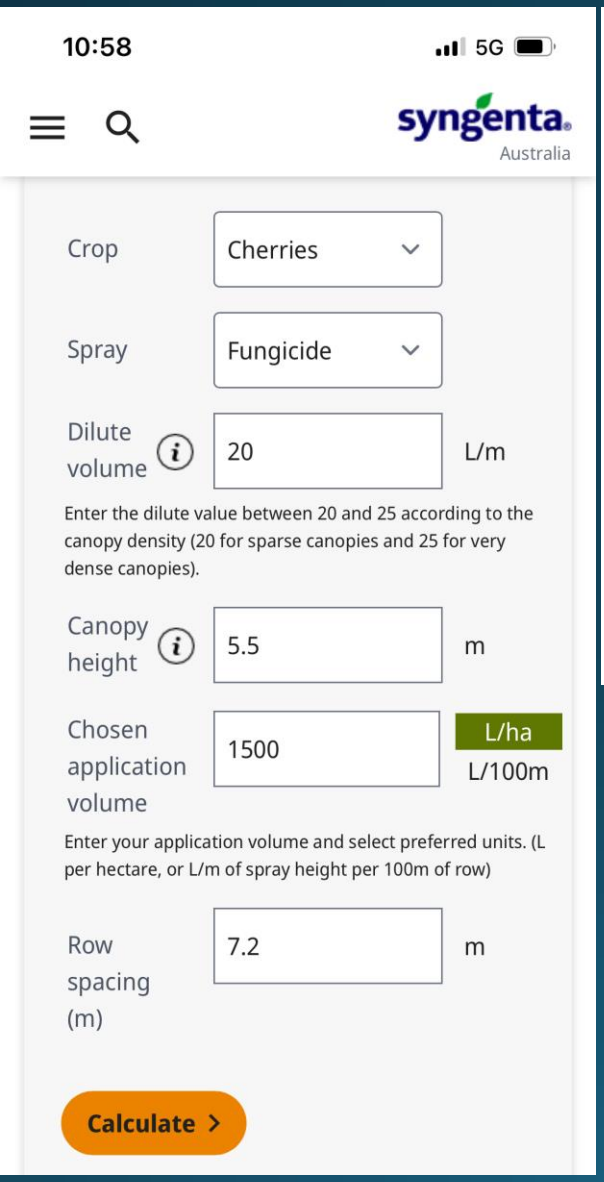
Spray coverage testing is the go-to method to "see" results, and make decisions about application rates, speed, nozzles etc

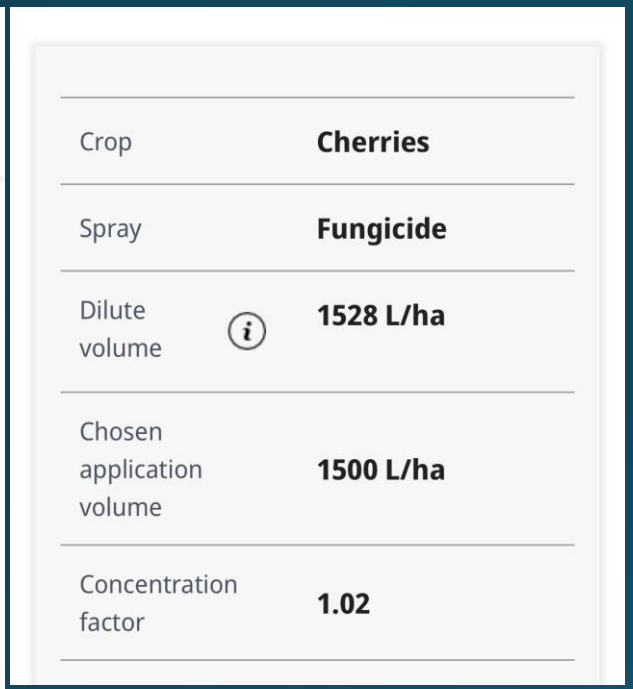
Notes:

Dilute application volume in the calculator is expressed in Litres per 100m of row for each metre of tree height – it varies according to the crop.

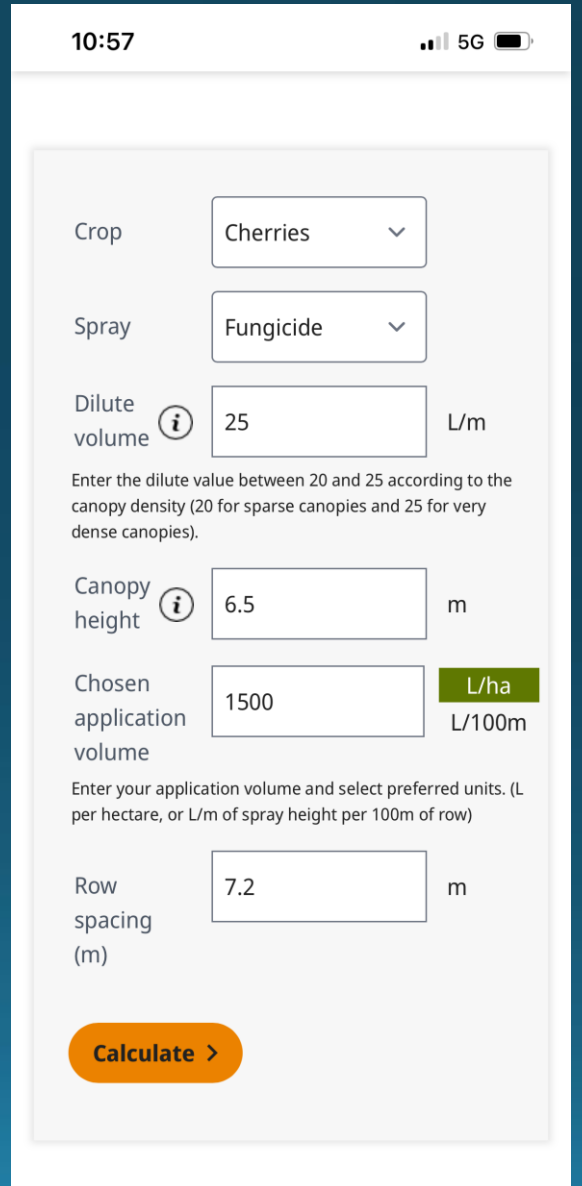
This is then used to estimate the dilute rate, and a suggested concentration factor, your trees may require when you enter the details of your tree height, row width, and current application rate.

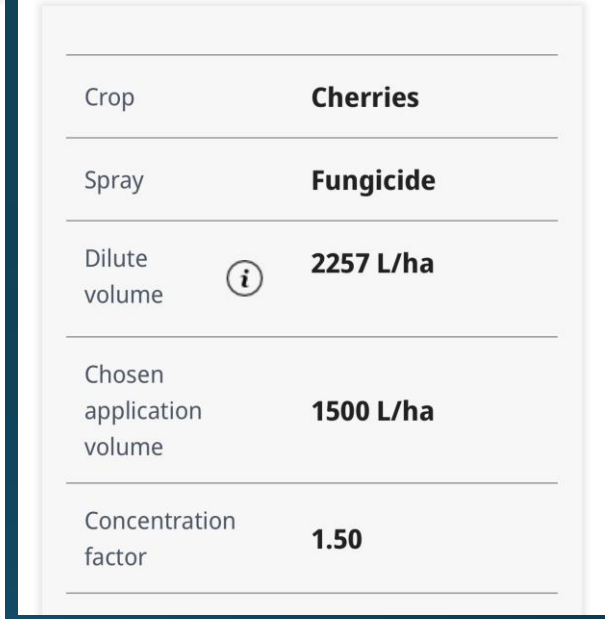
Dilute Calculation





- Example 1:
- 7-8 Year old trees
- 5.5m height
- 1500 L/ha target rate
- 20L dilute per metre of tree height per 100m row *(this number calculated on "sparse canopy)*





- Example 2:
- 25 Year old trees
- 6.5m height
- 1500 L/ha target rate
- 25L dilute per metre of tree height per 100m row *(this number for "dense canopy")*

Label example - Vertento

Vertento®
PLINAZOLIN® technology Insecticide

Key points:

- Maximum application rate in tree crops (excluding citrus) is 3000 L/ha dilute
- If concentrate spraying, know your dilute rate, and concentrate accordingly
- *Set up your sprayer to achieve even coverage through the canopy*
- Add a non-ionic adjuvant
- Can be used at up to (but not exceeding) 2.5X concentrate
- **ALWAYS READ THE LABEL**

Dilute application using rate per 100 L:

- Use a sprayer designed to apply high volumes of water up to the point of run-off and matched to the crop being sprayed
- Set up and operate the sprayer to achieve even coverage throughout the crop canopy
- Apply sufficient water to cover the crop to the point of run-off
- Avoid excessive run-off
- The required water volume may be determined by applying different test volumes, using different settings on the sprayer, from industry guidelines or expert advice
- Add the amount of product specified in the Directions for Use table for each 100 L of water
- Spray to the point of run-off, to a maximum of 4000 L/ha for citrus crops or 3000 L/ha for all other crops

Concentrate spraying:

- Use a sprayer designed and set up for concentrate spraying (that is a sprayer which applies spray volumes less than those required to reach the point of run-off) and matched to the crop being sprayed
- Set up and operate the sprayer to achieve even coverage throughout the crop canopy using your chosen spray volume
- Determine an appropriate dilute spray volume (See **Dilute Spraying** above) for the crop canopy
- This is needed to calculate the concentrate mixing rate

The mixing rate for concentrate spraying can then be calculated in the following way:
Example only

DO NOT exceed 150 mL of VERTENTO® insecticide per hectare per spray application.

Crop	Pest	Rate
Almonds	Carpophilus beetle (*Carpophilus* spp.)	**Dilute spraying** 5 mL/100 L plus non-ionic adjuvant Δ **Concentrate spraying** Can be used at up to 2.5X concentrate.

5 – Maintenance & Troubleshooting

Flushing & Cleanout

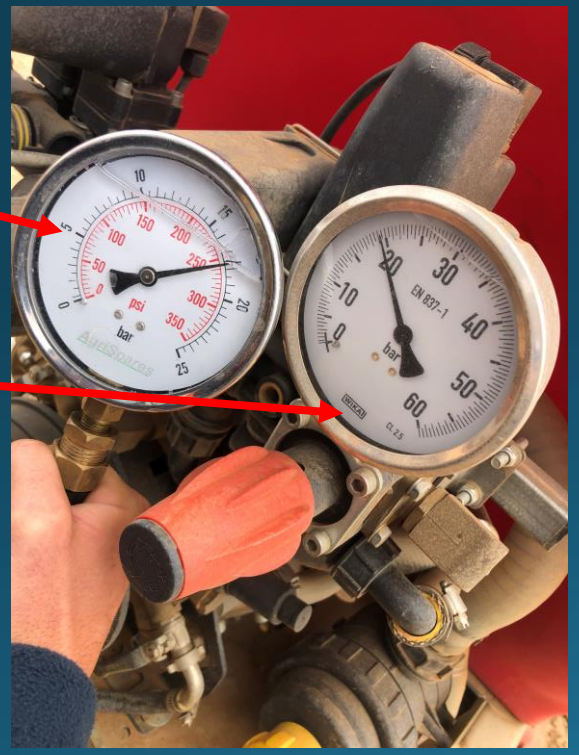
Do a thorough cleanout twice a year.

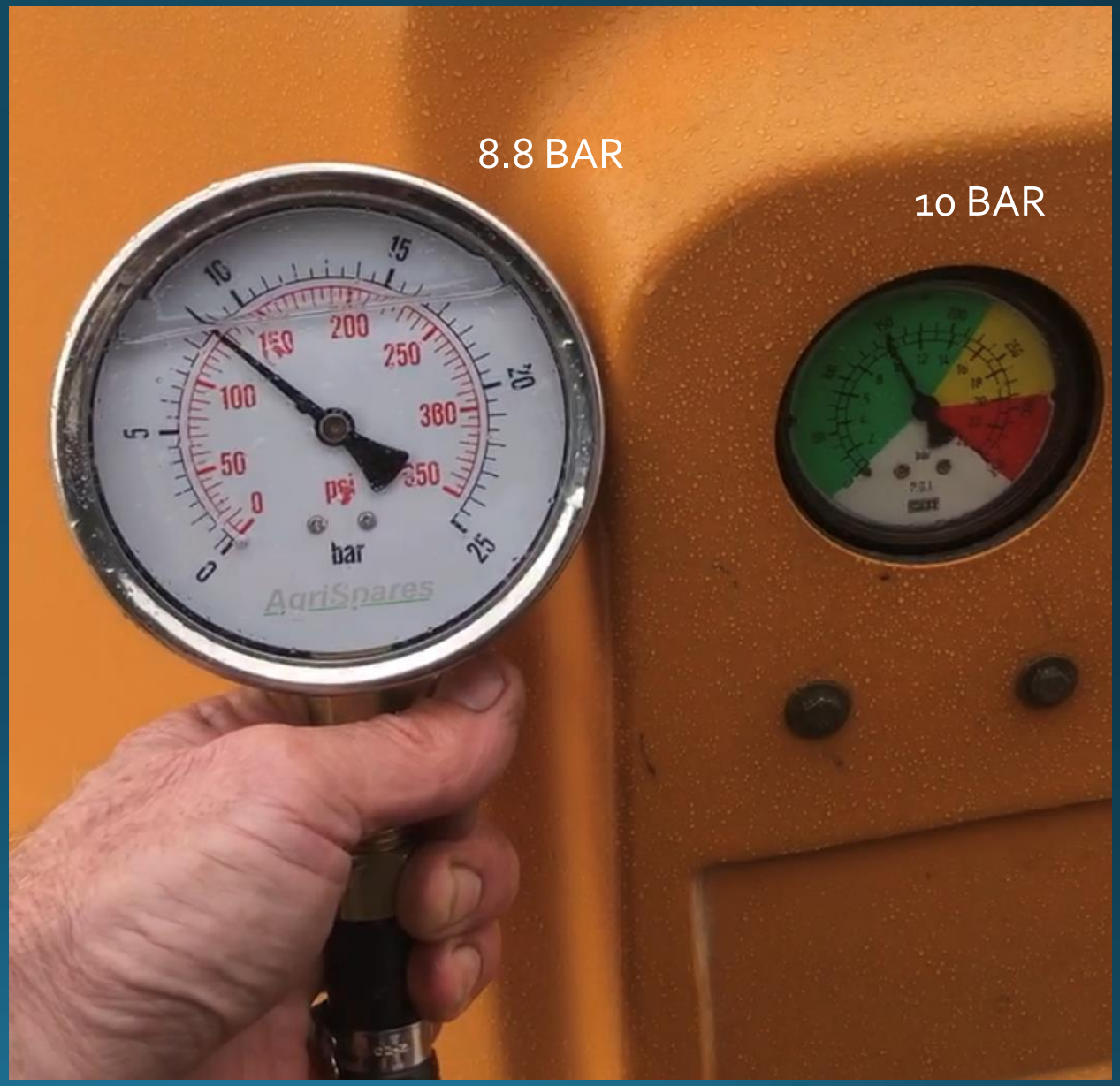
Liquid delivery

Flow and pressure loss – knowing your sprayer is important

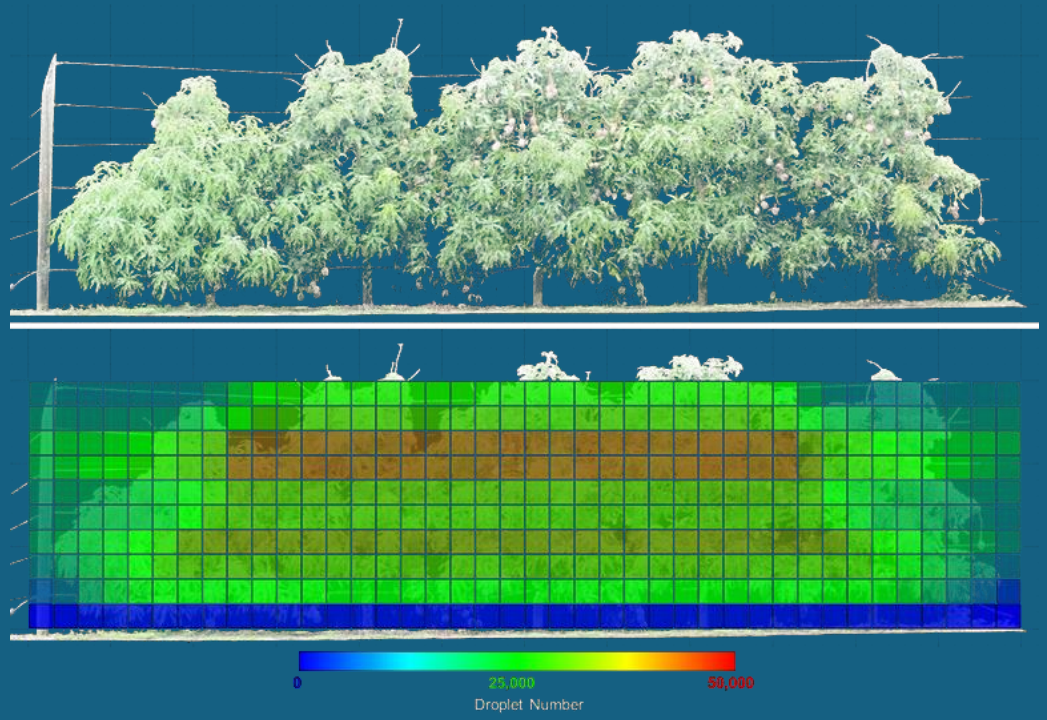
17.5 bar at nozzle

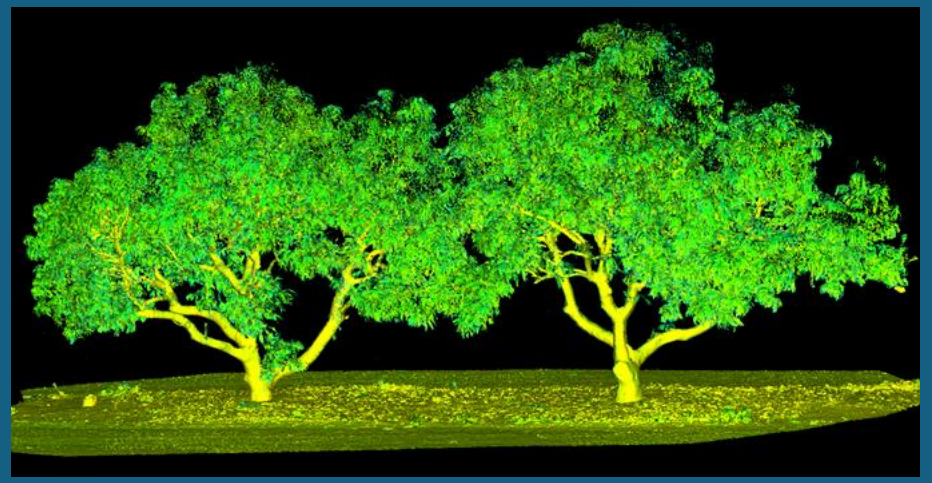
20 bar at spray manifold

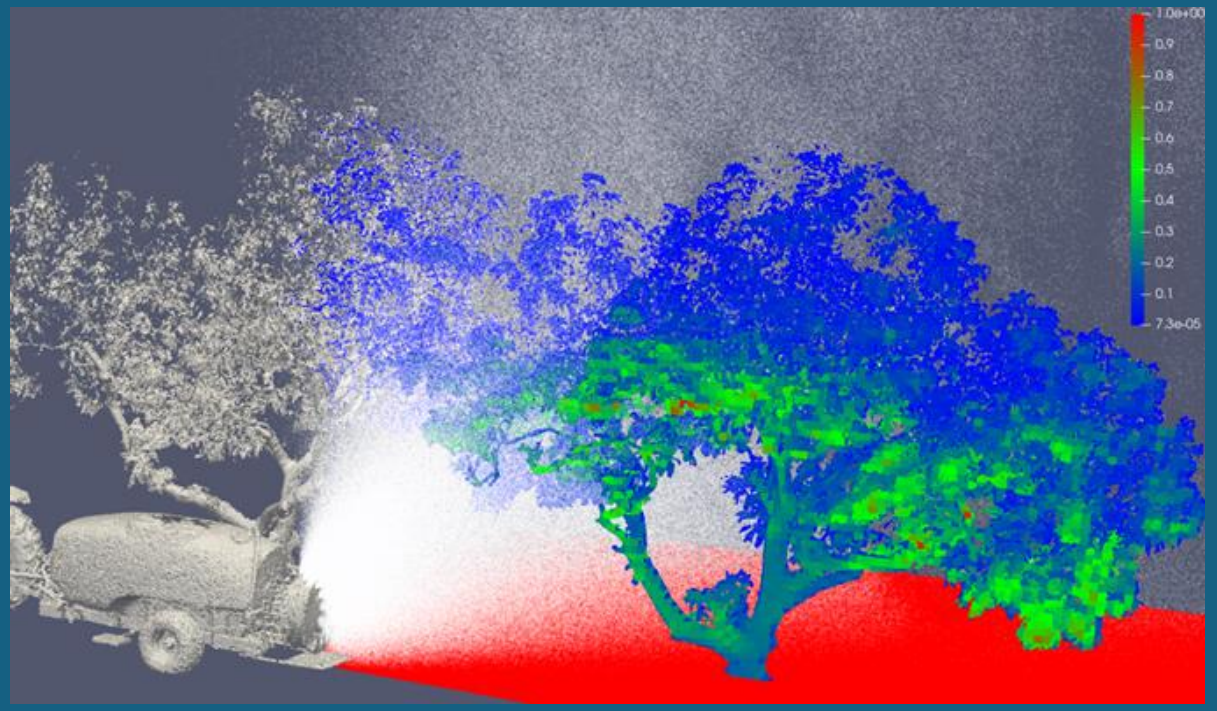




Research – the Digital Twin project







An exciting project, run by Dr Liqi Han to predict and allow computerised modelling of millions of droplets – where they will land, how to re-configure nozzle angle, pressure, fan adjustment and other parameters to heighten precision, reduce drift, lower residues and resistance, decrease pollution to waterways & the reef and improve community & worker safety.

Follow up discussions

If you wish to discuss any of the topics presented, I am staying on-site at the conference tomorrow and will be available for a chat in the foyer.

Hortspray:

E: don@hortspray.com

Ph: 0448 511 771

Questions and discussion

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