

Farmers Don't Have Enough Water. Can AI Help?

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For the fourth time in 10 years, farmers I know in California are facing a harsh reality – they won't see a drop of water from federal government reserves to supplement the little bit they'll get from Mother Nature.

Water allocations have become a hot-button issue throughout the state, as citizens, environmentalists and farmers fight for their fair share in a drought that's made it impossible to please everyone.

With no help coming from reserves, farms have been left to draw water from the ground where they can. Working with a fraction of their usual supply, many farmers have no choice but to leave fields fallow, a devastating hit to their bottom line. For smaller farms, that can be the beginning of the end.

But I've also seen a very different approach.

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Precision agriculture – the use of technology like networked sensors and artificial intelligence – is helping farmers get by without the water they once had. The efficiencies are real, and the impact is tangible. I've seen up close how precision agriculture is making a difference for farms facing extreme drought.

But embracing this technology isn't always easy. In fact, it requires fundamentally revisiting our relationship with water in agriculture.

From data to delivery

When it comes to irrigation, precision agriculture gives farmers a leg up in two areas – understanding how their water is being utilized, and maximizing delivery to stay alive.

On the understanding front, data is supplementing – and in some cases rewriting – irrigation practices that were developed over generations. Irrigation was, and still is, viewed as an art form. Farmers have long relied on rules of thumb based on visual signs of water stress in crops, or insights gained from working the land for decades. This ultimately led to irrigation being based on a general feeling, and not much more.

But that artform is changing into a science as we gain access to concrete data, both at the level of individual plants and in the aggregate. This data is stronger than the circumstantial evidence they used to base decisions on, giving them the ability to see what used to be hidden. I'll share an example that's close to home.

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My organization now has more than a billion trees under observation in orchards around the world, with sensors reporting back data every 10 minutes on variables like soil moisture, water absorption, and trunk diameter. With that much information, key correlations emerge that were previously unnoticed. Most of these sensors and the data they collect isn't new – but they have always been presented separately and required a trained eye and purposeful time to draw out the meaning. That's precious time growers don't have.

Now, with immense information available in one place, these systems can anticipate how soil moisture will be affected by factors such as temperature, humidity and wind, and translate

that into predictive algorithms. Herein lies the real potential of this technology: a prescription of exactly where to water and when. The result is an ability to maximize “crop-per-drop” at a level unthinkable even a few years ago.

But knowing that a particular row of trees needs water means very little unless you have the technology to get the water there.

That leads me to the second point – maximizing delivery. According to the World Bank, agriculture accounts for about 70% of the world’s water usage, and even the most efficient methods still result in significant wastage.

Here’s where precision agriculture is helping farmers do better. The key lies in pairing those data-driven insights with smart pumps and valves nimble and responsive enough to deliver water exactly when and where it’s needed.

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Currently, farmers have a single valve servicing a large block of trees. Irrigation is controlled by physically sending someone out to the water pump and its control valves. The duration that water is applied is largely determined by how long it takes that person to finish other tasks before returning to the field to shut off the water. Labor laws also come into play – if the best time to shut the water off occurs after hours, the water often remains on until the next morning. Some fields inevitably get too much water, leaching away nutrients, wasting energy and eroding soil, while others get too little water, compromising plant health, yield and quality. Throw a drought into this formula, and those inefficiencies become an even bigger problem.

With precision agriculture, networked valves and pumps allow for delivering water automatically, providing just enough water, without wastage caused by human factors. In time, with further development of both hardware and software, the large

irrigation blocks we know today could be broken down into smaller sections, making it possible to apply water exactly where it's needed most. Irrigation is well on its way from being a blunt instrument to a resource that can be microtargetted down to a much more precise level.

No way forward without efficiency

These solutions could not come at a better time. While California is in the news now for its three-year drought, water shortages are a challenge familiar to farmers all over the world.

The global population is expected to exceed 9 billion by 2050, which will require a massive increase in food production – all while the world's freshwater supplies dwindle. It's an untenable situation, one that's expected to fuel conflicts in decades to come.

These pressures are already falling squarely on the backs of individual farmers. When you can't get water through government allocations, you have to buy it from more expensive sources. For farmers we deal with, it's often one of the largest expenses in their annual budget.

The good news is that farmers adopting precision agriculture are seeing results, with researchers suggesting irrigation based on networked sensors can reduce water usage between 10 and 25%, with variability based on crop type and geography. As technology improves, that number will only get higher. While not a panacea, that boost can go a long way in surviving a drought without fallowing fields or bulldozing orchards.

As food insecurity grows, a serious conversation on how we prioritize water usage is needed. Environmental concerns will need to be reconciled with basic human needs. Decades-old water allocation rules may need revisiting, not to mention outdated policy initiatives. Fortunately, there are concrete,

actionable steps that individual farmers can take right now to make a difference. The technology currently exists to do more with less, and there's no way forward without it.

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