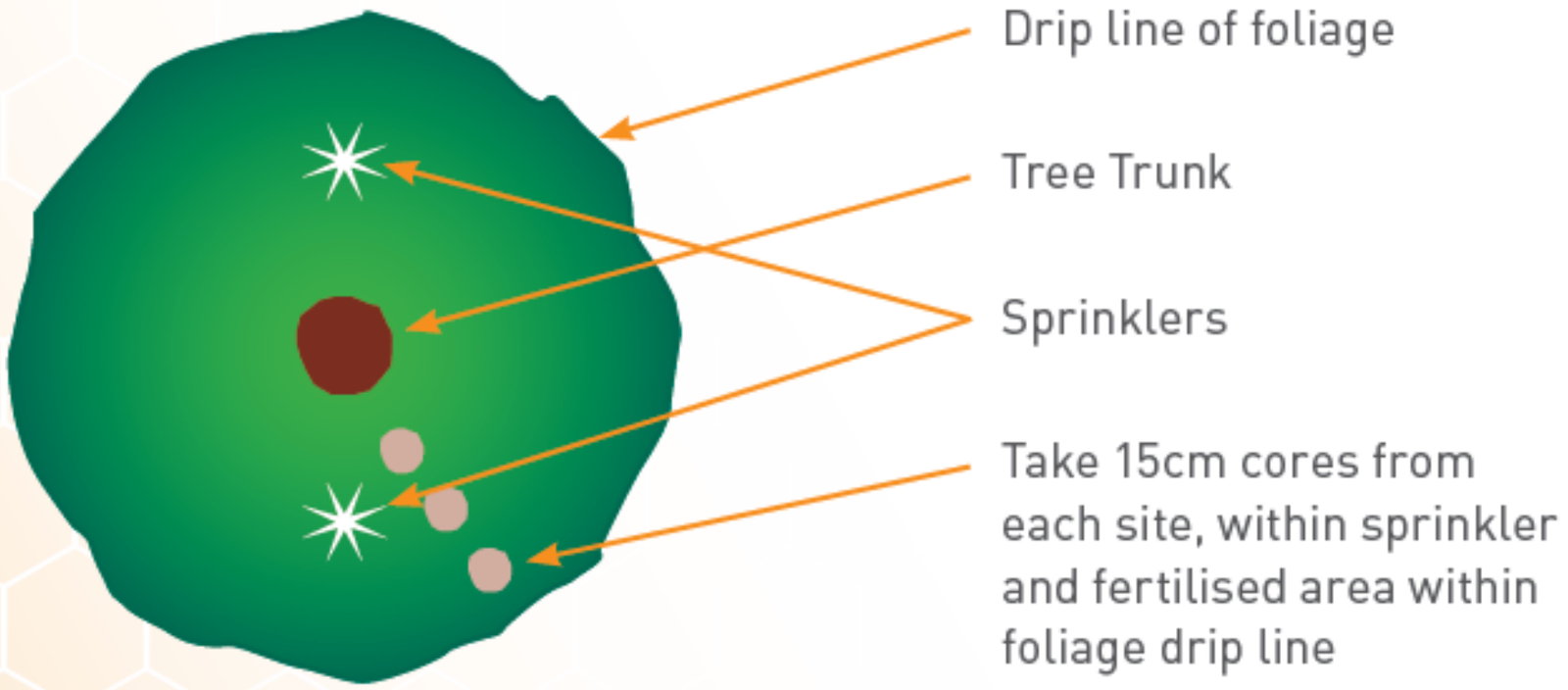
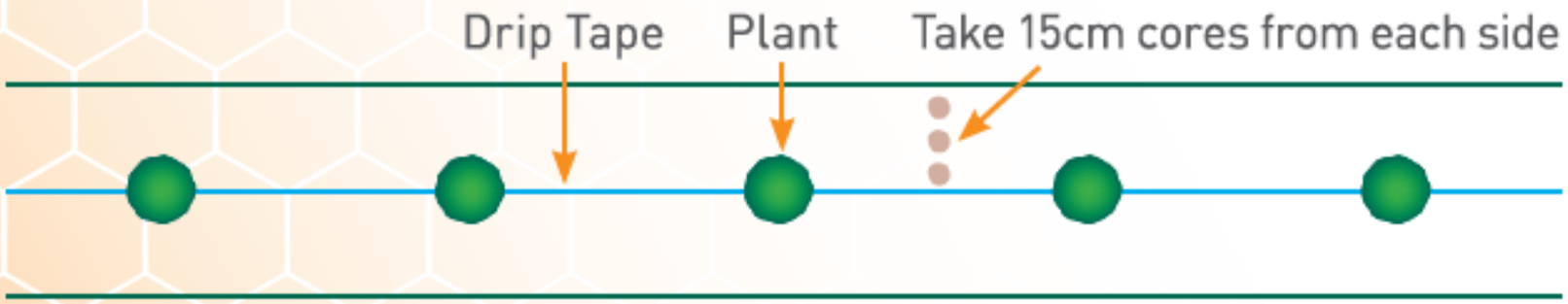
QUICKSOIL

SAMPLING MANUAL

TREE CROPS UNDER TREE SPRINKLERS



ROW CROPS



Sample at least 10 sites (30 cores) through the crop, mix very thoroughly, and send a 500g sub-sample to the laboratory.

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WHAT DO THEY SHOW

- Fast assessment for the availability of the major nutrients in the active root zone.
- Balance between the major nutrients.
- Shows the effect of irrigation practices and rainfall events on the EC and nutrient levels in the active root zone.

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Sample 3 cores across the wetted root zone at 10 sites across the block to 15 cm depth

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QUICK SOIL TESTS

- **EC** - BALANCE THE UPTAKE OF NUTRIENTS AND WATER
- **pH** - AFFECTS AVAILABILITY OF NUTRIENTS
- **NO3** - FOR VEGETATIVE GROWTH AND YIELD
- **Ca** - FOR CATION BALANCE AND QUALITY
- **K** - FOR YIELD AND QUALITY
- **Mg** - FOR SUGAR PRODUCTION
- **Na** - TO ASSESS SALINITY
- **Cl** - TO ASSESS THE EFFECTS ON NITRATE AND TOXICITY

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FRUIT QUALITY ISSUES

- CONTROLLED FILLING OF FRUIT REDUCES HOLLOWNESS
- INCREASE THE LEVELS OF CALCIUM IN FRUIT WALLS
- REDUCES SPLITTING OR SOFT FRUIT AFTER/DURING WET WEATHER BY MAINTAINING EC LEVELS

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WHY BALANCE NUTRIENTS IN THE ROOT ZONE

- Maintain consistent plant growth
- Optimise plant height
- Reduce rank vegetative growth
- Allow for even fruit setting
- Fill fruit evenly to improve internal quality
- Maintain availability of essential nutrients
- Reduce effects of adverse weather on fruit

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FACTORS AFFECTING ROOT GROWTH

- Physical structure, particle size, compaction
- Moisture content
- Salinity – EC
- PH and calcium content
- Phosphate concentration
- Soil temperature

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Losses from leaching and lockups

Any nutrients in solution can be lost through.

Exchangeable nutrients will be readily dissolved in acidic water

When the soil dries down, the concentrations of ions is solution increases and precipitation and crystallization can occur.

Changes also occur in the ratio of Cations that are exchanged to solution.

This can be seen by the different results that are obtained if samples are dried before extraction in soils with moderate to high ECEC

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EARLY GROWTH TO BUDDING

Consequences of Underwatering

Poor growth, reduced uptake of nitrogen and calcium.
Reduced vine growth.

Consequences of Overwatering

Leaching of base fertilizer, Increased susceptibility to root diseases like Pythium and Fusarium.
Lush vegetative growth and poor flowering.
Shallow Root System and susceptibility to sudden wilt later in the crop.

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FLOWERING TO EARLY FRUIT SET

Consequences of Underwatering

Small vines, low calcium & nitrogen uptake.
Falling flowers & dropping of small fruit under extreme circumstances.

Consequences of Overwatering

Excessive vegetation growth, poor flower and fruit set due to low sap sugars. Poor pollination.
Shallow root development.
Increased disease risk.

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FRUIT SET TO FRUIT FILL

Consequences of Underwatering

Small fruit size.
Dropping small fruit. Small vine, sunburn.

Consequences of Overwatering

Poor fruit set.
Excessive vine growth,
Poor flesh structure due to low calcium balance.

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MATURITY / HARVEST

Consequences of Underwatering

Small fruit, early maturity of young melons, sunburn, low yields

Consequences of Overwatering

Poor keeping quality, stem end break down, prone to ground rots, low sugars, slow to mature.
Soft fruit.

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FRUIT QUALITY

- Pre Harvest Management

- WATER (manipulating sugars)
- NO3 (reducing to harvest)
- K (adequately supplied)
- Ca (continuously available)
- Cl (used to reduce NO3)
- S + P (for color)

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NUTRIENT RATIOS AFFECTING FRUIT QUALITY

Ca/Mg	Affects the uptake of Potassium and Calcium if this ratio is low
NO_3/Cl	If chloride is high uptake of nitrate will be reduced
NH_4/NO_3	Where high levels of Ammonium are present it may be preferentially taken up and calcium uptake may also be reduced
Ca/Na	High levels of sodium in the soil solution will reduce the uptake of calcium and potassium

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Fertilizer Compatibility

Fertigation products

1. All calcium products must be used on their own
2. All phosphorus products must be used on their own
3. Nitrogen and sulphur products mix OK
4. Non compatible products can be used in the same irrigation following each other only

- Calcium nitrate **on its own**
- Calcium chloride **on its own**
- Gypsum **on its own**
- MAP **on its own**
- MKP **on its own**
- Urea sulfuric acid **Generally on its own**
    - Phosphoric acid, sulphate sources of micronutrients, muriate of potash, and other chloride containing materials
    - Injection port away form other fertilizers in the manifold

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Fertilizer compatibility

- **Do not mix any more than two of the following together (water quality can also dictate compatibilities).**
- Potassium Nitrate
- Magnesium Sulphate
- Potassium Sulphate
- Magnesium Nitrate
- Ammonium Nitrate
- Urea
- Sulphate of Ammonia
- Potassium Chloride

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Fertilizer compatibility

- **High Risk Products**
- 1. Hard Water (high Ca especially)
- Sulphate products won't mix
- Phosphate products won't mix (do NOT Fertigate in such conditions)
  - Phosphate precipitates out with the calcium and magnesium as pH rises
- 2. Gypsum has a solubility of 8-9% which means that no more than 10-
- 15kg/ha can be applied through a pd tank in any one irrigation.
- 3. Potassium Sulphate can be difficult to dissolve.
- 4. A 15 min flush at the tape should always be used after the fertiliser
- injection has finished.
- 5. White phosphoric acid less clogging risk than green

Fertilizer Compatibility

- **Blockages**

- 1. Mixing most calcium products with sulphate or phosphate products will block up filters.
- 2. Not applying an adequate flush after fertiliser injection will leave a residue and cause a blockage.
- 3. Gypsum can cause blockages if too much is pushed through without creating a proper suspension or solution.
- 4. Potassium hydroxide will block filters

Fertilizer Compatibility - P

- **4 main considerations with phosphates:**

- 1. Phosphorous and calcium, when in solution together, form di – and tricalcium phosphate which are insoluble forms of phosphate. This presents a clogging risk for irrigation lines. Calcium may be form fertilizers or from the irrigation water.
- 2. Phosphorous, ammonium nitrogen and magnesium, when in solution together, sometimes can form magnesium phosphates or magnesium ammonium phosphates, which are insoluble and can clog drip lines. Magnesium can be from fertilizers or from the irrigation water.
- 3. Phosphorous and ion, when in solution together, can form ion phosphates which are insoluble and can cause clogging of drip lines. However, most water contains low ion so his is a rare issue. Lowering the irrigation water pH will also reduce the risk of ion phosphate precipitation.
- 4. For ammonium ortho/polyphosphate materials and Monoammonium and Diammonium phosphates, irrigation water quality must be known prior to injection. These phosphorous materials will react with hard water to cause precipitates and clog the drip line.
    - Combined Ca and Mg must be below 50ppm
    - Bicarbonate should be less than 150ppm
    - Ca and Magnesium can be up to 75ppm if the bicarbonate is less than 100ppm with a neutral source of P

Fertilizer compatibility - K

- **Key points:**

- All potassium based fertilizers are water soluble
- Potassium sulphate might cause mealy substance if mixed with gypsum
- Potassium thiosulphate is compatible with urea and ammonium polyphosphate solutions in any ration.
- Potassium thiosulphate should not be mixed with any acids or acidified fertilizers
- Potassium thiosulphate mixed with UAN
    - Do jar test

Fertilizer compatibility - Ca

- Flush all irrigation apparatus after using calcium products
- Calcium should not be injected with any sulfate form of fertilizer as this combines to form gypsum and risks clogging the lines

Fertilizer compatibility

- **Foliar Fertiliser**

- 1. Do not mix any more than 500g/100L of sulphate based fertiliser in a tank on any crop unless previously tested.
- 2. Do not mix any more than 500g/100L of chelate based fertiliser in a tank on any crop unless previously tested.
- 3. Do not mix chelates and sulphate in a tank unless previously tested.
- 4. Do not mix any more than 3 different fertilisers in a tank.
- 5. If using fungicides and insecticides then drop the number of fertiliser so that there are not more than 5-6 (max) products in the tank.
- 6. Try to keep the pH of the tank around 6.
- 7. Copper Sulphate (max 100g/100L) should not be mixed with copper fungicides and should only be mixed with other sulphates totalling up to a maximum of 300g/100L as it is very touchy on most crops.

Fertilizer compatibility

Tank mixes – foliar applications

• Calcium Nitrate • Solubor • Sodium Molybdate • MAP/MKP • • Magnesium Sulphate • Zinc Sulphate • • Zinc Sulphate • Manganese Sulphate • Iron Sulphate	• Solubor • • Potassium Nitrate • Magnesium Sulphate • • Calcium Nitrate • • Urea • • All mixes can be substituted for with chelates or liquid/powder blends. • • Do not exceed the recommended rates on application tables in the manual.

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Fertigation applications:

Balance applications for demand

Fertigate at the end of irrigation or apply a small irrigation

Select compatible products and consider water quality

Little and often

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