Unique water-saving strategies can help vegetable farmers when they need it most.

AquaSpy®

Water-Saving Ideas Amid Drought

FOR FARMERS WHO THINK they've experienced droughts in the past, the 2020-2021 water year brought a whole new level of water scarcity to their vegetable crops as more than 99 percent of the Western U.S. recorded dryness at historic levels.

In California alone, where a $50-billion agriculture industry grows two-thirds of the country's fruits and nuts and one-third of the country's vegetables, farmers' wells have dried up and their access to state surface water allocations were slashed. California's food and agriculture secretary said she expected farmers to idle 500,000 acres of farmland as a result.

Decades of water issues, combined with record-high temperatures, have led to other widespread impacts for the Western U.S. as well, including destructive wildfires, emergency declarations and the first ever water delivery shortfall among the states sharing the Colorado River.

And it's not just the Colorado River. Many rivers, lakes and reservoirs in the West are at extremely low levels, if not record lows. Multiple years of surplus rain and snow are needed to refill them, but today's warmer temperatures speed up evapotranspiration and melt snowpacks faster, making this harder.

Through 2022, the National Oceanic and Atmospheric Administration predicts drought conditions and hotter temperatures will persist, amplifying the decades-long megadrought.

This situation puts immense pressure on farmers to think more creatively and strategically.

Sustainability-minded farmers are using an arsenal of methods to conserve water, including dry farming, finding ways to save or redirect floodwater, increasing organic matter in the soil with cover crops, listening to crops and being more in tune with their specific irrigation needs, implementing crop diversity, saving and monitoring soil moisture, and, most of all, not wasting a single drop.

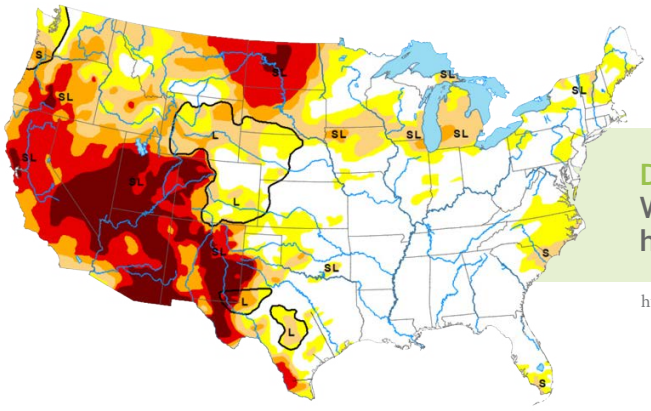
DRY FARMING

Relying on soil moisture alone, dry farmers don't irrigate. They use special tilling practices and pay careful attention to microclimates.

Crops that grow primarily during a rainy season aren't dry farmed; rather, dry-farmed crops are grown during a dry season. It typically occurs in a region that receives at least 20 inches of annual rainfall and uses moisture stored in the soil from the rainy season. The practice can offer farms crop security during times of uncertain water supply.

While dry farming may produce lower yields than irrigated crops (25% to 50% in some cases, according to Oregon State University Extension), it's been known to enhance vegetable flavors.

Some crops that have done well using dry farming include beans, melons, potatoes, squash (winter squash and zucchini), pumpkins, and tomatoes.



DROUGHT MAP
Western U.S. recorded dryness at historic levels.

https://www.climate.gov/maps-data/dataset/weekly-drought-map

CAPTURING FLOODWATER

Some farms are working on projects to capture floodwater when it's available, diverting it and bringing it on their farms to recharge groundwater stores.

The goal is that as weather extremes persist, capturing floodwater prevents downstream damage to nearby communities and enhances groundwater supplies.

Floods, once considered a nuisance to farmers, are now looked at as liquid gold to those who can capture it.

Aggressively capturing and storing floodwaters could make up for 40 percent to 50 percent of the current groundwater deficit, according to California water consultants.

COVER CROPS

A cover crop is a crop that's not intended for harvest. Farmers harvest their vegetable crops and then plant cover crops for the improvement of soil fertility and water quality, as well as to help manage weeds, diseases and pests. They plant cover crops after harvesting their vegetable crops and then terminate them before planting their next vegetable crops.

Over time, this regimen increases organic matter in the soil, leading to soil structure improvements and stability, as well as boosting moisture and nutrient-holding capacity for plant growth.

Studies continue to show that cover crops help stabilize – and even increase – yields and improve moisture availability during increasingly erratic weather. No wonder the number of farms planting cover crops continues to grow – increasing 15.2% from 2012 to 2017, according to the Census of Agriculture.

When it comes to benefit payoff on alleviating compaction and improving nutrient management, farmers can usually expect that in the second or third year of cover cropping.

SUBSURFACE DRIP IRRIGATION

Subsurface drip irrigation is a low-pressure, high-efficiency irrigation system that uses buried drip tubes to meet crop water needs. It's especially useful for arid, semi-arid, hot and windy areas with limited water supply.

The practice saves water and improves yields by applying water directly to the root zones of crops, eliminating surface water evaporation and reducing weed and disease pressure.

With the use of subsurface drip irrigation, strawberry, tomato, potato, cantaloupe, onions and other vegetables have shown improvements in yield and quality, with melon crops maturing earlier and more uniformly, according to Colorado State University research.

Farmers usually must make a higher initial investment with a subsurface drip irrigation system than they do with a traditional system. Costs will vary due to water source, water quality, filtration needs, materials used, soil characteristics and automation needs.

CROP DIVERSITY

Planting the same crop over and over doesn't improve the soil. Different plants release different carbohydrates through their roots, which are consumed by different microbes in the soil and return various nutrients to the plants. Through crop diversity, growers can create nutrient-dense soils that hold water better.

Crop diversification means growing more than one crop in an area, such as a different crop species or different varieties or by changing the cropping system a farmer currently uses. Typically, it means adding more crops to an existing rotation; replacing a low-value

commodity with higher value commodities, such as vegetables and fruits; or integrating livestock (known as mixed farming).

Spreading production and economic risks over a broader range of crops reduces farmers' financial risks associated with unfavorable weather. It's considered one of the more feasible, cost-effective ways to develop a more resilient cropping system.

ADOPT SMART TECHNOLOGY

For years, farmers have relied on gut instinct and field inspections to water their crops. But with today's water shortages, understanding and tuning into crop water needs throughout the season requires more than guesswork.

Using intelligent crop-sensing technology with underground root and soil sensors has been around for years, but installation costs and equipment were expensive and time-consuming to utilize for shallow-rooted or short-season vegetables.

Today, soil sensors have become smaller, lighter and easier to install, taking advantage of long-lasting battery and mobile technology to make them farm-tough and more reliable. Add to that years of vegetable crop intelligence that gives insight into specific vegetable's water and nutrient patterns and needs, and you can add some key insights to your farming arsenal.

One new tool on the market is the Crophesy app from AquaSpy. Farmers can use the mobile app on their smartphones to remotely monitor vegetable health. The Pay As You Grow solution allows users to see daily stats on soil moisture, density, temperature, salinity and water consumption – without stepping foot in their fields. It all comes with a monthly subscription fee similar to a smartphone contract.

To use the app, farmers install a rugged, 3-sensor, wireless soil probe that is included with each subscription. It's water-tight and weather-proof and can be quickly and easily pushed into any soil type. With a minimum five-year battery life, it will last multiple seasons without fail. And it logs data at either the 4-, 8- and 12-inch marks or the 8-, 12- and 16-inch marks.

Crophesy's probe sensors independently send out electrical signals through the layers of soil at the different sensor marks. Then, it uses AgSpy intelligent algorithms to turn those signal readings into actionable metrics and graphs through a Yield Efficiency Score (YES!). The YES! Score adjusts hourly, telling the farmer what the plant roots need to optimize stalk and fruit potential in a particular layer of soil. Each crop type has its own specific needs, guiding the farmer for more precise use of water.

Farmers find that using soil moisture sensors compared to watering how they normally would saves them time, water and nutrients while it improves crop health and yield quality. This is because they learn that some vegetables have completely opposite needs, so watering them the same way would be unproductive. When every drop counts, tuning into specifics for optimized application is critical.

Crophesy™
3-SENSOR PROBES

Research shows that carrots, for instance, don't require frequent irrigation but they are deep drinkers. They drink water slowly and as long as they aren't watered too frequently, they don't get soggy. Watermelon, on the other hand, are regularly thirsty until later in their cycle when too much water can cause disease or leach nutrients away from fully developing the crop.

Research is continuing to show where different vegetable crops can survive with less water and not suffer negative impacts.

GROWING INTO THE FUTURE

While long-term weather changes are difficult to predict, experts expect that by 2050 the global mean temperature will increase 1.5 degrees to 2 degrees Celcius (2.7 degrees to 3.6 degrees Fahrenheit), increasing heat waves, decreasing rainfall, and causing more intense bursts of precipitation when it comes.

At the same time, the population will also continue to increase. Projections show that feeding the world will require raising the overall food production by around 70 percent by 2050, according to the Frontiers research journal.

These changes will push growers to continue to adapt. Researchers predict that only the most resilient farmers willing to try new, diverse strategies will thrive.

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