RainMaker

Consolidated Water Conservation Data

RAINMAKER TREATED WATER SAVES A MINIMUM OF 20% IN IRRIGATION WATER USE FOR THE SAME YIELD.

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RainMaker

RainMaker treated water saves a minimum of 20% in irrigation water use for the same yield.

The information in this summary document is detailed in the Consolidated Water Conservation Data document. Every field is different, climactic conditions vary and operating practices are different from region to region and farm to farm. Generally, a larger difference in outcomes is shown when the source water is more highly mineralized or generally of a worse quality than in locations where the source water is of a higher quality.

RainMaker technology has a 16 year history of commercial deployment, with over 4,000 installations world wide. The information discussed is taken from actual RainMaker installations in a diverse set of regions and crops.

RainMaker treatment restructures irrigation water, mimicking the reactions natural rain is subjected to in the upper atmosphere. The RainMaker process does not take anything out of the water. It breaks up mineral particles to restore viscosity and load the water with oxygen.

Uniformly clean irrigation systems delivering water of decreased viscosity, together with the subsequent compaction relief allow water to quickly penetrate uniformly across the field, reducing both run off and evaporation loss.

This saves a minimum of 20% of the water required per ton of yield. Where there is natural rain, it is more efficiently stored reducing water requirements even further.

Breaking up the mineral particles makes them more plant available, and it leaves the soil in a much more friable state with much improved water holding capacity and nutrient and moisture dynamics.

This increases holding capacity and decreases the permanent wilting point.

The associated compaction relief facilitates better root growth.

An aerobic soil environment is created and provides a suitable environment for ‘good’ bacteria and is supportive of both beneficial fungi and increased earthworm counts.

Support of aerobic soil life functioning can influence nutritional requirements positively potentially lowering input costs.

Summary of Data

Section 1

Independent report on water savings (wheat)

Detailed report that demonstrates a 30% water saving per kg of yield while improving overall plant health. The actual energy savings are recorded, adjusted to 2024 US dollars. Root structure and other benefits are discussed.

Section 2

Independent report on water savings (citrus trees)

This report reviews water movement and withdrawals from a soil sensor array in a lemon orchard. The information tracks water movement improvements over time and provides further validation of the effect of RainMaker water on irrigation efficiency. The progression shows how quickly changes begin to occur.

Section 3

Independent report on water consumption (citrus trees)

Water consumption records using uSchedule software recorded a 30% saving over adjacent orchard, and an 80% reduction from recommended water use. Information on water movement from soil sensors is also provided.

Section 4

Internal report on hydraulic conductivity of treated water

To support infiltration rate increases using treated water we have implemented mini disk infiltrometer testing into our validation protocols. Mini disk infiltrometer readings provide a simple and inexpensive method for measuring hydraulic conductivity. For this data set, we have compared the infiltration rate of treated and untreated water and demonstrated infiltration rate increases of between 41 and 177%. This result further validates the reduced evaporation and runoff potential. (see section 8 on viscosity testing).

Section 5

Independent report on water infiltration, withdrawals and rooting depth (macadamias)

This report demonstrates further the ability of RainMaker treatment to promote compaction relief, greatly increased water mobility. Water infiltration and movement is the primary vector for irrigation efficiency employed by RainMaker. Rooting depth improvements are reported.

Section 6

Internal report uniformity of dripper delivery

Dripper or sprinkler output can be deteriorated by mineral build up and biofilm contamination. Uniformity is an important factor in irrigation efficiency. Where a percentage of emitters is under delivering, the grower is forced to over water some areas to get enough water to all the plants.

This report looks at an existing system and plots drip emitter output to design output over a 5 week period after installation. Drippers under delivering were reduced from 46% to 4%.

Summary of Data

Section 7

Water holding capacity changes

Water holding capacity, field capacity and permanent wilting point are key factors in efficient use of irrigation water.

This data series shows the change after less than a full season of operation, and is indicative of the trajectory continued RainMaker use establishes as the impact on water holding capacity penetrates deeper and deeper. In the first year, the 0-6” layer increased substantially, and the 6-24” layer began to be impacted. Water holding capacity improvements ranged from a low of 2% to 43%.

Testing was done on soils that ranged in quality, and results indicated that poorer soils were dramatically impacted, and soils where the operator ensured a high carbon content and good microbial activity were not improved as much.

By lowering the permanent wilting point, we can demonstrate the increased ability for plants to access the water.

Section 8

Viscosity restoration

Water testing at an independent lab established how rainmaker treatment restores even highly mineralized water to an optimum viscosity. In all 7 tests shown viscosity was reduced.

RainMaker cannot reduce viscosity below that of rainwater, but it can dramatically improve it, supporting the section on hydraulic conductivity. Small changes in viscosity have large impacts on hydraulic conductivity.

Section 9

Observations and supplementary data

The first observation provides observations from an irrigation professional showing a 40% water use reduction and confirms some of the other benefits like emitter cleaning and efficiency.

Section 10

Penetrometer reading analysis

We have also added some penetrometer data which we have found to be an excellent tool for identifying compaction depth. The data shown was at the end of one season of RainMaker treatment and shows compaction being moved lower in the soil column, further validating the positive RainMaker effect.

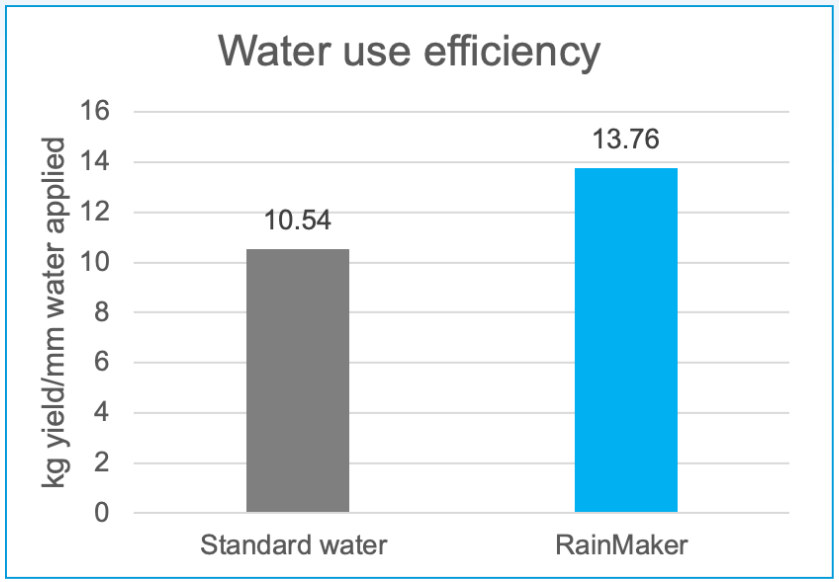
Table of Contents

SECTION 1

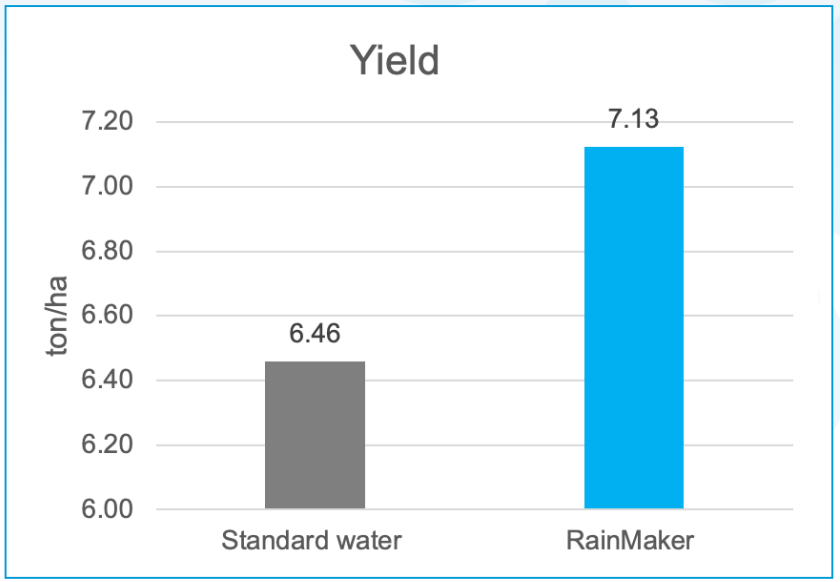
Independent Report on Water Savings (Wheat)

TRIAL NAME:	A comprehensive independent report on the response of wheat after installation of RainMaker's Water Treatment Technology
CROP:	Wheat
CULTIVAR:	SST 843
AREA:	Greefslaagte, Lichtenburg District, 2011
COMPILED BY:	Dr Willem Otto, NWK Ltd. Lichtenburg and amended by Dr Derek J. Askew in 2016.
PARAMETERS:	1. Water use efficiency 2. Yield 3. Yield components parameters 4. Total savings in irrigation costs and electricity
WAS DONE BY EXTERNAL COMPANY (NWK):	

RainMaker effect on water use efficiency and yield



Improved water use efficiency by 30% compared to the standard water.



Improved yield by 10% compared to the standard water.

The RainMaker field produced a higher yield while using less irrigation water in total – hence the higher efficiency of water use.

More extensive root development ensured the ability to extract water more efficiently from the complete soil profile.

RainMaker effect on yield and plant measurements

Plant Component	RainMaker Treated Water	Standard Water	% Improvement
Average number of tillers/plant	4.64	3.71	25.1
Average number of ears/plant	4.18	3.29	27.1
Ear length (cm)	10.5–11.0	9.5–10.0	10.0
Tiller diameter (mm)	4	3.6	14.3
Plant height (cm)	86	84	2.4
Maximum kernels/ear	48	44	9.1
Maximum spikelets/ear	18	16	12.5
Yield (ton/ha)	7.125	6.459	10.3

Results of the yield components measured on the RainMaker treated and standard irrigation water systems.

RainMaker treatment enabled improvements across the board on all these components.

RainMaker effect on total savings in irrigation and electricity at different levels of water usage

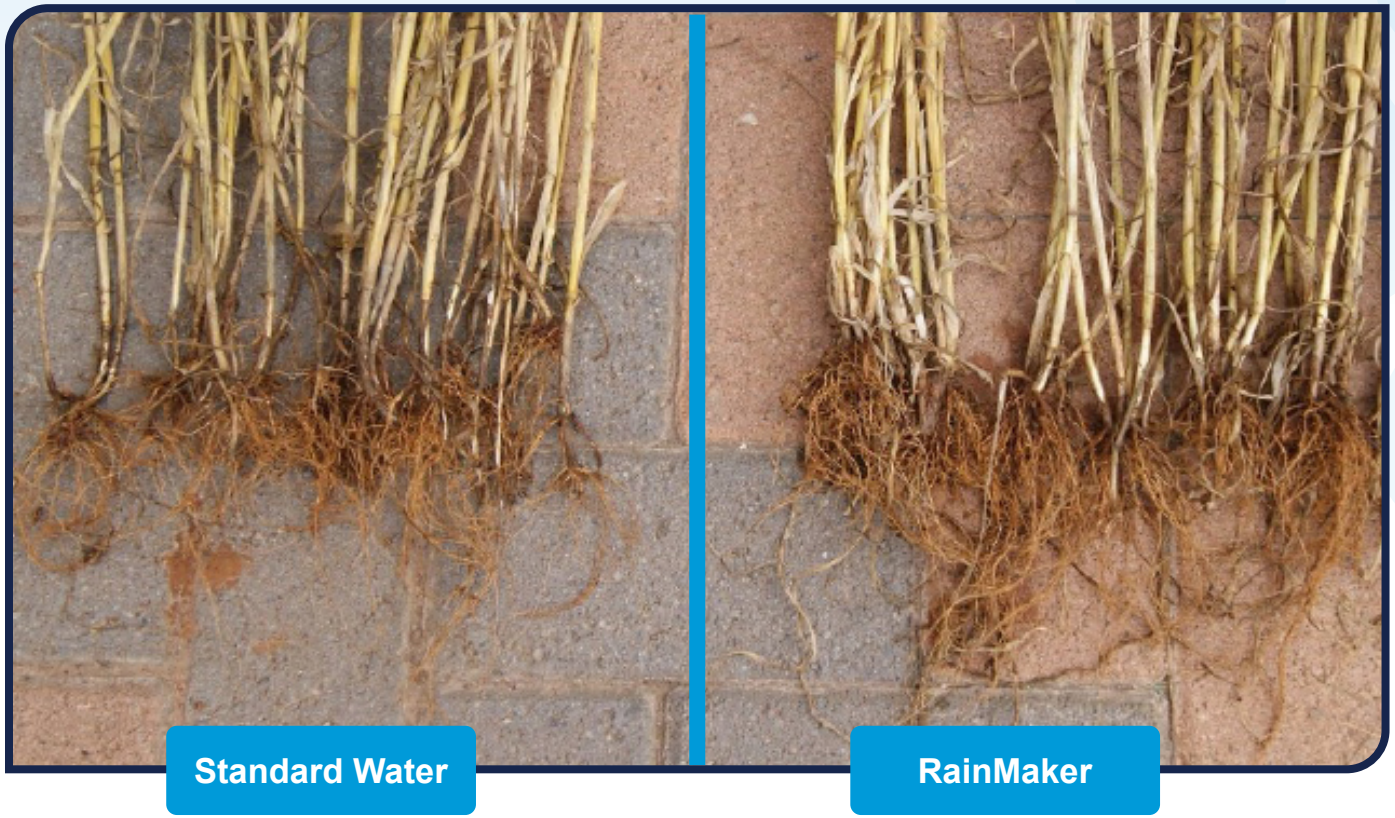
2011 costing data in Rand

mm Water irrigated	Water use efficiency (kg yield/mm water)	Irrigation costs (R/ha)	Savings in total costs (R/ha)	Electricity savings (R/ha)
600	12.08	2374	-	-
570	12.72	2257.2	116.8	75.3
540	13.43	2138.4	235.6	150.6
510	14.22	2019.6	354.4	225.9
2011 USD average exchange rate				0.1386
2011 USD in 2024 USD (factor)				1.36
2024 USD adjusted for inflation				
mm Water irrigated	**Water use efficiency (kg yield/mm water)**	**Irrigation costs (2024 USD/ha)**	**Savings in total costs (2024 USD/ha)**	**Electricity savings (2024 USD/ha)**
600	12.08	447.49	-	-
570	12.72	425.47	22.02	14.19
540	13.43	403.08	44.41	28.39
510	14.22	380.69	66.80	42.58

The savings in irrigation costs at different levels of water usage can be seen in the table.

Linking these to the **31% improvement in water use efficiency**, the cost savings in water, maintenance and electricity costs were substantial.

Plant samples taken during ripening



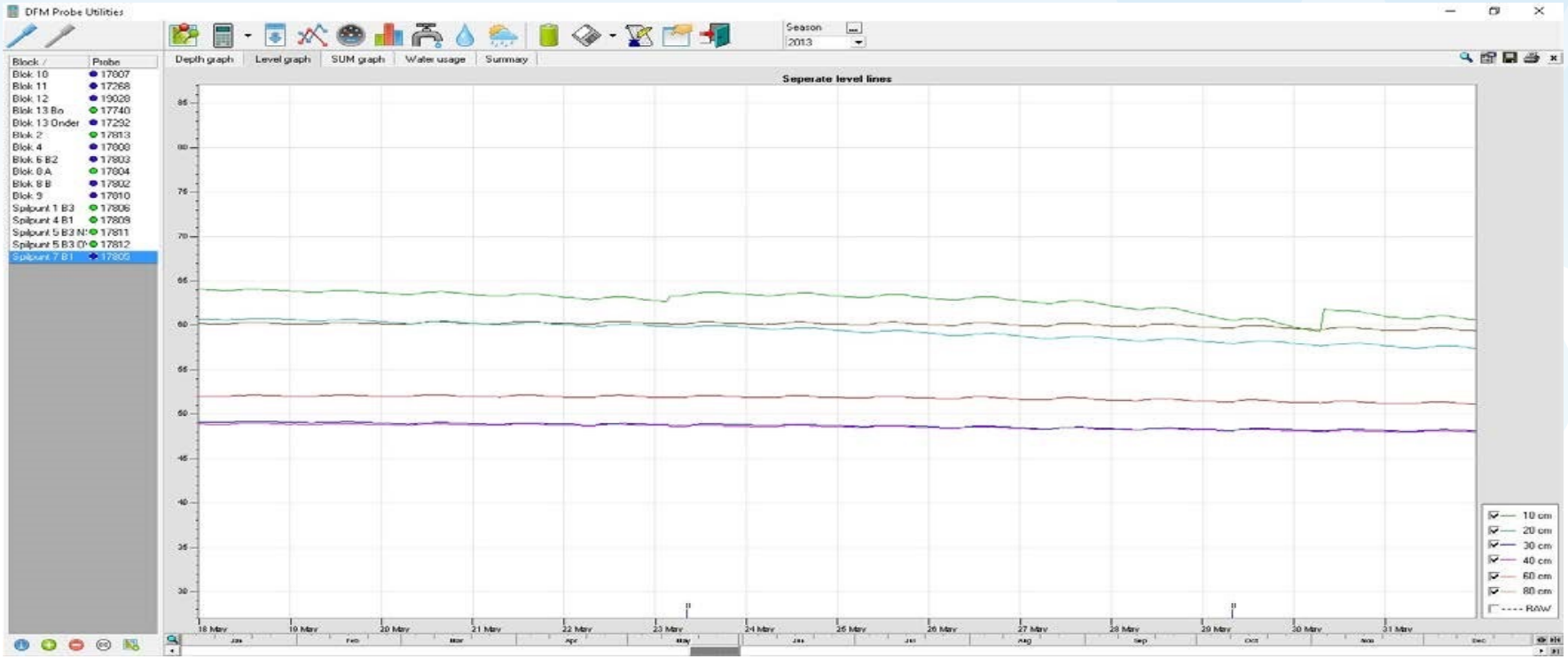
The excellent root development, especially in the topsoil of the profile, indicated that water absorption by the RainMaker plants was more efficient.

The available groundwater in the treated system was totally extracted, whereas in the standard system, groundwater was still available deeper in the profile until late in the growing season.

Independent Report on Water Savings (Citrus Trees)

TRIAL NAME:	Improvements in water infiltration and rooting depth of Bloempoort Delta Valencias at HN Pieterse Farming - 2013 to 2016
CROP:	Citrus
CULTIVAR:	Delta Valencias
AREA:	Groblersdal (South-Africa)
IRRIGATION TYPE:	Centre pivot at 8mm/rotation
SOIL TYPE:	Glenrosa type heavier clay soils (struggle with water penetration)
PREPARED BY:	Dr Derek J. Askew B.Sc.Agric, M.Sc.Agric, Ph.D., AVCASA, Pr.Sci.Nat.
ASSISTED BY:	Gisela D. de Jager B.Sc.Agric, M.Sc.Agric.
PARAMETERS:	1. Improve water infiltration at 20, 40, 60 and 80 cm 2. Improve water withdrawals at 20, 40, 60 and 80 cm

DFM (Irrigation management software) level graph on S7 from 18 – 31 May 2013 before RainMaker installation



10 cm	20 cm	30 cm	40 cm	60 cm	80 cm

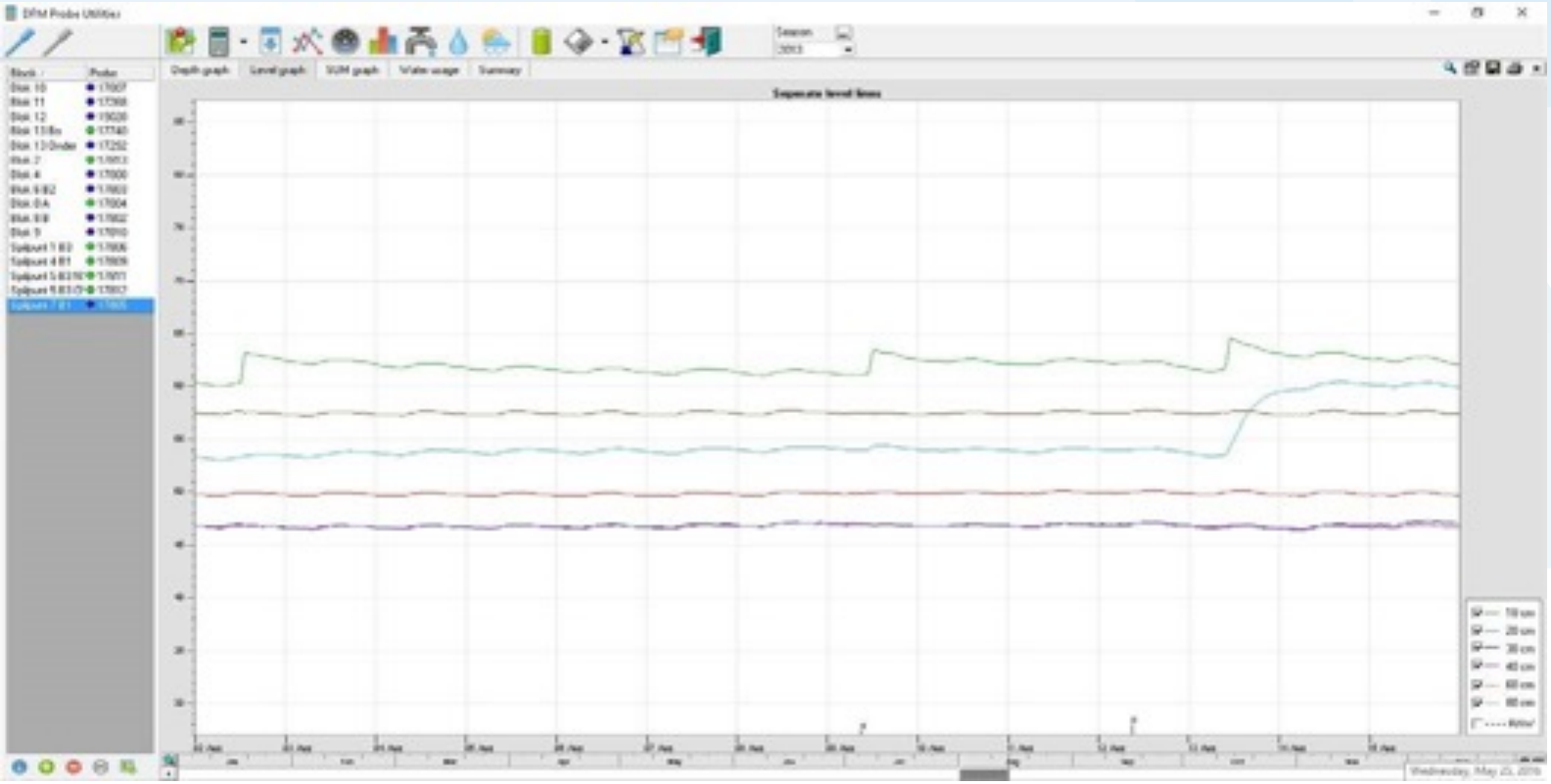
Typical water movements before RainMaker installation:

Very little water extraction at 10cm.

No evidence of water extraction by roots below 10cm.

This soil, especially at deeper level stayed close or at saturation, without any significant leaching ability.

DFM level graph on S7 from 2 – 15 August 2013 after RainMaker installation



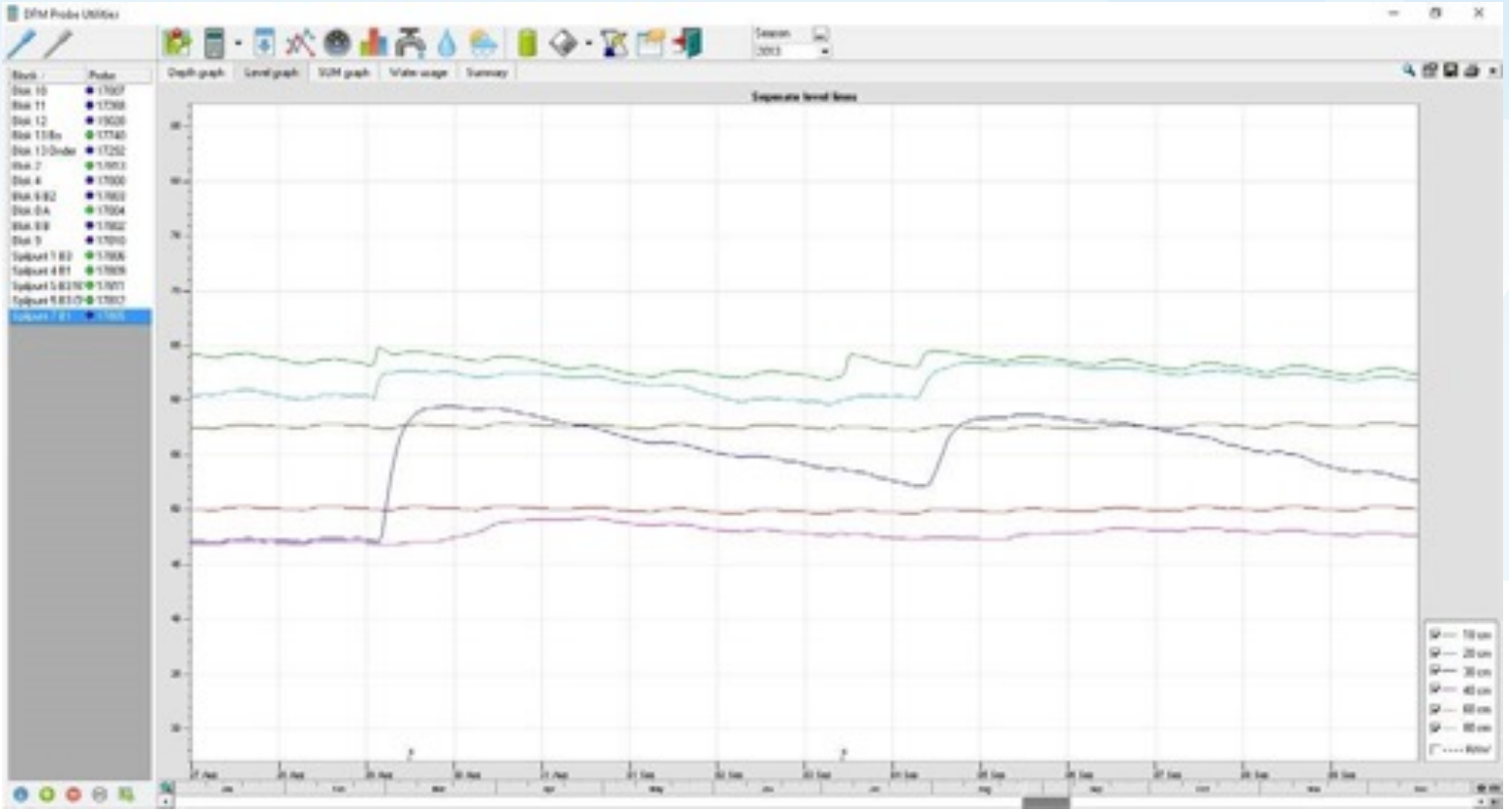
10 cm	20 cm	30 cm	40 cm	60 cm	80 cm

Water movement a few weeks after RainMaker installation:

Almost immediately slight improvements in transpiration cycles, water withdrawals and root activity could be seen at 10 and 20 cm. No evidence of water extraction by roots below 10cm.

This was due to better aeration and feeder roots extracting water and nutrients more efficiently at 20cm.

DFM level graph on S7 from 27 August – 9 September 2013 after RainMaker installation



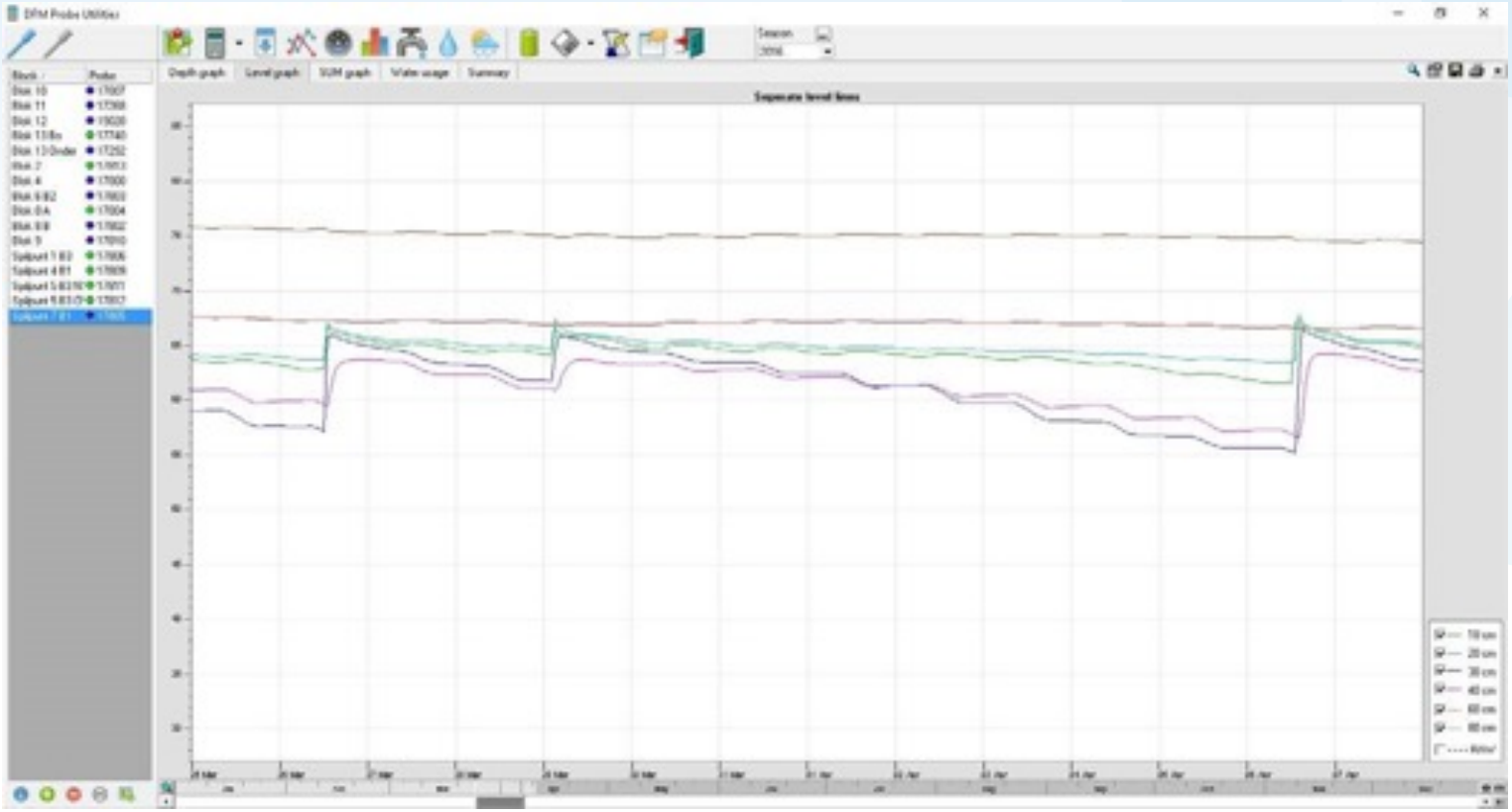
10 cm	20 cm	30 cm	40 cm	60 cm	80 cm

Water movements 1 month after RainMaker installation:

Water infiltration and extraction cycles can be seen at 30 cm depth.

Evidence of water movement at 40cm is starting to show up for the first time, regardless of time of season.

DFM level graph on S7 from 25 March – 7 April 2016 after RainMaker installation



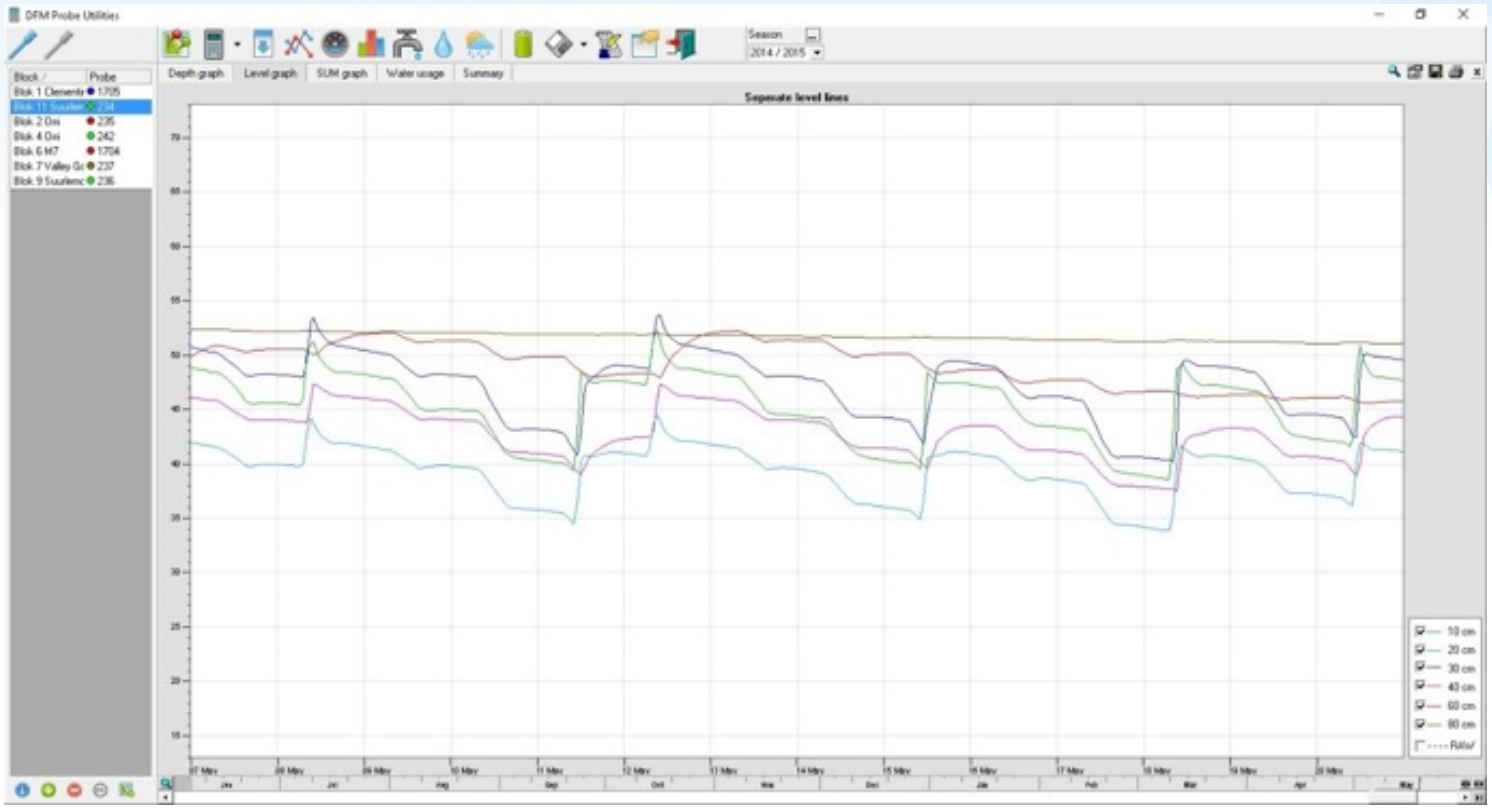
10 cm	20 cm	30 cm	40 cm	60 cm	80 cm

Water movements 3 years after RainMaker installation:

Water infiltration and extraction cycles are successfully sustained down to at least 40cm depth.

Similar orchards on this farm receiving RainMaker treated water showed consistent efficient water cycles down to 80cm depth.

DFM level graph on Lemons in Block 11 from 7 – 28 May 2015 after RainMaker installation



10 cm	20 cm	30 cm	40 cm	60 cm	80 cm

Soil water movements under RainMaker treatment through colder winter season:

Efficient water infiltration and good soil aeration continuously support healthy root function.

Roots are able to actively and efficiently extract water from 60cm depths even during colder winter months.

This enable a much larger volume of soil to be available to store available soil water for plants to utilize, thus significantly improving the efficiency of water cycles and utilization.

Independent Report on Water Consumption (Citrus Trees)

TRIAL NAME:	Comparison of actual irrigation water used by HN Pieterse Farming on lemons, versus standard practice and the Netafim™ uSchedule® software program - 2013 to 2016
CROP:	Citrus
CULTIVAR:	Delta Valencias (3 years old)
AREA:	Groblersdal (South-Africa)
IRRIGATION TYPE:	Drip
SOIL TYPE:	Glenrosa type heavier clay soils (struggle with water penetration)
PREPARED BY:	Dr Derek J. Askew B.Sc.Agric, M.Sc.Agric, Ph.D., AVCASA, Pr.Sci.Nat.
ASSISTED BY:	Gisela D. de Jager B.Sc.Agric, M.Sc.Agric
PARAMETERS:	1. Improve water saving 2. Improve water infiltration at 20, 40, 60 and 80 cm

Netafim™ uSchedule® recommendations

Netafim South Africa — uSchedule — Version: 2.07

NETAFIM

Name:	8 tot 12	25-May-16	Date printed	Orchards		Crop Type	
Crop:	Suurlemoene	2013	Date planted	60	%	Crop coverage	
Age of orchard (printed year)		3	Years	2.1	Hours	Irrigation time (theoretical)	
Application rate (ℓ/h/tree)		7.6	Efficiency reduction	8.0	ℓ/h/tree (Total)	95%	Total Efficiency

ETo - Evaporation		Litres	Tree Requirement per Day		Irrigation Schedule at: 100% of tree potential.					
mm/day	Description	100%	Time		Days	Pulses	Time		Actual	mm/day
1.5	Early Spring	6.5	51.2	Minutes	2	1	1.7	Hours	40%	0.36
2.5	Cool	12.9	1.7	Hours	1	1	1.7	Hours	40%	0.72
5.0	Moderate	25.9	3.4	Hours	1	2	1.7	Hours	40%	1.44
7.5	Warm	38.8	5.1	Hours	1	2	2.6	Hours	61% H	2.16
10.0	Heat Wave	51.8	6.8	Hours	1	3	2.3	Hours	54%	2.88
>10	Extreme Heat	71.2	9.4	Hours	1	4	2.3	Hours	56%	3.96

Note: In dry regions also irrigate evergreen trees during winter months.

Type of system	Drip		Method	Strip		A.W.C. 'Per depth'	90	mm/m
System flow rate (water meter)	4.4	m³/h/ha	Lat./crop row	1.0	#	Allowable depletion	50	%
Emitter flow rate: Total	1.60	ℓ/h	Wetted strip	0.60	m	Less Rock (stones)	67	%
Only applicable for Micro + Strip	n/a	-	Wetted area	10.0	%	Effective root depth	0.60	m
Only applicable for Micro + Strip	n/a	-	Leaching	0	%	P.A.W. (root depth)	8.91	mm
System Efficiency	95	%	Emitters/tree	5.0	#	Actual rate 'WET'	4.2	mm/h

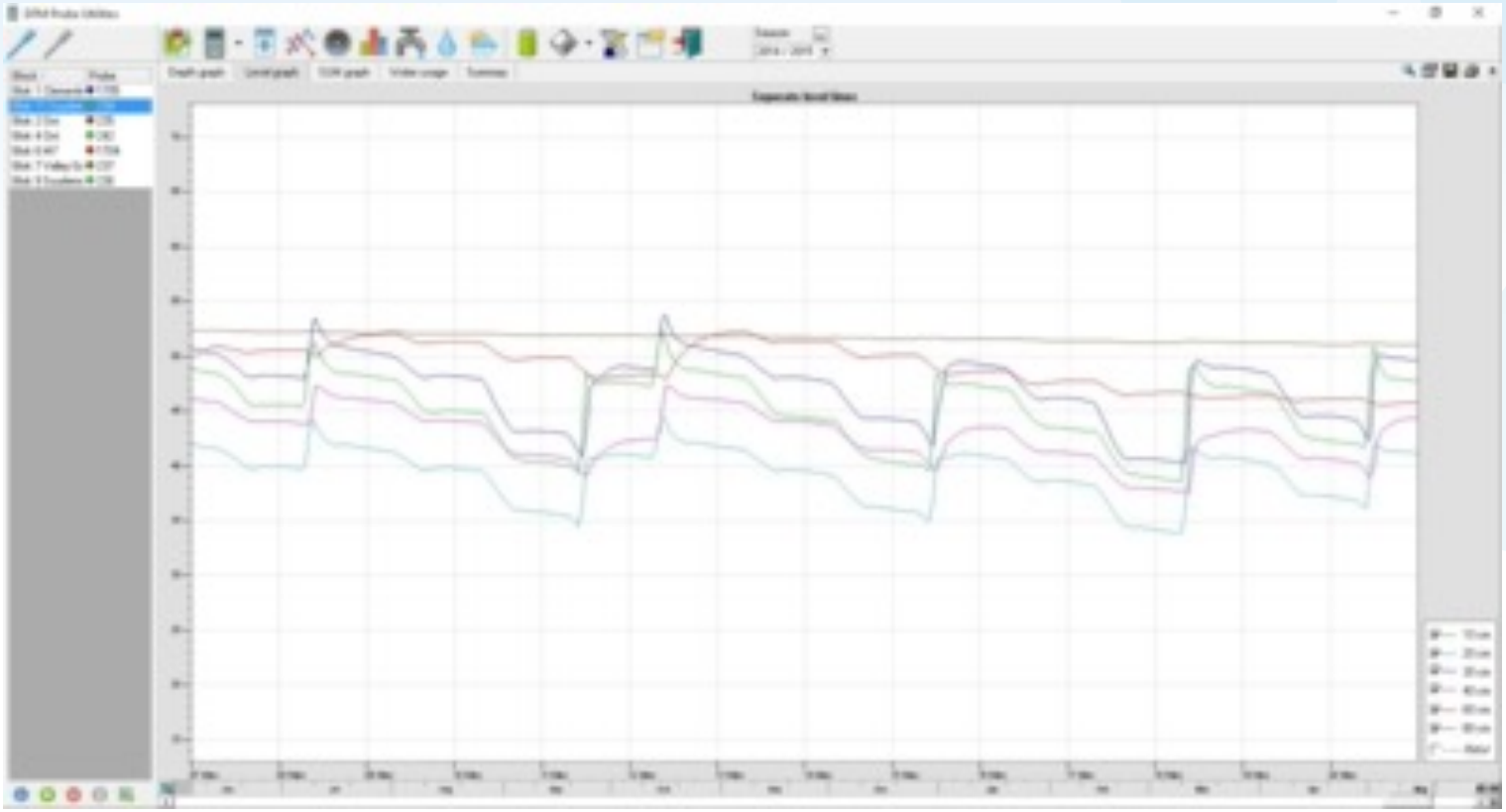
Irrigation recommendation by uSchedule for these trees in the specific area and conditions: 181 L/tree/week.

Actual irrigation rates after installation of RainMaker on this orchard: 36 L/tree/week.

Water saving of 80% compared to standard practice irrigation recommendation.

Compared to neighbouring farms with lower water use, a water saving of 30% was still achieved.

DFM probe utilities measurements showing water withdrawals at 20, 40 & 60 cm – Block 11 citrus



10 cm	20 cm	30 cm	40 cm	60 cm	80 cm

RainMaker treated water can effectively penetrate the soil and reach deep into the soil profile.

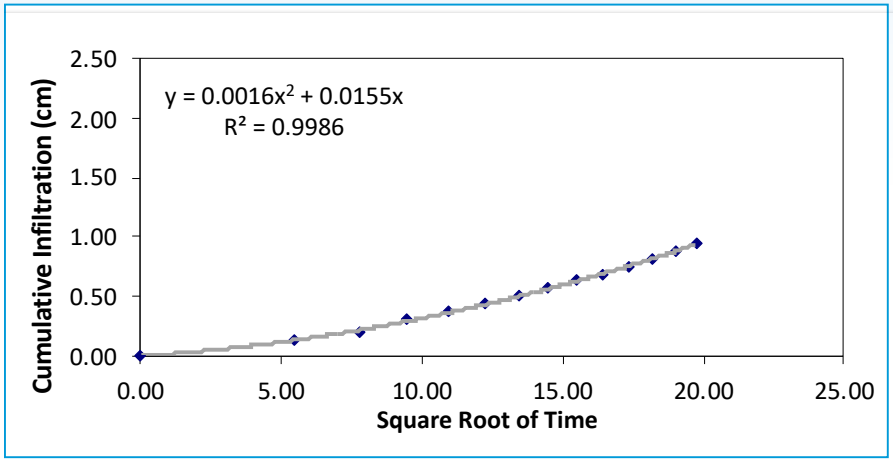
Trees were able to efficiently extract available water from the soil profile, even down at depths of 60cm.

Internal report on hydraulic conductivity of treated water

TRIAL NAME:	The effect of RainMaker treated water on soil infiltration using a mini disk infiltrometer
CROP:	Cut flowers
CULTIVAR:	Fynbos
AREA:	South-Africa, Western-Cape
IRRIGATION TYPE:	Drip irrigation
SOIL TYPE:	Sandy loam with high Mg and Na content (this soil struggles with water infiltrations)
PREPARED BY:	Barend Pienaar, M.Sc. Molecular and Cell Biology
ASSISTED BY:	Remina Pienaar, BEng Chemical Engineer
PARAMETERS:	Water infiltration

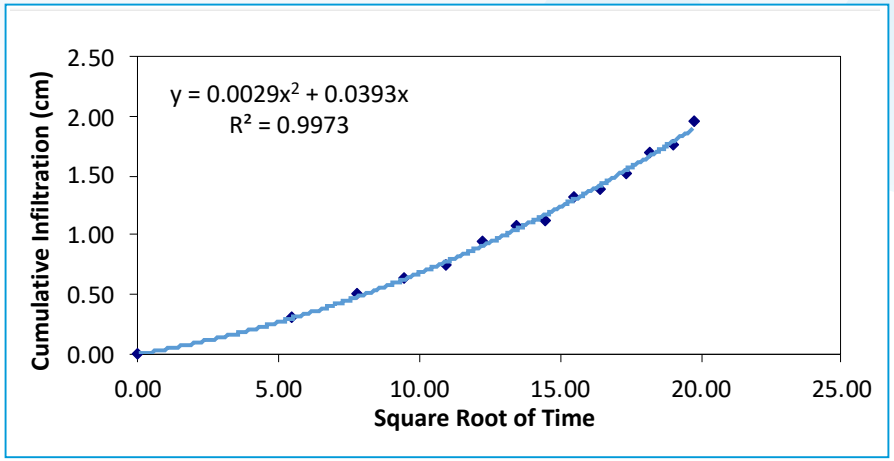
Infiltration Test 1 – RainMaker effect on infiltration in soil

Standard Water



Infiltration: 1.510 cm/h

RainMaker Treated Water



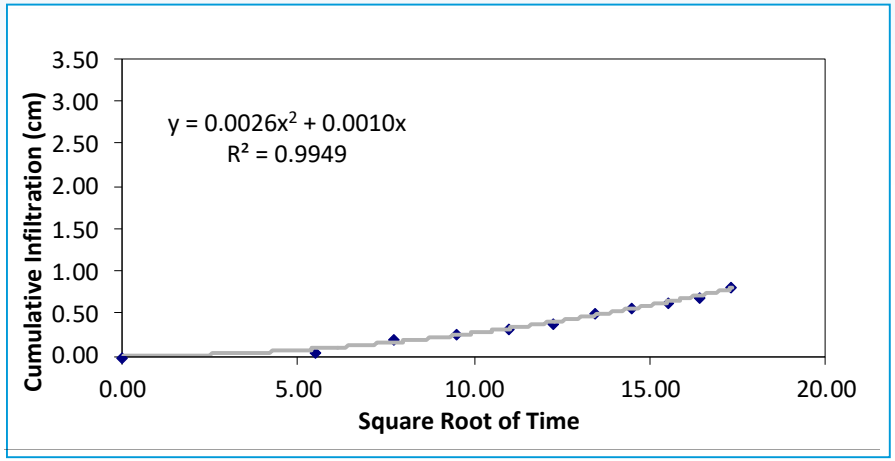
Infiltration: 2.674 cm/h

RainMaker treated water penetrated the untreated soil **77% faster compared to the standard water.**

Faster, more efficient and more effective water infiltration into the soil ensures less losses to evaporation and run-off.

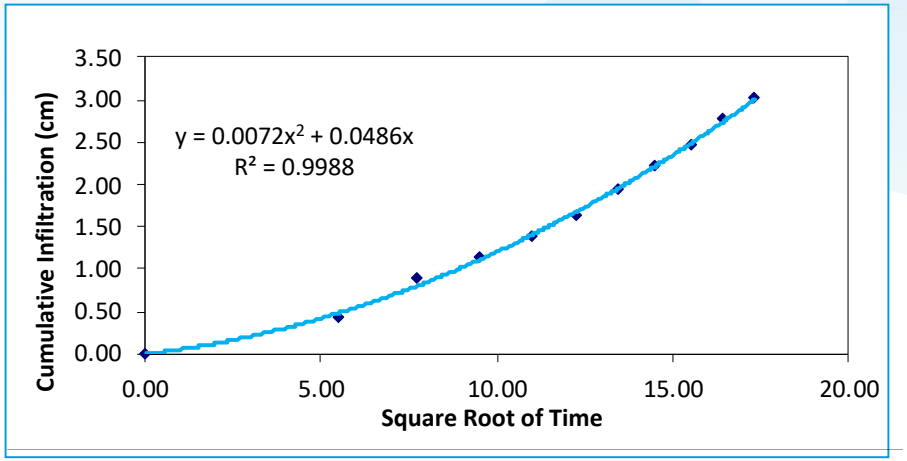
Infiltration Test 2 – RainMaker effect on infiltration in soil

Standard Water



Infiltration: 3.355 cm/h

RainMaker Treated Water



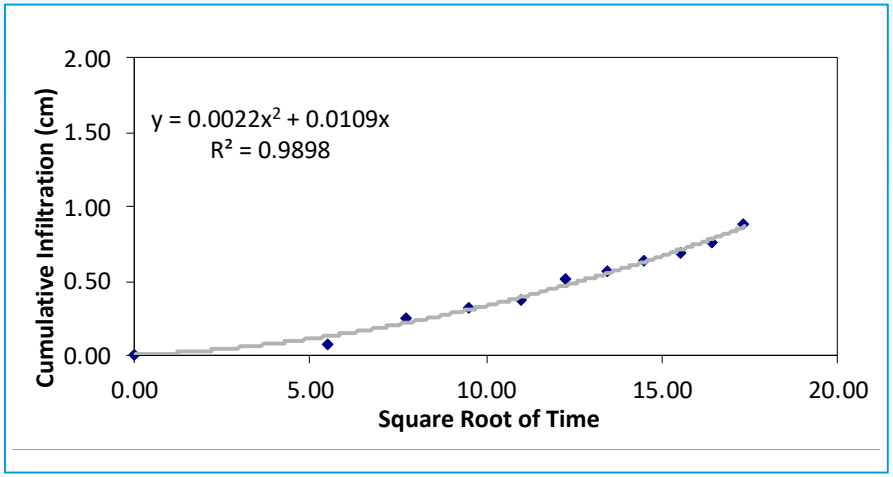
Infiltration: 9.295 cm/h

RainMaker treated water penetrated the untreated soil **177% faster compared to the standard water.**

Faster, more efficient and more effective water infiltration into the soil ensures less losses to evaporation and run-off.

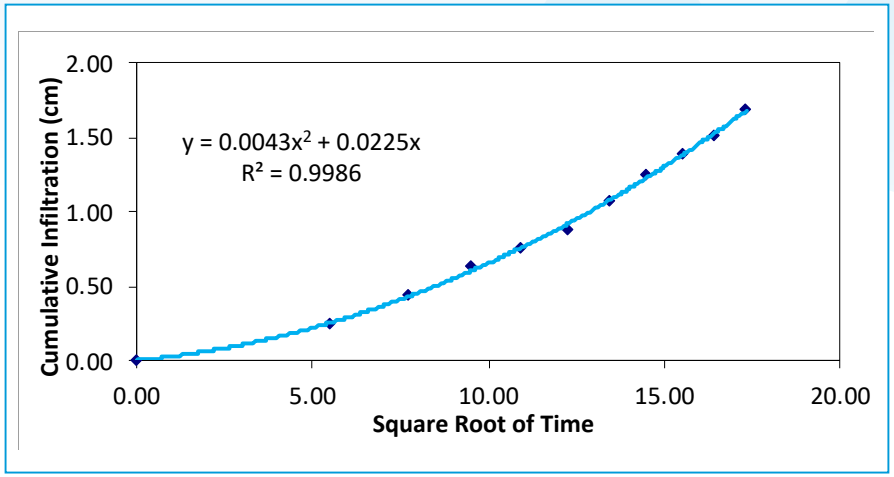
Infiltration Test 3 – RainMaker effect on infiltration in soil

Standard Water



Infiltration: 2.903 cm/h

RainMaker Treated Water



Infiltration: 5.559 cm/h

RainMaker treated water penetrated the untreated soil **47% faster compared to the standard water.**

Faster, more efficient and more effective water infiltration into the soil ensures less losses to evaporation and run-off.

Independent Report on Water Infiltration, Withdrawals and Rooting Depth (Macadamias)

TRIAL NAME:	Improvements in water infiltration, water withdrawals and increased rooting depth of Macadamias after upgrading of RainMaker Water Treatment Technology
CROP:	Macadamias
AREA:	Twee Spruit Trust in White River South Africa
IRRIGATION TYPE:	Drip
PREPARED BY:	Dr Derek J. Askew B.Sc.Agric, M.Sc.Agric, Ph.D., AVCASA, Pr.Sci.Nat.
ASSISTED BY:	Gisela D. de Jager B.Sc.Agric, M.Sc.Agric
PARAMETERS:	Improve water infiltration

Comparison of water withdrawals of RainMaker treated and untreated lands at different soil depths over 3 years

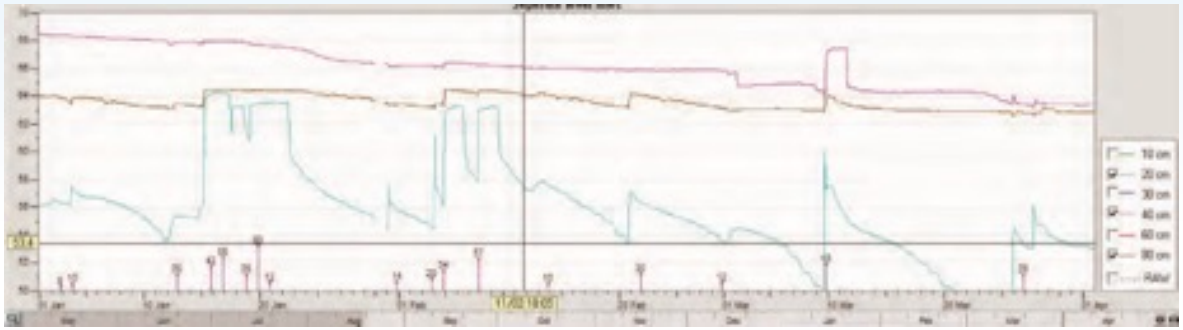
Land	2014 (before upgrade)			2015 (after upgrade)			2016 (after upgrade)			Improvement ranking
	20 cm	40 cm	80 cm	20 cm	40 cm	80 cm	20 cm	40 cm	80 cm	* = poor *** = good
RainMaker Treated MM4	✓	x	x	✓	✓	✓	✓	✓	✓	***
Untreated Control TM5	✓	x	x	✓	x	x	✓	✓	x	**

Under RainMaker treatment the roots of the trees showed activity deeper in the soil profile.

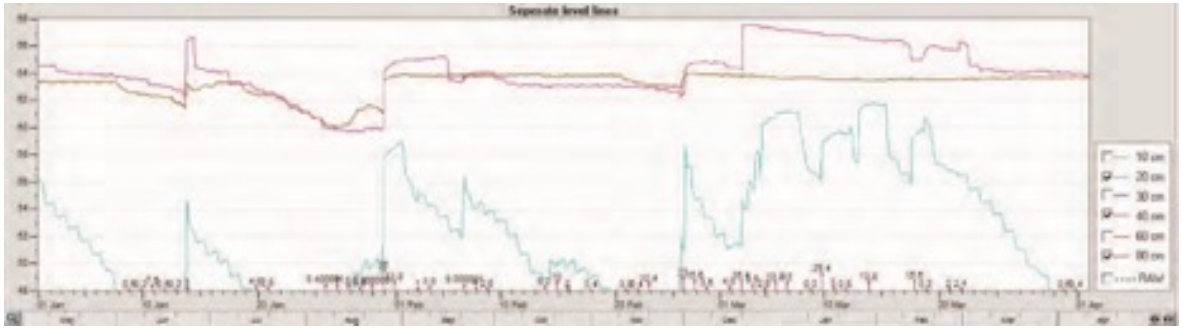
Tree were able grow active roots and utilize water from the top to 80cm depth of the soil profile under RainMaker treatment within a year after treatment initiation.

This shows a pronounced increased in soil volume that can efficiently be used to farm – actively storing available nutrition and water for the trees.

DFM probe data before RainMaker installation - Block MM4



1 January 2013 to 1 April 2013

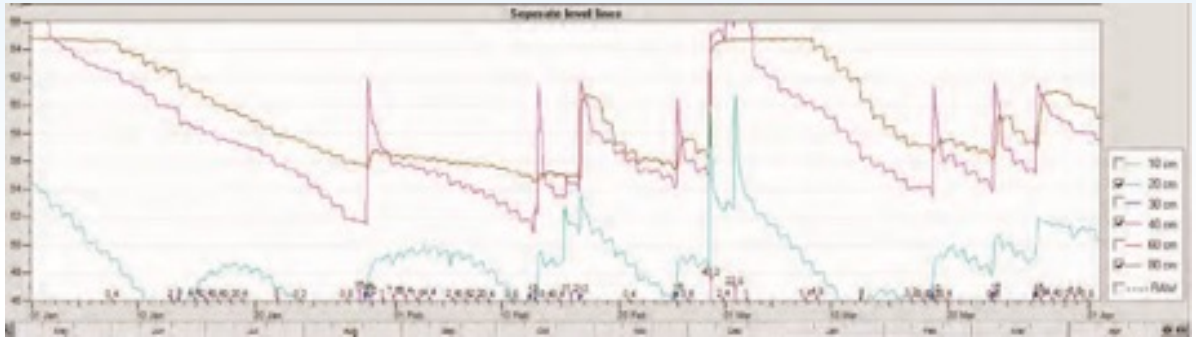


1 January 2014 to 1 April 2014

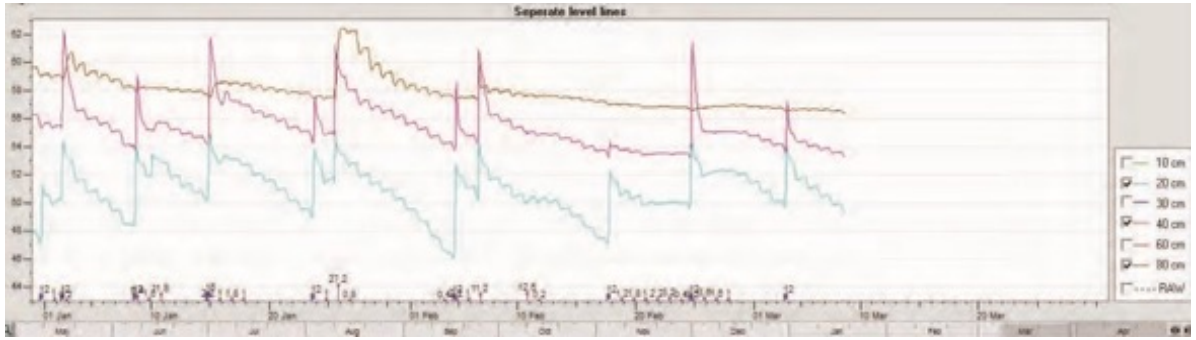
2013 and 2014 probe data shows similar trends for root activity before RainMaker installation.

Water is only efficiently extracted from the 0-20cm depth (very little and inconsistent activity at lower depths).

DFM probe info after RainMaker installation - Block MM4



1 January 2015 to 1 April 2015

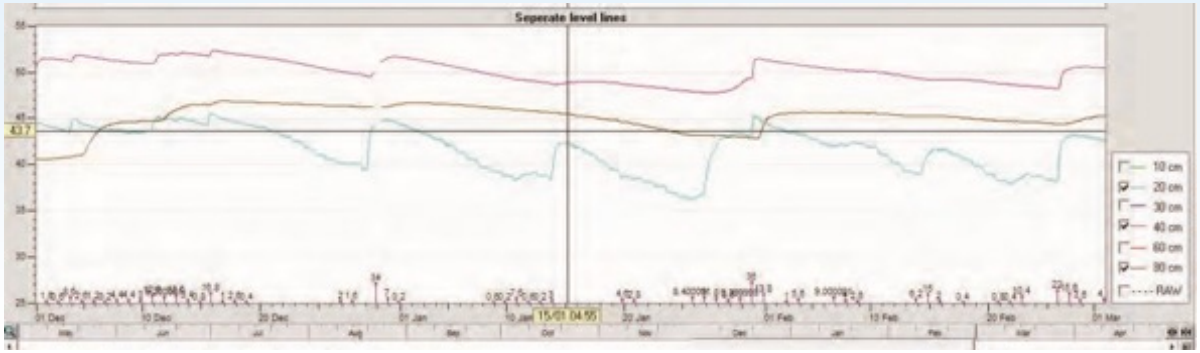


1 January 2016 to 10 March 2016

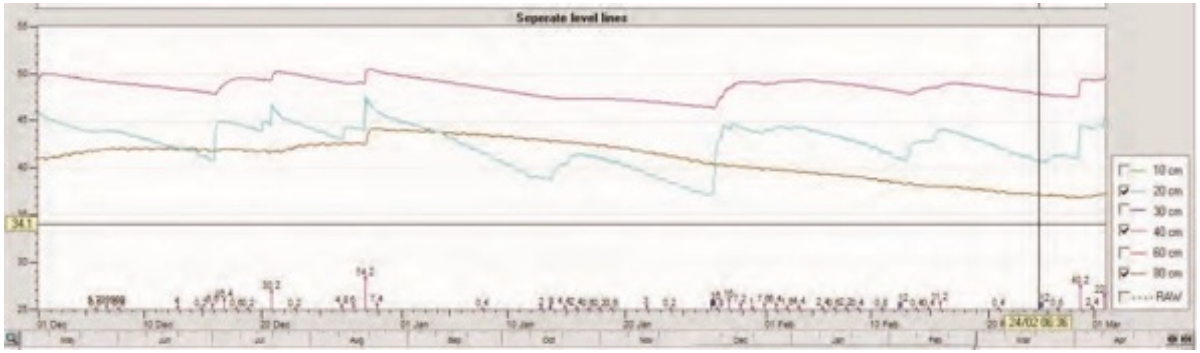
2015 probe data (6 months after RainMaker installation) shows consistent water extraction from the 20-40cm zone, as well as well-defined and consistent water infiltration and extractions from depth as low as 80cm.

These same trend are sustained in the probe data from 2016, confirming continued health root activity and water movement throughout the whole soil profile, from the top down to past 80cm depth.

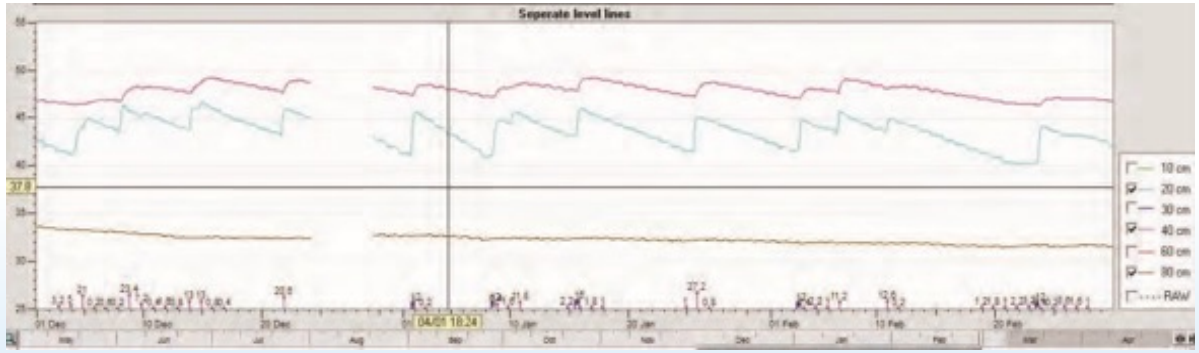
DFM probe info for untreated - Block TM5



1 December 2013 to 1 March 2014



1 December 2014 to 1 March 2015



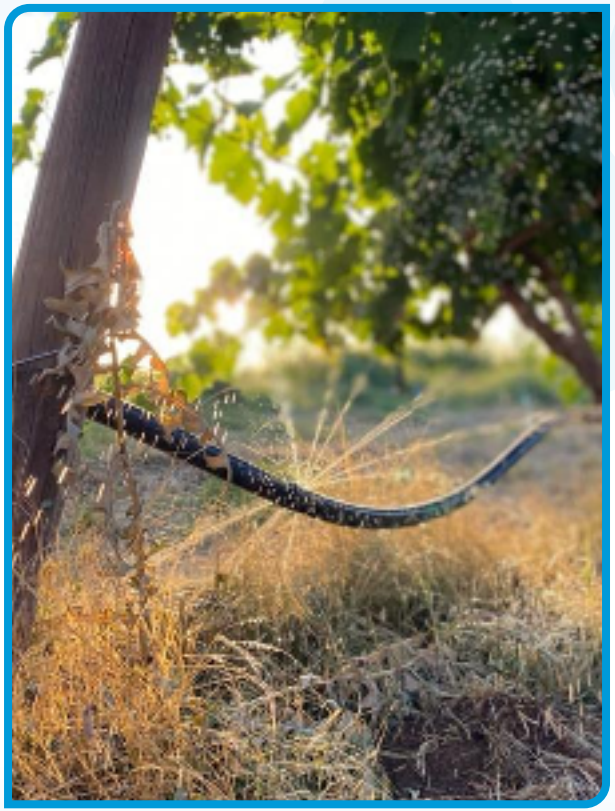
1 December 2015 to 1 March 2016

The untreated block (TM5) showed small daily transpiration cycles only at 20 cm in the 2013/2014 and 2014/2015 seasons.

Only slight improvements were seen in the 2015/2016 season - small withdrawals happening at 40cm.

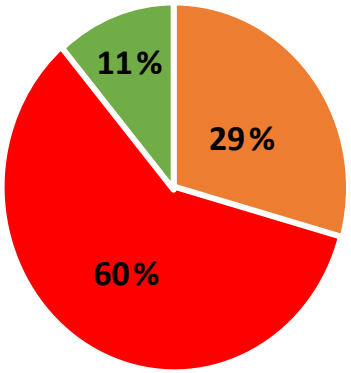
Internal Report
Uniformity of Dripper Delivery

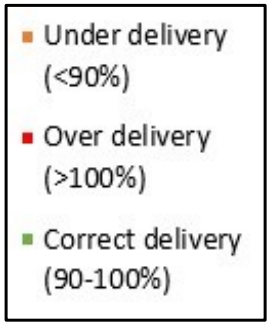
TRIAL NAME:	Influence of RainMaker water treatment on drip irrigation performance and uniformity
CROP:	Table grapes
AREA:	Vredendal, Western Cape, South Africa
IRRIGATION TYPE:	Netafim AgriPlus and Stiner PC
PREPARED BY:	Remina Pienaar, BEng Chemical Engineer
ASSISTED BY:	Barend Pienaar, M.Sc. Molecular and Cell Biology
PARAMETERS:	Uniformity of dripper delivery



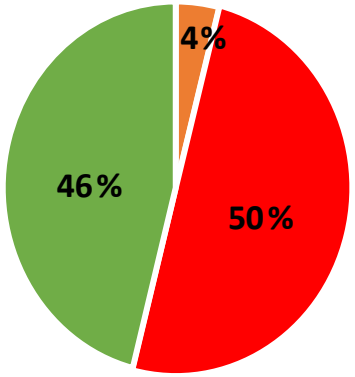
Dripper delivery showing over, under and correct delivering drippers

Before RainMaker installation





5 weeks after RainMaker installation

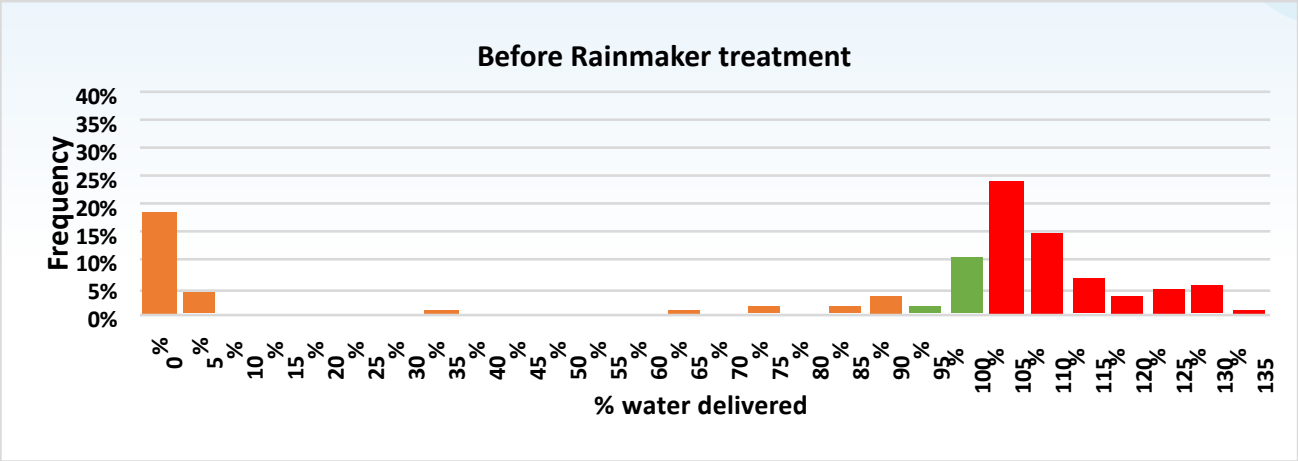


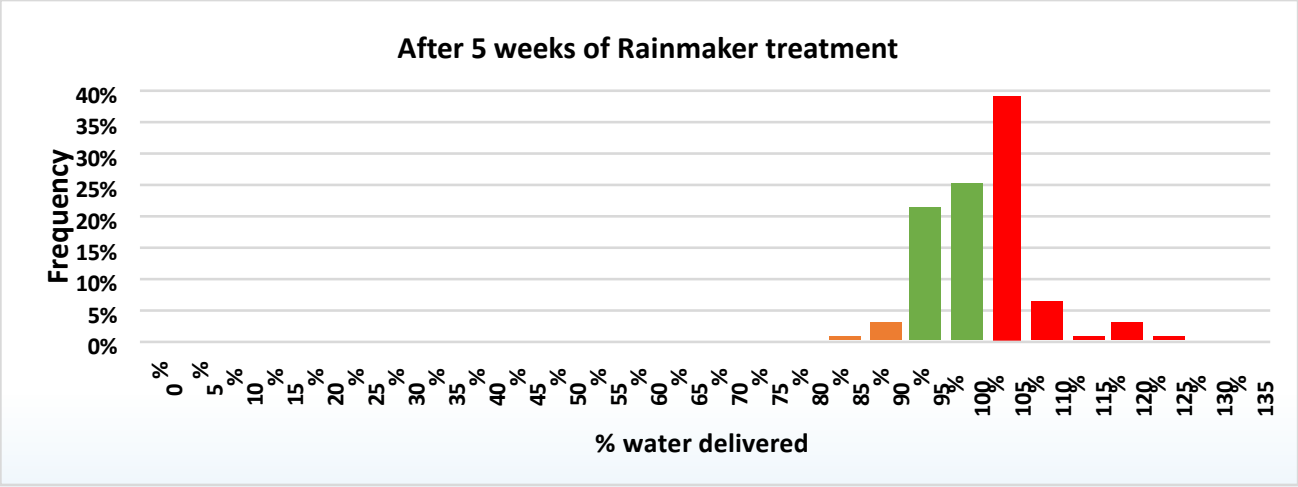
Before RainMaker treatment, only 11% of the drippers delivered the correct amount of water and 29% was under delivering.

After 5 weeks of RainMaker treatment, 46% of dippers delivered the correct amount of water while only 4% were still delivering only slightly below optimum.

Drippers were effectively and efficiently unclogged by RainMaker treatment.

Frequency distributions of dripper delivery before and after RainMaker treatment, respectively.





Drippers still under delivering after 5 weeks of RainMaker treatment, were delivering within 10% under the optimum delivery rate while initially plenty of emitters were completely blocked.

Delivery rate after 5 weeks of treatment was thus very uniform.

Distribution uniformity (DU) and coefficients of uniformity (CU) values

	Time of measurements	Distribution uniformity (%)	Coefficient of uniformity (%)
Rainmaker treated Block 15	1 week*	86.46	93.48
	2 week*	97.97	94.74
	3 week*	91.43	95.64
	5 week*	92.86	96.36
Rainmaker treated Block 17	1 week*	89.26	91.79
	2 week*	89.75	92.26
	3 week*	91.37	92.83
	5 week*	90.89	92.59
Control Block 1	Before flushing**	36.85***	49.81
	After flushing**	81.38***	66.34
Control Block 7	After flushing**	86.51	92.86

* Time after installation of the Rainmaker water treatment unit in the irrigation system.
** Additional rigorous flushing of lateral lines was done to attempt to clean clogged irrigation lines.
*** Completely clogged emitters were excluded from calculation because more than 25% of emitters had zero discharge.

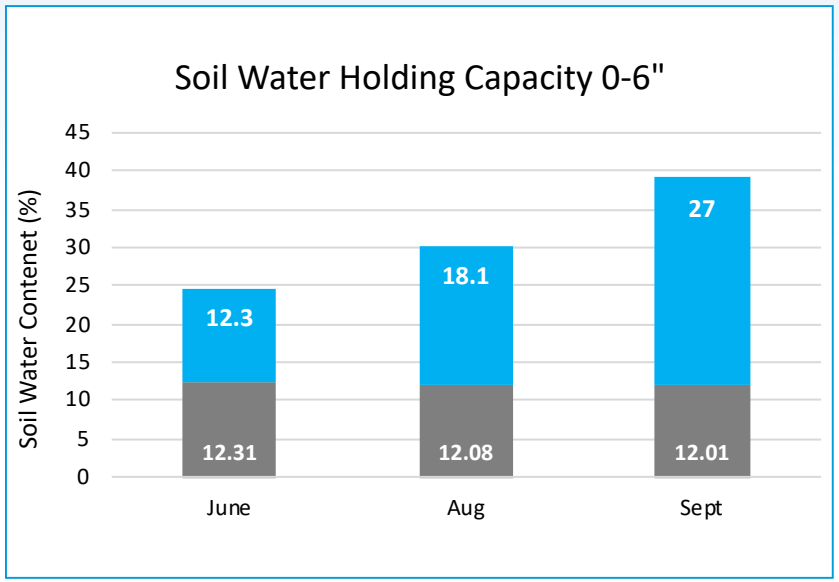
Over 5 weeks DU and CU values (already close to that of newly manufactured non-pressure compensating emitters) further improved to DU and CU values of 92.86% and 96.36% for Block 15 and 90.89% and 92.59% for Block 17, respectively.

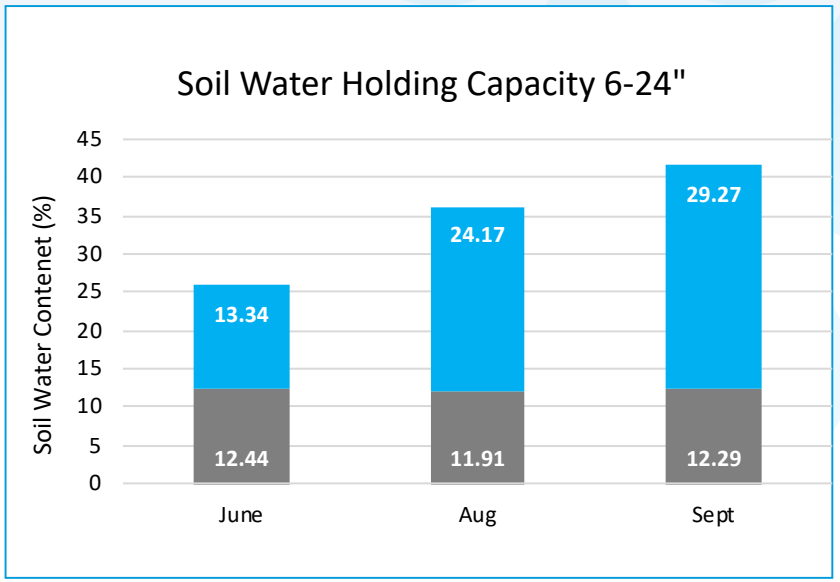
These final calculated values for the RainMaker treated blocks were comparable to standards of newly manufactured pressure compensating drip emitter lines.

Water Holding Capacity Changes

TRIAL NAME:	The effect of RainMaker treated irrigation on the water holding capacity of the soil (first treatment season – 2023) from various sites
AREA:	Alberta, Canada
IRRIGATION TYPE:	Centre pivot irrigation
PREPARED BY:	Remina Pienaar, BEng Chemical Engineer
ASSISTED BY:	Hal Reed
PARAMETERS:	Soil Water Holding Capacity

Site 1, Client 71 - Water Holding Capacity



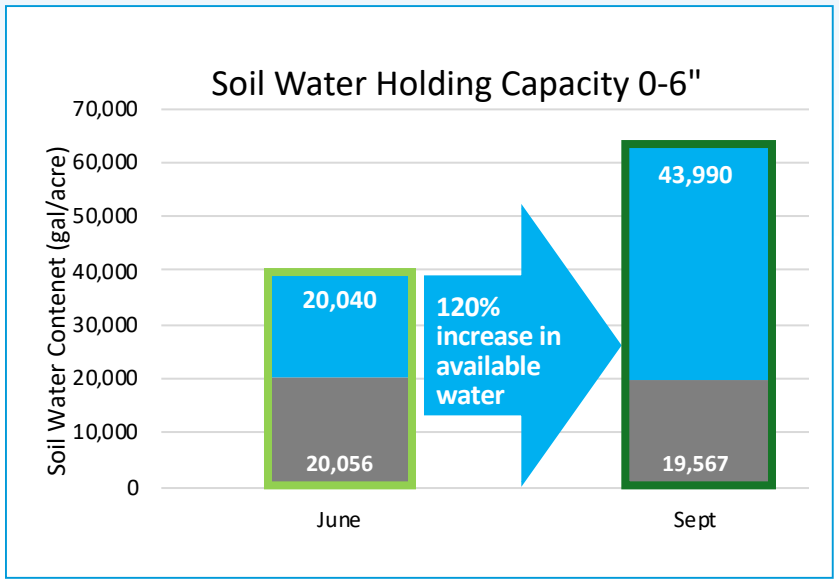


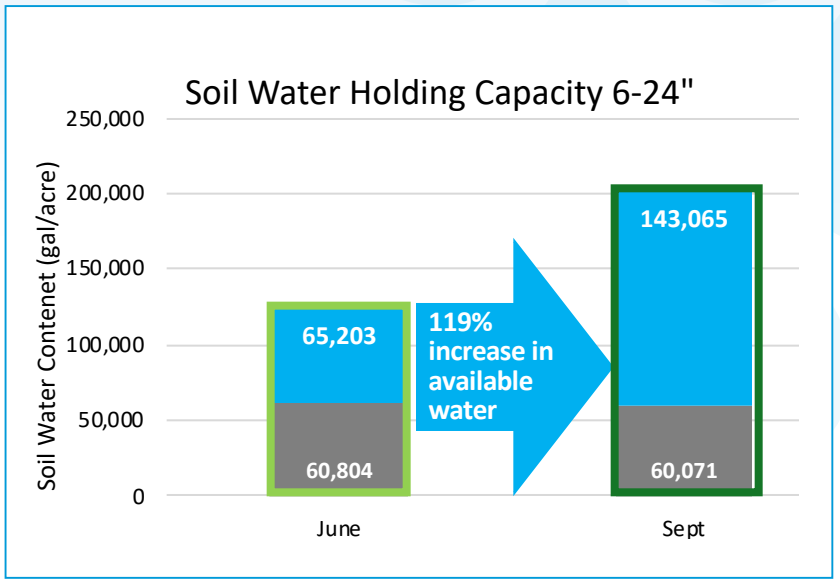
Permanent Wilting Point Available Soil Water Field Capacity

Soil water holding capacity increased significantly throughout the first season of RainMaker treatment in both the top and deeper layers of the soil.

Permanent wilting point stayed relatively unchanged while more water was progressively able to be stored in the soil before field capacity is reached.

Site 1, Client 71 - Water Holding Capacity Changes

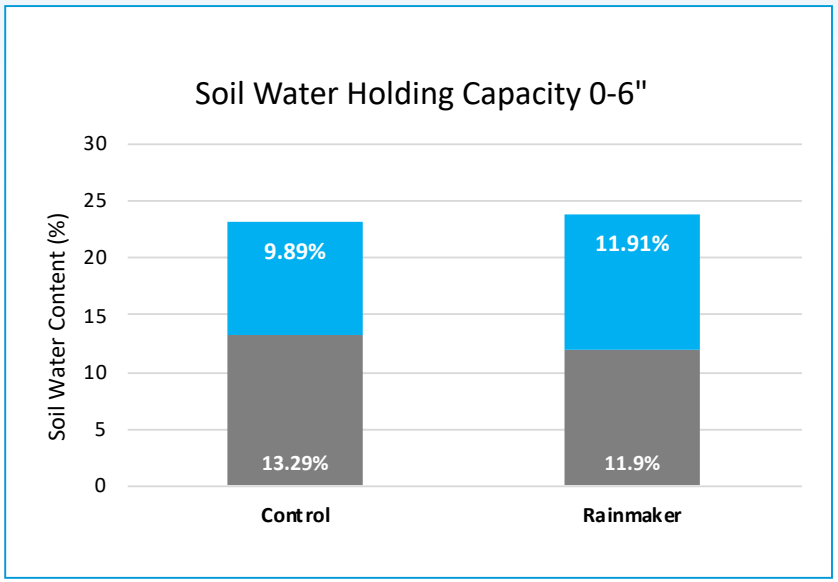


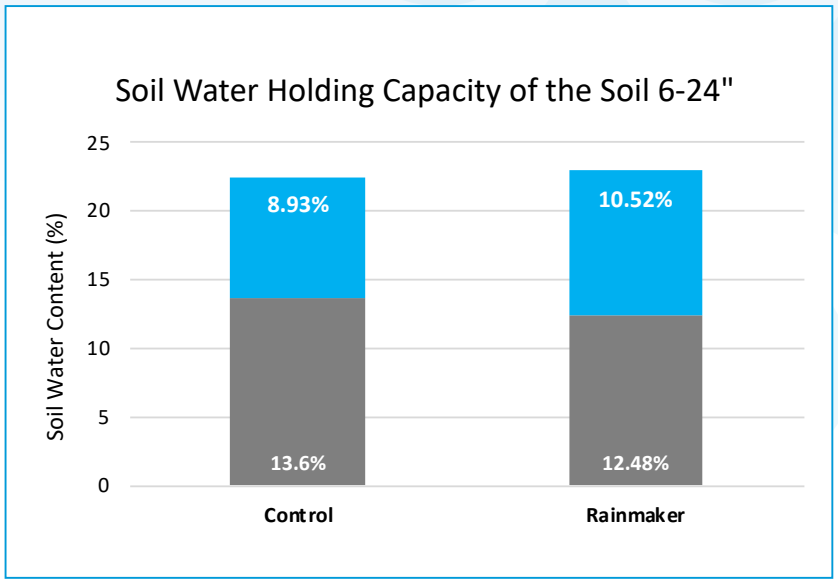


Permanent Wilting Point Available Soil Water Field Capacity

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.

Site 2, Client 46 - Water Holding Capacity Changes



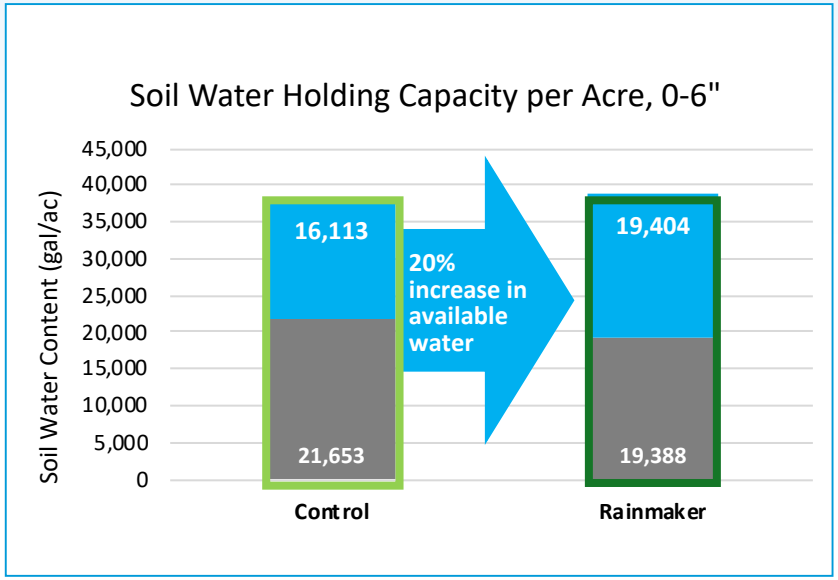


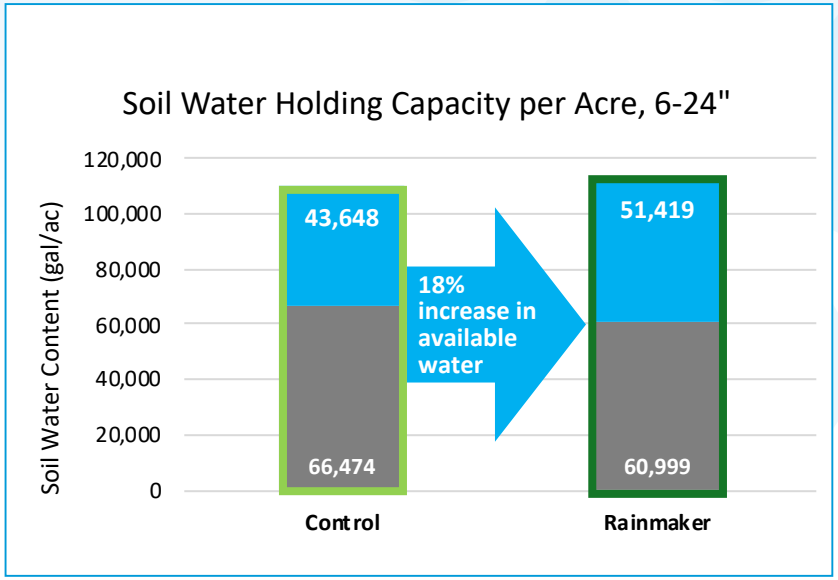
Permanent Wilting Point Available Soil Water Field Capacity

Soil water holding capacity improved on the RainMaker treatment treated field compared to the control in both the top and deeper layers of the soil.

Permanent wilting point came down well as the soil became more conductive to water movement under RainMaker treatment.

Site 2, Client 46 - Water Holding Capacity Changes

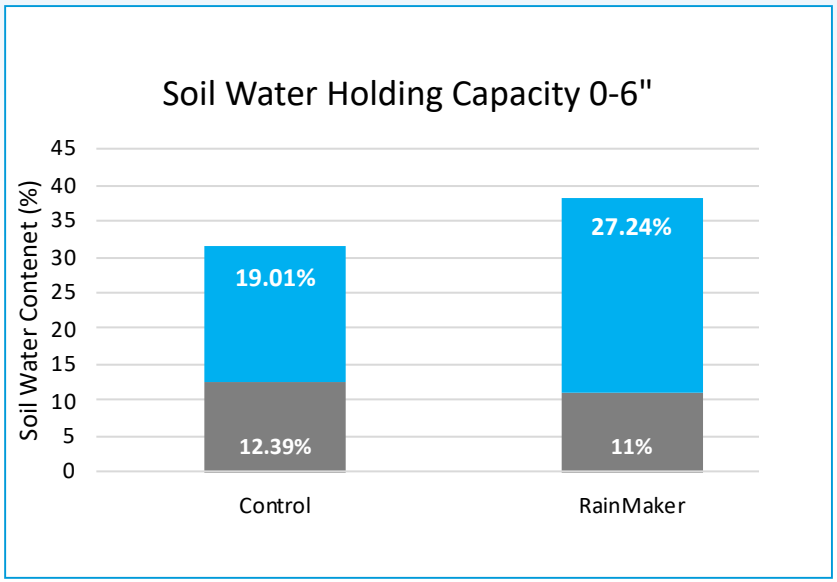


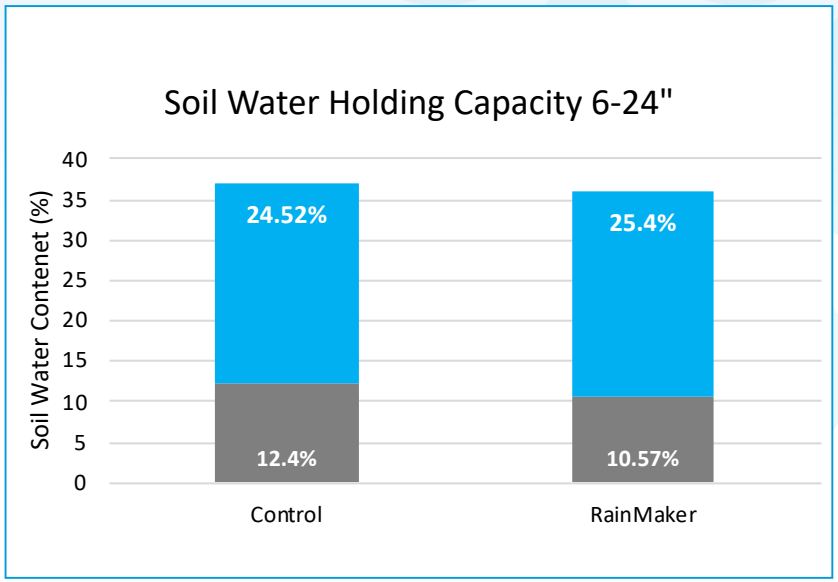


Permanent Wilting Point Available Soil Water Field Capacity

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.

Site 3, Client 74D - Water Holding Capacity Changes





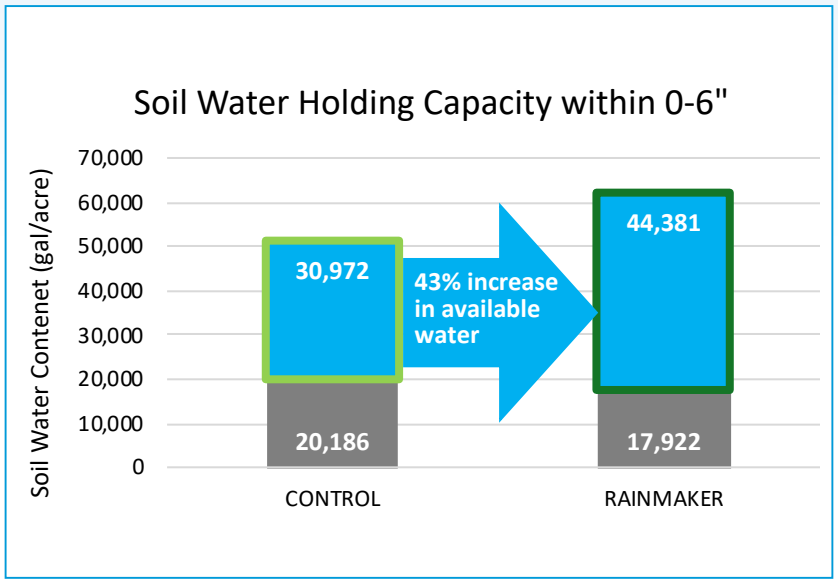
Permanent Wilting Point Available Soil Water Field Capacity

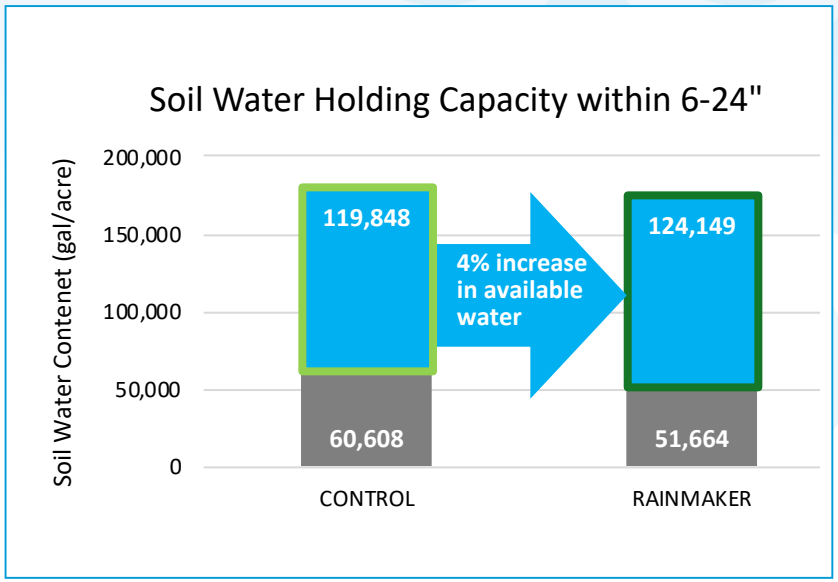
Soil water holding capacity improved very well in the topsoil of the RainMaker treated section compared to the control section.

Soil water holding capacity of the deeper soil profile was already quite good on the control section, but also saw overall improvements on the RainMaker section.

Permanent wilting point came down well as the soil became more conductive to water movement under RainMaker treatment.

Site 3, Client 74D - Water Holding Capacity Changes

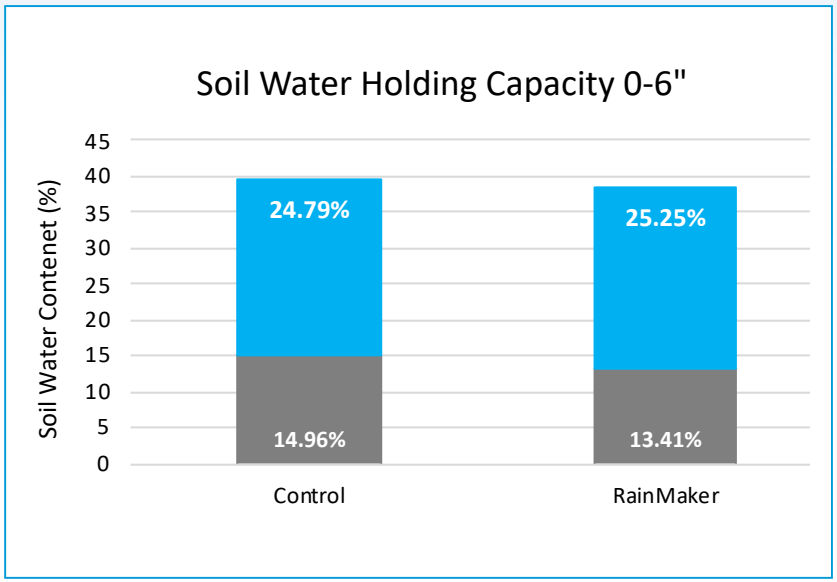


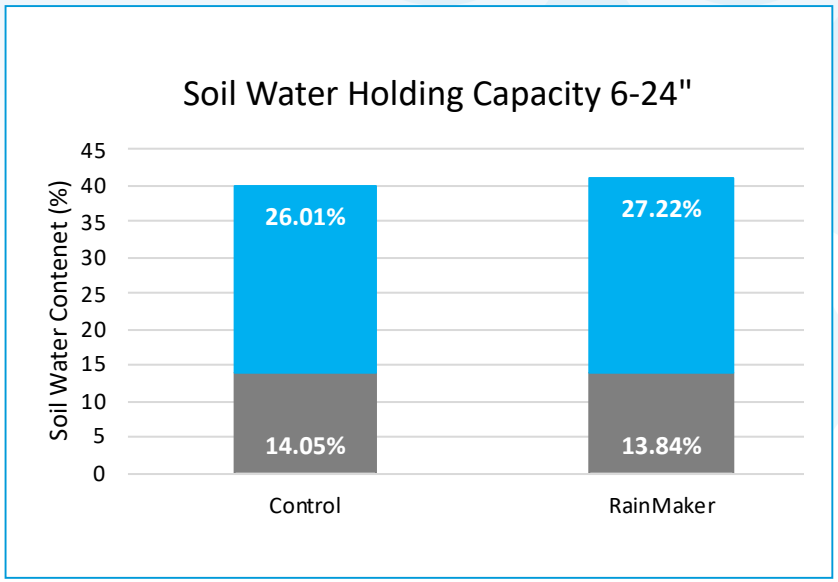


Permanent Wilting Point Available Soil Water Field Capacity

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.

Site 4, Client 78C - Water Holding Capacity Changes



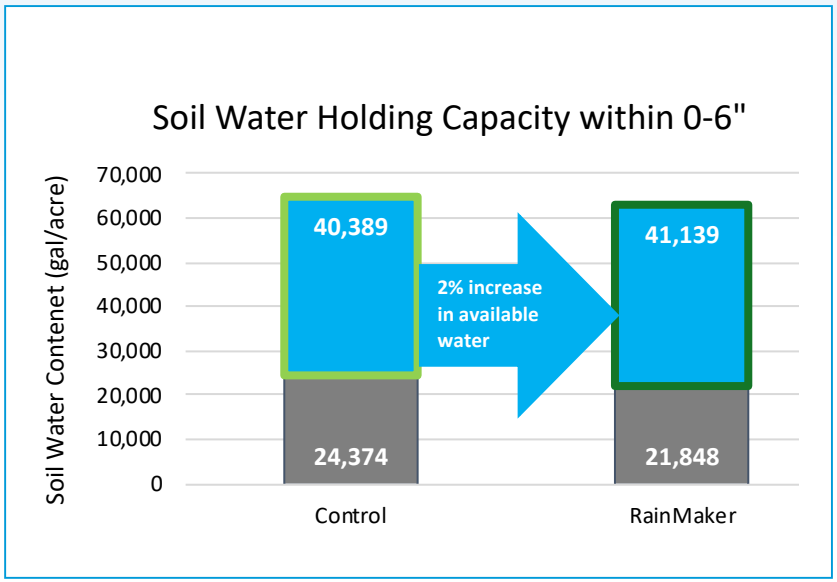


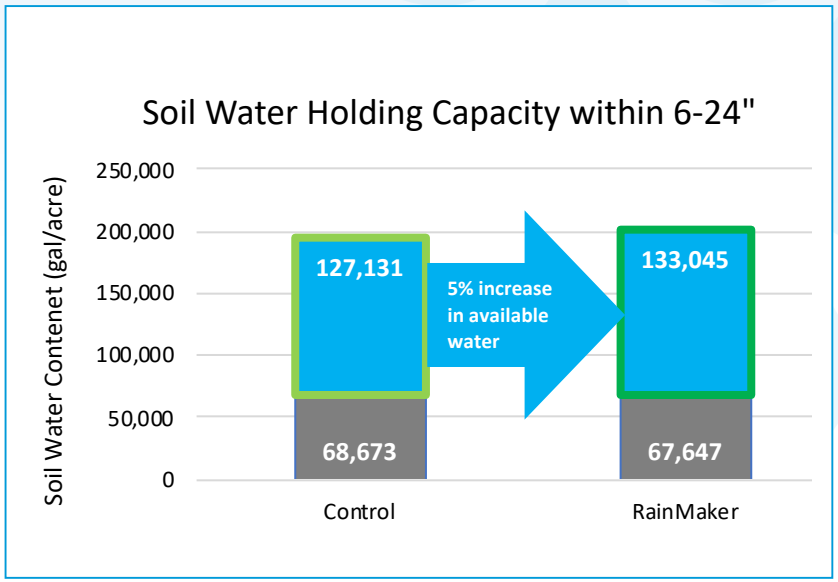
Permanent Wilting Point Available Soil Water Field Capacity

Even in well balanced soil with good water holding capacities the RainMaker treated section still achieved improvements in WHC of both the top and deeper layers of the soil.

Permanent wilting point came down well as the soil became more conductive to water movement under RainMaker treatment.

Site 4, Client 78C - Water Holding Capacity Changes





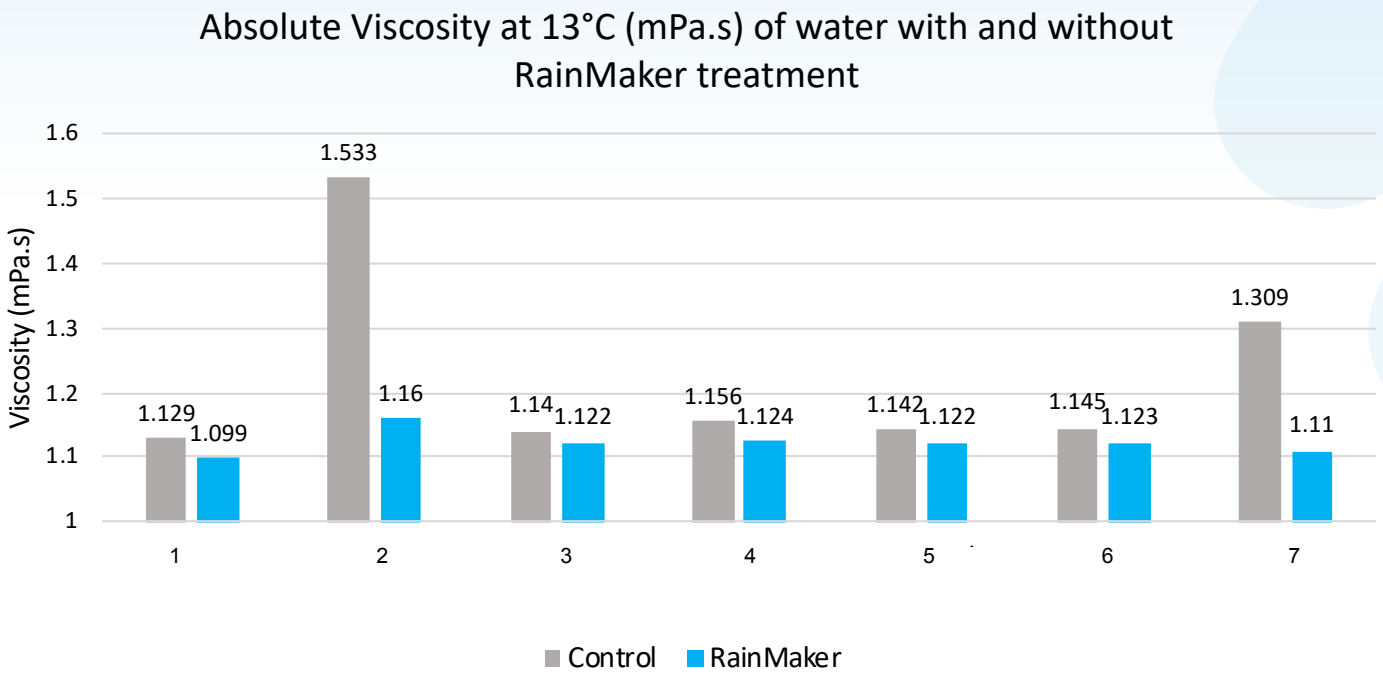
Permanent Wilting Point Available Soil Water Field Capacity

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.

Viscosity Restoration

TRIAL NAME:	Water Viscosity – Analyses from Various Sites
AREA:	Canada
IRRIGATION TYPE:	Various
PREPARED BY:	Remina Pienaar, BEng Chemical Engineer
ASSISTED BY:	Hal Reed
PARAMETERS:	Viscosity

Water Viscosity – Analyses from Various Sites



Water with increased viscosity levels (above 1.1mPa.s) are consistently reduced to levels closer to 1.1 mPa.s by RainMaker water treatment.

Dramatic reductions in water viscosity are seen in water of high viscosity levels when treated by RainMaker.

Observations and Supplementary Data

TRIAL NAME:	Observations recorded on Citrus in Patensie, over the 2013/2014/2015 citrus seasons
CROP:	Citrus
CULTIVAR:	Navels, Midnights, Novas, Clementines and lemons
ORCHARD AGE:	Orchards that's was treated range from 8 to >15 year old
AREA:	Groblersdal (South Africa)
SOIL TYPE:	Deep Hutton soil type with compaction problems
PREPARED BY:	Dr Derek J. Askew B.Sc.Agric, M.Sc.Agric, Ph.D., AVCASA, Pr.Sci.Nat.
ASSISTED BY:	Gisela D. de Jager B.Sc.Agric, M.Sc.Agric
PARAMETERS:	1. Improve water infiltration at 20, 40, 60 and 80 cm 2. Improve penetration 3. Drippers and pipes were kept clean 4. Improve water use efficiency 5. Improve water savings

Over the 2014 to 2015 seasons, the following changes were noted by the independent consultant and irrigation advice amended accordingly

2013 – before installation

Drippers and pipes were always blocked and required weekly maintenance.

Penetrometers would not penetrate deeper than 20–30 cm and that with difficulty.

The average volume of water required to wet the profile down to 60 cm was 276– 300ℓ/tree/week before installation.

2014/2015

The drippers and pipes were kept clean.

Penetrometers now reached 40–60 cm in depth with relative ease.

The average volume of water required to wet the profile down to 60 cm was now an average of 165–180ℓ/tree /week by November 2014.

- In other words some 40% less water was required.
- Water use efficiency showed substantial improvement. Weekly water requirements per tree were reduced across the board – for each given season.

What were the results?

Drippers and pipes were checked for blockages.

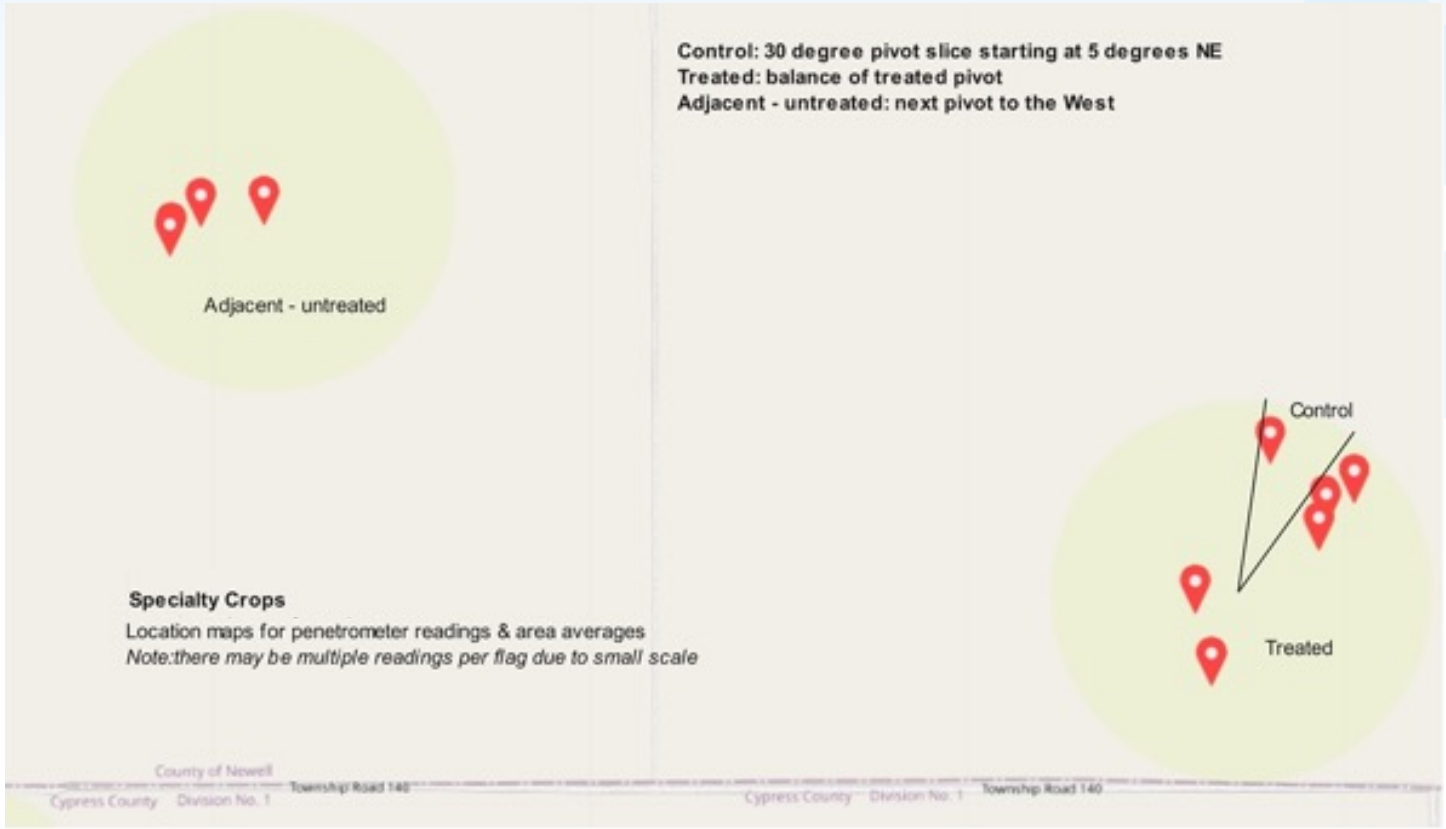
Soil compaction was measured with a penetrometer.

All aspects of irrigation scheduling as above were closely monitored.

Penetrometer Reading Analysis

TRIAL NAME:	Penetrometer readings taken Sept. 23, 2023
TAKEN BY:	Darren Kitzan
EQUIPMENT:	Falker digital penetrometer with GPS
SOFTWARE:	Falker Compact for data collection, graphing and averages
INTERPRETATION:	Compaction measurement, as with any field data, uses averages of 3 or more measurements in a reporting area.
	Compaction limitations on root structure
	Less than1,500 mPa = no root growth limitations
	Between 1,500 – 2500 mPa = root growth inhibited by compaction
	Above 2,500 mPa = Very limited or no root growth possible
	RainMaker compaction relief is a cumulative process, with the compaction layer being relieved at the top of the soil column first, with the aerobic soil environment migrating steadily downwards.

Penetrometer readings



Averages

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

FOR MORE INFORMATION

BOB KNIGHT, President, Rainmaker.Earth Corp.

EMAIL: bob.knight@rainmaker.earth **PHONE:** 403-512-2300

rainmaker.earth

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