



**LawrieCo**

Improving water efficiency &  
productivity through soil health  
and fertigation

# Farming in Australia today

Smarter, more efficient farming methods are necessary to ensure profitable, sustainable farm enterprises and overcome the **key concerns** we see on farms we work with.



RONI is a numbers man. We refer to RONI to understand how efficient and effective fertiliser applications are, in terms of nutrient uptake by plants and crops.

RONI tells us when there is room to improve the effectiveness of fertiliser applications and increase the return on nutrient investment. There is lots of room to improve RONI, which in turn directly affects the bottom line for farms we work with.

For example the phosphorus efficiency of the major southern Australian broad acre farm enterprises varies considerably from extremely poor (5-15% for some horticultural enterprises), through poor (20-40% for grazing industries), to moderate (45-60% in cropping enterprises).

*Simpson R, Senior Research Scientist, Plant Industry, CSIRO, [wwwtheconversation.com](http://www.theconversation.com)*

## Meet RONI aka Return On Nutrient Investment

## Meet ROWI aka Return On Water Investment



# Farming in Australia today

## Water scarcity and the changing climate

It is widely accepted that water is the most universally limiting factor in Australian agricultural production systems.

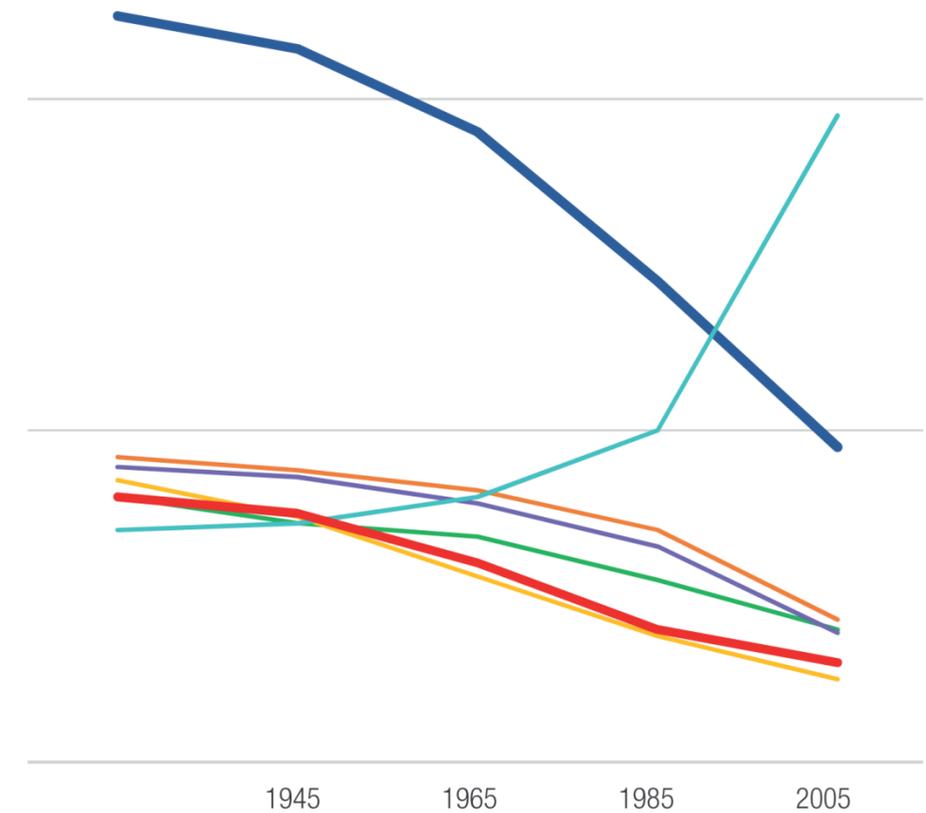
The value of water is increasing and over recent years growers across most of Australia have suffered from unreliable rainfall.<sup>2</sup>

## Growing more with less

In the past decade there has been a 13% reduction in the land used for agricultural production in Australia.<sup>1</sup>

## Declining soil quality

It is widely accepted the state of soil health in Australian agriculture has declined significantly over the past century.<sup>3</sup>



80 Years of Soil Health Indicators Department of Primary Industry Vic Research Station

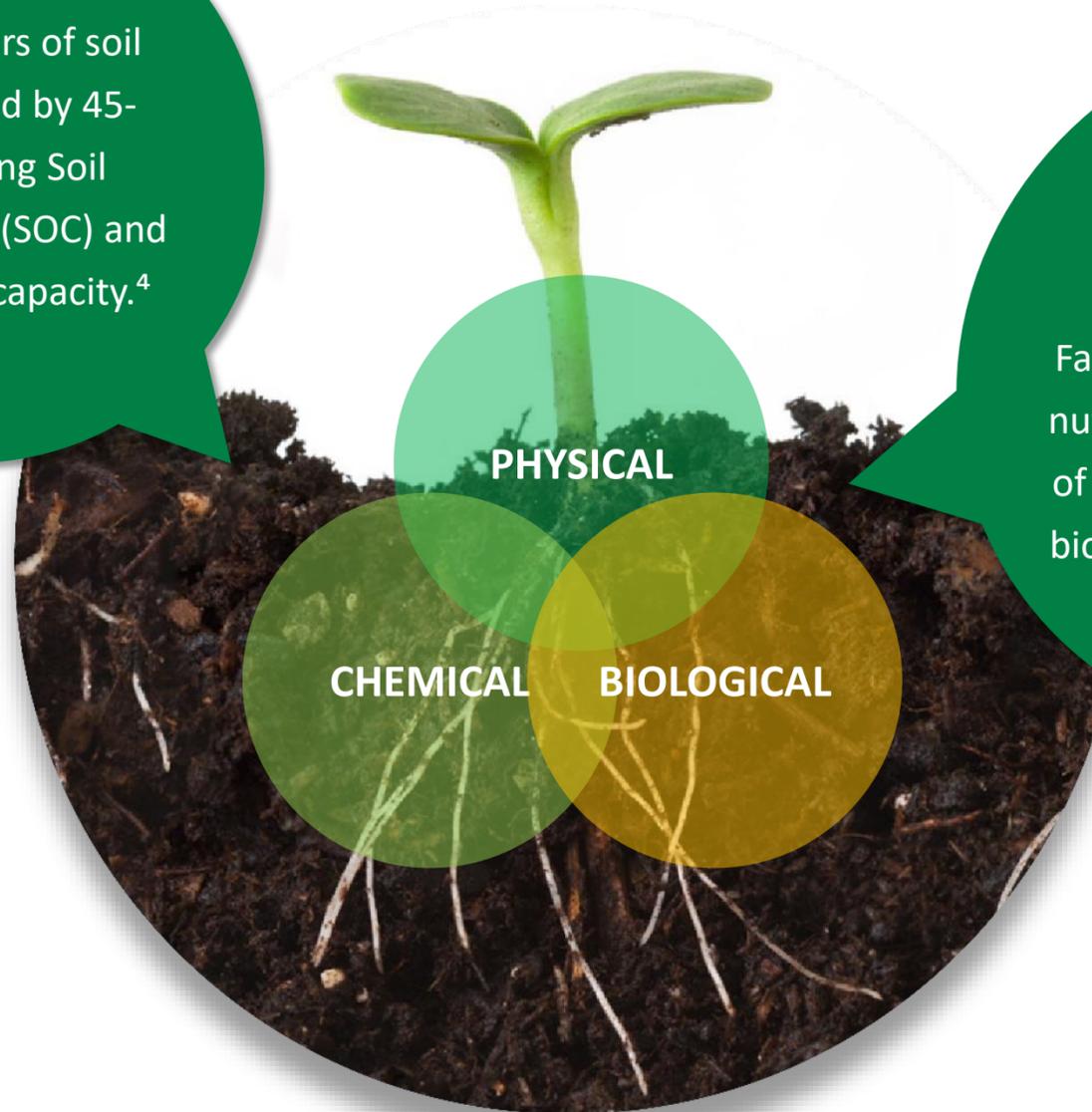
Soil Health Indicator	1925	2005	
Soil Organic Carbon	2.25%	0.95%	58% Decline
% of Optimum			
Macroaggregate Density	80%	35%	Drop of 45%
Water Holding Capacity	80%	30%	Drop of 50%
Trace Element Load	85%	20%	Drop of 65%
Fungal Load	90%	40%	Drop of 50%
Bacteria Load	70%	200%	Increase of 130%
Soil Compaction	90%	38%	Drop of 52%

1. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/7121.0> 2. <https://www.csiro.au/en/Research/AF/Areas/Sustainable-farming/Soil-water-landscape/WUE-Initiative> 3. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/7121.0> 4. Australia - State of the Environment 2016 <https://soe.environment.gov.au/download/reports>

# For any grower, Soil is our greatest asset

From our experience if you build soil quality it is one of the fastest ways to address the key concerns on farms in Australia.

Over 80 years all Seven indicators of soil health dropped by 45-65%. Including Soil Organic Carbon (SOC) and water holding capacity.<sup>4</sup>



## Balancing act

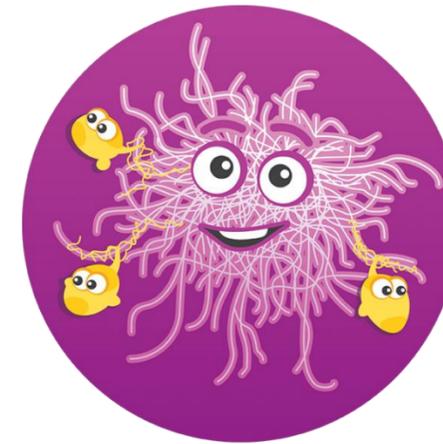
Farms we work with balance the nutrient (chemical) requirements of high level production with the biological processes of the soil to optimize soil quality.

# Key soil health indicators influence Soil Structure and resulting Water Use Efficiency



CARBON AKA CA BON'

Soil Carbon increases soil water storage and water availability to plants. And improves the stability of soil structure.<sup>5</sup>



FUNGI AKA FUN-GUY

**FUN-GUY FACT**  
A single gram of soil can contain several kilometres of fungal hyphae<sup>7</sup>

Biological processes improve soil structure by producing substances that chemically and physically bind soil particles into micro-aggregates.  
The hyphal strands of fungi can cross-link soil particles helping to form and maintain aggregates.<sup>7</sup>

5. Australia - State of the Environment 2016 <https://soe.environment.gov.au/download/reports>

7. Fact Sheet – Soil Biological Fertility [www.soilquality.irc.au](http://www.soilquality.irc.au)



## The importance of Microbial Balance

Microbial biomass makes up the living component of soil organic matter and it is mainly composed of fungi and bacteria.

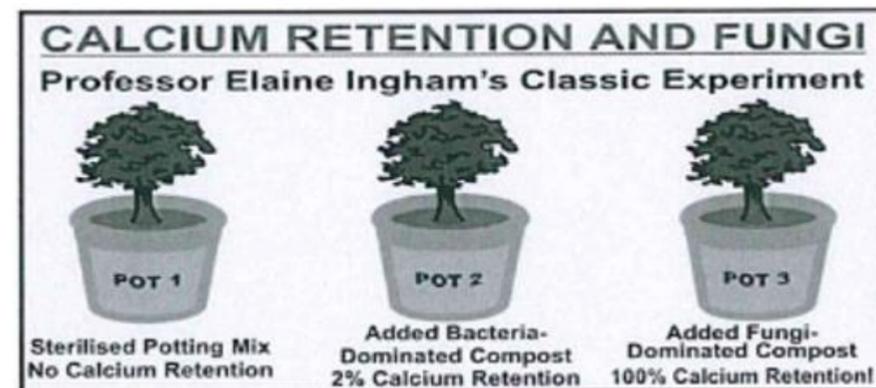
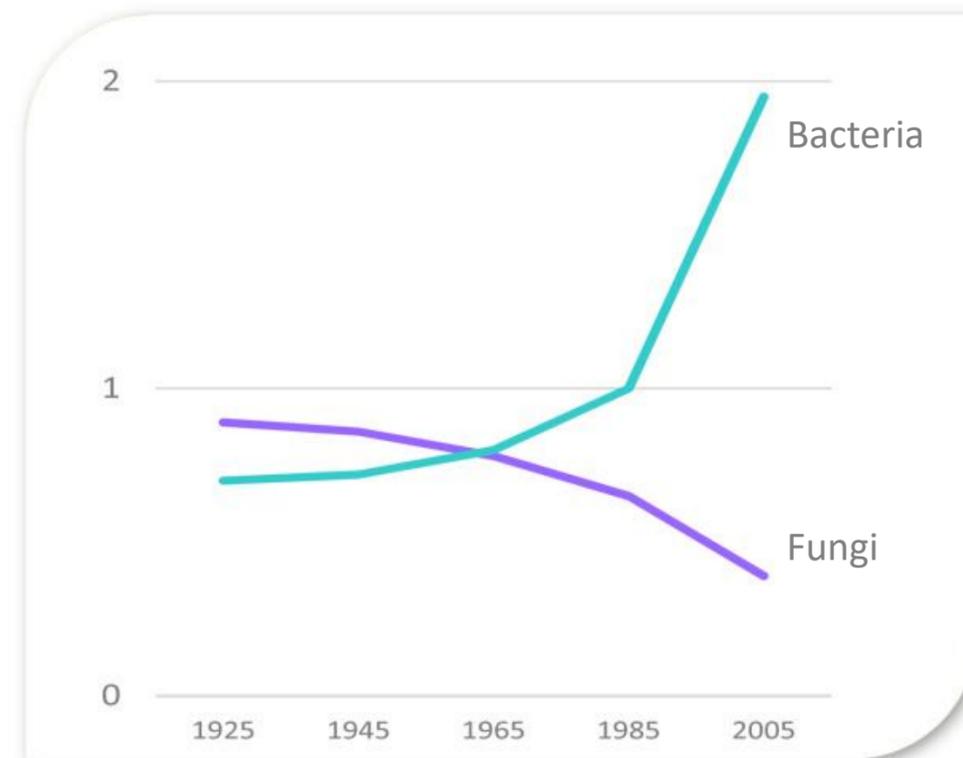
Fungi and bacteria degrade plant residues differently and have different roles in the recycling of nutrients.

Fungi are generally much more efficient at assimilating and storing nutrients than bacteria, including carbon.

Fungi and bacteria differ in their responses to changes in agricultural management practices; Fungi are more sensitive and low levels represent reduced soil biological health.

The fungal-to-bacterial ratio is therefore a good indicator of environmental changes in the soil. Most plants benefit from a 1:1 ratio or fungal dominance.

Prof Lyn Abbot, UniWA, [www.soilhealth.com](http://www.soilhealth.com)



## Better soil quality

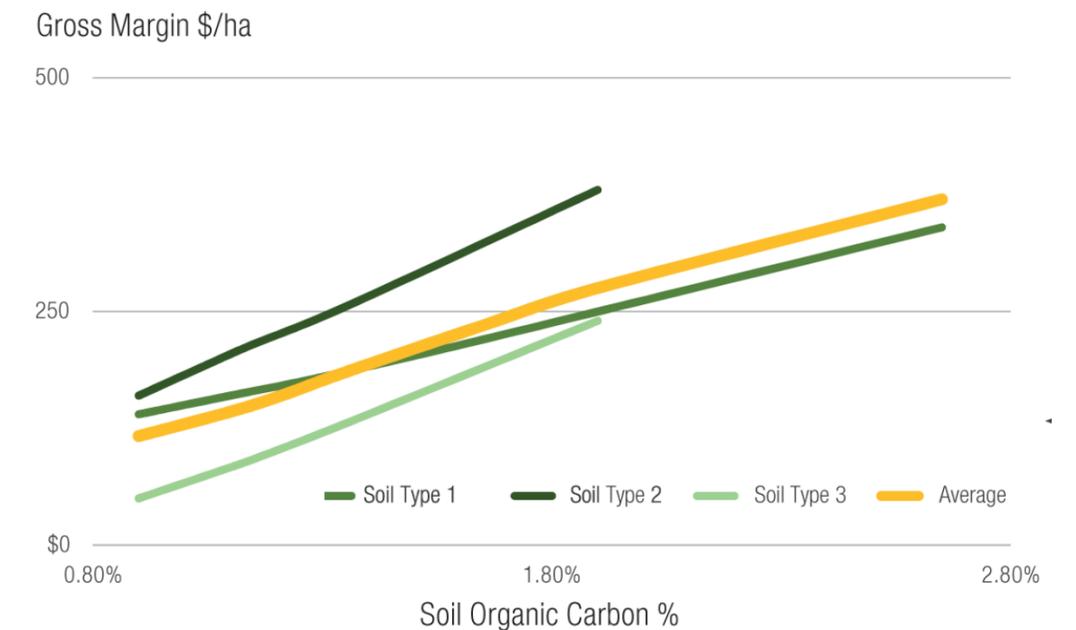
In the short term, this balance improves the nutrients available to plants and stimulates beneficial biological processes that support healthy plant growth and soil quality. Better quality soil enables farmers to produce better quality crops or produce, higher yields and healthier animals. Over time, working on the 'balancing act' for better soil quality increases soil water use efficiency and soil carbon. All of which result in greater returns for the farmer.

Soil Carbon increases soil water storage and water availability to plants. And improves the stability of soil structure.<sup>5</sup>



A key indicator of soil quality is soil carbon which has a direct link to farm returns

In financial terms if we take a look at findings from a CSIRO Technical Report it demonstrates a direct correlation between the Soil Organic Carbon and expected gross margin and in varying soil types across mixed farming, cropping and pasture operations.<sup>6</sup>



6. Soil indicators of changing land quality and capital value (Ringros-Voase et al) CSIRO Technical report 17/97)

# What you see above...

Enhance yield potential and quality right from the start

Plants show greater resilience to dry conditions, environmental stress, pest and disease

Balanced, healthy Plants growth

Water soaks in more quickly and plants stay green for longer

Improved performance in yield, quality and shelf life all result in greater returns



# ...and below the ground



Significant increases in root growth during early growth stages

Greater access to moisture and nutrients from the soil

Reduce compaction in heavy soils and improve stability in sandy soils

# Meet the lifeforce of your soil

Understanding the biological processes of the soil is an important part of understanding how plants grow, but what are microbiology? and how does microbiology influence plant health and nutrition?

To answers these questions, let's turn to the life in soil.

Microbe  
aka 'Mike Robe'

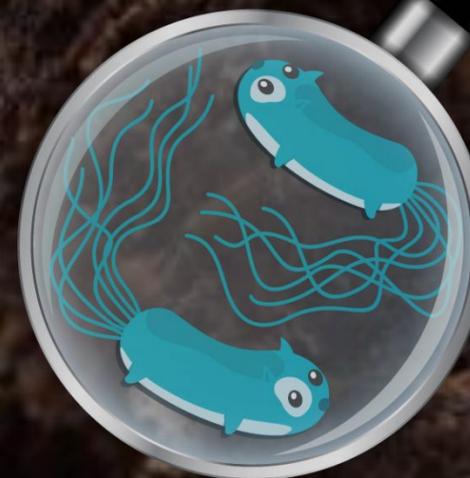


Carbon

aka Ca'Bon 'The Boss'



Fungi  
aka 'Fun-Guy'



Bacteria  
aka 'Bach Terrier'



Humus  
aka My Mate Hugh  
'Heavy Lifter'



## **Tools to Build Soil Biology**

Optimise plant & root growth

Buffer toxicities such as chemical fertilisers and inputs

Minimise soil tillage

Return crop and plant residues to provide organic matter

Use fertilisers which promote soil biological processes



# Simple solutions to enhance your soils complex ecosystem

## **Our focus is on product simplicity and farm results**

Our solid and liquid fertilisers are easy to apply, and are derived from natural materials such as bacteria, plants, fungi, minerals and trace elements.

We look for continual improvement and innovation in our product offering and service to farms we work with.

All of our products are a result of extensive research and development, with more than 20 years of successful results across Australia.



**P**

## **Chemical Fertilisers**

are important inputs to meet nutrient and production needs.

Farms generally continue with 60-80% of current fertiliser inputs, enhanced with 20-40% biologicals.

**\$**

## **Budget**

Farms we work with integrate biological solutions with a range of fertiliser budgets.

We have options to suit each farm's short and long term outcomes.



## **Application**

Our products fit within current farm practices, including air-seeders, fertigation, sprayers and spreaders.

We have a range of liquid, granular and solid fertilisers.

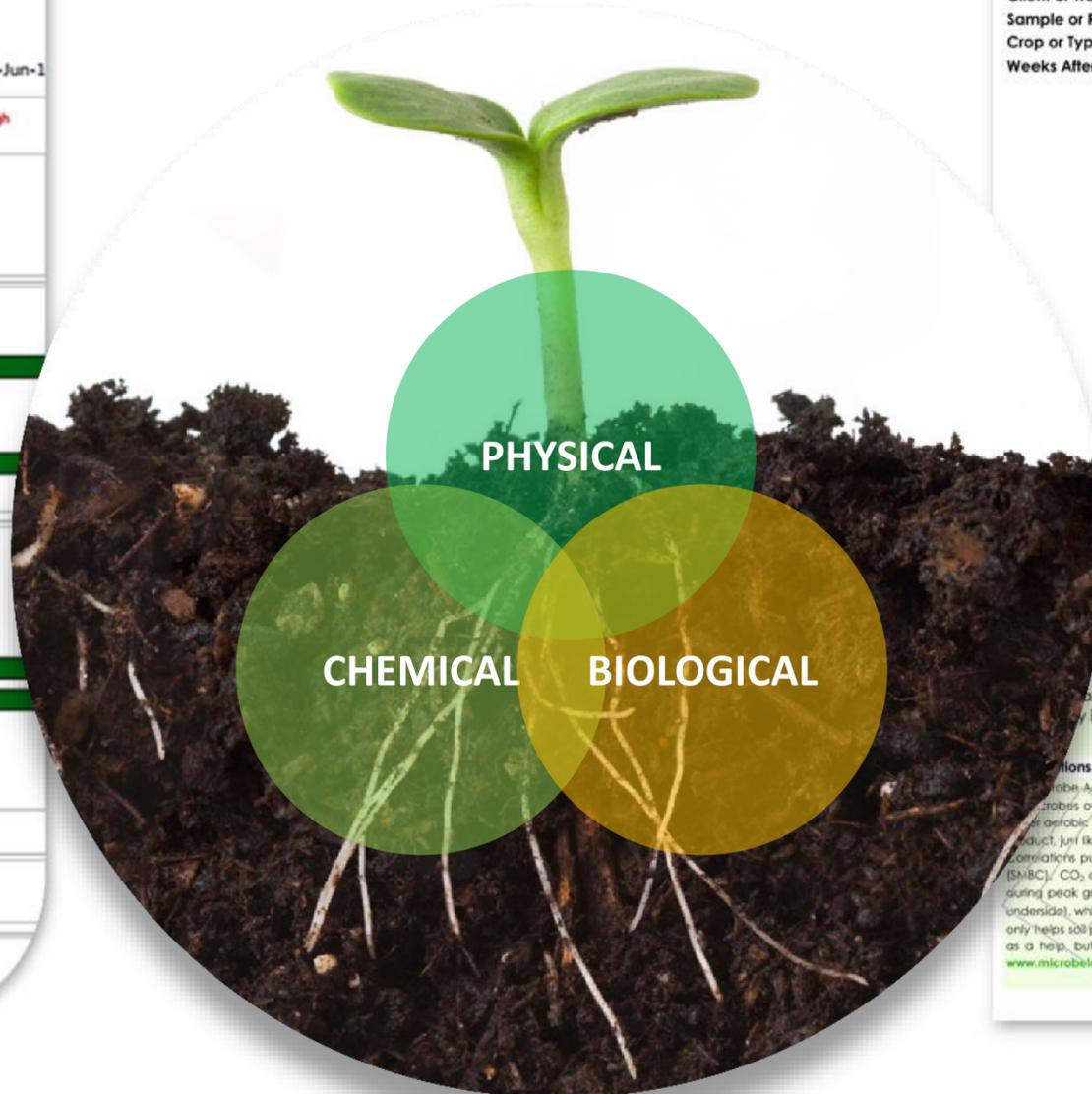


# CS1 Complete Soil Analysis



**Customer:** APAL  
**Sample Name:** #1  
**Lab No.:** Z141  
**Agent:** TIM WALKER  
**Crop:** Beans  
**Date:** 4-Jun-1

	Unit	Desired Level	Level Found	Very Low	Low	Acceptable	High
<b>Control 13697</b>							
ECEC	c.mol/kg	5 - 25	6.33	[Bar chart]			
Organic Carbon (W&B)	%	>0.5	1.30	[Bar chart]			
pH 1:5 (Water)		6.0 - 7.0	6.60	[Bar chart]			
pH 1:5 (CaCl2)		5.5 - 6.5	5.87	[Bar chart]			
<b>Exchangeable N-P-K-S</b>							
Nitrate - N	ppm	10 - 50	8.9	[Bar chart]			
Ammonium - N	ppm	1 - 5	1.6	[Bar chart]			
Colwell Phosphorus	ppm	25 - 35	52	[Bar chart]			
PBI - ColP		<100	42	[Bar chart]			
DGT P	ug/L	-	NR	[Bar chart]			
Colwell K	ppm	40 - 80	286	[Bar chart]			
KCl Sulfur (S)	ppm	10 - 20	7.9	[Bar chart]			
<b>Exchangeable cations</b>							
Calcium (Ca)	ppm	900 - 1000	888	[Bar chart]			
Magnesium (Mg)	ppm	150 - 175	115	[Bar chart]			
Potassium (K)	ppm	> 100	257	[Bar chart]			
Sodium (Na)	ppm	< 70	67	[Bar chart]			
Exch. Aluminium (Al)	c.mol/kg	< 0.5	<0.02	[Bar chart]			
Exch. Hydrogen	c.mol/kg	-	<0.02	[Bar chart]			
<b>Salt</b>							
Chlorides (Cl)	ppm	<120	NR	[Bar chart]			
Salinity EC 1:5	dS/m	< 0.15	0.08	[Bar chart]			
<b>Elements</b>							
Boron (B)	ppm	0.5 - 2.0	0.72	[Bar chart]			
DTPA Iron (Fe)	ppm	10 - 70	86	[Bar chart]			
DTPA Manganese (Mn)	ppm	4 - 50	6.6	[Bar chart]			

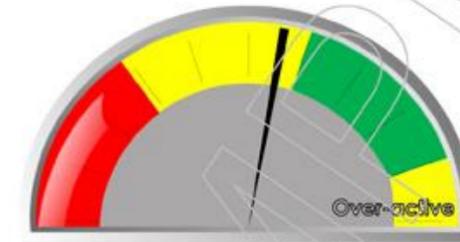


# MICROBE ACTIVITY WISE

**Customer Name**  
**Client or Treatment Name**  
**Sample or Replicate Name**  
**Crop or Type**  
**Weeks After Emergence**

**Sample Date**  
**Received Date**  
**Agent**  
**Authorised by**  
**Analysis no.**

## Microbial Activity Indicator



## Data

	Yours	Guide		Yours	Guide
Microbial Activity Indicator	62.0	80.0	Soil Basal Respiration (7-28 day)	1153.7	1520.0
			mg CO <sub>2</sub> /kg soil	4227.4	5569.6
			Soil Microbial Biomass C	334.5	463.6
			mg C/kg soil		

(Detailed Custom Report available - see Order Form)  
 Your microbial activity was fair to good. However, by creating conditions that are more favourable to microbial activity, such as increasing soil carbon, this level could be improved.

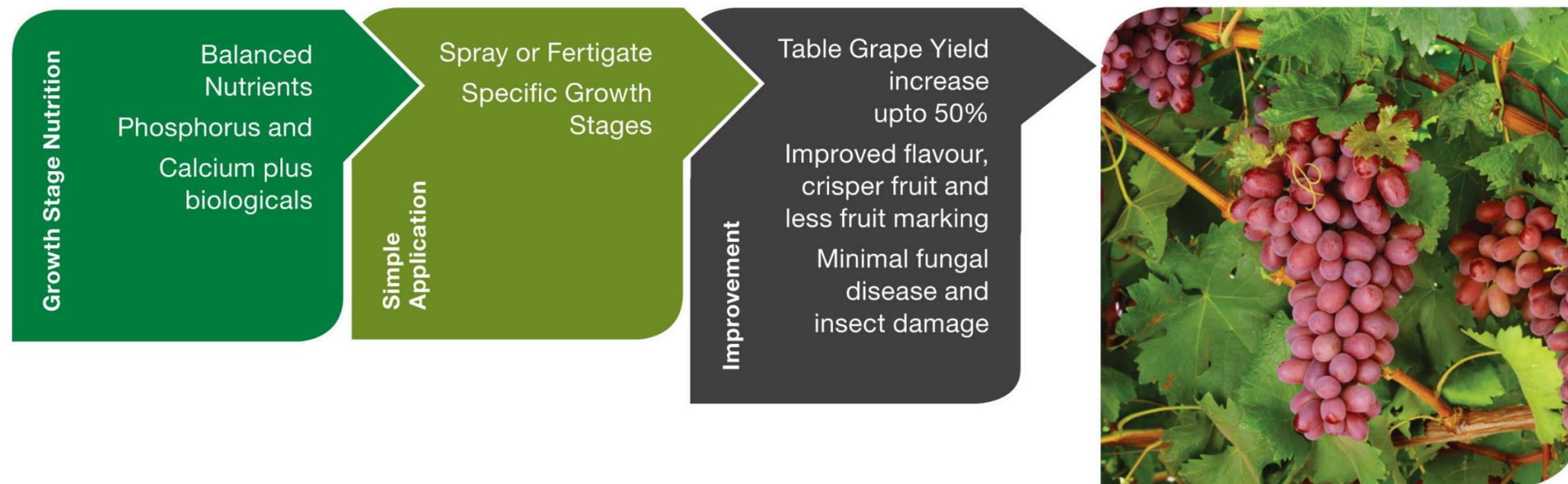
**Microbial Activity Wise** test measures activity of soil microbes directly from your sample. It measures the amount of carbon dioxide (CO<sub>2</sub>) emitted by soil microbes over time to calculate microbial activity, soil basal respiration (SBR) and soil microbial biomass carbon (C) (SMBC). Most soil microbes are aerobic organisms (the state your soil should be in) use oxygen to convert carbohydrates into energy and CO<sub>2</sub> gas, which they emit as a waste product. Just like animals, plants and humans. This rate is used to calculate the microbial activity indicator (0 to 100) based on known values for soils. Correlations published in scientific journals are also used to convert this rate into soil basal respiration (SBR, 7-28 day) and soil microbial biomass C (SMBC). CO<sub>2</sub> concentration in the atmosphere surrounding many crops is often a limiting factor (it is not high enough) to optimal plant production during peak growth. Stomata, the pores plants use to take in CO<sub>2</sub>, are located on both sides of the leaf (dicotyledons tend to have more on the underside), which allows plants to use the CO<sub>2</sub> emitted by soil microbes as it rises from the soil. Having a good level of microbial activity in your soil not only helps soil processes, but can also help to improve crop growth. Always compare your results with a control sample. Guide values are included as a help, but because a large number of factors affect microbiology the guide levels may not be optimal for your specific conditions. Visit [www.microbiolabs.com.au](http://www.microbiolabs.com.au) for more information.



## Table grape yield & quality improvements

Balancing growth stage nutrition on table grapes in the Sunraysia region has showed up to 50% increases in yield, along with pest and disease resistance and fruit quality.

Liquid fertiliser was applied to address nutrient balance and biological stimulation during the growing season.





# Visit LawrieCo at Hort Connections - Site 228

# 1

**Talk to our team of experts to establish where your soil health is at**

In addition to farm observations, we use independent soil analysis and soil microbe testing to customise a nutrient and biological fertiliser plan to suit your farm outcomes.



# 2

**Check out our product range online [www.lawrieco.com.au](http://www.lawrieco.com.au)**

You will find simple solutions to integrating biologicals into your current fertiliser program. The range include granular fertilisers, liquid fertilisers, seed treatments, soil conditioning blends, humic and fulvics, humates, trace elements and animal health.



We also have a range of Certified Organic Inputs.



# 3

**Join our mailing list**

To receive monthly updates on farms we work with, product reviews, latest in biologicals, soil carbon market and seasonal specials.

