



AgriWater

Agriwater Soil Treatment Process

**IT ALL STARTS WITH THE BIGGEST
INPUT GOING INTO YOUR SOIL – WATER.
GIVE YOUR SOIL THE BEST WITH
AGRIWATER TREATED WATER!**



AgriWater

Treatment Process Steps

STEP
1

Water Penetration & Distribution

Water with high gas content and lower viscosity penetrates the soil faster and is distributed wider and deeper in your soil profile.

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STEP
2

Soil Aeration & Compaction Relief

Water entrails O₂, CO₂ and N₂ gas into the soil profile, in addition to high concentrations of dissolved O₂.

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STEP
3

Aerobic Soil Life Support

Aerated soil environment provides conditions that supports the flourishing of beneficial soil microbes throughout the soil profile.

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STEP
4

Release of Tied-up Nutrients & Minerals

Enhanced water movement, aeration and dynamic microbial populations drive improved nutrient and mineral cycling and stimulate release of built-up and tied-up salts, minerals and nutrients.

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STEP
5

Reduced Stress on Roots

Root growth and functioning can take place with less stress and more vigor in the healthy soil environment that is supported.

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Water Penetration & Distribution

Agriwater treated irrigation water penetrate the soil faster and has improved distribution throughout the soil profile - HERE IS WHY:

Enhanced water quality and relieved oxygen demand

- The Agriwater advanced oxidation process ensures that contaminants are broken down.
- Precipitate formation is inhibited.
- Dissolved components are in oxidized states that no longer will pull O₂ out of solution.

Loaded with enhanced atmospheric air

- Fine bubbles containing O₂, CO₂, N₂ gas and low amount of residual O₃ are distributed in the treated water.
- Strong dissolved oxygen content is present.
- Reactives from the Agriwater AOP are broken down to O₂ and CO₂ and contribute to further generation of fine bubbles from the oversaturated solution.

Reduced surface tension and viscosity

- Fine bubble generation and accumulation creates dynamic movement in treated water.
- This interferes with attraction forces between water molecules and other dissolved components.
- As bubbles start to leave the oversaturated solution, the water's surface tension is reduced.

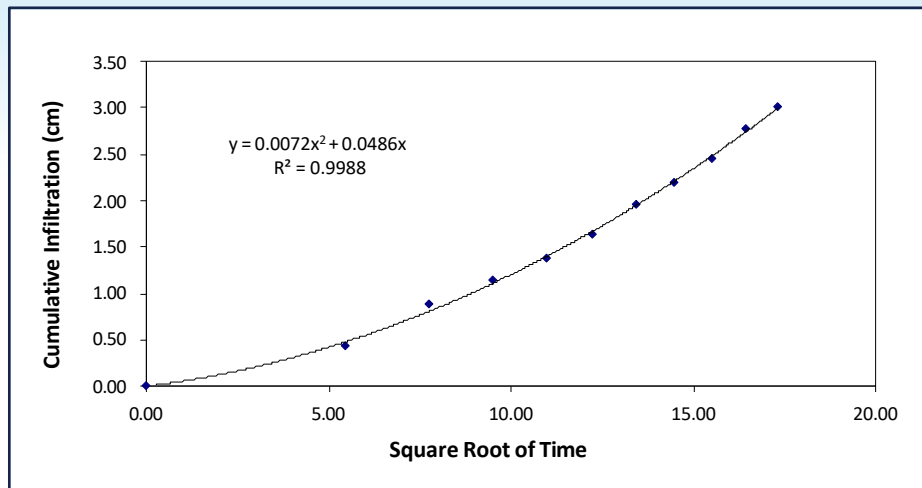
Dynamic penetration and further movement

- Repulsion from any hydrophobic areas on and in the soil is reduced due to changes in surface tension and viscosity of the water.
- Drops will have a lower tendency to adhere to each other enabling them to move into any small pores or crevices.
- An enhanced tendency to spread out enables water to cover soil particles and spread out throughout the soil profile more effectively.

WATER INFILTRATION DATA

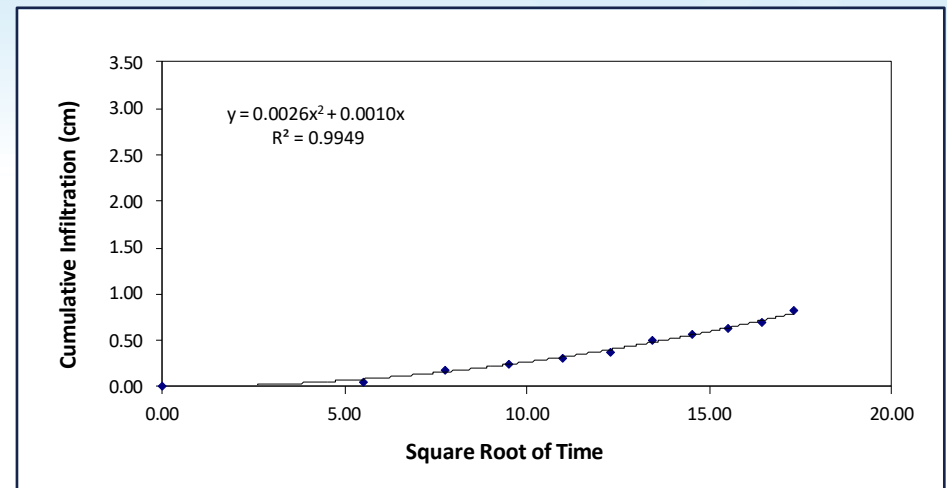
Effect of Agriwater treatment on infiltration rate of water into the soil.

AGRIWATER 1



Infiltration rate 9.295 cm/h

1
STANDARD WATER 1



Infiltration rate 3.356 cm/h

MOISTURE PROBE DATA

**BEFORE
AGRIWATER
May 2013**

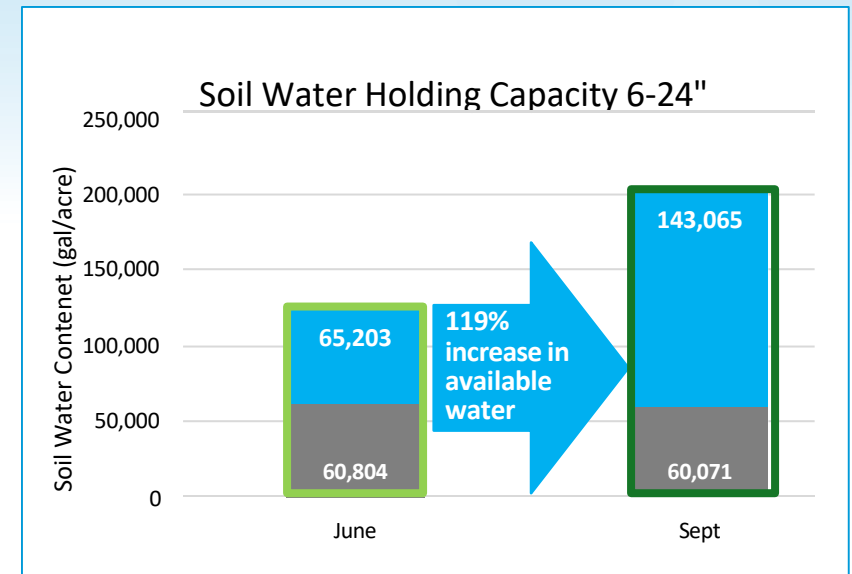
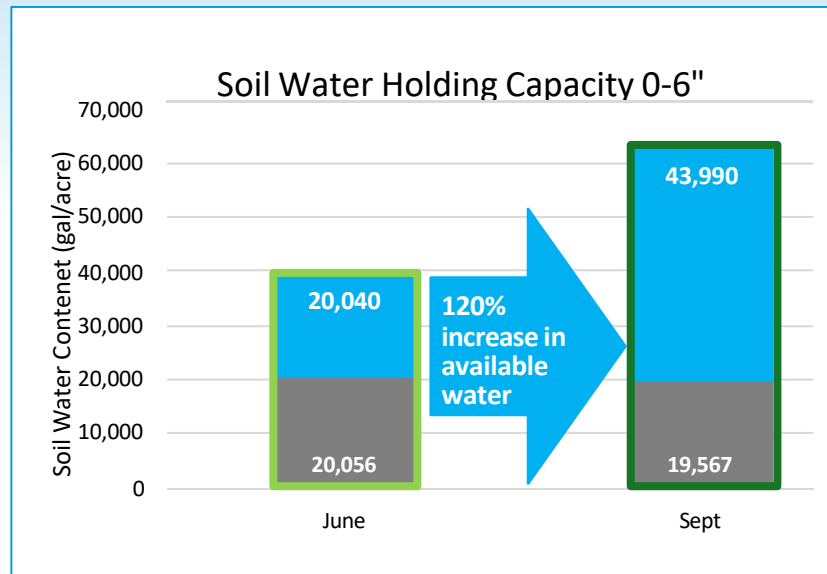
Progression of soil water movements
and root water extraction on a
citrus farm.

**3 MONTHS
AFTER AGRIWATER
INSTALL
September 2013**

**2 YEARS
AFTER AGRIWATER
INSTALL
May 2015**

WATER HOLDING CAPACITY CHANGES

More water can thus be successfully held available in the soil profile for microbes and plants to utilize. This decreases risk of losses to evaporation, excessive leaching and run-off, especially combined with improved infiltration rates.

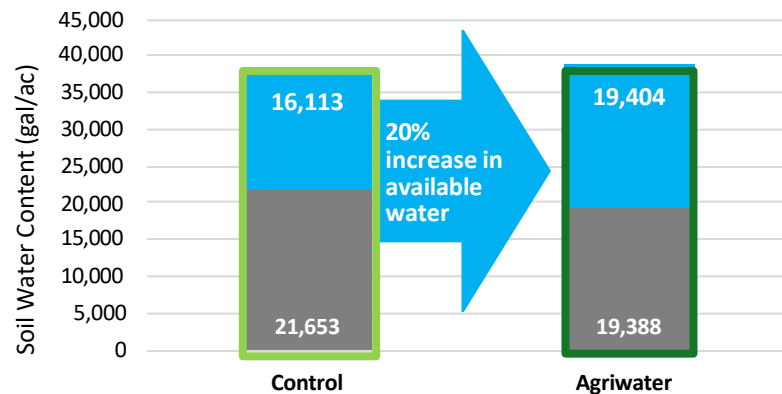


■ Permanent Wilting Point ■ Available Soil Water ■ Field Capacity

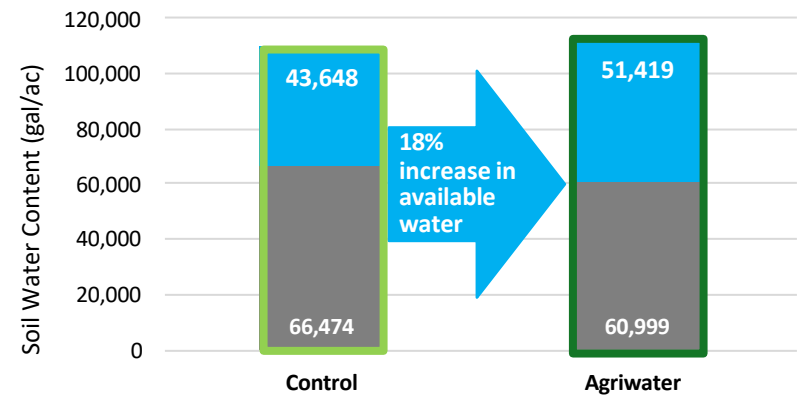
WATER HOLDING CAPACITY CHANGES

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Soil Water Holding Capacity per Acre, 0-6"



Soil Water Holding Capacity per Acre, 6-24"



■ Permanent Wilting Point ■ Available Soil Water ■ Field Capacity

Soil Aeration & Compaction Relief

Agriwater treated irrigation water promotes aerobic soil environments and alleviates hardpans, crusting and compaction - HERE IS WHY:

Enhanced atmospheric air entrained into the soil

- Fine bubbles of O₂, CO₂, N₂ gas and low amount of residual O₃ gets entrained with the Agriwater treated water into soil profile.
- These bubbles get released beneath the surface of the soil and are available to support microbial activity, breakdown of precipitates and root activity.

Resistance to precipitate formation

- Radical reacted carbonates and bicarbonates have reduced ability to form mineral precipitates with cations.
- Oxidized chloride ions also have reduced toxicity and affinity for reactions that lead to chloride salt build-up.
- Excessive salts and minerals can thus easily move with the improved water movements through the soil.

Benefits to cation exchange

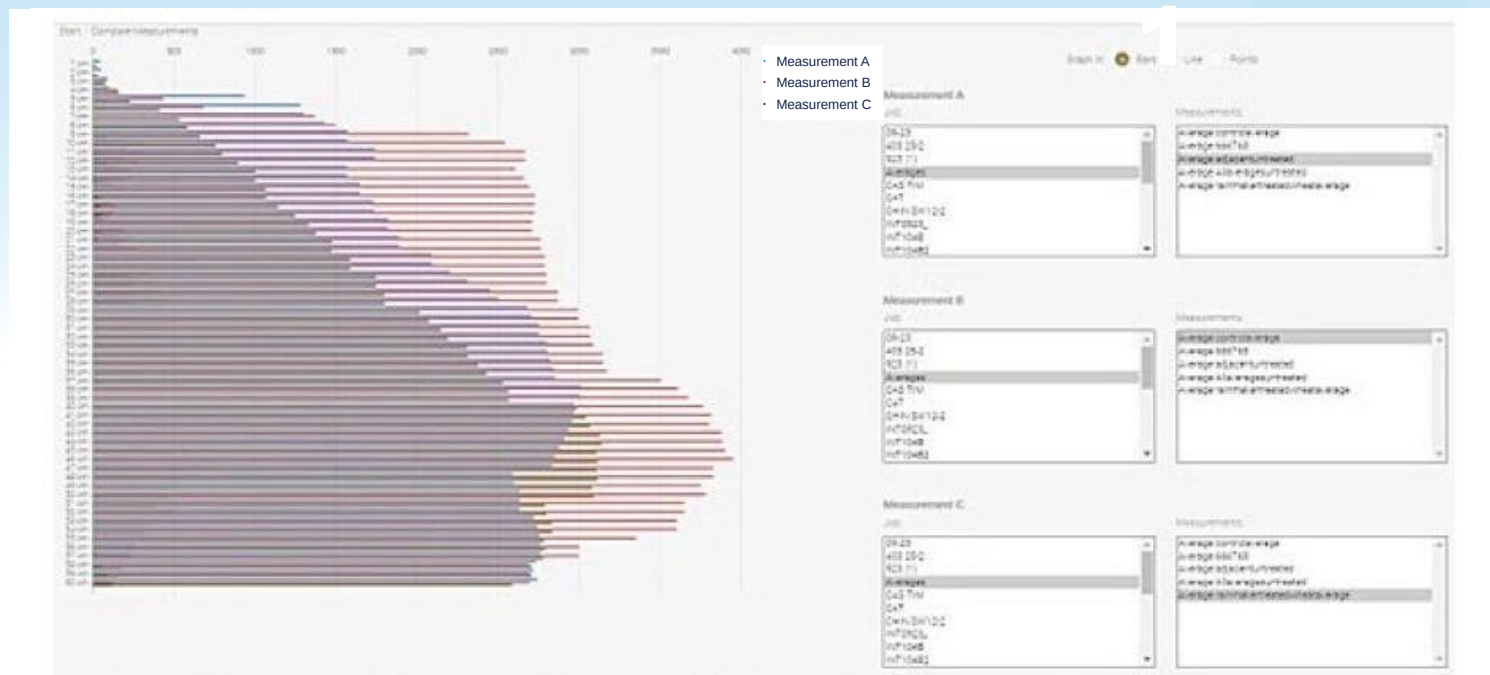
- Calcium and magnesium are kept available in the treated water by inhibition of precipitate forming reactions and associations with ozone molecules.
- Calcium and magnesium thus have much improved ability to compete with sodium for exchange onto soil colloids.
- This enables cation base saturations to be easier managed and brought into balance.

Benefits systematically spreads deeper

- As entrained air and dissolved oxygen improves aeration and other soil characteristics in the soil that gets contacted with Agriwater treated water, treated water can penetrate the soil faster and deeper.
- Deeper layers of the soil profile can thus receive the before mentioned benefits more efficiently as water movement in the profile improve.

PENETROMETER DATA

Using Falker's software, average readings for the three areas shown on the legend as "adjacent-untreated" (measurement A) "Control" (Measurement B) and "Treated" (Measurement C) using 3 or more penetrometer readings.



Compaction begins to inhibit root growth at 8cm below surface in both the untreated – adjacent and control data sets. Root growth is not inhibited until 21cm below surface on the treated lands.

Severe root growth limitations begin at 9cm on the adjacent untreated land and at 28cm below grade on the control land. Compaction levels under 2,500mPa have extended down to 37cm, an 11cm improvement over the control averages.

Aerobic Soil Life Support

Agriwater treated irrigation water stimulate and support aerobic soil life activity - HERE IS WHY:

Soil aeration and compaction relief

- By entraining fine bubbles of air and low amount of residual O_3 , into the soil profile with Agriwater treated water with high DO levels, hypoxic conditions even during long irrigation cycles are mitigated.
- Drawing these gasses into the soil profile with the treated water efficiently breaks down compaction layers.
- As compaction get alleviated deeper and deeper in the soil profile, an optimal environment for aerobic soil life to flourish in is established and expanded.

Utilization of organic matter and sulfur

- Improved aerobic soil conditions support higher rates of aerobic soil life activity.
- This increased activity require food to sustain it, therefore it is important to make sure that soils have sufficient sources of organic matter that microbes can utilize and set nutrition free from.
- While most minerals can be set available for plant uptake by microbial digestion of OM, sulfur gets used up. Ensure proper availability to sustain increased microbial activity.

Release of built-up salts and minerals

- Nutrition will be set available from OM digested by aerobic soil life activity.
- As aerobic soil life activity is stimulated, microbes will also aid in breaking down built up salts and minerals from the now aerobic soil environment, making it available for uptake or leaching out of the rootzone.

Communities built for your specific soil and crops

- Having Agriwater water treat your soil builds a favorable environment for beneficial microbes to flourish in. This facilitates beneficial population present and adapted to the mineral make-up of your soil to grow and become more active.
- By creating a soil environment more favorable to all aerobic soil life, Agriwater treatment also gives injected microbial amendments a better chance of acclimatizing to that soil environment.

SOIL MICROBIAL DATA

Enhancements in total microbial population sizes and diversity thereof will progress at different rates adapted to different soil environments.

Farm 1 - Larger increase in biomass vs diversity.

Control – Pivot N

	Value
Total Biomass, PLFA ng/g soil	395.13
Functional Group Diversity Index	0.840

Agriwater – Pivot S

	Value
Total Biomass, PLFA ng/g soil	831.79
Functional Group Diversity Index	0.730

Farm 2 - Larger increase in diversity vs biomass.

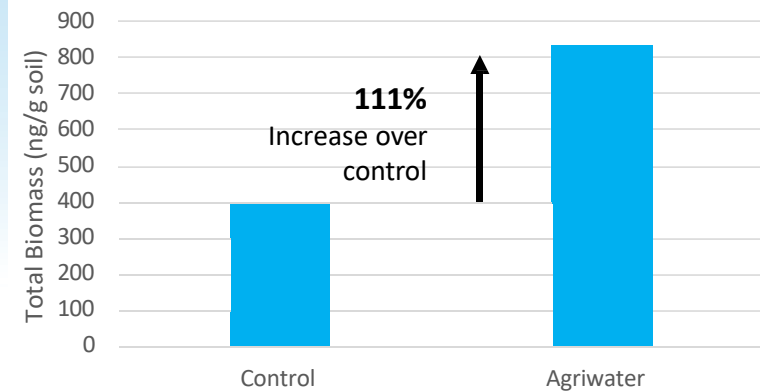
Control – Pivot W

	Value
Total Biomass, PLFA ng/g soil	751.08
Functional Group Diversity Index	0.556

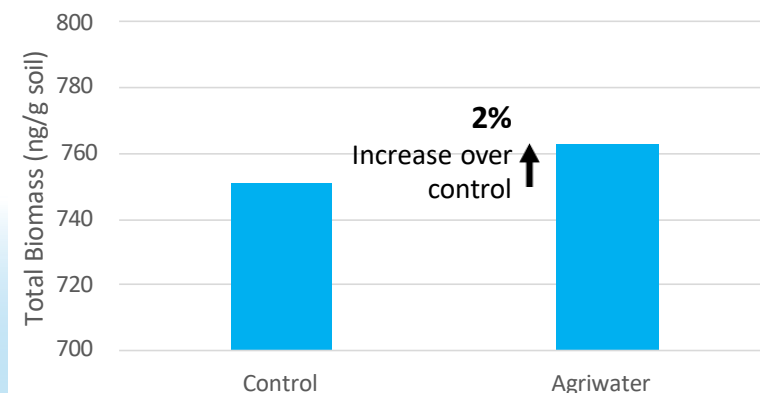
Agriwater – Pivot E

	Value
Total Biomass, PLFA ng/g soil	763.10
Functional Group Diversity Index	0.834

Farm 1 – Partial Season Agriwater

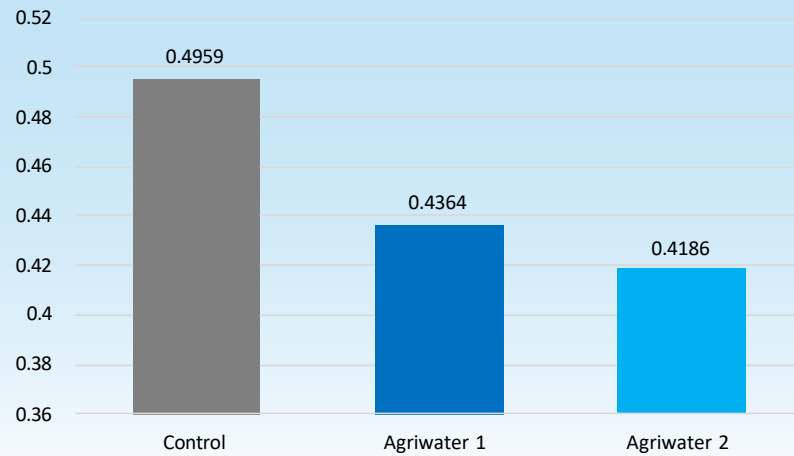


Farm 2 – Partial Season Agriwater

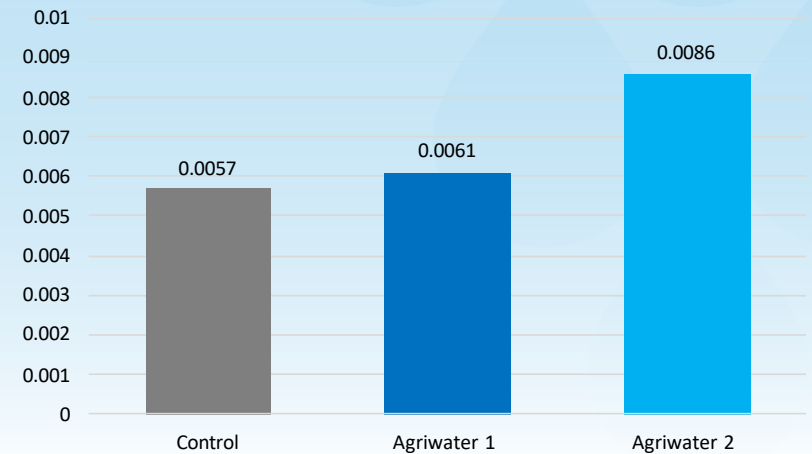


SOIL RHIZOSPHERE ANALYSIS

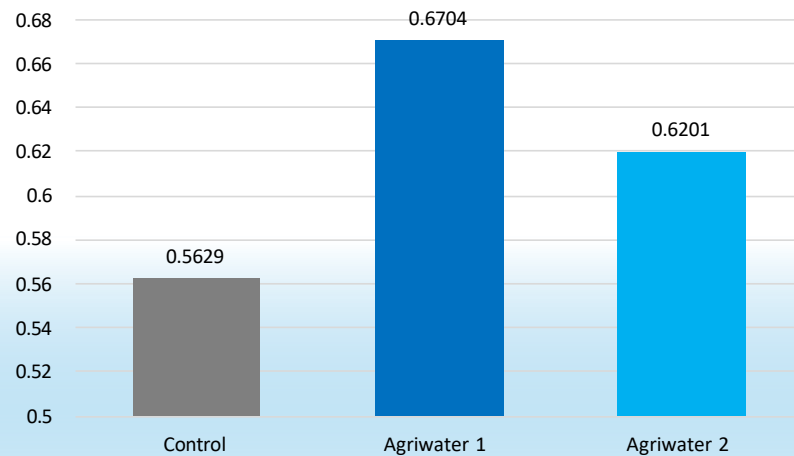
**Soil Biome Analysis -
Denitrification Potential**



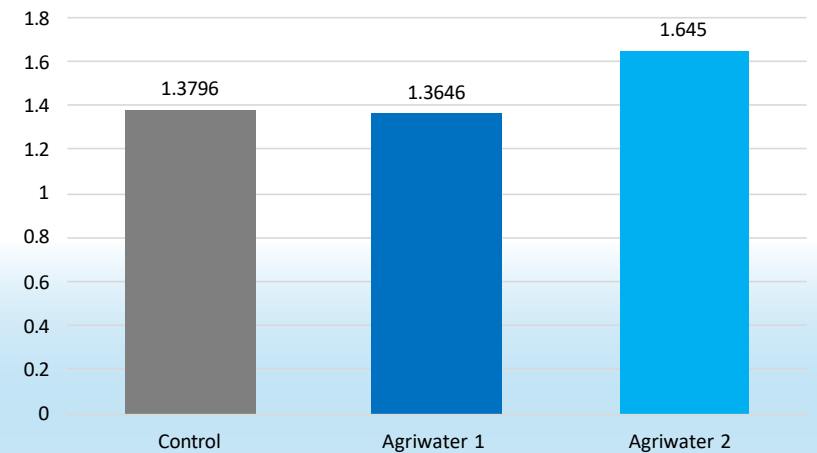
**Soil Biome Analysis -
Nitrification Potential**



**Soil Biome Analysis -
Phosphorus Mineralization Potential**



**Soil Biome Analysis -
Phosphorus Solubilization Potential**



Release of Tied-up Nutrients & Minerals

Salts and minerals that have been tied up in the soil can systematically be broken down and made available for uptake or movement through Agriwater treatment - HERE IS WHY:

Stimulated aerobic soil life

- Irrigating with Agriwater treated water systematically builds an aerated, compaction free soil environment.
- This soil environment supports the stimulation of aerobic soil life to systematically grow and be more active.
- By preventing anoxic conditions during irrigation cycles, and decreasing toxicity of high salt load in water, Agriwater treatment preserves aerobic soil life and facilitates better functioning thereof.

Reduced tie-up by carbonates

- By reducing the ability of carbonate species present in the water being treated to tie up minerals like calcium and magnesium, availability of those minerals is significantly improved.
- This not only avoids formation of compaction layers, but also ensures more efficient movement and cycling of minerals that tend to get tied up by carbonates (and phosphates).

Support of dynamic nutrient cycling

- Increases of aerobic soil life activity will enable increased amounts of nutrition to be set available from OM and tied-up salts and minerals.
- By inhibiting nutrient tie-up of precipitate forming reactions, Agriwater treatment supports improved mineral application efficiencies.
- Improved movement of water and gasses throughout the soil profile under Agriwater treatment will support improved movement and balancing of soil minerals and nutrients.

TUBER MINERAL ANALYSIS DATA

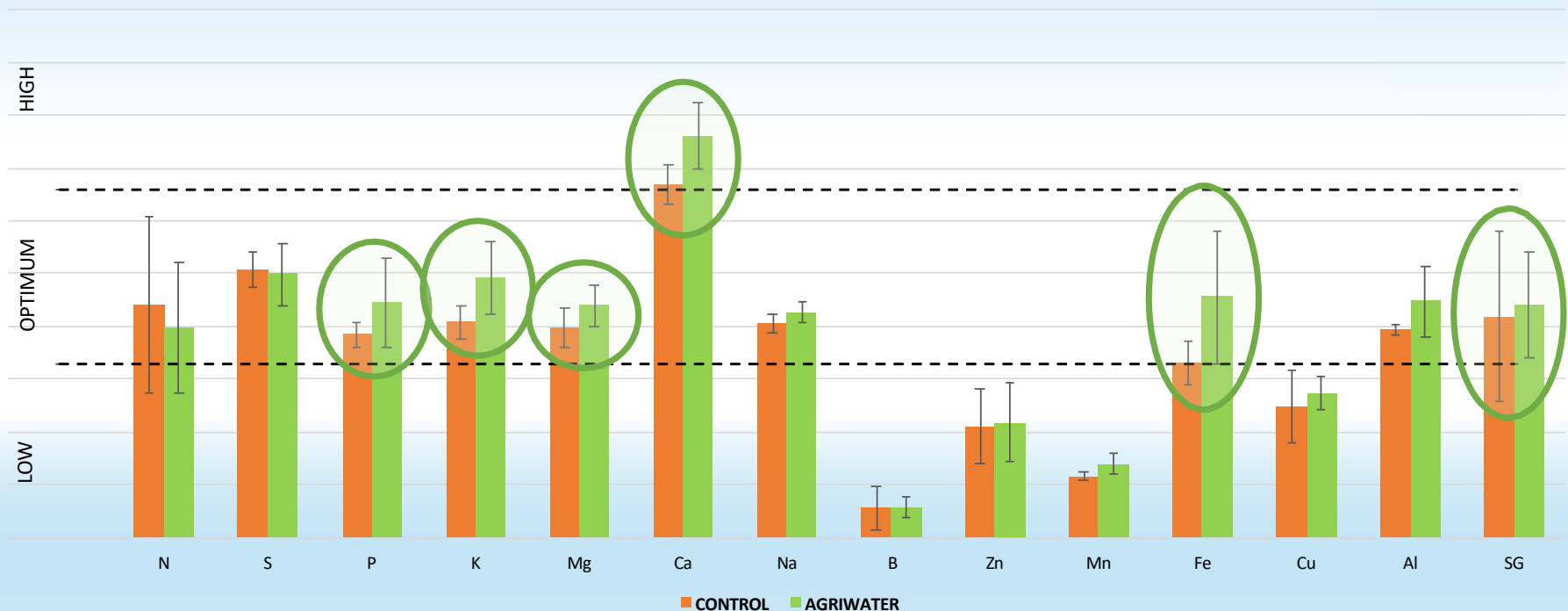
Phosphor and **Potassium** had significant increases in the Agriwater treated tubers. P and K are key element required for good **bulking** of potatoes.

Magnesium and **Calcium** also had significant increases in the Agriwater treated tubers. Strong calcium levels are important for building strong and stable **cell structures**. Magnesium is crucial for photosynthesis and also plays important roles in **protein production**.

Iron content in Agriwater treated tubers had a significantly big increase over the control tuber. Improvements in overall low micronutrient content of these potatoes give very good support to **health and resistance** to infections.

Specific Gravity of Agriwater treated tubers where more **consistently within the optimum range** (with less variance). These tuber thus achieved more consistently good specific gravities compared to the control tubers.

Tuber Mineral Analysis



Reduced Stress on Roots

Well aerated soils with improved water movement and nutritional dynamics will reduce instances of plants stress and improve functioning - HERE IS WHY:

Improved water availability to roots

- As water penetration and movement through the soil profile improves and promotes aeration under Agriwater treatment, water holding capacity of the soil will be improved.
- This, combined with the supply of well oxygenated water through Agriwater treatment, improved the ability of plant roots to utilize the water from the soil solution.

Active aerobic soil environment

- The aerated compaction free soil environment built by Agriwater treatment will support increased activity of beneficial aerobic soil life.
- Beneficial aerobic soil microbes release nutrition from the soil to make it available for plant uptake.
- Those microbes also form synergies with plant roots to support improved functioning and nutrient uptake.

Improved root growth and functioning

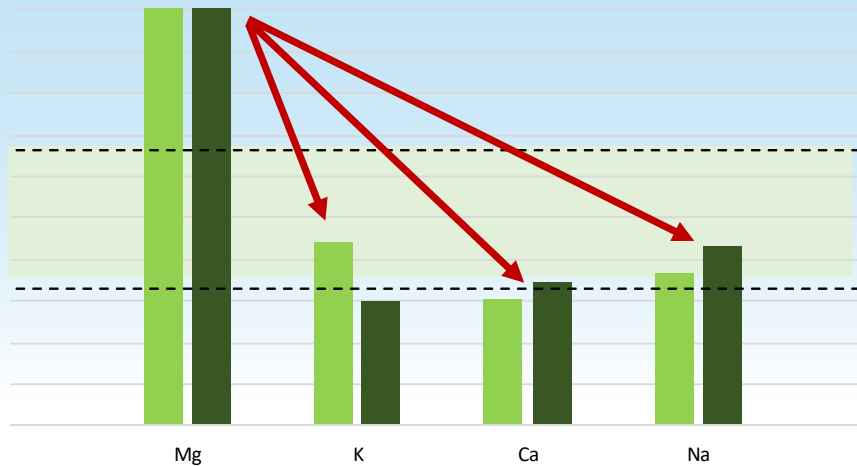
- Under well aerated compaction free soil conditions, roots are able to grow more easily. The conditions built through Agriwater treatment supports growth of more extensive root systems.
- Larger root systems, and thus root zones in the soil, extends the volume of soil over which plant roots have access to for uptake of nutrition.

Adjust to promote optimal health and production & achieve optimal savings

- Increased aerobic microbial activity can lead to increased release of nutrition from the soil.
- Increased root growth can lead to increased uptake of nutrition from larger parts of the soil profile.
- Fertilization needs to be adjusted accordingly to prevent over fertilization of certain minerals and nutrients to avoid plants going into overly vegetative growth and ensure optimal savings on nutritional inputs while doing so.

SAP & TUBER ANALYSIS DATA

Plant Sap Analysis - Major cation uptake (July)



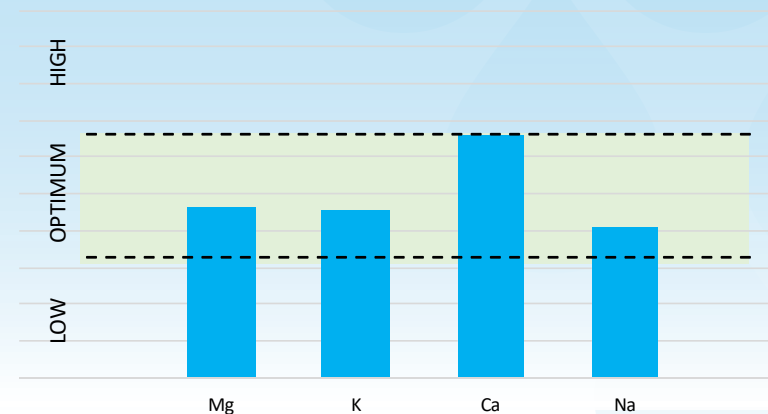
	Magnesium (ppm)	Potassium (ppm)	Calcium (ppm)	Sodium (ppm)
Young leaves	1628	4129	579	5
Old leaves	1724	3303	675	6

Plant sap analysis results (July) show the **excessive uptake of magnesium** caused by the excessive Mg soil content and soil base saturation.

Excessive Mg uptake put a lot of **pressure of the effectiveness of potassium, calcium and sodium uptake.**

Under **Agriwater treatment** these plants were able to **still take up K, Ca and Na efficiently** enough to reach optimum levels within the plant.

Potato Tuber Analysis - Cations



Mg: 251 ppm
 K: 4'535 ppm
 Ca: 150 ppm
 Na: 27,55 ppm

Under **Agriwater treatment** these plants were able **regulate** cation movement to tuber very efficiently.

Concentrations of all cations were within normal ranges in the analysed tubers.

Strong Ca levels support strong cell structures that also enhances health and storability of potatoes.



FOR MORE INFORMATION

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agriwater.earth