

EXPLORE THE NEXT GENERATION OF SUSTAINABLE WATER MANAGEMENT

WATER IS A FINITE RESOURCE.

Groundwater levels in California are plummeting due to periods of severe drought conditions and over-pumping for irrigation purposes.¹

Just under 80% of all surface and groundwater withdrawals in the state are associated with agricultural production.² In an average year, approximately 9.6 million acres in California are irrigated with roughly 34 million acre-feet of water, an amount that would cover 31 million football fields with 1 foot of water.³ As one of the most agriculturally diverse production regions in the country, California depends on the availability of high-quality water to deliver food, feed and fiber to support a growing population.

New challenges and competing demands will continue to put a heightened burden on water resources for growers. Factors that will affect water availability in the future include urbanization and population growth, climate change, reductions in average daily precipitation, increased severity and incidence of drought, saltwater intrusion, aquifer (groundwater) depletion and changes in government policy and federal regulations limiting withdrawals.⁴

Without access to high-quality water, crop productivity will suffer. Water stress negatively affects crop establishment, plant health, crop yield and quality, nutrient uptake and the performance of soil-applied inputs. West Coast growers, in particular, face tremendous challenges as drought conditions make water management even more difficult.



THE WORLD RESOURCES INSTITUTE PROJECTS A 56% GAP BETWEEN GLOBAL WATER SUPPLY AND DEMAND BY 2030.⁵

Producing for today, preserving for tomorrow

It's no secret water is at a premium for several high-production agricultural regions in the United States. Crop production comprises more than 95% of national consumptive water use,⁶ and irrigation accounts for 47% of national surface water consumption and 75% of national groundwater consumption.⁷

Sustainable production practices, including efficient water use, can help support progressive farming operations to provide food, feed and fiber for a growing population. Growers, food companies and processors that can do more with less will be more profitable and competitive as consumer demands and needs evolve.

These practices aren't only beneficial to the environment. They're also good for business. Working in an unsustainable way creates supply chain, operational and financial risks for

companies, organizations and growers. Today's consumers pay more attention to how products are manufactured and demand more planet-friendly production practices.

To help meet consumer demands and ensure surface and groundwater resources can sustain food production and other water uses, stakeholders, including government organizations, food companies and farming operations, need to explore new water management strategies. Growers must employ practices that improve water use, including implementing more effective irrigation methods, adopting water-efficient cropping systems and using technology that optimizes water infiltration, soil retention and use.

61%

of U.S. consumers
rate sustainability
as an important
criterion when making
purchase decisions.⁸



BY 2025, GLOBAL WATER DEMAND FOR AGRICULTURE WILL INCREASE BY 60%.⁴

3 steps to meet water sustainability goals

As an influencer in the food production system, here are several steps you can take to support more efficient water use.

1. Lead positive, sustainable change for food production

Use your expertise, resources and credentials to help build a more sustainable food system. Look for ways to increase water use efficiency and recharge aquifers by supporting new technologies and production practices.

2. Help growers adopt more sustainable production practices

There's no silver bullet solution for the challenges that face modern agriculture. However, taking a more holistic approach to production and implementing new tools and technologies to support more sustainable practices is a step in the right direction. Efficient water use goes hand in hand with regenerative agriculture practices. Healthy soil absorbs more water, making irrigation more efficient. Educate your partners about tools and production practices that promote water productivity:

- Audit irrigation systems to identify improvement opportunities.
 - Implement more efficient irrigation equipment.
 - Adopt more effective watering and maintenance schedules.
 - Incorporate recycled water.
 - Add technologies that optimize irrigation water infiltration and retention to prevent runoff.
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3. Continue to explore new research and technology

Over the past several decades, specialty crop producers have successfully implemented practices to reduce water consumption. The amount of water used to produce each pound of almonds, for example, was reduced by 33% between 1990 and 2010.⁹ But, there's still work to be done.

It will take new technology, focused research and interdisciplinary collaboration to continue progress into the next decade.

IRRIGATION WATER OPTIMIZERS: SUPPORTING MORE FOCUSED SUSTAINABILITY EFFORTS.

While modern irrigation equipment, effective watering schedules and irrigation efficiency methods have led to more efficient water use, progressive growers and food companies will need to continue to adopt new technologies to future-proof their operations. The goal is to implement management strategies that improve water use efficiency while maintaining yield and quality expectations.

Irrigation Water Optimizers (IWOs) are a category of products that enhance water use and productivity by:

- Improving soil infiltration of water, reducing evaporation and runoff.
- Facilitating lateral water movement within the soil profile.
- Holding water in the root zone.

IWOs by Precision Laboratories are a convenient and simple way to optimize water use. They are easily incorporated into irrigation programs with options for injection via drip, sprinkler or micro emitters. Most IWOs can also be applied directly on the soil surface and irrigated into the soil profile, and some are compatible with other nutrient applications via fertigation or preplant sprays.

IWOs ARE SUSTAINABLE AND PROFITABLE

Studies show IWOs can help optimize a plant's growing environment and health by enhancing irrigation water characteristics. The benefits of IWOs include:

- Improved irrigation efficiency and potential for reduction in water usage.
- More efficient nutrient uptake.
- More uniform moisture environment to improve performance of crop inputs.
- Decreased energy costs.
- Additional revenue generated from improved crop yield and quality.



IT'S ALL IN THE SCIENCE

There are two primary types of IWOs: infiltration surfactants and hydration surfactants.

Infiltration surfactants treat water and reduce surface tension, allowing the water to move into and throughout the plant root zone. They are ideal for crusted hardpans and tight soils, and work well under wet conditions. Tight soils repel water, causing runoff, which can induce plant stress, reduce crop yield and quality, reduce the efficacy of soil-applied chemistries and limit nutrient availability and uptake. To address these issues, growers often increase the amount of irrigation water applied, reducing their return on investment and inefficiently using a limited resource. Water repellency affects how soils are wetted and can cause significant yield reductions under dry conditions.¹⁰

Studies indicate that water repellency can cause an annual economic loss of 40% in crop production due to:¹⁰

- Rapid leaching of surface-applied crop protection products.
- Loss of water and nutrient availability from soil runoff, erosion and evaporation.
- Uneven distribution of nutrients and water.

Hydration surfactants treat soil and improve water availability in the root zone to maintain water content and reduce plant stress. They are ideal for dry climates with limited water supplies and in coarse soils that are susceptible to water leaching from the root zone. In these conditions, growers may increase the frequency of irrigation cycles to maintain ideal soil moisture and offset leaching, increasing the use of irrigation water. Lack of moisture retention within the soil profile adds demand for water in areas with resource limitation.

IWOs can help address these issues to improve water availability to the plant over time, ultimately improving crop productivity and potentially reducing the amount of irrigation water required to sustain the crop.

**"WE CAN BUILD IWO PRODUCTS THAT MOVE WATER MORE
READILY INTO AND THROUGHOUT THE SOIL TO HELP
REDUCE RUNOFF AND LOSS OF NUTRIENTS OR RETAIN
WATER IN SOILS FOR ADDED STRESS RESISTANCE, OR
CREATE ONE THAT COMBINES BOTH ATTRIBUTES."**

-Rob Osburn Ph.D.,
Technical Manager, Product
and Field Development,
Precision Laboratories

A PARTNER FOR PROGRESS

IWOs are an economical way to support water sustainability initiatives while improving growers' profitability potential. Independent research studies support the use of Precision Laboratories IWOs as part of a comprehensive water management strategy.

STRETTA™ TRIAL RESULTS

A research trial was conducted by SynTech Research in Sanger, Calif., on a new planting of Independence variety of almond trees in sandy loam soil.

The trial was done in a small plot replicated design with six replications per treatment. STRETTA was applied during a micro-sprinkler irrigation cycle at an initial rate of 2 quarts per acre, followed by subsequent applications at 1 quart per acre in four-week intervals, for a total of six applications per season. Trees were assessed for growth at the beginning and the end of each season, along with flowering, nut set and nut yield at the end of the trial.



Applying STRETTA, an IWO, through irrigation injection benefits moisture retention, allowing for better growing conditions and reduced tree stress. Results over four years following transplanting showed consistent benefits to trunk development and overall tree growth.



5.7%
INCREASE

average annual increase
in trunk circumference

2.6%
INCREASE

average annual increase
in tree height



Improved tree growth and establishment with the use of STRETTA resulted in greater flowering and nut set, ultimately leading to improved initial nut yield on the young trees.

34.9%
INCREASE
in almond blooms

38.5%
INCREASE
increase in almond nut set

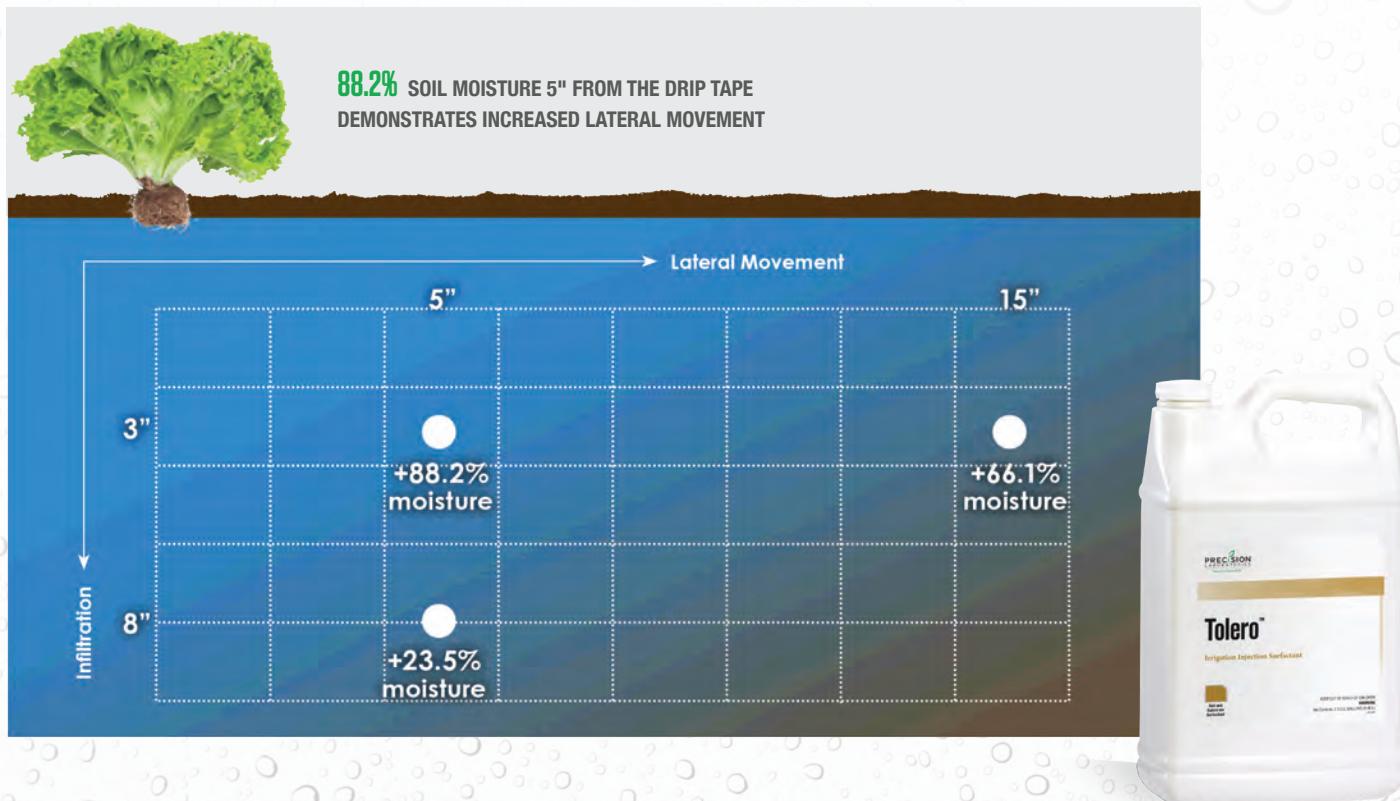
10.4%
INCREASE
increase in almond yield

OUR PORTFOLIO OF IRRIGATION WATER OPTIMIZERS IMPROVES LATERAL WATER MOVEMENT AND INFILTRATION, OPTIMIZING IRRIGATION WATER EFFICIENCY.

TOLERO™ TRIAL RESULTS

A research trial was conducted by Holden Research and Consulting in Camarillo, Calif.

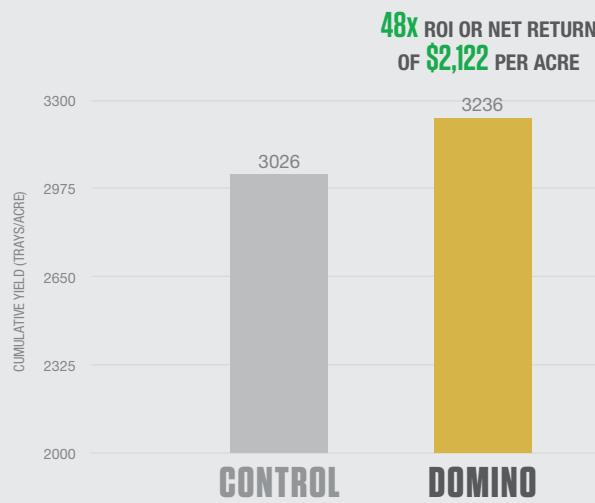
The objective of the study was to evaluate lateral and downward movement of TOLERO in a heavier silty clay soil. Product was applied at 1 qt/acre into a bed of transplanted lettuce via drip irrigation during a 7 hour irrigation cycle. Volumetric moisture content was assessed using a Spectrum Technologies TDR 350 utilizing 3" and 8" probes at 5", 10", and 15" from the drip tape, alternating between the two sides of the bed. Measurements were taken pre-application as well as 1.5, 3, 5 and 24 hours post application.



DOMINO™ TRIAL RESULTS

INCREASED STRAWBERRY YIELD AND PROFITABILITY

Holden Research & Consulting conducted a research trial to evaluate soil surfactant effect on fruit development and yield in a commercial strawberry field. A completely randomized replicated strip trial design was used to test a control and DOMINO. The treatments were injected via drip irrigation at 1 quart per acre for the first application, followed by 1 pint per acre for the remaining applications. A total of five applications were made from November to March. The fruit was harvested from January to April 2019 and assessed for quality and yield characteristics.

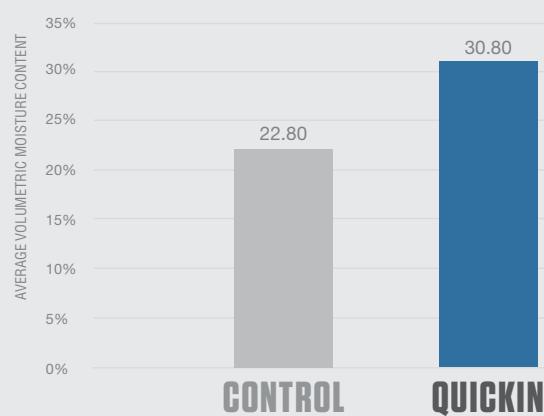


QUICKIN™ TRIAL RESULTS

INFILTRATION STUDY

A commercial cherry grower near Patterson, California, conducted a trial to evaluate the effect of QUICKIN on moisture infiltration in a clay-loam soil prone to runoff. The trial was set up with treated and untreated blocks with QUICKIN applied at a rate of 1 quart per acre through micro-sprinkler irrigation. Infiltration was evaluated 6 hours after completion of a 7-hour irrigation cycle. Ten different measurements of volumetric moisture content were taken in each 25-acre block at an 8" depth using a Spectrum Technologies FieldScout TDR 350 soil moisture meter.

QUICKIN IMPROVED SOIL INFILTRATION AND REDUCED RUNOFF, RESULTING IN AN **8%** INCREASE IN SOIL MOISTURE.

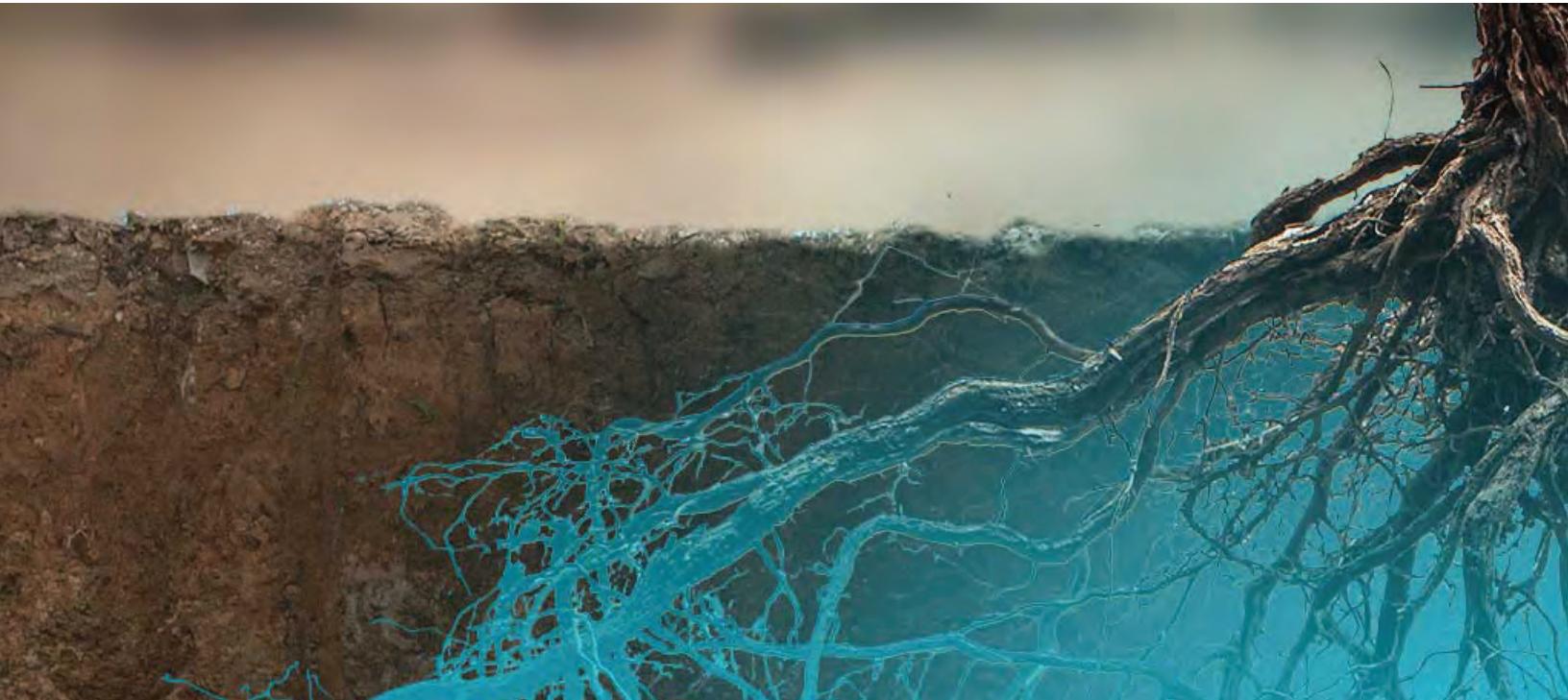


PRECISION LABORATORIES IS DEDICATED TO DELIVERING INNOVATIVE TECHNOLOGIES THAT SUPPORT MORE SUSTAINABLE WATER MANAGEMENT INITIATIVES TODAY AND IN THE FUTURE.

We continue to evolve our product lineup to align with the changing needs of the agricultural and food industries, and we've expanded our portfolio to include IWOs derived from natural, plant-based polymers. Our commitment to collaboration, innovation and planet-friendly practices will help us deliver the most effective, economical products to support more progressive water management strategies.



Learn how Precision Laboratories' IWOs can support your water sustainability efforts at our website: precisionlab.com/IWO.

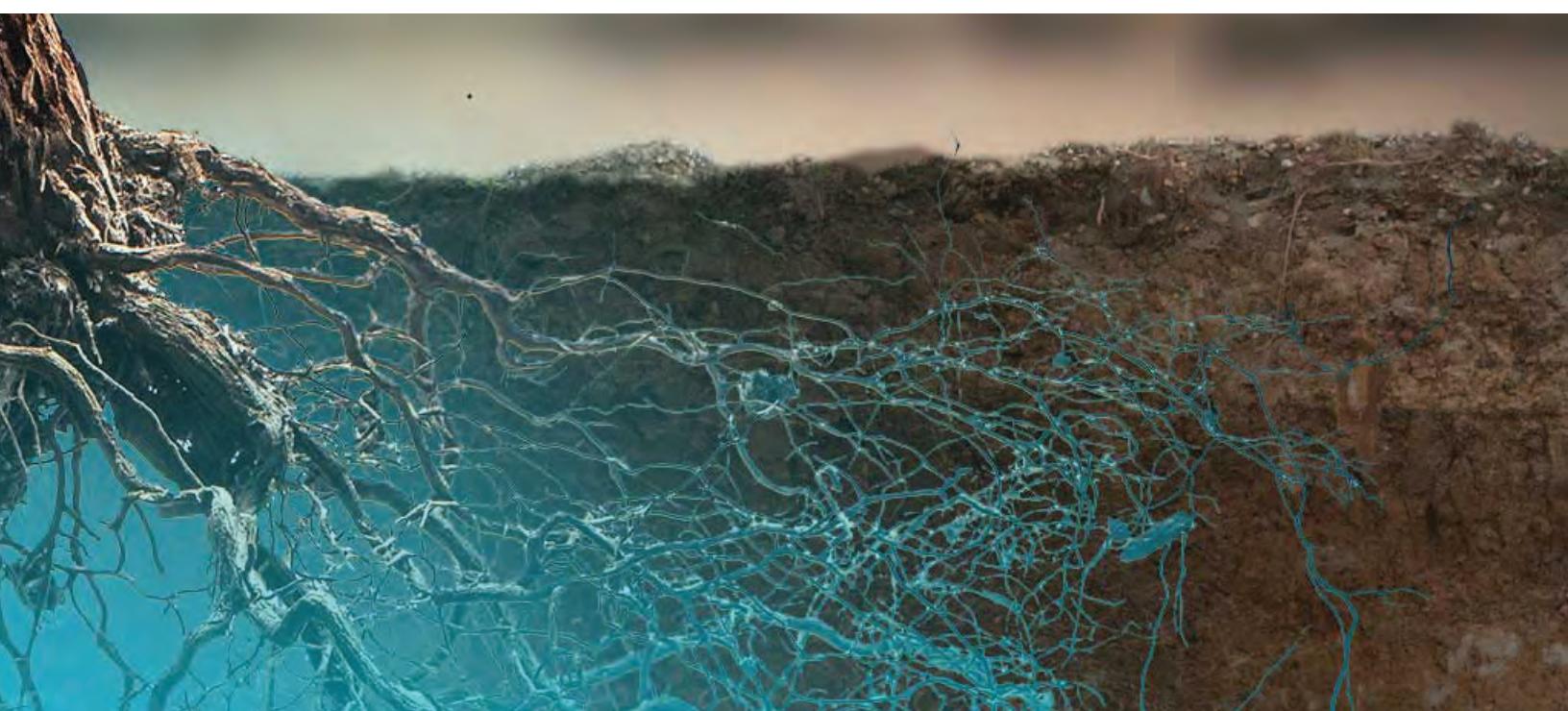


RESOURCES

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Results. Expect it.[®]