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New technologies promise savings in labor, water and other inputs, but California growers still need to know whether the numbers hold up in their own operations.

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Ecorobotix's ARA precision sprayer uses camera-guided technology to target applications in the field. Cover story, page 6. Photo by Kristin Platts.

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Getting Back to the Fundamentals

By **JASON SCOTT**, *Publisher & Founder, Enterprise Ag Magazine*



> "A tool earns its place when it makes an important part of the operation work better."
> – *Jason Scott*

A micro-sprinkler delivers water beneath an orchard tree. Routine irrigation system checks are one of the everyday management practices that can help keep an operation running efficiently. (Photo by Kathy Coatney)

I LIKE A big idea. Give me a new way to grow a business or put technology to work, and you've got my attention. With everything happening in AI and automation, there's plenty to get excited about.

But when we're looking for ways to improve our businesses, I think there's a question we ought to ask first: How well are we doing the things we already know matter?

You know your ground, your crops and the work it takes to get through a season. The challenge is keeping that work consistent when you're managing more acres, more people and a long list of decisions that all seem urgent.

That's where the fundamentals deserve another look. Is the irri-

gation system getting checked? Is someone following through on the PCA's recommendations? Is the equipment ready when the crew needs it? These are everyday management questions worth asking before the next busy stretch.

The Value of Getting the Basics Right

The financial side deserves the same attention. I want to know where a business is making money and where it's giving it away. On a farm, that means looking beyond overall production numbers and understanding what it costs to produce and deliver a marketable crop.

For example, saving $25 an acre in avoidable expenses across 1,000 acres leaves $25,000 in the business, assuming revenue and other costs stay the same. That's worth looking for. The key is finding waste without cutting something the crop needs.

Then there's communication. Saying something needs to get done is easy. Making sure somebody owns it, understands the expectations and follows through takes more effort. As owners, we also have to give people the information and support to do the job well.

A short weekly conversation with the right people can help. What needs to happen this week? What's holding it up? Where do we need to make a decision? Give your team room to speak up. The person closest to the work may see a problem before it reaches your desk.

Making Technology Work for You

I'd bring the same questions to any new technology purchase. What problem will it solve? Who will use it? How will we know it's helping? A tool earns its place when it makes an important part of the operation work better.

My suggestion is to pick one recurring frustration this month. Maybe it's a repair that keeps getting postponed or a job that regularly takes longer than expected. Get the people involved together, agree on a better way to handle it and check back to see whether it worked.

That's the kind of conversation I want Enterprise Ag to encourage: practical ideas you can take back to your operation and use. We can learn a lot from one another by sharing what's working and being honest about what still needs attention.

Keep looking for the next opportunity. While you're at it, take a fresh look at the work already in front of you. There may be more room to improve there than you think.

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> "The person closest to the work may see a problem before it reaches your desk."
>
> *– Jason Scott*

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What Does AgTech Have to Prove?

By **KRISTIN PLATTS** *Editor*

New technologies promise savings in labor, water and other inputs, but California growers still need to know whether the numbers hold up in their own operations.



> "The tech needs to solve a real problem, work reliably under real farming conditions and make financial sense for the grower's farming operation."
>
> *– Helle Petersen, UC ANR Innovate*

UC Cooperative Extension irrigation researcher Michael Cahn discusses a mobile irrigation monitoring system developed with Huntington Farms. Cahn reported approximately 20% water savings and 30% nitrogen fertilizer savings over four years of use. (All photos by K. Platts)

AGRICULTURAL TECHNOLOGY companies are offering California growers new ways to reduce labor, conserve water and cut input costs. But as more equipment enters the market, growers face a familiar question: Will the investment pay off?

The answer depends on more than what a machine can do during a demonstration. Growers need to know how it performs under commercial conditions, what it costs to operate and whether the savings justify the investment.

Those questions were part of a recent UC Agriculture and Natural Resources (UC ANR) Connect AgTech Field Day near San Juan Bautista, where companies demonstrated precision spraying equipment, soil treatment technology and other tools aimed at improving production efficiency. UC researchers also presented technology developed in collaboration with growers.

Helle Petersen, director of UC ANR Innovate, said growers should start by determining whether a technology addresses a problem in their operation.

"The tech needs to solve a real problem, work reliably under real farming conditions and make financial sense for the grower's farming operation," Petersen said.

Growers also need to look closely at manufacturers' claims and how the results were achieved.

Measuring Savings in the Field

Michael Cahn, a University of California Cooperative Extension (UCCE) irrigation researcher based

in Salinas, presented a mobile irrigation monitoring system developed in collaboration with Huntington Farms.

The system addresses a challenge in Salinas Valley vegetable production, where growers often have multiple fields at different stages of development and use both drip and sprinkler irrigation.

Drip systems operate at much lower pressures than sprinklers. When pressure is too low, water distribution can become uneven, affecting fertilizer applied through the drip system. Growers may compensate by irrigating longer or applying more fertilizer.

Cahn and his collaborators developed a mobile platform equipped with a pressure regulator, flow meter and sensors to monitor irrigation performance. Information is transmitted to UC-developed CropManage software, allowing irrigators to check pressure and flow remotely.

During his field-day presentation, Cahn reported water savings of approximately 20% and nitrogen fertilizer savings of 30% over four years of using the system at Huntington Farms.

Petersen said multi-year field results can be valuable when evaluating new technology.

"Having four years of results is good because it gives you more confidence that the savings hold up across seasons, rather than just under one set of conditions," she said.

Growers considering similar technology would still need to evaluate how the results might differ under their own conditions, along with the costs of installing and operating the system.

The value of those savings can also change as water, energy and fertilizer prices fluctuate.

"I would want to know whether the investment still makes sense in a year when the savings are smaller or input prices are lower, after accounting for the ongoing costs of using the technology," Petersen said.

The project received funding through the California Department of Food and Agriculture's State Water Efficiency and Enhancement Program. Local irrigation company Brigantino Irrigation assembled the mobile equipment.

The Costs Growers Don't Always See

Even technology that delivers measurable savings can come with expenses beyond the purchase price. Installation, training, subscriptions, maintenance and repairs all affect the return. Growers also need to consider how much time employees





High Degree Machinery demonstrates its steam-based soil treatment technology, which uses heat to manage soilborne diseases and weeds before planting. The company is developing the service as an alternative to soil fumigation.

spend monitoring equipment, interpreting data or completing tasks the technology can't handle on its own.

Petersen said downtime can be especially costly during planting and harvest, when growers have limited windows to complete fieldwork.

"If it stops working during planting or harvest, how quickly can you get help or replacement parts? You have a limited window to get that work done, so downtime can quickly eat into the expected savings," she said.

Cahn's irrigation system provides an example. The equipment uses cellular connectivity to transmit data at a subscription cost of about $10 per month. Cahn said connectivity has generally been reliable in the Salinas Valley, although some locations require an additional antenna. The system also contains filters that need periodic cleaning.

"So, all these tools are great, but if you don't maintain them, you're going to find out in a year or two they're not working," Cahn said.

The equipment was designed to move between fields, an important consideration in vegetable production.

Cahn explained that some automated irrigation companies have concentrated on permanent crops, where irrigation infrastructure remains in place. That equipment doesn't necessarily meet the needs of vegetable growers who move irrigation systems as crops are planted and harvested.

"I think in the Salinas Valley, we have to sort of innovate for what we need," he said.

A Different Approach to Soil Treatment

For some technologies, growers don't need to purchase equipment at all.

Salinas-based High Degree Machinery is developing a steam-based soil

treatment service aimed primarily at strawberry production. Founder Austin Bowie said the technology uses steam to heat soil to approximately 160 to 180 degrees Fahrenheit to manage soilborne diseases and weeds before planting.

High Degree charges approximately $5,000 per acre for strawberry treatment, which Bowie said is comparable to current fumigation costs.

The company sees particular opportunities in organic production and conventional acreage where fumigation is restricted by buffer zones near homes or other sensitive sites. Rather than purchasing specialized equipment, growers pay High Degree to perform the treatment.

Bowie said the company has conducted research through grants involving UC Santa Cruz, although those trial results have not yet been published. He also pointed to previous research on soil steaming that has shown promising results compared with fumigation.

High Degree is still refining its equipment and expects to expand its fleet over the next several years, according to Bowie.

While the service model eliminates the need for growers to purchase and maintain machinery, treatment effectiveness, equipment capacity and the ability to complete work within planting windows will determine how widely the technology can be used.

What Do Input Reductions Really Save?

Precision spraying equipment offers another opportunity to reduce production costs, particularly where growers make multiple applications throughout the season.

At the field day, Ecorobotix demonstrated its ARA precision spraying system, which uses cameras, artificial intelligence and individually controlled nozzles to identify plants and direct applications. The machine can be used for thinning, weeding and targeted crop applications.



Caylin Cole, Ecorobotix's pre-sales regional manager for the Southwest, discusses the company's ARA precision spraying system during a UC ANR Connect AgTech Field Day near San Juan Bautista. (Photo by K. Platts)

Caylin Cole, Ecorobotix's pre-sales regional manager for the Southwest, reported spray material reductions of approximately 65% to 85%, with the higher end reflecting his experience operating the machine. Cole said the equipment can cover 60 to 80 acres per day once operators become familiar with it.

Those reductions could represent significant savings, but the amount of material used is only one part of the financial calculation.

Petersen said growers should ask the manufacturer a few questions about how they arrived at their results.

"I would ask, 'What are you comparing it with?' If a company says it saves 30 percent, what crop was that in, under what conditions and over how much time?"

Growers also need to account for equipment costs, annual acreage, maintenance and whether crop performance is maintained.

Labor savings require similar scrutiny.

"A technology might let that person do other work, which can be really useful, but replacing a task does not necessarily mean replacing a job," Petersen said.

A machine that allows employees to accomplish more work may improve efficiency without reducing payroll expenses. Both benefits have value, but they affect the return on investment differently.

Making Technology Fit the Operation

New equipment may also require changes to existing production practices.

Ryan O'Callaghan of Seminis Vegetable Seeds, part of Bayer Vegetable Seeds, discussed how plant breeding is evolving to accommodate automated field equipment.

The company is working on broccoli characteristics that allow automated harvesters and camera systems to identify and cut crowns more accurately. Seed uniformity is also be-



A close-up of Ecorobotix's ARA precision sprayer shows the equipment positioned above young crops. The system uses camera-guided technology to target applications and reduce spray material use. (Photo by K. Platts)

coming more important as precision planting and automated equipment depend on consistent plant spacing.

"As they develop technology, we've got to make sure our stuff's adaptable," O'Callaghan said.

Petersen said compatibility with existing equipment, crews and farming practices should be part of any investment decision, since technology that requires extensive changes to an operation may create additional costs or complications.

She also encouraged growers to look for results from comparable farms and, when possible, test equipment on a smaller scale before making a larger investment.

The Value of Independent Testing

As more agricultural technologies enter the market, independent research can help growers determine whether manufacturers' claims hold up under commercial conditions.

Petersen said UC ANR can provide that perspective through testing at research and extension centers and on cooperating farms.

"Growers need credible validation and an unbiased perspective," she said.

UCCE advisors bring knowledge of local crops and production systems, while agricultural economists can help evaluate costs, savings and potential payback. UC ANR Innovate connects growers and technology developers with those resources.

The technologies demonstrated near San Juan Bautista address different production challenges, but growers still need to know how they'll perform in their own fields. That means looking beyond a demonstration or a manufacturer's savings claims.

Petersen said firsthand experience can help growers make that decision.

"Seeing results from similar farms, and having an opportunity to test it themselves, can go a long way toward building that confidence," she said.

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A mobile irrigation monitoring platform developed through a collaboration between UC Cooperative Extension and Huntington Farms uses pressure and flow monitoring equipment to help growers manage irrigation. (Photo by K. Platts)

AGTECH BY THE NUMBERS

20%
Water savings reported by UC Cooperative Extension researcher Michael Cahn over four years at Huntington Farms

65%–85%
Spray material reductions reported by Ecorobotix for its ARA precision sprayer

30%
Nitrogen fertilizer savings reported by Cahn over the same four-year period

$5,000
Approximate per-acre charge for High Degree Machinery's strawberry soil treatment service, according to founder Austin Bowie

$10
Approximate monthly cellular data subscription cost for the irrigation monitoring system, according to Cahn

60–80
Acres per day Ecorobotix's ARA sprayer can cover once operators are familiar with it, according to company representative Caylin Cole

> "A technology might let that person do other work, which can be really useful, but replacing a task does not necessarily mean replacing a job."
>
> *– Helle Petersen, UC ANR Innovate*

PUBLISHER'S TAKE



The Big Picture: What to Do Next

❶ Identify the problem
Determine what you need the technology to improve, whether it's labor efficiency, water use or input costs.

❷ Verify the savings
Ask manufacturers for field results, what the savings were measured against and whether the technology has been tested on comparable farms.

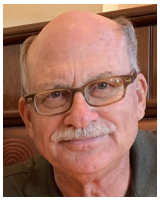
❸ Calculate the full cost
Factor in installation, training, subscriptions, maintenance and potential downtime, not just the purchase price.

❹ Evaluate the fit
Consider how the technology will work with your existing equipment, employees and production practices.

❺ Test before investing
Look for opportunities to trial the technology on a smaller scale and measure the results under your own growing conditions.

❻ Seek independent results
Look for testing at UC ANR research and extension centers or on cooperating farms, not just manufacturer claims.

What Makes Farm Technology Useful to Me



By **GARY OSTEEN** *Contributing Writer*

Start with a job that needs doing, try the tool in your operation and help your people become comfortable using it.



> "I still have to do the scouting and understand the crop. The software helps me work with the information I collect."
>
> – *Gary Osteen*

An agricultural drone makes a field application. Gary Osteen recommends testing new technologies under representative field conditions before expanding their use. (Photo by K. Platts)

I SPEND MY TIME looking at crops, talking with growers and deciding what needs attention. When I look at technology, that is the work I have in mind. I want to understand how a tool helps me collect information, use it or get it to the people who need it.

There are useful opportunities in that everyday work. A scouting observation needs to become a record. A measurement needs to help us understand the field. A grower needs information that supports a decision. That is where I would begin when considering what an operation should invest in next.

Start With Something You Already Do

Tellia has been very helpful in my work. I have used it for a little over a year, and it is getting better and better. It lets me talk into my phone while I am scouting and records my observations, inspections and trapping information.

It organizes that information by grower and field. It includes maps, identifies where I am and lets me retrieve the information to prepare reports for growers. That fits directly into a job I am already doing in the orchard.

What I like is being able to describe what I see while I am there and have it organized so I can use it afterward. I still have to do the scouting and understand the crop. The software helps me work with the information I collect.

If you are considering something similar, start with a report your operation needs. Follow it from the field observation to the person who receives it. Who records the information? How do you know which

> “Be clear about who will collect the information, who will look at it and what decision it will help you make. When those pieces are understood, the measurement has a place in the operation’s regular work.”
>
> *– Gary Osteen*



Monitoring equipment installed in an almond orchard illustrates the importance of collecting field data. Sensor placement and field variability must be considered when interpreting measurements, according to Osteen. (Photo by T. Chalstrom)

block it belongs to? Can the manager or grower get back to it when a question comes up?

Have the people who will use the tool work through a real task. Let them see how it fits into their day and how the information reaches the next person. You will have a much clearer idea of its value.

Know What the Measurement Represents

Irrigation monitoring can help us make decisions, but placement is important to getting useful information. You need to know the soil and the trees around a monitoring point. Then you can think about how well that point represents the area you are managing.

Fields vary. A reading from one tree or a small area gives you information about that location. When you are making a decision for a larger acreage, you need to put that reading alongside what you know about the rest of the field.

I would discuss that with the adviser before expanding a monitoring program. Where should we collect information? Which parts of the field are similar? Where do we need another observation? Knowing your ground helps you decide how to interpret what the system tells you.

Pressure chambers are good tools, too. You also have to account for the time and people needed to take readings at the appropriate time of day. That practical side matters when you are deciding how a monitoring program will work throughout the season.

Be clear about who will collect the information, who will look at it and what decision it will help you make. When those pieces are understood, the measurement has a place in the operation’s regular work.

Use AI for a Useful Information Task

Another tool I use is ChatGPT. Sometimes I have a product in the back of my mind and cannot quite remember its name. I can ask about it and get an answer, or several possibilities, that help me recognize what I was trying to remember.

That has been useful for information searches. Once I have an answer, I check it to make sure it is right before putting the information to use.

For a farm operation, that is a practical place to start thinking about AI. Find an information task where assistance would help. Decide who will review the result and how it will be used. Keep the process understandable for the people doing the work.

AS FEATURED IN THIS ISSUE
TALK WHILE YOU SCOUT. WE'LL WRITE THE REPORT.
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> “Bring that perspective into the conversation with your own field records and staff experience. Then choose a useful improvement, put it to work and see what you learn.”
>
> *– Gary Osteen*

Give People Time to Get Comfortable

Getting comfortable with a new tool means learning the vocabulary and understanding what the system is asking you to do. I need to know what information to give it and how to ask for what I want back.

Training should connect those steps to familiar field work. Take an observation from an orchard your team knows. Enter it, find it again and show how someone else will use it. That gives the terminology a practical meaning and lets people ask questions as they go.

The provider can be a useful partner in that process. Ask for explanations and demonstrations around the jobs your employees actually perform. Make sure the people expected to use the system have an opportunity to practice. Their understanding is part of making the investment work.

Try It on Representative Ground

If you want to evaluate a new approach in your own fields, keep the first comparison manageable. Find a representative area with similar conditions. You might divide a field, use the approach in one part and compare it with the other part.

You should know your fields well enough to choose a sensible location. Think about the soil, crop condition and other differences that could affect what you see. The purpose is to learn how the approach performs under your conditions.

Decide what you are looking for before you begin. If the question involves a crop response, know what you will observe. If it involves reporting, look at how the information is collected and used. Give the comparison a clear purpose that everyone involved understands.

I did an exploratory drone application trial in almonds this season that showed some potential. It gave me something to keep evaluating. That is a useful way to approach a promising first result: understand what you saw and decide what you need to learn next.

Review the conditions around the result with your adviser. Keep the comparison straightforward, but pay attention to details that affect its meaning. Your own field experience can help you decide whether an approach deserves a broader evaluation.

Put the Next Investment Where It Helps

If you ask me to choose among equipment, technology, training and more crop advising, I naturally lean toward advising. But each can be worthwhile. The right choice depends on what is holding the operation back and what improvement would help the work get done.

If you need more capacity to cover your acres on time, look at equipment. If people need a better understanding of their jobs, look at training. If a tool can help with a specific information task, give it a practical evaluation with the people who will use it.

The same thinking applies to familiar work such as residual weed management. Each field can have a different weed complex. Know those differences and build the program around them. Good information is useful when it guides the work.

Our work takes us to 45 growers each week across different sites and management programs. We see what works under different conditions. Bring that perspective into the conversation with your own field records and staff experience. Then choose a useful improvement, put it to work and see what you learn.

Comments about this article? We want to hear from you. Feel free to email us at article@jcsmarketinginc.com

PUBLISHER’S TAKE



The Big Picture: What to Do Next

1. **Start with a real need**
   Identify a specific task or problem before investing in new technology.
2. **Understand your measurements**
   Consider soil conditions, field variability and sensor placement when interpreting data.
3. **Use AI as a tool, not a final authority**
   Verify AI-generated information before using it to make decisions.
4. **Invest in employee training**
   Give workers opportunities to practice with new tools using familiar tasks.
5. **Test before expanding**
   Evaluate new technology under representative field conditions before committing to a larger investment.

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What 16 West Coast Orchards Taught Us About Automation

By **M. ANNE VISSER**, *Ph.D., UC Davis*

Eighteen months inside West Coast tree fruit operations suggest AgTech pays off when experienced growers and workers help shape it, not when it is designed to work around them.



> "For owners and executives, worker input before purchase is not a courtesy. It is due diligence."
> – *M. Anne Visser, UC Davis*

Experienced orchard workers bring knowledge and judgment that automated systems cannot always replicate. Research across 16 West Coast tree fruit operations found that human expertise remained essential to successful technology adoption. (Photo by tuquibraun/Shutterstock)

STAND IN AN APPLE ORCHARD during harvest and ask a grower what keeps them up at night. You will hear about labor: whether the crew will come back next season, whether H-2A timing will work out, what wages will look like in five years. Increasingly, you will also hear about machines. Will the fruit counter be accurate enough to plan harvest and contracts around? Will platforms pay for themselves? Is a robotic harvester three years away, or thirty?

For tree fruit operations, automation is not simply a technology question. It is a capital planning problem. A platform fleet or a sensing system is a major investment made against assumptions about how work will get done and who will do it. When those assumptions turn out to be wrong, expensive equipment ends up parked at the edge of the block.

That reality sits at the center of research our team at UC Davis recently published in New Technology, Work and Employment. Between 2023 and 2025, we followed 16 tree fruit operations across California and Washington, ranging from 200 to more than 5,000 acres. Our team spent 25 weeks working alongside crews, riding platforms and joining troubleshooting sessions when machines broke down. We also interviewed 165 owners, managers, crew leads and workers. Much of the conversation around AgTech assumes technical capability decides which tools succeed. Across fruit counting, orchard platforms and robotic harvesters, the strongest pattern we found was simpler. Technology worked when experienced people were positioned to interpret, correct and adapt it. It struggled when it was introduced as a way around them.

The Value of Human Experience

On one apple orchard, we compared an 18-year picker's pick-or-leave decisions with a fruit-maturity sensor the farm was testing. Over 200 apples, they agreed 76% of the time. When they disagreed, the orchard manager sided with the picker in all but three cases. The sensor measured two or three variables. The picker, in the manager's words, was integrating "maybe twenty": sun exposure, how the tree had performed all season, a cold snap back in May.

We call this kind of work human middleware. It is the skilled, often invisible labor that keeps autonomous systems functioning in an environment as variable as an orchard. We saw it everywhere. On another ranch, an automated counting system projected 420 bins for a block. The ranch manager adjusted that to 385 based on spring pollination and tree vigor, and landed within 2% of the actual harvest. The system made him better informed, but the call, and the accountability for it, remained his.

Why Implementation Matters

Orchard platforms showed how much the method of introduction matters. On one operation, platforms were chosen and rolled out without consulting the crew. Workers repeatedly flagged that the machines could not handle the orchard's row spacing, and the system was eventually abandoned. On another, a committee of managers, crew leads and workers piloted three platform models before purchase. The workers rejected management's preferred model because sightlines and ease of use mattered more to productivity than its technical specifications. The farm followed their recommendation. Worker-driven changes to deck layout and training followed, and productivity rose. It was the same category of machine, with opposite outcomes.

Robotic harvesters, the most ambitious goal in tree fruit automation, remained largely experimental across our study. One manager calculated that the harvester his operation was testing ran at less than one-third the speed of a human crew with double the cull rate. He judged it economically unviable even after accounting for labor savings. Many growers still see robotic harvest as a real long-term possibility, but most likely one with people kept in the loop.

That finding matters because it reframes a central assumption in the automation conversation. Labor shortages are often treated as an engineering problem: identify the bottleneck and design it out. Better machines matter enormously. But our findings suggest adoption depends as much on how technology is introduced as on what it can do.

At the same time, growers face real pressure. One orchard manager told us some seasons they lose up to 40% of the previous year's crew to almonds, construction or visa timing. Add compliance requirements that favor data that is "documentable and defensible," and an industry culture that increasingly rewards looking innovative, and it is easy to see why automation looks like a way to reduce dependence on experience that keeps walking out the door. Yet experience still mattered. On one orchard, when seven veteran crew members fell ill for several weeks, the remaining crew fell 30% behind schedule, even with a platform system meant to simplify the work.

Finding a Middle Ground

Some operations are already finding a workable middle path. One farm moved from ladder to platform harvest over three seasons through attrition rather than layoffs. Workers who stayed moved into platform jobs paying roughly 15% to 25% more, and new hires started on ladders to learn to read target fruit first. Other operations paired veterans with newer workers in formal mentorship programs. Some evaluated new tools collectively through industry research commissions and university test orchards, and one farm brought its system operator,

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orchard manager and vendor together after the season to work out why a yield forecast missed. Different approaches, same principle: technology works best when the people who run it are treated as partners in its design rather than obstacles to it.

The broader lesson is straightforward. The work of keeping these systems running is more demanding and more site-specific than the work it replaces, yet it is often still paid as unskilled labor. That leaves a retention risk sitting directly beneath a capital investment. Many of the farms we studied had already begun adjusting pay structures to address it.

Protecting the Investment

For owners and executives, worker input before purchase is not a courtesy. It is due diligence. Piloting equipment with the people who will operate it, budgeting for the human oversight a system will need, and building pay steps for tech-skilled roles protect the investment itself.

For technology developers, the orchard is not a factory floor. Tools designed from the start for human interpretation and correction are more likely to survive their first season than tools designed to eliminate it.

For industry organizations and policymakers, shared testing infrastructure deserves serious attention. Where growers had access to collaborative research networks, they could evaluate technology collectively before betting on it alone. It is also worth asking whether compliance frameworks unintentionally discount the judgment of experienced workers simply because it is harder to document.

The growers and workers who opened their gates to us were not resisting technology. As one manager put it, "We aren't luddites." They were asking for technology that works in a real orchard: tools that respect operational realities, build on the knowledge already in the rows, and reward the people who make them perform.



Orchard platforms can improve harvest efficiency, but Anne Visser's research found that involving workers in equipment selection and implementation was critical to successful adoption. (Photo by Baloncici/Shutterstock)

West Coast agriculture has absorbed every wave of mechanization that came before. The farm of the future is being negotiated now, block by block. Its success may depend not only on what the machines can do, but on whether the people who make them work have a seat at the table.

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To read the full paper, visit https://onlinelibrary.wiley.com/doi/epdf/10.1111/ntwe.70047

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PUBLISHER'S TAKE



The Big Picture: What to Do Next

❶ Involve workers before investing
Include experienced operators and crew leaders in equipment evaluations before making major purchases.

❷ Test equipment under real conditions
Pilot automation in working orchards to identify limitations before committing to a full rollout.

❸ Budget for human oversight
Account for the skilled workers needed to operate, troubleshoot and adapt automated systems.

❹ Invest in workforce training
Develop training, mentorship and compensation structures that recognize employees' growing technical responsibilities.

❺ Make adoption a team effort
Work with employees, technology developers and research organizations to evaluate and improve equipment performance.

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From Pilot to Payback

By **KEITH LORIA** *Contributing Writer*

As California growers plan their 2027 investments, technologies must demonstrate measurable savings, fit existing operations and perform beyond the initial demonstration.



> "If you can't point to a line item in a spreadsheet where this technology is going to reduce costs, then you need to go back and do some more homework."
>
> *– Ben Palone, Western Growers Association*

A customer uses Netafim's GrowSphere MAX to turn field information into physical control of irrigation and fertigation, helping crews automate repetitive tasks and respond faster. (Photo courtesy of Netafim)

CALIFORNIA AGRICULTURE is entering a more disciplined phase of technology adoption. Artificial intelligence is finding its way into everything from weed control and harvest equipment to irrigation management. The harder question is what happens after the demonstration.

A pilot can show that a machine recognizes weeds, a sensor detects a pressure change or a platform organizes field data. A commercial investment must do more. It has to lower a known cost, fit the production schedule and keep working through dust, heat, wet ground, changing crops and different operators. It also must justify subscriptions, connectivity, training, maintenance and downtime.

That distinction is shaping 2027 investment plans. With margins tight and labor, water and input costs elevated, growers are becoming less interested in technology as a category and more interested in proof, asking themselves what line item will change, how quickly will the investment pay back and what must the operation change to capture the projected savings?

For Ben Palone, senior director of automation and commercialization for Western Growers Association, that proof starts with the operating budget.

"Reduced operational costs are first and foremost," Palone said. "If you can't point to a line item in a spreadsheet where this technology is going to reduce costs, then you need to go back and do some more homework."

Put a Number on the Problem

Automated weeding and thinning are among the clearest current examples because they address labor-intensive jobs with established per-acre costs. Western Growers' financial case studies examine purchase and operating expenses, acreage covered and savings under commercial conditions. In one case involving a laser weeder in high-density vegetable crops, hand weeding had cost about $900 per acre. The automated program reduced the total to approximately $500 to $600 per acre.

The machine's weight limited how soon it could enter after irrigation, and it performed best while weeds were small. The grower adjusted irrigation timing and staggered plantings to create a workable operating window.

That is a central lesson in calculating return on investment. Utilization matters as much as capability. A machine creates no return while it is parked because the soil is too wet, the crop is beyond its operating window or a replacement part has not arrived. The relevant measure is not the acres it can cover in ideal conditions, but the productive acres it can reliably complete within the farm's schedule.

Payback expectations also vary. Palone noted early adopters often want a machine to recover its cost a couple of years before the end of its depreciable life, providing a cushion for the risk of buying newer equipment.

Melissa Lilze, senior vice president of Netafim North America, sees many California growers seeking a return within two to three growing seasons.

"Beyond that, the assumptions become harder to assess, especially when the investment competes with equipment repairs, labor and other immediate needs," Lilze said. "Annual crops and leased ground usually require a faster return, but almonds, pistachios, vineyards and other permanent crops can support a longer period when the investment protects crop quality or productive acreage."



A customer uses Netafim's FertiKit 5G in a controlled-environment agriculture operation, linking monitoring with control to apply water and nutrients more precisely in the crop's active root zone. (Photo courtesy of Netafim)

Proof From a Commercial Field

TopFlavor Farms in the Salinas Valley provides one example of a pilot becoming a production program. The operation runs two Verdant Robotics SharpShooters across head lettuce, romaine, green Boston, endive, cilantro, beets and other specialty crops. The machines make the early weeding pass, followed later by hand crews.

TopFlavor compared that hybrid program with its previous fully manual system. With one machine, hand-labor costs came in 29% below the old baseline, representing approximately $500,000 in savings. The equipment paid for itself within one season, according to Daniel Alameda, a third-generation grower at TopFlavor.

"We'd tried other technology years earlier, such as in-row cultivators and early-generation directional sprayers, and the ROI simply wasn't there," Alameda said. "The SharpShooter is the first tool that took a real bite out of that, which is why we bought the second machine and why we're now evaluating a third."

The return depends on using the equipment as part of a coordinated program rather than treating it as a complete replacement for people. Historically, crews weeded twice. The machine now eliminates the early hand pass and leaves a cleaner field, allowing workers to move faster when they return.

"Those savings only materialize if you actually manage the hand-labor program behind the machine," Alameda said. "You have to let the machine make the decisions, trust the work it did and adjust what comes after it. It isn't a machine replacing a crew; it's a machine setting the crew up to work faster and more consistently on a cleaner field."

Count the Costs After Purchase

TopFlavor's experience also illustrates why the purchase price is only the beginning of an ROI calculation. The farm pays an annual subscription of approximately $50,000 to $75,000, depending on configuration. The fee includes field support, training, software updates, repairs and maintenance.

Training was not a major expense because the SharpShooter operated like an advanced cultivator. On other projects, however, manager time becomes a hidden cost as someone coordinates installation, training and troubleshooting.

Lilze recommends that growers establish a block-level baseline before installing irrigation automation or remote monitoring. That means documenting water, pumping energy or fuel, fertilizer, irrigation labor, weed-management costs, maintenance, yield and packout. The ownership model should then include communications, subscriptions, replacement sensors, calibration and staff time.

The strongest irrigation returns, she said, generally occur when monitoring is connected to physical control. Flow and pressure monitoring, remote alerts and pump and valve automation can eliminate routine field checks and warn crews about leaks, failed valves or missed irrigation sets. Precision fertigation can reduce losses by delivering nutrients closer to crop demand and the active root zone.

"Some of the most valuable returns never appear on a traditional ROI spreadsheet because they represent losses that never occurred," Lilze said. "When evaluating technology investments, growers should consider both the resources they save and the risks they avoid."

Make the Pilot Resemble Production

Demonstrations are designed to show technology at its best. A commercial field introduces weed pressure, uneven terrain, dust, variable crop size, changing light and operators with competing responsibilities. Technology companies and growers therefore need to test not only whether a tool works, but whether it performs consistently at production speed.

Yang Fang, founder and CEO of California agricultural robotics company Beagle Technology, said reliability is especially important during harvest.

"A machine working well for a two-hour demo is very different from working every day during harvest," Fang said. "A cheaper machine with a lot of downtime can ultimately be much more expensive."

BY THE NUMBERS

29%
Reduction in hand-labor costs TopFlavor Farms reported with one machine, about $500,000 in savings, according to grower Daniel Alameda

$500–$600
Per-acre weeding cost with an automated laser-weeding program in high-density vegetables, down from about $900 by hand

$50K–$75K
TopFlavor's approximate annual subscription, depending on configuration

100+
Ag-tech ROI calculators Ben Palone of Western Growers has reviewed

When dealing with harvest equipment, Fang noted a one- to two-year payback attracts attention, but the model must include acres harvested, seasonal utilization, maintenance and downtime. A breakdown during harvest can cost more than the repair when a perishable crop is left in the field.

Palone has reviewed more than 100 ag-tech ROI calculators and regularly sees capacity assumptions that do not reflect commercial use. A precision weeder, for example, slows as weed density rises. Some projections even include gains expected from future equipment versions.

"You can't fold that future performance into the calculation and cost today," Palone said. "You have to look at what the machine can actually perform at now."

A stronger pilot starts on consistent fields where a dedicated team can learn the equipment and accumulate productive acres. The machine should face normal operating conditions, but it should not be sent immediately into the farm's worst field and expected to solve every problem. Its output also should not be counted fully in the production plan until the team understands its limits.

Service may be the most important test. Growers should establish who will respond, how quickly technicians and parts are available and whether the equipment can operate manually when communications fail. For systems using computer vision, Palone recommends asking how quickly a vendor can retrain a model for a new soil color, weed, crop or field condition. A response measured in weeks or months is a warning when the production window may last only days.

The 2027 Test

The technologies positioned for broader adoption in 2027 turn intelligence into an action the operation already understands. That includes automated weeding and thinning, precision application, labor-saving harvest equipment and irrigation systems connecting field conditions with pumps, valves and flow control.

AI is likely to gain ground when it is embedded in equipment and workflows rather than presented as another platform to manage. A dashboard that delivers more data but no clear next step can add labor instead of reducing it. A system that alerts a manager to a pressure loss, directs an application or helps a machine distinguish crop from weed has a clearer path to value.

The return does not have to come from eliminating a crew. At TopFlavor, the SharpShooter changes when workers enter the field, how quickly they move and how predictably the farm can budget a volatile expense. Alameda said growers can start with current hand-weeding costs per acre, use realistic machine utilization and work backward from a one- to two-year payback.

"Labor is the one input cost we can push back against," Alameda said. "With fuel, fertilizer and chemistry, we're bystanders in those purchasing decisions. This is a tool that lets us do something about the one line we can influence."

For growers evaluating their next purchase, that is the practical divide between a promising pilot and a durable investment. The technology that earns a place in the 2027 budget will not be the one with the most impressive label. It will be the one that performs through an entire season, fits the people and equipment already on the farm and leaves a measurable return after every cost is counted.

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PUBLISHER'S TAKE



The Big Picture: What to Do Next

1 Start with the numbers
Identify the specific labor, water or input costs a technology will reduce before investing.

2 Set a baseline first
Record current labor, water and input use by block so you can measure what a new tool actually saves.

3 Calculate realistic payback
Base projections on actual field conditions, productive acreage and equipment utilization.

4 Look beyond the purchase price
Subscriptions, training, maintenance and downtime can significantly affect returns.

5 Test before committing
Make sure equipment performs reliably under everyday field conditions, not just during demonstrations.

6 Evaluate vendor support
Confirm that repairs, replacement parts and technical assistance will be available when needed.



More Than a Wage Increase: What the 2026 AEWR Update Means for Growers

By **NATALIE D. GUPTON**, *MPA, CFRE, Vice President and Chief Operations Officer, AgSafe*

Under the 2026 AEWR update, classifying H-2A jobs correctly is no longer just paperwork. It is a wage decision.



> "The 2026 AEWR update reinforces an important reality: Job classification is a wage decision, not just paperwork."
> – *Natalie D. Gupton, AgSafe*

H-2A wage compliance begins with a clear understanding of the work employees perform in the field.
(All photos courtesy of AgSafe)

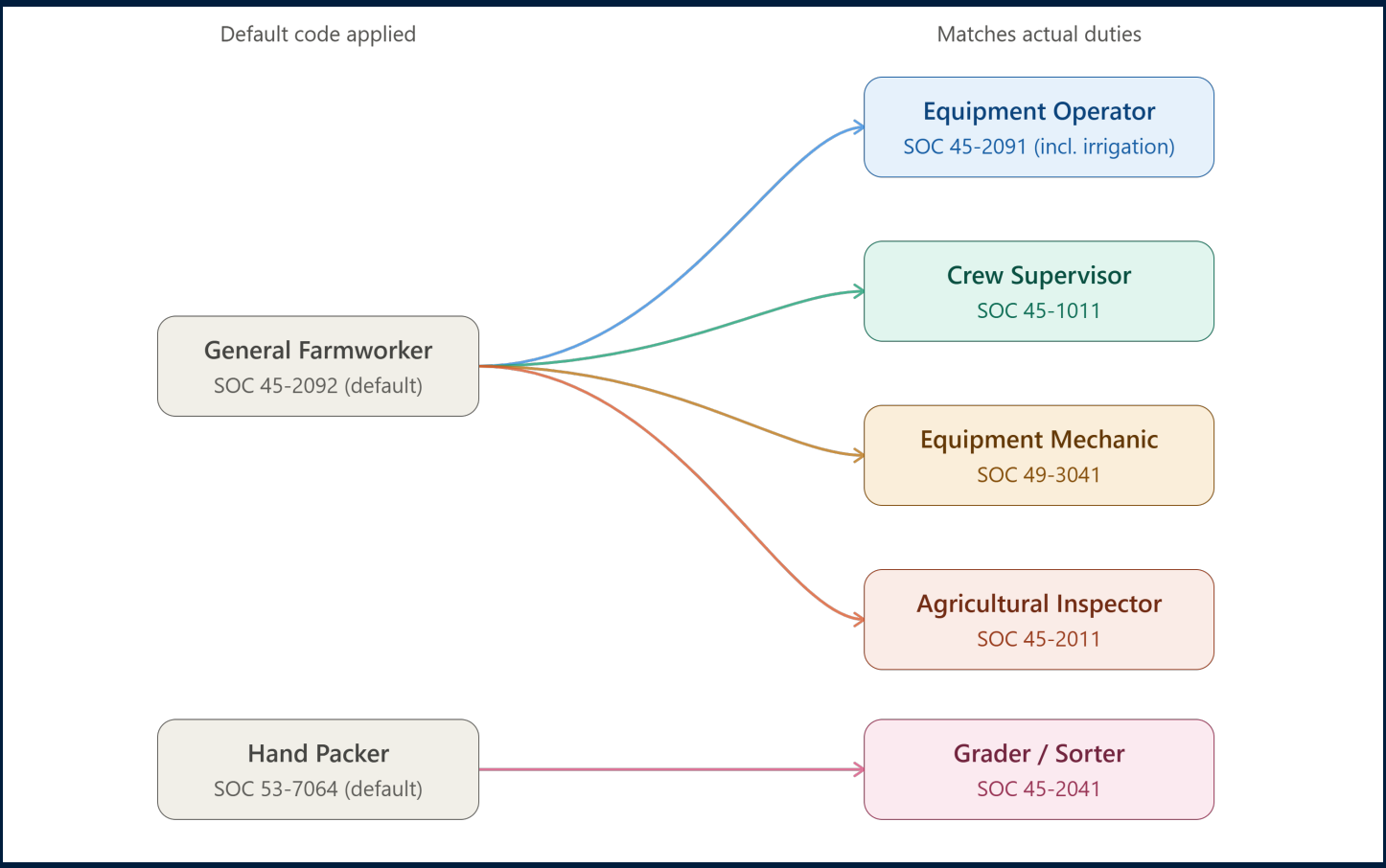
THE H-2A PROGRAM has become a core part of the agricultural labor supply. The U.S. Department of Labor certified nearly 398,000 H-2A positions in fiscal year 2025, and H-2A workers now account for roughly one-sixth of the U.S. agricultural workforce. That growth has arrived alongside a redesigned wage-setting process: under the Department of Labor's (DOL) revised methodology, non-range Adverse Effect Wage Rates (AEWR) are now published annually on July 1, based on Bureau of Labor Statistics occupational wage data, with pay tied to occupation and skill level rather than a single blended farm wage.

For many employers, the annual AEWR update has traditionally meant checking the new rate and moving on. The 2026 update calls for a broader review because employees' daily duties now help determine their wages. Employers cannot assume one rate applies to every H-2A worker on the farm.

Whether you operate a vineyard, dairy, orchard, vegetable operation, nursery, or custom harvesting business, now is the time to review how each position is classified. Employers who do this now build confidence for audits, avoid payroll surprises, and reduce the risk of wage violations.

One Farm, Many Jobs

Agricultural employees often wear multiple hats. During harvest, one worker may drive a tractor, supervise a crew and haul product in the same day. DOL's methodology considers the duties an employee performs most often, not the job title. A Washington orchard, for example, may hire pickers alongside workers running harvest platforms and forklifts; those roles should not share a classification. Similarly, a vegetable operation's crew leaders, who coordinate schedules and handle quality control, will need a



Examples of agricultural job functions and their corresponding SOC codes. Employers should determine the appropriate classification based on actual job duties and qualifications.

different classification than general field labor.

Job Titles Don't Determine Compliance

A title on an application does not establish compliance. Calling someone a "general farmworker" may be inaccurate if the employee primarily runs specialized equipment or maintains irrigation systems. Job descriptions and SOC codes should reflect those primary duties.

What Misclassification Actually Costs

Misclassification isn't a paperwork technicality; it carries real financial exposure, and agriculture is a consistent DOL enforcement priority. Recent H-2A cases show how fast the numbers add up: a Nevada onion grower paid $2,338,700 in back wages to 1,365 workers plus a $500,000 civil penalty; an Alabama tomato operation paid over $18,000 after underpaying domestic workers relative to its H-2A crew, a corresponding-employment violation.

Exposure tends to compound: FLSA back wages recoverable for up to three years if willful, civil penalties that can exceed $2,000 per violation, state penalties that can add $5,000 to more than $25,000 per violation, and unpaid payroll taxes. For H-2A employers, willful or repeat violations can also jeopardize standing in the program itself, a risk that often outweighs the back wages from any single finding.

Annual Reviews and Your Domestic Workforce

Wage and classification reviews deserve the same annual attention as safety and compensation programs, because new equipment, automation, expanded crops or cross-training can all shift job duties without anyone updating the description. Employers should also review corresponding employment: when domestic workers perform substantially the same job as H-2A workers, they must receive the same applicable wage. For farm labor contractors, the annual update affects bonding too, since DOL uses the average AEWR to calculate required bond amounts, worth reviewing each year rather than waiting for license renewal.

Why the Stakes Are Higher for Larger Operations

For larger growers, compliance risk does not just scale with size; it compounds:

- More classifications, more room for error. A single misapplied SOC code doesn't cause one wage mistake; it applies to every worker under that job order, which is why enforcement cases involve thousands of workers at once.
- Multistate footprints create a compliance patchwork. AEWRs are set state by state, and litigation over DOL's methodology has at times

applied unevenly, leaving multisite operations to track different rules by location.

- Headcount multiplies exposure faster than it multiplies risk. Back wages and penalties are calculated per worker and per violation, so a manageable error at a 20-worker operation can become a seven-figure liability at 500 workers.
- FLC relationships extend liability. Enforcement actions often name both the contractor and the grower who used its crews; joint employer findings can reach the operation that benefited from the labor.
- Audit and reputational visibility are higher. Larger growers are more likely to face retailer or processor supply-chain compliance requirements, turning an enforcement action into a customer relationship issue.
- Program access is a continuity risk. For operations that depend heavily on H-2A labor, willful or repeat violations that threaten program eligibility can put next season's labor supply at risk, not just create a bill.

None of this means larger operations are inherently riskier employers. It means the cost of an undetected error is higher, and compliance systems need to scale with the size and complexity of the workforce.

Six Steps Every Agricultural Employer Should Take Today

1. Download the current AEWR tables. Ensure payroll, HR, and recruitment staff are using the latest wage information.

2. Review every job description. Confirm each position reflects primary duties instead of copying prior-year language.

3. Verify occupation codes. Ensure each position aligns with the appropriate SOC code used in the H-2A application.

4. Review active payroll. Make required wage adjustments promptly if the updated AEWR affects current contracts.

5. Evaluate corresponding employment. Review wages for domestic employees performing substantially the same work.

6. Review bond requirements. FLCs should confirm whether updated average AEWR calculations affect required bonds.



When employees perform multiple roles, proper classification and task-specific training are essential.

Compliance Is Good Business

Most agricultural employers aren't trying to cut corners; they're trying to grow crops, manage labor shortages, and stay profitable. But as the H-2A program evolves, compliance expectations are becoming more detailed. The 2026 AEWR update reinforces an important reality: Job classification is a wage decision, not just paperwork. Reviewing classifications now can help employers avoid compliance problems and focus on running their operations.

AgSafe is a nonprofit 501(c)(3) organization (EIN 68-0259724) established in 1991 and recognized as an educational leader in agricultural safety, human resources and leadership development. The organization provides training, education, and practical tools to support agricultural employers, supervisors, and workers in promoting safe workplaces, regulatory compliance, and effective leadership practices. Headquartered in California, AgSafe delivers programs nationwide, including Hawaii and the Pacific Islands, through in-person instruction, virtual learning, and partnerships with industry organizations. Agricultural employers and those seeking additional information about AgSafe and its services can visit www.agsafe.org, email safeinfo@agsafe.org or call 209-526-4400.

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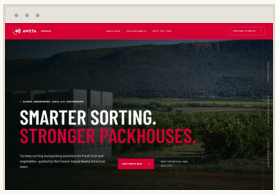
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Budgeting for the Unknown

By **KEITH LORIA** *Contributing Writer*

With fertilizer, fuel, water and financing costs difficult to predict, California growers are building 2027 plans around flexibility, cash flow and the ability to change course.



> "Uncertainty remains higher than normal. Diesel and UAN-32 fertilizer prices are heavily influenced by energy markets, while water costs can swing dramatically depending on weather conditions and water allocations."
>
> *– Matt Woolf, Terrain*

Irrigation and fertigation infrastructure represents an ongoing investment for California growers, who must account for water, fertilizer, energy and equipment costs when developing annual budgets. (Photo by K. Platts)

GROWERS TACKLING their 2027 operating budget are finding it's no easy task, as the challenge is no longer simply determining what fertilizer, fuel, labor, water and equipment will cost, but deciding how much uncertainty the operation can afford to carry.

These days, prices can change quickly, water availability is constantly altering production plans and interest rates are impacting the economics of buying inputs early or financing machinery.

What's more, commodity returns may not provide enough margin to absorb unexpected increases. And for permanent-crop growers, changing acreage or switching crops is rarely a simple response when the numbers move in the wrong direction.

That is pushing budgeting beyond a single set of assumptions and making the timing of purchases almost as important as the price itself.

"California farmers are facing substantial uncertainty around fertilizer prices and availability," said Steven Fenaroli, managing director of public affairs and communications for the California Farm Bureau. "Fuel, labor, water, insurance, equipment and regulatory costs are adding pressure at the same time commodity prices and farm returns have not kept pace."

The evidence of that pressure was clear in an American Farm Bureau Federation survey released in April. Among 249 California respondents, 67% said they could not afford all the fertilizer they expected to need

without reducing either applications or acreage. Nearly 62% described their financial situation as worse than the previous year, while another 32% said it was unchanged.

In 2027, that combination is changing the goal of the budgeting process. Rather than attempting to predict one precise outcome months in advance, growers may be better served by identifying their largest exposures, protecting liquidity and building enough flexibility into their plans to react as conditions change.

A Budget Built Around Variables

Among the expenses California growers are watching most closely are energy, fertilizer, labor and water, according to Matt Woolf, Ph.D., specialty crop analyst at Terrain, an agricultural economics and market intelligence service.

"Uncertainty remains higher than normal," Woolf said. "Diesel and UAN-32 fertilizer prices are heavily influenced by energy markets, while water costs can swing dramatically depending on weather conditions and water allocations."

Labor offers somewhat greater visibility because minimum wage increases are generally known ahead of time. Availability remains an issue, Woolf noted, but has become less of a pain point in recent years.

Other expenses are proving harder to pin down. For instance, Farm Bureau survey respondents identified fuel as the most common additional concern beyond fertilizer, followed by labor, regulatory costs, water, insurance, equipment and crop-protection products. For some, transportation has become another major variable.

"For us, fuel costs are quite high, and there are these intangible costs of driver shortages on the trucking side of our business," said Duncan Young, principal of San Francisco-based Saorsa Growth Partners, which provides fractional CFO services and works with agricultural businesses. "As finding qualified drivers becomes increasingly competitive, we can't be certain of our freight costs, since we may have to pay drivers more or contract with third parties if we continue to have retention problems."

Insurance presents a different problem because an operation may know the premium but still have difficult decisions to make about the amount of risk it wants to transfer.

"Insurance has also been increasingly painful over the last several years," Young said. "Given rising rates, I'm increasingly leaning toward holding more cash."

That emphasis on cash is likely to play a larger role in 2027 planning as growers weigh discounts against the financial cost of committing money months before an input is needed.

Pre-Buy or Wait?

In a volatile market, purchasing early can provide price certainty and protect against potential shortages. But the Farm Bureau survey suggests many California growers have been reluctant to lock in fertilizer well ahead of use.

Only 62 of the 249 respondents, or about 25%, had pre-booked fertilizer. Of those who had not, 72 said prices were too high, 54 cited uncertainty about acreage and 48 were waiting for prices to decline. Even among the growers who had pre-booked, fewer than half had locked in more than 50% of their expected needs.

Those numbers illustrate the dilemma. A pre-buy may lower the purchase price or eliminate exposure to a later spike, but it can also tie up working capital, generate financing costs and create storage and inventory risk. The decision, therefore, cannot be made on price alone.

"Interest rates, inventory levels, supply-chain conditions and oil futures are all useful market signals," Woolf said. "How much is purchased through a fixed-price agreement versus the spot market is farmer-dependent, since each grower will have a different level of risk tolerance."



Compost application is one of many field operations growers must account for when budgeting for inputs, equipment and labor. (Photo by Roger Duncan, UCCE)

The same principle applies outside inputs. Young experienced the other side of prepayment when one of his clients received money early from a cash-rich customer.

"For us, it was interest-free cash that offset the cost of our working-capital facility," Young said. "Our bank didn't incorporate prepayments into its borrowing-base calculations, so we also effectively increased our credit line at the same time."

The lesson for growers is that the value of an early transaction depends on what happens to cash after the agreement is signed. A discount that appears attractive on an invoice may be less compelling once borrowing costs, storage, insurance and the opportunity cost of the capital are included.

Contracts Can Reduce Risk, Not Eliminate It

Fixed-price agreements offer another means of controlling uncertainty, but contracts introduce their own risks.

Young sees that firsthand in organic grain, a market that does not trade on an exchange and relies heavily on bilateral agreements. High commodity prices have shortened the horizon for some buyers that might otherwise have contracted through the following harvest.

"Where we used to see contracts around this time of year heading out to the following harvest, we're seeing a lot more customers hesitant to contract at the current market prices," Young said. "If they thought they'd go up, they'd be booking, but they aren't."

That reluctance creates another form of exposure. Buyers that wait may benefit if supplies improve and prices decline, but they risk having less product available if the market stays tight.

Contracts themselves do not remove counterparty risk.

"In practice, we contract by the quarter with weekly truckload targets, but in this business you sometimes have to give to get," Young said. "Reputation is the real enforcement mechanism in a bilateral market, and it's more durable than any contract provision."

That means when growers evaluate suppliers, they place added value on reliability rather than simply the lowest quoted price. A procurement plan built around a bargain is of little value if the product does not arrive when it is needed.

Carrying Inventory Comes at a Price

Additional storage capacity can give agricultural businesses another option as it allows them to buy or retain inventory when conditions are favorable and carry it until it is needed or until a contracted delivery date arrives.

But storage is not free, and holding inventory can quietly turn procurement into speculation.

"Contracting end-of-season prices and holding all year can be great if you have the balance sheet to support it and have good storage facilities," Young said. "That said, any time you're betting on the price, you're betting."

His preference is to separate operating expertise from market speculation whenever possible.

"If you're best at managing assets, collect a premium there and use contracts to manage price risk," Young said. "If your edge is predicting weather and reading global markets, then bet on price and pay someone else the asset-management premium."

That distinction matters for a 2027 procurement strategy. More storage or larger inventories may create financial value when they support a known operational need or contracted sale. They become more dangerous when the expected return depends primarily on guessing where a commodity price will move.

Preserve Cash Before Adding Equipment

The same cash-flow discipline applies to machinery. Higher borrowing costs and tight margins are making growers more cautious about whether to purchase equipment, lease it, continue repairing an existing machine or postpone replacement.

Fenaroli noted the credit environment has become a significant concern.

"Interest rates are a huge concern for ranchers," Fenaroli said. "A lot of banks are looking at ways to help people make their payments, or are just writing fewer loans. As a whole, it is a tough time economically right now."

Young recommends resisting the temptation to view available credit as proof that an equipment purchase makes financial sense.

"From what I can tell, the banks love to lend to ag, which can make it easy to borrow your way into equipment, but that equipment depreciates," Young said. "Just because your lender marks the collateral at a certain price doesn't mean it'll sell for that when you need to sell it."

An asset sale involving one of his clients reinforced how uncertain equipment values can be. The agricultural machinery market remained relatively localized, and equipment moved slowly until the seller gained a better understanding of where demand existed.

Plan Several Versions of 2027

Perhaps the biggest change growers can make in preparing for 2027 is to stop treating the annual budget as a single prediction.

Woolf recommends scenario analysis that tests the operation against different combinations of commodity prices, water availability and input costs.

"Rather than rely on a single forecast, many growers evaluate how their operation would perform under different commodity prices, water availability and input costs," Woolf said. "The goal is usually about maintaining flexibility rather than predicting the future."

Those scenarios can create decision points before a crisis develops. A grower may establish the commodity price at which acreage no longer generates an acceptable return, the water-cost threshold that changes an irrigation or planting decision or the input increase that requires spending to be pulled back elsewhere.

For annual-crop producers, that may mean reducing acreage or switching crops when projected margins no longer justify the investment. Permanent-crop growers have fewer options, making contingency planning and liquidity even more important.

"The scenario analysis provides more clarity for when it's a good time to fallow part of the land or place greater emphasis on pulling in input spending," Woolf said. "Maintaining flexibility is more important

than assuming one forecast is going to be correct."

That may be the most useful principle for growers entering another uncertain budgeting cycle.

The strongest 2027 plan may not be the one that predicts fertilizer, diesel, water or interest rates correctly. It may be the one that identifies what the operation will do when those assumptions prove wrong.

"Plan for the worst and hope to weather the storm," Fenaroli said. "California Farm Bureau is doing what we can to ease regulatory pressures and ensure the farmer can remain profitable."

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PUBLISHER'S TAKE



The Big Picture: What to Do Next

1 Build flexibility into the budget
Develop multiple financial scenarios for 2027 rather than relying on a single forecast for input costs and commodity returns.

2 Protect working capital
Evaluate whether early purchasing discounts justify tying up cash or taking on additional financing costs.

3 Look beyond the lowest price
Consider supplier reliability, delivery schedules and contract terms when making purchasing decisions.

4 Weigh equipment purchases
Compare buying, leasing, repairing or postponing equipment investments while accounting for borrowing costs and depreciation.

5 Set financial decision points
Identify the commodity prices, water costs and input increases that would trigger changes in spending or production plans.

6 Keep speculation separate
If you store inputs or crops, use contracts to manage price risk instead of betting on the market.

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