

# Using New Technology to Prevent Weather-Related Losses in Agriculture



As weather becomes increasingly volatile, farmers' most crucial tool may now be the smartphone.

New technology is transforming the agriculture business, putting real-time information and analysis of every step from planning and planting to harvesting right at the fingertips. Through apps, wireless sensors, "Big Data," improved cellular service, cloud computing, and more, farms large and small are harnessing advanced implements to improve yields, boost efficiency, save resources—and increase profitability.

It's looking like an important advantage as extreme weather continues to frustrate America's farmers and ranchers. The environmental pressures come on top of the rising price of fertilizer, feed, pesticides, and land, as well as an unrelenting surge in demand for food from growing populations around the world.

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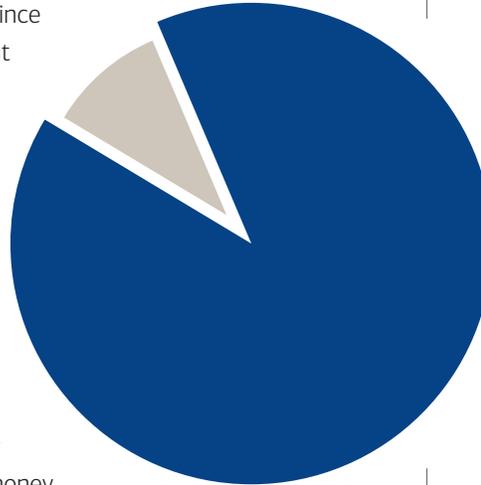
Enter new data-driven technologies, which can crunch vast amounts of information to deliver specifics on real-time conditions to farmers when they need it most. Though solutions to the eternal Man vs. Nature struggle come from countless angles and an array of specialties, the field is most commonly referred to as precision agriculture. A [winter 2014 report by Focus Investment Banking](#)<sup>1</sup> estimates that this growing industry has hit a value of between \$1 billion to \$2.5 billion, and is expected to top \$3.5 billion within five years.

Of course, farmers have wrestled with Mother Nature since the dawn of cultivation. Even today, the U.S. Department of Agriculture estimates that 90 percent of crop losses are related to weather. That's one reason everyone from startup entrepreneurs to the titans of corporate America are sensing new opportunities for applying technology in the agriculture sector, which contributed more than \$775 billion to the U.S. economy in 2012, according to the USDA's Economic Research Service.

Though farmers have always worked hard physically, this new breed of data-driven technologies offers many the chance to work smarter and, possibly, make more money in the process. And while the old adage "Everyone talks about the weather, but no one does anything about it" has long drawn chuckles, several companies are putting more control than ever in farmers' hands.

### Meteorology by mobile

Among the most promising products: hyperlocal climate predictions that can give specific, actionable details on a field-by-field basis. One promising new player is Climate Corporation, a San Francisco-based company started by former Google engineers that tries to replace guesswork with actual numbers about what's happening on the ground. Its central software platform divides the nation's more than 2.9-million croplands into small grids and tracks the weather occurring in each one now and for the past eight years, as well as running the probabilities about



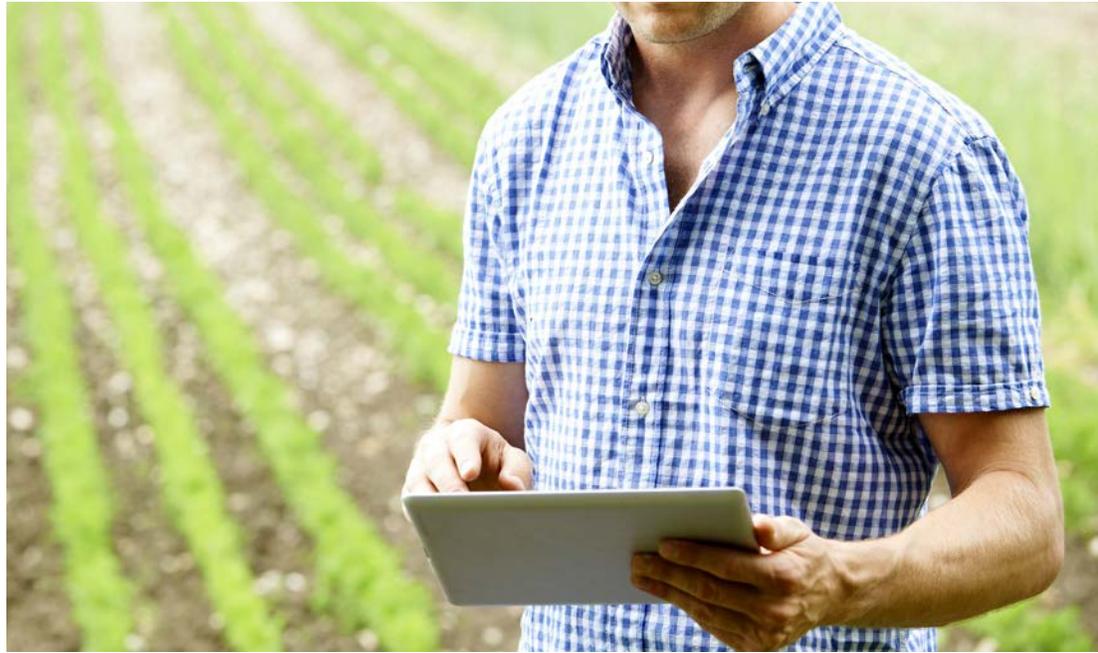
“Even today, the U.S. Department of Agriculture estimates that 90 percent of crop losses are related to weather.”



what is still to come. With remote sensors, geospatial mapping, and forecasting algorithms, users can stay informed, quite literally, at a granular level. Soil quality, field workability, details on nitrogen, pests and disease, precipitation, temperatures, and right on up to revenue advisories for harvest projections and their relation to commodities markets—all of this is accessible via a smartphone, tablet, or desktop. Depending on the crop, access to the company’s Climate Plus product costs \$15 per acre, and promises to raise yields enough to push up profits by \$100 an acre for corn, for example. (The entry-level version, Climate Basic, is free.)

Also of interest: Researchers from IBM are experimenting with its Deep Thunder super-computing technology to make more specific and accurate weather forecasts for individual farmers in the drought-prone Flint River Valley in southwest Georgia. Partnering with scientists from the University of Georgia, NOAA, and local agencies, the team is working to integrate soil-moisture sensor networks, variable-rate irrigation systems, and more precise weather data to better conserve water and other resources to lower usage (and bills) by as much as 15 percent. How? The IBM approach breaks down atmospheric information and real-time weather forecasts into 10-minute chunks as far out as 72 hours ahead, and determines when precipitation, and how much, will fall exactly where on its regional grid of kilometer-wide squares, and at what intensity it will fall and be absorbed into the soil.

The resulting site-specific data is transmitted to farmers’ desktops, laptops, tablets, or smartphones, and then lets them decide if, for example, it’s best to hold off on irrigation because strong thunderstorms are developing or, conversely, turn it on if a certain field missed the rainfall. “They’re not being shy about telling us the things that work and the things that don’t,” says Lloyd Treinish, IBM’s chief scientist and the lead on the Deep Thunder project. “But if we take a step back, these type of things could apply many places and the opportunity to help make more food available for parts of the world—that’s a pretty good opportunity. Improving yield, making more food available, conserving water and energy—this can all have a profound environmental and economic impact.”



## The cost-benefit analysis

Farmers have always sought out the most efficient tools, with affordability chief among their criteria. It's a conservative business, where profit margins are often slim even in the best of seasons.

That's the main reason why precision agriculture has shown a slow rate of adoption so far, says Sara Olson, a research analyst at Lux Research in Boston. In a [November 2013 report](#)<sup>2</sup>, Olson wrote that precision-agriculture systems cross over into cost-effectiveness for operations larger than 5,000 acres, but so far the extra yields are likely not enough to cover the associated expenses for smaller operations. For example, a technology that touts a \$20 to \$40 per acre increase in yield could mean as much as \$40,000 in extra revenue for a 1,000-acre farm. But if a precision service was charging as much as \$30 an acre to achieve that yield bump, it would likely mean losses after equipment adjustments and new gear are factored in, Olson's report concluded. Yet with a fully integrated system—with one wireless sensor per acre, weather forecasting, and integrated decision support—the savings on labor, water, fertilizer, and fuel can be compelling for large operations.

For those ready to test out precision technologies, Olson suggests soil-moisture sensors and irrigation-management systems as the place to start, with a high payoff and a quick return on investment. She points to USDA data that shows just 6.1 percent of U.S. farm acres utilize irrigation and calls this area “the low-hanging fruit” of smart solutions.

“The [farmers] that are investing in precision technologies are ahead of the curve.”

Jocelyn Boudreau,  
CEO of Hortau, a  
California-based  
smart irrigation  
systems company

## Innovations

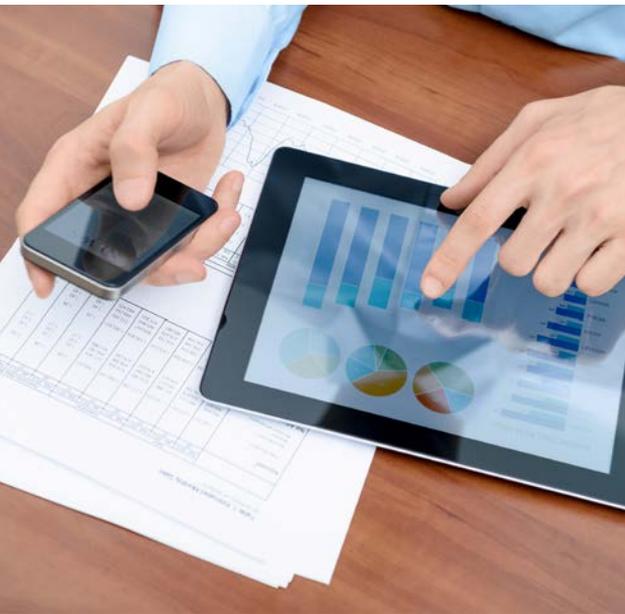
Just as farmers seek to do more with fewer resources, companies in the precision-agriculture sector are tailoring their products toward that same goal. No two farming operations are alike, but several companies are finding niches that solve problems in an economical way across the diverse landscape of environmental and financial conditions.

In the heart of bone-dry California is Hortau Inc., a San Luis Obispo-based company that makes “smart” irrigation systems that allow growers to manage water distribution via mobile devices. Its wireless monitors gauge soil moisture, control diesel- or electric-run pumps that turn drips or sprinklers on and off, all of which can lower water bills by as much as 30 percent. Jocelyn Boudreau, co-founder, chief executive, and soil engineer at Hortau, says these moisture sensors determine



the precise point when and where plants get stressed from too little water, which triggers the rest of the system to respond and keep crops from breaking down, in the worst case, or, in the best case, helps maximize yields.

Depending on the size of a farm's operation and the crops involved, the price per acre is around \$20 to \$40 for the first three years, which includes all of the equipment and a monthly subscription service for service and the secure data system. (After that term, the price comes down to \$5 to \$10 per acre.) "Farmers have to keep running their business even in these dry conditions now," Boudreau says. "And without data, it's almost impossible. The ones that are investing in precision technologies are ahead of the curve, mitigating the problems. But the ones that are doing things the way their great-grandfathers did, it's really tough. It's a huge challenge to stay in business."



### Management payoff

That business end is the focus of Cogent 3D's iCropTrak software, which approaches precision agriculture from the management angle, allowing users to collect, access, and analyze data on everything from soil and irrigation conditions to crop planning to the labor, schedules and outcomes for the wider business, including add-ons for things like timesheets and weather forecasting. Aaron Hutchinson, president and co-founder of the Tucson, Arizona-based company, points to one more valuable upshot: a precise reading of water usage that's increasingly required for regulators in states where droughts are common

headache. iCropTrak's pricing considers the numerous hands it takes to lift the heavy load of a modern farm: Unlike the prevailing technology models that charge by the acre, iCropTrak's pricing is based on the number of users and devices, allowing, for example, harvesters or machine operators to sign in and out and create an audit trail of cost- and time-efficiency for every resource, especially water.

Then there's the free model, by way of Silicon Valley. The FarmLogs app combines features like remote rainfall tracking, operations scheduling, soil and performance measures, inventory and market indicators, and historic weather data via the National Weather Service for specific fields—all available via smartphone or tablet. It's a favorite among the younger

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Aaron Hutchinson,  
president and  
co-founder, iCropTrak

generation of farmers, who are harnessing vastly improved rural high-speed Internet access and cellular connectivity. Among the innovations the company is working on: a geofencing capability, which will use sensors to alert farm managers in real time when connected machines enter specific fields.

“Farmers are at heart entrepreneurs,” says iCropTrak’s Hutchinson. “They’re used to taking risks and bidding long—you buy that seed the year before you plant it. But you won’t get paid until the next fall. That deferred gratification is built into the farmer and isn’t what’s naturally built into most of the culture. They appreciate the risk and reward because they can see the risk and reward. Not everyone is able to think that if they do something now there’s a payoff there on the horizon.”

<sup>1</sup>Focus Investment Banking, Winter 2014 report: [http://www.focusbankers.com/publications/pdfs/FOCUS\\_Precision\\_Agriculture.pdf](http://www.focusbankers.com/publications/pdfs/FOCUS_Precision_Agriculture.pdf)

<sup>2</sup>Lux Research, November 2013 report: [https://portal.luxresearchinc.com/research/report\\_excerpt/15529](https://portal.luxresearchinc.com/research/report_excerpt/15529)

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