FUTURE ORCHARDS TRIAL -
USE OF WETTING AGENT/ SURFACTANT TO IMPROVE WATER
PENETRATION AND DISTRIBUTION INTO DRY SOILS OR REPELLENT
SOILS

Prepared By - Julie Godwill, Elizabeth Mace,
Bhupinder Kaur, Petar Bursac
FUTURE ORCHARDS TRIAL

Contents
FUTURE ORCHARDS TRIAL OUTLINE ................................................................................................................. 2
1.  INTRODUCTION.............................................................................................................................................. 4
2.  OBJECTIVE ................................................................................................................................................... 4
3.  METHODOLOGY.............................................................................................................................................. 5
   A. Method of determining the soil texture by ribbon (Texture by feel) ......................................................... 5
   Figure 1: - Photos of the method of determining the soil texture by Ribbon technique .................................. 5
   Error! Bookmark not defined.
   Figure 2: - Flow Chart of the Ribbon method .................................................................................................. 5
   B. Method of applying surfactant in the field ..................................................................................................... 6
   Figure 3: Primary School Block. Example of Core. .......................................................................................... 6
4.  RESULTS....................................................................................................................................................... 7
   1. Soil texture results ....................................................................................................................................... 7
      Table 1- Results of the soil type of different sites ......................................................................................... 7
   2. Application of Surfactant results ................................................................................................................ 7
      Figure 4: River Block #2 Soil Penetration in organic rich soils. ................................................................. 7
      Figure 5: River Block#1, compacted clay on surface, minimal penetration. .................................................. 8
      Graph 1: Showing depth of penetration ....................................................................................................... 8
      Table 2: Showing depth of penetration ....................................................................................................... 9
      Table 3: Showing depth of penetration after applying Surfactant ............................................................ 9
5.  Summary ....................................................................................................................................................... 10
   Figure 6: Shepparton East Control after 1 min .............................................................................................. 11
   Figure 7: Shepparton East Product A after 1 min ......................................................................................... 11
   Figure 8: Grahamvale Control after 1 min .................................................................................................... 11
   Figure 9: Product A after 1 min .................................................................................................................... 11
6.  Benefits or Future Uses................................................................................................................................ 12
   Product Label ................................................................................................................................................. 13
   Product Label ................................................................................................................................................. 14
7.  REFERENCES: - ............................................................................................................................................ 15
**FUTURE ORCHARDS TRIAL OUTLINE**

<table>
<thead>
<tr>
<th><strong>Project Title:</strong></th>
<th>Proof of concept trial. Use of wetting agent/ surfactant to improve water penetration and distribution into dry soils or repellent soils</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region:</strong></td>
<td>Northern Victoria – Goulburn Valley</td>
</tr>
<tr>
<td><strong>Contact:</strong></td>
<td>Julie Godwill, Elizabeth Mace, Bhupinder Kaur, Petar Bursac</td>
</tr>
<tr>
<td><strong>Project Objective:</strong></td>
<td>Soil Wetting agents are designed to overcome water repellence in soils. Sandy soils, soils high in organic matter and potting mixes are the most likely to become hydrophobic. Soils that have low anaerobic activity will have a non-absorbance pooling affect when water is introduced. Surfactants reduce the surface tension allowing water to move into the soils through the pores. The purpose of this trial is to observe the effect of wetting agents and the depth of water penetration to different types of treated soil. Including assessing how this can be practically applied within an orchard management program.</td>
</tr>
</tbody>
</table>

| **Outline of Method:** | Six blocks in separate areas of east Shepparton to be assessed. Measurements and photographic evidence of vertical water distribution in apple and pear orchards to be recorded.  
At least two types of soil (clay loam and sandy clay) to be used for the trial. One sample being treated with a soil surfactant and one sample being water without surfactant to be used as the untreated control.  
Surfactant will applied at label rate using a spray unit and water applied after. A core sample of 15cms will then be taken and measurements of water movement through the soil will be observed and recorded.  
Photos of water distribution in the soil will be taken post application and 24hrs post application. |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------|
## FUTURE ORCHARDS TRIAL

**Milestones as defined by Petar Bursac**

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Planned Date or Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial Defined</td>
<td>30&lt;sup&gt;th&lt;/sup&gt; June 2016</td>
</tr>
<tr>
<td>Trial Set up</td>
<td>Summer 2017</td>
</tr>
<tr>
<td>Record of measurement 1</td>
<td></td>
</tr>
<tr>
<td>Field Day</td>
<td>June 6&lt;sup&gt;th&lt;/sup&gt; 2017</td>
</tr>
<tr>
<td>Record of measurement 2</td>
<td></td>
</tr>
<tr>
<td>Reporting</td>
<td>July 2017</td>
</tr>
<tr>
<td>Presentation to Growers</td>
<td>June/ July 2017</td>
</tr>
</tbody>
</table>

**Milestones as completed by J. Godwill, E. Mace and B. Kaur**

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Planned Date or Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial Defined</td>
<td>March 2017</td>
</tr>
<tr>
<td>Trial Set up</td>
<td>March 2017</td>
</tr>
<tr>
<td>Record of measurement 1</td>
<td>06/04/2017</td>
</tr>
<tr>
<td>Field Day</td>
<td></td>
</tr>
<tr>
<td>Record of measurement 2</td>
<td>07/04/2017</td>
</tr>
<tr>
<td>Reporting</td>
<td>May 2017</td>
</tr>
<tr>
<td>Presentation to Growers</td>
<td></td>
</tr>
</tbody>
</table>
1. INTRODUCTION

Soil Wetting agents are designed to overcome water repellence in soils. Sandy soils, soils high in organic matter and potting mixes are the most likely to become hydrophobic. Soils that have low anaerobic activity will have a non-absorbance pooling affect when water is introduced. Surfactants reduce the surface tension allowing water to move into the soils through the pores.

IrriGate is a commercially available soil surfactant specifically designed to enable water penetration on hydrophobic, clay and sandy soils. 20lt retails out at $195.25 or $9.76 per litre, with the recommended rate being between 2.5-10lt/ha through the irrigation lines. Using a mid-range rate of 5lt/ha it would cost the grower $48.81 to cover 1 ha.

2. OBJECTIVE

The purpose of this trial is to observe the effect of wetting agents enabling the depth of water penetration when applied different types of treated soil.

To prove the concept, soil texture will be determined and then soils will be treated with a soil surfactant Product A: Active Constituents: 180g/L Blended ethylene, propylene and glucose co-polymers which also contains 93g/L available carbon, will provide greater movement of water throughout the soil, cost benefits and assessing how this can be practically applied within an orchard management program.
3. METHODOLOGY

A. Method of determining the soil texture by ribbon (Texture by feel)

Figure 2: - Flow Chart of the Ribbon method
B. Method of applying surfactant in the field

The surfactant was applied at the rate of 2.5 litres /ha according to label recommendation via spray unit water was then applied to both the control and the input area. A core sample of 15cm was taken from both the input area and the control area the depth of vertical penetration measured in mm. A dry core sample was also taken for reference. The core was taken after an interval of ten mins then another core was taken from the same area the following day. The initial result showed deep penetration but after 24hrs the soil had dried to a point where there was no result to record. *Figure 3: example of core.*

**Figure 3: Primary School Block. Example of Core.**
4. RESULTS

1. Soil texture results
Dry samples were collected from 6 sites on 06/04/2017 and soil test for determining texture was held on 09/04/2017. Results from the soil test are given below in the table-1

Table 1 - Results of the soil type of different sites

<table>
<thead>
<tr>
<th>DATE</th>
<th>SITE</th>
<th>SOIL TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/04/2017</td>
<td>Grahamvale</td>
<td>Clay</td>
</tr>
<tr>
<td>09/04/2017</td>
<td>Shepparton East</td>
<td>Sandy Clay</td>
</tr>
<tr>
<td>09/04/2017</td>
<td>River Block # 1</td>
<td>Clay loam</td>
</tr>
<tr>
<td>09/04/2017</td>
<td>River Block #2</td>
<td>Silty Clay</td>
</tr>
<tr>
<td>09/04/2017</td>
<td>Primary School block</td>
<td>Sandy Clay Loam</td>
</tr>
<tr>
<td>09/04/2017</td>
<td>Orrvale</td>
<td>Clay</td>
</tr>
</tbody>
</table>

2. Application of Surfactant results
The areas that had the adjuvant then water applied at the recommended rate showed significant penetration into the soil with an approximate 45% greater penetration depth as opposed to the samples that had only water applied. This is in keeping with tech data supplied by the manufacture of Product A.

There was deeper penetration in the samples that had sandy and loamy attributes rather than the straight clay soil. This may be due to the more porous aspect of the soils, or the habit of clay soil taking time to absorb the water making it more difficult to wet during dry periods.

Organic rich soils such as River Block #2 showed a great level of absorption

Figure 4: River Block #2 Soil Penetration in organic rich soils.
FUTURE ORCHARDS TRIAL

Figure 5: River Block#1, compacted clay on surface, minimal penetration.

Graph 1: Showing depth of penetration
Product A: was applied to dry soil on 6 different sites, the growers told us which sites they felt were sandy, clay or loamy. The soil was the analysed by Bhupinder Kaur to determine the soil type.

Table 2: Showing depth of penetration

<table>
<thead>
<tr>
<th>Location</th>
<th>Grahamvale</th>
<th>Shepparton East</th>
<th>River #1 Clay Loam</th>
<th>River #2 Silty Clay</th>
<th>Block Sandy Loam</th>
<th>Primary school block Sandy Loam</th>
<th>Orrvale Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Type</td>
<td>Clay</td>
<td>Sandy Clay</td>
<td>Clay Loam</td>
<td>Silty Clay</td>
<td>Sandy Loam</td>
<td>Clay</td>
<td>Clay</td>
</tr>
<tr>
<td>Depth/ input in mm</td>
<td>30</td>
<td>120</td>
<td>30</td>
<td>100</td>
<td>120</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Depth/ water in mm</td>
<td>14</td>
<td>50</td>
<td>10</td>
<td>45</td>
<td>75</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>
5. Summary

In Summary, there was a significant difference in water penetration in the core samples that had the surfactant product applied vs. the control that had only water applied.

The time of absorbance of the input vs. control was visual; with the input soaking up the applied water much quicker than the control. This is evident in the photographs where there was a 1 min interval of absorption. This was an unexpected outcome and the results were not formally entered into the scope of the trial. See Figure 6-9
There are many orchards that do have areas of pooling in a range of soil types. A beneficial outcome for this problem would be widely adopted.

Further trials are relevant regarding the pooling issue. The 2016/2017 season was a wet season with many areas suffering from heavy water logging and the resulting issues included machine damage, anaerobic decay, soil born disease spikes and salinity burn.

The trial was conducted post-harvest and it was not feasible to ask the grower to turn on their irrigation for this trial.

Regarding the application, Petar had originally proposed to study the effect of horizontal dispersal when applied during peak watering periods and therefore try to rectify the issue of pooling in clay type soils as this is of concern to farmers with clay Goulbourn Valley soils

Further trials would need to be carried out when growers are actively watering and the product is able to be applied according to the labels directions through the drip line.
FUTURE ORCHARDS TRIAL

The obstacles faced during this trial were the lack of time for technical persons to be able to liaise with the growers and suitable sites to be found. Initially the aim was to observe the effect of this product being applied over the season and the benefits regarding fruit size, tree health and lateral growth to be recorded over the season. The effect on horizontal dispersal in orchards that have pooling issues would have been of great benefit.

6. Benefits or Future Uses

This and similar products, when assessed according to the data we could collect and the observations made by us conducting this limited trial, is a stand-up product particularly in times of low water allocation or extended dry periods.

By getting a 45% deeper water penetration you are effectively ensuring less transpiration and direct supply to the sub and laminar roots providing a “flood Irrigation” result that has been out dated but is still of great benefits to pear who benefit from deep watering.

In the outcome, there is an approximate 45% deeper penetration on the samples that had the product applied which is in line with the labels claim. See product label.
FUTURE ORCHARDS TRIAL

Product Label

KEEPS OUT OF REACH OF CHILDREN
READ SAFETY DIRECTIONS BEFORE OPENING OR USING

IrriGate™
Soil surfactant

Active Constituents: 180g/L Blended ethylene, propylene and glucose co-polymers.
Also contains 93 g/L available carbon.

(NB: This product is NOT a Polyacrylamide - PAM)

IrriGate is a specifically formulated soil surfactant that enhances infiltration
and penetration of irrigation water and rainfall in permanent and seasonal crops.

It is a blend of both hydrophilic and hydrophobic block co-polymers which improve water
movement and aid in adhesion to hydrophobic soil.

Ideal for use in centre pivot / lateral operations, orchards, vineyards, vegetables and
also in turf and sports fields.

Distributed by: Agricrop Pty Ltd ABN 84 100 473 309
255 Fort Road, Hindmarsh, South Australia, 5007
Telephone: 07 3348 4113 Facsimile: 07 3348 2702
www.agricrop.com.au

AGRICROP
FUTURE ORCHARDS TRIAL

Product Label

GENERAL INSTRUCTIONS:
IrriGate Soil Surfactant may be applied through any type of irrigation system. It will not burn foliage. Ideal for use in centre pivot, lateral operations, vineyards, tree crops, vegetables, row crops, potatoes, tomatoes and as a general purpose soil surfactant in turf and sport fields.

Situation                                      Ratio          Critical comments
Injection through irrigation systems           2.5 - 10        Apply through any type of irrigation system
Conventional sprayers                           2.5 - 10        Irrigation or rainfall should follow application.
Translucent Pack                               1 L per 1000 L of transparent water     Apply with first watering after transplanting.
Irri Gate Liquid                               5 - 10          Apply with boom spray or through irrigation water. Initial application of 10 L/ha with following applications of 5 L/ha every 4-6 weeks.
Garden beds and pot plants                     30 ml per 1 L water mixed with 20 ml Surfactant

WITHHOLDING PERIOD: NIL

PROTECTION OF WILDLIFE, FISH, CRUSTACEANS AND ENVIRONMENT
DO NOT contaminate streams, rivers or waterways with the chemical or used containers.

STORAGE AND DISPOSAL
Store in the closed, original container in a dry, cool, well-ventilated area out of direct sunlight. Always keep cover on containers before disposal. Add surfactant to mixing solution. DO NOT dispose of unlabelled chemicals on site. Dispose of the unwanted cleaning material in a marked disposal pit if recycling, replace cap and return clean containers to recycler for designated collection point. If not recycling, break, crush or puncture and bury empty containers in a local authority landfill. If no landfill is available, bury containers below 300 mm in a disposal pit sufficiently set up for this purpose. Clear of waterways, desirable vegetation and tree roots. Empty containers and product should not be burnt.

In case of emergency Phone: 1800 033 111, Australia wide 24 hours.

PRECAUTIONARY STATEMENTS
CAUTION - MAY CAUSE IRRITATION, DO NOT GET IN EYES.
AVOID BREATHING VAPORS OR MISTS.

Avoid using product in a manner as to directly or through drift, expose workers or other persons. Always consult the SDS for specific instructions.

When opening the container and preparing the solution wear cotton overall, banded to the nose and ears and a washable hat, allow length PVC gloves and goggles. When using the prepared solution wear elbow-length PVC sleeves and gloves. If product in eyes, wash it out immediately with water. Wash hands after use. After each days use, wash gloves, goggles and contaminated clothing.

FIRST AID MEASURES
EYE CONTACT: DO NOT RINSE EYES. Immediately flush eyes with large amounts of clean water for 15 minutes lifting the lower and upper lids. Seek medical attention if necessary.
SKIN CONTACT: Remove contaminated clothing and immediately wash affected area with large amounts of water for at least 5 minutes. If irritation or rash persists, seek medical attention as required.
INHALATION: Give large amount of water to drink. Seek medical attention if necessary. Induce vomiting only upon advice from a physician.
INHALE: Allow individual to fresh air and check to ensure adequate respiration. Seek medical attention if necessary.

POISONING: If poisoning occurs, contact a doctor or Poisons Information Centre (Tel: Australia 13 11 26).

SAFETY DATA SHEET
Additional information is listed in the Safety Data Sheet (SDS) that can be obtained from the supplier or by visiting the AgriCrop website on www.agricrop.com.au

CONDITIONS OF SALE:
"AgriCrop Pty Ltd" (AgriCrop) shall not be liable for any loss, injury, death or other consequences of any sort in connection with the sale, supply, use or application of this product. This product is not an ingredient used in the manufacture of any products. This product is not an ingredient in any material. No representative of AgriCrop has any authority to sell or alter these conditions.

DANGER
CAUSES SERIOUS EYE DAMAGE

When eye protection
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue Rinsing. Immediately call a POISON CENTRE or doctor/physician.
FUTURE ORCHARDS TRIAL

7. REFERENCES: -