



Water solutions for the world.

Oxygen-Powered Growth for Almonds.

CLEANER WATER.
HEALTHIER TREES.
BIGGER RETURNS.

E BOOK

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WELCOME

INTRODUCTION

OVERVIEW

Transforming Almond Irrigation with Oxygen Nanobubbles

Across the world's almond-growing regions, growers face mounting pressure to achieve more with less — less water, fewer inputs, and tighter margins.

Yet below the soil surface, oxygen deficiency quietly limits tree health, nutrient efficiency, and long-term yield.

Traditional irrigation delivers water, not oxygen. When dissolved oxygen (DO) levels fall, root respiration slows, beneficial microbes decline, and pathogens such as Phytophthora and Pythium thrive. The result is weaker trees, inconsistent yields, and rising input costs.

The Solari Water Nanobubble Generator changes this dynamic. By infusing billions of microscopic oxygen bubbles into irrigation water, it sustains DO levels up to 20 ppm — more than triple conventional systems. Growers report faster root recovery, reduced disease pressure, and stronger, more productive orchards.

Field results show yield increases of 15-30 %, water savings up to 25 %, and input reductions of 20-40 %, often delivering full ROI within two seasons.





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About The Author

Doug Fletcher

Through our work in water oxygenation and nanobubble irrigation across diverse environments, we've witnessed how the right technology can revitalise soil, strengthen plant health, and significantly improve productivity. The consistent results seen in orchards and farms inspired us to share those findings more broadly, and this eBook was created to help others understand the opportunity.

Our goal is simple — to make advanced water technology practical and accessible for growers. By harnessing the power of oxygen, farmers can improve yields, restore soil health, and reduce their reliance on chemicals and additives. It's an approach that benefits both the land and the bottom line.

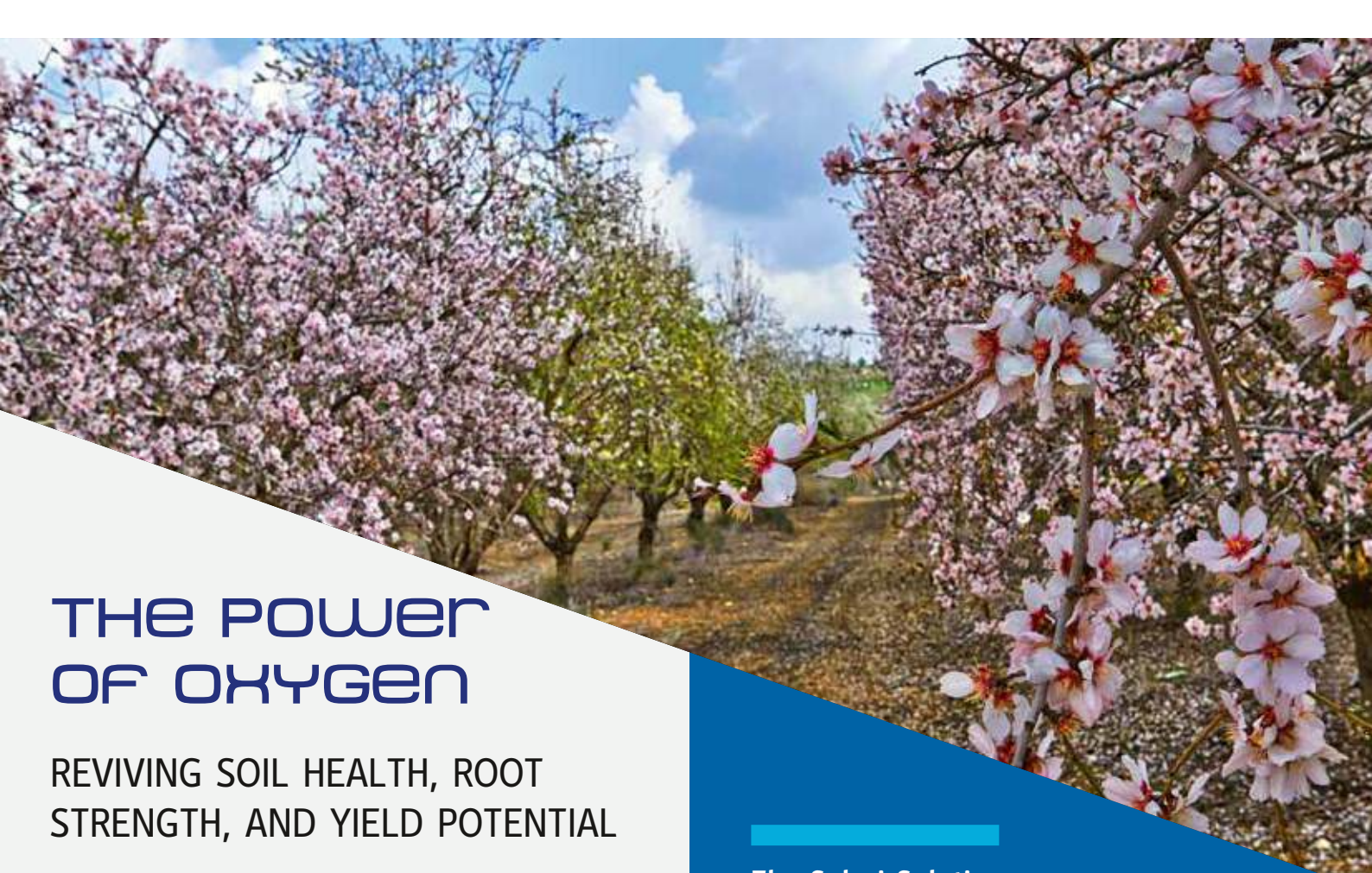
Look out for future Solari Water eBooks that explore nanobubble applications across other industries and crops, as we continue to document results and share practical knowledge from the field.



OXYGEN-POWERED Irrigation

The Smart Way to Grow
Stronger Almond Trees





THE POWER OF OXYGEN

REVIVING SOIL HEALTH, ROOT STRENGTH, AND YIELD POTENTIAL

Healthy orchards start below the surface. In almond production, soil structure, microbial activity, and oxygen availability determine how well every litre of water and gram of fertiliser is used. Yet in many systems, oxygen depletion quietly limits performance — roots struggle to breathe, microbes become inactive, and soil diseases take hold.

Solari Water's Nanobubble Generator turns ordinary irrigation water into a high-oxygen growth medium that reawakens biological function in the root zone. By maintaining dissolved oxygen (DO) levels up to 20 ppm, it restores balance in the soil, strengthens roots, and supports consistent, high-quality yields.

The Hidden Limitation

Low-oxygen conditions often go unnoticed. Compacted soils, stagnant water, and heavy fertigation all reduce dissolved oxygen, creating anaerobic zones that stress roots and favour pathogens like *Phytophthora* and *Fusarium*. Over time, growth slows, nutrient uptake drops, and trees lose their natural resilience.

The Solari Solution

Solari Water's Nanobubble Generator represents a breakthrough in irrigation performance — using advanced oxygen delivery to transform how water interacts with the soil and root environment. Each system infuses billions of stable nanobubbles, less than a micron in size, directly into the irrigation stream. Unlike conventional aeration, these oxygen bubbles remain suspended for hours, travelling through the network and reaching deep into the active root zone.

As oxygen permeates the soil profile, conditions shift from anaerobic to aerobic, stimulating beneficial microbial activity and restoring balance to the soil ecosystem. The result is faster nutrient conversion, improved breakdown of organic matter, and greater availability of nitrogen, phosphorus, and trace elements essential for tree health. Roots become more fibrous, active, and efficient — enhancing both nutrient uptake and water infiltration across the orchard.





IMPROVED ROOT FUNCTION & NUTRIENT UPTAKE

UNLOCKING THE BIOLOGICAL ENGINE OF ALMOND PRODUCTIVITY

Healthy root systems are the foundation of productive almond orchards, yet root performance is easily compromised when oxygen levels drop below optimal thresholds. In low-oxygen soil environments, root respiration slows, fine roots die back, and nutrient uptake becomes inefficient. These hidden losses compound over time — reducing tree vigour, limiting kernel fill, and increasing stress sensitivity throughout the season.

Almond orchards depend on a highly aerobic root system, yet repeated irrigation, fine-textured soils and machinery traffic can quickly deplete available oxygen when trees need it most. This creates anaerobic pockets where beneficial microbes decline and nutrient cycling slows. Nanobubble-infused irrigation restores dissolved oxygen across the soil profile, delivering billions of ultra-stable bubbles that remain active far longer than traditional aeration methods.

This sustained oxygenation supports aerobic microbes, improves fertiliser conversion into plant-available forms and encourages dense, fibrous root growth. Over time, trees show stronger early-season root flushes, more efficient nutrient uptake and more balanced growth across the orchard — even in challenging soil types or high-demand periods.

From water to root zone, Solari Water nanobubbles deliver stable oxygen exactly where almond trees need it most — supporting healthier orchards from below the surface.

Root Zone Balance & Recovery

In soils affected by compaction, salinity or repeated irrigation cycles, nanobubble-enriched water helps restore aerobic conditions that roots depend on. Consistent dissolved oxygen supports beneficial microbes, improves soil structure and strengthens fine-root recovery after stress, giving almond trees a more resilient foundation for growth.



DISEASE CONTROL IN ALMOND ORCHARDS

New Insights for Almond Growers

Oxygen Levels Shape the Orchard Environment

Almonds perform best when soil biology stays active — and that depends on oxygen below the surface. Trials across major growing regions show that higher dissolved-oxygen levels make soils less favourable for root-rot pathogens and more supportive of healthy root metabolism. Trees respond with steadier growth, better post-irrigation recovery and improved resilience in challenging moisture conditions.

Rebuilding the Soil's Defensive System

Healthy soil isn't just nutrient-rich — it's alive. Aerobic microbes help regulate disease, recycle organic matter and build the structure roots rely on. When oxygen drops, these beneficial organisms slow down and harmful fungi take advantage, reducing the soil's natural defence.



Oxygen-Driven Root Performance

Nanobubbles give almond roots something standard irrigation cannot: a long, steady supply of usable oxygen. Because these microscopic bubbles remain suspended for extended periods, oxygen continues to move through the soil well after irrigation has stopped. This keeps root tissues active, improves nutrient conversion and helps fine roots occupy more of the soil profile.

Field evidence shows that oxygen-rich irrigation encourages a busier, more diverse microbial community — one that breaks down organic matter faster and makes nutrients easier for trees to access. Growers often report earlier root activity in spring, better canopy momentum and more consistent nut development when oxygen remains available during critical growth windows.

A Soil Profile That Works With You — Not Against You

As oxygen reaches compacted or slow-draining layers, soil structure gradually shifts. Water begins to move more evenly, salts distribute more predictably, and root exploration improves. The result is a soil profile that supports the tree rather than restricting it — one that supplies moisture and nutrients efficiently, even when conditions fluctuate.

With stronger roots, a more active biological community and improved soil structure, almond orchards gain the kind of resilience that traditional irrigation simply can't replicate.





PATHOGEN SUPPRESSION MECHANISMS

Why Oxygen Nanobubbles Change the Disease Equation

A Defensive Environment Starts in the Soil

Soil-borne diseases in almonds often emerge when irrigation leaves the root zone saturated and oxygen levels collapse. In these low-oxygen pockets, root-rot fungi multiply rapidly, fine roots lose vigour and the tree becomes more vulnerable each season. Nanobubble-infused irrigation interrupts this cycle by keeping oxygen available deeper and longer in the soil. With oxygen present, pathogen activity slows, root metabolism stabilises and the environment becomes far less favourable for infection.

Restoring Microbial Balance After Stress Events

Periods of heavy rainfall, compaction, or over-irrigation can shift the soil biology in favour of harmful fungi. Nanobubbles help tilt that balance back. As aerobic microbes regain dominance, they break down organic residues faster, occupy physical space around the roots and outcompete pathogens for resources. For many growers, this means fewer flare-ups of disease after wet springs and more uniform recovery in stressed or marginal blocks.

Creating a Soil Profile That Resists Infection

When oxygen is consistently available throughout the season, the soil begins to behave like a defensive system rather than a risk zone. Water drains more uniformly, anaerobic pockets shrink, and root tissues maintain the metabolic activity needed to resist attack. Over time, almond orchards develop a more resilient root base capable of withstanding disease pressure without relying on intensive chemical input.

How Nanobubbles Disrupt Pathogen Conditions

Nanobubbles suspend oxygen in irrigation water far longer than traditional aeration, allowing oxygen to move into tight, compacted or slow-draining soil layers. This shift reduces the environments where root-rot fungi thrive and supports roots during high-demand periods. Almond growers often report reduced disease expression in blocks previously prone to persistent root decline or poor drainage.

Biology That Works in Your Favour

As oxygen availability steadies, the entire microbial community shifts. Beneficial aerobic organisms become more active, decomposing organic matter and removing the food sources pathogens rely on. At the same time, roots maintain better respiration and recover more quickly after waterlogging. The combined effect is a root zone that becomes progressively harder for pathogens to dominate — a biological advantage that builds with every irrigation cycle.





REAL-WORLD GAINS IN ALMOND ORCHARDS

How Oxygen Nanobubbles Lift Performance in Challenging Conditions

Healthier Growth After Stress Events

Almond growers regularly face conditions that weaken the root zone — wet springs, compaction, slow-draining soils and repeated irrigation that leaves oxygen depleted. Where nanobubbles are added to the system, growers report noticeably stronger recovery after these events. Roots re-activate faster, leaf-out is more consistent and trees maintain momentum instead of stalling through early-season stress.

More Uniform Blocks & Better Tree Balance

One of the most consistent outcomes seen in oxygen-enriched orchards is improved uniformity. Areas previously known as “soft spots” — corners that stayed wet, compacted lanes or zones with poor drainage — begin to perform more like the rest of the block. With better root aeration, trees hold their canopy shape, build stronger nut-bearing wood and push more stable growth across the entire orchard floor.

Reduced Disease Expression in High-Risk Areas

In blocks where root decline or waterlogging had become recurring issues, nanobubble irrigation has been associated with fewer outbreaks of root-zone disease. As oxygen availability rises, the environment becomes less favourable for pathogenic fungi, supporting cleaner root systems and reducing the seasonal setbacks that harm productivity.



ROI for Almond Growers

Transforming Irrigation Into a Measurable Financial Gain

Nanobubble-oxygenated irrigation doesn't just improve tree health — it delivers a clear, quantifiable return on investment for almond producers. By increasing dissolved oxygen levels, enhancing nutrient use efficiency, and reducing the impact of soil-borne disease, growers see meaningful yield gains within the first one to two seasons of operation.

Across commercial trials and modelling for 20-hectare orchards, even conservative improvements in yield translate into strong financial outcomes. Systems typically pay for themselves within 1–3 years, depending on market pricing and orchard conditions. Higher-return scenarios — particularly in orchards recovering from stress, compaction, or disease pressure — deliver exceptionally fast payback periods.

Why the ROI Is So Strong

- Higher yields:** Oxygen-rich irrigation boosts root activity and nutrient uptake, improving kernel set and consistency.
- Lower input costs:** More efficient fertiliser use and reduced need for corrective soil treatments.
- Improved system reliability:** Reduced biofilm, fewer blockages, and smoother irrigation performance.
- Greater resilience:** Better tree recovery after heat, waterlogging, or disease events.

For growers looking to increase productivity while managing rising input costs, nanobubble technology provides one of the most cost-effective upgrades available. It converts every irrigation cycle into a driver of healthier soil, stronger trees, and higher annual returns — season after season.

A smarter irrigation upgrade that pays for itself — and keeps paying every season after.

- Fast Payback
- Higher Yields
- Strong Response at Any Price Point
- Same Investment, Bigger Return
- Low Operating Cost
- Ideal for 20+ ha Developments

Almond ROI tables

Conservative Pricing (AU\$7.90/kg):

Scenario	Yield Gain	Investment	Annual Benefit (20ha)	Payback
Conservative	+8%	\$209,300	\$75,240	2.8 years
Typical	+12%	\$209,300	\$105,260	2.0 years
High return	+20%	\$209,300	\$165,300	1.3 years

Optimistic Pricing (AU\$10.35/kg - Current Market):

Scenario	Yield Gain	Investment	Annual Benefit (20ha)	Payback
Conservative	+8%	\$209,300	\$93,860	2.2 years
Typical	+12%	\$209,300	\$133,190	1.6 years
High return	+20%	\$209,300	\$211,850	1.0 years

For growers seeking cleaner water, healthier trees, and higher long-term profitability, nanobubble irrigation represents a proven, chemical-free



READY TO IMPROVE YOUR ORCHARD'S PERFORMANCE?

Cleaner Water | Healthier Trees | Bigger Returns

Solari Water partners with almond growers and irrigation specialists to lift orchard performance through cleaner water, healthier soils, and more reliable productivity. Our nanobubble generator systems integrate seamlessly into existing setups, delivering stable dissolved oxygen levels that strengthen root systems and support long-term orchard resilience.

Whether you're combating soil fatigue, improving uniformity, or aiming for stronger yield consistency across the block, oxygen nanobubbles provide a practical, chemical-free advantage.

💬 Let's talk about your orchard.

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